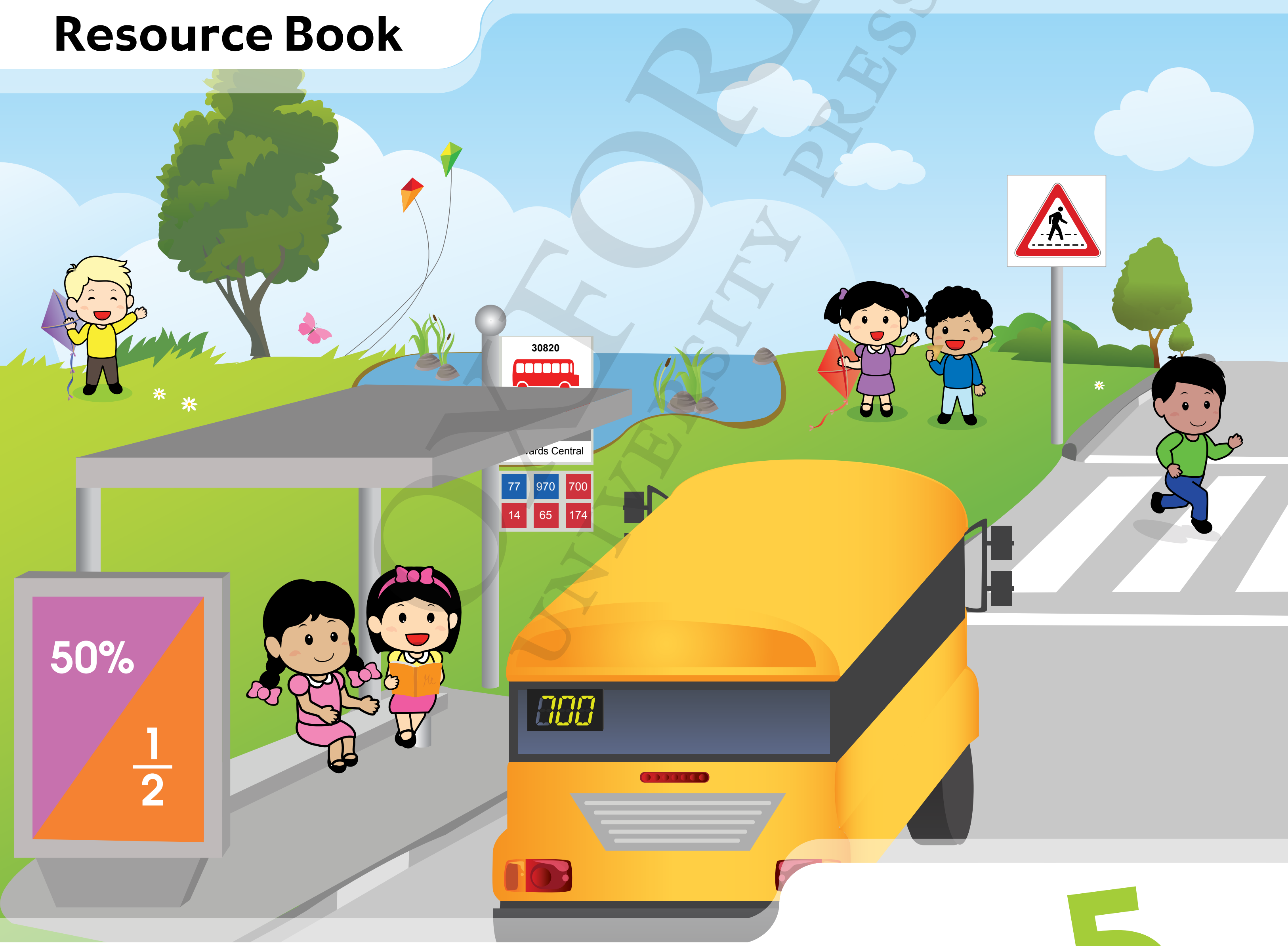
OXFORD

New Syllabus

PRIMARY MATHEMATICS

Teacher's Resource Book



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CHAPTER 1

Numbers up to 10 Million

Estimated number of periods: 12

Lesson	Number of Periods	Learning Objectives	Learning Experiences	Textbook Learning	Workbook Practice	Pupil-centred Activities	Concrete Materials
1	2	**Counting to 10 Million** • Read and write numbers in numerals and in words.	• Extend the number system to millions, read and write numbers in millions and thousands up to 10 million. • Develop the sense of size of 1 million with examples given.	Textbook 5 P1 − 12	Worksheet 1 Workbook 5A P1 − 5	Textbook 5 P6, 10	Computer (ICT), newspapers, place-value chart, place-value cards, number discs
2	2	**Prime Numbers** • List the factors of a number. • Identify prime numbers and composite numbers. • Use prime factorisation to express a number as a product of its prime factors.	• Recognise and differentiate between prime numbers and composite numbers. • Carry out prime factorisation using the factor tree or division method to express a number as a product of its prime factors.	Textbook 5 P13 – 16	Worksheet 2 Workbook 5A P6	–	Hundred chart, markers
3	3	**Highest Common Factor (HCF)** • Find the highest common factor of two or more numbers using prime factorisation.	• Use division method of prime factorisation to find the highest common factor of two or more numbers.	Textbook 5 P17 – 18	Worksheet 3 Workbook 5A P7 – 8	–	Mini whiteboard, markers
4	3	**Least Common Multiple (LCM)** • Find the least common multiple of two or more numbers using prime factorisation.	• Use division method of prime factorisation to find the lowest common multiple of two or more numbers.	Textbook 5 P19 – 20	Worksheet 4 Workbook 5A P9 – 10	–	Mini whiteboard, markers, numeral cards
–	2	**Problem Solving, Maths Journal and Pupil Review**	–	–	Review 1 Workbook 5A P12 − 16	Textbook 5 P21 Workbook 5A P11	Numeral cards

CHAPTER 2
Four Operations

Estimated number of periods: 10

Lesson	Number of Periods	Learning Objectives	Learning Experiences	Textbook Learning	Workbook Practice	Pupil-centred Activities	Concrete Materials
1	2	**Multiplying by Tens, Hundreds and Thousands** • Multiply numbers by tens. • Multiply numbers by hundreds. • Multiply numbers by thousands.	• Use number discs to illustrate multiplication of a whole number by tens, hundreds and thousands.	Textbook 5 P22 – 26	Worksheet 1A Workbook 5A P17 – 18	–	Number discs, conversion of unit cards
				Textbook 5 P27 – 30	Worksheet 1B Workbook 5A P19 – 20		
				Textbook 5 P30 – 33	Worksheet 1C Workbook 5A P21 – 22		
2	2	**Dividing by Tens, Hundreds and Thousands** • Divide numbers by tens. • Divide numbers by hundreds. • Divide numbers by thousands.	• Use number discs to illustrate division of a whole number by tens, hundreds and thousands.	Textbook 5 P34 – 36	Worksheet 2A Workbook 5A P23 – 24	–	Number discs, mini whiteboard, markers, conversion of unit cards
				Textbook 5 P36 – 38	Worksheet 2B Workbook 5A P25 – 26		
				Textbook 5 P38 – 40	Worksheet 2C Workbook 5A P27 – 28		
3	2	**Order of Operations** • Calculate in correct order of operations, including the use of brackets.	• Discover the rules for the order of operations with scientific calculator and explain why the rules are necessary. • Estimate answer before calculation to check reasonableness of calculated answer by comparison.	Textbook 5 P41 – 44	Worksheet 3 Workbook 5A P29 – 32	Textbook 5 P44	Calculator, mini whiteboard, markers, mathematical expressions cards

4	4	**Solving Word Problems** • Solve word problems involving the 4 operations.	• Solve problems using the part-whole and comparison models. • Solve non-routine problems using different heuristics.	Textbook 5 P45 – 51	Worksheet 4 Workbook 5A P33 – 39	–	–
–	2	**Problem Solving, Maths Journal and Pupil Review**	–	–	Review 2 Workbook 5A P41 – 44	Textbook 5 P51 – 52 Workbook 5A P40	Multiplication cards

CHAPTER 3

Introduction to Algebra

Estimated number of periods: 6

Lesson	Number of Periods	Learning Objectives	Learning Experiences	Textbook Learning	Workbook Practice	Pupil-centred Activities	Concrete Materials
1	4	**Using Letters for Unknown Quantities** • Write unknown quantities as letters to form an expression.	• Use letters to represent unknown quantities and form algebraic expressions.	Textbook 5 P13 – 16	Worksheet 2 Workbook 5A P6	Textbook 5 P59	Hundred chart, markers
–	2	**Problem Solving, Maths Journal and Pupil Review**	–	–	Review 3 Workbook 5A P50	Textbook 5 P60 – 61	–

CHAPTER 4
Fractions

Estimated number of periods: 30

Lesson	Number of Periods	Learning Objectives	Learning Experiences	Textbook Learning	Workbook Practice	Pupil-centred Activities	Concrete Materials
1	3	**Fractions and Division** • Divide a whole number by another whole number and give the answer as a fraction. • Convert fractions to decimals.	• Divide a whole number by a 1-digit whole number and write the answer as a fraction, instead of as quotient and remainder, or as a decimal. • Explain how fraction and division are related, e.g. $\frac{3}{5}$ is 3 divided by 5; when 3 pies are shared equally among 5 children, each child gets $\frac{3}{5}$ of a pie. • Use the part-whole model to illustrate the concepts of fraction and division, and their relationship, e.g. draw a model to show 12 ÷ 3 as a whole divided into 3 equal parts which is also $\frac{1}{3}$ of 12. • Work in groups to discuss the methods of converting fractions to decimals by division and by making the denominators into 10, 100 or 1000.	Textbook 5 P62 – 67	Worksheet 1 Workbook 5A P53 – 56	Textbook 5 P67	Fraction discs, coloured papers, scissors, drawing block, markers, conversion of fraction cards

2	2	**Adding Mixed Numbers** • Add mixed numbers.	• Use fraction discs to illustrate addition of mixed numbers which involve adding the whole-number parts, followed by adding the fractional parts. • Use calculator to check addition of fractions.	Textbook 5 P68 – 72	Worksheet 2 Workbook 5A P57– 58	Textbook 5 P68 – 72	Fraction discs, calculator
3	2	**Subtracting Mixed Numbers** • Subtract mixed numbers.	• Use fraction discs to illustrate subtraction of mixed numbers which involve subtracting the whole-number parts, followed by subtracting the fractional parts. • Use calculator to check subtraction of fractions.	Textbook 5 P73 – 77	Worksheet 3 Workbook 5A P59 – 60	Textbook 5 P74 – 77	Fraction discs, calculator, mini whiteboard, markers
4	4	**Solving Word Problems** • Solve word problems involving division of numbers to give fractions, adding mixed numbers and subtracting mixed numbers.	• Use calculator to do addition and subtraction of fractions. • Solve problems using the part-whole and comparison models.	Textbook 5 P78 – 80	Worksheet 4 Workbook 5A P61 – 64	–	Calculator
5	3	**Multiplying a Fraction and a Whole Number** • Multiply a fraction and whole number.	• Relate multiplication of whole number and fraction to finding the number of objects in a fraction of a set, e.g. $\frac{3}{4}$ x 60 = $\frac{3}{4}$ of 60.	Textbook 5 P81 – 84	Worksheet 5 Workbook 5A P65 – 68	–	–
6	4	**Multiplying Two Fractions** • Multiply two proper fractions. • Multiply a proper fraction and an improper fraction. • Multiply two improper fractions.	• Discuss the advantages of doing cancellation before multiplying the fractions. • Use calculator to do multiplication of two improper fractions.	Textbook 5 P85 – 89	Worksheet 6 Workbook 5A P69 – 72	–	Fraction bars, paper, scissors, calculator

7	2	**Multiplying a Mixed Number and a Whole Number** • Multiply a mixed number and a whole number.	• Use calculator to check multiplication of a mixed number and a whole number.	Textbook 5 P90 – 92	Worksheet 7 Workbook 5A P73 – 74	–	Fraction bars, calculator
8	8	**More Word Problems** • Solve word problems involving fractions.	• Use calculator to check addition, subtraction and multiplication of fractions. • Solve problems using the part-whole and comparison models. • Work in groups to solve multi-step word problems.	Textbook 5 P93 – 99	Worksheet 8 Workbook 5A P75 – 81	Textbook 5 P98	Mini whiteboard, markers
–	2	**Problem Solving, Maths Journal and Pupil Review**	• Use calculator to check addition, subtraction and multiplication of fractions. • Solve problems using the part-whole and comparison models. • Work in groups to solve multi-step word problems.	–	Review 4 Workbook 5A P83 – 88	Textbook 5 P99 – 100 Workbook 5A P82	Word problem card

CHAPTER 5
Ratio

Estimated number of periods: 16

Lesson	Number of Periods	Learning Objectives	Learning Experiences	Textbook Learning	Workbook Practice	Pupil-centred Activities	Concrete Materials
1	4	**Ratio** • Understand notation and representations of ratio • Interpret a:b and a:b:c, where a, b and c are whole numbers. • Find the ratio of two or three given quantities.	• Use objects in the classroom to practise simplifying ratios and using ratio language.	Textbook 5 P101 – 107	Worksheet 1 Workbook 5A P102 – 103	Textbook 5 P106	–
2	4	**Equivalent Ratios** • Find equivalent ratios of a given ratio. • Express a ratio in its simplest form. • Find the missing term in a pair of equivalent ratios.	• Work in groups to make different ratios from two or three given sets of objects, e.g. given 8 blue cubes and 12 green cubes, make different ratios by forming equal groups of varying sizes and recognise the ratios as equivalent ratios because the number of cubes remain unchanged, only groupings change. • Make connections between simplifying fractions and ratios by dividing the terms of the fraction/ratio by a common factor.	Textbook 5 P108 – 112	Worksheet 2 Workbook 5A P104 – 105	Textbook 5 P111	Counters, magnetic buttons

3	6	**Solving Word Problems** • Divide a quantity in a given ratio. • Find one quantity given the other quantity and their ratio. • Solve up to 2-step word problems involving ratio.	• Solve problems using the part-whole and comparison models.	Textbook 5 P113 – 118	Worksheet 3 Workbook 5A P106 – 110	–	–
–	2	**Problem Solving, Maths Journal and Pupil Review**	–	–	Review 5 Workbook 5A P112 – 116	Textbook 5 P118 – 119 Workbook 5A P111	–

CHAPTER 6
Area of Triangles

Estimated number of periods: 15

Lesson	Number of Periods	Learning Objectives	Learning Experiences	Textbook Learning	Workbook Practice	Pupil-centred Activities	Concrete Materials
1	3	**Base and Height of a Triangle** • Identify the base of a triangle and its corresponding height.	• Use a set square to check the height of a triangle to a given base. • Draw different triangles on square grid and identify the height of each triangle corresponding to a given base.	Textbook 5 P120 – 129	Worksheet 1 Workbook 5A P117 – 120	Textbook 5 P127	Set squares, square grid paper, shape cut-outs
2	4	**Area of Triangles** • Determine that the area of triangle is half the area of its related rectangle. • Use formula to find the area of a triangle.	• Use paper folding as well as the cut-and-paste method to explore the relationship between area of a triangle and its related rectangle.	Textbook 5 P130 – 135	Worksheet 2 Workbook 5A P121 – 124	Textbook 5 P132	Scissors, square grid paper, paper, ruler, set squares
3	5	**Area of Composite Figures** • Find the area of composite figures made up of squares, rectangles and triangles.	• Work in groups to determine the basic shapes that made up a composite figure; or use basic shapes to form different composite figures.	Textbook 5 P136 – 141	Worksheet 3 Workbook 5A P125 – 128	Textbook 5 P142	Cut-outs of triangles, squares and rectangles
–	3	**Problem Solving, Maths Journal and Pupil Review**	–	–	Review 6 Workbook 5A P131 – 136	Textbook 5 P142 Workbook 5A P129 – 130	Figure cut-outs

CHAPTER 7

Volume

Estimated number of periods: 14

Lesson	Number of Periods	Learning Objectives	Learning Experiences	Textbook Learning	Workbook Practice	Pupil-centred Activities	Concrete Materials
1	2	**Building Solids with Unit Cubes** • Build solids with unit cubes. • Express volume of a solid in cubic units.	• Use unit cubes or interlocking cubes to build different solids and express their volumes in cubic units. • Compare the sizes of solids in terms of their volumes.	Textbook 5 P143 – 148	Worksheet 1 Workbook 5A P137 – 140	Textbook 5 P147	Unit cubes, multilink cubes, square grid papers, 1-cm cubes
2	2	**Drawing Cubes and Cuboids** • Draw cubes and cuboids on an isometric grid.	• Draw cubes and cuboids in different sizes and orientations on isometric grids.	Textbook 5 P149 – 152	Worksheet 2 Workbook 5A P141 – 142	Textbook 5 P151	Unit cubes, multilink cubes, isometric grid papers
3	4	**Volume in cm^3 and m^3** • Measure volumes in cm^3 and m^3. • Use formula to find the volume of a cube/cuboid.	• Build cuboids layer by layer with cubes to establish the formula for finding volume. • Build cubes of various sizes to find the volume by counting and by use of formula. • Make connections between 1 cm^2 and 1 cm^3, and between 1 m^2 and 1 cm^3, e.g. use newspaper and masking tape to make a square of area 1 m^2 and a cube of volume 1 m^3.	Textbook 5 P153 – 159	Worksheet 3 Workbook 5A P143 – 148	Textbook 5 P155, 158	1-cm cubes, multilink cubes, metre rule, newspapers, scissors, tape, vanguard paper, mini whiteboard, markers
4	4	**Volume of Liquids** • Find the volume of liquid in a rectangular tank. • Convert between ℓ, ml and cm^3.	• Pour 1 litre of water into a container of 10 cm × 10 cm × 10 cm to establish the equivalence of 1 ℓ (1000 ml) and 1000 cm^3.	Textbook 5 P160 – 163	Worksheet 4 Workbook 5A P149 – 155	–	1-litre bottle, 10 cm × 10 cm × 10 cm container, cubical containers, water
–	2	**Problem Solving, Maths Journal and Pupil Review**	–	–	Review 7 Workbook 5A P157 – 160	Textbook 5 P163 – 164 Workbook 5A P156	–

CHAPTER 8
Decimals

Estimated number of periods: 20

Lesson	Number of Periods	Learning Objectives	Learning Experiences	Textbook Learning	Workbook Practice	Pupil-centred Activities	Concrete Materials
1	3	**Multiplying by Tens, Hundreds and Thousands** • Multiply decimals by tens.	• Use number and decimal discs to illustrate multiplication of a decimal by tens, hundreds and thousands.	Textbook 5 P165 – 167	Worksheet 1A Workbook 5B P1 – 2	–	Number discs, decimal discs, place-value chart, mini whiteboard, markers
		• Multiply decimals by hundreds.		Textbook 5 P168 – 170	Worksheet 1B Workbook 5B P3 – 4		
		• Multiply decimals by thousands.		Textbook 5 P170 – 172	Worksheet 1C Workbook 5B P5 – 6		
2	3	**Dividing by Tens, Hundreds and Thousands** • Divide decimals by tens.	• Use number and decimal discs to illustrate division of a decimal by tens, hundreds and thousands.	Textbook 5 P173 – 174	Worksheet 2A Workbook 5B P7 – 8	–	Number discs, decimal discs, place-value chart, mini whiteboard, markers
		• Divide decimals by hundreds.		Textbook 5 P175 – 176	Worksheet 2B Workbook 5B P9 – 10		
		• Divide decimals by thousands.		Textbook 5 P177 – 178	Worksheet 2C Workbook 5B P11 – 12		

3	6	**Converting Measurements** • Convert a measurement from a smaller unit to a larger unit in decimal form, and vice versa. Units of measurements include: - kilometres and metres - metres and centimetres - kilograms and grams - litres and millilitres	• Collect and talk about real life examples of the uses of different units of measurement. • Measure and compare amounts of liquid using measuring cylinders and beakers to determine the equivalent between the measurements. • Work in pairs to convert between larger and smaller units through games or quizzes. • Use a linear scale to show the relationship between larger and smaller units of measurement.	Textbook 5 P179 – 183	Worksheet 3A Workbook 5B P13 – 14	–	Number lines
				Textbook 5 P183 – 184	Worksheet 3B Workbook 5B P15 – 16	–	Number lines
				Textbook 5 P185 – 186	Worksheet 3C Workbook 5B P17 – 18	Textbook 5 P186	Decimal disc, unit of measurement conversion cards, decimal cards, conversion of unit cards, number lines, mini whiteboard, markers
4	6	**Solving Word Problems** • Solve word problems involving the 4 operations of decimals.	• Work in groups to create word problems based on everyday experiences for other groups to solve. • Estimate answer before calculation to check reasonableness of calculated answer by comparison. • Solve problems using the part-whole and comparison models. • Solve non-routine problems using different heuristics.	Textbook 5 P187 – 190	Worksheet 4 Workbook 5B P19 – 23	Textbook 5 P189	Computer (ICT), newspapers, mini whiteboard, markers
–	2	**Problem Solving, Maths Journal and Pupil Review**	–	–	Review 8 Workbook 5B P25 – 30	Textbook 5 P190 – 191 Workbook 5B P24	–

CHAPTER 9

Percentage

Estimated number of periods: 16

Lesson	Number of Periods	Learning Objectives	Learning Experiences	Textbook Learning	Workbook Practice	Pupil-centred Activities	Concrete Materials
1	4	**Percent** • Express a part of a whole as a percentage. • Express a fraction as a percentage. • Express a decimal as a percentage.	• Look for examples where percentages are used in real life, e.g. newspaper cuttings showing discounts, bank brochures showing interest rates, and discuss their usage. • Discuss different ways of expressing a part of a whole, e.g. the number of squares shaded to show 30% on 100-square and 200-square grids. • Use a percentage scale to illustrate the part-whole concept of percentage, and to show the relationship between percentage and fraction, e.g. $30\% = \frac{3}{10}$. • Use a linear scale to show the relationship between percentage and decimal • Play card games/ online games involving equivalent fractions, decimals and percentages, e.g. 20% is equivalent to or 0.2. 51.	Textbook 5 P192 – 202	Worksheet 1 Workbook 5B P31 – 34	Textbook 5 P200	10 × 10 square grid papers, colour pencils, decimal cards, fraction cards, percentage cards, percentage bars, mini whiteboard, markers

2	4	**Finding a Percentage Part of a Whole** • Find a percentage part of a whole.	• Collect receipts that show discounts, GST, service charges etc., and use calculator to check how these values are calculated.	Textbook 5 P203 – 205	Worksheet 2A Workbook 5B P35 – 36	–	–
		• Find discount, GST and annual interest.	• Work in groups to plan a shopping list with a given budget using newspaper advertisements and promotion pamphlets.	Textbook 5 P206 – 208	Worksheet 2B Workbook 5B P37 – 38	Textbook 5 P208	Calculator, receipts, computer (ICT), newspapers, mini whiteboard, markers
3	6	**Solving Word Problems** • Solve up to 2-step word problems involving percentage.	• Use the part-whole and comparison models to represent and solve percentage problems.	Textbook 5 P209 – 213	Worksheet 3 Workbook 5B P39 – 41	–	–
–	2	**Problem Solving, Maths Journal and Pupil Review**	–	–	Review 9 Workbook 5B P43 – 46	Textbook 5 P213 – 214 Workbook 5B P42	–

CHAPTER 10

Average

Estimated number of periods: 10

Lesson	Number of Periods	Learning Objectives	Learning Experiences	Textbook Learning	Workbook Practice	Pupil-centred Activities	Concrete Materials
1	8	**Average** • Find average by dividing total value by the number of data. • Understand the relationship between average, total value and number of data. • Find either average, total value or number of data, given the other two quantities. • Solve word problems involving average.	• Discuss the meaning of average in real-life situations such as average height, average load in a lift, average temperature in a day or month. • Recognise that there are three related quantities in a set of data (average, total value and number of data) and given any two quantities, the third quantity can be calculated.	Textbook 5 P215 – 222	Worksheet 1 Workbook 5B P47 – 51	Textbook 5 P221	Multilink cubes, paper plates, mini whiteboard, markers, formula for average card, computer (ICT)
–	2	**Problem Solving, Maths Journal and Pupil Review**	–	–	Review 10 Workbook 5B P53 – 54	Textbook 5 P223 Workbook 5B P52	Solving a word problem card

CHAPTER 11

Rate

Estimated number of periods: 14

Lesson	Number of Periods	Learning Objectives	Learning Experiences	Textbook Learning	Workbook Practice	Pupil-centred Activities	Concrete Materials
1	6	**Understanding Rate** • Express rate as an amount of quantity per unit of another quantity. • Find rate given the total amount and number of units. • Find the total amount given the rate and number of units. • Find the number of units given the rate and the total amount.	• Talk about examples of rate in everyday situations such as postage rates and utility rates (water and electricity consumption rates). • Talk about a situation involving rate and recognise that there are three related quantities (rate, total amount, number of units) and given any two quantities, the third quantity can be calculated.	Textbook 5 P224 – 229	Worksheet 1 Workbook 5B P55 – 58	Textbook 5 P228	Computer (ICT), newspapers, mini whiteboard, markers
2	6	**Solving Word Problems** • Solve word problems involving rate.	• Solve problems using proportional reasoning.	Textbook 5 P230 – 236	Worksheet 2 Workbook 5B P59 – 63	–	–
–	2	**Problem Solving, Maths Journal and Pupil Review**	–	–	Review 11 Workbook 5B P65 – 68	Textbook 5 P236 – 237 Workbook 5B P64	Calculator

CHAPTER 12
Angles

Estimated number of periods: 10

Lesson	Number of Periods	Learning Objectives	Learning Experiences	Textbook Learning	Workbook Practice	Pupil-centred Activities	Concrete Materials
1	2	**Angles on a Straight Line** • Use the property of 'sum of angles on a straight line is 180' to find unknown angles.	• Describe and illustrate the sum of angles on a straight line is 180°. • Use this angle property to find unknown angles and explain how they obtain the answers.	Textbook 5 P238 – 242	Worksheet 1 Workbook 5B P79 – 80	Textbook 5 P240	Protractor, scissors, angle cut-out
2	2	**Angles at a Point** • Use the property of 'sum of angles at a point is 360°' to find unknown angles.	• Describe and illustrate the sum of angles at a point is 360°. • Use this angle property to find unknown angles and explain how they obtain the answers.	Textbook 5 P243 – 247	Worksheet 2 Workbook 5B P81 – 82	Textbook 5 P247	Protractor, ruler, angle cut-out
3	2	**Vertically Opposite Angles** • Use the property of 'vertically opposite angles are equal' to find unknown angles.	• Describe and illustrate that vertically opposite angles are equal. • Use this angle property to find unknown angles and explain how they obtain the answers.	Textbook 5 P248 – 252	Worksheet 3 Workbook 5B P83 – 84	Textbook 5 P249	Protractor, scissors, ruler, angle cut-out
4	2	**Finding Unknown Angles** • Find unknown angles involving angles on a straight line, angles at a point and vertically opposite angles.	• Use the appropriate angle properties to find unknown angles and explain how they obtain the answers.	Textbook 5 P253 – 256	Worksheet 4 Workbook 5B P85 – 87	–	–
–	2	**Problem Solving, Maths Journal and Review**	• Look for real-life examples of different types of angles in the environment that relate to the various angle properties.	–	Review 12 Workbook 5B P89 – 92	Textbook 5 P257 Workbook 5B P88	–

CHAPTER 13
Properties of Triangles

Estimated number of periods: 16

Lesson	Number of Periods	Learning Objectives	Learning Experiences	Textbook Learning	Workbook Practice	Pupil-centred Activities	Concrete Materials
1	4	**Types of Triangles** • Properties of right-angled triangle, isosceles triangle and equilateral triangle.	• Pupils work in groups to sort different triangles according to their angles and lengths of sides and describe them as acute triangles, obtuse triangles, right-angled triangles, isosceles triangles or equilateral triangles. • Relate various triangles to real-world objects around them. • Work in pairs to explore drawing special triangles on square grid papers.	Textbook 5 P258 – 262	Worksheet 1 Workbook 5B P93 – 94	Textbook 5 P262	Cut-outs of different triangles, square grid paper, mini whiteboard, markers, ruler, protractor, table cut-out
2	6	**Sum of Angles in a Triangle** • Use the property of sum of angles in a triangle to find an unknown angle. • Use angle properties of various types of triangles to find unknown angles.	• Investigate the property of sum of angles in a triangle is 180° using cut-outs and folding.	Textbook 5 P263 – 270	Worksheet 2A Workbook 5B P95 – 102	–	Cut-outs of different triangles, protractor, scissors
			• Identify and justify the angle properties of various triangles using cut-outs and folding.	Textbook 5 P271 – 275	Worksheet 2B Workbook 5B P103 – 110	Textbook 5 P274	
3	4	**Drawing Triangles** • Draw different triangles according to given dimensions.	• Sketch and draw different triangles according to given dimensions using a ruler, a protractor and a set square.	Textbook 5 P276 – 281	Worksheet 3 Workbook 5B P111 – 113	–	Ruler, protractor, set squares
–	2	**Problem Solving, Maths Journal and Pupil Review**	–	–	Review 13 Workbook 5B P115 – 120	Textbook 5 P281 – 282 Workbook 5B P114	Table cut-out

CHAPTER 14

Properties of Four-sided Figures

Estimated number of periods: 15

Lesson	Number of Periods	Learning Objectives	Learning Experiences	Textbook Learning	Workbook Practice	Pupil-centred Activities	Concrete Materials
1	8	**Properties of Four-sided Figures** • Properties of parallelograms, rhombuses and trapeziums. • Use the properties to find unknown angles involving parallelograms, rhombuses and trapeziums.	• Investigate the properties of parallelogram, rhombus and trapezium using cut-outs and discuss their differences. • Recognise the four-sided figures and identify their properties. • Work in pairs to explore drawing special quadrilaterals on square grid papers. • Draw special quadrilaterals on square grid. • Use the properties of special quadrilaterals to find unknown angles and explain how they obtain the answers.	Textbook 5 P283 – 294	Worksheet 1 Workbook 5B P121 – 126	Textbook 5 P292	Cut-outs of different four-sided figures, square grid paper, scissors, paper, markers
3	5	**Drawing Four-sided Figures** • Draw different four-sided figures according to given dimensions.	• Sketch and draw different four-sided figures according to given dimensions using a ruler, a protractor and a set square .	Textbook 5 P295 – 302	Worksheet 2 Workbook 5B P127 – 129	–	Ruler, protractor, set squares, mini whiteboard, markers
–	2	**Problem Solving, Maths Journal and Pupil Review**	–	–	Review 14 Workbook 5B P131 – 134	Textbook 5 P303 Workbook 5B P130	–

CHAPTER 15

Probability

Estimated number of periods: 5

Lesson	Number of Periods	Learning Objectives	Learning Experiences	Textbook Learning	Workbook Practice	Pupil-centred Activities	Concrete Materials
1	3	**Probability** • Understand what probability means. • Find the probability of an event occurring or an event not occurring.	• Understand that probability is the chance of an event occurring. • Relate probability to real-life examples. • Find the probability of an event.	Textbook 5 P304 – 307	Worksheet 1 Workbook 5B P135 – 136	–	Coin, marbles, opaque bag, dice
–	2	**Problem Solving, Maths Journal and Pupil Review**	–	–	Review 15 Workbook 5B P138 – 139	Textbook 5 P307 Workbook 5B P137	Alphabet Cards, spinner

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SYLLABUS MATCHING GRID
CAMBRIDGE PRIMARY MATHEMATICS STAGE 5

Learning Objective	Reference
1. Number	
Numbers and the number system	
Count on and back in steps of constant size, extending beyond zero.	Chapter 1
Know what each digit represents in five- and six-digit numbers.	Chapter 1
Partition any number up to one million into thousands, hundreds, tens and units.	Chapter 1
Use decimal notation for tenths and hundredths and understand what each digit represents.	Chapter 8
Multiply and divide any number from 1 to 10 000 by 10 or 100 and understand the effect.	Chapter 2
Round four-digit numbers to the nearest 10, 100 or 1000.	Book 4 Chapter 1
Round a number with one or two decimal places to the nearest whole number.	Book 4 Chapter 8
Order and compare numbers up to a million using the > and < signs.	Book 4 Chapter 1
Order numbers with one or two decimal places and compare using the > and < signs.	Book 4 Chapter 8
Recognise and extend number sequences.	Book 4 Chapter 1
Recognise odd and even numbers and multiples of 5, 10, 25, 50 and 100 up to 1000.	Chapter 1
Make general statements about sums, differences and multiples of odd and even numbers.	Chapter 1
Recognise equivalence between: $\frac{1}{2}$, $\frac{1}{4}$ and $\frac{1}{8}$; $\frac{1}{3}$ and $\frac{1}{6}$; $\frac{1}{5}$ and $\frac{1}{10}$.	Chapter 4
Change an improper fraction to a mixed number, e.g. $\frac{7}{4}$ to $\frac{13}{4}$; order mixed numbers and place between whole numbers on a number line.	Book 4 Chapter 3
Relate finding fractions to division and use to find simple fractions of quantities.	Chapter 4
Understand percentage as the number of parts in every 100 and find simple percentages of quantities.	Chapter 9
Express halves, tenths and hundredths as percentages.	Chapter 9
Use fractions to describe and estimate a simple proportion, e.g. $\frac{1}{5}$ of the beads are yellow.	Chapter 4
Use ratio to solve problems, e.g. to adapt a recipe for 6 people to one for 3 or 12 people.	Chapter 5
2. Calculation	
Mental strategies	
Know multiplication and division facts for the 2× to 10× tables.	Chapter 2
Know and apply tests of divisibility by 2, 5, 10 and 100.	Chapter 2
Recognise multiples of 6, 7, 8 and 9 up to the 10th multiple.	Book 3 Chapter 3
Find factors of two-digit numbers.	Chapter 1
Count on or back in thousands, hundreds, tens and ones to add or subtract.	Chapter 1
Add or subtract near multiples of 10 or 100, e.g. 4387 – 299.	Chapters 1 and 2
Use appropriate strategies to add or subtract pairs of two- and three-digit numbers and numbers with one decimal place, using jottings where necessary.	Chapter 8
Calculate differences between near multiples of 1000, e.g. 5026 – 4998, or near multiples of 1, e.g. 3.2 – 2.6.	Chapter 2
Multiply multiples of 10 to 90, and multiples of 100 to 900, by a single-digit number.	Chapter 2
Multiply by 19 or 21 by multiplying by 20 and adjusting.	Book 4 Chapter 2
Use factors to multiply, e.g. multiply by 3, then double to multiply by 6.	Chapter 2
Addition and Subtraction	
Find the total of more than three two- or three-digit numbers using a written method.	Chapter 2
Add or subtract any pair of three- and/or four-digit numbers, with the same number of decimal places, including amounts of money.	Chapter 8

Multiplication and division	
Multiply or divide three-digit numbers by single-digit numbers.	Chapter 2
Multiply two-digit numbers by two-digit numbers.	Chapter 2
Multiply two-digit numbers with one decimal place by single-digit numbers, e.g. 3.6 × 7.	Chapter 8
Divide three-digit numbers by single-digit numbers, including those with a remainder (answers no greater than 30).	Chapter 2
Start expressing remainders as a fraction of the divisor when dividing two-digit numbers by single-digit numbers.	Book 3 Chapter 3 and Book 4 Chapter 2
Decide whether to group (using multiplication facts and multiples of the divisor) or to share (halving and quartering) to solve divisions.	Chapter 2
Decide whether to round an answer up or down after division, depending on the context.	Chapter 2
Begin to use brackets to order operations and understand the relationship between the four operations and how the laws of arithmetic apply to multiplication.	Chapter 2
3. Geometry	
Shapes and geometric reasoning	
Identify and describe properties of triangles and classify as isosceles, equilateral or scalene.	Chapter 13
Recognise reflective and rotational symmetry in regular polygons.	Book 4 Chapter 4
Create patterns with two lines of symmetry, e.g. on a pegboard or squared paper.	Book 4 Chapter 4
Visualise 3D shapes from 2D drawings and nets, e.g. different nets of an open or closed cube.	Book 6 Chapter 10
Recognise perpendicular and parallel lines in 2D shapes, drawings and the environment.	Book 3 Chapter 12
Understand and use angle measure in degrees; measure angles to the nearest 5°; identify, describe and estimate the size of angles and classify them as acute, right or obtuse.	Book 4 Chapter 5
Calculate angles in a straight line.	Chapter 12
Position and movement	
Read and plot co-ordinates in the first quadrant.	Book 4 Chapter 6
Predict where a polygon will be after reflection where the mirror line is parallel to one of the sides, including where the line is oblique.	Book 4 Chapter 4
Understand translation as movement along a straight line, identify where polygons will be after a translation and give instructions for translating shapes.	Book 4 Chapter 6
4. Measure	
Length, mass and capacity	
Read, choose, use and record standard units to estimate and measure length, mass and capacity to a suitable degree of accuracy.	Chapter 7
Convert larger to smaller metric units (decimals to one place), e.g. change 2.6 kg to 2600 g.	Chapter 8
Round measurements to the nearest whole unit.	Chapter 8
Interpret a reading that lies between two unnumbered divisions on a scale.	Chapter 8
Compare readings on different scales.	Book 3 Chapters 4 – 6
Draw and measure lines to the nearest centimetre and millimetre.	Chapters 13 and 14
Time	
Recognise and use the units for time (seconds, minutes, hours, days, months and years).	Book 4 Chapter 12
Tell and compare the time using digital and analogue clocks using the 24-hour clock.	Book 4 Chapter 12
Read timetables using the 24-hour clock.	Book 4 Chapter 12
Calculate time intervals in seconds, minutes and hours using digital or analogue formats.	Book 4 Chapter 12
Calculate time intervals in months or years.	Chapter 10
Area and perimeter	
Measure and calculate the perimeter of regular and irregular polygons.	Book 4 Chapter 10
Understand area measured in square centimetres (cm^2).	Chapter 6
Use the formula for the area of a rectangle to calculate the rectangle's area.	Chapter 6

5. Handling data

Organising, categorising and representing data

Answer a set of related questions by collecting, selecting and organising relevant data; draw conclusions from their own and others' data and identify further questions to ask.	Chapter 10
Draw and interpret frequency tables, pictograms and bar line charts, with the vertical axis labelled for example in twos, fives, tens, twenties or hundreds. Consider the effect of changing the scale on the vertical axis.	Book 4 Chapter 11
Construct simple line graphs, e.g. to show changes in temperature over time.	Book 4 Chapter 11
Understand where intermediate points have and do not have meaning, e.g. comparing a line graph of temperature against time with a graph of class attendance for each day of the week.	Book 4 Chapter 11

Probability

Describe the occurrence of familiar events using the language of chance or likelihood.	Chapter 15

6. Problem solving

Using techniques and skills in solving mathematical problems

Understand everyday systems of measurement in length, weight, capacity, temperature and time and use these to perform simple calculations.	Across Book 5 and lessons on Solving Word Problems
Solve single and multi-step word problems (all four operations); represent them, e.g. with diagrams or a number line.	Across Book 5 and lessons on Solving Word Problems
Check with a different order when adding several numbers or by using the inverse when adding or subtracting a pair of numbers.	Across Book 5 and lessons on Solving Word Problems
Use multiplication to check the result of a division, e.g. multiply 3.7 × 8 to check 29.6 ÷ 8.	Chapter 2
Recognise the relationships between different 2D and 3D shapes, e.g. a face of a cube is a square.	Chapter 7
Estimate and approximate when calculating, e.g. using rounding, and check working.	Chapter 2 and across Book 5
Consider whether an answer is reasonable in the context of a problem.	Across Book 5

Using understanding and strategies in solving problems

Understand everyday systems of measurement in length, weight, capacity, temperature and time and use these to perform simple calculations.	Across Book 5
Choose an appropriate strategy for a calculation and explain how they worked out the answer.	Across Book 5
Explore and solve number problems and puzzles, e.g. logic problems.	Across Book 5
Deduce new information from existing information to solve problems.	Across Book 5
Use ordered lists and tables to help to solve problems systematically.	Across Book 5
Describe and continue number sequences, e.g. –30, –27, ☐, ☐, –18...; identify the relationships between numbers.	Book 4 Chapter 1
Identify simple relationships between shapes, e.g. these triangles are all isosceles because ...	Chapter 13
Investigate a simple general statement by finding examples which do or do not satisfy it, e.g. the sum of three consecutive whole numbers is always a multiple of three.	Across Book 5
Explain methods and justify reasoning orally and in writing; make hypotheses and test them out.	Across Book 5
Solve a larger problem by breaking it down into sub-problems or represent it using diagrams.	Across Book 5

INTRODUCTION

The Teacher's Resource Book has been designed to promote good teaching practices for teachers to effectively implement the Primary Mathematics Curriculum.

This series provides teachers with the flexibility to choose the elements that are right for their learners. The key focus in Lower Primary Mathematics comprise of the following:

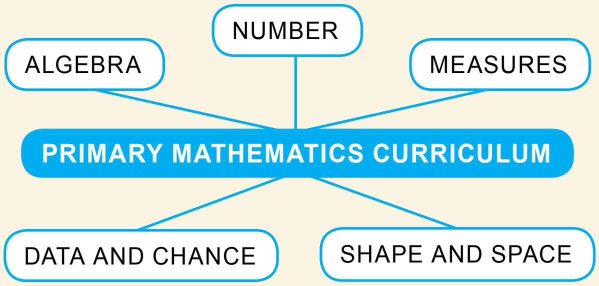
1. pupil-centred learning
2. active participation
3. problem solving
4. critical thinking
5. real-life contextual exercises
6. mathematical communication and reasoning

Teachers must provide a conducive environment for learning Mathematics in the classroom that encourages creativity and enjoyment. When introducing a concept to pupils, teachers need to ensure that pupils are able to relate mathematical activities and problems to relevant and real-life situations. Teaching mathematical concepts in real-life contexts and providing hands-on experience assist pupils to understand the concepts. Therefore, teachers need to provide mathematical contexts that are relevant to the pupils. Pupils need to apply the concepts and skills in various areas of Mathematics to find solutions to problems involving real-life situations. This series engages the pupils to learn by the Concrete-Pictorial-Abstract (C-P-A) approach:

Exploring concepts using **concrete** materials, leading to the use of **pictorial** representations and then, the **abstract**. Using this approach, pupils are first introduced to a concept through real-life examples or hands-on activities. The exercises then progress with the help of pictorial representations. Once they have a good understanding of the concept, mathematical notation; symbols and computations are introduced to achieve mastery in the abstract.

The Teacher's Resource Book provides instructions on the use of resources to help them carry out the abovementioned objectives. If a concept is taught in a comprehensive manner with clear instructions supplemented with hands-on activities and practice, most pupils would be able to achieve the set assessment target. Each pupil has a set pattern and pace of grasping concepts, but the expectation is the plateau of mathematical competency for all. In this regard, the Teacher's Resource Book serves as a support to teachers using this series.

The five main strands of the Primary Mathematics Curriculum are:



The Teacher's Resource Book supports a meaningful and holistic approach to teaching the strands of Mathematics. The buildup of concepts throughout this series is progressive and comprehensive.

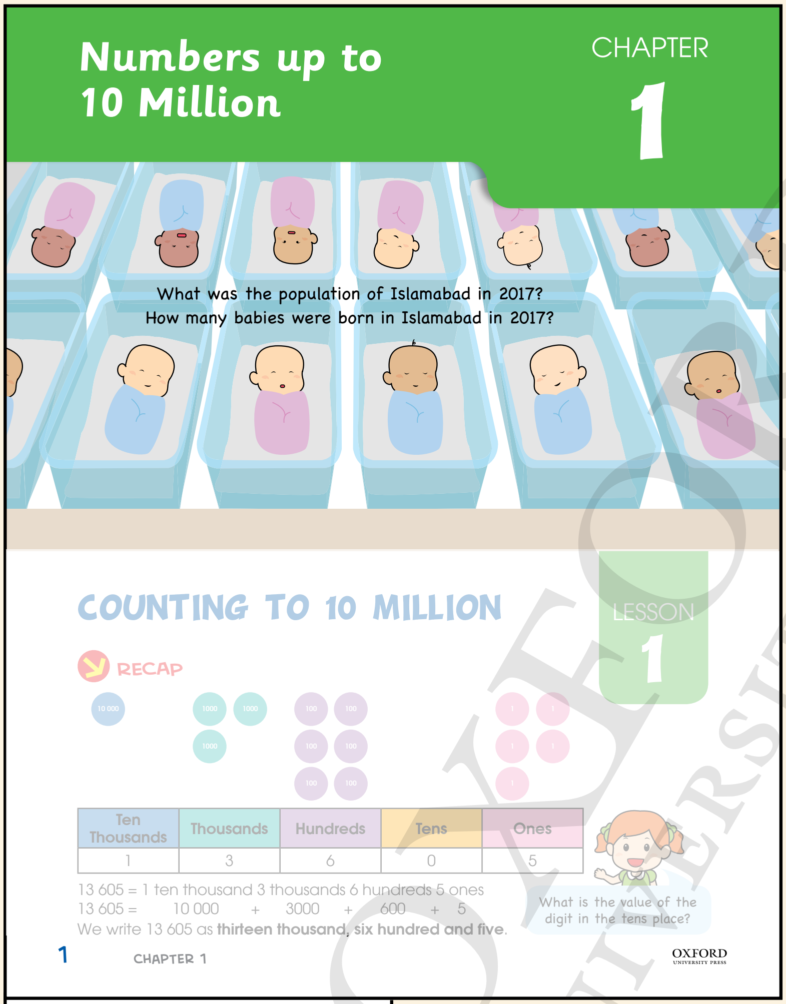
With the implementation of hands-on activities, the learning of a mathematical concept is complemented with experiences that make learning Mathematics enjoyable and give pupils the ownership of independent and group practices. Multiple strategies are implemented through activities in the form of games, model work, standard and non-standard materials and resources. The Teacher's Resource Book facilitates teachers to implement this aspect of the series proficiently. The Teacher's Resource Book provides a structure whereby teachers and coordinators can select, combine and improvise various pedagogical practices for the pupil-centric textbook and workbooks.

In this regard, the Teacher's Resource Book provides the following elements:

- **Scheme of Work** - A tabulated guide showing a breakdown of each lesson's learning objectives, learning experiences, page references of relevant resources, concrete materials required and suggested number of periods required to conduct the lesson, keeping in mind the level of difficulty of the content.
- **Syllabus Matching Grid** - A tabulated guide referring the chapters in this series to the learning objectives of the Cambridge Primary Mathematics curriculum.
- **Exposition of Lessons** - A guide for teachers to prepare and conduct lessons.
- **Answers** - Solutions to questions in the textbook and workbook are provided, along with detailed steps where required.
- **Activities** - Additional activities to assist teachers to support struggling learners and challenge advanced learners.
- **Lesson Plans** - Detailed lesson plans for the lessons to formalise the teaching approach for the teachers. It encompasses prior learning, pre-emptive pitfalls, introduction, problem solving and mathematical communication support.
- **Navigating through the Assessment Activities and Exercises** - An essay explaining to teachers how to use the resources provided effectively when conducting the lessons. The resources include formative and progressive exercises, activities and assessments provided in the textbook and workbook.
- **Activity Handbook** - Activity templates and worksheets for pupils to use when carrying out activities and to supplement the lessons.

NUMBERS UP TO 10 MILLION

CHAPTER 1



Numbers up to 10 Million

CHAPTER 1

What was the population of Islamabad in 2017?
How many babies were born in Islamabad in 2017?

COUNTING TO 10 MILLION

LESSON 1

RECAP

Ten Thousands	Thousands	Hundreds	Tens	Ones
1	3	6	0	5

13 605 = 1 ten thousand 3 thousands 6 hundreds 5 ones
13 605 = 10 000 + 3000 + 600 + 5
We write 13 605 as **thirteen thousand, six hundred and five.**

What is the value of the digit in the tens place?

1 CHAPTER 1

Textbook 5 P1

Related Resources
NSPM Textbook 5 (P1 – 21)
NSPM Workbook 5A (P1 – 16)

Materials
Computer (ICT), number discs, newspapers, place-value chart, place-value cards, numeral cards, mini whiteboard, markers

Lesson

Lesson 1	Counting to 10 Million

Problem Solving, Maths Journal and Pupil Review

INTRODUCTION

In Grade Four, pupils have learnt to read and write 5-digit numbers and to interpret the place values of each digit. This chapter on numbers will extend their learning of the number system to 10 million with the aid of number discs and place-value chart.

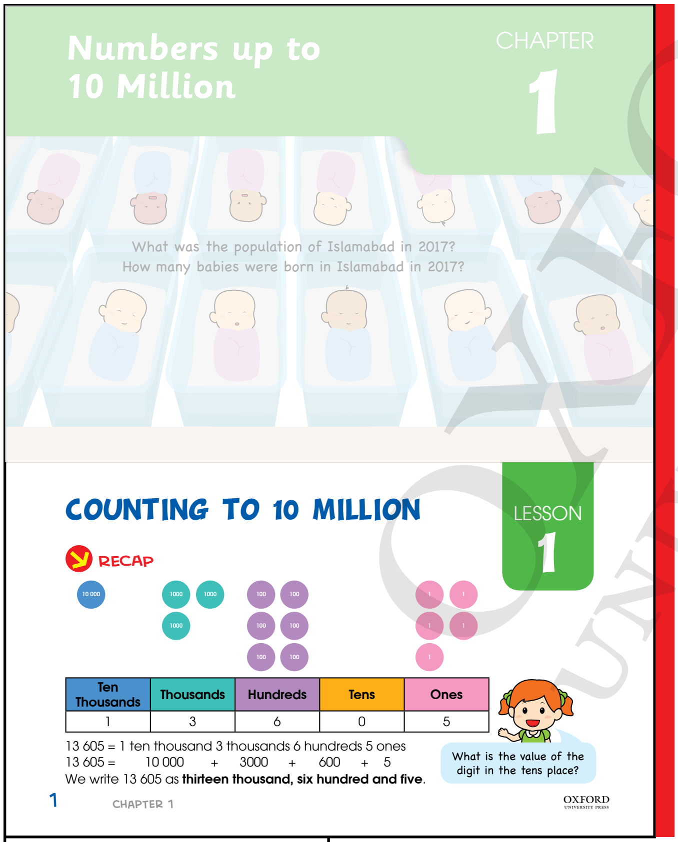
Adopting the spiral approach, visualisation and observation through real-life examples, pupils develop the sense of the size of 1 million, and learn to count and write numbers up to 10 million in numerals and in words.

LESSON 1

COUNTING TO 10 MILLION

LEARNING OBJECTIVE

1. Read and write numbers in numerals and in words.



Numbers up to 10 Million

CHAPTER 1

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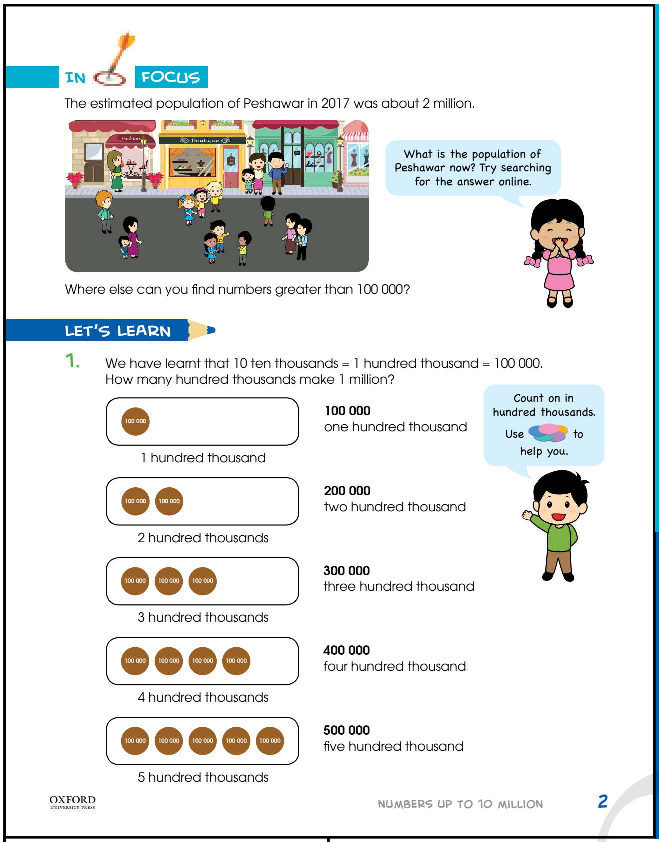
What is the value of the digit in the tens place?

1 CHAPTER 1

Textbook 5 P1

RECAP

Help pupils link their prior knowledge with the current topic by revisiting numbers up to 100 000, with the use of place-value chart and number discs.



IN FOCUS

The estimated population of Peshawar in 2017 was about 2 million.

What is the population of Peshawar now? Try searching for the answer online.

Where else can you find numbers greater than 100 000?

LET'S LEARN

1. We have learnt that 10 ten thousands = 1 hundred thousand = 100 000. How many hundred thousands make 1 million?

1 hundred thousand	100 000 one hundred thousand
2 hundred thousands	200 000 two hundred thousand
3 hundred thousands	300 000 three hundred thousand
4 hundred thousands	400 000 four hundred thousand
5 hundred thousands	500 000 five hundred thousand

Count on in hundred thousands. Use to help you.

OXFORD UNIVERSITY PRESS NUMBERS UP TO 10 MILLION 2

Textbook 5 P2

IN FOCUS

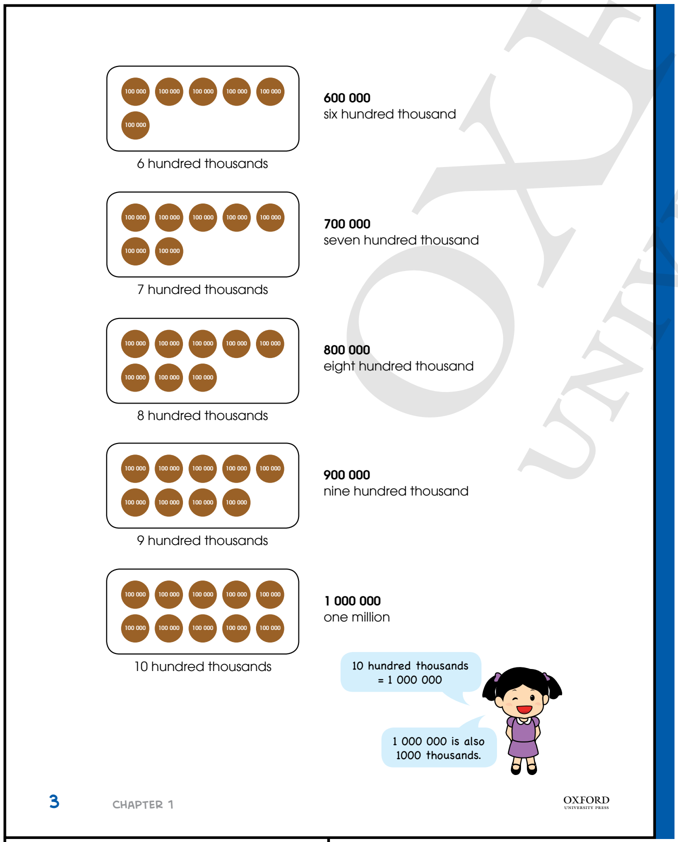
Get pupils to relate to real-life examples involving numbers up to 10 million. The population of Peshawar is a good example. Ask:

- What is the population of Peshawar now?
- What was the population of Peshawar 5 years or 10 years ago?

Discussion may even touch on national education such as the importance of population growth for Pakistan. Elicit more responses from pupils to give other examples involving numbers up to 10 million. Some examples include the property prices in Pakistan, land size of some countries or continents, and the mass of a truck.

LET'S LEARN

For Let's Learn 1, guide pupils to visualise and understand that 10 hundred thousands make a million with the aid of number discs.



6 hundred thousands	600 000 six hundred thousand
7 hundred thousands	700 000 seven hundred thousand
8 hundred thousands	800 000 eight hundred thousand
9 hundred thousands	900 000 nine hundred thousand
10 hundred thousands	1 000 000 one million

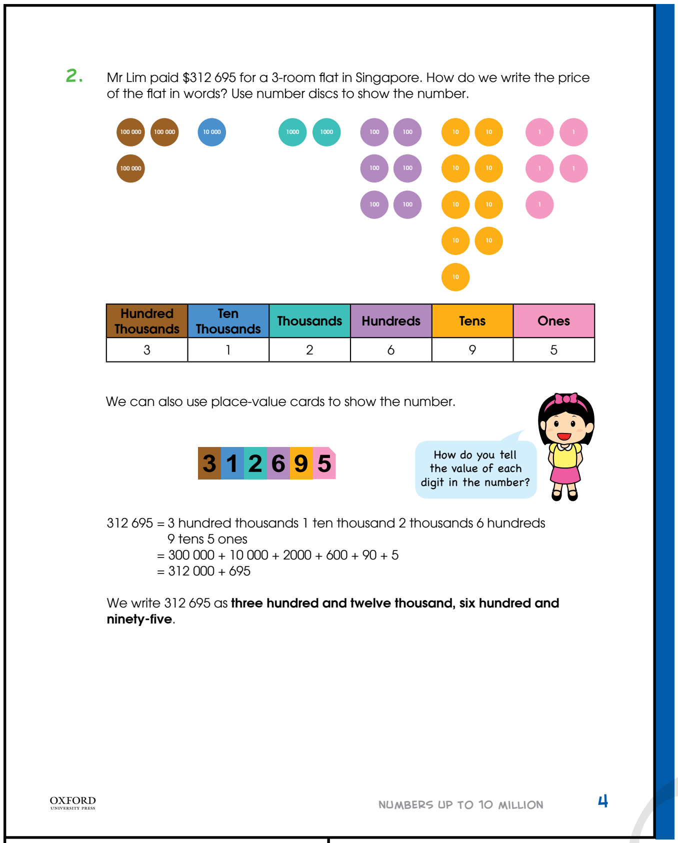
10 hundred thousands = 1 000 000

1 000 000 is also 1000 thousands.

3 CHAPTER 1 OXFORD UNIVERSITY PRESS

Textbook 5 P3

Pupils need to recognise numbers in hundred thousands and millions both in numerals and words.



2. Mr Lim paid $312 695 for a 3-room flat in Singapore. How do we write the price of the flat in words? Use number discs to show the number.

Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Ones
3	1	2	6	9	5

We can also use place-value cards to show the number.

3 1 2 6 9 5

312 695 = 3 hundred thousands 1 ten thousand 2 thousands 6 hundreds 9 tens 5 ones
= 300 000 + 10 000 + 2000 + 600 + 90 + 5
= 312 000 + 695

We write 312 695 as **three hundred and twelve thousand, six hundred and ninety-five**.

OXFORD UNIVERSITY PRESS NUMBERS UP TO 10 MILLION 4

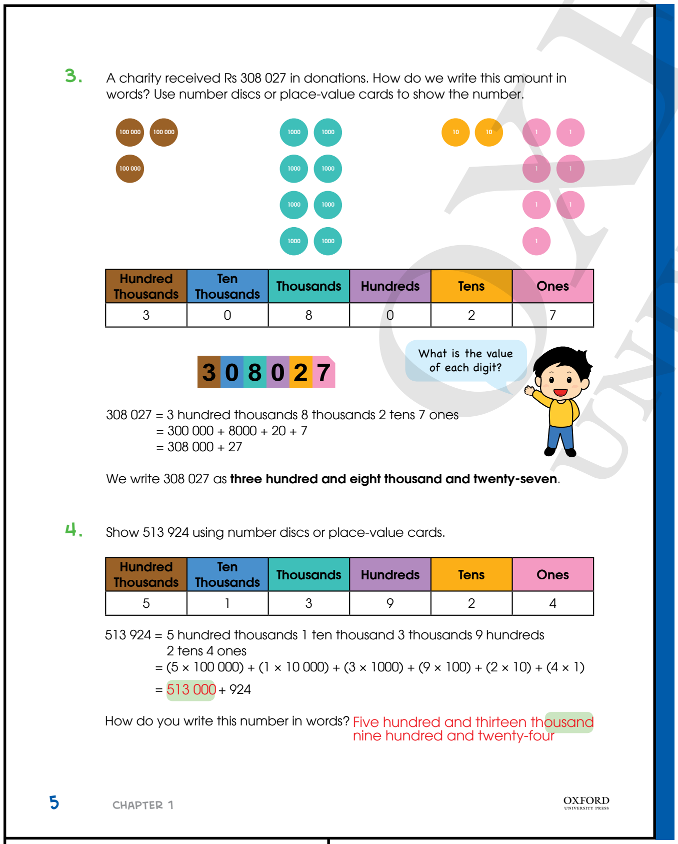
Textbook 4A P4

Let's Learn 2 shows pupils how numbers up to 1 million are written in words and numerals. The use of place-value charts, together with number discs or place-value cards helps pupils understand the breakdown of each number into the different place values of its digits. By visualising each digit in its individual place-value, pupils are able to understand what the number represents.

For instance, in the number 312 695, teacher can use number discs or place-value cards to represent each digit and place them at the appropriate columns in a place-value chart. Guide the pupils to see that the digit 3 in the hundred thousands place represents 300 000, the digit 1 in the ten thousands place represents 10 000, the digit 2 in the thousands place represents 2000, the digit 6 in the hundreds place represents 600, the digit 9 in the tens place represents 90 and the digit 5 in the ones place represents 5. Teacher explains that, to read the number, the digits in the hundred thousands, ten thousands and thousands place are grouped together as one collective thousands. Teacher reads the number aloud and writes:

Three hundred and twelve thousand, six hundred and ninety-five

Guide the pupils to read the number aloud while pointing to the numerals.



3. A charity received Rs 308 027 in donations. How do we write this amount in words? Use number discs or place-value cards to show the number.

Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Ones
3	0	8	0	2	7

3 0 8 0 2 7

308 027 = 3 hundred thousands 8 thousands 2 tens 7 ones
= 300 000 + 8000 + 20 + 7
= 308 000 + 27

We write 308 027 as **three hundred and eight thousand and twenty-seven**.

4. Show 513 924 using number discs or place-value cards.

Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Ones
5	1	3	9	2	4

513 924 = 5 hundred thousands 1 ten thousand 3 thousands 9 hundreds 2 tens 4 ones
= (5 × 100 000) + (1 × 10 000) + (3 × 1000) + (9 × 100) + (2 × 10) + (4 × 1)
= 513 000 + 924

How do you write this number in words? Five hundred and thirteen thousand nine hundred and twenty-four

5 CHAPTER 1 OXFORD UNIVERSITY PRESS

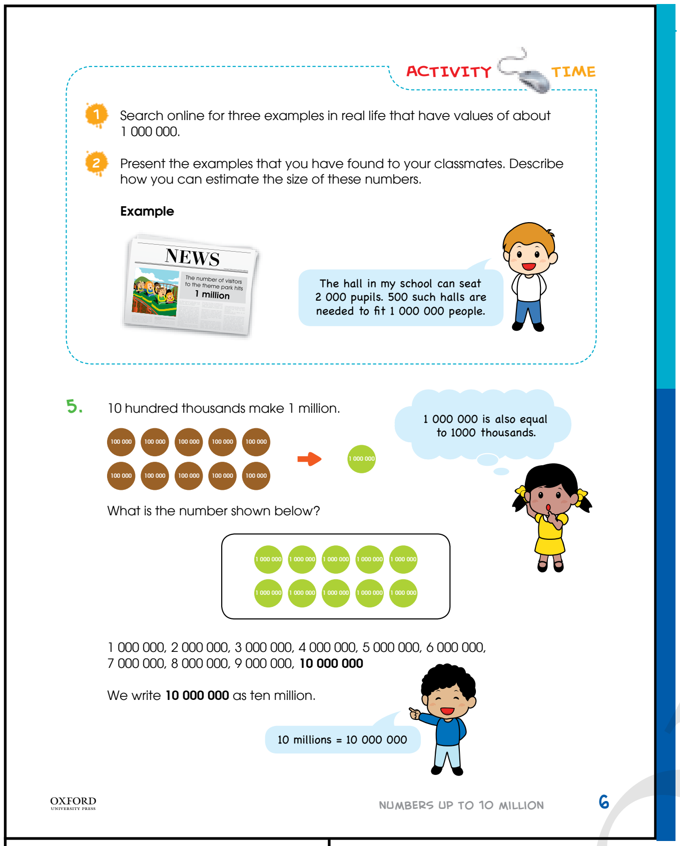
Textbook 5 P5

In Let's Learn 3, pupils are shown the representation of the digit zero in a number up to 1 million. It shows pupils how the number is written in words and the value it represents if the number contains the digit zero. As shown in the place-value chart, a place-value in a number that contains zero will have zero value represented by that place-value, and will not be read as part of the number. For instance, in 308 027 the digit zero in the ten thousands and the hundreds place will not be read. Teacher reads the number aloud and writes:

Three hundred and eight thousand and twenty seven

Guide the pupils to read the number aloud while pointing to the numerals. Remind pupils that when writing a 6-digit number, we leave a gap between the thousand and hundred digit.

For Let's Learn 4, pupils need to see that the digit in a particular place-value represents the number of times of the unit place-value. For example, the digit 5 in 513 924 means 5 groups of 100 000 or 5 × 100 000, which is 500 000. Guide pupils to find the missing number. For instance, based on the breakdown of the values represented by each digit in the number, guide pupils to see what is already being represented and what is missing. Give them some time to fill in the blanks.



ACTIVITY TIME

① Search online for three examples in real life that have values of about 1 000 000.

② Present the examples that you have found to your classmates. Describe how you can estimate the size of these numbers.

Example

NEWS

The number of visitors to the theme park hits 1 million

The hall in my school can seat 2 000 pupils. 500 such halls are needed to fit 1 000 000 people.

5. 10 hundred thousands make 1 million.

1 000 000 is also equal to 1000 thousands.

What is the number shown below?

1 000 000, 2 000 000, 3 000 000, 4 000 000, 5 000 000, 6 000 000, 7 000 000, 8 000 000, 9 000 000, **10 000 000**

We write **10 000 000** as ten million.

10 millions = 10 000 000

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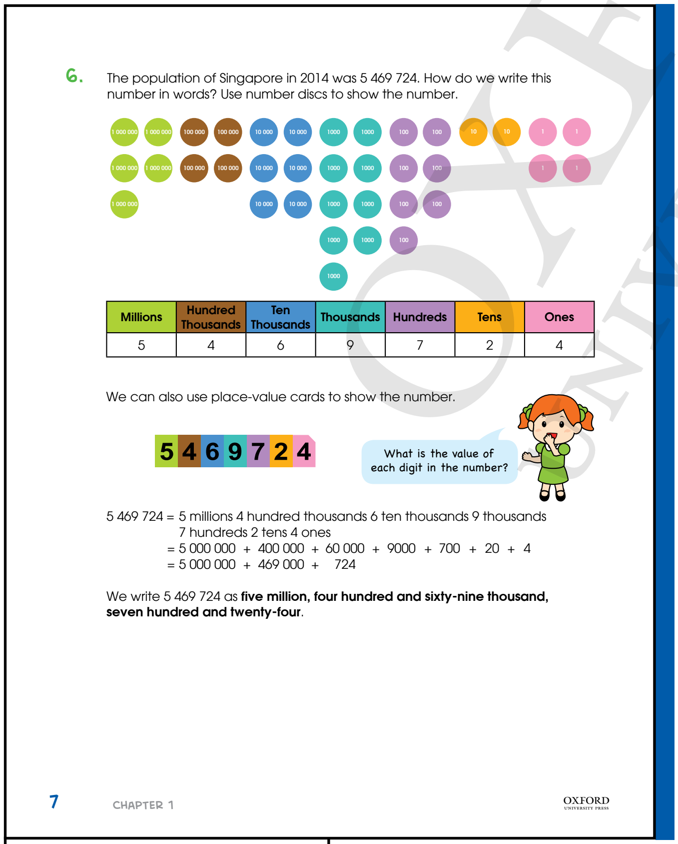
NUMBERS UP TO 10 MILLION 6

Textbook 5 P6

ACTIVITY TIME

Assign pupils to do this in pairs or individually. This activity involving ICT allows pupils to explore and relate to real-life examples with the number around 1 million. Through discussion, pupils get a sense of the value and size of the number in million in various contexts.

For Let’s Learn 5, use number discs to illustrate how 10 sets of 1 million make 10 million. Show pupils how 10 million is written in numerals and words.



6. The population of Singapore in 2014 was 5 469 724. How do we write this number in words? Use number discs to show the number.

Millions	Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Ones
5	4	6	9	7	2	4

We can also use place-value cards to show the number.

5 4 6 9 7 2 4

What is the value of each digit in the number?

5 469 724 = 5 millions 4 hundred thousands 6 ten thousands 9 thousands 7 hundreds 2 tens 4 ones
= 5 000 000 + 400 000 + 60 000 + 9000 + 700 + 20 + 4
= 5 000 000 + 469 000 + 724

We write 5 469 724 as **five million, four hundred and sixty-nine thousand, seven hundred and twenty-four**.

7 CHAPTER 1

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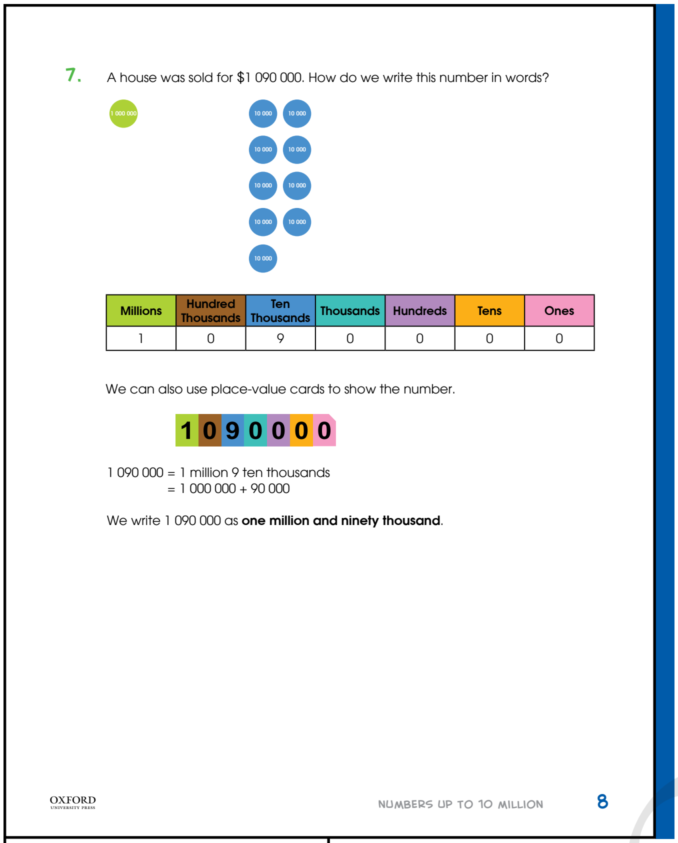
Textbook 5 P7

For Let’s Learn 6, help pupils to understand the breakdown of each number up to 10 million into the different place values of its digits with the aid of place-value charts and number discs or place-value cards.

Guide pupils to see that the entire number is made up of the sum of all the values of the digits in their respective place values. Pupils also learn to write numbers up to 10 million in numerals and words.



7. A house was sold for $1 090 000. How do we write this number in words?

Millions	Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Ones
1	0	9	0	0	0	0

We can also use place-value cards to show the number.

1 0 9 0 0 0 0

1 090 000 = 1 million 9 ten thousands
= 1 000 000 + 90 000

We write 1 090 000 as **one million and ninety thousand**.

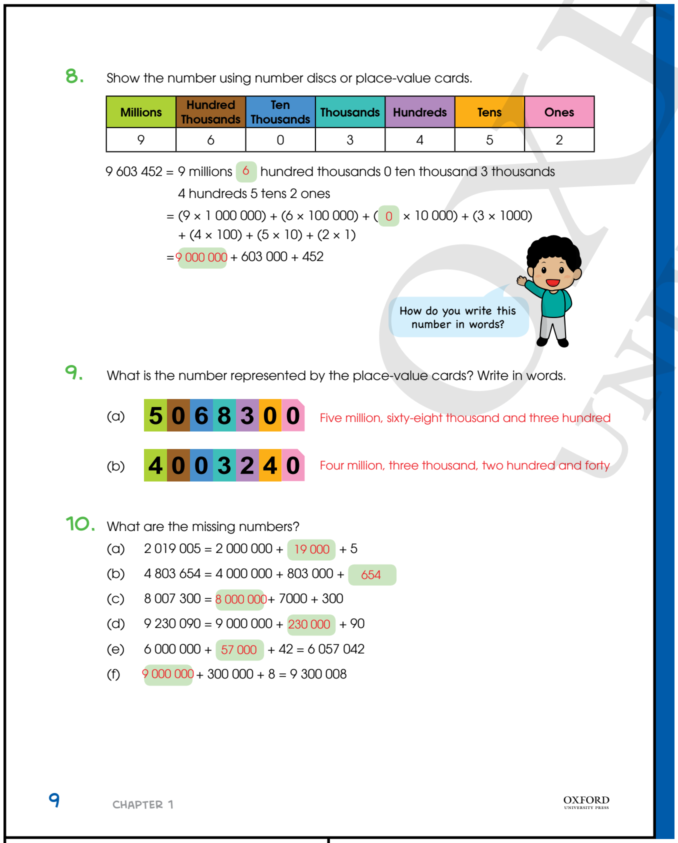
OXFORD UNIVERSITY PRESS NUMBERS UP TO 10 MILLION 8

Textbook 5 P8

For Let's Learn 7, write 1 090 000 on the board. Ask pupils how many 'one million' and 'ten thousand' number discs are needed to make up 1 090 000. Elicit that 1 'one million' and 9 'ten thousands' are needed. Similarly, as shown in the place-value chart, a place-value in a number that contains zero will have zero value represented by that place-value, and will not be read as part of the number. For instance, in 1 090 000, only the non-zero digits are read, where the digit in the millions place are read first, followed by the digits in thousands, and the rest. Teacher reads the number aloud and writes:

One million and ninety thousand

Guide the pupils to read the number aloud pointing to the numerals. Remind pupils that when writing a 7-digit number, we leave a gap between the thousand and hundred digit as well as between the million and hundred thousand digit.



8. Show the number using number discs or place-value cards.

Millions	Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Ones
9	6	0	3	4	5	2

9 603 452 = 9 millions 6 hundred thousands 0 ten thousand 3 thousands
4 hundreds 5 tens 2 ones
= (9 × 1 000 000) + (6 × 100 000) + (0 × 10 000) + (3 × 1000)
+ (4 × 100) + (5 × 10) + (2 × 1)
= 9 000 000 + 603 000 + 452

9. What is the number represented by the place-value cards? Write in words.

(a) 5 0 6 8 3 0 0 Five million, sixty-eight thousand and three hundred

(b) 4 0 0 3 2 4 0 Four million, three thousand, two hundred and forty

10. What are the missing numbers?

(a) 2 019 005 = 2 000 000 + 19 000 + 5
(b) 4 803 654 = 4 000 000 + 803 000 + 654
(c) 8 007 300 = 8 000 000+ 7000 + 300
(d) 9 230 090 = 9 000 000 + 230 000 + 90
(e) 6 000 000 + 57 000 + 42 = 6 057 042
(f) 9 000 000+ 300 000 + 8 = 9 300 008

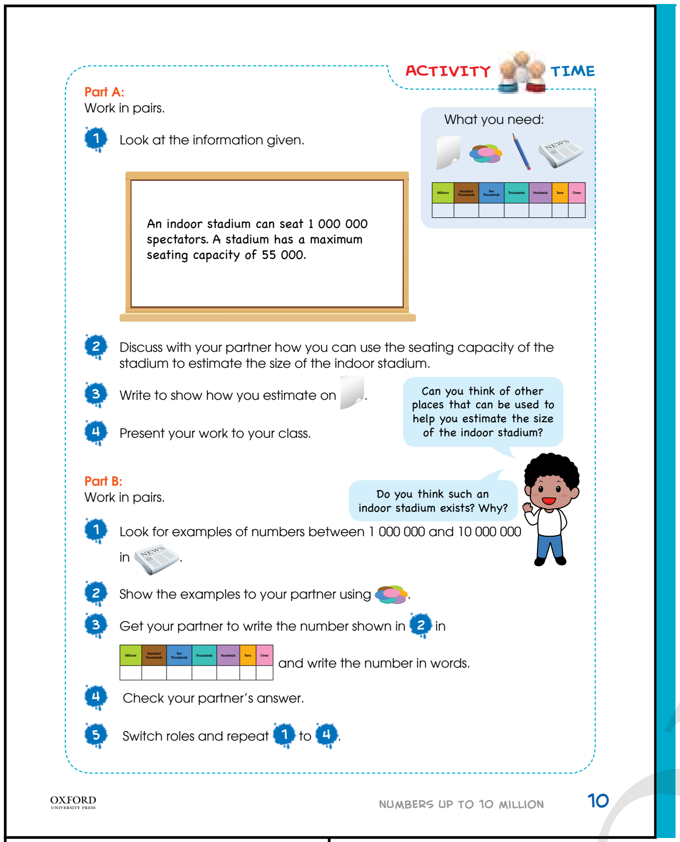
9 CHAPTER 1 OXFORD UNIVERSITY PRESS

Textbook 5 P9

For Let's Learn 8, use number discs and place-value cards to guide pupils to fill in the blanks. Invite a pupil to write the number in words. Highlight any errors for class discussion.

For Let's Learn 9, allow pupils to work in pairs to read and write the number in words. If necessary, allow pupils to use number discs and place-value cards to find the answers.

For Let's Learn 10, allow pupils to work in pairs. If necessary, allow pupils to use number discs and place-value cards to find the answers.



ACTIVITY TIME

Part A:
Work in pairs.

① Look at the information given.

An indoor stadium can seat 1 000 000 spectators. A stadium has a maximum seating capacity of 55 000.

What you need:

② Discuss with your partner how you can use the seating capacity of the stadium to estimate the size of the indoor stadium.

③ Write to show how you estimate on .

④ Present your work to your class.

Can you think of other places that can be used to help you estimate the size of the indoor stadium?

Part B:
Work in pairs.

Do you think such an indoor stadium exists? Why?

① Look for examples of numbers between 1 000 000 and 10 000 000 in .

② Show the examples to your partner using .

③ Get your partner to write the number shown in ② in and write the number in words.

④ Check your partner's answer.

⑤ Switch roles and repeat ① to ④.

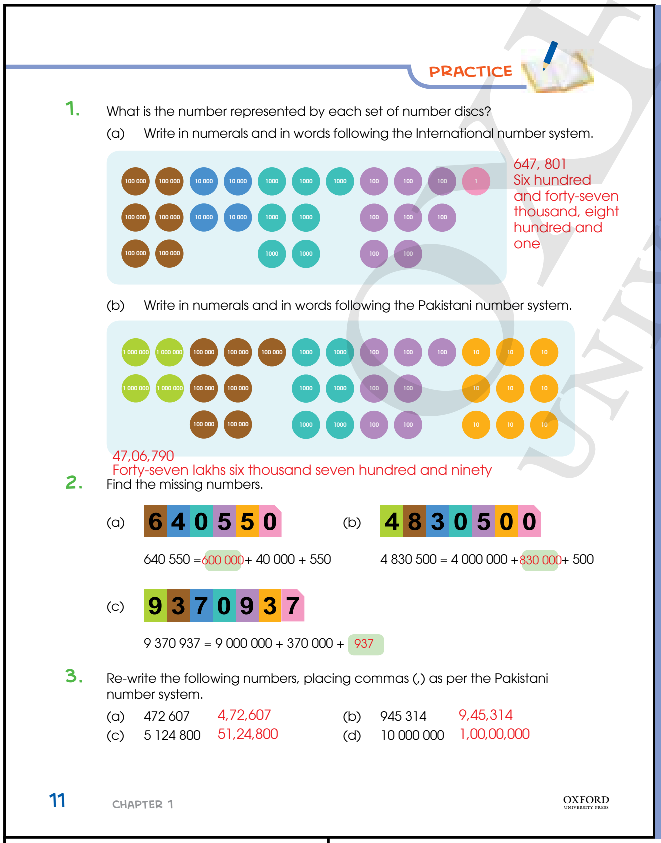
OXFORD UNIVERSITY PRESS NUMBERS UP TO 10 MILLION 10

Textbook 5 P10

ACTIVITY TIME

Part A
Working in pairs, pupils will think of ways to estimate the size of the indoor stadium. Pupils will develop the sense of how big is a million with reference to real-life space. The activity also helps pupils to apply estimation skill to obtain a reasonable value. Ask pupils if they can think of other methods to help them in their estimation and if such an indoor stadium exists. Invite pupils to share their responses.

Part B
Working in pairs, pupils search for more examples through newspapers, reinforcing their understanding of the number system up to 10 million. The activity also helps pupils relate to real-life examples involving numbers up to 10 million, giving them a better understanding looking at various contexts. The use of place-value charts and number discs reinforces pupils' understanding of the value of the numbers they have written down.



PRACTICE

1. What is the number represented by each set of number discs?
(a) Write in numerals and in words following the International number system.

647, 801
Six hundred and forty-seven thousand, eight hundred and one

(b) Write in numerals and in words following the Pakistani number system.

47,06,790
Forty-seven lakhs six thousand seven hundred and ninety

2. Find the missing numbers.

(a) 6 4 0 5 5 0
640 550 = 600 000 + 40 000 + 550

(b) 4 8 3 0 5 0 0
4 830 500 = 4 000 000 + 830 000 + 500

(c) 9 3 7 0 9 3 7
9 370 937 = 9 000 000 + 370 000 + 937

3. Re-write the following numbers, placing commas (,) as per the Pakistani number system.

(a) 472 607 4,72,607
(b) 945 314 9,45,314
(c) 5 124 800 51,24,800
(d) 10 000 000 1,00,00,000

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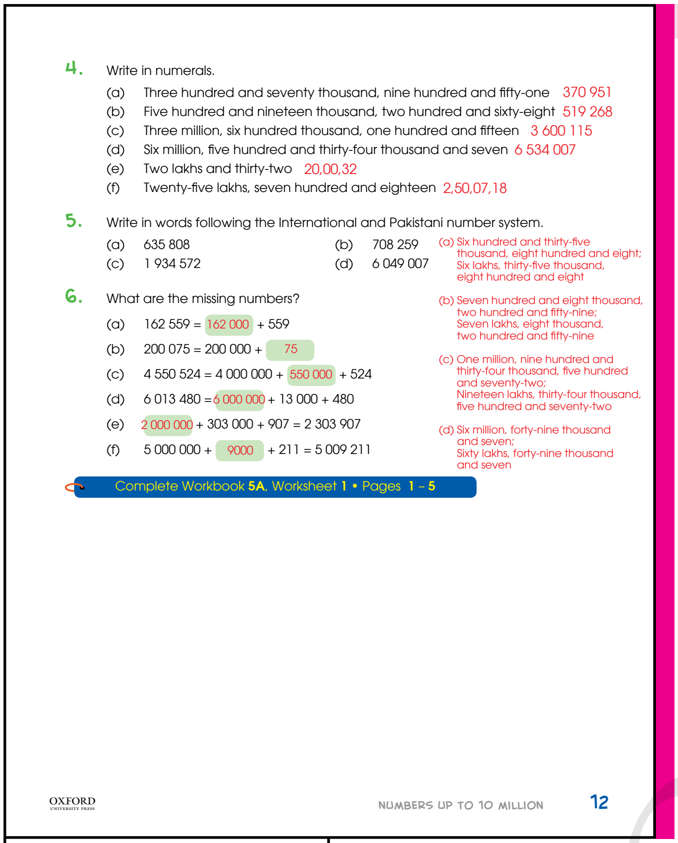
Textbook 5 P11

PRACTICE

Work with pupils on the practice questions.



4. Write in numerals.

(a) Three hundred and seventy thousand, nine hundred and fifty-one 370 951
(b) Five hundred and nineteen thousand, two hundred and sixty-eight 519 268
(c) Three million, six hundred thousand, one hundred and fifteen 3 600 115
(d) Six million, five hundred and thirty-four thousand and seven 6 534 007
(e) Two lakhs and thirty-two 20,00,32
(f) Twenty-five lakhs, seven hundred and eighteen 2,50,07,18

5. Write in words following the International and Pakistani number system.

(a) 635 808 (b) 708 259
(c) 1 934 572 (d) 6 049 007

(a) Six hundred and thirty-five thousand, eight hundred and eight; Six lakhs, thirty-five thousand, eight hundred and eight

(b) Seven hundred and eight thousand, two hundred and fifty-nine; Seven lakhs, eight thousand, two hundred and fifty-nine

(c) One million, nine hundred and thirty-four thousand, five hundred and seventy-two; Nineteen lakhs, thirty-four thousand, five hundred and seventy-two

(d) Six million, forty-nine thousand and seven; Sixty lakhs, forty-nine thousand and seven

6. What are the missing numbers?

(a) 162 559 = 162 000 + 559
(b) 200 075 = 200 000 + 75
(c) 4 550 524 = 4 000 000 + 550 000 + 524
(d) 6 013 480 = 6 000 000 + 13 000 + 480
(e) 2 000 000 + 303 000 + 907 = 2 303 907
(f) 5 000 000 + 9000 + 211 = 5 009 211

Complete Workbook **5A**, Worksheet **1** • Pages **1 – 5**

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NUMBERS UP TO 10 MILLION 12

Textbook 5 P12

Independent seatwork

Assign pupils to complete Worksheet 1 (Workbook 5A P1 – 5).

Answers

Worksheet 1 (Workbook 5A P1 – 5)

1. (a) 435 121
   (b) 302 061
   (c) 2 113 414
   (d) 1 510 203

2. (a) 106 934
   (b) 732 523
   (c) 6 891 888
   (d) 7 545 009
   (e) 2 300 010

3. (a) Two hundred and thirty-nine thousand, five hundred and twelve
   (b) Five lakhs, eighty thousand, two hundred and seven
   (c) Two million, five hundred and forty-three thousand, one hundred and sixty-eight
   (d) Fifty lakhs, seventy-six thousand and twenty
   (e) Nine million, four hundred and thrity thousand and forty-nine

4. (a) Seven hundred and seventy-nine thousand, eight hundred and thirty
   (b) Nine hundred and eighty thousand and ninety-five
   (c) Three million, nine hundred thousand, five hundred and twelve
   (d) Four million, eighty-seven thousand, four hundred and sixty

5. (a) 8, 681 000
   (b) 9, 290 000

6. (a) 10 000
   (b) 6000
   (c) 300 000
   (d) 570 000
   (e) 310
   (f) 9 000 000

7. (a) 26 872
   (b) 9310 502

*8. (a) 9 765 421
   (b) 9 765 421
   (c) 1 245 796

LESSON PLAN

Chapter 1
Lesson 1

Specific Learning Focus

- Read and write numbers in numerals and in words.

Suggested Duration

2 periods

Prior Learning

In the earlier grade, pupils have learnt place values up to ten thousands. They should understand that 10 ten thousands make one hundred thousand. This chapter expands their understanding of numbers up to 10 million and place values up to millions.

Pre-emptive Pitfalls

Making smaller numbers tangible is less challenging. However, as the number gets larger with more number of digits, visualisation and conceptualisation of their values in real-life context becomes increasingly difficult to understand. Linking or extending their understanding through number discs will be beneficial in explaining that 10 hundred thousands make a million.

Introduction

Introduce the concept of millions by quoting real-life examples such as the population of cities and countries, property prices, distances between planets, masses of vehicles, etc. Use number discs to guide pupils to visualise that 10 hundred thousands make a million. In Let's Learn 1 (Textbook 5 P2), get pupils to use number discs to count and then write the numbers in words. Encourage pupils to say each number out loud in class.

Problem Solving

Emphasise that 10 hundred thousands make a million or 1000 thousands make a million and write the following on the board:

10 × 100 000 = 1 000 000
or 1000 × 1000 = 1 000 000

The use of place-value chart is beneficial as it helps pupils identify the value of each digit in a number. For example, in the number 513 924, guide pupils to see that the digit 5 is to be placed under the 'hundred thousands' column. Hence in 513 924, there are 5 hundred thousands, 1 ten thousands, 3 thousands, 9 hundreds, 2 tens and 4 ones.
Write the following on the board:

5 × 100 000 = 500 000
1 × 10 000 = 10 000
3 × 1000 = 3 000
9 × 100 = 900
2 × 10 = 20
4 × 1 = 4

Get pupils to use their individual sets of number discs and place-value cards while working on 'Let's Learn' and 'Practice' (Textbook 5 P2, 11). Explain to pupils that the value of each digit in a number is equivalent to the digit multiplied by the place value. Also, a place-value in a number that contains zero will have zero value represented by that place-value and will not be read as part of the number.

Activities

Have an interactive class discussion of the activity in 'Activity Time' (Textbook 5 P10). Ask pupils to talk about the number of spectators in a recent home ground match or concert. Ask them to give an estimate of the number of seats in each row and then the number of rows in each block. Encourage pupils to give an estimated number. Encourage pupils to come up and present in front of the class elaborating the mathematical strategy that helps them obtain a 6- or 7-digit estimated answer.

Resources

- computer (ICT)
- place-value chart (Activity Handbook 5 P2 − 3)
- newspapers
- number discs (Activity Handbook 5 P1)
- place-value cards (Activity Handbook 5 P3 − 8)

Mathematical Communication Support

The teacher can draw number discs or place-value chart representing a number, on the board, and ask pupils to call out the 6- or 7-digit number out loud, enunciating the place value of each digit. Encourage individual responses. Remind them that a place-value in a number that contains zero will have zero value represented by that place-value and will not be read as part of the number. Prompt pupils by asking:

1. How many ones, tens, hundreds, thousands, ten thousands, hundred thousands and millions are there in the number written on the board?
2. What number comes after 99 999?
3. What will be the value of a certain number if the 'hundreds' or 'thousands' is halved or quartered?
4. What number should be added to 99 998 to make 100 000?

Ask for real-life examples where numbers between 1 million and 10 million are involved (e.g. the length of the amazon river in metres, economic data of federal reserve of foreign currency, etc.).

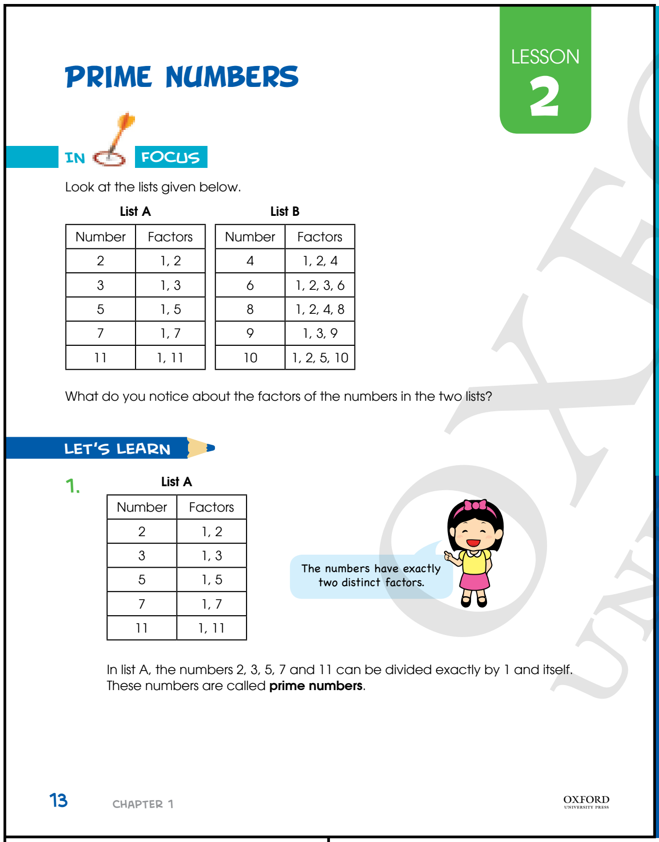
LESSON

2

PRIME NUMBERS

LEARNING OBJECTIVE

1. List the factors of a number.
2. Identify prime numbers and composite numbers.
3. Use prime factorisation to express a number as a product of its prime factors.



LESSON 2

PRIME NUMBERS

IN FOCUS

Look at the lists given below.

List A

Number	Factors
2	1, 2
3	1, 3
5	1, 5
7	1, 7
11	1, 11

List B

Number	Factors
4	1, 2, 4
6	1, 2, 3, 6
8	1, 2, 4, 8
9	1, 3, 9
10	1, 2, 5, 10

What do you notice about the factors of the numbers in the two lists?

LET'S LEARN

1.

List A

Number	Factors
2	1, 2
3	1, 3
5	1, 5
7	1, 7
11	1, 11

The numbers have exactly two distinct factors.

In list A, the numbers 2, 3, 5, 7 and 11 can be divided exactly by 1 and itself. These numbers are called **prime numbers**.

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Textbook 5 P13

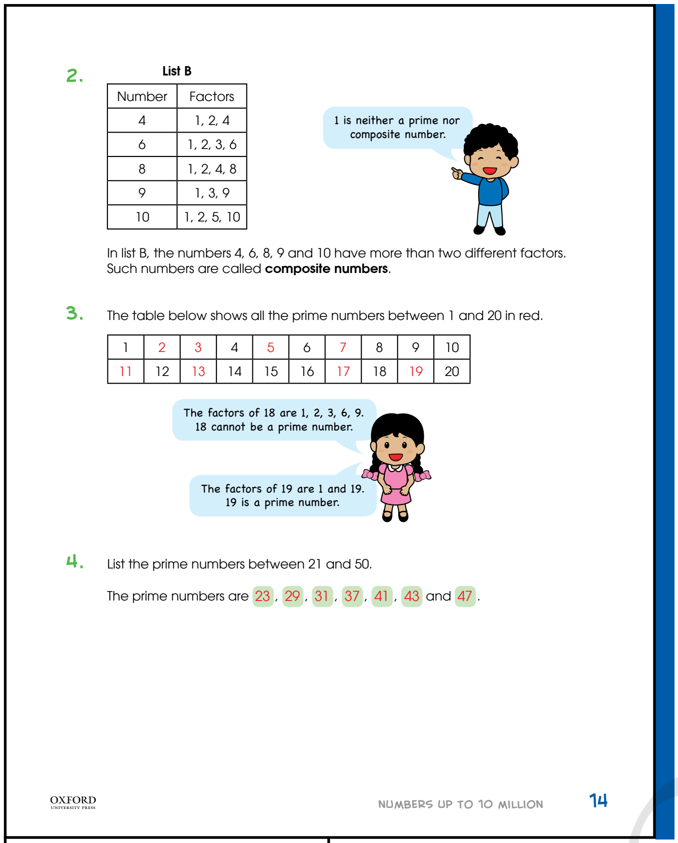
IN FOCUS

Ask pupils to look at the factors of the numbers in the two lists and ask the following questions:

- What do you notice about the factors of the numbers in each list?
- Are there any factors that are factors of more than one number?
- In which list do we have more common factors of the numbers?

LET'S LEARN

Focus on the numbers in list A first. Lead pupils to see that the numbers have exactly two distinct factors. Explain to them that the numbers can be divided exactly by 1 and itself. Say that these numbers are called **prime numbers**.



2. List B

Number	Factors
4	1, 2, 4
6	1, 2, 3, 6
8	1, 2, 4, 8
9	1, 3, 9
10	1, 2, 5, 10

1 is neither a prime nor composite number.

In list B, the numbers 4, 6, 8, 9 and 10 have more than two different factors. Such numbers are called **composite numbers**.

3. The table below shows all the prime numbers between 1 and 20 in red.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20

The factors of 18 are 1, 2, 3, 6, 9. 18 cannot be a prime number.

The factors of 19 are 1 and 19. 19 is a prime number.

4. List the prime numbers between 21 and 50.

The prime numbers are 23, 29, 31, 37, 41, 43 and 47.

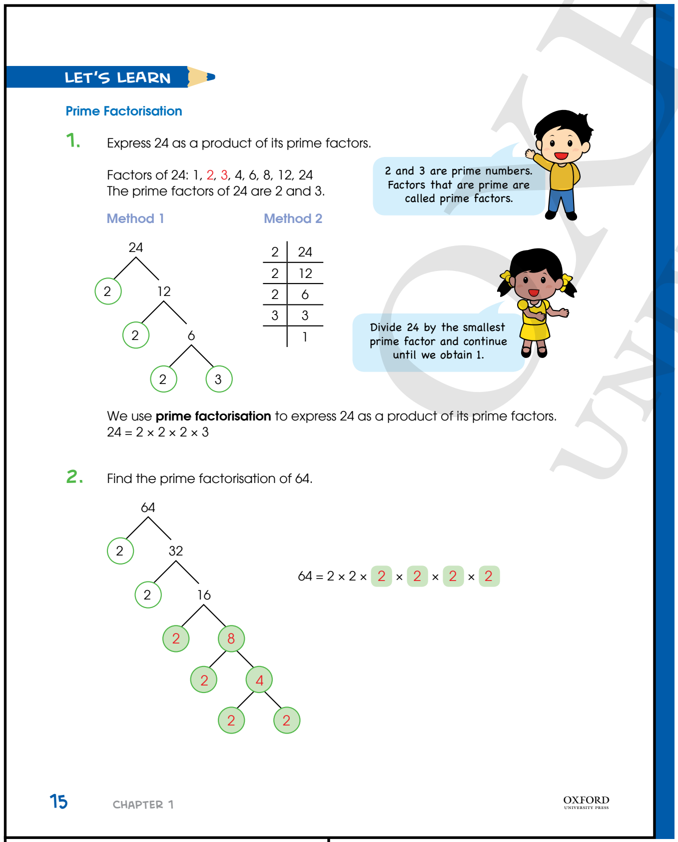
OXFORD UNIVERSITY PRESS NUMBERS UP TO 10 MILLION 14

Textbook 5 P14

In Let's Learn 2, bring pupils' attention to the numbers in list B. Lead pupils to see that the numbers have more than two different factors. Say that such numbers are called **composite numbers**.

In Let's Learn 3, remind pupils that prime numbers are numbers that can be divided exactly by 1 and itself. Highlight to them all the prime numbers between 1 and 20, as shown in the table. Give pupils some time to understand why those numbers are prime numbers.

Give pupils some time to work on Let's Learn 4, after which discuss the answers with the class.



LET'S LEARN

Prime Factorisation

1. Express 24 as a product of its prime factors.

Factors of 24: 1, 2, 3, 4, 6, 8, 12, 24
The prime factors of 24 are 2 and 3.

2 and 3 are prime numbers. Factors that are prime are called prime factors.

Method 1

24
2 12
2 6
2 3

Method 2

2	24
2	12
2	6
3	3
	1

Divide 24 by the smallest prime factor and continue until we obtain 1.

We use **prime factorisation** to express 24 as a product of its prime factors.
24 = 2 × 2 × 2 × 3

2. Find the prime factorisation of 64.

64
2 32
2 16
2 8
2 4
2 2

64 = 2 × 2 × 2 × 2 × 2 × 2

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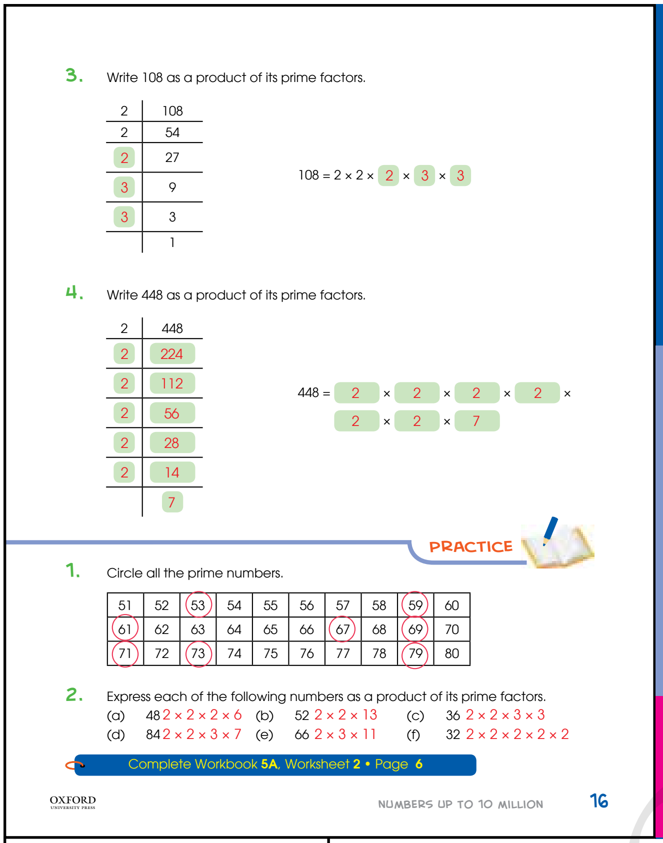
Textbook 5 P15

In Let's Learn 1, explain to pupils that prime factorisation is used to express a number as a product of its prime factors. Show them the two methods: factor tree and division method. Emphasise that prime factorisation is done by dividing the number by the smallest prime factor until we obtain 1.

In Let's Learn 2, give pupils some time to work on Let's Learn 2, after which discuss the answers with the class.



3. Write 108 as a product of its prime factors.

2	108
2	54
2	27
3	9
3	3
	1

108 = 2 × 2 × 2 × 3 × 3

4. Write 448 as a product of its prime factors.

2	448
2	224
2	112
2	56
2	28
2	14
	7

448 = 2 × 2 × 2 × 2 ×
2 × 2 × 7

PRACTICE

1. Circle all the prime numbers.

51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80

2. Express each of the following numbers as a product of its prime factors.

(a) 48 2 × 2 × 2 × 6 (b) 52 2 × 2 × 13 (c) 36 2 × 2 × 3 × 3
(d) 84 2 × 2 × 3 × 7 (e) 66 2 × 3 × 11 (f) 32 2 × 2 × 2 × 2 × 2

Complete Workbook **5A**, Worksheet **2** • Page **6**

OXFORD UNIVERSITY PRESS NUMBERS UP TO 10 MILLION 16

Textbook 5 P16

In Let's Learn 3 and 4, allow pupils to spend some time to do prime factorisation using the division method and hence find the missing prime factors of the numbers. Go through the answers with the pupils once they have completed the questions.

PRACTICE

Work with pupils on the practice questions.

For better understanding, select items from **Worksheet 2** and work these out with the pupils.

Independent seatwork

Assign pupils to complete Worksheet 2 (Workbook 5A P6).

Answers Worksheet 2 (Workbook 5A P6)

1.

Prime Numbers				Composite Numbers			
3	11	29	31	12	18	15	25
				42	27	58	39
13	71	43	101	51	63	49	32
				21	111	123	117
				236	115	141	220
				256	237	310	415
				153	261	381	291

2. (a) 2 × 2 × 3
(b) 2 × 2 × 2 × 2 × 2 × 3
(c) 2 × 2 × 3 × 3 × 3
(d) 2 × 2 × 3 × 3 × 3 × 5
(e) 2 × 3 × 5 × 11
(f) 5 × 5 × 173

LESSON PLAN

Chapter 1
Lesson 2

Specific Learning Focus

- List the factors of a number.
- Identify prime numbers and composite numbers.
- Use prime factorisation to express a number as a product of its prime factors.

Suggested Duration

2 periods

Prior Learning

Pupils should understand that the factors of a specific number are numbers that the specific number can be divided exactly by. In this lesson, pupils learn that some numbers have only prime numbers as factors, while some numbers have prime numbers and composite numbers as factors.

Pre-emptive Pitfalls

Pupils might confuse prime numbers with composite numbers, especially with numbers like 57, which may seem like a prime number but is not. It will be helpful for pupils to know their tests of divisibility of 2, 3, 5, 6, 8 and 10.

Introduction

Explore the prime and composite numbers in Textbook 5 P13 – 14, and lists A and B, which clearly differentiates between prime numbers and composite numbers. Emphasise that prime numbers can be divided exactly by 1 and itself, while composite numbers can be divided exactly by other numbers besides 1 and itself. The examples in 'Let's Learn' teach pupils to express a number as a product of its prime factors. Factor tree and division are two methods of prime factorisation to express a number as a product of its prime factors. It should be emphasised that composite numbers can be expressed as a product of composite numbers or prime numbers too (e.g. 24 = 8 × 3 = 6 × 4 = 12 × 2 or 24 = 2 × 2 × 2 × 3). Expressing numbers as a product of prime factors will be beneficial later when finding highest common factor or lowest common multiple.

Problem Solving

Pupils should understand that 1 and the number itself will always be divided by the number exactly without a remainder. Explain that '1' is not a prime number as it has only one factor. Prime numbers have two distinct factors and composite numbers have more than two different factors.

Activities

'Sieve of Eratosthenes' can be played in pairs, where pupils are required to cross out all the multiples (from 1 to 100) of 2, 3, 5, 7 and 9 using different coloured markers, and ask pupils to say what they notice about the numbers that are not crossed out. They have done this activity in Grade 4 but without formally being introduced to prime numbers.

Resources

- hundred chart (Activity Handbook 5 P9)
- markers

Mathematical Communication Support

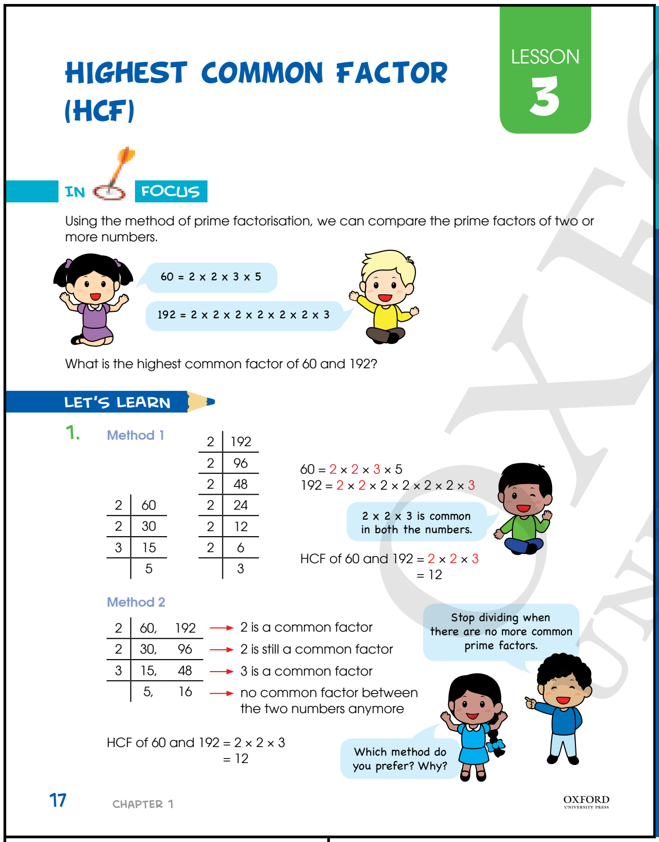
The 'Sieve of Eratosthenes' activity can be done in pairs or as a class activity. Emphasise the key terms with their core concepts: prime, composite, product of prime factors. The expression of a number as a product of its prime factors should be emphasised (e.g. 124 = 2 × 2 × 31). Lots of practice questions (Textbook 5 P16 and Workbook 5A P6) can be done on the board.

LESSON
3

HIGHEST COMMON FACTOR (HCF)

LEARNING OBJECTIVE

1. Find the highest common factor of two or more numbers using prime factorisation.



HIGHEST COMMON FACTOR (HCF)

LESSON
3

IN FOCUS

Using the method of prime factorisation, we can compare the prime factors of two or more numbers.

60 = 2 x 2 x 3 x 5

192 = 2 x 2 x 2 x 2 x 2 x 2 x 3

What is the highest common factor of 60 and 192?

LET'S LEARN

1. Method 1

$$\begin{array}{r|l} 2 & 60 \\ \hline 2 & 30 \\ \hline 3 & 15 \\ \hline & 5 \end{array} \qquad \begin{array}{r|l} 2 & 192 \\ \hline 2 & 96 \\ \hline 2 & 48 \\ \hline 2 & 24 \\ \hline 2 & 12 \\ \hline 2 & 6 \\ \hline & 3 \end{array}$$

60 = 2 × 2 × 3 × 5
192 = 2 × 2 × 2 × 2 × 2 × 2 × 3

2 x 2 x 3 is common in both the numbers.

HCF of 60 and 192 = 2 × 2 × 3
= 12

Method 2

$$\begin{array}{r|ll} 2 & 60, & 192 \\ \hline 2 & 30, & 96 \\ \hline 3 & 15, & 48 \\ \hline & 5, & 16 \end{array}$$

→ 2 is a common factor
→ 2 is still a common factor
→ 3 is a common factor
→ no common factor between the two numbers anymore

Stop dividing when there are no more common prime factors.

HCF of 60 and 192 = 2 × 2 × 3
= 12

Which method do you prefer? Why?

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Textbook 5 P17

IN FOCUS

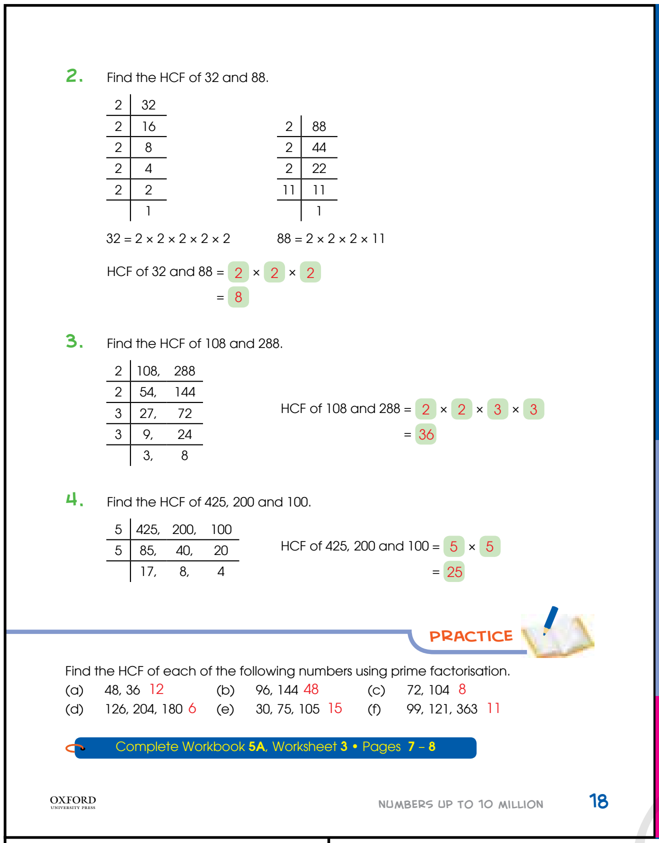
Recapitulate with pupils how prime factorisation is done using the division method learnt in Lesson 2. Lead them to compare the prime factors of 60 and 192, and find the highest common factor (HCF).

LET'S LEARN

In Let's Learn 1, explain to pupils that there are two methods of prime factorisation to find the HCF of two or more numbers. Lead pupils to see that one method is to use the division method to find the prime factors of 60 and 192 respectively. Then, the prime factors of 60 and 192 are listed respectively. The common prime factors are then identified based on the list of prime factors. HCF of the two numbers can be found by taking the product of all the common prime factors.

Explain to pupils that the second method is to use the division method to find the prime factors by dividing both numbers each time. Emphasise that this means that we keep dividing until there are no more common prime factors between both numbers. HCF of the two numbers can then be found by taking the product of the common prime factors found by the division method.

Ask pupils for their preferred method, giving their reasons.



2. Find the HCF of 32 and 88.

2	32
2	16
2	8
2	4
2	2
	1

2	88
2	44
2	22
11	11
	1

32 = 2 × 2 × 2 × 2 × 2

88 = 2 × 2 × 2 × 11

HCF of 32 and 88 = 2 × 2 × 2

= 8

3. Find the HCF of 108 and 288.

2	108,	288
2	54,	144
3	27,	72
3	9,	24
	3,	8

HCF of 108 and 288 = 2 × 2 × 3 × 3

= 36

4. Find the HCF of 425, 200 and 100.

5	425,	200,	100
5	85,	40,	20
	17,	8,	4

HCF of 425, 200 and 100 = 5 × 5

= 25

PRACTICE

Find the HCF of each of the following numbers using prime factorisation.

(a) 48, 36 12
(b) 96, 144 48
(c) 72, 104 8
(d) 126, 204, 180 6
(e) 30, 75, 105 15
(f) 99, 121, 363 11

Complete Workbook **5A**, Worksheet **3** • Pages **7 – 8**

OXFORD UNIVERSITY PRESS

NUMBERS UP TO 10 MILLION 18

Textbook 5 P18

Point out to pupils that the method of prime factorisation used in Let's Learn 2 is using division method to find the factors of 32 and 88 respectively. Give pupils some time to work on the question, after which discuss the answers with the class.

Point out to pupils that the method of prime factorisation used in Let's Learn 2 and 3 is using division method to find the common prime factors of the numbers by dividing all the numbers each time.

Explain to pupils that no matter how many numbers there are, the HCF of the numbers can be found using the same method.

PRACTICE

Work with pupils on the practice questions.

For better understanding, select items from **Worksheet 3** and work these out with the pupils.

Independent seatwork

Assign pupils to complete Worksheet 3 (Workbook 5A P7 – 8).

Answers

Worksheet 3 (Workbook 5A P7 – 8)

1. (a) HCF = 5 × 7 = 35
   (b) HCF = 2 × 11 × 13 = 286

2. (a) 156 = 2 × 2 × 3 × 13
   204 = 2 × 2 × 3 × 17
   HCF of 156 and 204 = 2 × 2 × 3 = 12
   (b) 425 = 5 × 5 × 17
   250 = 2 × 5 × 5 × 5
   HCF of 425 and 250 = 5 × 5 = 25
   (c) 28 = 2 × 2 × 7
   42 = 2 × 3 × 7
   98 = 2 × 7 × 7
   HCF of 28, 42 and 98 = 2 × 7 = 14
   (d) 35 = 5 × 7
   420 = 2 × 2 × 3 × 5 × 7
   350 = 2 × 5 × 5 × 7
   HCF of 35, 420 and 350 = 5 × 7 = 35

3. (a) 3 × 5, 15
   (b) 2 × 3 × 11, 66

LESSON PLAN

Chapter 1
Lesson 3

Specific Learning Focus

- Find the highest common factor of two or more numbers using prime factorisation.

Suggested Duration

3 periods

Prior Learning

Pupils should be well-versed with expressing a number as a product of its prime factors. In this lesson, pupils will learn that the highest common factor (HCF) is the greatest factor that is common between or among 2 or more numbers. In continuation of the earlier lesson, the division method of prime factorisation is employed to find the HCF.

Pre-emptive Pitfalls

Pupils should be well-versed with the tests of divisibility of prime numbers to express numbers as a product of prime factors.

Introduction

Pupils will be introduced to two methods of finding the HCF. They should be given the liberty to choose and apply the method they are comfortable with. In method 1 (Textbook 5 P17), each number is first expressed as the product of its prime factors, then the common factors of both numbers are identified, and hence the highest common factor is determined. In method 2, both numbers are simultaneously divided by common prime factors until no one common prime factor can be divided exactly by both numbers. Encourage pupils to work with both methods and let them decide which method they are more comfortable with.

Problem Solving

Get pupils to use method 1 first and once well-versed pupils can then use method 2 to solve the problems. They generally prefer method 2 as it is faster and there is no need to identify and circle the common prime factors of both numbers. Once their preferred method is identified, ask them to find the HCF of numbers and let them do practice questions (Workbook 5A P7 – 8) as independent or pair work.

Activities

Pupils can come up to the board and solve sums. Divide the board into two halves so that two pupils can solve the same sum using methods 1 and 2 simultaneously.

Resources

- mini whiteboard
- markers

Mathematical Communication Support

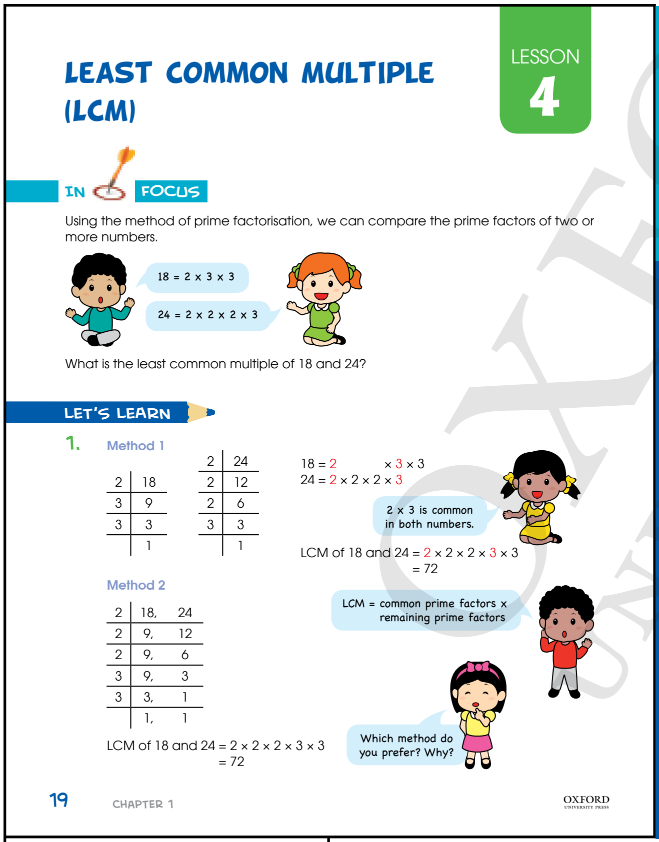
Ask pupils individually which method they prefer and give reasons why. Prompt them by asking: Is method 2 faster and easier? In which step do you think you will most likely make mistakes? What are prime numbers? Are factors of numbers a finite or an infinite set of numbers?

LESSON
4

LEAST COMMON MULTIPLE (LCM)

LEARNING OBJECTIVE

1. Find the least common multiple of two or more numbers using prime factorisation.



LEAST COMMON MULTIPLE (LCM)

LESSON 4

IN FOCUS

Using the method of prime factorisation, we can compare the prime factors of two or more numbers.

What is the least common multiple of 18 and 24?

LET'S LEARN

1. Method 1

2	18
3	9
3	3
	1

2	24
2	12
2	6
3	3
	1

$18 = 2 \qquad\quad \times 3 \times 3$

$24 = 2 \times 2 \times 2 \times 3$

LCM of 18 and 24 = $2 \times 2 \times 2 \times 3 \times 3$
= 72

Method 2

2	18,	24
2	9,	12
2	9,	6
3	9,	3
3	3,	1
	1,	1

LCM of 18 and 24 = $2 \times 2 \times 2 \times 3 \times 3$
= 72

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Textbook 5 P19

IN FOCUS

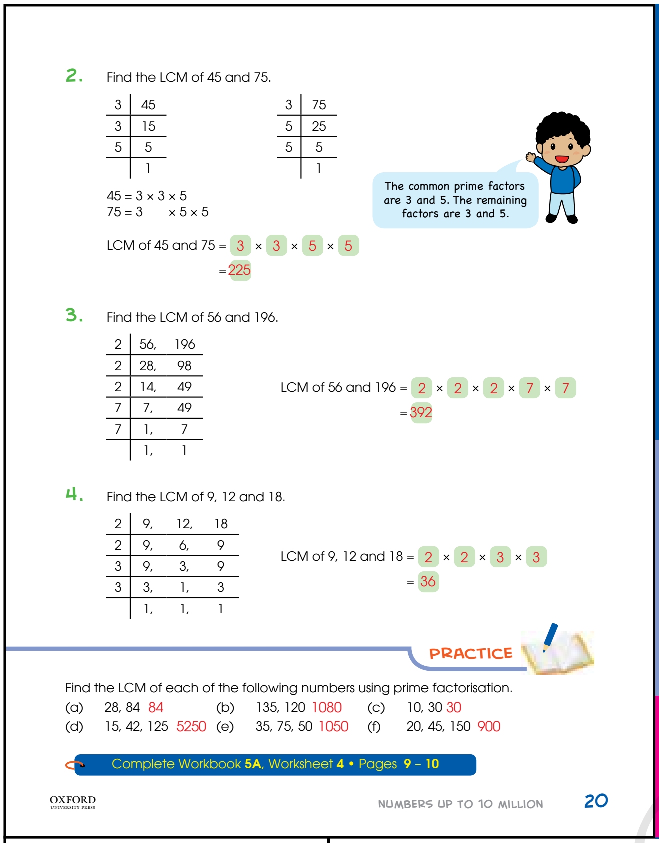
Discuss with pupils how the least common multiple of the two numbers can be found. Assist the pupils by asking the following questions:

- What are the multiples of 18 and 24 respectively?
- What is the difference between a factor and a multiple?

LET'S LEARN

In Let's Learn 1, explain to pupils that there are two methods of prime factorisation to find the LCM of two or more numbers. Lead pupils to see that one method is to use the division method to find the prime factors of 18 and 24 respectively. Then, the multiples of 18 and 24 are listed respectively. Lead pupils to highlight the multiples that are common in both numbers. Explain to them that LCM is found by multiplying the common prime factors with the remaining prime factors.

Explain to pupils that the second method is to use the division method to find the prime factors by dividing both numbers each time. Lead them to see that in this method, both numbers are divided until they cannot be divided any further without any remainder. LCM of the two numbers can be found by multiplying all the prime factors found in the division method. Ask pupils for their preferred method, giving their reasons.



2. Find the LCM of 45 and 75.

3	45
3	15
5	5
	1

3	75
5	25
5	5
	1

45 = 3 × 3 × 5
75 = 3 × 5 × 5

The common prime factors are 3 and 5. The remaining factors are 3 and 5.

LCM of 45 and 75 = 3 × 3 × 5 × 5
= 225

3. Find the LCM of 56 and 196.

2	56,	196
2	28,	98
2	14,	49
7	7,	49
7	1,	7
	1,	1

LCM of 56 and 196 = 2 × 2 × 2 × 7 × 7
= 392

4. Find the LCM of 9, 12 and 18.

2	9,	12,	18
2	9,	6,	9
3	9,	3,	9
3	3,	1,	3
	1,	1,	1

LCM of 9, 12 and 18 = 2 × 2 × 3 × 3
= 36

PRACTICE

Find the LCM of each of the following numbers using prime factorisation.
(a) 28, 84 84 (b) 135, 120 1080 (c) 10, 30 30
(d) 15, 42, 125 5250 (e) 35, 75, 50 1050 (f) 20, 45, 150 900

Complete Workbook **5A**, Worksheet **4** • Pages **9 – 10**

OXFORD UNIVERSITY PRESS NUMBERS UP TO 10 MILLION 20

Textbook 5 P20

For Let's Learn 2, get pupils to find LCM using prime factorisation to find the prime factors of both numbers respectively.

For Let's Learn 3 and 4, pupils are required to find LCM using the division method to find the prime factors of the numbers. Give pupils some time to work on the questions, after which discuss the answers with the class.

PRACTICE

Work with pupils on the practice questions.

For better understanding, select items from **Worksheet 4** and work these out with the pupils.

Independent seatwork

Assign pupils to complete Worksheet 3 (Workbook 5A P9 – 10).

Answers

Worksheet 4 (Workbook 5A P9 – 10)

1. (a) 60
   (b) 675
   (c) 1540
   (d) 4536

2. (a) 3 × 7 × 2 × 5 × 5 = 1050
   (b) 2 × 2 × 3 × 3 × 3 × 11 = 1188

3. (a) 2 × 2 × 7 × 3 × 3 × 3 = 756
   (b) 2 × 3 × 5 × 7 × 7 = 1470

LESSON PLAN

Chapter 1
Lesson 4

Specific Learning Focus

- Find the least common multiple of two or more numbers using prime factorisation.

Suggested Duration

3 periods

Prior Learning

Pupils should understand that a multiple of a number is that number multiplied by a whole number. Remind pupils that in the multiplication table of a particular number, multiples of the number are listed.

Pre-emptive Pitfalls

Pupils might get confused between HCF and LCM, and the concept of factors and multiples. It should be clearly explained that factors of a number can be divided by the number exactly without a remainder and a multiple of a number can divide the number exactly without a remainder.

Introduction

Since the number of multiples of a number is infinite, to find the smallest multiple common to both numbers, the first multiple that is common to both numbers is the lowest common multiple. For example, explain to pupils that to find LCM of 18 and 24, we first list the multiples of 18 and 24, and then circle the lowest common multiple:
multiples of 18 = 18, 36, 54, 72, 90, …
multiples of 24 = 24, 48, 72, 96, …
72 is the first multiple common to both 18 and 24, hence it is the lowest common multiple of 18 and 24. In Textbook 5 P19, methods 1 and 2 are exactly the same as the two methods used to find HCF, however in the case of finding LCM using method 1, we multiply all the common factors. When using method 2, we continue dividing regardless whether the prime factor is divided by both numbers or just one number. We divide completely until both numbers become 1.

Problem Solving

There are infinite number of multiples of a number, hence the lowest common multiple of two or more numbers can be identified. On the other hand, we cannot find the highest common multiple of numbers. Similarly, when finding HCF, ‘1’ is a universal factor and therefore the smallest common factor of all numbers. As such, we only find the highest common factors of numbers.

Activities

Two pupils can be asked to come up to the board at a time and they can both find the LCM of a set of numbers simultaneously using methods 1 and 2. The teacher should say out loud each step done by the pupils on the board.

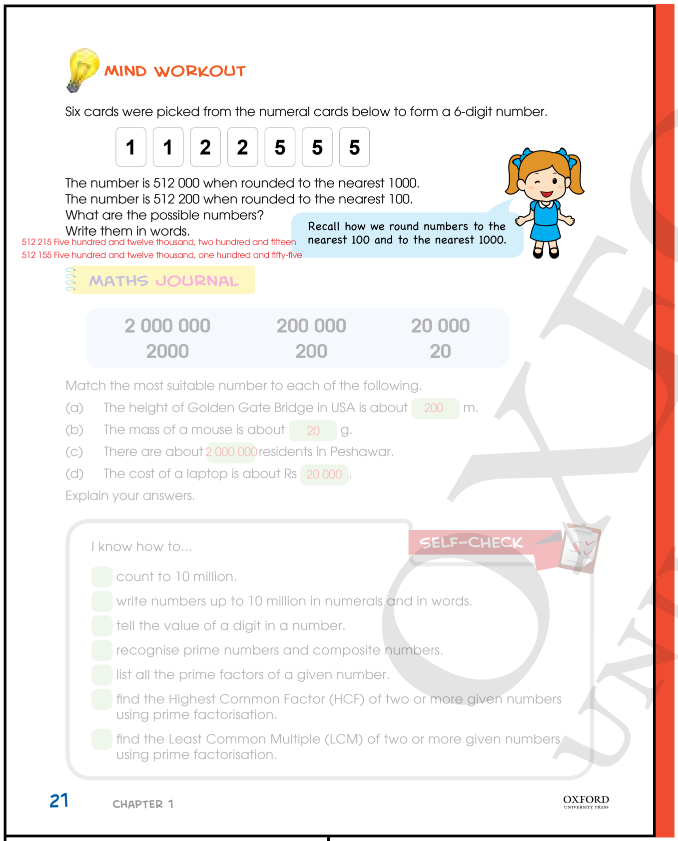
Resources

- mini whiteboard
- markers

Mathematical Communication Support

Ask pupils to identify the method they prefer and why. Ask them why we are asked to find the highest (not the lowest) common factor and the lowest (not the highest) common multiple.

PROBLEM SOLVING, MATHS JOURNAL AND PUPIL REVIEW



MIND WORKOUT

Six cards were picked from the numeral cards below to form a 6-digit number.

1 1 2 2 5 5 5

The number is 512 000 when rounded to the nearest 1000.
The number is 512 200 when rounded to the nearest 100.
What are the possible numbers?
Write them in words.

512 215 Five hundred and twelve thousand, two hundred and fifteen
512 155 Five hundred and twelve thousand, one hundred and fifty-five

Recall how we round numbers to the nearest 100 and to the nearest 1000.

MATHS JOURNAL

2 000 000	200 000	20 000
2000	200	20

Match the most suitable number to each of the following.

(a) The height of Golden Gate Bridge in USA is about 200 m.
(b) The mass of a mouse is about 20 g.
(c) There are about 2 000 000 residents in Peshawar.
(d) The cost of a laptop is about Rs 20 000.

Explain your answers.

SELF-CHECK

I know how to...

- ☐ count to 10 million.
- ☐ write numbers up to 10 million in numerals and in words.
- ☐ tell the value of a digit in a number.
- ☐ recognise prime numbers and composite numbers.
- ☐ list all the prime factors of a given number.
- ☐ find the Highest Common Factor (HCF) of two or more given numbers using prime factorisation.
- ☐ find the Least Common Multiple (LCM) of two or more given numbers using prime factorisation.

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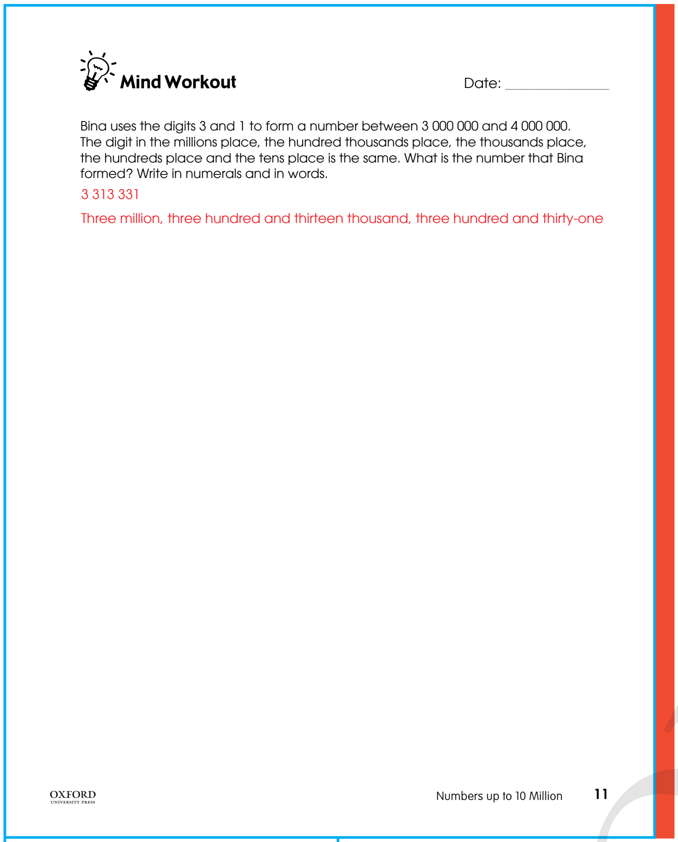
Textbook 5 P21

MIND WORKOUT

Pupils get to revisit and reinforce the concept of rounding off numbers, similar to what they have learnt in Grade Four. The repeated digits in the numeral cards challenge pupils to think about how these digits can be arranged in different ways.



Mind Workout Date: ____________

Bina uses the digits 3 and 1 to form a number between 3 000 000 and 4 000 000. The digit in the millions place, the hundred thousands place, the thousands place, the hundreds place and the tens place is the same. What is the number that Bina formed? Write in numerals and in words.

3 313 331

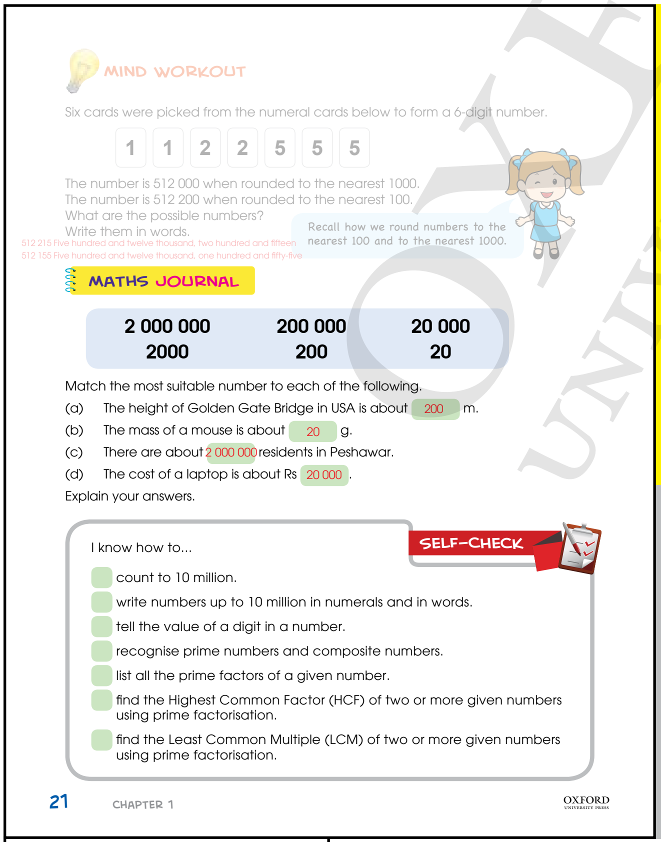
Three million, three hundred and thirteen thousand, three hundred and thirty-one

OXFORD UNIVERSITY PRESS Numbers up to 10 Million 11

Workbook 5A P11

Mind Workout

Pupils' concept of place values up to 10 million is reinforced in this Mind Workout. While there are several possible arrangements to the digits, pupils need to write the one correct number that meets all the conditions given.



MIND WORKOUT

Six cards were picked from the numeral cards below to form a 6-digit number.

1	1	2	2	5	5	5

The number is 512 000 when rounded to the nearest 1000.
The number is 512 200 when rounded to the nearest 100.
What are the possible numbers?
Write them in words.

512 215 Five hundred and twelve thousand, two hundred and fifteen
512 155 Five hundred and twelve thousand, one hundred and fifty-five

Recall how we round numbers to the nearest 100 and to the nearest 1000.

MATHS JOURNAL

2 000 000	200 000	20 000
2000	200	20

Match the most suitable number to each of the following.

(a) The height of Golden Gate Bridge in USA is about 200 m.
(b) The mass of a mouse is about 20 g.
(c) There are about 2 000 000 residents in Peshawar.
(d) The cost of a laptop is about Rs 20 000.

Explain your answers.

SELF-CHECK

I know how to...

- ☐ count to 10 million.
- ☐ write numbers up to 10 million in numerals and in words.
- ☐ tell the value of a digit in a number.
- ☐ recognise prime numbers and composite numbers.
- ☐ list all the prime factors of a given number.
- ☐ find the Highest Common Factor (HCF) of two or more given numbers using prime factorisation.
- ☐ find the Least Common Multiple (LCM) of two or more given numbers using prime factorisation.

21 CHAPTER 1 OXFORD UNIVERSITY PRESS

Textbook 5 P21

MATHS JOURNAL

This Maths Journal provides good practice for pupils to reinforce their number sense. Pupils learn to differentiate numbers ranging from tens to millions and to apply these numbers in different contexts and units of measurement.

SELF-CHECK

Before the pupils do the self-check, review the important concepts once more by asking for examples learnt for each objective.

The self-check can be done after pupils have completed **Review 1** (Workbook 5A P12 − 16).

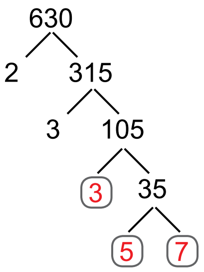
Answers Review 1 (Workbook 5A P12 – 16)

1. (a) 199 230
   (b) 613 413
   (c) 903 002
   (d) 3 685 951
   (e) 7 900 126
   (f) 9 000 070

2. (a) One hundred and fifty-three thousand, six hundred and fifty-two; One lakh, fifty-three thousand, six hundred and fifty-two
   (b) Four hundred and sixty-two thousand and eight-five; Four lakhs, sixty-two thousand and eighty-five
   (c) Three million, eight hundred and ninety-one thousand, two hundred and fifty-three; Thirty-eight lakhs, ninety-one thousand, two hundred and fifty-three
   (d) Seventy-eight lakhs, fifty thousand and nine

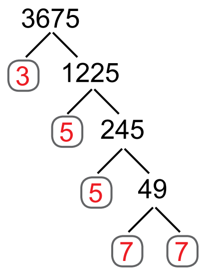
3. (a) 60 000
   (b) 90 000
   (c) 215
   (d) 2 000 000
   (e) 9 000 000
   (f) 6000

4. (a)



$630 = 2 \times 3 \times \boxed{3} \times \boxed{5} \times \boxed{7}$

(b)



$3675 = 3 \times 5 \times \boxed{5} \times \boxed{7} \times \boxed{7}$

5. (a)

2	1350
3	675
$\boxed{3}$	$\boxed{225}$
$\boxed{3}$	$\boxed{75}$
$\boxed{5}$	$\boxed{25}$
$\boxed{5}$	$\boxed{5}$
	1

$3675 = 2 \times 3 \times \boxed{3} \times \boxed{3} \times \boxed{5} \times \boxed{5}$

(b)

$\boxed{2}$	882
$\boxed{3}$	$\boxed{441}$
$\boxed{3}$	$\boxed{147}$
$\boxed{7}$	$\boxed{49}$
$\boxed{7}$	$\boxed{7}$
	1

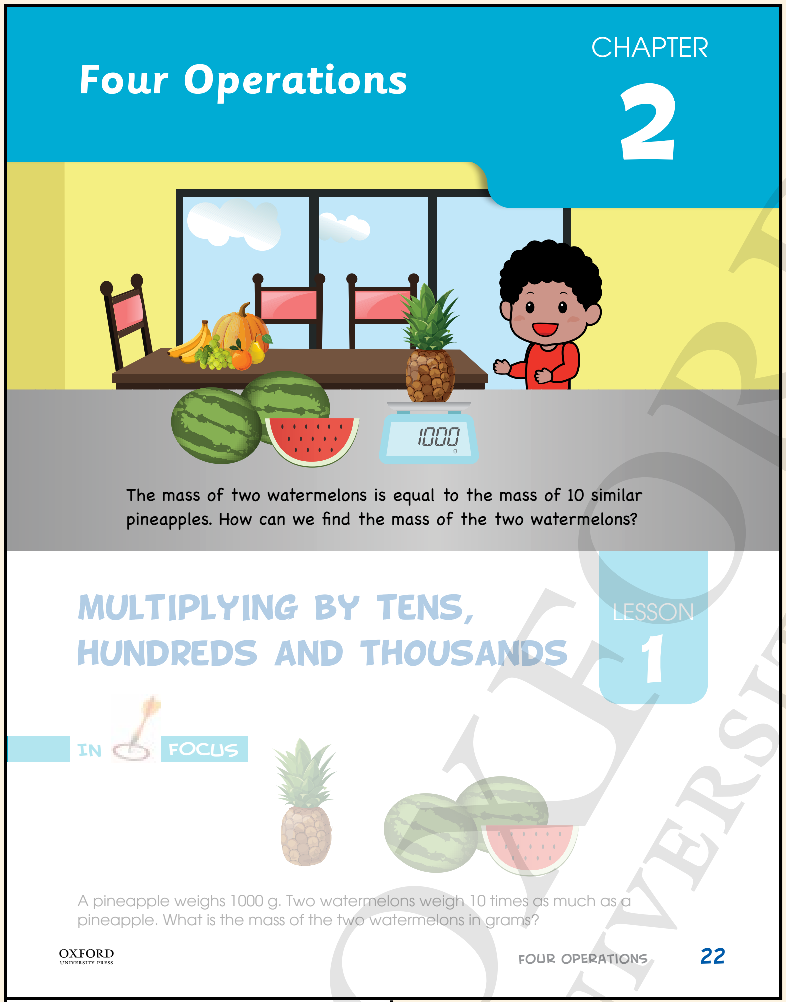
$882 = \boxed{2} \times \boxed{3} \times \boxed{3} \times \boxed{7} \times \boxed{7}$

6. 140

7. 7700

FOUR OPERATIONS

CHAPTER 2



Four Operations

CHAPTER 2

The mass of two watermelons is equal to the mass of 10 similar pineapples. How can we find the mass of the two watermelons?

MULTIPLYING BY TENS, HUNDREDS AND THOUSANDS

LESSON 1

IN FOCUS

A pineapple weighs 1000 g. Two watermelons weigh 10 times as much as a pineapple. What is the mass of the two watermelons in grams?

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FOUR OPERATIONS 22

Textbook 5 P22

Related Resources

NSPM Textbook 5 (P22 − 52)
NSPM Workbook 5A (P17 − 44)

Materials

Number discs, mini whiteboard, markers, calculator, conversion of unit cards, mathematical expression cards, bar model strips

Lesson

Lesson 1	Multiplying by Tens, Hundreds and Thousands
Lesson 2	Dividing by Tens, Hundreds and Thousands
Lesson 3	Order of Operations
Lesson 4	Solving Word Problems

Problem Solving, Maths Journal and Pupil Review

INTRODUCTION

This chapter continues to help pupils visualise and perform multiplication and division of whole numbers by tens, hundreds and thousands. It also helps pupils understand the rules of the order of operations, and subsequently estimate and calculate numbers based on given operations.

Pupils will also learn to apply the four operations in solving word problems, including the use of bar models and heuristics for non-routine questions.

LESSON
1

MULTIPLYING BY TENS, HUNDREDS AND THOUSANDS

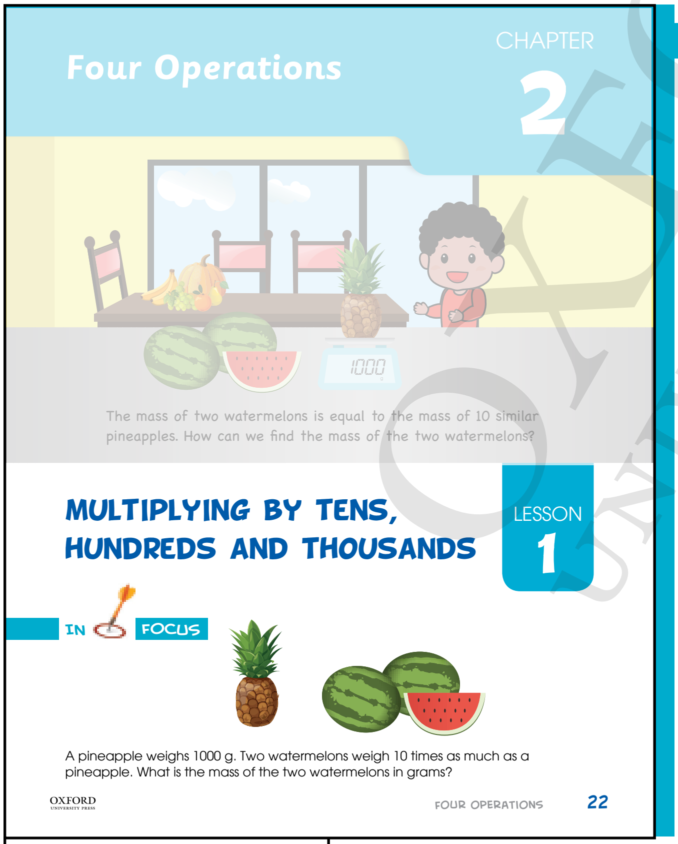
LEARNING OBJECTIVES

1. Multiply numbers by tens.
2. Multiply numbers by hundreds.
3. Multiply numbers by thousands.

IN FOCUS

The Chapter Opener (P22) gets pupils to relate to a situation involving the multiplication of numbers with 10/100/1000. Pose the problem to the pupils. Elicit responses from pupils on how they would find the answer based on their prior knowledge.

In addition, tell pupils that the mass of heavier fruits, such as watermelons and pineapples, are generally measured in kilograms in real life. Have pupils understand that masses in kilograms can be converted to grams by multiplying the mass in kilogram by 1000. This provides pupils with a real-life situation related to multiplying by ten, hundreds and thousands.



Four Operations

CHAPTER
2

The mass of two watermelons is equal to the mass of 10 similar pineapples. How can we find the mass of the two watermelons?

MULTIPLYING BY TENS, HUNDREDS AND THOUSANDS

LESSON
1

IN FOCUS

A pineapple weighs 1000 g. Two watermelons weigh 10 times as much as a pineapple. What is the mass of the two watermelons in grams?

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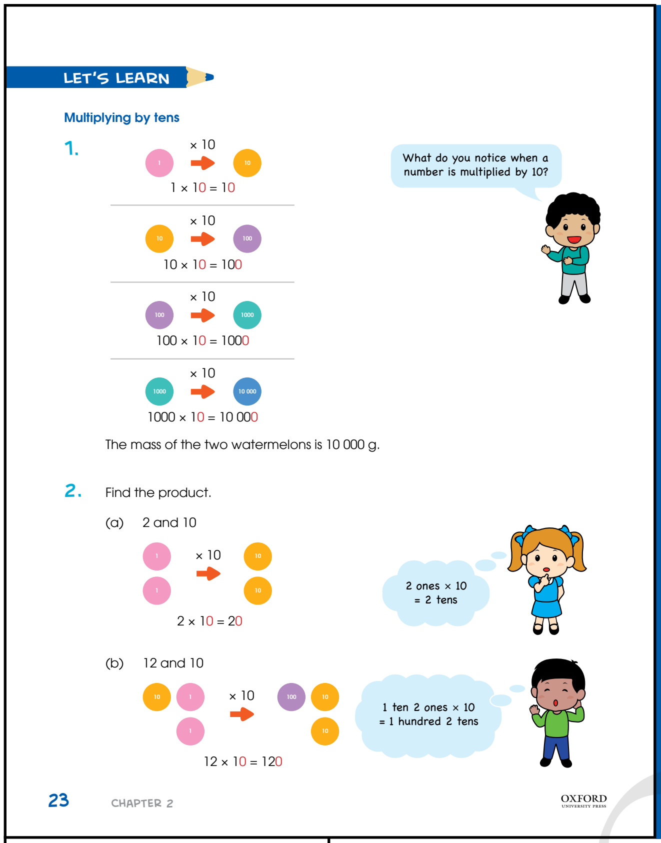
FOUR OPERATIONS 22

Textbook 5 P22



LET'S LEARN

Multiplying by tens

1\.

× 10

1 × 10 = 10

× 10

10 × 10 = 100

× 10

100 × 10 = 1000

× 10

1000 × 10 = 10 000

The mass of the two watermelons is 10 000 g.

What do you notice when a number is multiplied by 10?

2\. Find the product.

(a) 2 and 10

× 10

2 × 10 = 20

2 ones × 10
= 2 tens

(b) 12 and 10

× 10

12 × 10 = 120

1 ten 2 ones × 10
= 1 hundred 2 tens

23 CHAPTER 2

Textbook 5 P23

LET'S LEARN

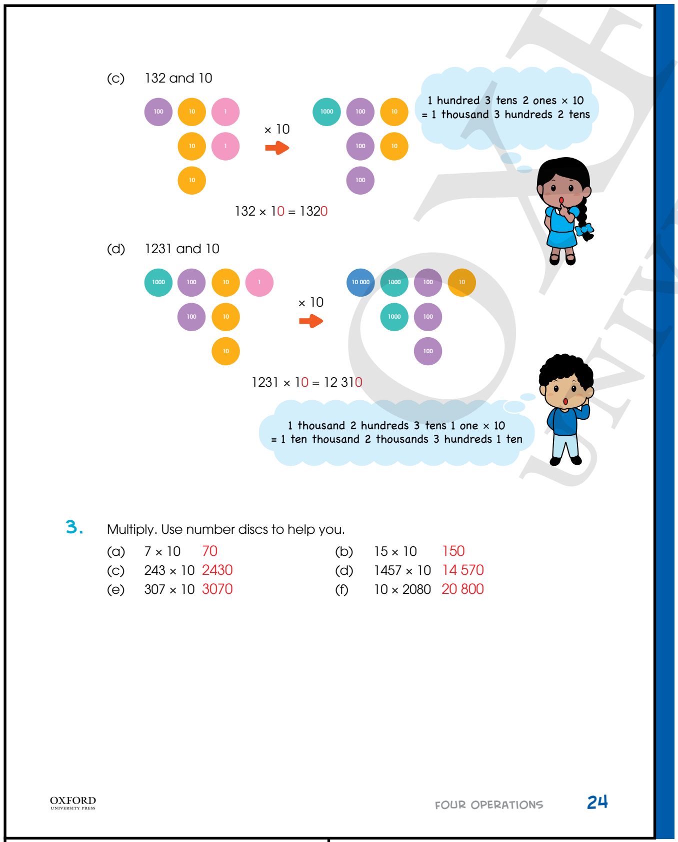
Multiplying by tens

With the use of number discs, help pupils visualise and understand the products of 10 with 1/10/100/1000 in Let's Learn 1. Ask pupils if they notice a pattern in the answers obtained. Lead pupils to arrive at the strategy of appending a zero when multiplying by 10.

Let's Learn 2 extends pupils' learning by going further to products of other whole numbers with 10.
Get the pupils to visualise through the use of number discs and work out the product between:

- A 1-digit number and 10
- A 2-digit number and 10
- A 3-digit number and 10
- A 4-digit number and 10

Get pupils to see a pattern in the answers. Explain to pupils that the products can also be worked out by multiplying each digit in its place values by 10.



(c) 132 and 10

× 10

132 × 10 = 1320

1 hundred 3 tens 2 ones × 10
= 1 thousand 3 hundreds 2 tens

(d) 1231 and 10

× 10

1231 × 10 = 12 310

1 thousand 2 hundreds 3 tens 1 one × 10
= 1 ten thousand 2 thousands 3 hundreds 1 ten

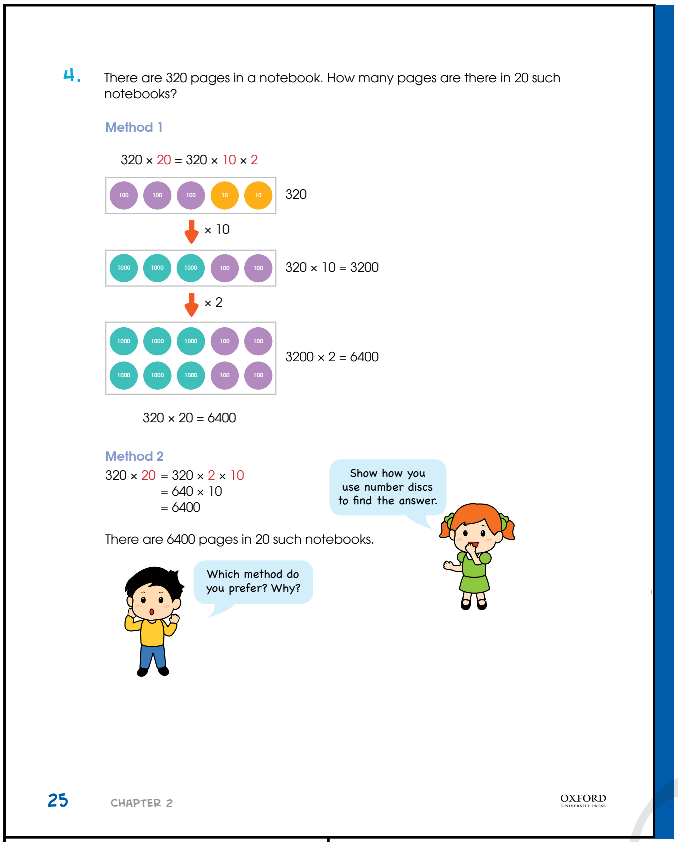
3\. Multiply. Use number discs to help you.

(a) 7 × 10 70
(b) 15 × 10 150
(c) 243 × 10 2430
(d) 1457 × 10 14 570
(e) 307 × 10 3070
(f) 10 × 2080 20 800

FOUR OPERATIONS 24

Textbook 5 P24

Get pupils to work on the questions in Let's Learn 3 with guidance and discussions.



4. There are 320 pages in a notebook. How many pages are there in 20 such notebooks?

Method 1

320 × 20 = 320 × 10 × 2

320

× 10

320 × 10 = 3200

× 2

3200 × 2 = 6400

320 × 20 = 6400

Method 2

320 × 20 = 320 × 2 × 10
= 640 × 10
= 6400

Show how you use number discs to find the answer.

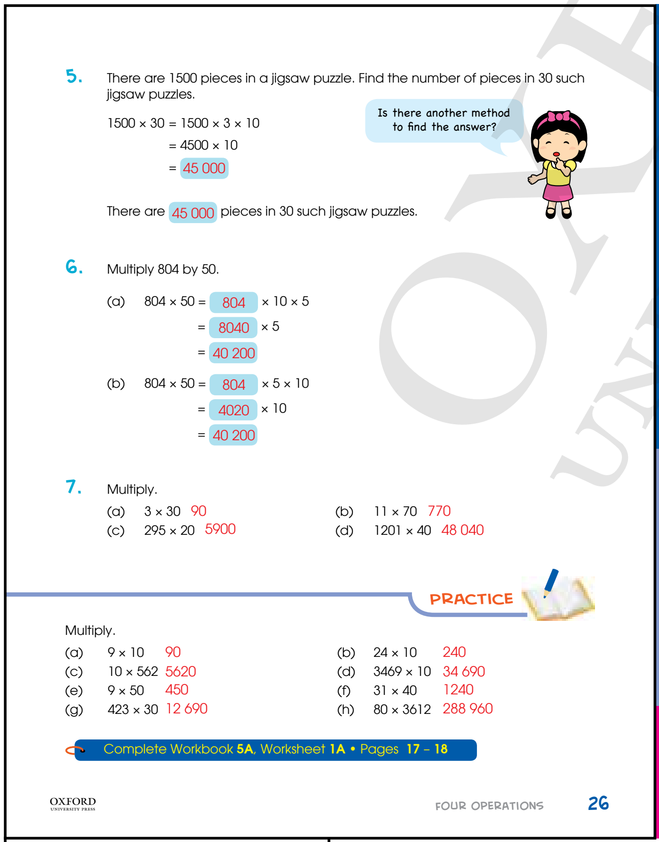
There are 6400 pages in 20 such notebooks.

Which method do you prefer? Why?

25 CHAPTER 2 OXFORD UNIVERSITY PRESS

Textbook 5 P25

For Let's Learn 4, help pupils visualise and understand the products of a whole number with a multiple of ten with the use of number discs. Explain the two methods of calculating 320 × 20. Ask pupils to compare the two methods.



5. There are 1500 pieces in a jigsaw puzzle. Find the number of pieces in 30 such jigsaw puzzles.

1500 × 30 = 1500 × 3 × 10
= 4500 × 10
= 45 000

Is there another method to find the answer?

There are 45 000 pieces in 30 such jigsaw puzzles.

6. Multiply 804 by 50.

(a) 804 × 50 = 804 × 10 × 5
= 8040 × 5
= 40 200

(b) 804 × 50 = 804 × 5 × 10
= 4020 × 10
= 40 200

7. Multiply.

(a) 3 × 30 90
(b) 11 × 70 770
(c) 295 × 20 5900
(d) 1201 × 40 48 040

PRACTICE

Multiply.

(a) 9 × 10 90
(b) 24 × 10 240
(c) 10 × 562 5620
(d) 3469 × 10 34 690
(e) 9 × 50 450
(f) 31 × 40 1240
(g) 423 × 30 12 690
(h) 80 × 3612 288 960

Complete Workbook **5A**, Worksheet **1A** • Pages **17 – 18**

OXFORD UNIVERSITY PRESS FOUR OPERATIONS 26

Textbook 5 P26

Let's Learn 5 involves the calculation of the product of a 4-digit number and 10. Give pupils some time to work on their solutions then ask them if there is another way of solving the same problem.

Let's Learn 6 allows pupils to practise multiplying 804 and 50 using both methods learnt in Let's Learn 4.

Let's Learn 7 gets pupils to calculate the multiplication of 1/2/3/4-digit numbers with a multiple of ten. Allow pupils to work in pairs. Give them sufficient time to work on the questions before going through.

PRACTICE

Allow pupils to discuss and work in pairs or groups. Then, go through the solutions with the class.

Independent seatwork

Assign pupils to complete Worksheet 1A (Workbook 5A P17 – 18).

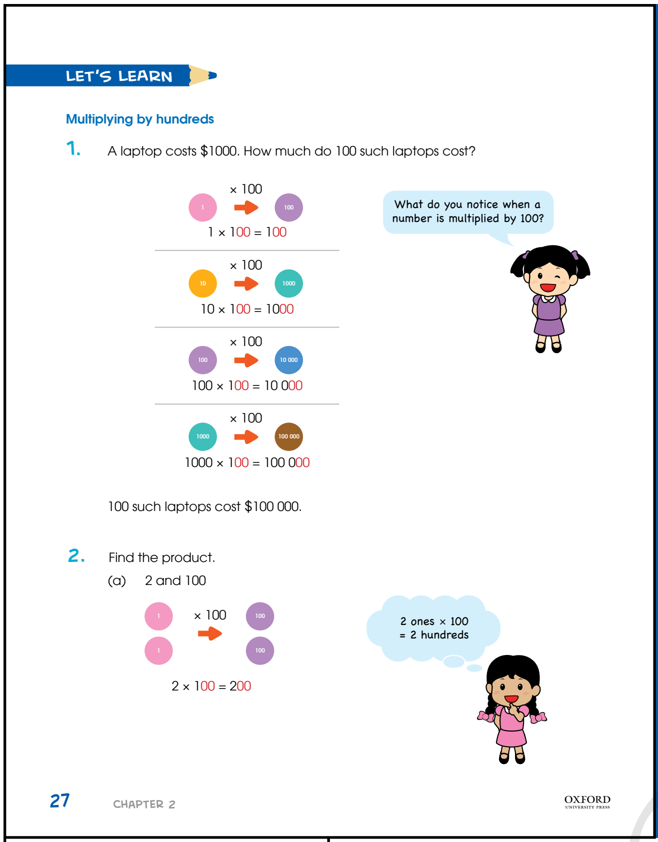
Answers Worksheet 1A (Workbook 5A P17 – 18)

1. (a) 320
   (b) 2050
   (c) 14 000

2. (a) 770
   (b) $85 \times 20 = 85 \times \boxed{2} \times \boxed{10}$
   $= \boxed{170} \times \boxed{10}$
   $= \boxed{1700}$
   (c) $632 \times 30 = 632 \times 3 \times 10$
   $= 1896 \times 10$
   $= 18\,960$
   (d) $1011 \times 40 = 1011 \times 4 \times 10$
   $= 4044 \times 10$
   $= 40\,400$

3. (a) 320
   (b) 9180
   (c) 54 290
   (d) 87 650
   (e) 3050
   (f) 9210
   (g) 88 160
   (h) 481 200

4. (a) 10
   (b) 10
   (c) 850
   (d) 6767



LET'S LEARN

Multiplying by hundreds

1. A laptop costs $1000. How much do 100 such laptops cost?

× 100
1 × 100 = 100

× 100
10 × 100 = 1000

× 100
100 × 100 = 10 000

× 100
1000 × 100 = 100 000

100 such laptops cost $100 000.

2. Find the product.

(a) 2 and 100

× 100

2 × 100 = 200

27 CHAPTER 2 OXFORD

Textbook 5 P27

LET'S LEARN

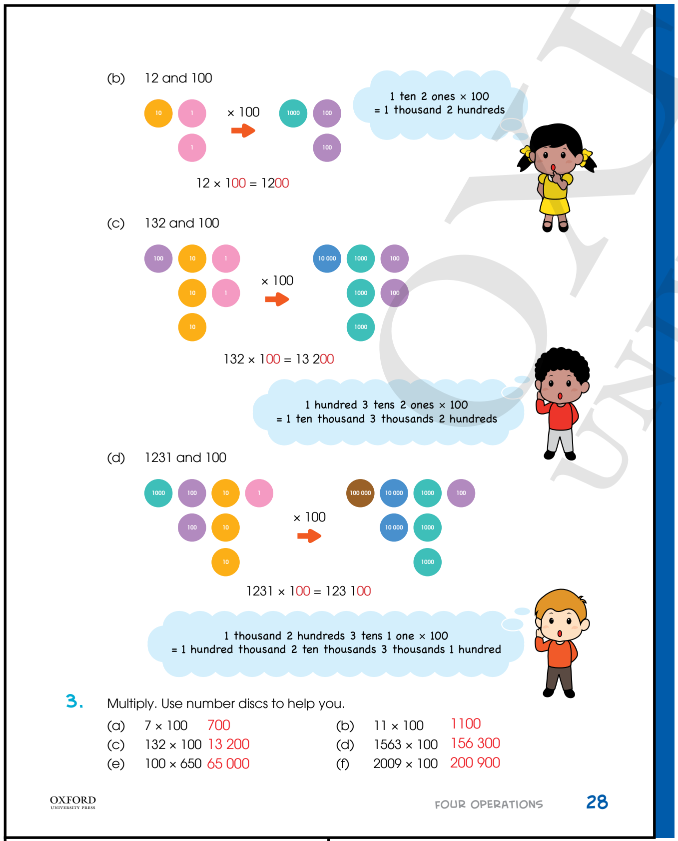
Multiplying by hundreds
With the use of number discs, help pupils visualise and understand the products of 100 with 1/10/100/1000 in Let's Learn 1. Ask pupils if they notice a pattern in the answers obtained. Lead pupils to arrive at the strategy of appending two zeroes when multiplying by 100.

Let's Learn 2 extends pupils' learning by going further to products of other whole numbers with 100.
Get the pupils to visualise through the use of number discs and work out the product between:

- A 1-digit number and 100
- A 2-digit number and 100
- A 3-digit number and 100
- A 4-digit number and 100

Ask pupils to find a pattern in the answers. Explain to pupils that the products can also be worked out by multiplying each digit in its place values by 100. Show pupils that by multiplying 100:

- ones become hundreds
- tens become thousands
- hundreds become ten thousands
- thousands become hundred thousands



(b) 12 and 100

× 100

12 × 100 = 1200

(c) 132 and 100

× 100

132 × 100 = 13 200

(d) 1231 and 100

× 100

1231 × 100 = 123 100

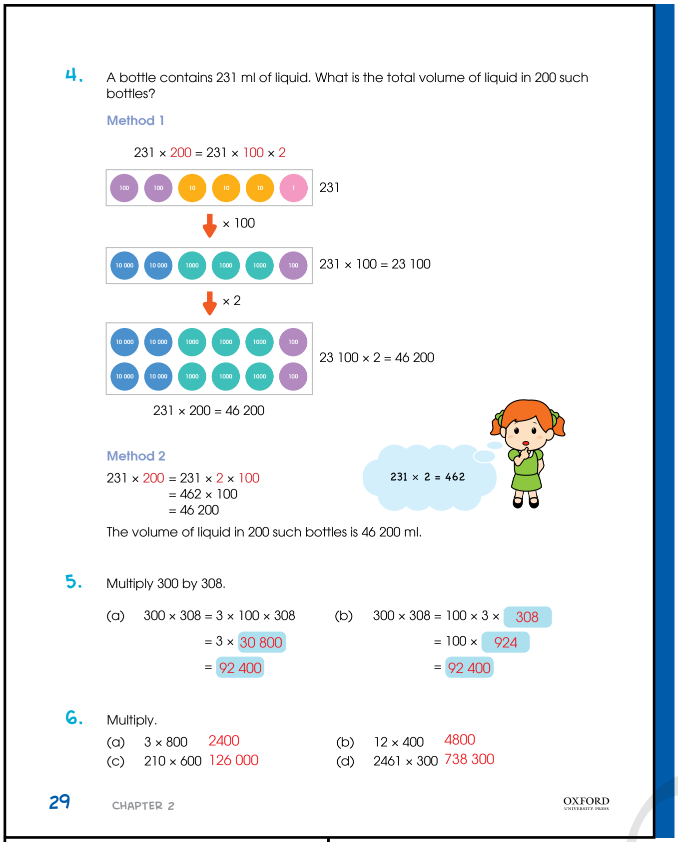
3. Multiply. Use number discs to help you.

(a) 7 × 100 700
(b) 11 × 100 1100
(c) 132 × 100 13 200
(d) 1563 × 100 156 300
(e) 100 × 650 65 000
(f) 2009 × 100 200 900

OXFORD FOUR OPERATIONS 28

Textbook 5 P28

Get pupils to work on the questions in Let's Learn 3 with guidance and discussions. Pupils may use number discs to help them find the answers if necessary.



4. A bottle contains 231 ml of liquid. What is the total volume of liquid in 200 such bottles?

Method 1

231 × 200 = 231 × 100 × 2

231

× 100

231 × 100 = 23 100

× 2

23 100 × 2 = 46 200

231 × 200 = 46 200

Method 2

231 × 200 = 231 × 2 × 100
= 462 × 100
= 46 200

231 × 2 = 462

The volume of liquid in 200 such bottles is 46 200 ml.

5. Multiply 300 by 308.

(a) 300 × 308 = 3 × 100 × 308
= 3 × 30 800
= 92 400

(b) 300 × 308 = 100 × 3 × 308
= 100 × 924
= 92 400

6. Multiply.

(a) 3 × 800 2400
(b) 12 × 400 4800
(c) 210 × 600 126 000
(d) 2461 × 300 738 300

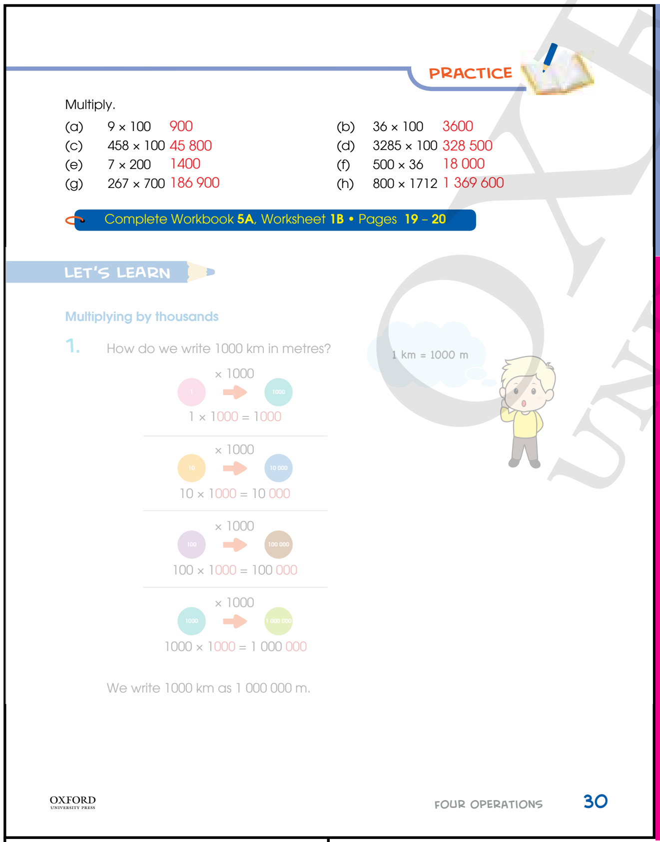
29 CHAPTER 2 OXFORD UNIVERSITY PRESS

Textbook 5 P29

For Let's Learn 4, help pupils visualise and understand the products of a whole number with a multiple of 100 with the use of number discs. Explain the two methods of calculating 231 × 200. Ask pupils to compare the two methods.

Let's Learn 5 allows pupils to practise multiplying 300 and 308 using both methods learnt in Let's Learn 4.

Let's Learn 6 gets pupils to calculate the multiplication of 1/2/3/4-digit numbers with a multiple of 100. Allow pupils to work in pairs. Give them sufficient time to work on the questions before going through.



PRACTICE

Multiply.

(a) 9 × 100 900
(b) 36 × 100 3600
(c) 458 × 100 45 800
(d) 3285 × 100 328 500
(e) 7 × 200 1400
(f) 500 × 36 18 000
(g) 267 × 700 186 900
(h) 800 × 1712 1 369 600

Complete Workbook **5A**, Worksheet **1B** • Pages **19 – 20**

LET'S LEARN

Multiplying by thousands

1. How do we write 1000 km in metres?

1 km = 1000 m

× 1000
1 × 1000 = 1000

× 1000
10 × 1000 = 10 000

× 1000
100 × 1000 = 100 000

× 1000
1000 × 1000 = 1 000 000

We write 1000 km as 1 000 000 m.

OXFORD UNIVERSITY PRESS FOUR OPERATIONS 30

Textbook 5 P30

PRACTICE

Allow pupils to discuss and work in pairs or groups before going through the solutions with the class.

Independent seatwork

Assign pupils to complete Worksheet 1B (Workbook 5A P19 – 20).

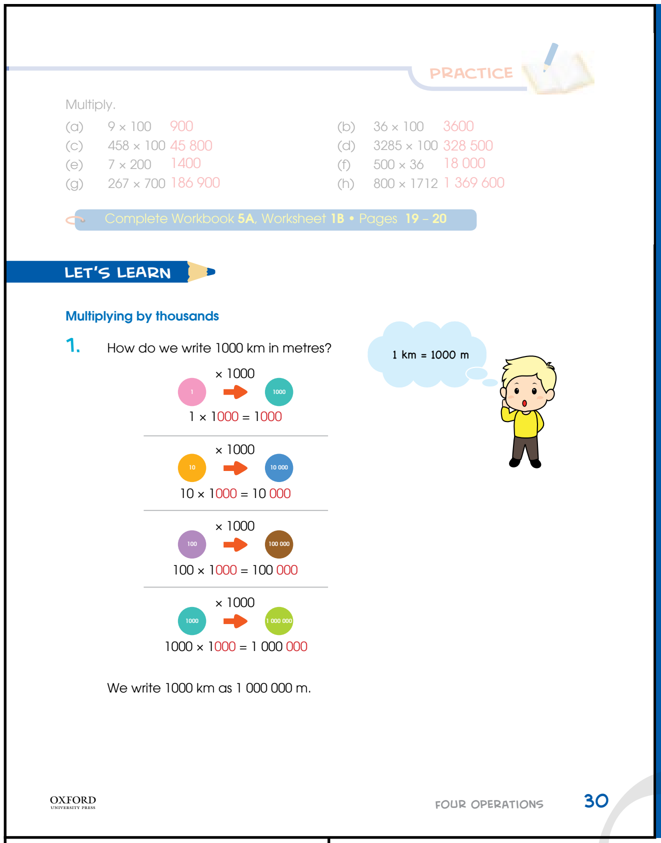
Answers Worksheet 1B (Workbook 5A P19 – 20)

1. (a) 1400
   (b) 24 600

2. (a) 7800
   (b) 69 900
   (c) 100 100
   (d) 923 400

3. (a) 4800
   (b) $98 \times 500 = 98 \times 5 \times 100$
   $= 490 \times 100$
   $= 49\ 000$
   (c) $4020 \times 300 = 4020 \times 3 \times 100$
   $= 12\ 060 \times 100$
   $= 1\ 206\ 000$
   (d) $7041 \times 600 = 7041 \times 6 \times 100$
   $= 42\ 246 \times 100$
   $= 4\ 224\ 600$

4. (a) F
   (b) D
   (c) B
   (d) C
   (e) A



PRACTICE

Multiply.

(a) 9 × 100 900
(b) 36 × 100 3600
(c) 458 × 100 45 800
(d) 3285 × 100 328 500
(e) 7 × 200 1400
(f) 500 × 36 18 000
(g) 267 × 700 186 900
(h) 800 × 1712 1 369 600

Complete Workbook **5A**, Worksheet **1B** • Pages **19 – 20**

LET'S LEARN

Multiplying by thousands

1. How do we write 1000 km in metres?

1 × 1000 = 1000

10 × 1000 = 10 000

100 × 1000 = 100 000

1000 × 1000 = 1 000 000

We write 1000 km as 1 000 000 m.

OXFORD UNIVERSITY PRESS

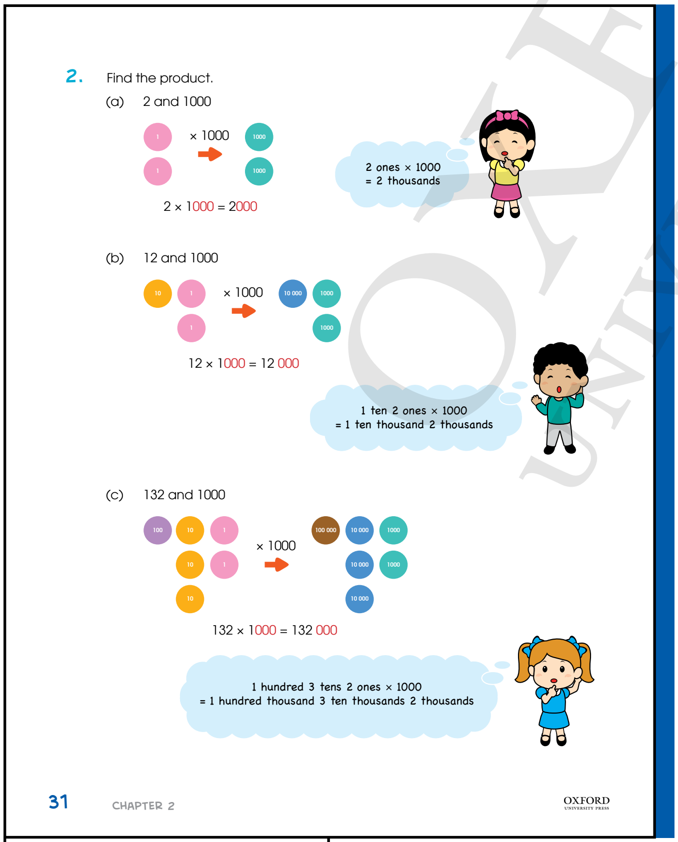
FOUR OPERATIONS 30

Textbook 5 P30

LET'S LEARN

Multiplying by thousands
With the use of number discs, help pupils visualise and understand the products of 1000 with 1/10/100/1000 in Let's Learn 1. Ask pupils if they notice a pattern in the answers obtained. Lead pupils to arrive at the strategy of appending three zeroes when multiplying by 1000.

The conversion of 1 km to 1000 m is an example of a product between 1 and 1000.



2. Find the product.

(a) 2 and 1000

2 × 1000 = 2000

(b) 12 and 1000

12 × 1000 = 12 000

(c) 132 and 1000

132 × 1000 = 132 000

31 CHAPTER 2

OXFORD UNIVERSITY PRESS

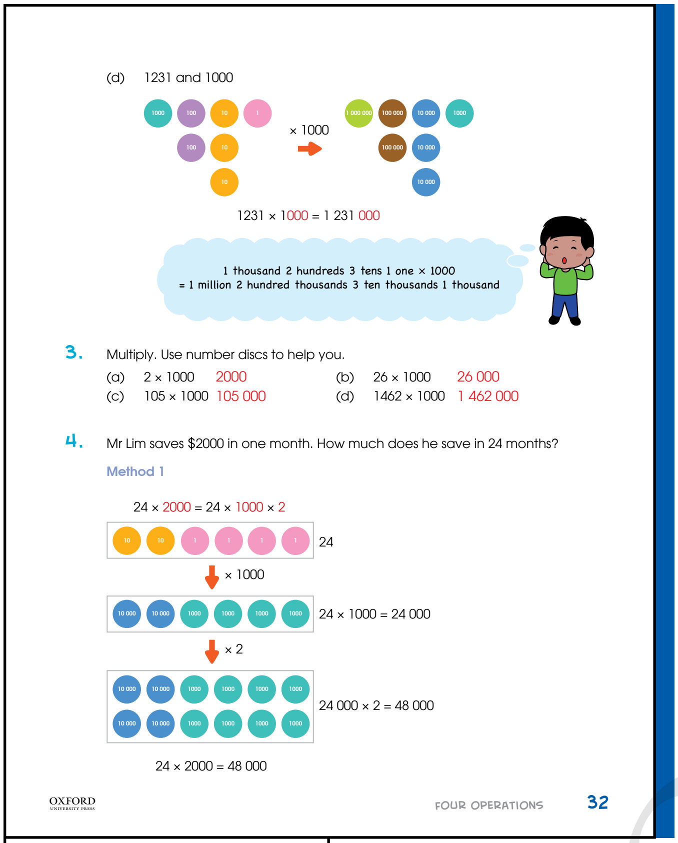
Textbook 5 P31

Let's Learn 2 extends pupils' learning by going further to products of other whole numbers with 1000.
Get the pupils to visualise through the use of number discs and work out the product between:

- A 1-digit number and 1000
- A 2-digit number and 1000
- A 3-digit number and 1000
- A 4-digit number and 1000

Get pupils to see a pattern in the answers. Explain to pupils that the products can also be worked out by multiplying each digit in its place values by 1000.
Show pupils that by multiplying 1000:

- ones become thousands
- tens become ten thousands
- hundreds become hundred thousands
- thousands become millions



(d) 1231 and 1000

1231 × 1000 = 1 231 000

3. Multiply. Use number discs to help you.

(a) 2 × 1000 2000
(b) 26 × 1000 26 000
(c) 105 × 1000 105 000
(d) 1462 × 1000 1 462 000

4. Mr Lim saves $2000 in one month. How much does he save in 24 months?

Method 1

24 × 2000 = 24 × 1000 × 2

24 × 2000 = 48 000

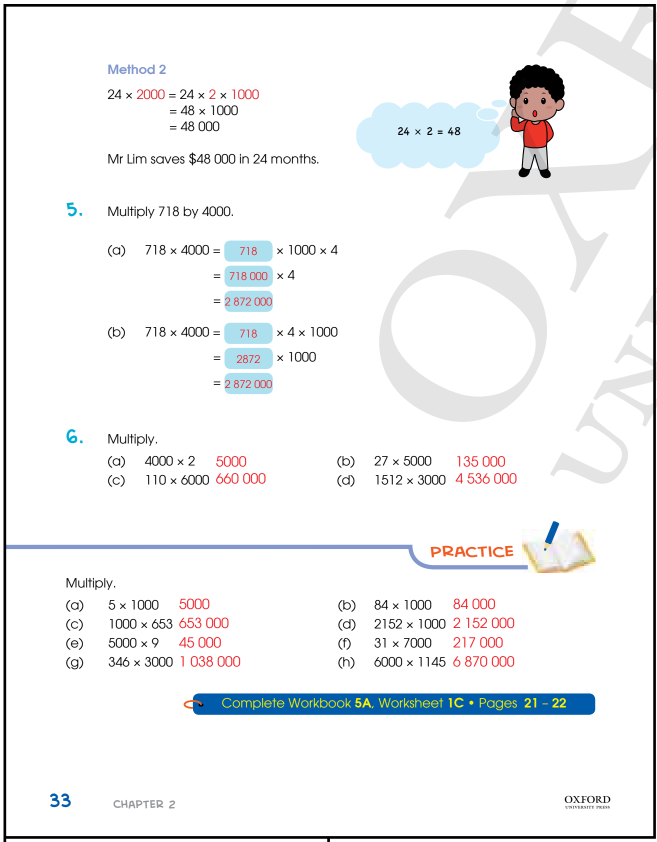
OXFORD UNIVERSITY PRESS

FOUR OPERATIONS 32

Textbook 5 P32

Get pupils to work on the questions in Let's Learn 3 with guidance and discussion. Pupils may use number discs to help them find the answers if necessary.

For Let's Learn 4, help pupils visualise and understand the products of a whole number with a multiple of 1000 with the use of number discs. Explain the two methods of calculating 24 × 2000. Ask pupils to compare the two methods.



Method 2

24 × 2000 = 24 × 2 × 1000
= 48 × 1000
= 48 000

Mr Lim saves $48 000 in 24 months.

5. Multiply 718 by 4000.

(a) 718 × 4000 = $\boxed{718}$ × 1000 × 4
= $\boxed{718\ 000}$ × 4
= $\boxed{2\ 872\ 000}$

(b) 718 × 4000 = $\boxed{718}$ × 4 × 1000
= $\boxed{2872}$ × 1000
= $\boxed{2\ 872\ 000}$

6. Multiply.

(a) 4000 × 2 5000
(b) 27 × 5000 135 000
(c) 110 × 6000 660 000
(d) 1512 × 3000 4 536 000

PRACTICE

Multiply.

(a) 5 × 1000 5000
(b) 84 × 1000 84 000
(c) 1000 × 653 653 000
(d) 2152 × 1000 2 152 000
(e) 5000 × 9 45 000
(f) 31 × 7000 217 000
(g) 346 × 3000 1 038 000
(h) 6000 × 1145 6 870 000

Complete Workbook **5A**, Worksheet **1C** • Pages **21 – 22**

33 CHAPTER 2

OXFORD UNIVERSITY PRESS

Textbook 5 P33

Let's Learn 5 allows pupils to practise multiplying 718 by 4000 using both methods learnt in Let's Learn 4.

Let's Learn 6 gets pupils to calculate the multiplication of 1/2/3/4-digit numbers with a multiple of 1000. Allow pupils to work in pairs. Give them sufficient time to work on the questions before going through.

PRACTICE

Allow pupils to discuss and work in pairs or groups. Then, go through the solutions with the class.

Independent seatwork

Assign pupils to complete Worksheet 1C (Workbook 5A P21 – 22).

Answers Worksheet 1C (Workbook 5A P21 – 22)

1. (a) 20 000
   (b) 54 000
   (c) 313 000

2. (a) 28 000
   (b) 69 000
   (c) 379 000
   (d) 565 000
   (e) 1 200 000
   (f) 7 613 000

3. (a) 66 000
   (b) 2801 × 2000 = 2801 × 2 × 1000
   = 5602 × 1000
   = 5 602 000
   (c) 390 × 7000 = 390 × 7 × 1000
   = 2730 × 1000
   = 2 730 000

LESSON PLAN

Chapter 2
Lesson 1

Specific Learning Focus

- Multiply numbers by tens.
- Multiply numbers by hundreds.
- Multiply numbers by thousands.

Suggested Duration

2 periods

Prior Learning

The spiral approach along with the C-P-A method are employed in the chapter opener. Pupils will be asked to recall from their earlier grades the multiplication concept where multiplying or dividing by 10, 100 or 1000 leads to the movement of the number to the left or to the right of a place-value chart (e.g. 20 × 10 gives 200, where the number moves 1 "slot" to the left in the place-value chart, i.e. the digit 2 moves from the tens column to the hundreds column). This concept is revisited in this lesson, while multiplying numbers by 10, 100 or 1000.

Pre-emptive Pitfalls

While multiplying by 10, 100 or 1000, numbers move to the left by a specific number of "slots" in the place-value chart, depending on the number of zeroes in 10, 100 or 1000 respectively. For example, multiplying by 10 will make the number move 1 "slot" to the left in the place-value chart, while multiplying by 100 will make the number move 2 "slots" to the left and multiplying by 1000 will make the number move 3 "slots" to the left. Pupils might make careless mistakes while carrying out multiplications involving large numbers.

Introduction

Lead pupils to see the abovementioned pattern in the movement of the numbers in a place-value chart as a result of multiplying by 10, 100 or 1000. Explain to pupils that a zero has to be appended when multiplying by 10, 2 zeroes when multiplying by 100, and 3 zeroes when multiplying by 1000. In Let's Learn 4 (Textbook 5 P25), method 1 involves the use of number discs and makes the operation more tangible to the pupils. Method 2 requires pupils to employ mental strategies of partitioning the number.

Explain the change of place value of the first digit after multiplying by 100:
ones → hundreds
tens → thousands
hundreds → ten thousands
thousands → hundred thousands

5 7 6 × 100 = 5 7 6 0 0
H T O Tth Th H T O

576 × 100 = 57 600

Explain the change of place value of the first digit after multiplying by 1000:
ones → thousands
tens → ten thousands
hundreds → hundred thousands
thousands → millions

2 5 6 × 1000 = 2 5 6 0 0 0
H T O Hth Tth Th H T O

256 × 1000 = 256 000

Problem Solving

Mental strategies of pupils are enhanced when they express a number as a product of a 1-digit whole number and 10, 100 or 1000. For example, in 'Practice' (Textbook 5 P33), 3000 = 3 × 1000, 7000 = 7 × 1000. Once a number is partitioned as such, the unit can be easily multiplied to give 1/2/3/4-digit numbers and zeroes are appended to the product.

Activities

Enable pupils to visualise with the use of number discs, and make the numbers and their place values tangible. Provide each pupil with a laminated set of number discs so that they can work on sums individually.

Resources

- number discs (Activity Handbook 5 P1)
- Conversion of Unit Cards (Activity Handbook 5 P11)

Mathematical Communication Support

Ask pupils the pattern they identify with when multiplying by tens, hundreds and thousands. Discuss the movement of numbers to the left in a place-value chart as the relevant number of zeroes are appended. Explain that this movement is because it is a multiplication process, and hence it is additive in nature. Do a lot of class discussions on mental strategies while doing the sums in the textbook and workbook. Encourage pupils to express the multiplicand as a product of a 1-digit whole number and 10, 100 or 1000, so that multiplication can be carried out mentally more easily.

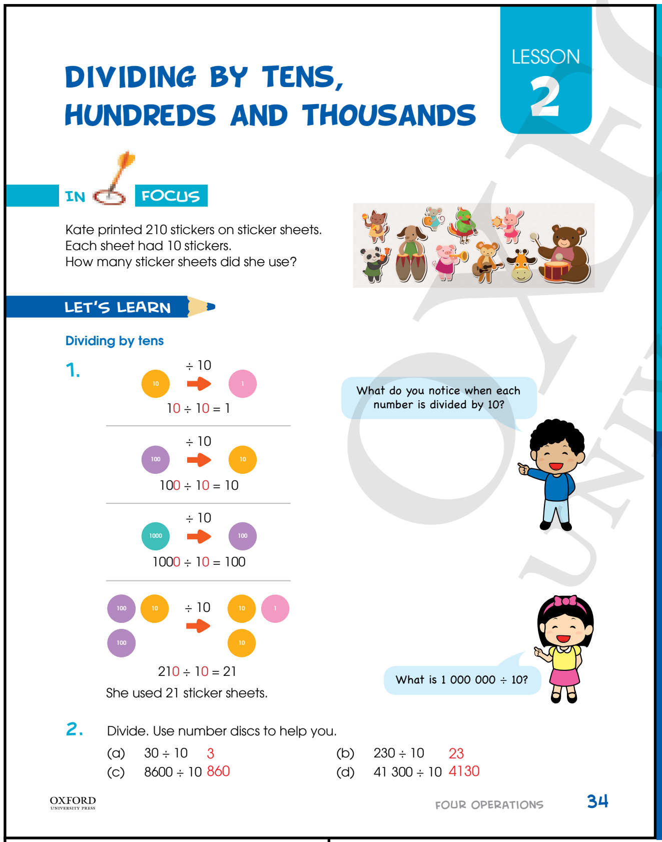
LESSON

2

DIVIDING BY TENS, HUNDREDS AND THOUSANDS

LEARNING OBJECTIVES

1. Divide numbers by tens.
2. Divide numbers by hundreds.
3. Divide numbers by thousands.



DIVIDING BY TENS, HUNDREDS AND THOUSANDS

LESSON 2

IN FOCUS

Kate printed 210 stickers on sticker sheets.
Each sheet had 10 stickers.
How many sticker sheets did she use?

LET'S LEARN

Dividing by tens

1\.

10 ÷ 10 = 1

100 ÷ 10 = 10

1000 ÷ 10 = 100

210 ÷ 10 = 21

She used 21 sticker sheets.

What do you notice when each number is divided by 10?

What is 1 000 000 ÷ 10?

2\. Divide. Use number discs to help you.

(a) 30 ÷ 10 3
(b) 230 ÷ 10 23
(c) 8600 ÷ 10 860
(d) 41 300 ÷ 10 4130

OXFORD UNIVERSITY PRESS FOUR OPERATIONS 34

Textbook 5 P34

IN FOCUS

Pose the problem to the pupils. In the example of sharing stickers, pupils are to see that it involves division of a whole number by 10. Elicit responses from pupils on how they would find the answer based on their prior knowledge.

Get pupils to relate to other situations involving the division of numbers with10/100/1000. For instance, if 2000 beads are to be divided into 10 groups, how many beads will there be in each group? What if the beads are divided into 100 groups or 1000 groups?

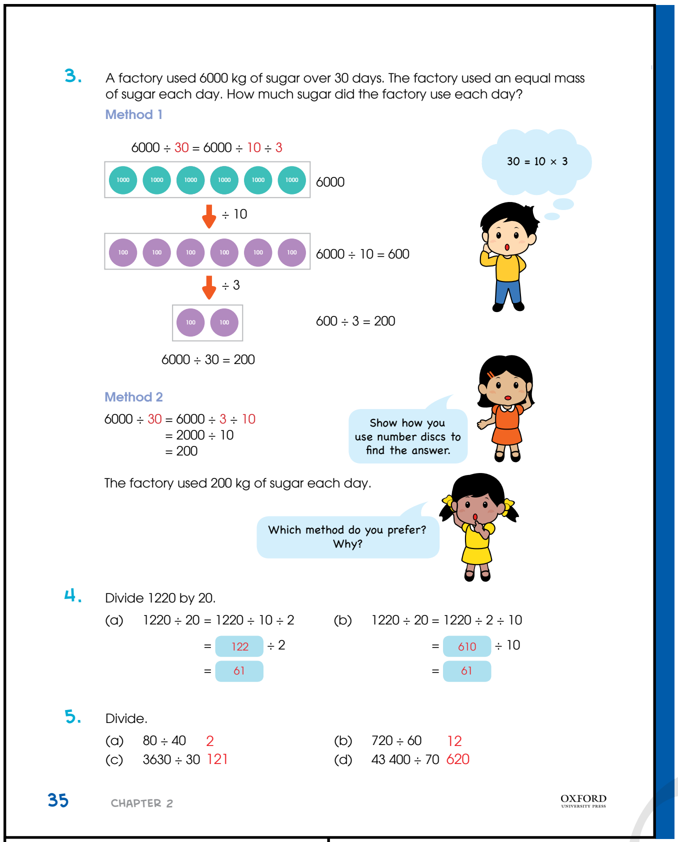
LET'S LEARN

Dividing by tens

With the use of number discs, help pupils visualise and understand the division of 10/100/1000 by 10 in Let's Learn 1. Ask pupils if they notice a pattern in the answers obtained. Lead pupils to arrive at the strategy of removing a zero when dividing by 10. Extend pupils' learning by going further to division of other whole numbers by 10. Get the pupils to visualise through the use of number discs and work out the division of:

- A 1-digit number by 10
- A 2-digit number by 10
- A 3-digit number by 10
- A 4-digit number by 10

Get pupils to work on the questions in Let's Learn 2 with guidance and discussion. Pupils may use number discs to help them find the answers if necessary.



3. A factory used 6000 kg of sugar over 30 days. The factory used an equal mass of sugar each day. How much sugar did the factory use each day?

Method 1

6000 ÷ 30 = 6000 ÷ 10 ÷ 3

6000

÷ 10

6000 ÷ 10 = 600

÷ 3

600 ÷ 3 = 200

6000 ÷ 30 = 200

30 = 10 × 3

Method 2

6000 ÷ 30 = 6000 ÷ 3 ÷ 10
= 2000 ÷ 10
= 200

Show how you use number discs to find the answer.

The factory used 200 kg of sugar each day.

Which method do you prefer? Why?

4. Divide 1220 by 20.

(a) 1220 ÷ 20 = 1220 ÷ 10 ÷ 2
= 122 ÷ 2
= 61

(b) 1220 ÷ 20 = 1220 ÷ 2 ÷ 10
= 610 ÷ 10
= 61

5. Divide.

(a) 80 ÷ 40 2
(b) 720 ÷ 60 12
(c) 3630 ÷ 30 121
(d) 43 400 ÷ 70 620

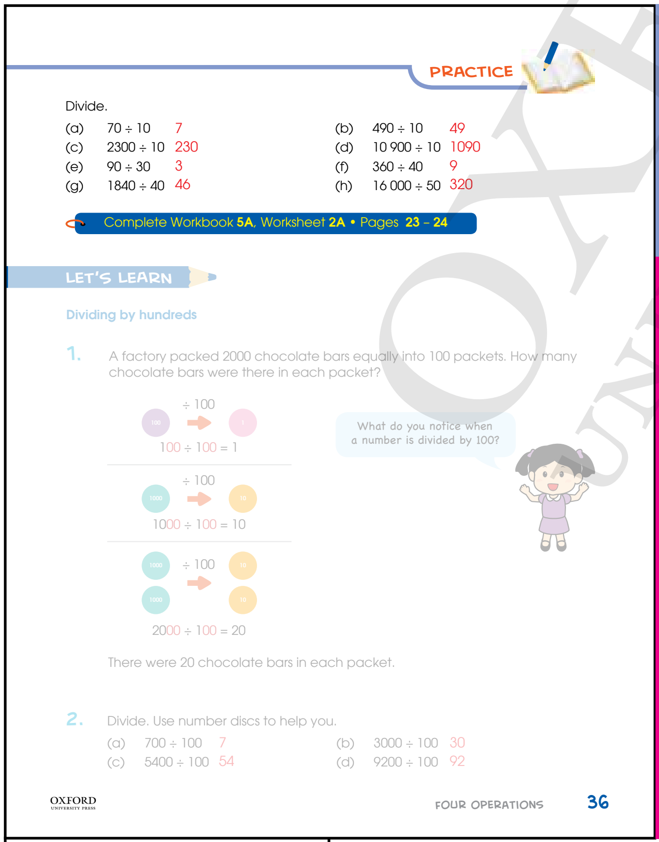
35 CHAPTER 2 OXFORD UNIVERSITY PRESS

Textbook 5 P35

For Let's Learn 3, help pupils visualise and understand the division of a whole number with a multiple of 10 with the use of number discs. Explain the two methods of calculating 6000 ÷ 30. Ask pupils to compare the two methods.

Let's Learn 4 allows pupils to practise dividing 1220 by 20 using both methods learnt in Let's Learn 3.

Let's Learn 5 gets pupils to calculate the division of 2/3/4/5-digit numbers by a multiple of 10. Allow pupils to work in pairs. Give them sufficient time to work on the questions before going through.



PRACTICE

Divide.

(a) 70 ÷ 10 7
(b) 490 ÷ 10 49
(c) 2300 ÷ 10 230
(d) 10 900 ÷ 10 1090
(e) 90 ÷ 30 3
(f) 360 ÷ 40 9
(g) 1840 ÷ 40 46
(h) 16 000 ÷ 50 320

Complete Workbook 5A, Worksheet 2A • Pages 23 – 24

LET'S LEARN

Dividing by hundreds

1. A factory packed 2000 chocolate bars equally into 100 packets. How many chocolate bars were there in each packet?

÷ 100

100 ÷ 100 = 1

÷ 100

1000 ÷ 100 = 10

÷ 100

2000 ÷ 100 = 20

What do you notice when a number is divided by 100?

There were 20 chocolate bars in each packet.

2. Divide. Use number discs to help you.

(a) 700 ÷ 100 7
(b) 3000 ÷ 100 30
(c) 5400 ÷ 100 54
(d) 9200 ÷ 100 92

OXFORD UNIVERSITY PRESS FOUR OPERATIONS 36

Textbook 5 P36

PRACTICE

Allow pupils to discuss and work in pairs or groups. Then, go through the solutions with the class.

Independent seatwork

Assign pupils to complete Worksheet 2A (Workbook 5A P23 – 24).

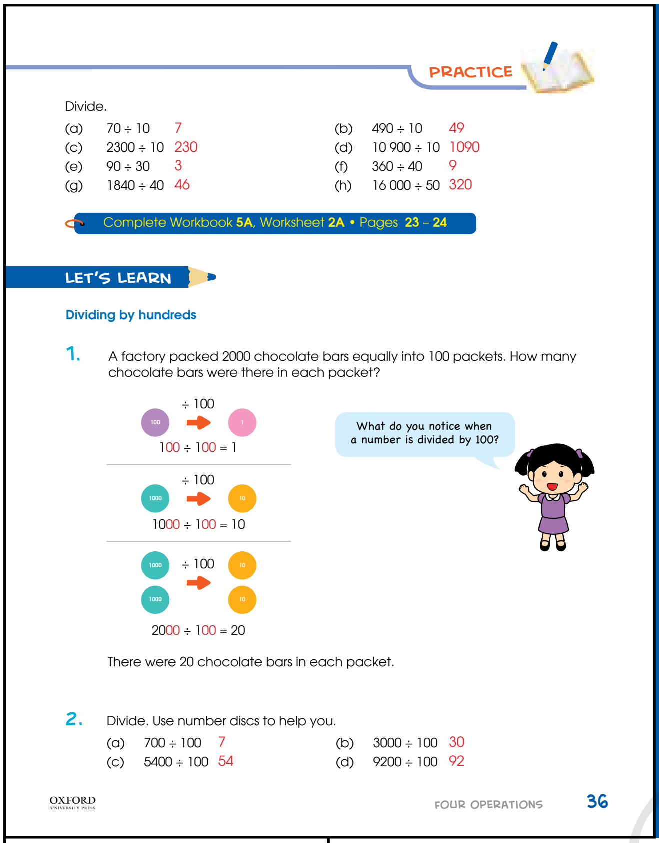
Answers Worksheet 2A (Workbook 5A P23 – 24)

1. (a) 3
   (b) 31

2. (a) 17
   (b) $8700 \div 30 = 8700 \div 10 \div 3$
   $= 870 \div 3$
   $= 290$
   (c) $15\,480 \div 60 = 15\,480 \div 10 \div 6$
   $= 258$

3. (a) 76
   (b) 85
   (c) 923
   (d) 4201
   (e) 17
   (f) 40
   (g) 1785
   (h) 2200

4. (a) 10
   (b) 10
   (c) 4600
   (d) 5280



PRACTICE

Divide.

(a)	70 ÷ 10 7	(b)	490 ÷ 10 49
(c)	2300 ÷ 10 230	(d)	10 900 ÷ 10 1090
(e)	90 ÷ 30 3	(f)	360 ÷ 40 9
(g)	1840 ÷ 40 46	(h)	16 000 ÷ 50 320

Complete Workbook **5A**, Worksheet **2A** • Pages **23 – 24**

LET'S LEARN

Dividing by hundreds

1. A factory packed 2000 chocolate bars equally into 100 packets. How many chocolate bars were there in each packet?

÷ 100

100 ÷ 100 = 1

÷ 100

1000 ÷ 100 = 10

÷ 100

2000 ÷ 100 = 20

What do you notice when a number is divided by 100?

There were 20 chocolate bars in each packet.

2. Divide. Use number discs to help you.

(a) 700 ÷ 100 7 (b) 3000 ÷ 100 30

(c) 5400 ÷ 100 54 (d) 9200 ÷ 100 92

OXFORD UNIVERSITY PRESS FOUR OPERATIONS 36

Textbook 5 P36

Dividing by hundreds

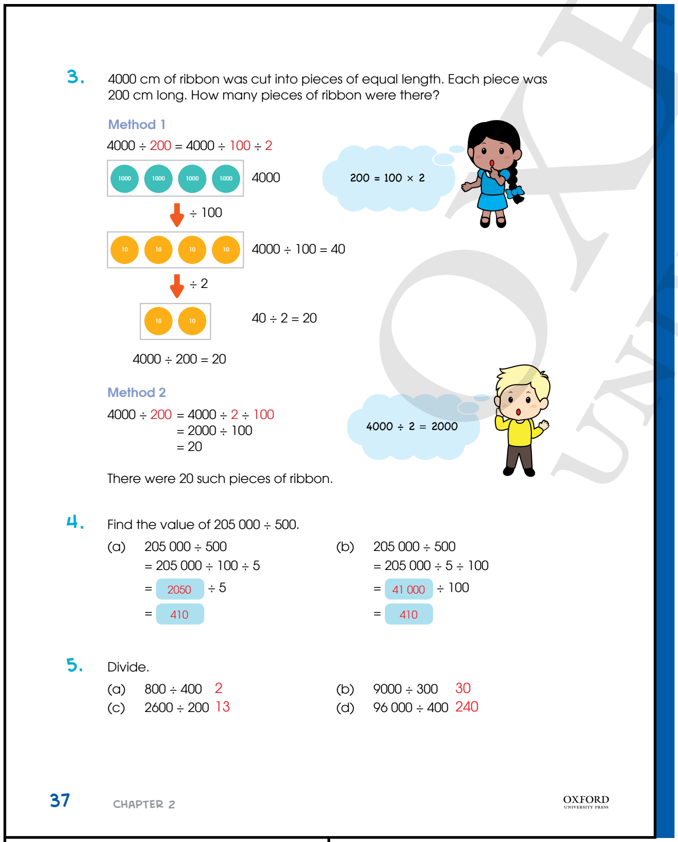
With the use of number discs, help pupils visualise and understand the division of 100/1000/2000 by 100 in Let's Learn 1. Ask pupils if they notice a pattern in the answers obtained. Lead pupils to arrive at the strategy of removing two zeroes when dividing by 100.

Extend pupils' learning by going further to division of other whole numbers by 100.

Get the pupils to visualise through the use of number discs and work out the division of:

- A 3-digit number by 100
- A 4-digit number by 100

Get pupils to work on the questions in Let's Learn 2 with guidance and discussion. Pupils may use number discs to help them find the answers if necessary.



3. 4000 cm of ribbon was cut into pieces of equal length. Each piece was 200 cm long. How many pieces of ribbon were there?

Method 1

4000 ÷ 200 = 4000 ÷ 100 ÷ 2

4000

÷ 100

4000 ÷ 100 = 40

÷ 2

40 ÷ 2 = 20

4000 ÷ 200 = 20

200 = 100 × 2

Method 2

4000 ÷ 200 = 4000 ÷ 2 ÷ 100
= 2000 ÷ 100
= 20

4000 ÷ 2 = 2000

There were 20 such pieces of ribbon.

4. Find the value of 205 000 ÷ 500.

(a) 205 000 ÷ 500
= 205 000 ÷ 100 ÷ 5
= 2050 ÷ 5
= 410

(b) 205 000 ÷ 500
= 205 000 ÷ 5 ÷ 100
= 41 000 ÷ 100
= 410

5. Divide.

(a) 800 ÷ 400 2 (b) 9000 ÷ 300 30

(c) 2600 ÷ 200 13 (d) 96 000 ÷ 400 240

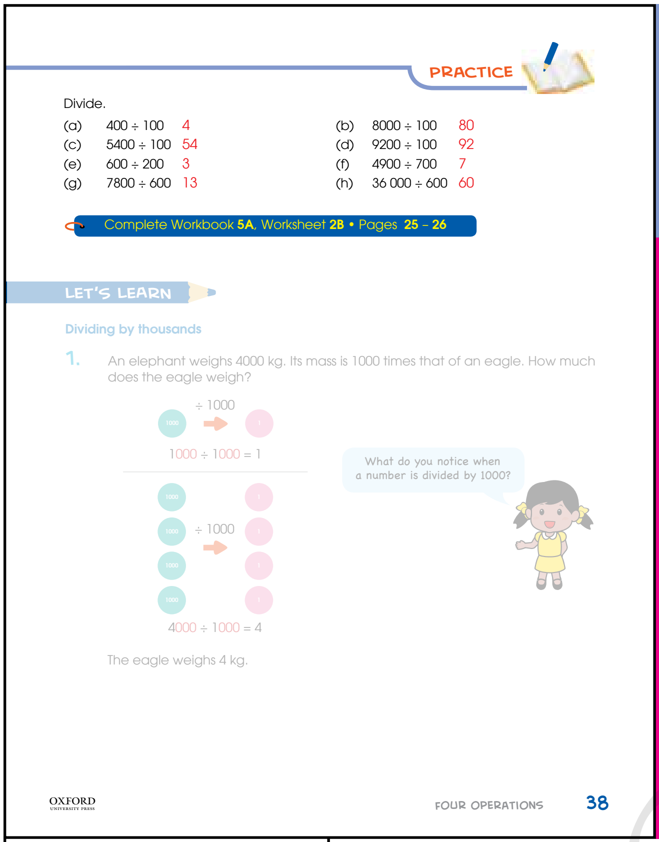
37 CHAPTER 2 OXFORD UNIVERSITY PRESS

Textbook 5 P37

For Let's Learn 3, help pupils visualise and understand the division of a whole number with a multiple of 100 with the use of number discs. Explain the two methods of calculating 4200 ÷ 200. Ask pupils to compare the two methods.

Let's Learn 4 allows pupils to practise dividing 205 000 by 500 using both methods learnt in Let's Learn 3.

Let's Learn 5 gets pupils to calculate the division of 3/4/5-digit numbers by a multiple of 100. Allow pupils to work in pairs. Give them sufficient time to work on the questions before going through.



PRACTICE

Divide.

(a) 400 ÷ 100 4
(b) 8000 ÷ 100 80
(c) 5400 ÷ 100 54
(d) 9200 ÷ 100 92
(e) 600 ÷ 200 3
(f) 4900 ÷ 700 7
(g) 7800 ÷ 600 13
(h) 36 000 ÷ 600 60

Complete Workbook **5A**, Worksheet **2B** • Pages **25 – 26**

LET'S LEARN

Dividing by thousands

1. An elephant weighs 4000 kg. Its mass is 1000 times that of an eagle. How much does the eagle weigh?

÷ 1000

1000 ÷ 1000 = 1

÷ 1000

4000 ÷ 1000 = 4

What do you notice when a number is divided by 1000?

The eagle weighs 4 kg.

OXFORD UNIVERSITY PRESS

FOUR OPERATIONS 38

Textbook 5 P38

PRACTICE

Allow pupils to discuss and work in pairs or groups. Then, go through the solutions with the class.

Independent seatwork

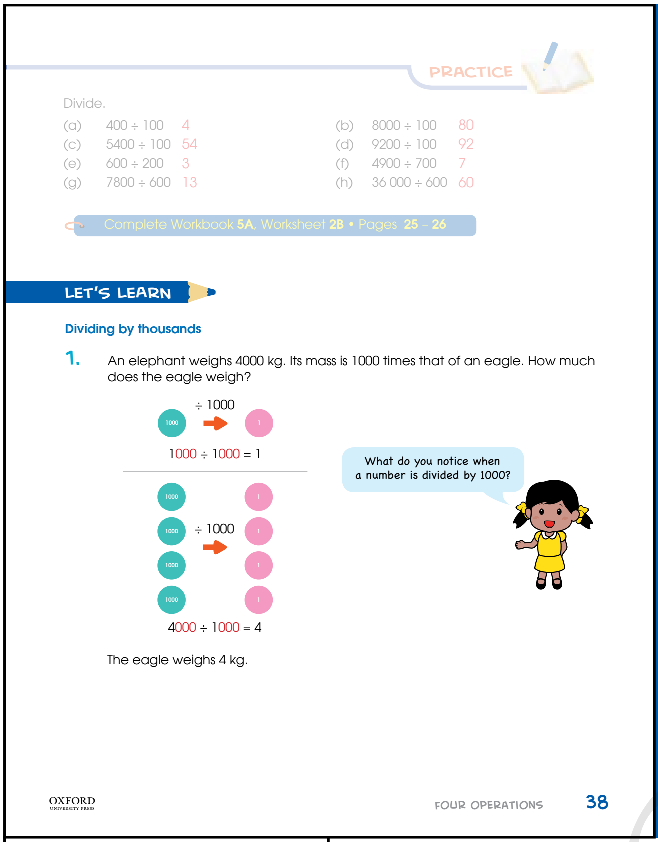
Assign pupils to complete Worksheet 2B (Workbook 5A P25 − 26).

Answers Worksheet 2B (Workbook 5A P25 – 26)

1. (a) 11
   (b) 65
   (c) 280
   (d) 597
   (e) 1203
   (f) 2345

2. (a) 9
   (b) 5400 ÷ 900 = 5400 ÷ 100 ÷ 9
   = 54 ÷ 9
   = 6
   (c) 62 400 ÷ 800 = 62 400 ÷ 100 ÷ 8
   = 624 ÷ 8
   = 78

3. (a) 15, 1500
   (b) 131, 100



PRACTICE

Divide.

(a) 400 ÷ 100 4
(b) 8000 ÷ 100 80
(c) 5400 ÷ 100 54
(d) 9200 ÷ 100 92
(e) 600 ÷ 200 3
(f) 4900 ÷ 700 7
(g) 7800 ÷ 600 13
(h) 36 000 ÷ 600 60

Complete Workbook **5A**, Worksheet **2B** • Pages **25 – 26**

LET'S LEARN

Dividing by thousands

1. An elephant weighs 4000 kg. Its mass is 1000 times that of an eagle. How much does the eagle weigh?

÷ 1000

1000 ÷ 1000 = 1

÷ 1000

4000 ÷ 1000 = 4

What do you notice when a number is divided by 1000?

The eagle weighs 4 kg.

Textbook 5 P38

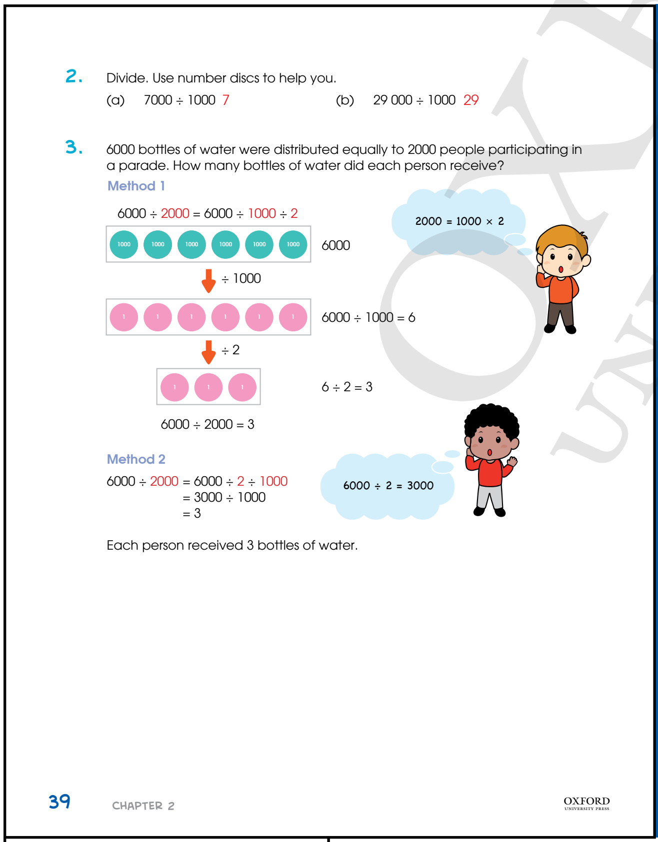
LET'S LEARN

Dividing by thousands

With the use of number discs, help pupils visualise and understand the division of 1000/4000 by 1000 in Let's Learn 1.

Ask pupils if they notice a pattern in the answers obtained. Lead pupils to arrive at the strategy of removing three zeros when dividing by 1000.

Extend pupils' learning by going further to division of other whole numbers by 1000.



2. Divide. Use number discs to help you.
(a) 7000 ÷ 1000 7
(b) 29 000 ÷ 1000 29

3. 6000 bottles of water were distributed equally to 2000 people participating in a parade. How many bottles of water did each person receive?

Method 1

6000 ÷ 2000 = 6000 ÷ 1000 ÷ 2

6000

÷ 1000

6000 ÷ 1000 = 6

÷ 2

6 ÷ 2 = 3

6000 ÷ 2000 = 3

2000 = 1000 × 2

Method 2

6000 ÷ 2000 = 6000 ÷ 2 ÷ 1000
= 3000 ÷ 1000
= 3

6000 ÷ 2 = 3000

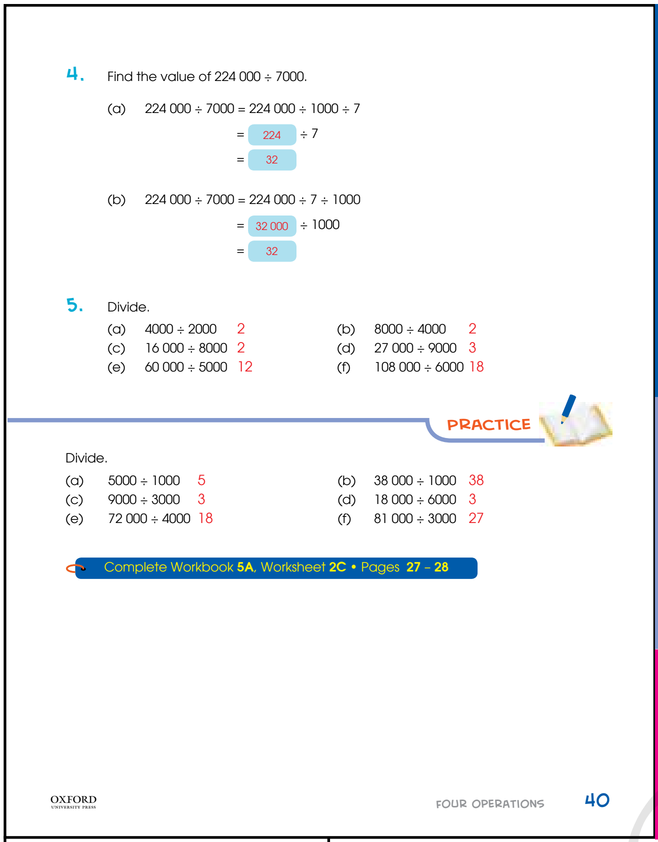
Each person received 3 bottles of water.

Textbook 5 P39

LET'S LEARN

Get pupils to work on the questions in Let's Learn 2 with guidance and discussions. Pupils may use number discs to help them find the answers if necessary.

For Let's Learn 3, help pupils visualise and understand the division of a whole number with a multiple of 1000 with the use of number discs. Explain the two methods of calculating 6000 ÷ 2000. Ask pupils to compare the two methods.



4. Find the value of 224 000 ÷ 7000.

(a) 224 000 ÷ 7000 = 224 000 ÷ 1000 ÷ 7
= 224 ÷ 7
= 32

(b) 224 000 ÷ 7000 = 224 000 ÷ 7 ÷ 1000
= 32 000 ÷ 1000
= 32

5. Divide.

(a) 4000 ÷ 2000 2
(b) 8000 ÷ 4000 2
(c) 16 000 ÷ 8000 2
(d) 27 000 ÷ 9000 3
(e) 60 000 ÷ 5000 12
(f) 108 000 ÷ 6000 18

PRACTICE

Divide.

(a) 5000 ÷ 1000 5
(b) 38 000 ÷ 1000 38
(c) 9000 ÷ 3000 3
(d) 18 000 ÷ 6000 3
(e) 72 000 ÷ 4000 18
(f) 81 000 ÷ 3000 27

Complete Workbook **5A**, Worksheet **2C** • Pages **27 – 28**

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FOUR OPERATIONS 40

Textbook 5 P40

Let's Learn 4 allows pupils to practise dividing 224 000 by 7000 using both methods learnt in Let's Learn 3.

Let's Learn 5 gets pupils to calculate the division of 4/5/6-digit numbers by a multiple of 1000. Allow pupils to work in pairs. Give them sufficient time to work on the sums before going through.

PRACTICE

Allow pupils to discuss and work in pairs or groups. Then, go through the solutions with the class.

Independent seatwork

Assign pupils to complete Worksheet 2C (Workbook 5A P27 – 28).

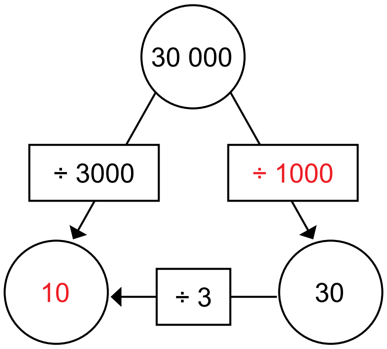
Answers

Worksheet 2C (Workbook 5A P27 – 28)

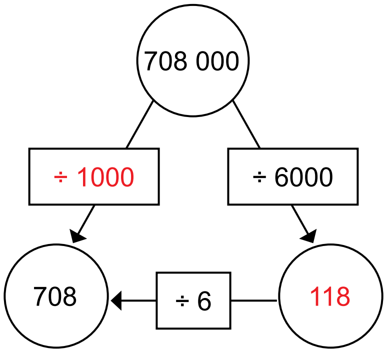
1. (a) 4
   (b) 90
   (c) 23
   (d) 777
   (e) 801
   (f) 5839

2. (a) 93
   (b) 84 000 ÷ 7000 = 84 000 ÷ 1000 ÷ 7
   = 84 ÷ 7
   = 12
   (c) 150 000 ÷ 2000 = 150 000 ÷ 1000 ÷ 2
   = 150 ÷ 2
   = 75
   (d) 2 416 000 ÷ 8000 = 2 416 000 ÷ 1000 ÷ 8
   = 7536 ÷ 6
   = 1256
   (e) 7 536 000 ÷ 6000 = 7 536 000 ÷ 1000 ÷ 6
   = 7536 ÷ 6
   = 1256

3. (a)



(b)



LESSON PLAN

Chapter 2
Lesson 2

Specific Learning Focus

- Divide numbers by tens.
- Divide numbers by hundreds.
- Divide numbers by thousands.

Suggested Duration

2 periods

Prior Learning

In ‘In Focus’ (Textbook 5 P34), pupils are required to recall prior knowledge of division. Elicit responses from pupils using key terms like ‘sharing’, ‘sharing equally’ and ‘without any remainder’.

Pre-emptive Pitfalls

This should be a relatively easy lesson as in the earlier grades pupils have done long divisions with and without remainders. Dividing multiples of 10 by 10, 100 or 1000 should be easy concepts to grasp, but the movement of numbers in the place-value chart should be explained well. Explain that dividing by 10, 100 or 1000 causes the number to move to the right in a place-value chart.

Introduction

Since division is the inverse operation of multiplication, instead of appending the zeroes when multiplying by 10, 100 or 1000, when dividing by 10, 100 or 1000, the zeroes are removed. Follow the format of the earlier lesson of employing both methods. Express the divisor as a division of a whole number by 10, 100 or 1000. The unit can then be easily divided and the zeroes can be removed. Explain that when divided by 10, the number moves 1 “slot” to the right in a place-value chart. When dividing by 100, the place value moves 2 “slots” to the right. When dividing by 1000, the number moves 3 “slots” to the right.

Explain the change of place value of the first digit after dividing by 100:
hundreds → ones
thousands → tens
ten thousands → hundreds
hundred thousands → thousands
For example, 2600 ÷ 100 = 26

Explain the change of place value of the first digit after dividing by 1000:
thousands → ones
ten thousands → tens
hundred thousands → hundreds
For example, 234 000 ÷ 1000 = 234

Problem Solving

In this lesson, division is carried out with 2/3/4/5-digit dividends. It should be noted that pupils are not very well-versed with decimal fractions and divisions involving smaller numbers can be done later, where division by 10, 100 and 1000 can be revisited. Mental strategies can be encouraged by discussing with the help of number bonds.

Activities

Get pupils to verbalise and visualise the concepts of the lesson, using the number discs. ‘Let’s Learn’ and ‘Practice’ can be done in class in pairs or groups of 4 as a collective assignment. They can be encouraged to check each other’s work by applying the inverse operation of division (multiplication) to see if any careless mistakes were made.

Resources

- number discs (Activity Handbook 5 P1)
- markers
- mini whiteboard
- conversion of unit cards (Activity Handbook 5 P11)

Mathematical Communication Support

Verbalise the division operation by eliciting individual responses of the movement/shift of the place value. Encourage the recognition of the pattern of answers when dividing by 10, 100 or 1000. The teacher may get pupils to do the questions on their exercise books to emphasise the recognition of the pattern. For example:
26 000 ÷ □ = 26
26 000 ÷ □ = 260
26 000 ÷ □ = 2600
Pupils can derive the missing numbers by looking at the mathematical equations.

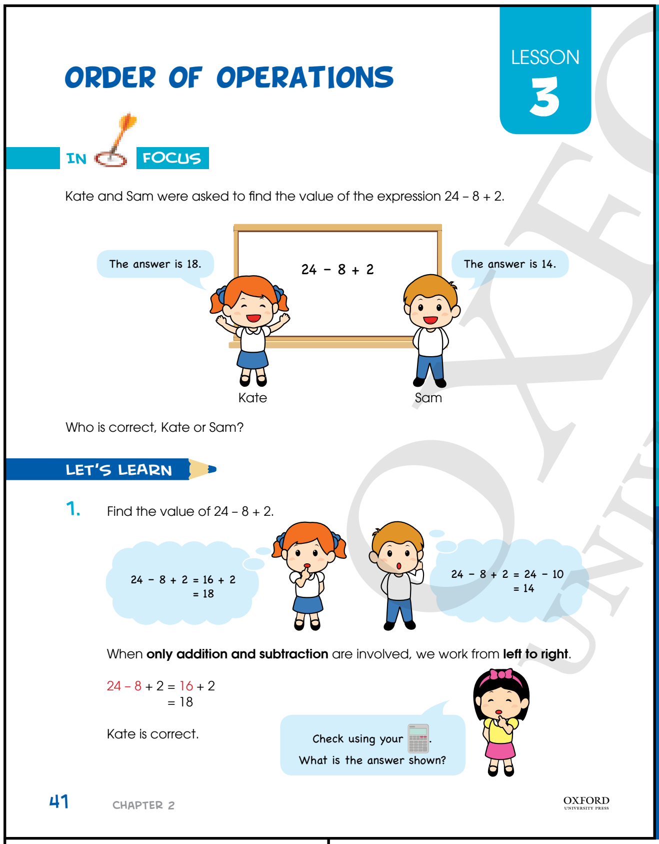
LESSON

3

ORDER OF OPERATIONS

LEARNING OBJECTIVE

1. Calculate in correct order of operations, including the use of brackets.



ORDER OF OPERATIONS

LESSON 3

IN FOCUS

Kate and Sam were asked to find the value of the expression 24 – 8 + 2.

24 – 8 + 2

The answer is 18.

The answer is 14.

Kate

Sam

Who is correct, Kate or Sam?

LET'S LEARN

1. Find the value of 24 – 8 + 2.

24 – 8 + 2 = 16 + 2
= 18

24 – 8 + 2 = 24 – 10
= 14

When **only addition and subtraction** are involved, we work from **left to right**.

24 – 8 + 2 = 16 + 2
= 18

Kate is correct.

Check using your calculator.
What is the answer shown?

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Textbook 5 P41

IN FOCUS

Get pupils to look at an expression involving more than one operation and attempt to solve it.

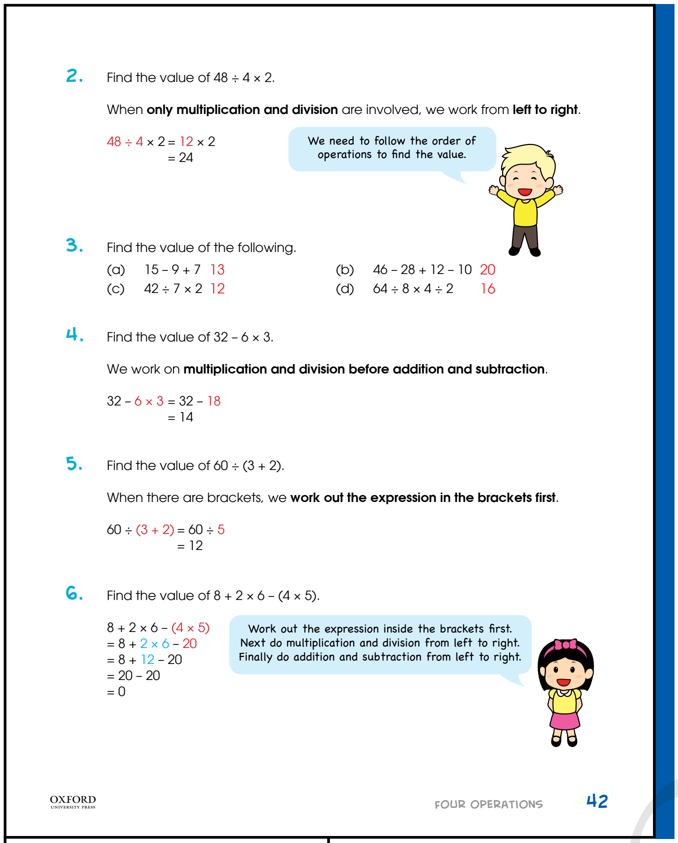
Discuss with pupils the possible answers worked out without following the rules of operations.
Ask:

- How did Kate and Sam get their answers?
- Who has the correct answer?

Elicit responses from pupils on how they would find the answer based on their prior knowledge.

LET'S LEARN

For Let's Learn 1, help pupils to understand the rule of operation involving only addition and subtraction. Guide pupils to see that when a sum involves only addition and subtraction, simply work from left to right. Explain why Kate is correct. Get the pupils to verify the answer using the calculator.



2. Find the value of 48 ÷ 4 × 2.

When **only multiplication and division** are involved, we work from **left to right**.

48 ÷ 4 × 2 = 12 × 2
= 24

3. Find the value of the following.

(a) 15 – 9 + 7 13
(b) 46 – 28 + 12 – 10 20
(c) 42 ÷ 7 × 2 12
(d) 64 ÷ 8 × 4 ÷ 2 16

4. Find the value of 32 – 6 × 3.

We work on **multiplication and division before addition and subtraction**.

32 – 6 × 3 = 32 – 18
= 14

5. Find the value of 60 ÷ (3 + 2).

When there are brackets, we **work out the expression in the brackets first**.

60 ÷ (3 + 2) = 60 ÷ 5
= 12

6. Find the value of 8 + 2 × 6 – (4 × 5).

8 + 2 × 6 – (4 × 5)
= 8 + 2 × 6 – 20
= 8 + 12 – 20
= 20 – 20
= 0

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FOUR OPERATIONS 42

Textbook 5 P42

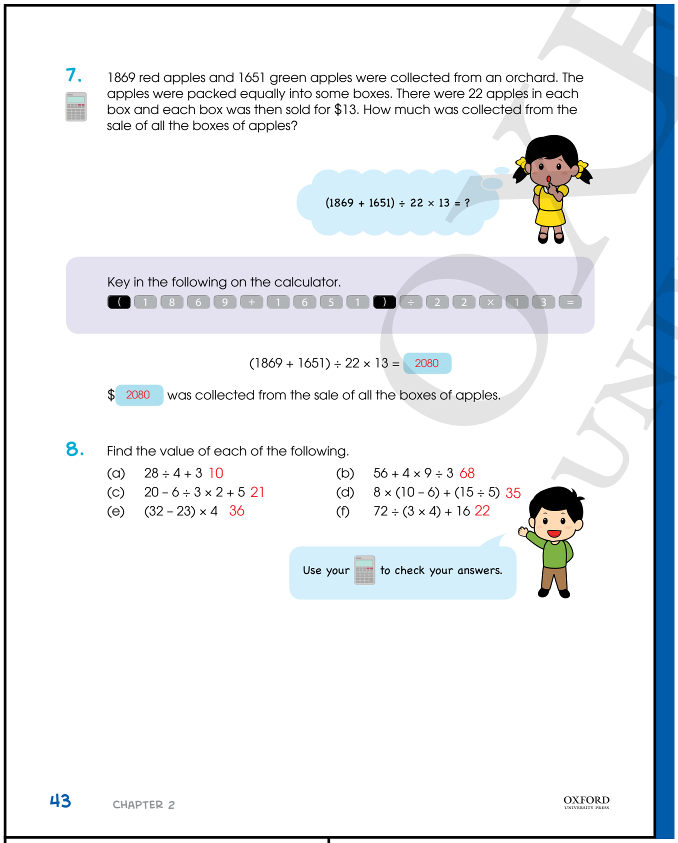
For Let's Learn 2, help pupils to understand the rule of operation involving only multiplication and division. Guide pupils to see that when a sum involves only multiplication and division, simply work from left to right. Get the pupils to verify the answer using the calculator.

Get pupils to work on Let's Learn 3 with guidance and discussion. The questions involve either only addition and subtraction or only multiplication and division. Allow sufficient time for pupils to work through the questions before going through with the class.

For Let's Learn 4, help pupils understand the rule of operation involving all the four operations. Explain that multiplication and division are to be worked on first before addition and subtraction. Get pupils to verify the answer using the calculator.

Let's Learn 5 involves all four operations and brackets. Guide pupils to see that when brackets are involved, they should work out the expression in the bracket first before multiplication and division then addition and subtraction. Get pupils to verify the answer using the calculator.

Let's Learn 6 further illustrates the rule learnt in Let's Learn 5. Reinforce that the expressions within brackets have to be worked on first.



7. 1869 red apples and 1651 green apples were collected from an orchard. The apples were packed equally into some boxes. There were 22 apples in each box and each box was then sold for $13. How much was collected from the sale of all the boxes of apples?

Key in the following on the calculator.

(1 8 6 9 + 1 6 5 1) ÷ 2 2 × 1 3 =

(1869 + 1651) ÷ 22 × 13 = 2080

$ 2080 was collected from the sale of all the boxes of apples.

8. Find the value of each of the following.

(a) 28 ÷ 4 + 3 10
(b) 56 + 4 × 9 ÷ 3 68
(c) 20 – 6 ÷ 3 × 2 + 5 21
(d) 8 × (10 – 6) + (15 ÷ 5) 35
(e) (32 – 23) × 4 36
(f) 72 ÷ (3 × 4) + 16 22

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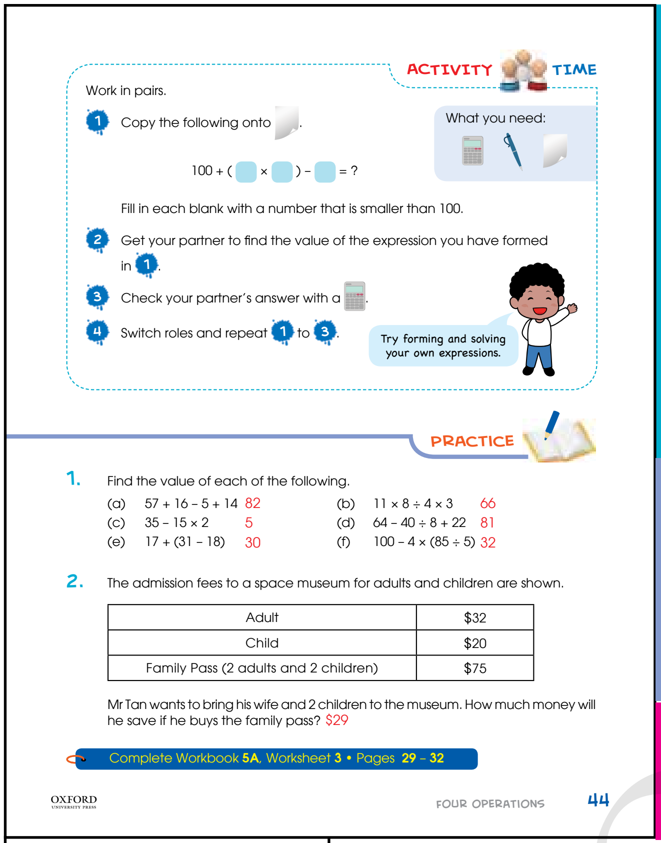
OXFORD UNIVERSITY PRESS

Textbook 5 P43

Give pupils sufficient time to read and understand the word problem in Let's Learn 7. Guide pupils to see the operations involved. Demonstrate how to key in the expression using a calculator. Remind pupils to key in the brackets.

Allow pupils to work in pairs for Let's Learn 8. Pupils can use their calculators to check their answers.



ACTIVITY TIME

Work in pairs.

① Copy the following onto .

100 + (☐ × ☐) – ☐ = ?

Fill in each blank with a number that is smaller than 100.

② Get your partner to find the value of the expression you have formed in ①.

③ Check your partner's answer with a .

④ Switch roles and repeat ① to ③.

What you need:

PRACTICE

1. Find the value of each of the following.

(a) 57 + 16 – 5 + 14 82
(b) 11 × 8 ÷ 4 × 3 66
(c) 35 – 15 × 2 5
(d) 64 – 40 ÷ 8 + 22 81
(e) 17 + (31 – 18) 30
(f) 100 – 4 × (85 ÷ 5) 32

2. The admission fees to a space museum for adults and children are shown.

Adult	$32
Child	$20
Family Pass (2 adults and 2 children)	$75

Mr Tan wants to bring his wife and 2 children to the museum. How much money will he save if he buys the family pass? $29

Complete Workbook **5A**, Worksheet **3** • Pages **29 – 32**

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Textbook 5 P44

ACTIVITY TIME

Assign pupils to work in pairs. The activity helps pupils to reinforce their understanding of the rules of order of operations and apply the rules in finding values of expressions based on numbers filled in the blanks.

PRACTICE

Allow pupils to work in pairs. Give pupils sufficient time to work through the practice before going through. Highlight common errors and misconceptions for class discussion.

Independent seatwork

Assign pupils to complete Worksheet 3 (Workbook 5A P29 – 32).

Answers Worksheet 3 (Workbook 5A P29 – 32)

1. (a) 23 + 4 − 5
= $\boxed{27}$ − 5
= $\boxed{22}$

(b) 52 + 67 − 40
= $\boxed{119}$ −40
= $\boxed{79}$

(c) 91 − 7 + 17
= $\boxed{84}$ + 17
= $\boxed{101}$

(d) 49 − 23 + 69
= $\boxed{26}$ + 69
= $\boxed{95}$

(e) 92 + 4 − 8
= 96 − 8
= 88

(f) 50 + 9 − 34
= 59 − 34
= 25

(g) 81 − 12 + 38
= 69 + 38
= 107

(h) 78 − 68 + 9
= 10 + 9
= 19

(i) 88 − 32 − 3 + 45
= 56 − 3 + 45
= 53 + 45
= 98

(j) 30 + 4 − 14 + 5
= 34 − 14 + 5
= 20 + 5
= 25

(k) 74 − 45 + 7 − 13
= 29 + 7 − 13
= 36 − 13
= 23

(l) 90 + 19 + 9 − 5
= 109 + 9 − 5
= 118 − 5
= 113

2. (a) $9 \times 2 \div 3$
$= \boxed{18} \div 3$
$= \boxed{6}$

(b) $14 \times 5 \div 10$
$= \boxed{70} \div 10$
$= \boxed{7}$

(c) $100 \div 5 \times 3$
$= \boxed{20} \times 3$
$= \boxed{60}$

(d) $324 \div 9 \times 8$
$= \boxed{36} \times 8$
$= \boxed{288}$

(e) $32 \times 3 \div 8$
$= 96 \div 8$
$= 12$

(f) $8 \times 20 \div 4$
$= 160 \div 4$
$= 40$

(g) $90 \div 10 \times 7$
$= 9 \times 7$
$= 63$

(h) $135 \div 15 \times 5$
$= 9 \times 5$
$= 45$

(i) $100 \div 2 \div 5 \times 3$
$= 50 \div 5 \times 3$
$= 10 \times 3$
$= 30$

(j) $12 \times 6 \div 3 \times 9$
$= 72 \div 3 \times 9$
$= 24 \times 9$
$= 216$

(k) $95 \div 5 \times 4 \div 2$
$= 19 \times 4 \div 2$
$= 76 \div 2$
$= 38$

(l) $4 \times 12 \times 5 \div 10$
$= 48 \times 5 \div 10$
$= 240 \div 10$
$= 24$

3. (a) $5 \times 6 - 7$
$= \boxed{30} - 7$
$= \boxed{23}$

(b) $36 \div 9 - 2$
$= \boxed{4} - 2$
$= \boxed{2}$

(c) $34 - 10 \times 3$
$= 34 - \boxed{30}$
$= \boxed{4}$

(d) $64 - 8 \div 2$
$= 64 - \boxed{4}$
$= \boxed{60}$

(e) $10 \times 2 + 9$
$= 20 + 9$
$= 29$

(f) $42 \div 3 + 3$
$= 14 + 3$
$= 17$

(g) $32 + 4 \div 4$
$= 32 + 1$
$= 33$

(h) $50 + 10 \div 5$
$= 50 + 2$
$= 52$

(i) $100 \div 10 - 5 \times 2$
$= 10 - 5 \times 2$
$= 10 - 10$
$= 0$

(j) $25 \times 3 + 40 \div 8$
$= 75 + 40 \div 8$
$= 75 + 5$
$= 80$

(k) $200 - 10 \times 20 \div 2$
$= 200 - 200 \div 2$
$= 200 - 100$
$= 100$

(l) $80 + 30 \div 10 \times 4 - 12$
$= 80 + 3 \times 4 - 12$
$= 80 + 12 - 12$
$= 80$

4. (a) 8 + (12 − 10)
$= 8 + \boxed{2}$
$= \boxed{10}$

(b) 12 × (4 ÷ 2)
$= 12 \times \boxed{2}$
$= \boxed{24}$

(c) 13 × (2 + 3)
$= 13 \times \boxed{5}$
$= \boxed{65}$

(d) 18 ÷ (19 − 10)
$= 18 \div \boxed{9}$
$= \boxed{2}$

(e) 12 × 2 − 4 + (6 − 3)
= 12 × 2 − 4 + 3
= 24 − 4 + 3
= 20 + 3
= 23

(f) 9 ÷ 3 × (2 + 2) − 10
= 9 ÷ 3 × 4 − 10
= 3 × 4 − 10
= 12 − 10
= 2

(g) (40 − 10) × 2 + (30 − 20)
= 30 × 2 + (30 − 20)
= 30 × 2 + 10
= 60 + 10
= 70

(h) 25 − 3 + 10 × (5 − 2)
= 25 − 3 + 10 × 3
= 25 − 3 + 30
= 52

(i) 300 ÷ (3 + 7) − 6 × 2
= 300 ÷ 10 − 6 × 2
= 30 − 12
= 18

(j) 30 − (4 × 2 + 2) ÷ 5
= 30 − (8 + 2) ÷ 5
= 30 − 10 ÷ 5
= 30 − 2
= 28

LESSON PLAN

Chapter 2 Lesson 3

Specific Learning Focus

- Calculate in correct order of operations, including the use of brackets.

Suggested Duration

2 periods

Prior Learning

Pupils should be well-versed with the four different modes of operations (+, –, × and ÷). The correct order of operations will be taught in this lesson.

Pre-emptive Pitfalls

If the rules are not learnt well and the correct order of operations are not followed, pupils will get incorrect answers and face difficulties in the next lesson which involves the use of different operations to solve word problems. Therefore, it is important for them to learn and follow the correct order.

Introduction

Get the pupils to first identify the different operations involved in each sum. Elicit answers by pointing out the correct order of operations. The following rules need to be explained to the pupils:

- In a sum involving only multiplication and division, work from left to right.
- In a sum involving only addition and subtraction, work from left to right.
- If three or all four operations are involved in a sum, the DMAS rule* is applied.

*DMAS rule:
Division
Multiplication
Addition
Subtraction

In Let's Learn 5 (Textbook 5 P42 – 43) onwards, brackets are also involved, hence DMAS progresses to BODMAS, where 'B' stands for brackets, which means the expression in the bracket must be worked out first. The use of calculators is also introduced in this lesson. In Let's Learn 7 (Textbook 5 P43), the buttons to be keyed in on the calculator are provided, and get pupils to work out the answer using a calculator.

Problem Solving

It must be communicated that the order of operations matters, otherwise the answers will be different. This fact can be elaborated by having the two pupils come up to the board and get them to do the same sum simultaneously with different orders of operation. Similarly, the use of calculator should only be encouraged when checking answers after pupils have done the sum without its help. It should be pointed out that when keying in the expression on the calculator, the exact expression must be keyed in, including the brackets. Also, emphasise to pupils that they should not rely on the calculator and must still know the correct order of operations.

Activities

Provide pupils with mathematical expression cards and markers for them to work on multiple sums in pairs.

Resources

- mini whiteboard
- markers
- mathematical expression cards (Activity Handbook 5 P12)
- calculator

Mathematical Communication Support

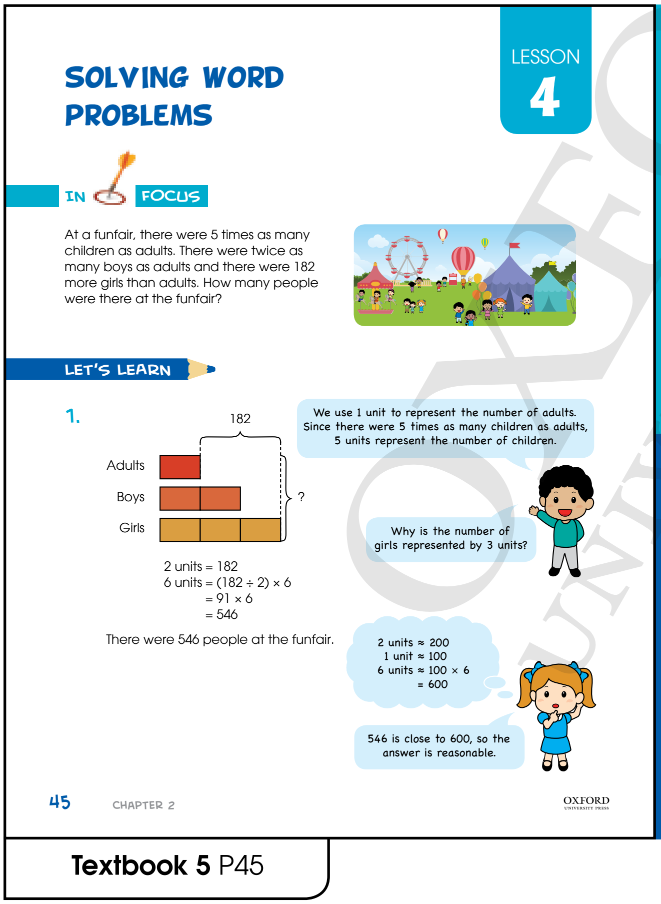
Ask pupils non-routine questions and work out the story sum in the wrong order of operations and explain that order matters. Emphasise key terms like 'left to right', 'order matters', 'DMAS' and 'BODMAS'.

LESSON
4

SOLVING WORD PROBLEMS

LEARNING OBJECTIVE

1. Solve word problems involving the 4 operations.



SOLVING WORD PROBLEMS

LESSON
4

IN FOCUS

At a funfair, there were 5 times as many children as adults. There were twice as many boys as adults and there were 182 more girls than adults. How many people were there at the funfair?

LET'S LEARN

1.

2 units = 182
6 units = (182 ÷ 2) × 6
= 91 × 6
= 546

There were 546 people at the funfair.

We use 1 unit to represent the number of adults. Since there were 5 times as many children as adults, 5 units represent the number of children.

Why is the number of girls represented by 3 units?

2 units ≈ 200
1 unit ≈ 100
6 units ≈ 100 × 6
= 600

546 is close to 600, so the answer is reasonable.

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Textbook 5 P45

IN FOCUS

Get pupils to read and understand the word problem involving four operations.

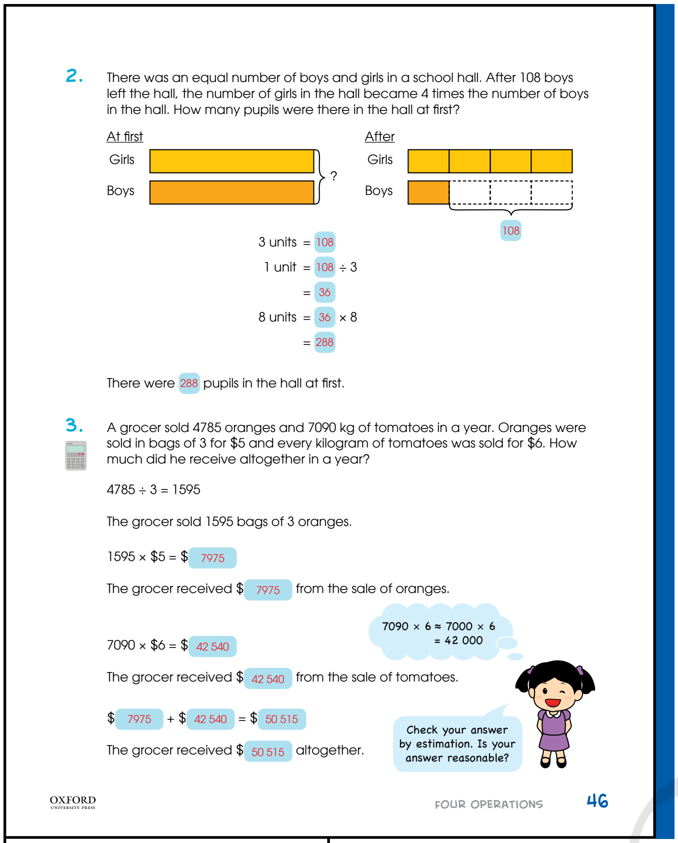
The question which involves comparison, i.e. 'twice', 'five times', 'more', challenges pupils to visualise and understand the question before thinking of a strategy to find the solution.

Recall the stages of problem solving and elicit responses on how the question can be solved.

LET'S LEARN

Help pupils learn how to solve the word problem in Let's Learn 1 with the use of models. Show and explain the derivation of the model.

Explain to pupils that the number of boys is represented by two units and the number of adults is represented by 1 unit. Since the number of children is 5 times the adults, the total number of units for boys and girls should be 5. Therefore, the number of girls is represented by 3 units. Guide pupils to solve the problem using the unitary method. Discuss how the answer obtained can be checked for reasonableness.



2. There was an equal number of boys and girls in a school hall. After 108 boys left the hall, the number of girls in the hall became 4 times the number of boys in the hall. How many pupils were there in the hall at first?

3 units = 108
1 unit = 108 ÷ 3
= 36
8 units = 36 × 8
= 288

There were 288 pupils in the hall at first.

3. A grocer sold 4785 oranges and 7090 kg of tomatoes in a year. Oranges were sold in bags of 3 for $5 and every kilogram of tomatoes was sold for $6. How much did he receive altogether in a year?

4785 ÷ 3 = 1595

The grocer sold 1595 bags of 3 oranges.

1595 × $5 = $ 7975

The grocer received $ 7975 from the sale of oranges.

7090 × $6 = $ 42 540

The grocer received $ 42 540 from the sale of tomatoes.

$ 7975 + $ 42 540 = $ 50 515

The grocer received $ 50 515 altogether.

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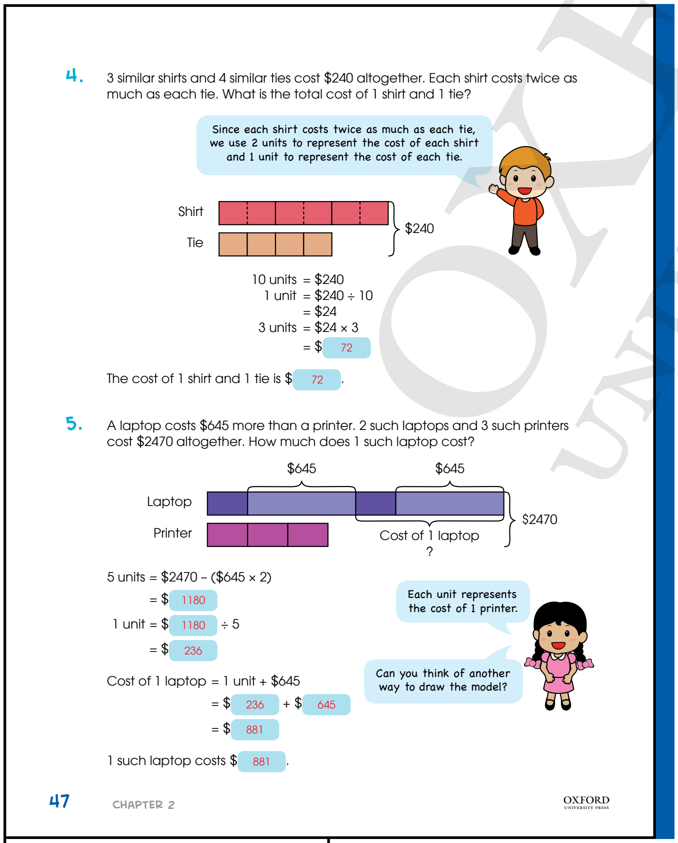
Textbook 5 P46

The before-after model in Let's Learn 2 enables pupils to make a comparison in the number of units representing the number of boys and girls. Prompt pupils to fill in the blanks guiding them to solve the problem using the unitary method.

For Let's Learn 3, allow pupils to work in pairs.
Ask:

- What are the operations involved?
- Is your answer reasonable?



4. 3 similar shirts and 4 similar ties cost $240 altogether. Each shirt costs twice as much as each tie. What is the total cost of 1 shirt and 1 tie?

10 units = $240
1 unit = $240 ÷ 10
= $24
3 units = $24 × 3
= $ 72

The cost of 1 shirt and 1 tie is $ 72.

5. A laptop costs $645 more than a printer. 2 such laptops and 3 such printers cost $2470 altogether. How much does 1 such laptop cost?

5 units = $2470 – ($645 × 2)
= $ 1180
1 unit = $ 1180 ÷ 5
= $ 236

Cost of 1 laptop = 1 unit + $645
= $ 236 + $ 645
= $ 881

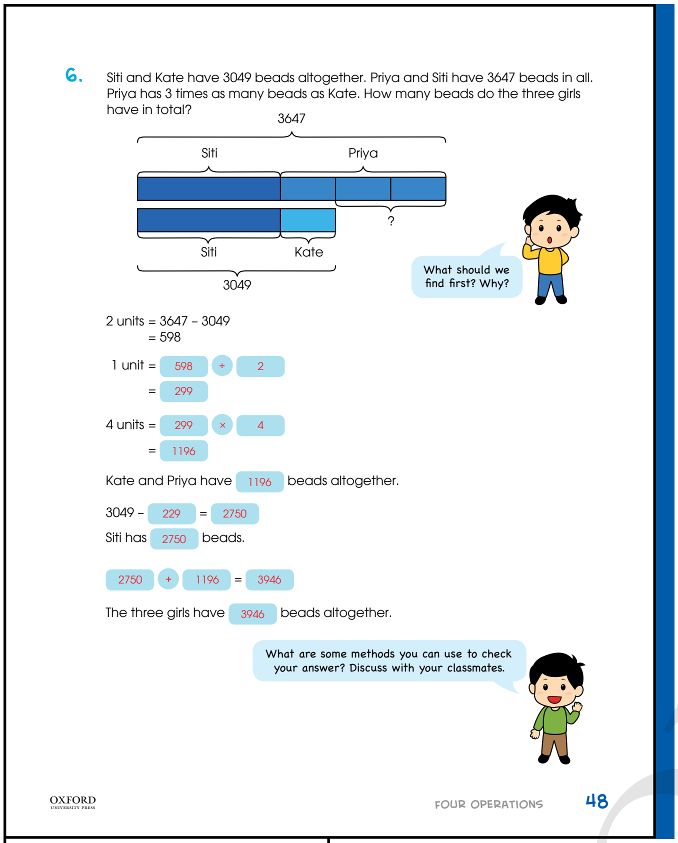
1 such laptop costs $ 881.

47 CHAPTER 2 OXFORD UNIVERSITY PRESS

Textbook 5 P47

For Let's Learn 4, get pupils to explain how the comparison model is drawn. If each tie is represented by 1 unit, then each shirt is represented by 2 units, with a total of 6 units for 3 similar shirts. Work together with the pupils to find the answer using the unitary method.

For Let's Learn 5, the model is both part-whole and comparison to illustrate the portion of the price of a laptop that is more than a printer. The bars are then duplicated to represent 2 laptops and 3 printers. Work together with the pupils in finding the answer using the unitary method.



6. Siti and Kate have 3049 beads altogether. Priya and Siti have 3647 beads in all. Priya has 3 times as many beads as Kate. How many beads do the three girls have in total?

2 units = 3647 – 3049
= 598

1 unit = 598 ÷ 2
= 299

4 units = 299 × 4
= 1196

Kate and Priya have 1196 beads altogether.

3049 – 229 = 2750

Siti has 2750 beads.

2750 + 1196 = 3946

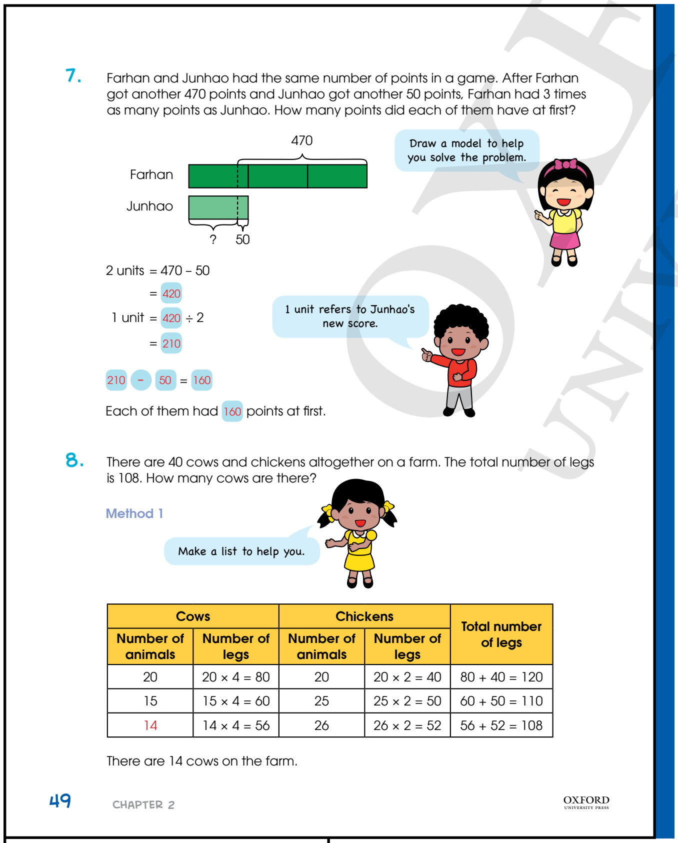
The three girls have 3946 beads altogether.

Textbook 5 P48

For Let's Learn 6, explain to pupils that since information is provided such that Siti is repeated in both scenarios, the model is drawn as such.

Guide pupils to see that the value of the unknown part of the model can be found by comparing the bars based on the information provided.

For class discussion, ask pupils to share alternative methods to solving the problem.



7. Farhan and Junhao had the same number of points in a game. After Farhan got another 470 points and Junhao got another 50 points, Farhan had 3 times as many points as Junhao. How many points did each of them have at first?

2 units = 470 – 50
= 420

1 unit = 420 ÷ 2
= 210

210 – 50 = 160

Each of them had 160 points at first.

8. There are 40 cows and chickens altogether on a farm. The total number of legs is 108. How many cows are there?

Method 1

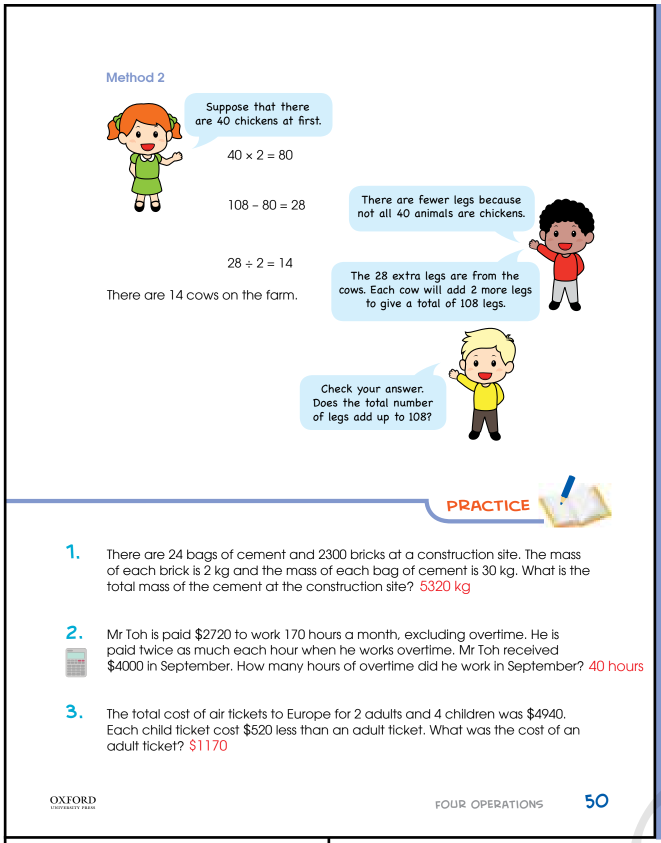
Cows		Chickens		Total number of legs
Number of animals	Number of legs	Number of animals	Number of legs	
20	20 × 4 = 80	20	20 × 2 = 40	80 + 40 = 120
15	15 × 4 = 60	25	25 × 2 = 50	60 + 50 = 110
14	14 × 4 = 56	26	26 × 2 = 52	56 + 52 = 108

There are 14 cows on the farm.

Textbook 5 P49

Explain to pupils that model drawing can help them visualise and solve the problem in Let's Learn 7. Go through the drawing of the model step-by-step. Work together with the pupils in finding the answer by unitary method. Ask pupils if they know what 1 unit represents in this problem. Get pupils to discuss how answers can be checked.

Use Let's Learn 8 to help pupils learn how to solve non-routine word problems with the use of various methods, including the guess and check method and the assumption method. Get pupils to explain the pros and cons of each method. Guide pupils in checking the answers obtained.



Method 2

Suppose that there are 40 chickens at first.

40 × 2 = 80

108 – 80 = 28

There are fewer legs because not all 40 animals are chickens.

28 ÷ 2 = 14

There are 14 cows on the farm.

The 28 extra legs are from the cows. Each cow will add 2 more legs to give a total of 108 legs.

Check your answer. Does the total number of legs add up to 108?

PRACTICE

1. There are 24 bags of cement and 2300 bricks at a construction site. The mass of each brick is 2 kg and the mass of each bag of cement is 30 kg. What is the total mass of the cement at the construction site? 5320 kg

2. Mr Toh is paid $2720 to work 170 hours a month, excluding overtime. He is paid twice as much each hour when he works overtime. Mr Toh received $4000 in September. How many hours of overtime did he work in September? 40 hours

3. The total cost of air tickets to Europe for 2 adults and 4 children was $4940. Each child ticket cost $520 less than an adult ticket. What was the cost of an adult ticket? $1170

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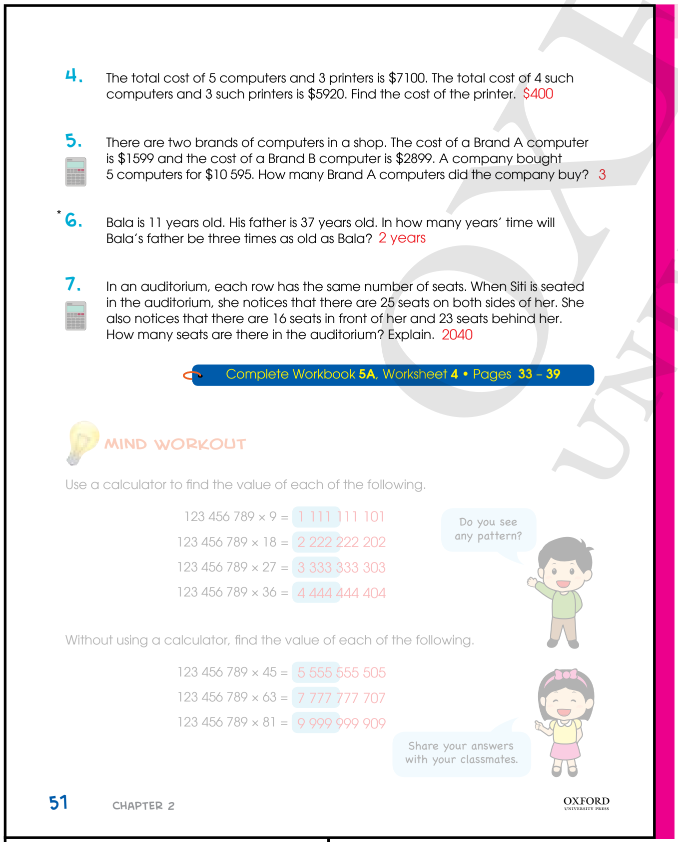
Textbook 5 P50

PRACTICE

Allow pupils to work in pairs. Give pupils sufficient time to work on the practice before going through.



4. The total cost of 5 computers and 3 printers is $7100. The total cost of 4 such computers and 3 such printers is $5920. Find the cost of the printer. $400

5. There are two brands of computers in a shop. The cost of a Brand A computer is $1599 and the cost of a Brand B computer is $2899. A company bought 5 computers for $10 595. How many Brand A computers did the company buy? 3

*6. Bala is 11 years old. His father is 37 years old. In how many years' time will Bala's father be three times as old as Bala? 2 years

7. In an auditorium, each row has the same number of seats. When Siti is seated in the auditorium, she notices that there are 25 seats on both sides of her. She also notices that there are 16 seats in front of her and 23 seats behind her. How many seats are there in the auditorium? Explain. 2040

Complete Workbook **5A**, Worksheet **4** • Pages **33 – 39**

MIND WORKOUT

Use a calculator to find the value of each of the following.

123 456 789 × 9 = 1 111 111 101
123 456 789 × 18 = 2 222 222 202
123 456 789 × 27 = 3 333 333 303
123 456 789 × 36 = 4 444 444 404

Do you see any pattern?

Without using a calculator, find the value of each of the following.

123 456 789 × 45 = 5 555 555 505
123 456 789 × 63 = 7 777 777 707
123 456 789 × 81 = 9 999 999 909

Share your answers with your classmates.

51 CHAPTER 2 OXFORD UNIVERSITY PRESS

Textbook 5 P51

Independent seatwork

Assign pupils to complete Worksheet 4 (Workbook 5A P33 – 39).

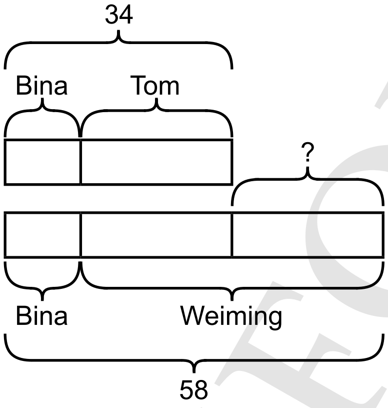
Answers Worksheet 4 (Workbook 5A P33 – 39)

1. 4 × 0 = 0
   10 × 1 = 10
   12 × 2 =24
   6 × 3 = 18
   35 − (4 + 10 + 12 + 6) = 3
   3 × 4 = 12
   10 + 24 + 18 + 12 = 64

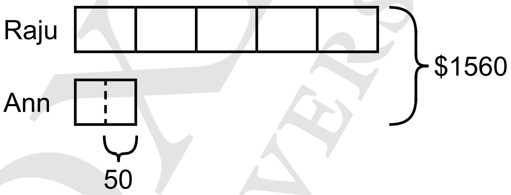
2. 20 × 14 = 280
   280 + 28 = 308

3. (a) $2580 ÷ $60 = 43
   (b) $100 × 43 = $4300
   $4300 − $2580 = $1720

4. 1 unit = 58 − 34
   = 24
   34 − 24 = 10



5. 6 units = $1560
   1 unit = $1560 ÷ 6
   = $260
   5 units = $260 × 5
   = $1300
   $1300 + $50 = $1350



6. 1500 ÷ 10 = 150
   $15 × 150 = $2250
   810 ÷ 5 = 162
   $12 × 162 = $1944
   $2250 + $1944 = $4194

7. 142 ÷ 2 = 71
   71 × 4 = 284
   284 × 4 = 1136

8. $216 x 2 = $432
   $7215 − $432 = $6783
   $6783 ÷ 7 = $969
   $969 + $216 = $1185
   $1185 x 3 = $3555

9. 1 badminton racquet and 3 baseball bats = $163
   3 badminton racquet and 9 baseball bats = $163 × 3
   = $489
   7 baseball bats = $489 − $167
   = $322
   1 baseball bat = $322 ÷ 7
   = $46
   1 badminton racquet = $163 − (3 × $46)
   = $25

10. 3 × 5 = 15
    36 − 15 = 21
    21 ÷ 3 = 7 years

11. 20 × 2 = 40
    40 × 21 = 840

12. 93 × 2 = 186
    211 − 186 = 25
    93 − 25 = 68

LESSON PLAN

Chapter 2
Lesson 4

Specific Learning Focus

- Solve word problems involving the 4 operations.

Suggested Duration

4 periods

Prior Learning

Pupils should be aware of the four stages involved when solving word problems. They should be well-versed with interpreting the word problem and converting into a mathematical equation.

Pre-emptive Pitfalls

Pupils may have difficulty in sifting the information provided in the question and translating it into a bar model. To ascertain the mode(s) of operation is the next challenge they may face. Mathematical computation and remembering how to carry out the standard algorithm are generally not a challenge to most pupils.

Introduction

In ‘In Focus’ (Textbook 5 P45), emphasise the four steps of approach to solving the word problem:

1. Visualise and understand the information given.
2. Draw a bar model based on the information given. According to the bar model, pupils should see that 2 units is equivalent to 182, and that one unit is used to represent the number of adults, while two units is used to represent the number of boys.
3. Decide on a strategy and the mode of operation. Since 2 units represent 182, then 1 unit represents 182 ÷ 2.
4. Solve the problem. Since 182 ÷ 2 = 91, then 1 unit represents 91 people. Hence, 6 units represent 6 × 91 = 546 people altogether.

Guide pupils through the various stages by teaching by asking. The bar modelling method is very beneficial and it also helps pupils to understand the unitary method.

Problem Solving

While understanding the bar modelling strategy, explain that in ‘In Focus’, the number of adults is represented by 1 unit, the boys 2 units and the girls 3 units, as ‘there were 5 times as many children as adults’. Since ‘there were twice as many boys as adults’, the number of units representing the number of boys is 2. Then, the number of units representing the number of girls is 5 – 2 = 3.To check for reasonableness of the answer, an estimation can be done. 182, which 2 units represent, is rounded to 200, and hence 6 units represents 600. Since 546 is close to 600, the answer is reasonable. Encourage multiple strategies (rounding off, unitary method in this case) to develop critical and problem-solving skills in pupils.

Activities

The questions in ‘Practice’ (Textbook 5 P50 – 51) can be enacted in class by roleplay. Pupils can take on the role of the characters in the questions (Mr Toh, Bala and Siti) with the help of flash cards of the data. The class can then decide on the operation to use to solve the word problems and the teacher may get a volunteer to work on the board. A group of pupils can be the “check brigade” and say if the answer is reasonable and if the operation used is correct.

Resources

- mini whiteboard
- bar model strips (Activity Handbook 5 P13)

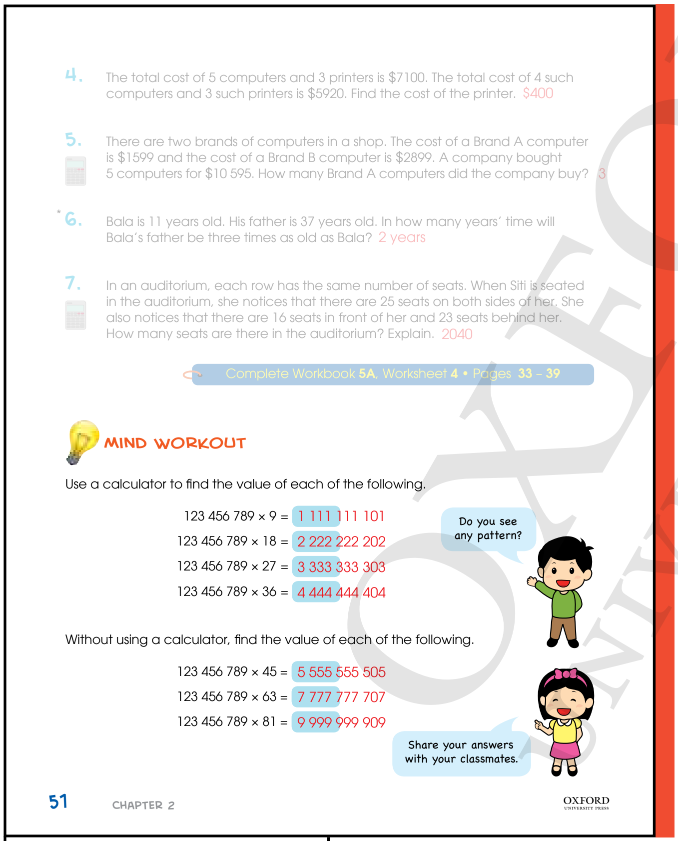
Mathematical Communication Support

Ask pupils essential questions leading to the four stages involved when solving word problems:

1. What is the information given?
2. How do we translate it into a bar model?
3. What strategy/operation will you employ?
4. Is your answer reasonable? Check the operations by applying an alternative mental strategy.

Drawing or tabulating the data helps pupils visualise the scenario and come up with a strategy and method to solve the word problem.

PROBLEM SOLVING, MATHS JOURNAL AND PUPIL REVIEW



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Complete Workbook **5A**, Worksheet **4** • Pages **33 – 39**

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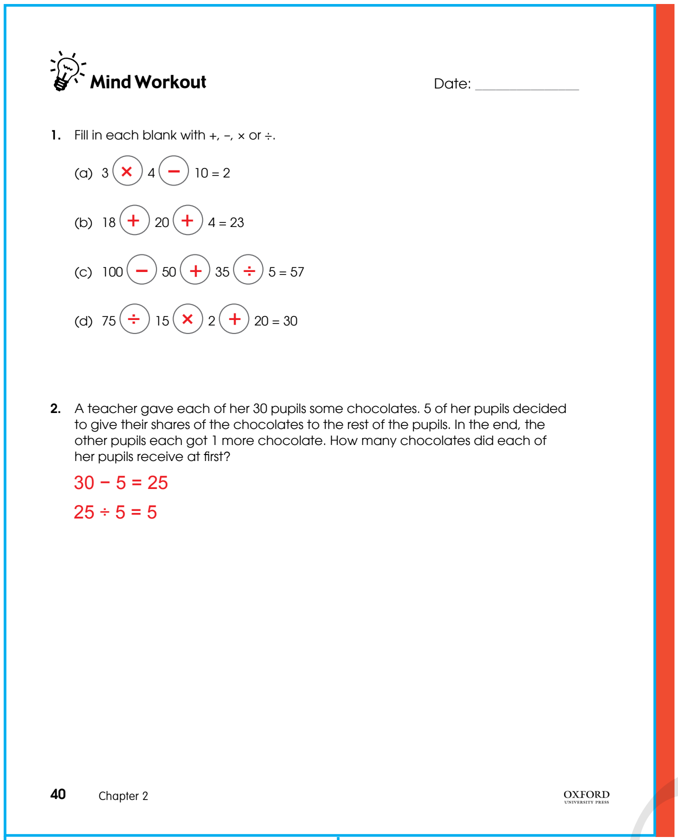
123 456 789 × 81 = 9 999 999 909

51 CHAPTER 2 OXFORD UNIVERSITY PRESS

Textbook 5 P51

MIND WORKOUT

The Mind Workout allows pupils to attempt multiplying large numbers with the use of calculator. Pupils will apply the pattern observed to find the products of other expressions.



Mind Workout Date: ____________

1. Fill in each blank with +, −, × or ÷.

(a) 3 × 4 − 10 = 2

(b) 18 + 20 + 4 = 23

(c) 100 − 50 + 35 ÷ 5 = 57

(d) 75 ÷ 15 × 2 + 20 = 30

2. A teacher gave each of her 30 pupils some chocolates. 5 of her pupils decided to give their shares of the chocolates to the rest of the pupils. In the end, the other pupils each got 1 more chocolate. How many chocolates did each of her pupils receive at first?

30 − 5 = 25

25 ÷ 5 = 5

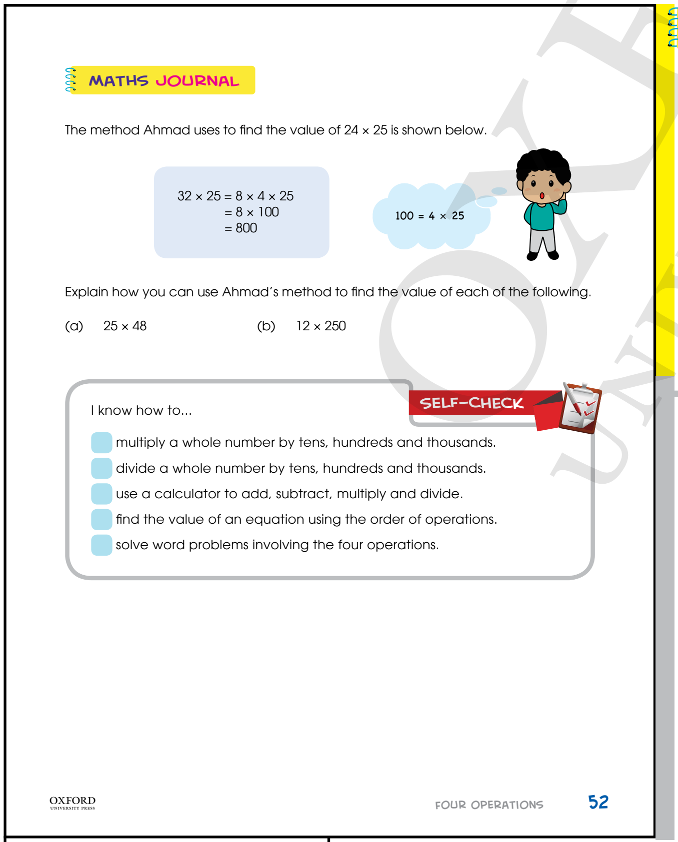
40 Chapter 2 OXFORD

Workbook 5A P40

Mind Workout

For question 1, pupils are required to identify the correct signs that give each answer. Pupils may need to try several times and perform a number of calculations before obtaining the correct answer.

For question 2, guide pupils by asking them how many chocolates from the 5 pupils were redistributed to the remaining 25 pupils.



MATHS JOURNAL

The method Ahmad uses to find the value of 24 × 25 is shown below.

32 × 25 = 8 × 4 × 25
= 8 × 100
= 800

100 = 4 × 25

Explain how you can use Ahmad's method to find the value of each of the following.

(a) 25 × 48 (b) 12 × 250

SELF-CHECK

I know how to...

- ☐ multiply a whole number by tens, hundreds and thousands.
- ☐ divide a whole number by tens, hundreds and thousands.
- ☐ use a calculator to add, subtract, multiply and divide.
- ☐ find the value of an equation using the order of operations.
- ☐ solve word problems involving the four operations.

OXFORD FOUR OPERATIONS 52

Textbook 5 P52

MATHS JOURNAL

The task helps pupils to perform multiplication by regrouping. Encourage pupils to think of other methods to solve the problem. Invite pupils to share how these methods differ from one another.

SELF-CHECK

Before doing the self-check, review important concepts.

The self-check can be done after pupils have completed **Review 2** (Workbook 5A P41 − 44) as a consolidation of understanding for the chapter.

1. (a) 340 × 10 = 3400
   (b) 55 × 100 = 5500
   (c) 182 × 1000 = 182 000
   (d) 250 × 500 = 125 000
   (e) 67 × 300 = 20 100
   (f) 48 × 6000 = 288 000
   (g) 220 ÷ 10 = 22
   (h) 70 800 ÷ 100 = 708
   (i) 419 000 ÷ 1000 = 419
   (j) 30 000 ÷ 300 = 100
   (k) 960 ÷ 20 = 48
   (l) 52 000 ÷ 4000 = 13

2. (a) = 40 + 80 − 50
   = 120 − 50
   = 70
   (b) = 30 + 240 ÷ 4
   = 30 + 60
   = 90
   (c) = 50 + (12 − 9) ÷ 3
   = 50 + 3 ÷ 3
   = 50 + 1
   = 51
   (d) = 7 × 21 + 36 ÷ 9
   = 147 + 4
   = 151

3. $540 + $235 = $775
   $1000 − $775 = $225

4. 2040 cm ÷ 30 = 68 cm
   68 cm × 10 = 680 cm
   2040 cm − 680 cm = 1360 cm

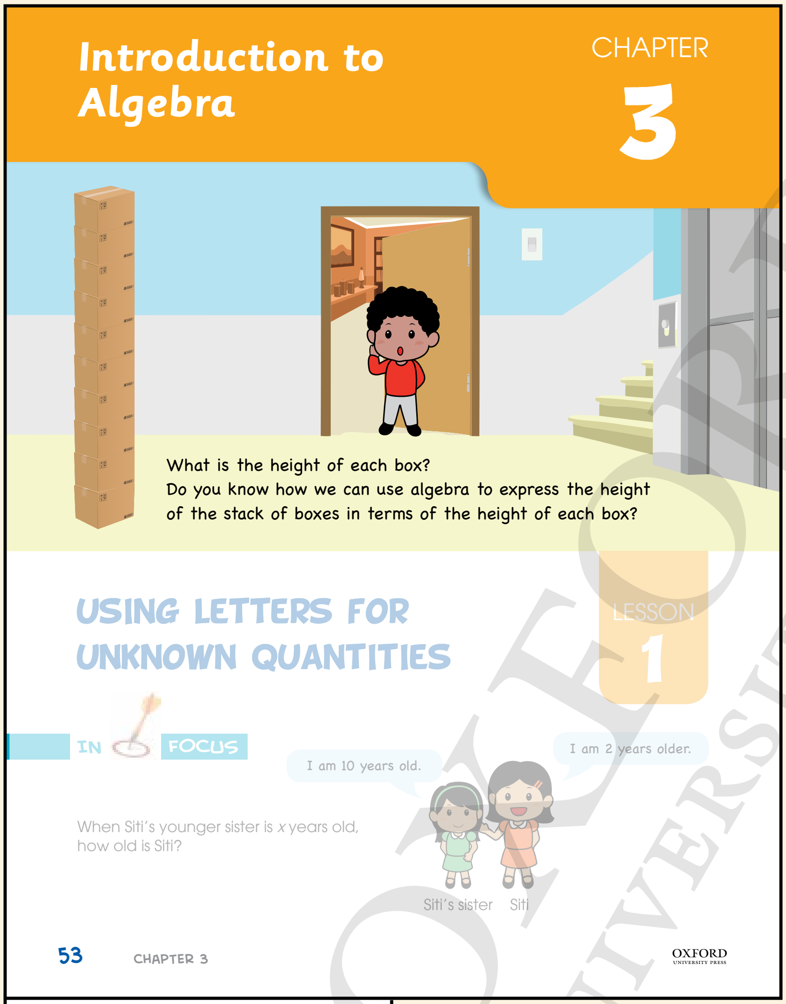
5. 2 units = 55 − 15
   = 40
   1 unit = 40 ÷ 2
   = 20
   3 units = 20 × 3
   = 60

6. 5 units = 70
   1 unit = 70 ÷ 5
   = 14
   9 units = 14 × 9
   = 126

*7. 3 units = 738 − 42
   = 696
   1 unit = 696 ÷ 3
   = 232
   232 + 42 = 274

INTRODUCTION TO ALGEBRA

CHAPTER 3



Introduction to Algebra

CHAPTER 3

What is the height of each box?
Do you know how we can use algebra to express the height of the stack of boxes in terms of the height of each box?

USING LETTERS FOR UNKNOWN QUANTITIES

LESSON 1

IN FOCUS

I am 10 years old.

I am 2 years older.

When Siti's younger sister is x years old, how old is Siti?

Siti's sister

Siti

53 CHAPTER 3

OXFORD UNIVERSITY PRESS

Textbook 5 P53

Related Resources

NSPM Textbook 5 (P53 – 61)
NSPM Workbook 5A (P45 – 52)

Materials

Mini whiteboard, markers

Lesson

Lesson 1 Using Letters for Unknown Quantities

Problem Solving, Maths Journal and Pupil Review

INTRODUCTION

This chapter introduces the concept of algebra. Pupils will learn to express numbers and quantities algebraically, i.e. use letters to represent unknown numbers.

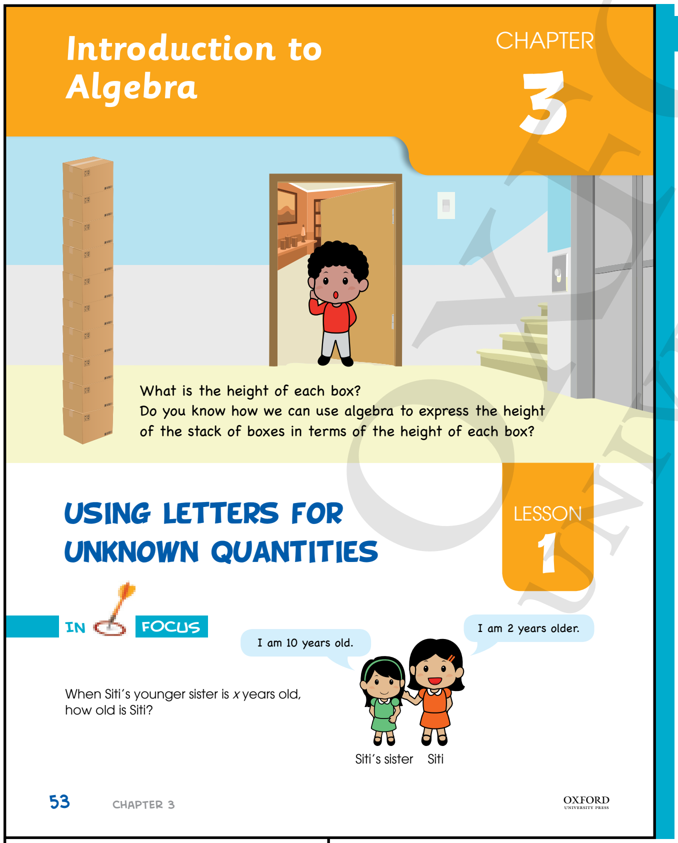
LESSON

1

USING LETTERS FOR UNKNOWN QUANTITIES

LEARNING OBJECTIVE

1. Write unknown quantities as letters to form an expression.



Introduction to Algebra

CHAPTER 3

What is the height of each box?
Do you know how we can use algebra to express the height of the stack of boxes in terms of the height of each box?

USING LETTERS FOR UNKNOWN QUANTITIES

LESSON 1

IN FOCUS

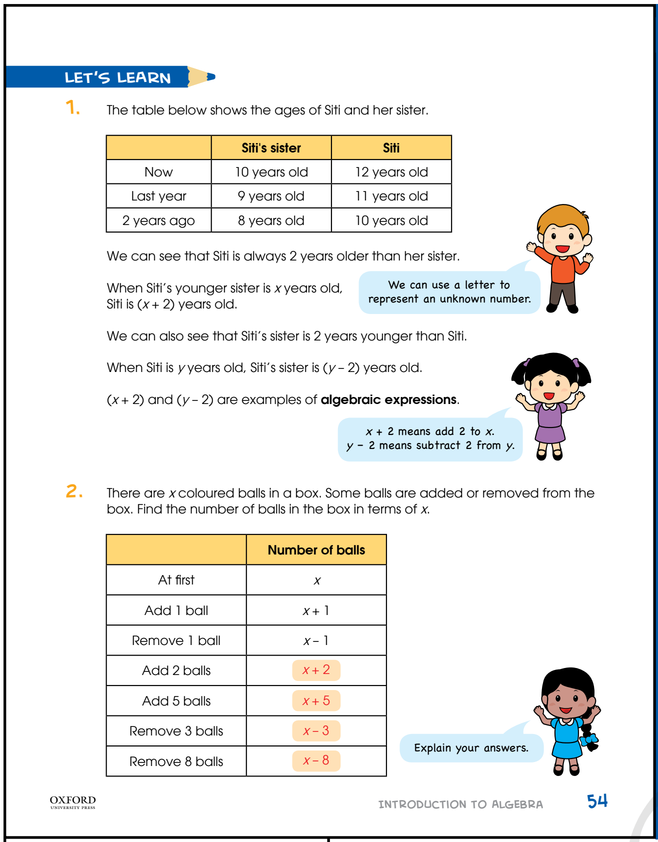
When Siti's younger sister is x years old, how old is Siti?

53 CHAPTER 3 OXFORD UNIVERSITY PRESS

Textbook 5 P53

IN FOCUS

Get pupils to relate to algebraic expressions using real-life examples involving small numbers: in this case, the use of age, where Siti is 2 years older than her sister. Get pupils to express the ages of the two sisters algebraically and explain why it is so.



LET'S LEARN

1. The table below shows the ages of Siti and her sister.

	Siti's sister	Siti
Now	10 years old	12 years old
Last year	9 years old	11 years old
2 years ago	8 years old	10 years old

We can see that Siti is always 2 years older than her sister.

When Siti's younger sister is x years old, Siti is $(x + 2)$ years old.

We can use a letter to represent an unknown number.

We can also see that Siti's sister is 2 years younger than Siti.

When Siti is y years old, Siti's sister is $(y - 2)$ years old.

$(x + 2)$ and $(y - 2)$ are examples of **algebraic expressions**.

$x + 2$ means add 2 to x.
$y - 2$ means subtract 2 from y.

2. There are x coloured balls in a box. Some balls are added or removed from the box. Find the number of balls in the box in terms of x.

	Number of balls
At first	x
Add 1 ball	$x + 1$
Remove 1 ball	$x - 1$
Add 2 balls	$x + 2$
Add 5 balls	$x + 5$
Remove 3 balls	$x - 3$
Remove 8 balls	$x - 8$

Explain your answers.

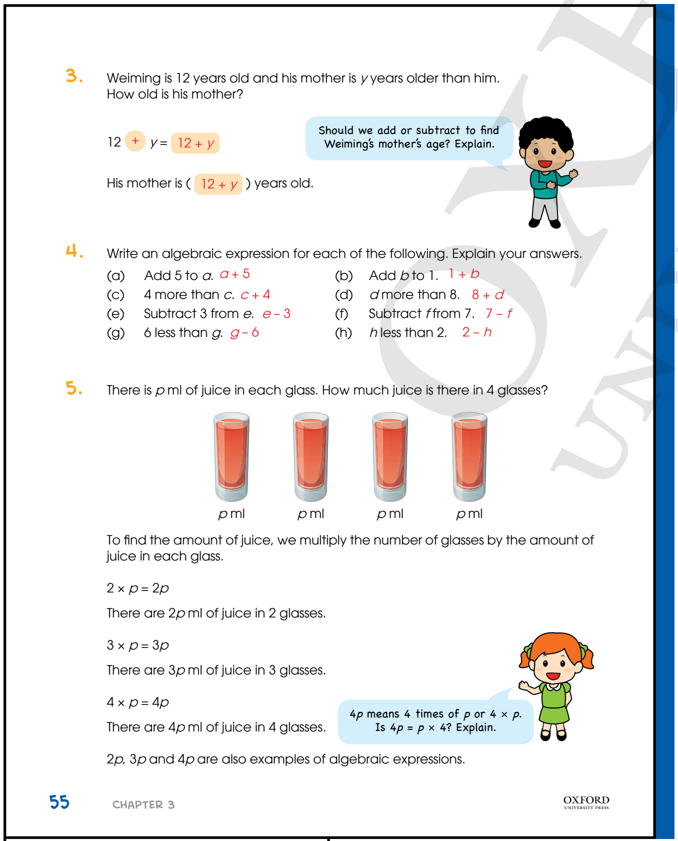
OXFORD UNIVERSITY PRESS INTRODUCTION TO ALGEBRA 54

Textbook 5 P54

LET'S LEARN

In Let's Learn 1, a systematic listing of the ages of the two sisters allows pupils to see a pattern over the years form, where the difference between the two ages is always 2. Introducing the idea that letters can be used to represent unknown numbers, pupils can express the ages of the two girls in algebraic expressions. Get pupils to see that the expressions represent the ages of the sisters regardless of which year it is.

For Let's Learn 2 to 4, guide pupils to write algebraic expressions involving addition and subtraction, based on different contexts.



3. Weiming is 12 years old and his mother is y years older than him. How old is his mother?

$12 + y = 12 + y$

His mother is ($12 + y$) years old.

Should we add or subtract to find Weiming's mother's age? Explain.

4. Write an algebraic expression for each of the following. Explain your answers.

(a) Add 5 to a. $a + 5$
(b) Add b to 1. $1 + b$
(c) 4 more than c. $c + 4$
(d) d more than 8. $8 + d$
(e) Subtract 3 from e. $e - 3$
(f) Subtract f from 7. $7 - f$
(g) 6 less than g. $g - 6$
(h) h less than 2. $2 - h$

5. There is p ml of juice in each glass. How much juice is there in 4 glasses?

p ml p ml p ml p ml

To find the amount of juice, we multiply the number of glasses by the amount of juice in each glass.

$2 \times p = 2p$

There are $2p$ ml of juice in 2 glasses.

$3 \times p = 3p$

There are $3p$ ml of juice in 3 glasses.

$4 \times p = 4p$

There are $4p$ ml of juice in 4 glasses.

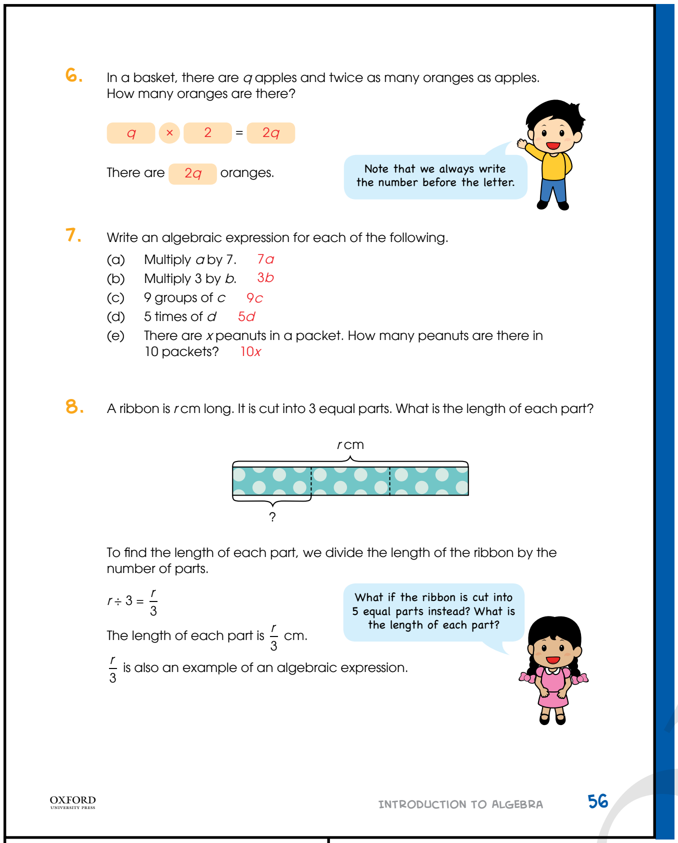
$4p$ means 4 times of p or $4 \times p$.
Is $4p = p \times 4$? Explain.

$2p$, $3p$ and $4p$ are also examples of algebraic expressions.

55 CHAPTER 3 OXFORD UNIVERSITY PRESS

Textbook 5 P55

In Let's Learn 5, pupils explore algebraic expressions involving multiplication. It is important for them to recognise and explain the difference between $4p$ and $4 + p$, where $4p = 4 \times p$, and not $4 + p$. The use of a context, such as the one in the example, will give a good concrete understanding of the meaning of such expressions.



6. In a basket, there are q apples and twice as many oranges as apples. How many oranges are there?

$q \times 2 = 2q$

There are $2q$ oranges.

7. Write an algebraic expression for each of the following.

(a) Multiply a by 7. $7a$
(b) Multiply 3 by b. $3b$
(c) 9 groups of c $9c$
(d) 5 times of d $5d$
(e) There are x peanuts in a packet. How many peanuts are there in 10 packets? $10x$

8. A ribbon is r cm long. It is cut into 3 equal parts. What is the length of each part?

To find the length of each part, we divide the length of the ribbon by the number of parts.

$r \div 3 = \frac{r}{3}$

The length of each part is $\frac{r}{3}$ cm.

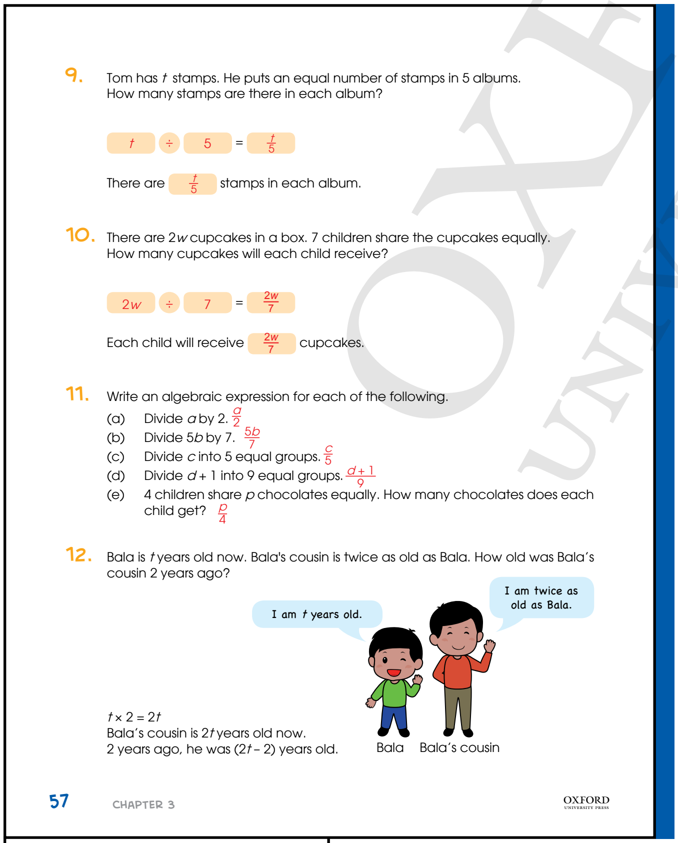
$\frac{r}{3}$ is also an example of an algebraic expression.

OXFORD UNIVERSITY PRESS INTRODUCTION TO ALGEBRA 56

Textbook 5 P56

In Let's Learn 6 and 7, guide pupils to write algebraic expressions involving multiplication, based on different contexts.

In Let's Learn 8, pupils explore algebraic expressions involving division using the context of cutting a ribbon into parts. Get pupils to explore finding the algebraic expression for different scenarios such as cutting the ribbon into a different number of parts, or expressing the original length of the ribbon differently.



9. Tom has t stamps. He puts an equal number of stamps in 5 albums. How many stamps are there in each album?

$t \div 5 = \frac{t}{5}$

There are $\frac{t}{5}$ stamps in each album.

10. There are $2w$ cupcakes in a box. 7 children share the cupcakes equally. How many cupcakes will each child receive?

$2w \div 7 = \frac{2w}{7}$

Each child will receive $\frac{2w}{7}$ cupcakes.

11. Write an algebraic expression for each of the following.

(a) Divide a by 2. $\frac{a}{2}$
(b) Divide $5b$ by 7. $\frac{5b}{7}$
(c) Divide c into 5 equal groups. $\frac{c}{5}$
(d) Divide $d + 1$ into 9 equal groups. $\frac{d+1}{9}$
(e) 4 children share p chocolates equally. How many chocolates does each child get? $\frac{p}{4}$

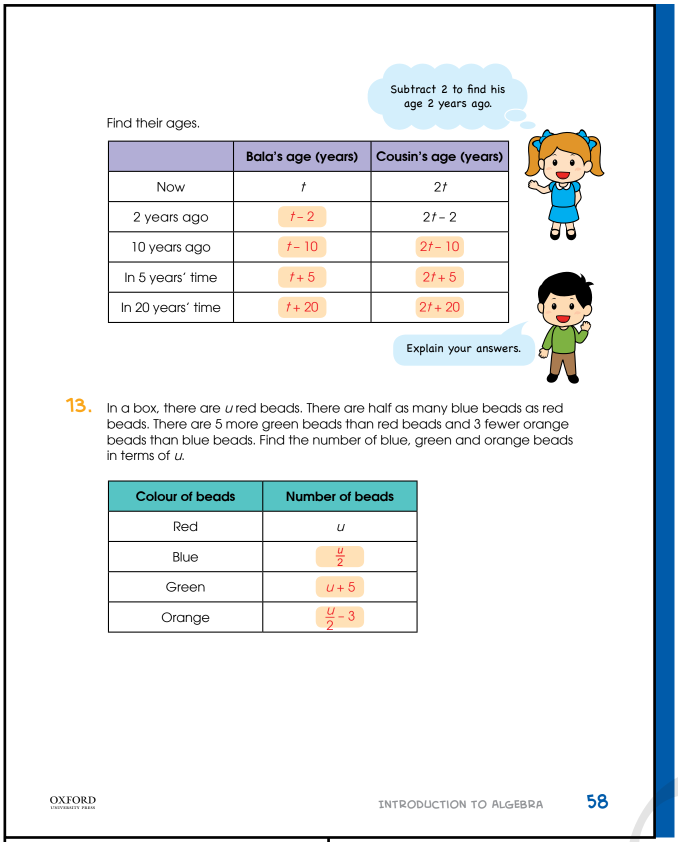
12. Bala is t years old now. Bala's cousin is twice as old as Bala. How old was Bala's cousin 2 years ago?

$t \times 2 = 2t$
Bala's cousin is $2t$ years old now.
2 years ago, he was $(2t - 2)$ years old.

57 CHAPTER 3 OXFORD UNIVERSITY PRESS

Textbook 5 P57

For Let's Learn 9 to 11, guide pupils to write algebraic expressions involving division, based on different contexts.



Subtract 2 to find his age 2 years ago.

Find their ages.

	Bala's age (years)	Cousin's age (years)
Now	t	$2t$
2 years ago	$t - 2$	$2t - 2$
10 years ago	$t - 10$	$2t - 10$
In 5 years' time	$t + 5$	$2t + 5$
In 20 years' time	$t + 20$	$2t + 20$

Explain your answers.

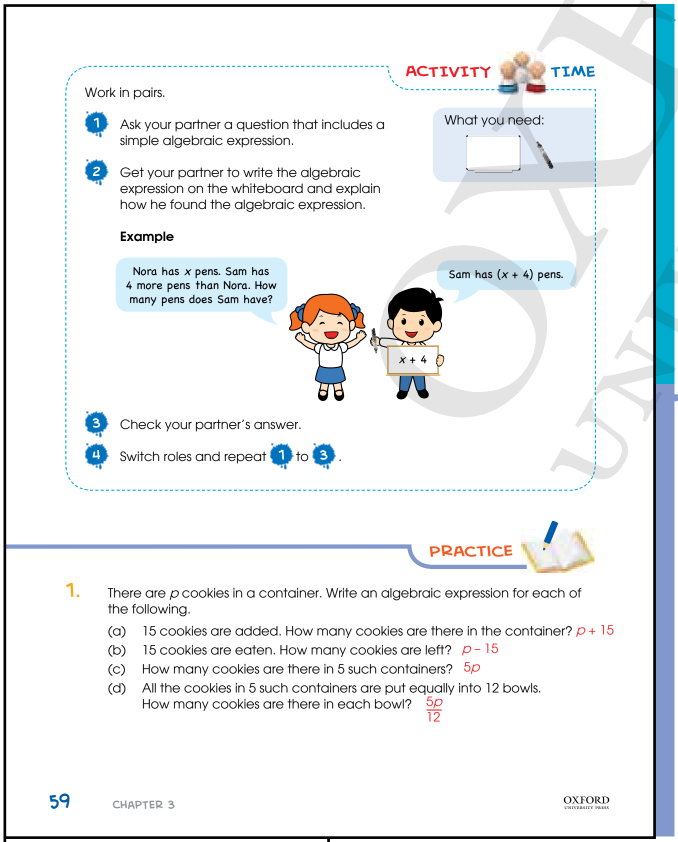
13. In a box, there are u red beads. There are half as many blue beads as red beads. There are 5 more green beads than red beads and 3 fewer orange beads than blue beads. Find the number of blue, green and orange beads in terms of u.

Colour of beads	Number of beads
Red	u
Blue	$\frac{u}{2}$
Green	$u + 5$
Orange	$\frac{u}{2} - 3$

OXFORD UNIVERSITY PRESS INTRODUCTION TO ALGEBRA 58

Textbook 5 P58

For Let's Learn 12 and 13, guide pupils to write algebraic expressions involving addition, subtraction, multiplication and division, based on different contexts. When pupils are unable to visualise or make sense of numbers algebraically, teacher need to help them understand the information given and make sense of the problem using numerals only, before guiding them to express the variables algebraically.



ACTIVITY TIME

Work in pairs.

① Ask your partner a question that includes a simple algebraic expression.

② Get your partner to write the algebraic expression on the whiteboard and explain how he found the algebraic expression.

What you need:

Example

Nora has x pens. Sam has 4 more pens than Nora. How many pens does Sam have?

Sam has $(x + 4)$ pens.

$x + 4$

③ Check your partner's answer.

④ Switch roles and repeat ① to ③.

PRACTICE

1. There are p cookies in a container. Write an algebraic expression for each of the following.

(a) 15 cookies are added. How many cookies are there in the container? $p + 15$

(b) 15 cookies are eaten. How many cookies are left? $p - 15$

(c) How many cookies are there in 5 such containers? $5p$

(d) All the cookies in 5 such containers are put equally into 12 bowls. How many cookies are there in each bowl? $\frac{5p}{12}$

59 CHAPTER 3 OXFORD UNIVERSITY PRESS

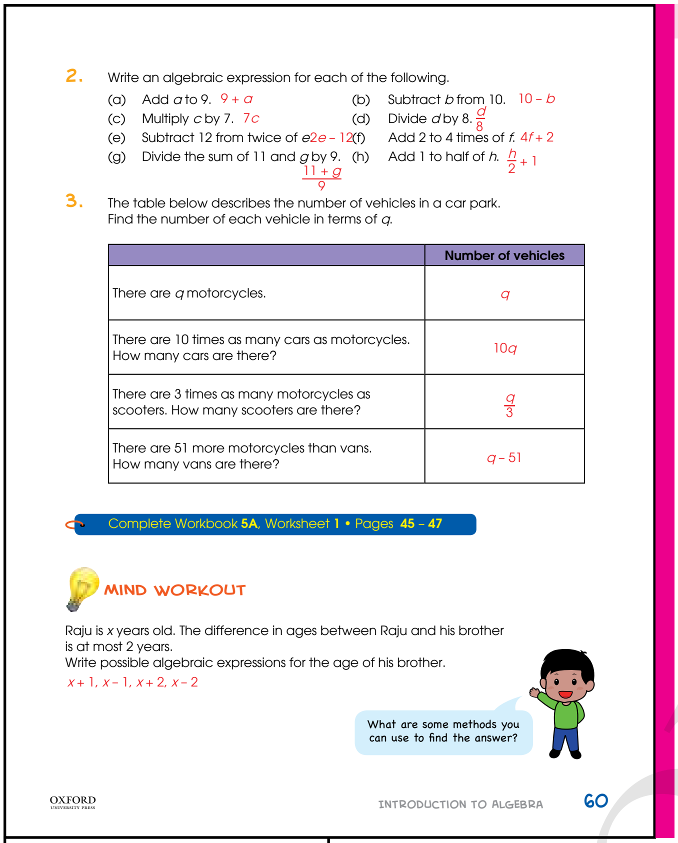
Textbook 5 P59

ACTIVITY TIME

This activity allows pupils to write algebraic expressions based on contexts of their own. This helps them to develop familiarity and fluency in expressing a number or quantity algebraically regardless of context. Checking each other's answers can help reinforce understanding as well as rectify any misconceptions.

PRACTICE

Allow pupils to discuss and work in pairs or groups. Then, go through the questions and solutions with the class. It is important that the pupils have grasped the concept of algebra and its applications before they are given independent work.



2. Write an algebraic expression for each of the following.

(a) Add *a* to 9. $9 + a$
(b) Subtract *b* from 10. $10 - b$
(c) Multiply *c* by 7. $7c$
(d) Divide *d* by 8. $\frac{d}{8}$
(e) Subtract 12 from twice of *e* $2e - 12$
(f) Add 2 to 4 times of *f*. $4f + 2$
(g) Divide the sum of 11 and *g* by 9. $\frac{11 + g}{9}$
(h) Add 1 to half of *h*. $\frac{h}{2} + 1$

3. The table below describes the number of vehicles in a car park.
Find the number of each vehicle in terms of *q*.

	Number of vehicles
There are *q* motorcycles.	q
There are 10 times as many cars as motorcycles. How many cars are there?	$10q$
There are 3 times as many motorcycles as scooters. How many scooters are there?	$\frac{q}{3}$
There are 51 more motorcycles than vans. How many vans are there?	$q - 51$

Complete Workbook **5A**, Worksheet **1** • Pages **45 – 47**

MIND WORKOUT

Raju is *x* years old. The difference in ages between Raju and his brother is at most 2 years.
Write possible algebraic expressions for the age of his brother.
$x + 1, x - 1, x + 2, x - 2$

What are some methods you can use to find the answer?

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INTRODUCTION TO ALGEBRA 60

Textbook 5 P60

Independent seatwork

Assign pupils to complete Worksheet 1 (Workbook 5A P45 – 47).

Answers

Worksheet 1 (Workbook 5A P45 – 47)

1. (a) $a + 2$
   (b) $b - 5$
   (c) $8c$
   (d) $\frac{d}{12}$
   (e) $72 - 4e$
   (f) $\frac{6f + 1}{7}$
   (g) $\frac{3g}{2} - 10$
   (h) $\frac{h}{2} + 9$
   (i) $\frac{15 + i}{2}$
   (j) $8 + \frac{j}{3}$

2. (a) $k + 30$
   (b) $k - 8$
   (c) $3k$
   (d) $\frac{k}{2}$
   (e) $k + 14$
   (f) $\frac{k}{3}$

3. (a) $(184 - p)$ cm
   (b) $3q$ cm
   (c) $(r + 3)$ years old
   (d) $2t$
   (e) $\left(\frac{w}{3} - 5\right)$ years old

LESSON PLAN

Chapter 3
Lesson 1

Specific Learning Focus

- Write unknown quantities as letters to form an expression.

Suggested Duration

4 periods

Prior Learning

Pupils have done correspondence problems in grades 3 and 4, which leads to the introduction of Algebra in this lesson.

Pre-emptive Pitfalls

Using letters to represent unknown quantities does not mean that the letter does not have any numerical value. In this lesson, pupils will be introduced to algebra formally and the use of letters in mathematical expressions and equations.

Introduction

Introduce the concept of letters/variables in mathematical computation to pupils. In algebra, unknown quantities are represented by letters. To form an algebraic expression, the unknown quantity is represented by x, y or any other letter of the alphabet. An algebraic expression can involve addition or subtraction, where numerical values can be added or subtracted to the letter representing an unknown quantity. For example, in Let's Learn 3 (Textbook 5 P54), Weiming's mother is y years older than him, hence since he is 12 years old, his mom is $(12 + y)$ years old. An algebraic expression can involve multiplication too, where the letter can have a scalar multiple (number). For example, in Let's Learn 5 (Textbook 5 P55), the volume of juice in each glass is represented by p. Hence, the volume of juice in 4 glasses would be $4 \times p = 4p$. Bar models (Let's Learn 8 in Textbook 5 P56) and tables (Textbook 5 P53 – 54, 57 – 58) are used to form algebraic expressions.

Problem Solving

Algebra should be explained as an extension of mathematical computation and assure pupils that it is not as difficult as it may seem. Explain that algebra integrates the use of variables to interpret and create data in the form of an algebraic expression. Explain that the letter x is generally used to represent an unknown quantity in an algebraic expression and should not be confused with the multiplication sign.

Activities

In 'Activity Time' (Textbook 5 P58), group pupils into pairs with mixed abilities and check if their algebraic expressions are written and explained correctly.

Resources

- mini whiteboard
- markers
- tables (Activity Handbook 5 P15 – 17)

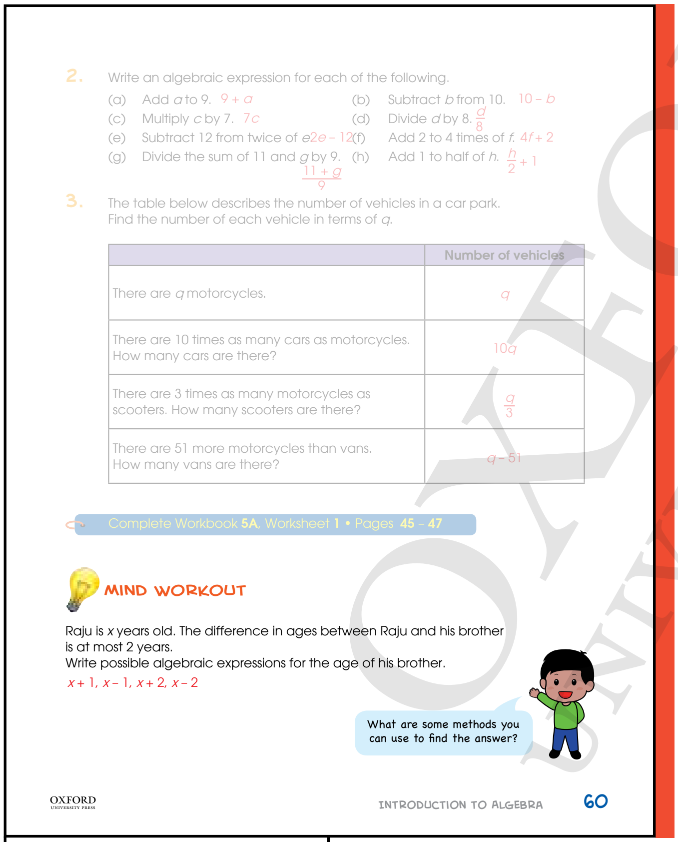
Mathematical Communication Support

In Let's Learn 11 (Textbook 5 P57), guide pupils to understand that each letter in each algebraic expression represents a different quantity. The teacher can write different letters on each post-it note to represent different materials that can be found in the classroom, such as b to represent books, p to represent pencils, etc. Discuss in class by asking pupils to make algebraic expressions involving the material shown on the post-it note. For example, Sara may come up with $5b$ and $3p$ as algebraic expressions for the number of her books and pencils respectively. Elicit individual responses and write expressions on the board representing the number of real-life objects. For example:

1. number of cars (c) and buses (b) in the school parking lot
2. amount of ingredients to bake cookies (flour (f), sugar (s) and eggs (e))
3. sum of the ages of each pupil's family

Get pupils to brainstorm for more of such examples and write them on the board.

PROBLEM SOLVING, MATHS JOURNAL AND PUPIL REVIEW



2. Write an algebraic expression for each of the following.

(a) Add a to 9. $9 + a$
(b) Subtract b from 10. $10 - b$
(c) Multiply c by 7. $7c$
(d) Divide d by 8. $\frac{d}{8}$
(e) Subtract 12 from twice of e $2e - 12$
(f) Add 2 to 4 times of f. $4f + 2$
(g) Divide the sum of 11 and g by 9. $\frac{11 + g}{9}$
(h) Add 1 to half of h. $\frac{h}{2} + 1$

3. The table below describes the number of vehicles in a car park.
Find the number of each vehicle in terms of q.

	Number of vehicles
There are q motorcycles.	q
There are 10 times as many cars as motorcycles. How many cars are there?	$10q$
There are 3 times as many motorcycles as scooters. How many scooters are there?	$\frac{q}{3}$
There are 51 more motorcycles than vans. How many vans are there?	$q - 51$

Complete Workbook **5A**, Worksheet **1** • Pages **45 – 47**

MIND WORKOUT

Raju is x years old. The difference in ages between Raju and his brother is at most 2 years.
Write possible algebraic expressions for the age of his brother.

$x + 1$, $x - 1$, $x + 2$, $x - 2$

What are some methods you can use to find the answer?

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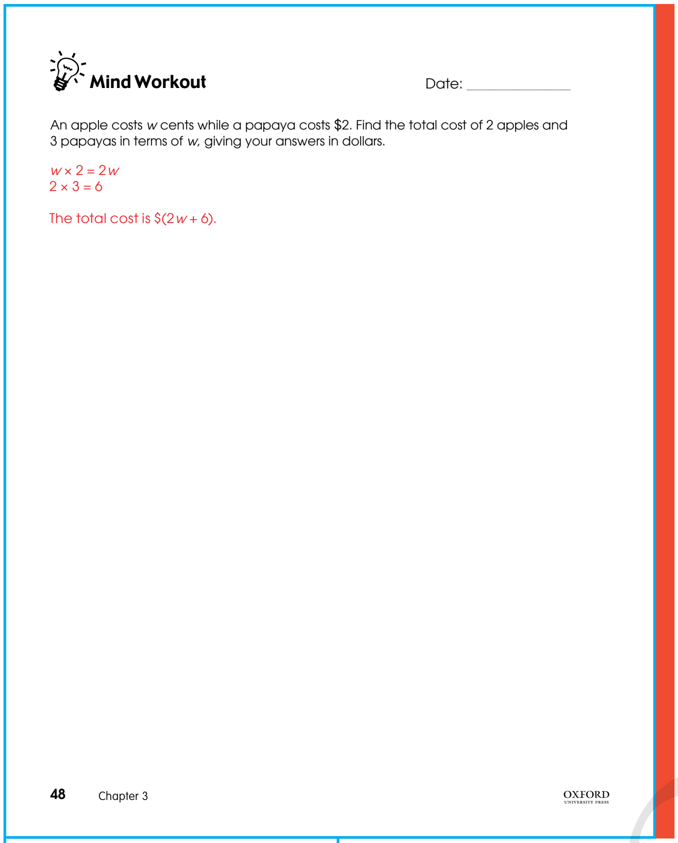
INTRODUCTION TO ALGEBRA 60

Textbook 5 P60

MIND WORKOUT

The Mind Workout involves the concept of rate, with the use of letters to represent a particular number of toys. Pupils will need to understand the question well, and apply the concept of rate, in addition to forming an algebraic equation and solving it.



Mind Workout Date: ____________

An apple costs *w* cents while a papaya costs $2. Find the total cost of 2 apples and 3 papayas in terms of *w*, giving your answers in dollars.

$w \times 2 = 2w$
$2 \times 3 = 6$

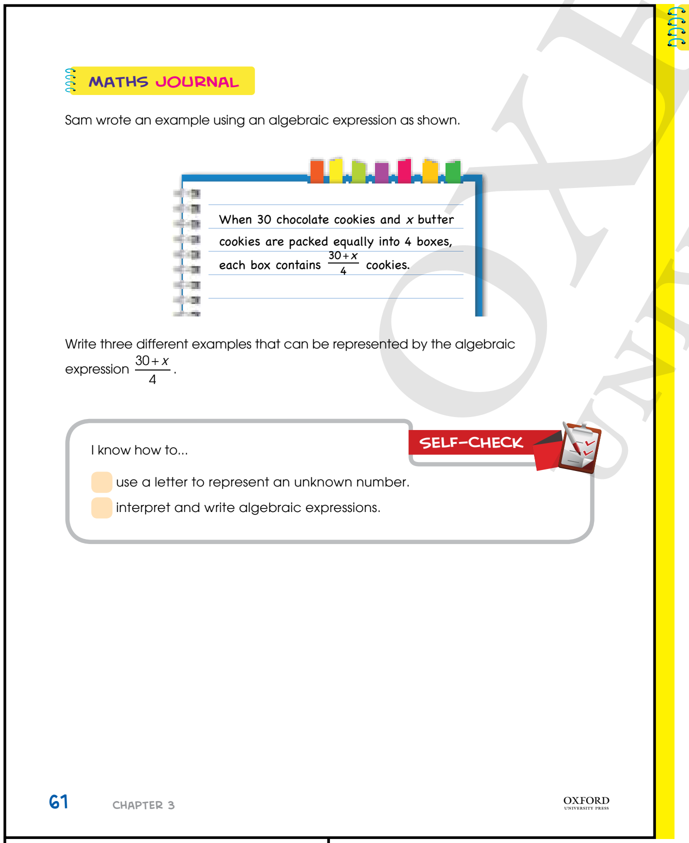
The total cost is $\$(2w + 6)$.

Workbook 5A P48

Mind Workout

For this question, guide pupils by asking:

- If an apple costs *w* cents, how much do 2 apples cost, in terms of *w*? What operation must be used?
- If a papaya costs $2, how much do 3 papayas cost? What operation must be used?
- What operation must be used to find the total cost of 2 apples and 3 papayas?



MATHS JOURNAL

Sam wrote an example using an algebraic expression as shown.

When 30 chocolate cookies and *x* butter cookies are packed equally into 4 boxes, each box contains $\frac{30 + x}{4}$ cookies.

Write three different examples that can be represented by the algebraic expression $\frac{30 + x}{4}$.

SELF-CHECK

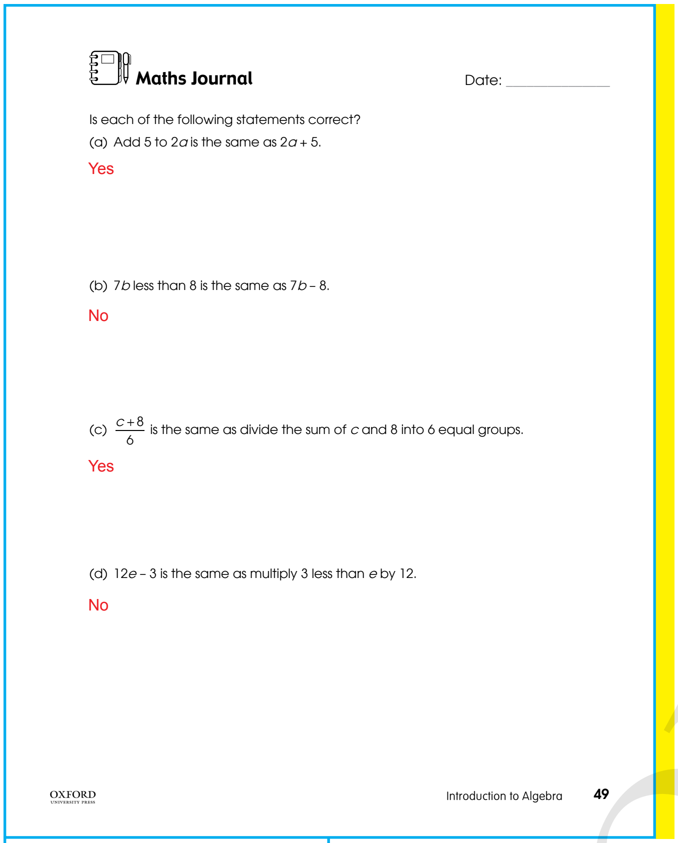
I know how to...

☐ use a letter to represent an unknown number.
☐ interpret and write algebraic expressions.

Textbook 5 P61

MATHS JOURNAL

This Maths Journal provides good practice for pupils to reinforce their understanding of writing algebraic expressions by getting them to use the same representations in different contexts.



Maths Journal Date: ____________

Is each of the following statements correct?

(a) Add 5 to $2a$ is the same as $2a + 5$.

Yes

(b) $7b$ less than 8 is the same as $7b - 8$.

No

(c) $\frac{c + 8}{6}$ is the same as divide the sum of c and 8 into 6 equal groups.

Yes

(d) $12e - 3$ is the same as multiply 3 less than e by 12.

No

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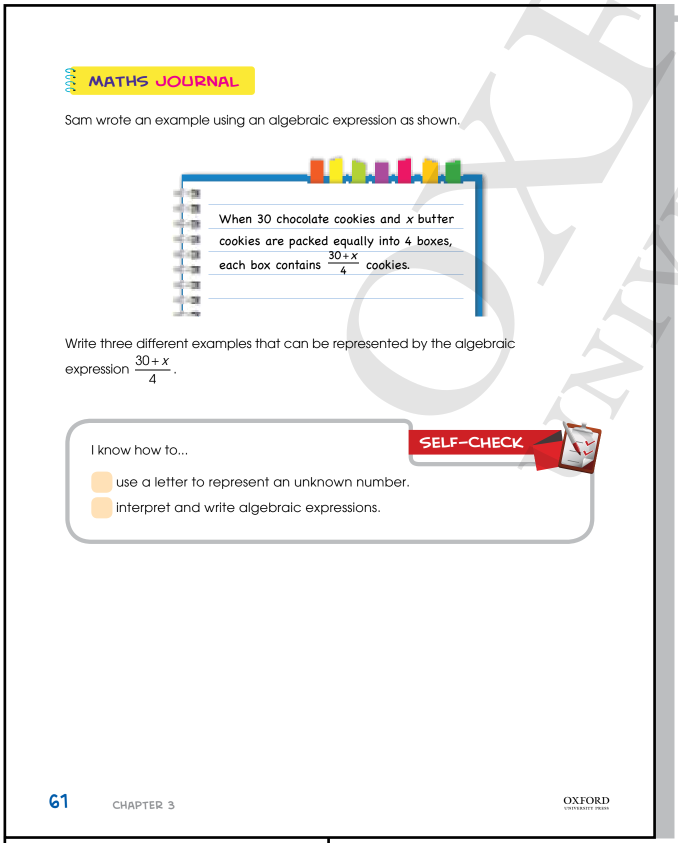
Workbook 5A P49

Maths Journal

Pupils can use this Maths Journal to ensure that they have grasped the concept of algebraic expressions under the different operations.



MATHS JOURNAL

Sam wrote an example using an algebraic expression as shown.

When 30 chocolate cookies and x butter cookies are packed equally into 4 boxes, each box contains $\frac{30 + x}{4}$ cookies.

Write three different examples that can be represented by the algebraic expression $\frac{30 + x}{4}$.

SELF-CHECK

I know how to...

☐ use a letter to represent an unknown number.

☐ interpret and write algebraic expressions.

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Textbook 5 P61

SELF-CHECK

Before getting the pupils to do the self-check, review important concepts. The self-check can be done after pupils have completed **Review 3** (Workbook 5A P50 – 52)

Answers Review 3 (Workbook 5A P50 – 52)

1. (a) $5 + 3p$
   (b) $7 - 2q$
   (c) $9 - r$
   (d) $s + 10$
   (e) $16t$
   (f) $\frac{9u + 1}{6}$
   (g) $6v$
   (h) $12w$
   (i) $\frac{x}{4}$
   (j) $\frac{9y + 2}{5}$

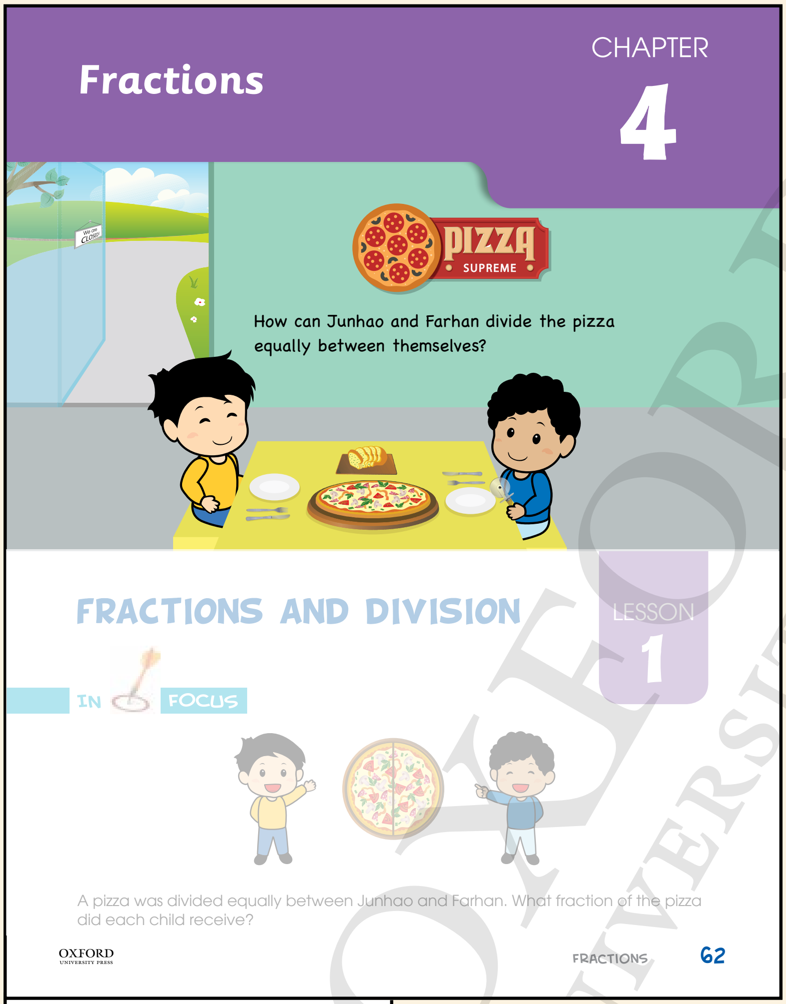
2. $\frac{x}{7}$

3. $\frac{y - 20}{4}$

4. (a) $z + 13$
   (b) $z - 12$
   (c) $3z$
   (d) $z + 2$
   (e) $5z$
   (f) $\frac{4z}{6}$

FRACTIONS

CHAPTER 4



Fractions

CHAPTER 4

PIZZA SUPREME

How can Junhao and Farhan divide the pizza equally between themselves?

FRACTIONS AND DIVISION

LESSON 1

IN FOCUS

A pizza was divided equally between Junhao and Farhan. What fraction of the pizza did each child receive?

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FRACTIONS 62

Textbook 5 P62

Related Resources

NSPM Textbook 5 (P62 – 100)
NSPM Workbook 5A (P53 – 88)

Materials

Fraction discs, fraction cards, coloured papers, scissors, drawing block, markers, mini whiteboard, calculator

Lesson

Lesson 1	Fractions and Division
Lesson 2	Adding Mixed Numbers
Lesson 3	Subtracting Mixed Numbers
Lesson 4	Solving Word Problems
Lesson 5	Multiplying a Fraction and a Whole Number
Lesson 6	Multiplying Two Fractions
Lesson 7	Multiplying a Mixed Number and a Whole Number
Lesson 8	More Word Problems

Problem Solving, Maths Journal and Pupil Review

INTRODUCTION

In Grade Four, pupils have learnt to add and subtract proper fractions. They have also learnt what a mixed number is. In Grade Five, they will extend this learning to the adding and subtracting of mixed numbers.
In addition, in Grade Four, pupils have learnt the concept of a fraction of a set. Pupils will revisit that concept and associate it to multiplication of a fraction and a whole number. Pupils will also learn how to multiply two fractions, as well as a mixed number and a whole number.

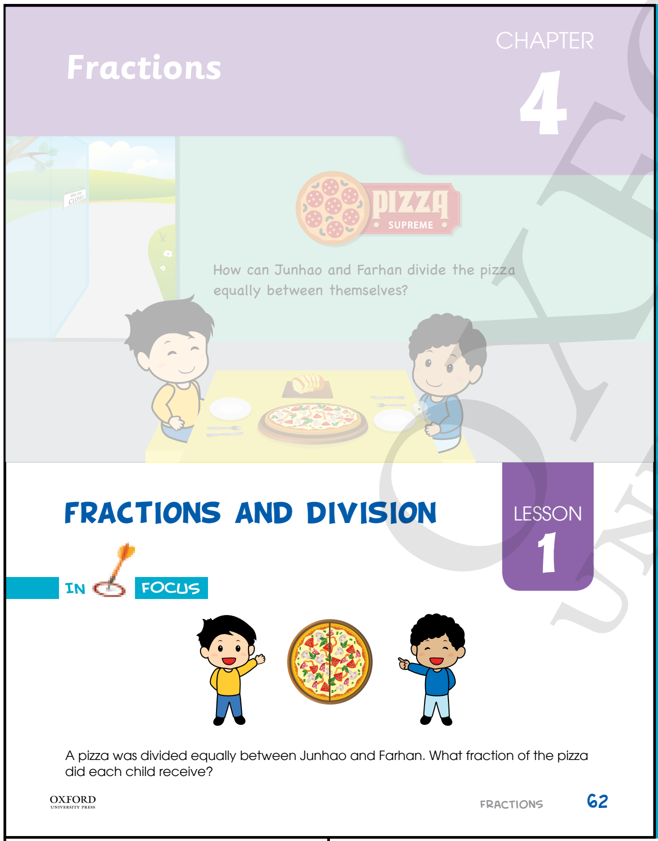
Lastly, pupils will learn to associate fractions with division. This could be taught through a teacher-directed inquiry approach where teachers lead pupils to identify that $4 \div 5 = \frac{4}{5}$, $8 \div 6 = \frac{8}{6}$ and so on.

LESSON
1

FRACTIONS AND DIVISION

LEARNING OBJECTIVES

1. Divide a whole number by another whole number and give the answer as a fraction.
2. Convert fractions to decimals.



Fractions

CHAPTER
4

How can Junhao and Farhan divide the pizza equally between themselves?

FRACTIONS AND DIVISION

LESSON
1

IN FOCUS

A pizza was divided equally between Junhao and Farhan. What fraction of the pizza did each child receive?

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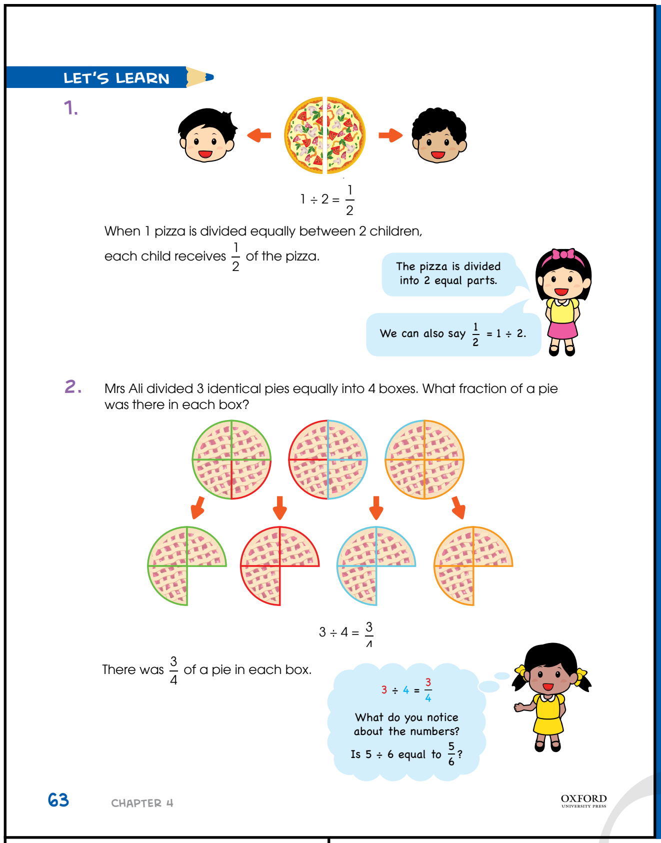
FRACTIONS 62

Textbook 5 P62

IN FOCUS

Use the Chapter Opener to discuss the different ways in which Junhao and Farhan can divide the pizza equally. Refer to the In Focus and ask questions such as:

- After they had divided the pizza equally, how many equal parts were there?
- How many parts did each child get?
- What fraction of the pizza did each child get?
- How did you arrive at the answer?



LET'S LEARN

1\. $1 \div 2 = \frac{1}{2}$

When 1 pizza is divided equally between 2 children, each child receives $\frac{1}{2}$ of the pizza.

The pizza is divided into 2 equal parts.

We can also say $\frac{1}{2} = 1 \div 2$.

2\. Mrs Ali divided 3 identical pies equally into 4 boxes. What fraction of a pie was there in each box?

$3 \div 4 = \frac{3}{4}$

There was $\frac{3}{4}$ of a pie in each box.

$3 \div 4 = \frac{3}{4}$

What do you notice about the numbers?

Is $5 \div 6$ equal to $\frac{5}{6}$?

63 CHAPTER 4

Textbook 5 P63

LET'S LEARN

Elicit the equation from pupils by asking questions such as:

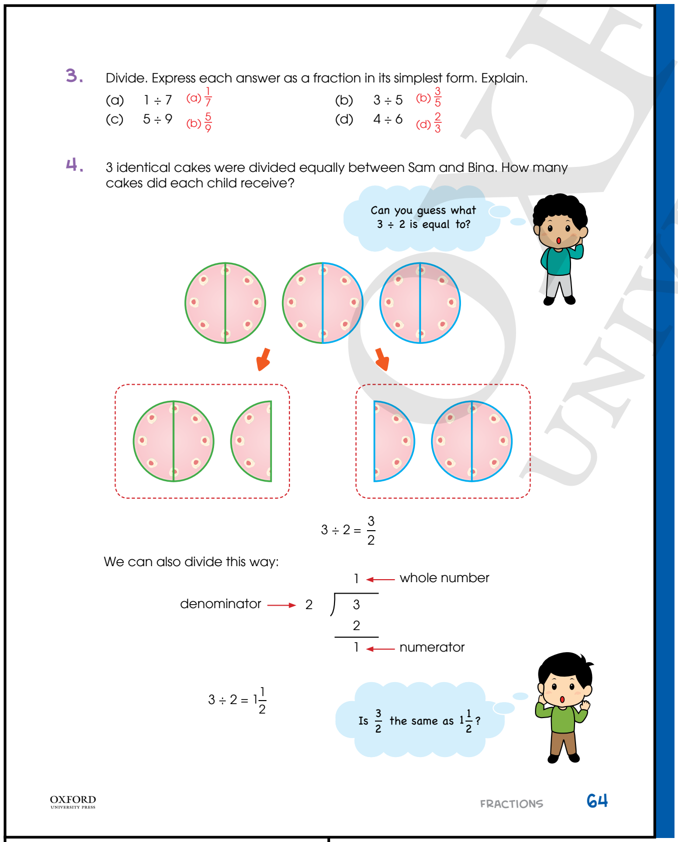
- How do you write the number equation?
- What is the operation involved - add, subtract, multiply or divide?

Say "Since 1 whole pizza is divided into 2 equal parts, we write 1 ÷ 2. Each child gets $\frac{1}{2}$ the pizza, so $1 \div 2 = \frac{1}{2}$ "

For Let's Learn 2, use fraction discs to show three wholes. Show that each whole is made up of 4 quarters. Draw 4 boxes and place one quarter in each box at a time until all the quarters have been distributed.
Ask:

- How many quarters are there in each box?
- How do you write the number equation?

Write "$1 \div 2 = \frac{1}{2}$ " and "$3 \div 4 = \frac{3}{4}$ " on the board and ask pupils if they notice anything about the numbers. Lead pupils to conclude that $a \div b = \frac{a}{b}$.



3\. Divide. Express each answer as a fraction in its simplest form. Explain.

(a) $1 \div 7$ (a) $\frac{1}{7}$
(b) $3 \div 5$ (b) $\frac{3}{5}$
(c) $5 \div 9$ (b) $\frac{5}{9}$
(d) $4 \div 6$ (d) $\frac{2}{3}$

4\. 3 identical cakes were divided equally between Sam and Bina. How many cakes did each child receive?

Can you guess what $3 \div 2$ is equal to?

$3 \div 2 = \frac{3}{2}$

We can also divide this way:

$$\begin{array}{r|l} & 1 \leftarrow \text{whole number} \\ \text{denominator} \rightarrow 2 & \overline{3} \\ & \underline{2} \\ & 1 \leftarrow \text{numerator} \end{array}$$

$3 \div 2 = 1\frac{1}{2}$

Is $\frac{3}{2}$ the same as $1\frac{1}{2}$?

FRACTIONS 64

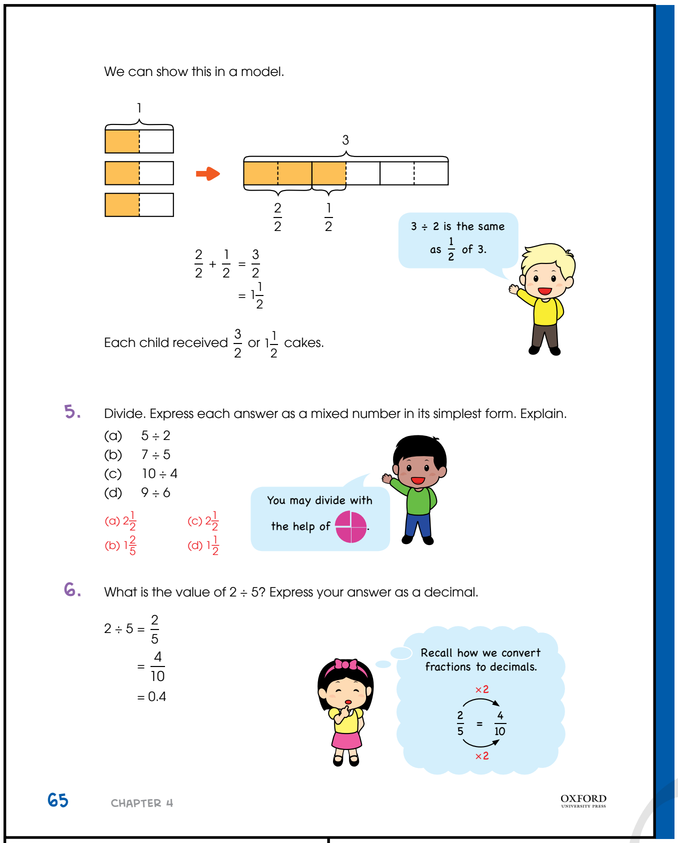
Textbook 5 P64

For Let's Learn 3, give pupils sufficient time to work through the Let's Learn before going through. If necessary, allow pupils to use fraction discs to find the answers.

For Let's Learn 4, use fraction discs to show three wholes. Show that each whole is made up of 2 halves. Get 2 pupil volunteers and distribute one half to each pupil at
a time until all the halves have been distributed.
Ask:

- How many halves does each child have?
- How do you write the number equation?
- Does this follow the pattern you spotted earlier?
- $\frac{3}{2}$ is an improper fraction. How do you convert it to a mixed number?

Demonstrate long division and drawing of the model.



We can show this in a model.

$\frac{2}{2} + \frac{1}{2} = \frac{3}{2}$

$= 1\frac{1}{2}$

3 ÷ 2 is the same as $\frac{1}{2}$ of 3.

Each child received $\frac{3}{2}$ or $1\frac{1}{2}$ cakes.

5. Divide. Express each answer as a mixed number in its simplest form. Explain.

(a) 5 ÷ 2
(b) 7 ÷ 5
(c) 10 ÷ 4
(d) 9 ÷ 6

You may divide with the help of ◕.

(a) $2\frac{1}{2}$ (c) $2\frac{1}{2}$
(b) $1\frac{2}{5}$ (d) $1\frac{1}{2}$

6. What is the value of 2 ÷ 5? Express your answer as a decimal.

$2 \div 5 = \frac{2}{5}$

$= \frac{4}{10}$

$= 0.4$

Recall how we convert fractions to decimals.

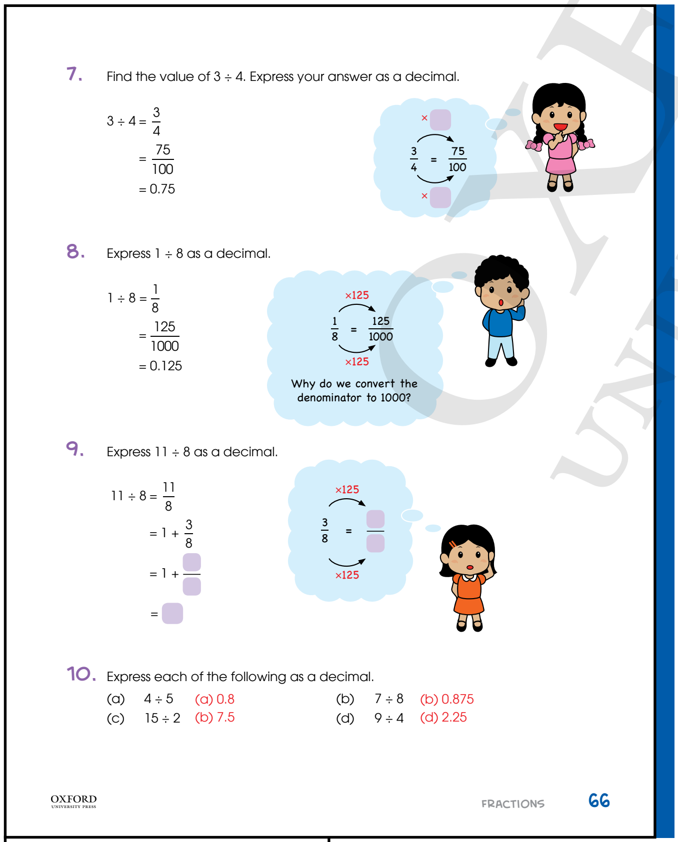
$\frac{2}{5} \overset{\times 2}{=} \frac{4}{10}$

65 CHAPTER 4 OXFORD

Textbook 5 P65

Get pupils to do Let’s Learn 5. Provide fraction discs to help them if needed.

For Let’s Learn 6, help pupils to recall that to convert a fraction to a decimal, they can convert the fraction to an equivalent fraction where the denominator is 10.



7. Find the value of 3 ÷ 4. Express your answer as a decimal.

$3 \div 4 = \frac{3}{4}$

$= \frac{75}{100}$

$= 0.75$

$\frac{3}{4} \overset{\times \square}{=} \frac{75}{100}$

8. Express 1 ÷ 8 as a decimal.

$1 \div 8 = \frac{1}{8}$

$= \frac{125}{1000}$

$= 0.125$

$\frac{1}{8} \overset{\times 125}{=} \frac{125}{1000}$

Why do we convert the denominator to 1000?

9. Express 11 ÷ 8 as a decimal.

$11 \div 8 = \frac{11}{8}$

$= 1 + \frac{3}{8}$

$= 1 + \frac{\square}{\square}$

$= \square$

$\frac{3}{8} \overset{\times 125}{=} \frac{\square}{\square}$

10. Express each of the following as a decimal.

(a) 4 ÷ 5 (a) 0.8 (b) 7 ÷ 8 (b) 0.875
(c) 15 ÷ 2 (b) 7.5 (d) 9 ÷ 4 (d) 2.25

OXFORD FRACTIONS 66

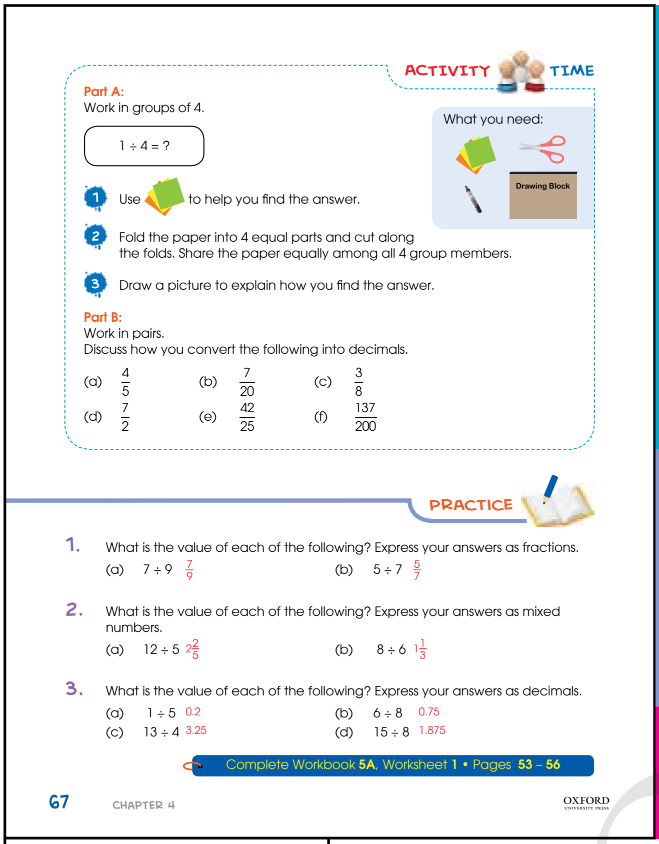
Textbook 5 P66

Repeat the same process for Let’s Learn 7. In this Let’s Learn, pupils can first convert the fraction to an equivalent fraction where the denominator is 100.

Repeat the same process for Let’s Learn 8. In this example, pupils can first convert the fraction to an equivalent fraction where the denominator is 1000.

Let’s Learn 9 involves converting an improper fraction to a decimal. Repeat the same process for this example after telling pupils to convert the improper fraction to mixed number.

Give pupils sufficient time to work on Let’s Learn 10 before going through.



ACTIVITY TIME

Part A:
Work in groups of 4.

$1 \div 4 = ?$

What you need:

1. Use to help you find the answer.
2. Fold the paper into 4 equal parts and cut along the folds. Share the paper equally among all 4 group members.
3. Draw a picture to explain how you find the answer.

Part B:
Work in pairs.
Discuss how you convert the following into decimals.

(a) $\frac{4}{5}$ (b) $\frac{7}{20}$ (c) $\frac{3}{8}$
(d) $\frac{7}{2}$ (e) $\frac{42}{25}$ (f) $\frac{137}{200}$

PRACTICE

1. What is the value of each of the following? Express your answers as fractions.
   (a) $7 \div 9$ $\frac{7}{9}$ (b) $5 \div 7$ $\frac{5}{7}$
2. What is the value of each of the following? Express your answers as mixed numbers.
   (a) $12 \div 5$ $2\frac{2}{5}$ (b) $8 \div 6$ $1\frac{1}{3}$
3. What is the value of each of the following? Express your answers as decimals.
   (a) $1 \div 5$ 0.2 (b) $6 \div 8$ 0.75
   (c) $13 \div 4$ 3.25 (d) $15 \div 8$ 1.875

Complete Workbook **5A**, Worksheet **1** • Pages **53 – 56**

67 CHAPTER 4 OXFORD UNIVERSITY PRESS

Textbook 5 P67

ACTIVITY TIME

Part A
Distribute the materials needed. Ensure that pupils understand the instructions of the task. High progress pupils can try other examples (e.g. 2 ÷ 8 etc).

Part B
Go around the class to ensure that pupils are explaining correctly.

PRACTICE

Work with pupils on the practice questions and selected examples from Worksheet 1 for better understanding.

Independent seatwork

Assign pupils to complete Worksheet 1 (Workbook 5A P53 – 56).

Answers

Worksheet 1 (Workbook 5A P53 – 56)

1. (a) $\frac{2}{5}, \frac{2}{5}$
   (b) $\frac{3}{4}, \frac{3}{4}$
   (c) $5\ \ell \div 2 = \frac{5}{2}\ \ell$
   $= 2\frac{1}{2}\ \ell$
   (d) $10 \text{ kg} \div 8 = \frac{10}{8} \text{ kg}$
   $= 1\frac{1}{4} \text{ kg}$
2. (a) $\frac{2}{7}$ (b) $\frac{1}{2}$
   (c) $\frac{4}{9}$ (d) $\frac{4}{5}$
   (e) $\frac{1}{3}$ (f) $\frac{3}{4}$
3. (a) $1\frac{3}{4}$ (b) $1\frac{1}{2}$
   (c) $2\frac{2}{3}$ (d) $2\frac{2}{3}$
   (e) $2\frac{4}{5}$ (f) $3\frac{3}{7}$
4. (a) 0.2 (b) 0.75
   (c) $4 \div 5 = \frac{4}{5}$
   $= \frac{8}{10}$
   $= 0.8$
   (d) $5 \div 8 = \frac{5}{8}$
   $= \frac{625}{1000}$
   $= 0.625$
5. (a) 1.4 (b) 2.75
   (c) $5 \div 2 = \frac{5}{2}$
   $= 1\frac{3}{2}$
   $= 1\frac{15}{10}$
   $= 2.5$
   (d) $12 \div 8 = \frac{12}{8}$
   $= 1\frac{1}{2}$
   $= 1\frac{5}{10}$
   $= 1.5$

LESSON PLAN

Specific Learning Focus

- Divide a whole number by another whole number and give the answer as a fraction.
- Convert fractions to decimals.

Suggested Duration

3 periods

Prior Learning

Pupils should be aware of the concepts of equivalence, part of a whole, total number of equal parts as the denominator of a fraction, number of equal parts as the numerator of a fraction, improper fraction, mixed numbers, addition and subtraction of like fractions, multiplication of a fraction with a whole number (fraction of a set).

Pre-emptive Pitfalls

Addition and subtraction of unlike fractions may be difficult for pupils to compute, as the unlike fractions must first be converted to like fractions before carrying out the operation.

Introduction

Recap with pupils that a fraction represents the number of equal parts of a whole. For example, if a child gets a quarter of a whole pizza or 4 children get equal parts of a whole, the fraction of the pizza that each child gets is $\frac{1}{4}$. It should be concluded abstractly that 1 ÷ 4 is represented by $\frac{1}{4}$ in fractions. The 'In Focus' and 'Let's Learn' (Textbook 5 P62 – 66) teaches the concept using C-P-A approach. Get pupils to use fraction discs to do the divisions. Let's Learn 3 (Textbook 5 P64) shows division using three different strategies: (i) using fraction discs, (ii) division algorithm, (iii) bar modelling. Encourage pupils to apply all three methods and develop mastery in all. When teaching the expressing of a fraction as a decimal, revisit the concept of equivalence. To convert a fraction to an equivalent fraction, the denominator is converted to a multiple of 10 and the factor used to multiply the denominator must also be used to multiply the numerator to maintain the numeric equivalence. Hence,

$$\frac{\square}{5} \underset{\times 2}{\overset{\times 2}{=}} \frac{\square}{10},\ \frac{\square}{4} \underset{\times 25}{\overset{\times 25}{=}} \frac{\square}{100} \text{ and } \frac{\square}{8} \underset{\times 125}{\overset{\times 125}{=}} \frac{\square}{1000},$$

Problem Solving

The bar modelling method should be one of the easiest methods to show $\frac{3}{2}$ as each of the three bars is divided into 2 equal parts, with 1 part shaded, which is converted to 1 whole and a half. When using division algorithm to divide to give a fraction, emphasise to pupils that the quotient represents the whole number, remainder represents the numerator, divisor represents the denominator.

Activities

In 'Activity Time' (Textbook 5 P67), part A can be done in groups of 4. Ask pupils to use bar modelling method to express the division. In part B, guide pupils to work in pairs and use the equivalence concept to convert the denominator into a multiple of 10. Pupils can take turns to working out the answers by selecting a fraction card in each turn.

Resources

- coloured papers
- markers
- fraction discs (Activity Handbook 5 P19)
- drawing block
- scissors
- conversion of fraction cards (Activity Handbook 5 P18)

Mathematical Communication Support

Teach by asking pupils important questions:

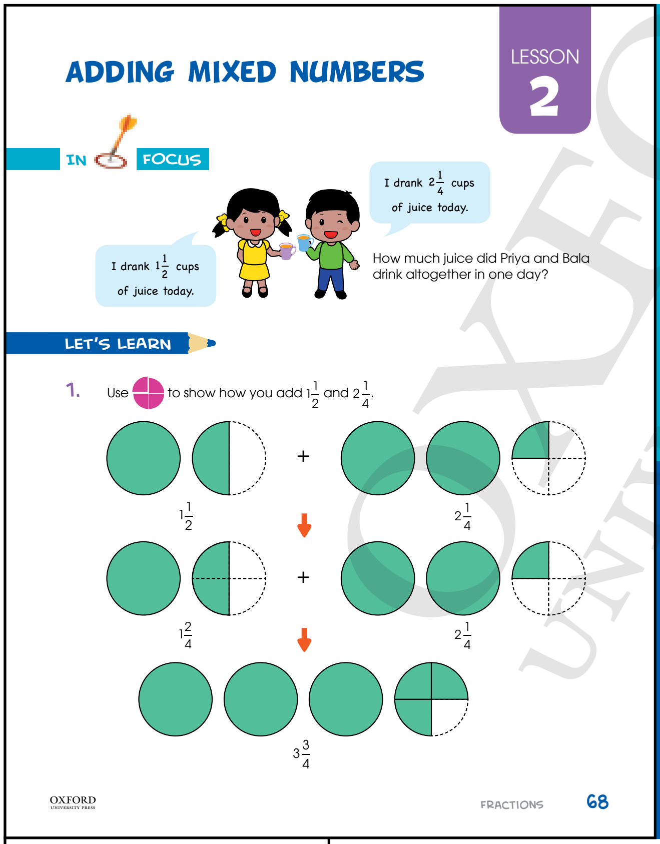
- Is each part of the whole equal?
- How do we differentiate an improper fraction from a proper fraction?
- What does it mean by equivalence?
- When converting a fraction to an equivalent fraction, why do we multiply both the numerator and denominator by the same factor?
- How do we write a number equation involving division of a whole number by another whole number and giving the answer as a fraction?

LESSON
2

ADDING MIXED NUMBERS

LEARNING OBJECTIVE

1. Add mixed numbers.



ADDING MIXED NUMBERS

LESSON
2

IN FOCUS

I drank $2\frac{1}{4}$ cups of juice today.

I drank $1\frac{1}{2}$ cups of juice today.

How much juice did Priya and Bala drink altogether in one day?

LET'S LEARN

1. Use ● to show how you add $1\frac{1}{2}$ and $2\frac{1}{4}$.

$1\frac{1}{2}$ + $2\frac{1}{4}$

$1\frac{2}{4}$ + $2\frac{1}{4}$

$3\frac{3}{4}$

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FRACTIONS 68

Textbook 5 P68

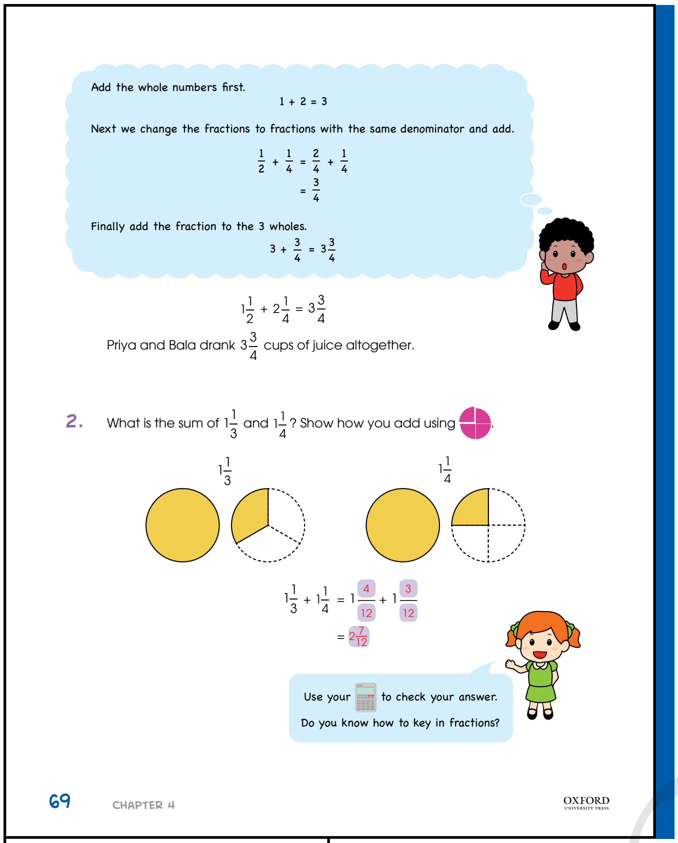
IN FOCUS

Ask:

- How can you find the total amount of juice that Priya and Bala drank that day?
- What are the different ways to get the answer?

LET'S LEARN

For Let's Learn 1, use fraction discs to demonstrate the steps for addition as shown. Articulate the steps as the fraction discs are moved. With the aid of the fractions discs and diagram in Let's Learn 1, guide pupils to see that $\frac{1}{2}$ is the same as $\frac{2}{4}$. Demonstrate how the equation is written.



Add the whole numbers first.

$$1 + 2 = 3$$

Next we change the fractions to fractions with the same denominator and add.

$$\frac{1}{2} + \frac{1}{4} = \frac{2}{4} + \frac{1}{4}$$
$$= \frac{3}{4}$$

Finally add the fraction to the 3 wholes.

$$3 + \frac{3}{4} = 3\frac{3}{4}$$

$$1\frac{1}{2} + 2\frac{1}{4} = 3\frac{3}{4}$$

Priya and Bala drank $3\frac{3}{4}$ cups of juice altogether.

2. What is the sum of $1\frac{1}{3}$ and $1\frac{1}{4}$? Show how you add using ⊕.

$$1\frac{1}{3} + 1\frac{1}{4} = 1\frac{4}{12} + 1\frac{3}{12}$$
$$= 2\frac{7}{12}$$

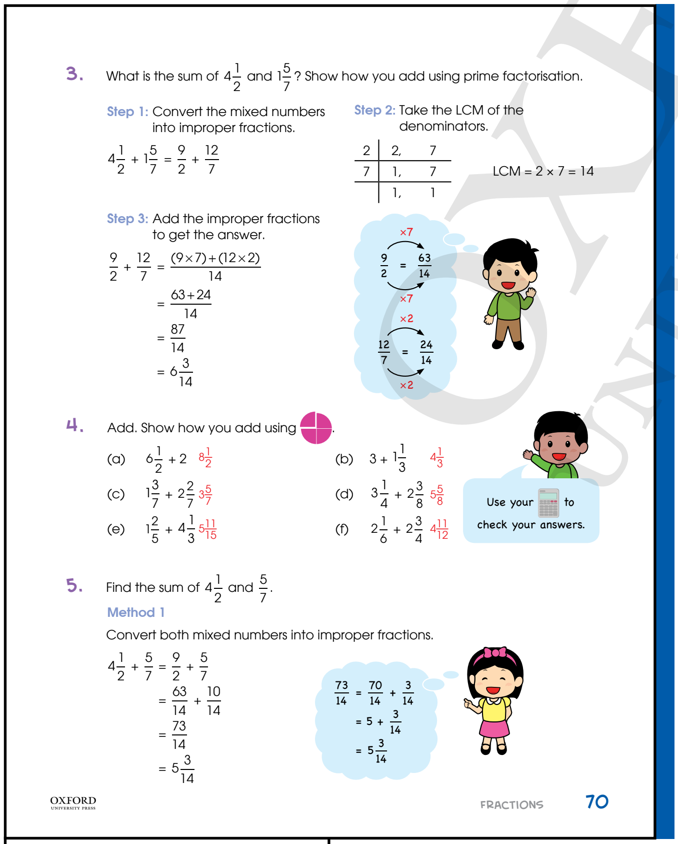
Use your 🖩 to check your answer.
Do you know how to key in fractions?

69 CHAPTER 4 OXFORD UNIVERSITY PRESS

Textbook 5 P69

For Let's Learn 2, distribute fraction discs to pupils to demonstrate the adding of $1\frac{1}{3}$ and $1\frac{1}{4}$. Elicit the steps used in Let's Learn 1. At step 2, ask them if $\frac{1}{3}$ and $\frac{1}{4}$ can be added directly. Recapitulate what they have learnt on adding two unlike fractions. Elicit the equation from pupils.

Demonstrate how to key in mixed numbers using a calculator as this is new to pupils.



3. What is the sum of $4\frac{1}{2}$ and $1\frac{5}{7}$? Show how you add using prime factorisation.

Step 1: Convert the mixed numbers into improper fractions.

$$4\frac{1}{2} + 1\frac{5}{7} = \frac{9}{2} + \frac{12}{7}$$

Step 2: Take the LCM of the denominators.

2	2,	7
7	1,	7
	1,	1

LCM = 2 × 7 = 14

Step 3: Add the improper fractions to get the answer.

$$\frac{9}{2} + \frac{12}{7} = \frac{(9\times7)+(12\times2)}{14}$$
$$= \frac{63+24}{14}$$
$$= \frac{87}{14}$$
$$= 6\frac{3}{14}$$

$$\frac{9}{2} \overset{\times7}{=} \frac{63}{14}$$
$$\frac{12}{7} \overset{\times2}{=} \frac{24}{14}$$

4. Add. Show how you add using ⊕.

(a) $6\frac{1}{2} + 2$ $8\frac{1}{2}$
(b) $3 + 1\frac{1}{3}$ $4\frac{1}{3}$
(c) $1\frac{3}{7} + 2\frac{2}{7}$ $3\frac{5}{7}$
(d) $3\frac{1}{4} + 2\frac{3}{8}$ $5\frac{5}{8}$
(e) $1\frac{2}{5} + 4\frac{1}{3}$ $5\frac{11}{15}$
(f) $2\frac{1}{6} + 2\frac{3}{4}$ $4\frac{11}{12}$

Use your 🖩 to check your answers.

5. Find the sum of $4\frac{1}{2}$ and $\frac{5}{7}$.

Method 1

Convert both mixed numbers into improper fractions.

$$4\frac{1}{2} + \frac{5}{7} = \frac{9}{2} + \frac{5}{7}$$
$$= \frac{63}{14} + \frac{10}{14}$$
$$= \frac{73}{14}$$
$$= 5\frac{3}{14}$$

$$\frac{73}{14} = \frac{70}{14} + \frac{3}{14}$$
$$= 5 + \frac{3}{14}$$
$$= 5\frac{3}{14}$$

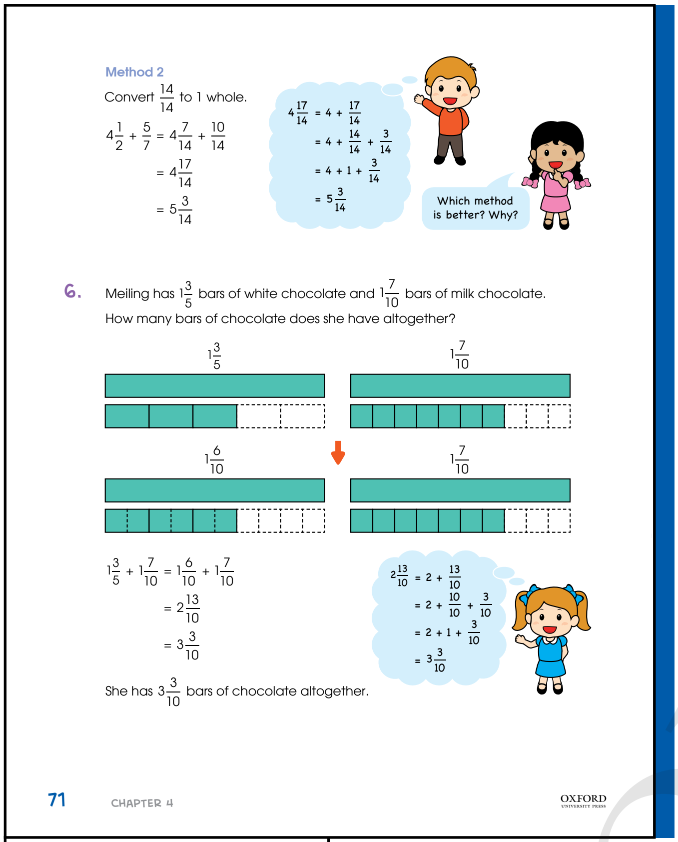
OXFORD UNIVERSITY PRESS FRACTIONS 70

Textbook 5 P70

In Let's Learn 3, lead pupils to see that the 3 steps are necessary to add mixed numbers using prime factorisation.

Allow pupils to use fraction discs to work on Let's Learn 4 and use their calculators to check their answers.

In Let's Learn 5, guide pupils to see that there are two methods of adding the mixed number and the proper fraction. Ask them for their preferred method and explain why.



Method 2

Convert $\frac{14}{14}$ to 1 whole.

$4\frac{1}{2} + \frac{5}{7} = 4\frac{7}{14} + \frac{10}{14}$

$= 4\frac{17}{14}$

$= 5\frac{3}{14}$

$4\frac{17}{14} = 4 + \frac{17}{14}$

$= 4 + \frac{14}{14} + \frac{3}{14}$

$= 4 + 1 + \frac{3}{14}$

$= 5\frac{3}{14}$

Which method is better? Why?

6. Meiling has $1\frac{3}{5}$ bars of white chocolate and $1\frac{7}{10}$ bars of milk chocolate. How many bars of chocolate does she have altogether?

$1\frac{3}{5}$ $1\frac{7}{10}$

$1\frac{6}{10}$ $1\frac{7}{10}$

$1\frac{3}{5} + 1\frac{7}{10} = 1\frac{6}{10} + 1\frac{7}{10}$

$= 2\frac{13}{10}$

$= 3\frac{3}{10}$

$2\frac{13}{10} = 2 + \frac{13}{10}$

$= 2 + \frac{10}{10} + \frac{3}{10}$

$= 2 + 1 + \frac{3}{10}$

$= 3\frac{3}{10}$

She has $3\frac{3}{10}$ bars of chocolate altogether.

71 CHAPTER 4

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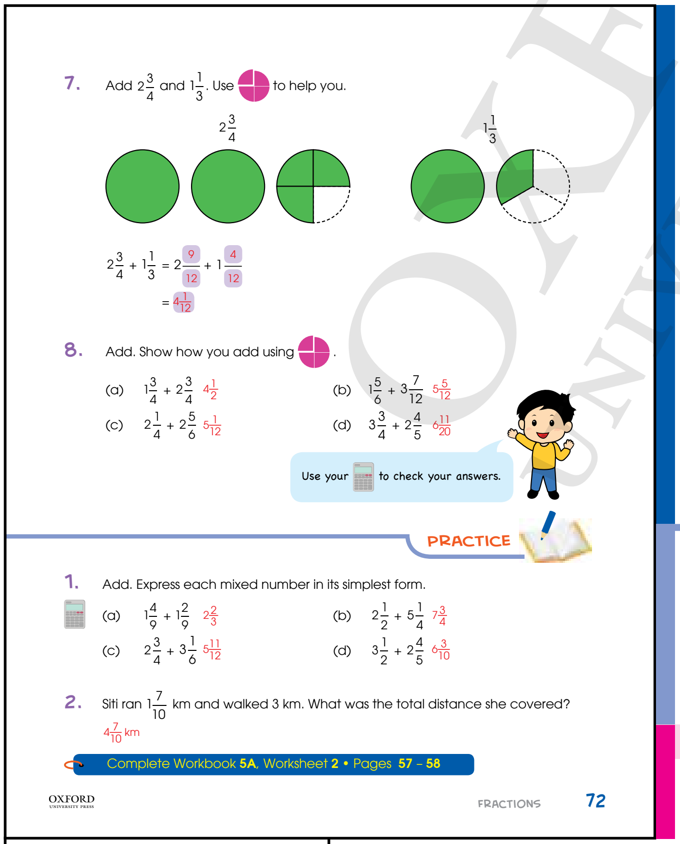
Textbook 5 P71

Let's Learn 6 illustrates the addition of mixed numbers using fraction bars. Remind pupils that they have to change fractions to fractions with the same denominator before adding. With the aid of the diagram in Let's Learn 6, guide pupils to see that $\frac{3}{5}$ is the same as $\frac{6}{10}$.



7. Add $2\frac{3}{4}$ and $1\frac{1}{3}$. Use ⊕ to help you.

$2\frac{3}{4}$ $1\frac{1}{3}$

$2\frac{3}{4} + 1\frac{1}{3} = 2\frac{9}{12} + 1\frac{4}{12}$

$= 4\frac{1}{12}$

8. Add. Show how you add using ⊕.

(a) $1\frac{3}{4} + 2\frac{3}{4}$ $4\frac{1}{2}$

(b) $1\frac{5}{6} + 3\frac{7}{12}$ $5\frac{5}{12}$

(c) $2\frac{1}{4} + 2\frac{5}{6}$ $5\frac{1}{12}$

(d) $3\frac{3}{4} + 2\frac{4}{5}$ $6\frac{11}{20}$

Use your 🖩 to check your answers.

PRACTICE

1. Add. Express each mixed number in its simplest form.

(a) $1\frac{4}{9} + 1\frac{2}{9}$ $2\frac{2}{3}$

(b) $2\frac{1}{2} + 5\frac{1}{4}$ $7\frac{3}{4}$

(c) $2\frac{3}{4} + 3\frac{1}{6}$ $5\frac{11}{12}$

(d) $3\frac{1}{2} + 2\frac{4}{5}$ $6\frac{3}{10}$

2. Siti ran $1\frac{7}{10}$ km and walked 3 km. What was the total distance she covered?

$4\frac{7}{10}$ km

Complete Workbook **5A**, Worksheet **2** • Pages **57 – 58**

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FRACTIONS 72

Textbook 5 P72

For Let's Learn 7, give pupils sufficient time to work out the solutions before going through. Allow pupils to use fraction discs to find the answers and then calculators to check their answers.

Allow pupils to use fraction discs to work on Let's Learn 8 and use their calculators to check their answers. Remind pupils to express their answers in the simplest form.

PRACTICE

Work with pupils on the practice questions.

Independent seatwork

Assign pupils to complete Worksheet 2 (Workbook 5A P57 – 58).

Answers Worksheet 2 (Workbook 5A P57 – 58)

1. (a) $3\frac{1}{6}$

   (b) $7\frac{9}{10}$

   (c) $7\frac{4}{9}$

   (d) $7\frac{3}{20}$

   (e) $4\frac{1}{2}$

   (f) $4\frac{5}{12}$

   (g) $5\frac{7}{8}$

   (h) $8\frac{1}{9}$

2. $1\frac{1}{4}$ hr + $1\frac{1}{3}$ hr = $1\frac{3}{12}$ hr + $1\frac{4}{12}$ hr

   = $2\frac{7}{12}$ hr

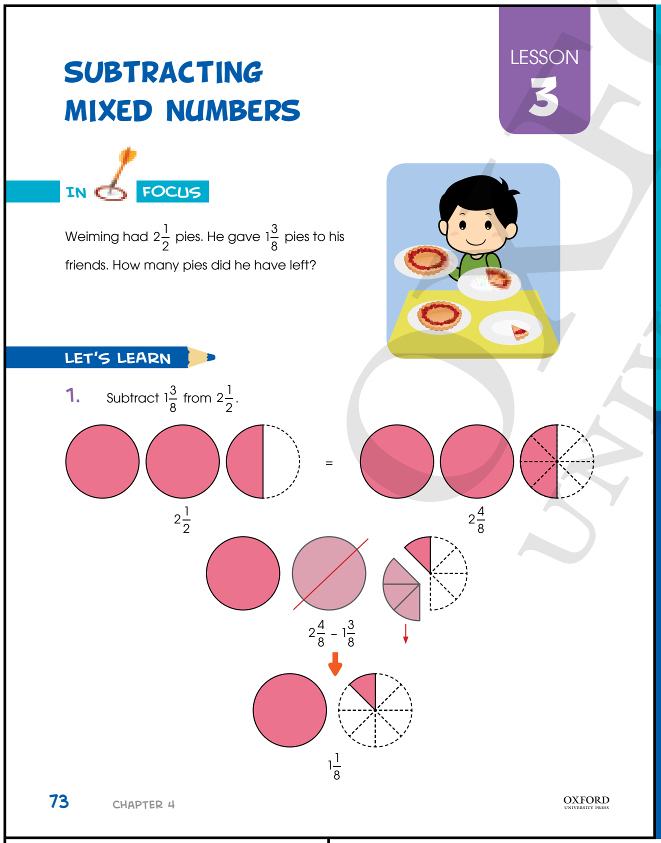
3. $2\frac{4}{5}\,\ell + 2\frac{1}{2}\,\ell = 5\frac{3}{10}\,\ell$

LESSON
3

SUBTRACTING MIXED NUMBERS

LEARNING OBJECTIVE

1. Subtract mixed numbers.



SUBTRACTING MIXED NUMBERS

LESSON 3

IN FOCUS

Weiming had $2\frac{1}{2}$ pies. He gave $1\frac{3}{8}$ pies to his friends. How many pies did he have left?

LET'S LEARN

1. Subtract $1\frac{3}{8}$ from $2\frac{1}{2}$.

$2\frac{1}{2}$ = $2\frac{4}{8}$

$2\frac{4}{8} - 1\frac{3}{8}$

$1\frac{1}{8}$

73 CHAPTER 4 OXFORD UNIVERSITY PRESS

Textbook 5 P73

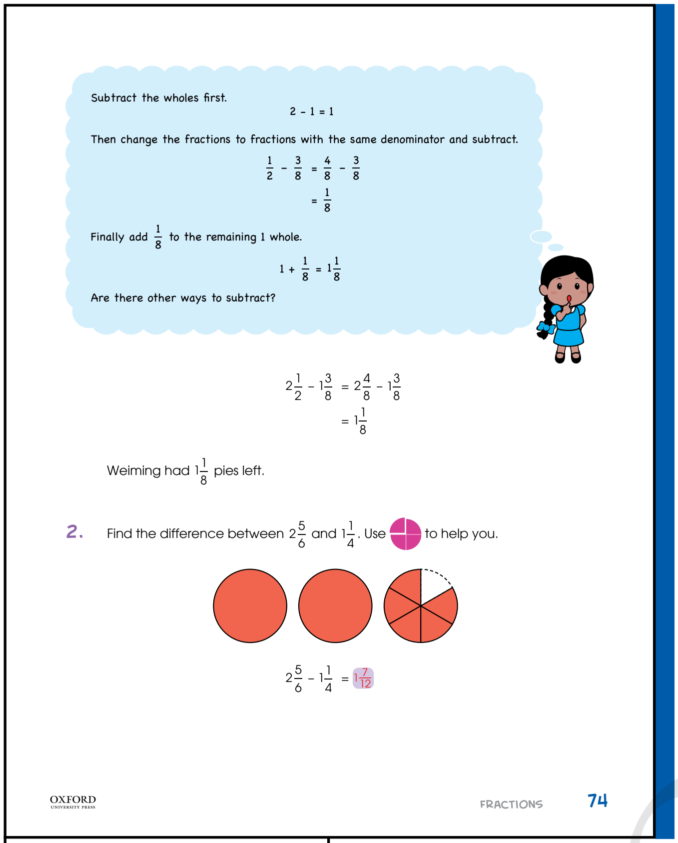
IN FOCUS

Pose the question to the class and allow pupils to relate their prior knowledge on fractions.
Ask:

- What do you do to find out how many pies Weiming had left?
- What are the ways to get the answer?

LET'S LEARN

For Let's Learn 1, use fraction discs to demonstrate the steps for subtraction as shown. Articulate the steps as the fraction discs are moved. With the aid of the fractions discs and diagram in Let's Learn 1, guide pupils to see that $\frac{1}{2}$ is the same as $\frac{4}{8}$.



Subtract the wholes first.

$$2 - 1 = 1$$

Then change the fractions to fractions with the same denominator and subtract.

$$\frac{1}{2} - \frac{3}{8} = \frac{4}{8} - \frac{3}{8}$$
$$= \frac{1}{8}$$

Finally add $\frac{1}{8}$ to the remaining 1 whole.

$$1 + \frac{1}{8} = 1\frac{1}{8}$$

Are there other ways to subtract?

$$2\frac{1}{2} - 1\frac{3}{8} = 2\frac{4}{8} - 1\frac{3}{8}$$
$$= 1\frac{1}{8}$$

Weiming had $1\frac{1}{8}$ pies left.

2. Find the difference between $2\frac{5}{6}$ and $1\frac{1}{4}$. Use ⊕ to help you.

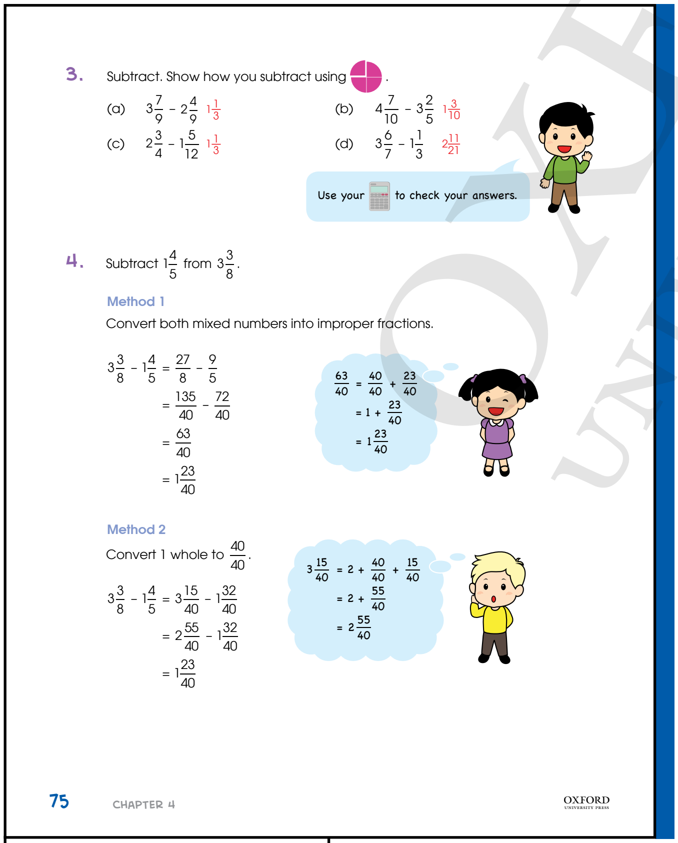
$$2\frac{5}{6} - 1\frac{1}{4} = 1\frac{7}{12}$$

FRACTIONS 74

Textbook 5 P74

Demonstrate how the equation is written. For class discussion, ask pupils if they have other ways of subtracting the mixed numbers.

For Let's Learn 2, distribute fraction discs to pupils to demonstrate $2\frac{5}{6} - 1\frac{1}{4}$. Elicit the steps used in Let's Learn 1. At step 2, ask them if $\frac{5}{6} - \frac{1}{4}$ can be done directly. Recapitulate what they have learnt on subtracting two unlike fractions. Elicit the equation from pupils.



3. Subtract. Show how you subtract using ⊕.

(a) $3\frac{7}{9} - 2\frac{4}{9}$ $1\frac{1}{3}$

(b) $4\frac{7}{10} - 3\frac{2}{5}$ $1\frac{3}{10}$

(c) $2\frac{3}{4} - 1\frac{5}{12}$ $1\frac{1}{3}$

(d) $3\frac{6}{7} - 1\frac{1}{3}$ $2\frac{11}{21}$

Use your ▦ to check your answers.

4. Subtract $1\frac{4}{5}$ from $3\frac{3}{8}$.

Method 1

Convert both mixed numbers into improper fractions.

$$3\frac{3}{8} - 1\frac{4}{5} = \frac{27}{8} - \frac{9}{5}$$
$$= \frac{135}{40} - \frac{72}{40}$$
$$= \frac{63}{40}$$
$$= 1\frac{23}{40}$$

$$\frac{63}{40} = \frac{40}{40} + \frac{23}{40}$$
$$= 1 + \frac{23}{40}$$
$$= 1\frac{23}{40}$$

Method 2

Convert 1 whole to $\frac{40}{40}$.

$$3\frac{3}{8} - 1\frac{4}{5} = 3\frac{15}{40} - 1\frac{32}{40}$$
$$= 2\frac{55}{40} - 1\frac{32}{40}$$
$$= 1\frac{23}{40}$$

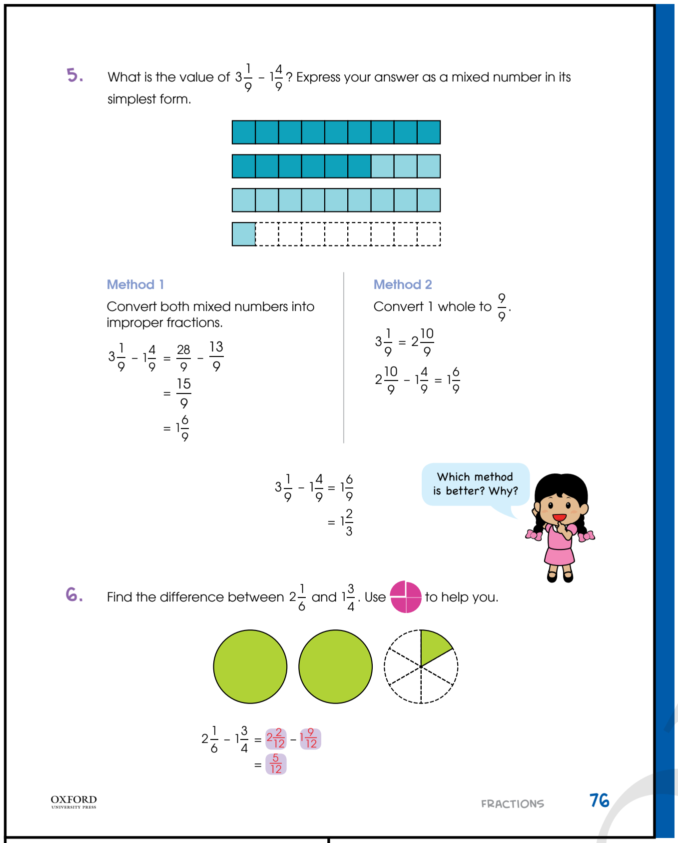
$$3\frac{15}{40} = 2 + \frac{40}{40} + \frac{15}{40}$$
$$= 2 + \frac{55}{40}$$
$$= 2\frac{55}{40}$$

75 CHAPTER 4

Textbook 5 P75

Allow pupils to use fraction discs to work on Let's Learn 3 and use their calculators to check their answers.

In Let's Learn 4, guide pupils to see the two methods of subtracting the mixed numbers. Explain that method 1 involves the conversion of mixed numbers into improper fractions while method 2 involves converting the denominators of the fractions to be the same.



5. What is the value of $3\frac{1}{9} - 1\frac{4}{9}$? Express your answer as a mixed number in its simplest form.

Method 1

Convert both mixed numbers into improper fractions.

$$3\frac{1}{9} - 1\frac{4}{9} = \frac{28}{9} - \frac{13}{9}$$
$$= \frac{15}{9}$$
$$= 1\frac{6}{9}$$

Method 2

Convert 1 whole to $\frac{9}{9}$.

$$3\frac{1}{9} = 2\frac{10}{9}$$
$$2\frac{10}{9} - 1\frac{4}{9} = 1\frac{6}{9}$$

$$3\frac{1}{9} - 1\frac{4}{9} = 1\frac{6}{9}$$
$$= 1\frac{2}{3}$$

Which method is better? Why?

6. Find the difference between $2\frac{1}{6}$ and $1\frac{3}{4}$. Use ⊕ to help you.

$$2\frac{1}{6} - 1\frac{3}{4} = 2\frac{2}{12} - 1\frac{9}{12}$$
$$= \frac{5}{12}$$

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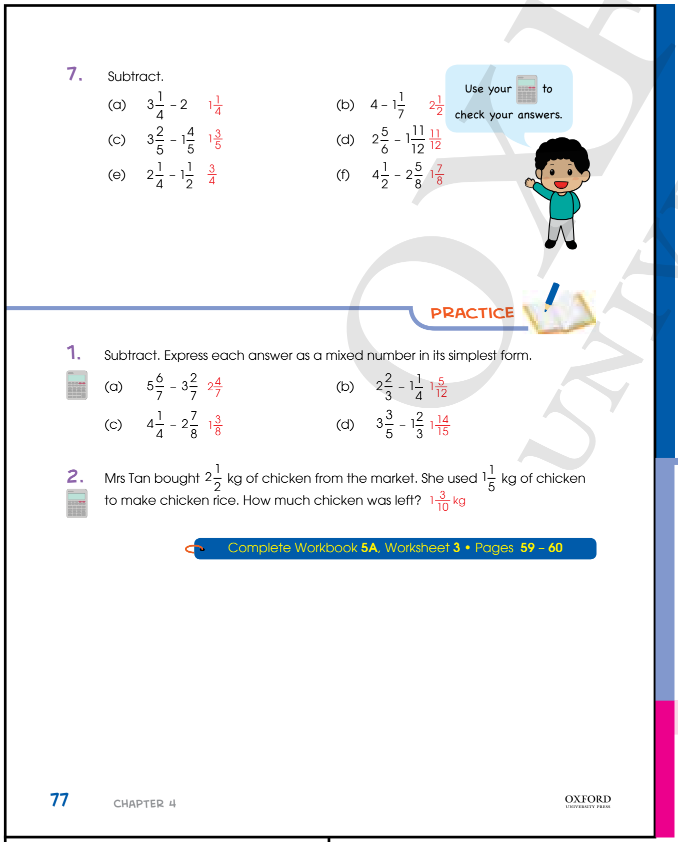
FRACTIONS 76

Textbook 5 P76

Let's Learn 5 illustrates the subtraction of mixed numbers using fraction bars. Remind pupils that they have to change fractions to fractions with the same denominator before subtracting. With the aid of the diagram in Let's Learn 5, guide pupils to see that $3\frac{1}{9} - 1\frac{4}{9}$ is the same as $\frac{28}{9} - \frac{13}{9}$. Guide pupils through the second method of solving the same problem.

Ask pupils which method they prefer and why.

For Let's Learn 6, give pupils sufficient time to fill in the blanks. Allow pupils to use fraction discs to find the answers and then calculators to check their answers.



7. Subtract.

(a) $3\frac{1}{4} - 2$ $1\frac{1}{4}$

(b) $4 - 1\frac{1}{7}$ $2\frac{1}{2}$

(c) $3\frac{2}{5} - 1\frac{4}{5}$ $1\frac{3}{5}$

(d) $2\frac{5}{6} - 1\frac{11}{12}$ $\frac{11}{12}$

(e) $2\frac{1}{4} - 1\frac{1}{2}$ $\frac{3}{4}$

(f) $4\frac{1}{2} - 2\frac{5}{8}$ $1\frac{7}{8}$

Use your 🖩 to check your answers.

PRACTICE

1. Subtract. Express each answer as a mixed number in its simplest form.

(a) $5\frac{6}{7} - 3\frac{2}{7}$ $2\frac{4}{7}$

(b) $2\frac{2}{3} - 1\frac{1}{4}$ $1\frac{5}{12}$

(c) $4\frac{1}{4} - 2\frac{7}{8}$ $1\frac{3}{8}$

(d) $3\frac{3}{5} - 1\frac{2}{3}$ $1\frac{14}{15}$

2. Mrs Tan bought $2\frac{1}{2}$ kg of chicken from the market. She used $1\frac{1}{5}$ kg of chicken to make chicken rice. How much chicken was left? $1\frac{3}{10}$ kg

Complete Workbook **5A**, Worksheet **3** • Pages **59 – 60**

77 CHAPTER 4

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Textbook 5 P77

For Let's Learn 7, allow pupils to use their calculators to check their answers. Remind pupils to express their answers in the simplest form.

PRACTICE

Work with pupils on the practice questions.

Independent seatwork

Assign pupils to complete Worksheet 3 (Workbook 5A P43 – 44).

Answers Worksheet 3 (Workbook 5A P59 – 60)

1. (a) $1\frac{1}{8}$

   (b) $2\frac{1}{9}$

   (c) $3\frac{5}{6}$

   (d) $1\frac{9}{20}$

   (e) $1\frac{19}{28}$

2. (a) $3\frac{8}{9}$

   (b) $4\frac{7}{12}$

   (c) $1\frac{23}{28}$

3. $2\,\ell - 1\frac{2}{5}\,\ell = \frac{3}{5}\,\ell$

4. $4\frac{2}{5}\text{ m} - 2\frac{3}{4}\text{ m} = 1\frac{13}{20}\text{ m}$

LESSON PLAN

Chapter 4
Lessons 2 & 3

Specific Learning Focus

- Add mixed numbers.
- Subtract mixed numbers.

Suggested Duration

Lesson 2: 2 periods
Lesson 3: 2 periods

Prior Learning

Pupils have learnt to add and subtract proper fractions. In the previous lessons, pupils have dealt with higher-order questions that require conversions to equivalent fractions and the addition and subtraction of unlike fractions. In these two lessons, pupils will learn to first convert unlike fractions to like fractions and then either add or subtract the wholes and the numerators to or from each other.

Pre-emptive Pitfalls

Fractions can be visually experienced with the help of fraction discs or fraction bars. Both manipulatives are equally easy for pupils to comprehend and express the fractions. However, the mathematical computation of adding or subtracting the wholes and the fractional parts separately, or converting mixed number to improper fraction and then to like fractions can be a bit challenging for most pupils.

Introduction

In Let's Learn 1 (Textbook 5 P68 – 69), $1\frac{1}{2}$ and $2\frac{1}{4}$ are visually represented by fraction discs. The methodology on page 69 guides the pupils to add the whole numbers first and then the fractions are converted to equivalent fractions to make like fractions. The like fractions are then added and the whole number is then added to the fraction. In subtraction (Textbook 5 P73), the same methodology is applied, where the wholes are subtracted first, and then the fractions are converted to equivalent fractions to make like fractions. The like fractions are then subtracted and the whole number is then added to the fraction. The bar modelling method is shown in Let's Learn 6 (Textbook 5 P71) and Let's Learn 4 (Textbook 5 P76). Each fraction bar is divided into 9 equal parts since the denominator of both mixed numbers is 9. In method 2 of Let's Learn 4, the whole number is converted to $\frac{9}{9}$ making $3\frac{1}{9}$ to $2\frac{10}{9}$, so that subtraction of the mixed numbers can be done easily.

Problem Solving

To convert to like fractions, the LCM is revisited, where the LCM is found by prime factorisation using the division method first. Once the LCM is found it is made the common denominator and the same factor is used to multiply both the numerator and denominator. Emphasise to pupils that the 3 steps of adding or subtracting mixed numbers are essential:

(i) Convert mixed numbers to improper fractions.
(ii) Find the LCM of the denominators.
(iii) Multiply the numerator and denominator with the factor.
(iv) Proceed to add or subtract.

Activities

Using fraction discs and fraction bars, get pupils to work in pairs. Peer-learning is beneficial for pupils.
The sums will be solved through the C-P-A approach, where the pupils will find it easier to comprehend the steps.
The questions in 'Practice' (Textbook 5 P72, 77) can be done as a grouped class activity.

Resources

- fraction discs (Activity Handbook 5 P19)
- markers
- mini whiteboard
- calculator

Mathematical Communication Support

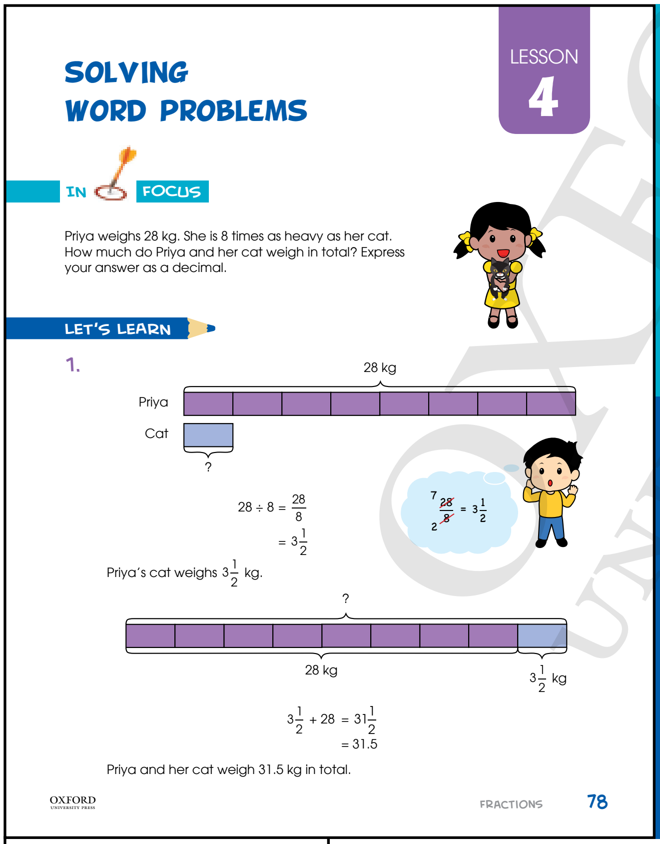
These two lessons involve a lot of concepts integrated together. Have verbal discussions and enunciate each step using key terms like 'proper fractions', 'improper fractions', 'mixed numbers', 'equivalent fractions', 'grouping whole numbers', 'lowest common multiple', 'prime factorisation', 'division method' and 'factors'.

LESSON
4

SOLVING WORD PROBLEMS

LEARNING OBJECTIVE

1. Solve word problems involving division of numbers to give fractions, adding mixed numbers and subtracting mixed numbers.



LESSON 4

SOLVING WORD PROBLEMS

IN FOCUS

Priya weighs 28 kg. She is 8 times as heavy as her cat. How much do Priya and her cat weigh in total? Express your answer as a decimal.

LET'S LEARN

1.

$$28 \div 8 = \frac{28}{8}$$
$$= 3\frac{1}{2}$$

$$\frac{\cancel{28}^{7}}{\cancel{8}_{2}} = 3\frac{1}{2}$$

Priya's cat weighs $3\frac{1}{2}$ kg.

$$3\frac{1}{2} + 28 = 31\frac{1}{2}$$
$$= 31.5$$

Priya and her cat weigh 31.5 kg in total.

OXFORD UNIVERSITY PRESS FRACTIONS 78

Textbook 5 P78

IN FOCUS

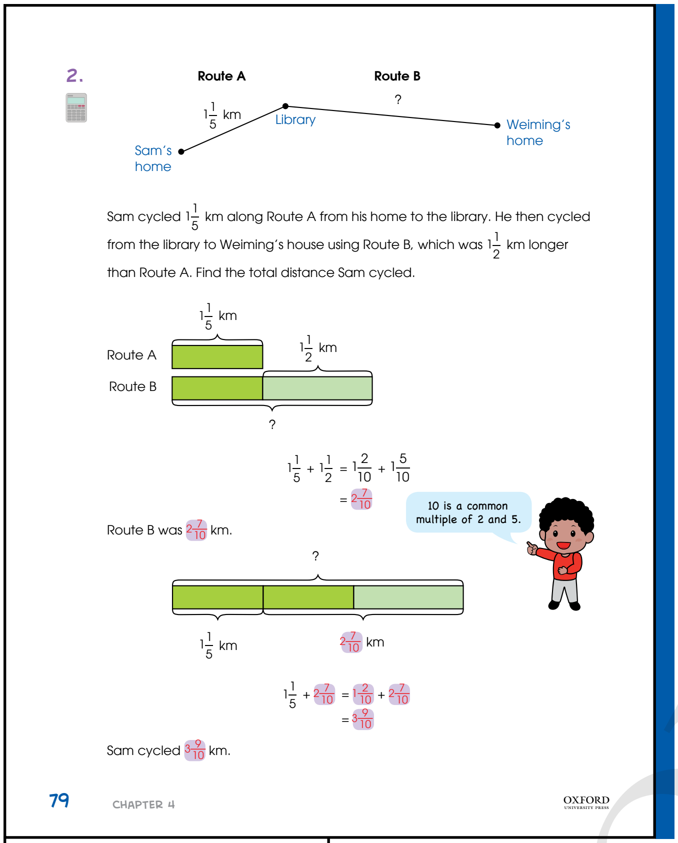
Discuss with pupils how the problem can be solved. Ask pupils to draw a model and ask them if they have encountered similar problems before.

Ask:
- What information do you need to find?
- How can you solve the problem in 1 step?

LET'S LEARN

Ask pupils to check if their models are the same as the one drawn on P78.

Go through the steps and ask:
- Do you think it is necessary to draw the second model? Why or why not?



2.

Route A Route B

$1\frac{1}{5}$ km

Library

?

Weiming's home

Sam's home

Sam cycled $1\frac{1}{5}$ km along Route A from his home to the library. He then cycled from the library to Weiming's house using Route B, which was $1\frac{1}{2}$ km longer than Route A. Find the total distance Sam cycled.

$1\frac{1}{5}$ km

Route A

$1\frac{1}{2}$ km

Route B

?

$1\frac{1}{5} + 1\frac{1}{2} = 1\frac{2}{10} + 1\frac{5}{10}$

$= 2\frac{7}{10}$

10 is a common multiple of 2 and 5.

Route B was $2\frac{7}{10}$ km.

?

$1\frac{1}{5}$ km $2\frac{7}{10}$ km

$1\frac{1}{5} + 2\frac{7}{10} = 1\frac{2}{10} + 2\frac{7}{10}$

$= 3\frac{9}{10}$

Sam cycled $3\frac{9}{10}$ km.

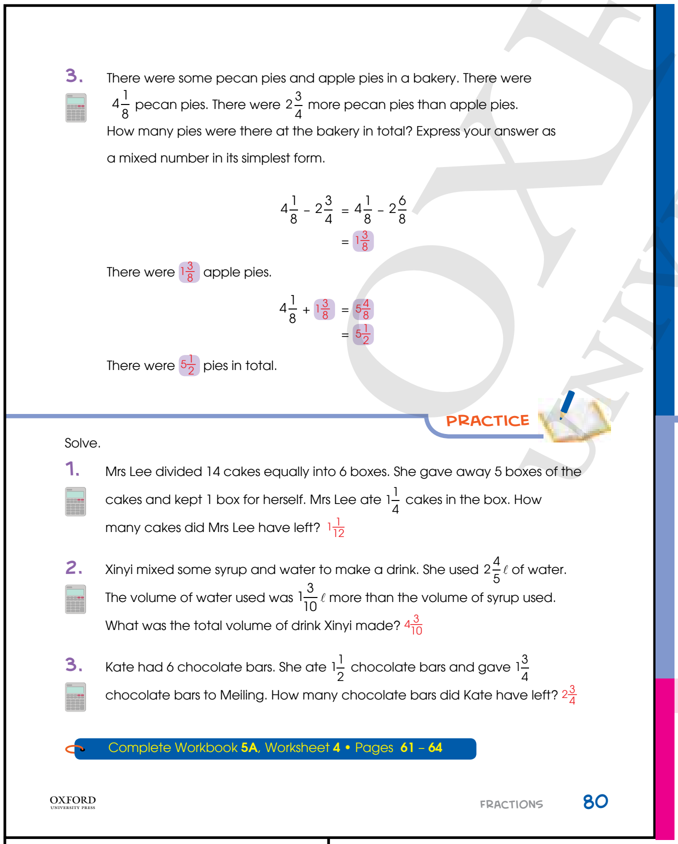
79 CHAPTER 4

Textbook 5 P79

For Let's Learn 2, ask pupils to draw the model. Review the earlier lesson on adding mixed numbers. Allow pupils to use their calculators for this question.

Ask:

- What information do you need to find?
- How can you solve the problem in 1 step?



3. There were some pecan pies and apple pies in a bakery. There were $4\frac{1}{8}$ pecan pies. There were $2\frac{3}{4}$ more pecan pies than apple pies. How many pies were there at the bakery in total? Express your answer as a mixed number in its simplest form.

$4\frac{1}{8} - 2\frac{3}{4} = 4\frac{1}{8} - 2\frac{6}{8}$

$= 1\frac{3}{8}$

There were $1\frac{3}{8}$ apple pies.

$4\frac{1}{8} + 1\frac{3}{8} = 5\frac{4}{8}$

$= 5\frac{1}{2}$

There were $5\frac{1}{2}$ pies in total.

PRACTICE

Solve.

1. Mrs Lee divided 14 cakes equally into 6 boxes. She gave away 5 boxes of the cakes and kept 1 box for herself. Mrs Lee ate $1\frac{1}{4}$ cakes in the box. How many cakes did Mrs Lee have left? $1\frac{1}{12}$

2. Xinyi mixed some syrup and water to make a drink. She used $2\frac{4}{5}$ ℓ of water. The volume of water used was $1\frac{3}{10}$ ℓ more than the volume of syrup used. What was the total volume of drink Xinyi made? $4\frac{3}{10}$

3. Kate had 6 chocolate bars. She ate $1\frac{1}{2}$ chocolate bars and gave $1\frac{3}{4}$ chocolate bars to Meiling. How many chocolate bars did Kate have left? $2\frac{3}{4}$

Complete Workbook **5A**, Worksheet **4** • Pages **61 – 64**

FRACTIONS 80

Textbook 5 P80

For Let's Learn 3, review the earlier lesson on subtracting mixed numbers. Allow pupils sufficient time to work out the solution using their calculators before going through.

Ask:

- What information do you need to find?
- How can you solve the problem in 1 step?

Remind pupils to check that their answer is in the simplest form.

PRACTICE

Work through the practice questions with the class and selected examples from Worksheet 4 for better understanding.

Independent seatwork

Assign pupils to complete Worksheet 4 (Workbook 5A P61 – 64).

Answers Worksheet 4 (Workbook 5A P61 – 64)

1. $8 - 1\frac{1}{12} = 6\frac{11}{12}$

   $6\frac{11}{12} - 1\frac{5}{6} = 4\frac{1}{12}$

2. $22\frac{1}{2}$ km − $19\frac{7}{10}$ km = $2\frac{4}{5}$ km

3. $1\frac{1}{2}$ kg + $1\frac{2}{5}$ kg = $2\frac{9}{10}$ kg

   $2\frac{9}{10}$ kg + $\frac{4}{5}$ kg = $3\frac{7}{10}$ kg

4. $1\frac{3}{4}$ km + $2\frac{1}{2}$ km = $5\frac{1}{4}$ km

   $6\frac{5}{8}$ km − $5\frac{1}{4}$ km = $1\frac{3}{8}$ km

5. 75 kg ÷ 10 = $7\frac{1}{2}$ kg

   75 kg ÷ $7\frac{1}{2}$ kg = $82\frac{1}{2}$ kg

6. $22\ \ell \div 4\ \ell = 5\frac{1}{2}\ \ell$

   $5\frac{1}{2}\ \ell + 1\frac{1}{8}\ \ell = 6\frac{5}{8}\ \ell$

7. $3\frac{4}{5}$ m − $2\frac{7}{10}$ m = $1\frac{1}{10}$ m

   $3\frac{4}{5}$ m + $1\frac{1}{10}$ m = $4\frac{9}{10}$ m

8. $1\frac{2}{3}$ hr + $1\frac{2}{3}$ hr = $3\frac{1}{3}$ hr

   $3\frac{1}{3}$ hr + $1\frac{2}{3}$ hr = 5 hr

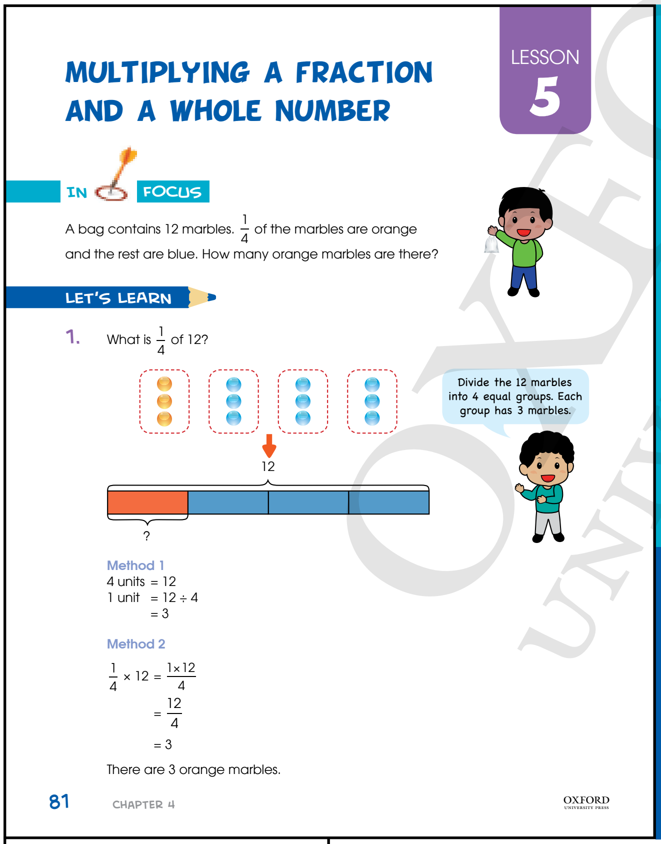
LESSON

5

MULTIPLYING A FRACTION AND A WHOLE NUMBER

LEARNING OBJECTIVE

1. Multiply a fraction and a whole number.



LESSON 5

MULTIPLYING A FRACTION AND A WHOLE NUMBER

IN FOCUS

A bag contains 12 marbles. $\frac{1}{4}$ of the marbles are orange and the rest are blue. How many orange marbles are there?

LET'S LEARN

1. What is $\frac{1}{4}$ of 12?

Divide the 12 marbles into 4 equal groups. Each group has 3 marbles.

12

?

Method 1

4 units = 12

1 unit = 12 ÷ 4

= 3

Method 2

$$\frac{1}{4} \times 12 = \frac{1 \times 12}{4} = \frac{12}{4} = 3$$

There are 3 orange marbles.

81 CHAPTER 4 OXFORD UNIVERSITY PRESS

Textbook 5 P81

IN FOCUS

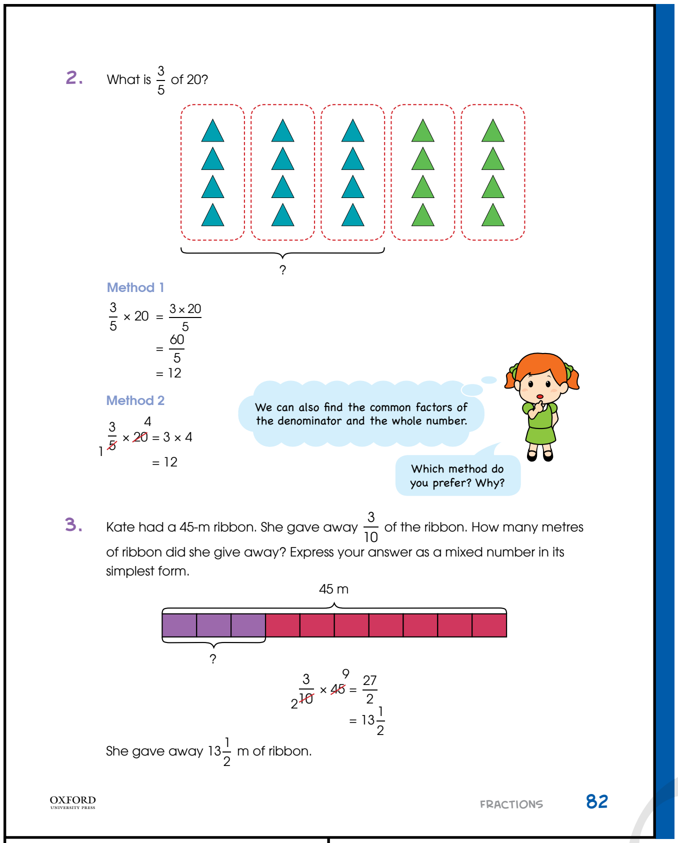
Discuss with pupils how the problem can be solved. Ask pupils to draw a model and ask them if they have encountered similar problems before. Recapitulate with pupils what they have learnt about a fraction of a set (Grade Four).

Ask:

- What fraction of the marbles are orange?
- What fraction of the marbles are blue?
- How many parts should you divide the model into? Why?
- What is the total number of marbles?

LET'S LEARN

Ask pupils to check if their models are the same as the one drawn on P81. Go through the 2 methods and ask pupils for their preferred method.



2. What is $\frac{3}{5}$ of 20?

?

Method 1

$\frac{3}{5} \times 20 = \frac{3 \times 20}{5}$

$= \frac{60}{5}$

$= 12$

Method 2

$\frac{3}{{}_1\cancel{5}} \times \overset{4}{\cancel{20}} = 3 \times 4$

$= 12$

We can also find the common factors of the denominator and the whole number.

Which method do you prefer? Why?

3. Kate had a 45-m ribbon. She gave away $\frac{3}{10}$ of the ribbon. How many metres of ribbon did she give away? Express your answer as a mixed number in its simplest form.

45 m

?

$\frac{3}{{}_2\cancel{10}} \times \overset{9}{\cancel{45}} = \frac{27}{2}$

$= 13\frac{1}{2}$

She gave away $13\frac{1}{2}$ m of ribbon.

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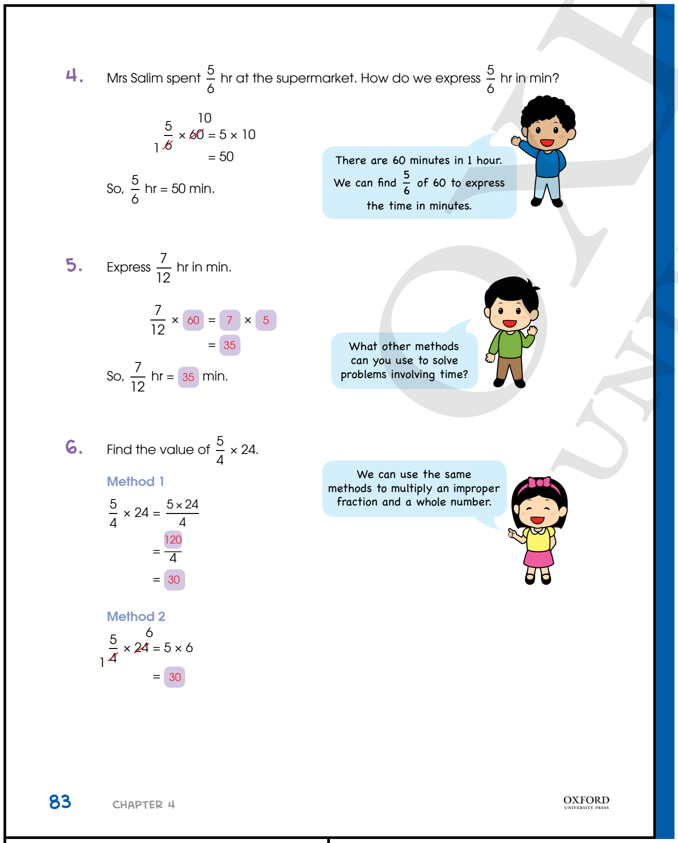
FRACTIONS 82

Textbook 5 P82

With the aid of the diagram in Let's Learn 2, show pupils that the 20 items can be divided into 5 equal groups of 4. $\frac{3}{5}$ means 3 out of 5 groups, which is equal to 3 x 4. Ask pupils to draw a model by using Let's Learn 1 as a guide. Go through the 2 methods.

For Let's Learn 3, ask:

- Why is the model divided into 10 equal parts?
- What fraction of the ribbon was given away? How many parts does that refer to?



4. Mrs Salim spent $\frac{5}{6}$ hr at the supermarket. How do we express $\frac{5}{6}$ hr in min?

$\frac{5}{{}_1\cancel{6}} \times \overset{10}{\cancel{60}} = 5 \times 10$

$= 50$

So, $\frac{5}{6}$ hr = 50 min.

There are 60 minutes in 1 hour. We can find $\frac{5}{6}$ of 60 to express the time in minutes.

5. Express $\frac{7}{12}$ hr in min.

$\frac{7}{12} \times \boxed{60} = \boxed{7} \times \boxed{5}$

$= \boxed{35}$

So, $\frac{7}{12}$ hr = $\boxed{35}$ min.

What other methods can you use to solve problems involving time?

6. Find the value of $\frac{5}{4} \times 24$.

Method 1

$\frac{5}{4} \times 24 = \frac{5 \times 24}{4}$

$= \frac{\boxed{120}}{4}$

$= \boxed{30}$

Method 2

$\frac{5}{{}_1\cancel{4}} \times \overset{6}{\cancel{24}} = 5 \times 6$

$= \boxed{30}$

We can use the same methods to multiply an improper fraction and a whole number.

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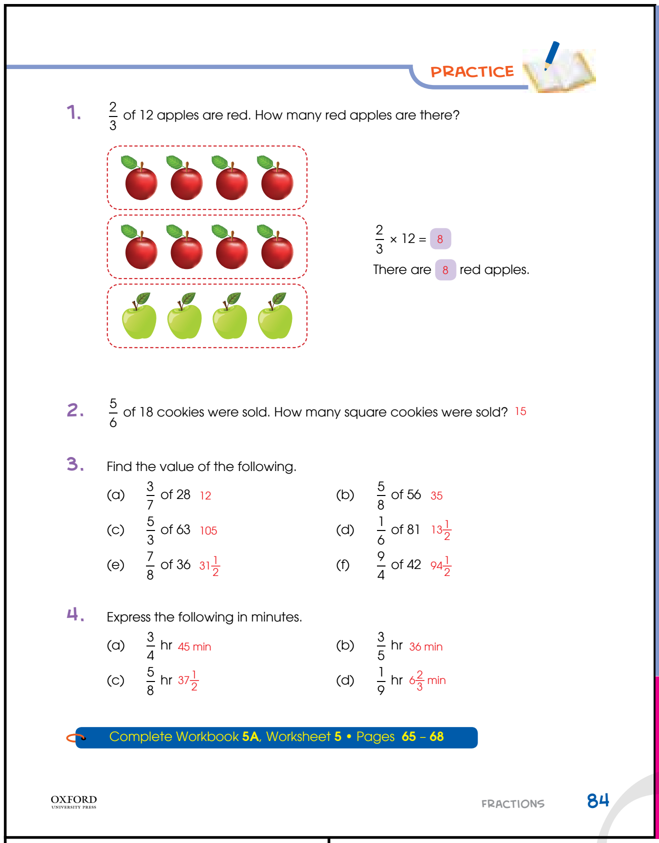
Textbook 5 P83

For Let's Learn 4, highlight to the pupils that $\frac{5}{6}$ hr is the same as $\frac{5}{6}$ of 1 hour, which is equivalent to $\frac{5}{6}$ of 60 minutes.

For Let's Learn 5, elicit the steps used in Let's Learn 4 and lead pupils to conclude that $\frac{7}{12}$ hr is $\frac{7}{12}$ of 60 min. Therefore, the answer can be obtained by multiplying the fraction by 60 min.

For Let's Learn 6, go through the 2 methods. Ask pupils which method they prefer and why. Teacher can guide pupils to understand that the same concept can be extended to multiplying improper fractions with whole numbers.



PRACTICE

1. $\frac{2}{3}$ of 12 apples are red. How many red apples are there?

$\frac{2}{3} \times 12 = \boxed{8}$

There are $\boxed{8}$ red apples.

2. $\frac{5}{6}$ of 18 cookies were sold. How many square cookies were sold? 15

3. Find the value of the following.

(a) $\frac{3}{7}$ of 28 12
(b) $\frac{5}{8}$ of 56 35
(c) $\frac{5}{3}$ of 63 105
(d) $\frac{1}{6}$ of 81 $13\frac{1}{2}$
(e) $\frac{7}{8}$ of 36 $31\frac{1}{2}$
(f) $\frac{9}{4}$ of 42 $94\frac{1}{2}$

4. Express the following in minutes.

(a) $\frac{3}{4}$ hr 45 min
(b) $\frac{3}{5}$ hr 36 min
(c) $\frac{5}{8}$ hr $37\frac{1}{2}$
(d) $\frac{1}{9}$ hr $6\frac{2}{3}$ min

Complete Workbook **5A**, Worksheet **5** • Pages **65 – 68**

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FRACTIONS 84

Textbook 5 P84

PRACTICE

Work with pupils on the practice questions and selected examples from Worksheet 5 for better understanding.

Independent seatwork

Assign pupils to complete Worksheet 5 (Workbook 5A P65 – 68).

Answers

Worksheet 5 (Workbook 5A P65 – 68)

1. (a) 2
   (b) 2
   (c) 6

2. (a) 15
   (b) 6
   (c) $36\frac{2}{3}$
   (d) 36
   (e) 84
   (f) $175\frac{1}{2}$

3. (a) $\frac{1}{3} \times 60 = 20$ min
   (b) $\frac{3}{4} \times 60 = 45$ min
   (c) $\frac{2}{5} \times 60 = 24$ min
   (d) $\frac{11}{12} \times 60 = 55$ min

4. $1 - \frac{1}{4} = \frac{3}{4}$
   $\frac{3}{4} \times 16 = 12$

5. $1 - \frac{1}{8} = \frac{7}{8}$
   $\frac{7}{8} \times 72 = 63$

6. $\frac{5}{6} \times 12$ km = 10 km

7. $\frac{3}{8} \times \$56 = \$21$

8. $1 - \frac{3}{5} = \frac{2}{5}$
   $\frac{2}{5} \times 80$ kg = 32 kg

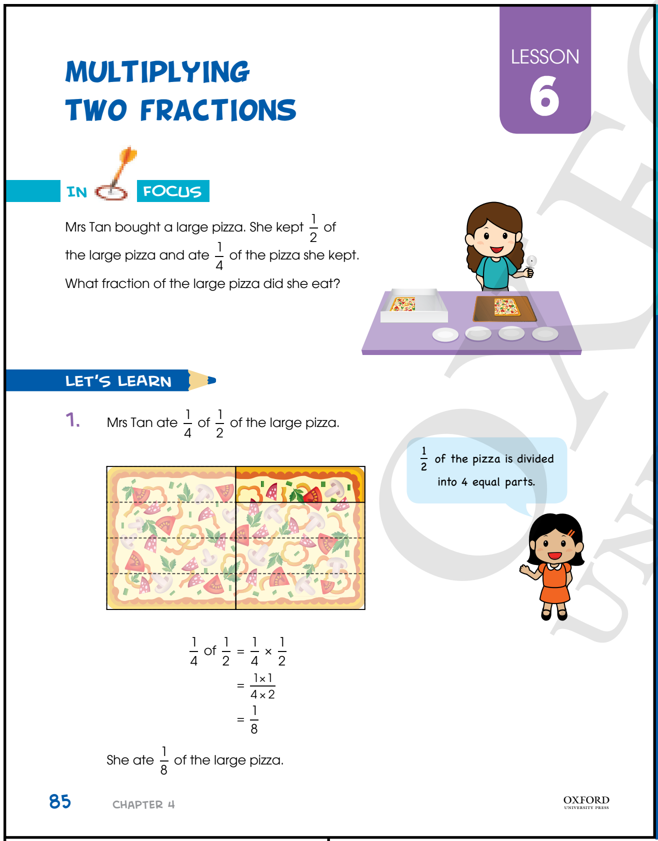
LESSON

6

MULTIPLYING TWO FRACTIONS

LEARNING OBJECTIVES

1. Multiply two proper fractions.
2. Multiply a proper fraction and an improper fraction.
3. Multiply two improper fractions.



MULTIPLYING TWO FRACTIONS

LESSON 6

IN FOCUS

Mrs Tan bought a large pizza. She kept $\frac{1}{2}$ of the large pizza and ate $\frac{1}{4}$ of the pizza she kept. What fraction of the large pizza did she eat?

LET'S LEARN

1. Mrs Tan ate $\frac{1}{4}$ of $\frac{1}{2}$ of the large pizza.

$$\begin{aligned}\frac{1}{4} \text{ of } \frac{1}{2} &= \frac{1}{4} \times \frac{1}{2}\\ &= \frac{1 \times 1}{4 \times 2}\\ &= \frac{1}{8}\end{aligned}$$

She ate $\frac{1}{8}$ of the large pizza.

85 CHAPTER 4 OXFORD UNIVERSITY PRESS

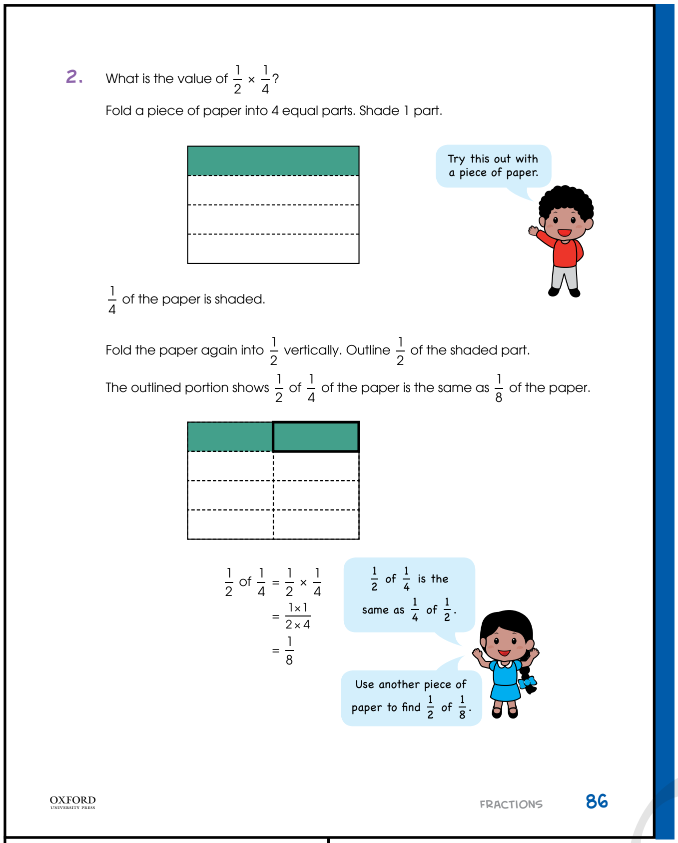
Textbook 5 P85

IN FOCUS

Discuss with pupils how the problem can be solved. Distribute paper and guide pupils to cut the paper into 2 equal parts. Set 1 part aside. Fold the other part into quarters and shade one part. Put the 2 equal parts side by side and ask pupils what fraction of the original piece of paper is shaded.

LET'S LEARN

Teacher can use pictorial representation of the concrete manipulation in the In Focus to explain further that $\frac{1}{4}$ of $\frac{1}{2}$ is $\frac{1}{8}$. Review with pupils that in Lesson 5, they learnt that $\frac{1}{4}$ of 12 = $\frac{1}{4} \times 12$. In the same way, $\frac{1}{4}$ of $\frac{1}{2} = \frac{1}{4} \times \frac{1}{2}$. Lead pupils to see that when 2 fractions, $\frac{N_1}{D_1}$ and $\frac{N_2}{D_2}$ are multiplied, the answer is $\frac{N_1 \times N_2}{D_1 \times D_2}$.



2. What is the value of $\frac{1}{2} \times \frac{1}{4}$?

Fold a piece of paper into 4 equal parts. Shade 1 part.

Try this out with a piece of paper.

$\frac{1}{4}$ of the paper is shaded.

Fold the paper again into $\frac{1}{2}$ vertically. Outline $\frac{1}{2}$ of the shaded part.

The outlined portion shows $\frac{1}{2}$ of $\frac{1}{4}$ of the paper is the same as $\frac{1}{8}$ of the paper.

$$\frac{1}{2} \text{ of } \frac{1}{4} = \frac{1}{2} \times \frac{1}{4} = \frac{1 \times 1}{2 \times 4} = \frac{1}{8}$$

$\frac{1}{2}$ of $\frac{1}{4}$ is the same as $\frac{1}{4}$ of $\frac{1}{2}$.

Use another piece of paper to find $\frac{1}{2}$ of $\frac{1}{8}$.

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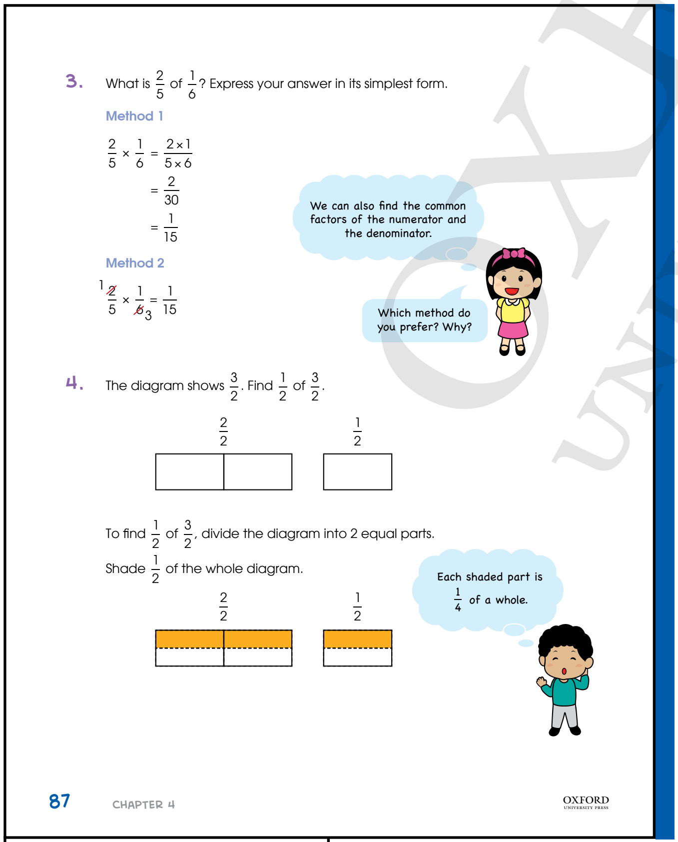
FRACTIONS 86

Textbook 5 P86

For Let's Learn 2, teacher can demonstrate using paper folding while explaining. Ask pupils to note down the answers for $\frac{1}{2}$ of $\frac{1}{4}$ and $\frac{1}{4}$ of $\frac{1}{2}$ and explain what they observe. Lead pupils to conclude that $\frac{1}{2}$ of $\frac{1}{4}$ is the same as $\frac{1}{4}$ of $\frac{1}{2}$.



3. What is $\frac{2}{5}$ of $\frac{1}{6}$? Express your answer in its simplest form.

Method 1

$$\frac{2}{5} \times \frac{1}{6} = \frac{2 \times 1}{5 \times 6} = \frac{2}{30} = \frac{1}{15}$$

Method 2

$$\frac{{}^{1}\cancel{2}}{5} \times \frac{1}{\cancel{6}_{3}} = \frac{1}{15}$$

We can also find the common factors of the numerator and the denominator.

Which method do you prefer? Why?

4. The diagram shows $\frac{3}{2}$. Find $\frac{1}{2}$ of $\frac{3}{2}$.

To find $\frac{1}{2}$ of $\frac{3}{2}$, divide the diagram into 2 equal parts.

Shade $\frac{1}{2}$ of the whole diagram.

Each shaded part is $\frac{1}{4}$ of a whole.

87 CHAPTER 4

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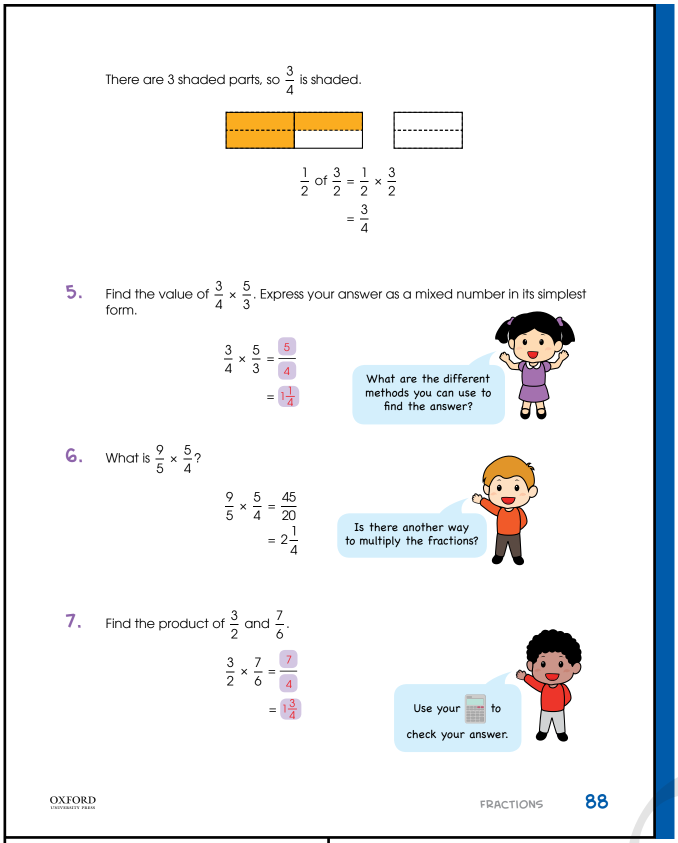
Textbook 5 P87

For Let's Learn 3, show that $\frac{N_1}{D_1} \times \frac{N_2}{D_2} = \frac{N_1 \times N_2}{D_1 \times D_2}$. When there are common factors between the numerators and denominators, the cancellation method can be used.

Let's Learn 4 illustrates the problem using fraction bars. Remind pupils that 2 halves make a whole and it can be represented by the fraction $\frac{2}{2}$. So $\frac{2}{2} + \frac{1}{2} = \frac{3}{2}$. The diagram shows 3 units with each unit representing $\frac{1}{2}$. Guide pupils to see that to find $\frac{1}{2}$ of $\frac{3}{2}$, they need to divide the 3 units into 2 groups. Teacher can use the model to show pupils that each shaded part represents $\frac{1}{4}$ of a whole.



There are 3 shaded parts, so $\frac{3}{4}$ is shaded.

$$\frac{1}{2} \text{ of } \frac{3}{2} = \frac{1}{2} \times \frac{3}{2}$$
$$= \frac{3}{4}$$

5. Find the value of $\frac{3}{4} \times \frac{5}{3}$. Express your answer as a mixed number in its simplest form.

$$\frac{3}{4} \times \frac{5}{3} = \frac{\boxed{5}}{\boxed{4}}$$
$$= \boxed{1\frac{1}{4}}$$

What are the different methods you can use to find the answer?

6. What is $\frac{9}{5} \times \frac{5}{4}$?

$$\frac{9}{5} \times \frac{5}{4} = \frac{45}{20}$$
$$= 2\frac{1}{4}$$

Is there another way to multiply the fractions?

7. Find the product of $\frac{3}{2}$ and $\frac{7}{6}$.

$$\frac{3}{2} \times \frac{7}{6} = \frac{\boxed{7}}{\boxed{4}}$$
$$= \boxed{1\frac{3}{4}}$$

Use your 🖩 to check your answer.

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FRACTIONS 88

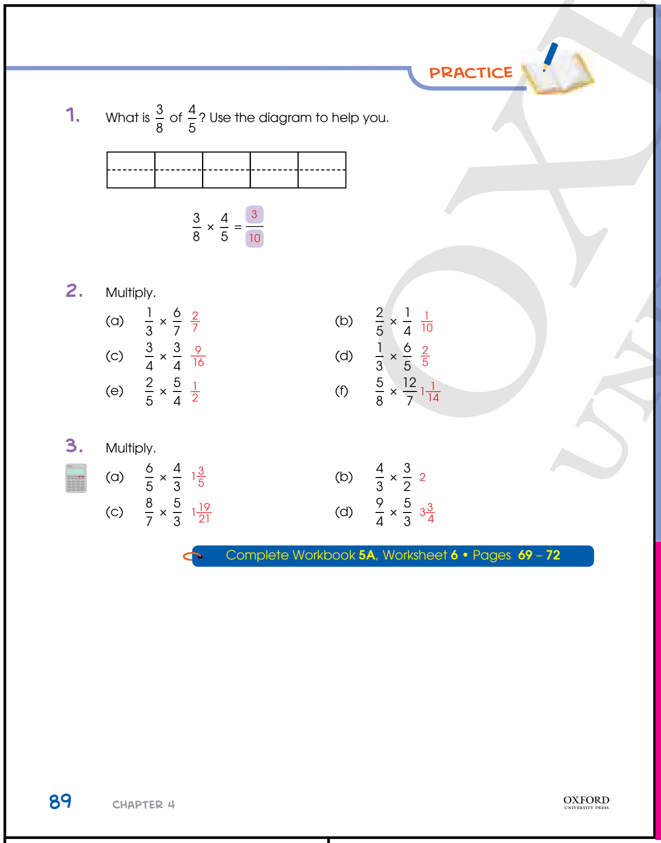
Textbook 5 P88

Guide pupils to see that if 1 shaded part represents $\frac{1}{4}$ of a whole then 3 shaded parts represent $\frac{3}{4}$ of a whole.

For Let's Learn 5, guide pupils to see that the cancellation method will be easier to work with since there are common factors between the numerators and the denominators.

For Let's Learn 6, ask pupils if they have alternative methods to solving the question. Allow pupils to work in pairs for discussion.

Let's Learn 7 involves multiplication of two improper fractions. Allow pupils to use a calculator to check their answer.



PRACTICE

1. What is $\frac{3}{8}$ of $\frac{4}{5}$? Use the diagram to help you.

$$\frac{3}{8} \times \frac{4}{5} = \frac{\boxed{3}}{\boxed{10}}$$

2. Multiply.

(a) $\frac{1}{3} \times \frac{6}{7}$ $\frac{2}{7}$

(b) $\frac{2}{5} \times \frac{1}{4}$ $\frac{1}{10}$

(c) $\frac{3}{4} \times \frac{3}{4}$ $\frac{9}{16}$

(d) $\frac{1}{3} \times \frac{6}{5}$ $\frac{2}{5}$

(e) $\frac{2}{5} \times \frac{5}{4}$ $\frac{1}{2}$

(f) $\frac{5}{8} \times \frac{12}{7}$ $1\frac{1}{14}$

3. Multiply.

(a) $\frac{6}{5} \times \frac{4}{3}$ $1\frac{3}{5}$

(b) $\frac{4}{3} \times \frac{3}{2}$ 2

(c) $\frac{8}{7} \times \frac{5}{3}$ $1\frac{19}{21}$

(d) $\frac{9}{4} \times \frac{5}{3}$ $3\frac{3}{4}$

Complete Workbook **5A**, Worksheet **6** • Pages **69 – 72**

89 CHAPTER 4

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Textbook 5 P89

PRACTICE

Work with pupils on the practice questions and selected examples from Worksheet 6 for better understanding.

Independent seatwork

Assign pupils to complete Worksheet 6 (Workbook 5A P69 – 72).

Answers Worksheet 6 (Workbook 5A P69 – 72)

1. (a) $\frac{1}{6}$
   (b) $\frac{5}{12}$
   (c) $\frac{1}{4}$
   (d) $\frac{5}{24}$
   (e) $\frac{1}{8}$

2. (a) $\frac{1}{10}$
   (b) $\frac{3}{14}$
   (c) $\frac{4}{7}$
   (d) $\frac{7}{10}$
   (e) $\frac{5}{8}$
   (f) $\frac{5}{6}$

3. (a) $1\frac{1}{2}$
   (b) $2\frac{1}{2}$
   (c) $1\frac{5}{9}$
   (d) $5\frac{3}{5}$

4. $\frac{1}{4}$ m × $\frac{1}{4}$ m = $\frac{1}{16}$ m^2

5. $\frac{1}{5}\ell \times \frac{4}{5}\ell = \frac{4}{25}\ell$

6. $\frac{3}{5} \times \frac{8}{9} = \frac{8}{15}$

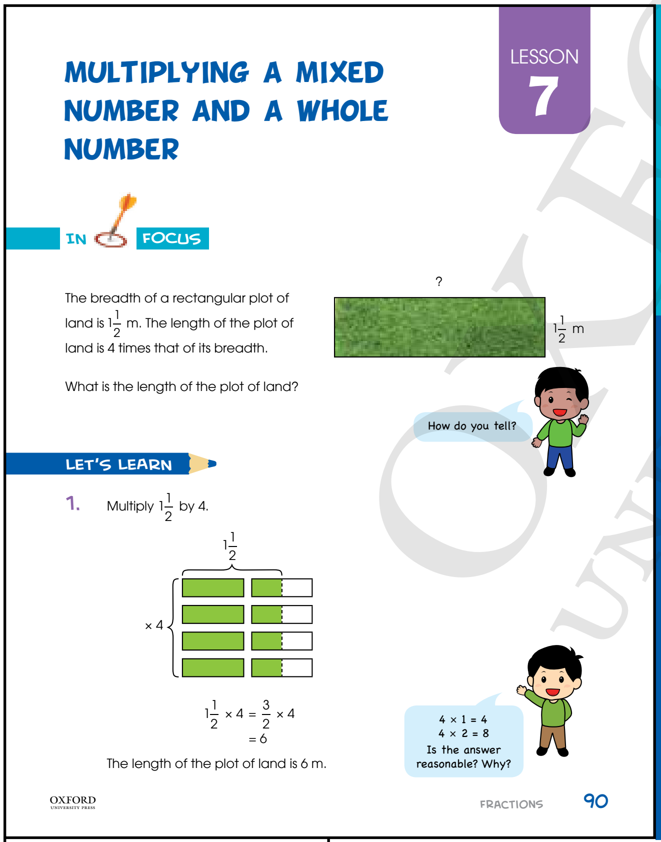
LESSON

7

MULTIPLYING A MIXED NUMBER AND A WHOLE NUMBER

LEARNING OBJECTIVE

1. Multiply a mixed number and a whole number.



MULTIPLYING A MIXED NUMBER AND A WHOLE NUMBER

LESSON 7

IN FOCUS

The breadth of a rectangular plot of land is $1\frac{1}{2}$ m. The length of the plot of land is 4 times that of its breadth.

What is the length of the plot of land?

?

$1\frac{1}{2}$ m

How do you tell?

LET'S LEARN

1. Multiply $1\frac{1}{2}$ by 4.

$1\frac{1}{2}$

× 4

$$1\frac{1}{2} \times 4 = \frac{3}{2} \times 4$$
$$= 6$$

The length of the plot of land is 6 m.

4 × 1 = 4
4 × 2 = 8
Is the answer reasonable? Why?

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FRACTIONS 90

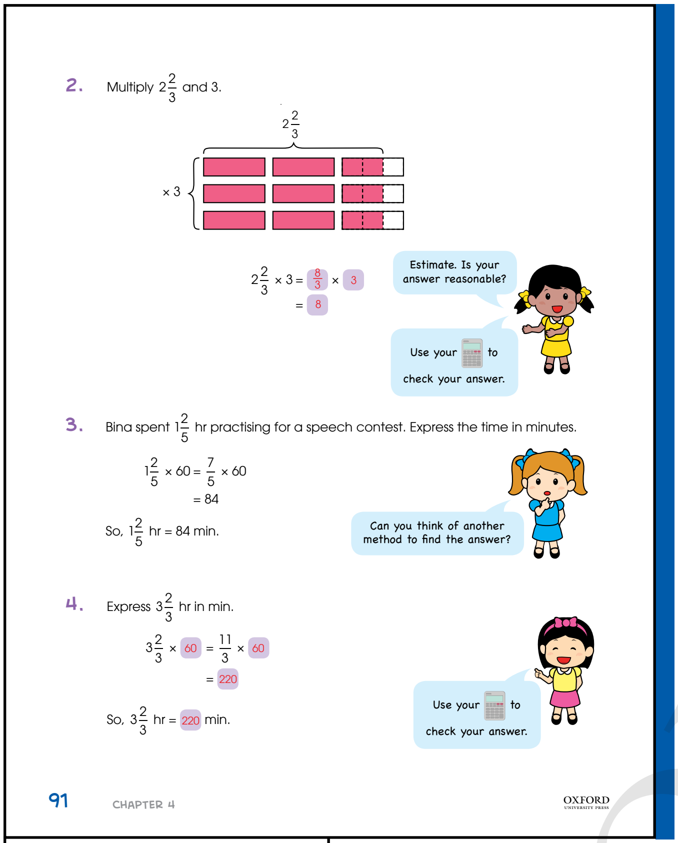
Textbook 5 P90

IN FOCUS

Discuss with pupils how the problem can be solved. Pupils can be asked to draw a model. Elicit that the length is 4 times the breadth of the rectangle.

LET'S LEARN

For Let's Learn 1, use fraction bars to illustrate $1\frac{1}{2} \times 4$. Move the 4 halves to show that they are equivalent to 2 wholes and that $1\frac{1}{2} \times 4 = 6$.



2. Multiply $2\frac{2}{3}$ and 3.

$$2\frac{2}{3} \times 3 = \boxed{\frac{8}{3}} \times \boxed{3}$$
$$= \boxed{8}$$

3. Bina spent $1\frac{2}{5}$ hr practising for a speech contest. Express the time in minutes.

$$1\frac{2}{5} \times 60 = \frac{7}{5} \times 60$$
$$= 84$$

So, $1\frac{2}{5}$ hr = 84 min.

4. Express $3\frac{2}{3}$ hr in min.

$$3\frac{2}{3} \times \boxed{60} = \frac{11}{3} \times \boxed{60}$$
$$= \boxed{220}$$

So, $3\frac{2}{3}$ hr = $\boxed{220}$ min.

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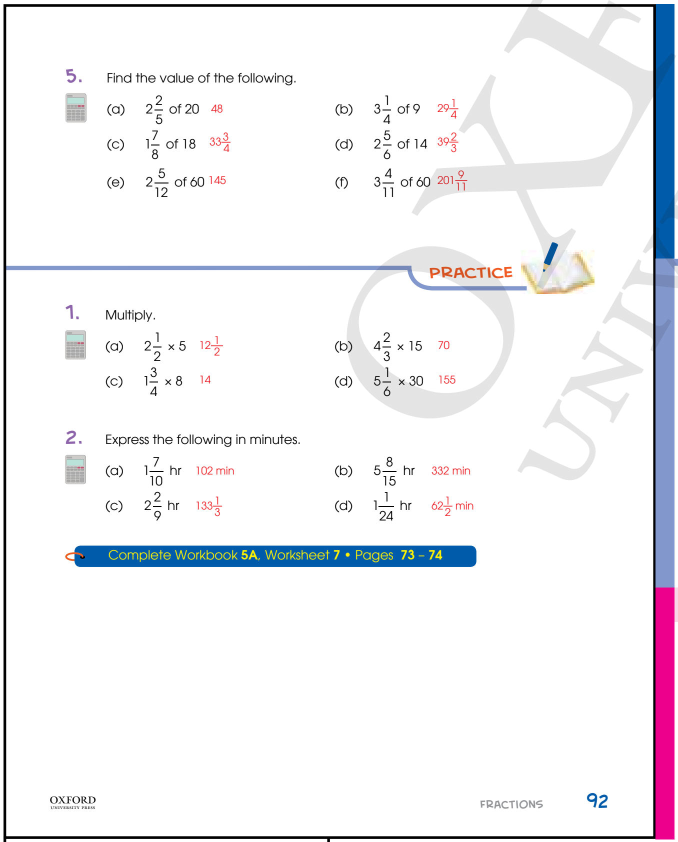
Textbook 5 P91

Repeat the process for Let's Learn 2. Ask pupils how many wholes they can obtain from the thirds. Allow pupils to check their answers using their calculators.

For Let's Learn 3, show that $1\frac{2}{5}$ hr is $1\frac{2}{5}$ of 1 hr, which is the same as $1\frac{2}{5}$ of 60 min.

For Let's Learn 4, give pupils sufficient time to work through the example before going through. Ask pupils to check their answers using their calculators.



5. Find the value of the following.

(a) $2\frac{2}{5}$ of 20 48

(b) $3\frac{1}{4}$ of 9 $29\frac{1}{4}$

(c) $1\frac{7}{8}$ of 18 $33\frac{3}{4}$

(d) $2\frac{5}{6}$ of 14 $39\frac{2}{3}$

(e) $2\frac{5}{12}$ of 60 145

(f) $3\frac{4}{11}$ of 60 $201\frac{9}{11}$

PRACTICE

1. Multiply.

(a) $2\frac{1}{2} \times 5$ $12\frac{1}{2}$

(b) $4\frac{2}{3} \times 15$ 70

(c) $1\frac{3}{4} \times 8$ 14

(d) $5\frac{1}{6} \times 30$ 155

2. Express the following in minutes.

(a) $1\frac{7}{10}$ hr 102 min

(b) $5\frac{8}{15}$ hr 332 min

(c) $2\frac{2}{9}$ hr $133\frac{1}{3}$

(d) $1\frac{1}{24}$ hr $62\frac{1}{2}$ min

Complete Workbook **5A**, Worksheet **7** • Pages **73 – 74**

OXFORD UNIVERSITY PRESS FRACTIONS 92

Textbook 5 P92

For Let's Learn 5, pupils are to work on the questions using their calculators. Give pupils sufficient time to work through the example before going through.

PRACTICE

Work with pupils on the practice questions.

Independent seatwork

Assign pupils to complete Worksheet 7 (Workbook 5A P73 – 74).

Worksheet 7 (Workbook 5A P73 – 74)

1. (a) 32
   (b) 135
   (c) 55
   (d) 40
   (e) 63
   (f) $3\frac{1}{2}$
   (g) $11\frac{1}{4}$
   (h) $247\frac{1}{2}$

2. (a) $6\frac{7}{10} \times 60 = 402$ min
   (b) $5\frac{5}{12} \times 60 = 325$ min
   (c) $3\frac{2}{15} \times 60 = 188$ min
   (d) $6\frac{2}{3} \times 60 = 400$ min

3. $1\frac{2}{5} \times 4 = 5\frac{3}{5}$ kg

4. $4\frac{1}{2}$ m × 3 m = $13\frac{1}{2}$ m^2

LESSON PLAN

Specific Learning Focus

- Multiply a fraction and a whole number.
- Multiply a proper fraction and an improper fraction.
- Multiply a mixed number and a whole number.
- Multiply two proper fractions.
- Multiply two improper fractions.

Suggested Duration

Lesson 5: 3 periods
Lesson 6: 4 periods
Lesson 7: 2 periods

Prior Learning

Pupils should be aware of multiplication of a fraction with a whole number (fraction of a set). They will be required to link this concept to the multiplications in these lessons.

Pre-emptive Pitfalls

Multiple strategies are employed in these lessons. There is no fixed correct or easiest method when it comes to multiplication of fractions. While bar modelling helps in visualising the fractions and understanding the equivalence between two fractions, the cancellation method is applied when there are common factors between the numerators and denominators.

Introduction

Fractions can be multiplied by (i) a whole number, (ii) another fraction, or (iii) a mixed number. In lessons 5 to 7, the multiplication involves a fraction and a whole number (Lesson 5), two proper fractions (Lesson 6), a mixed number and a whole number (Lesson 7). Fraction discs and fraction bars are used as visual manipulatives. In Lesson 5 (Let's Learn 1 in Textbook 5 P81), the unitary method and cancellation method (Let's Learn 2 in Textbook 5 P82) are emphasised. In Lesson 6 (Let's Learn 2 in Textbook 5 P86), paper folding is easily used to explain how $\frac{1}{2}$ of $\frac{1}{4}$ makes 1 eighth. Mathematically the numerators are multiplied with each other and the denominators are multiplied with each other, giving the answer as $\frac{1}{8}$. Guide pupils to see that before proceeding to multiply the numerator and denominator, they should check if there are common factors between the numerator and denominator, if there are, then the cancellation method should be used.

Problem Solving

Encourage the use of calculators to check the answers and the working of each step. In Lesson 7, the mixed number must first be converted to an improper fraction before the cancellation method can be used.

Activities

Do the questions in 'Practice' (Textbook 5 P84, 89, 92) as grouped assignments and go through the corrections on the board. The group with the greatest number of correct answers wins.

Resources

- fraction discs (Activity Handbook 5 P19)
- mini whiteboard
- markers
- calculator

Mathematical Communication Support

Elicit individual responses when doing the sums in 'Let's Learn' on the board. Prompt them by asking:

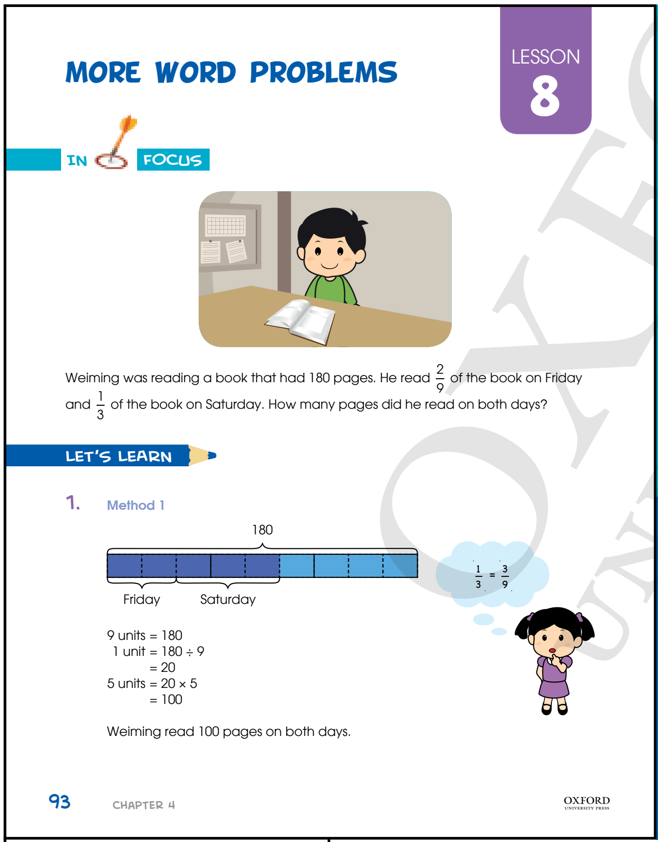
- Are there common factors between the numerator and denominator?
- Can the cancellation method be employed?
- Why do we need to convert mixed numbers to improper fractions when doing multiplication and division and not necessarily when doing addition and subtraction?
- $\frac{2}{3}$ of an hour also means $\frac{2}{3}$ of 60 minutes. Why is that so? What is the difference between the actual quantity in their specific units and the fraction which has no units?

LESSON
8

MORE WORD PROBLEMS

LEARNING OBJECTIVE

1. Solve word problems involving fractions.



MORE WORD PROBLEMS

LESSON
8

IN FOCUS

Weiming was reading a book that had 180 pages. He read $\frac{2}{9}$ of the book on Friday and $\frac{1}{3}$ of the book on Saturday. How many pages did he read on both days?

LET'S LEARN

1. Method 1

9 units = 180
1 unit = 180 ÷ 9
= 20
5 units = 20 × 5
= 100

Weiming read 100 pages on both days.

93 CHAPTER 4 OXFORD UNIVERSITY PRESS

Textbook 5 P93

IN FOCUS

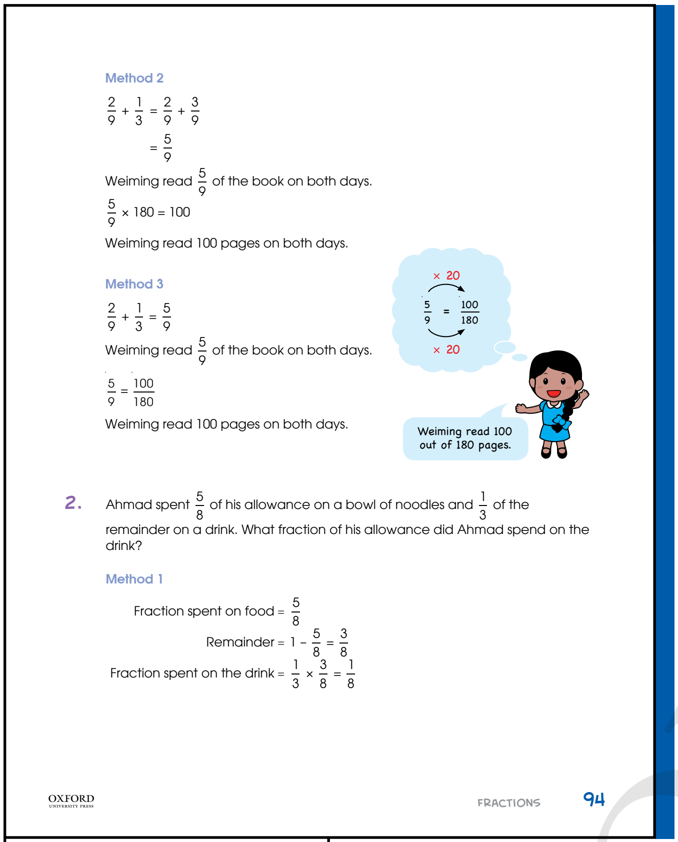
Discuss with pupils how the problem can be solved. Guide pupils in drawing a model.

Ask:

- How many parts do you divide the model into?
- How many parts represent the number of pages Weiming read on Friday?
- How many parts represent the number of pages Weiming read on Saturday?
- What other information do you know?

LET'S LEARN

Ask pupils to check if their models are the same as the one drawn on P93. Guide pupils through the other two methods. Revisit equivalent fractions and common multiples if necessary.



Method 2

$\frac{2}{9} + \frac{1}{3} = \frac{2}{9} + \frac{3}{9}$

$= \frac{5}{9}$

Weiming read $\frac{5}{9}$ of the book on both days.

$\frac{5}{9} \times 180 = 100$

Weiming read 100 pages on both days.

Method 3

$\frac{2}{9} + \frac{1}{3} = \frac{5}{9}$

Weiming read $\frac{5}{9}$ of the book on both days.

$\frac{5}{9} = \frac{100}{180}$

Weiming read 100 pages on both days.

$\overset{\times 20}{\frac{5}{9} = \frac{100}{180}}$ × 20

Weiming read 100 out of 180 pages.

2. Ahmad spent $\frac{5}{8}$ of his allowance on a bowl of noodles and $\frac{1}{3}$ of the remainder on a drink. What fraction of his allowance did Ahmad spend on the drink?

Method 1

Fraction spent on food = $\frac{5}{8}$

Remainder = $1 - \frac{5}{8} = \frac{3}{8}$

Fraction spent on the drink = $\frac{1}{3} \times \frac{3}{8} = \frac{1}{8}$

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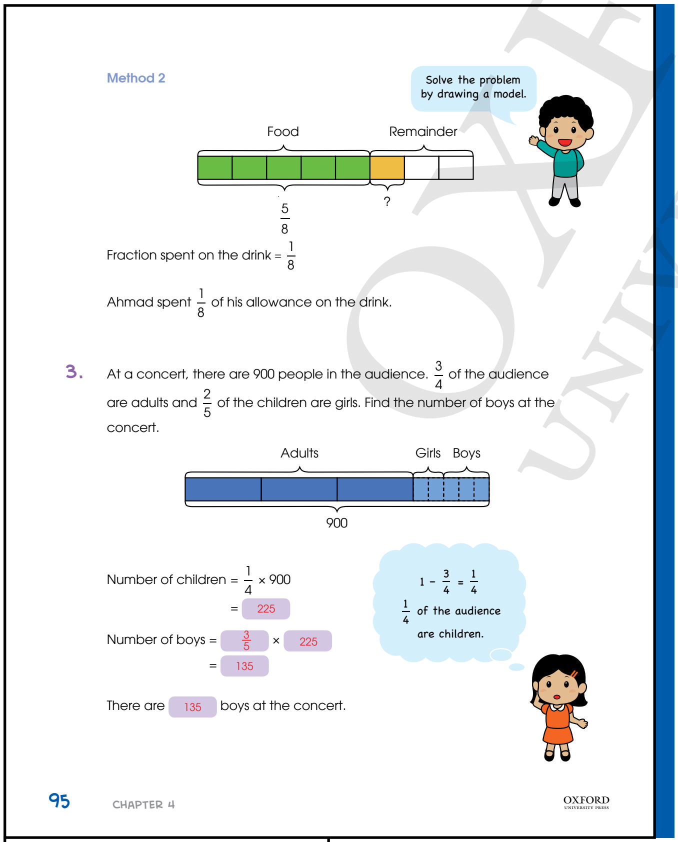
FRACTIONS 94

Textbook 5 P94

For Let's Learn 2, guide pupils through both methods. For the first method, review the earlier lessons on multiplying two fractions. Guide pupils to see that $\frac{1}{3}$ of the remainder is the same as $\frac{1}{3}$ × remainder.



Method 2

Solve the problem by drawing a model.

Food

Remainder

$\frac{5}{8}$

?

Fraction spent on the drink = $\frac{1}{8}$

Ahmad spent $\frac{1}{8}$ of his allowance on the drink.

3. At a concert, there are 900 people in the audience. $\frac{3}{4}$ of the audience are adults and $\frac{2}{5}$ of the children are girls. Find the number of boys at the concert.

Adults

Girls

Boys

900

Number of children = $\frac{1}{4} \times 900$

= $\boxed{225}$

Number of boys = $\boxed{\frac{3}{5}} \times \boxed{225}$

= $\boxed{135}$

There are $\boxed{135}$ boys at the concert.

$1 - \frac{3}{4} = \frac{1}{4}$

$\frac{1}{4}$ of the audience are children.

95 CHAPTER 4

OXFORD UNIVERSITY PRESS

Textbook 5 P95

For the second method, ask pupils to illustrate the solution using a model.

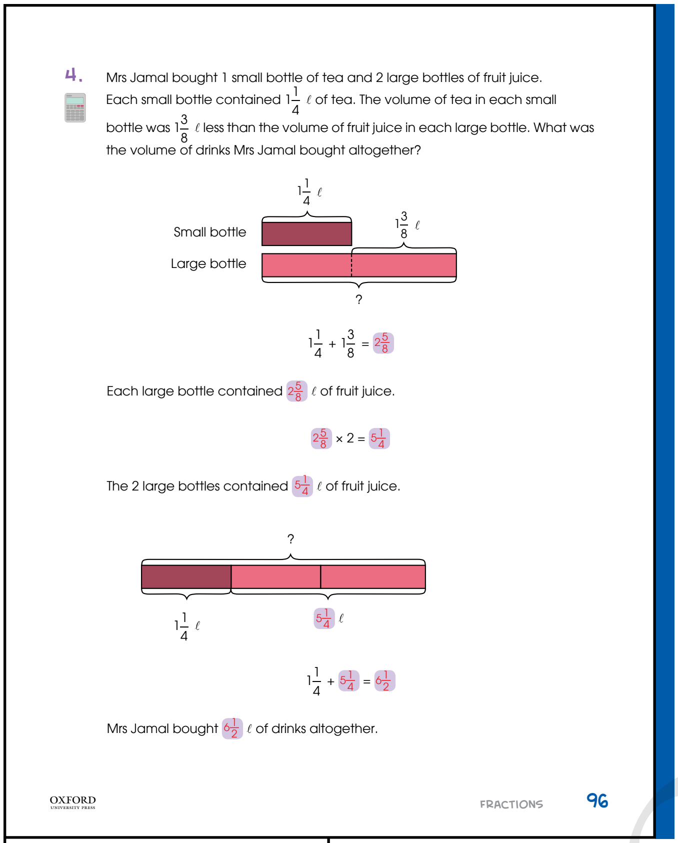
Ask:

- How many units do you divide the model into?
- How many units represent the amount spent on food?
- How many units are left? Which part represents the remainder?
- How many units is $\frac{1}{3}$ of the remainder?
- How is Let's Learn 2 different from 1?

For Let's Learn 3, guide the pupils step-by-step and prompt the class for the answers to each blank.

Ask:

- How many units do you divide the model into?
- How many units represent the adults?
- How many units represent the children?
- $\frac{2}{5}$ of the children are girls. How many parts do you need to further divide the unit representing the children?
- What other information do you have?
- What is another way to solve the problem in another way?



4. Mrs Jamal bought 1 small bottle of tea and 2 large bottles of fruit juice. Each small bottle contained $1\frac{1}{4}$ ℓ of tea. The volume of tea in each small bottle was $1\frac{3}{8}$ ℓ less than the volume of fruit juice in each large bottle. What was the volume of drinks Mrs Jamal bought altogether?

$$1\frac{1}{4} + 1\frac{3}{8} = \boxed{2\frac{5}{8}}$$

Each large bottle contained $\boxed{2\frac{5}{8}}$ ℓ of fruit juice.

$$\boxed{2\frac{5}{8}} \times 2 = \boxed{5\frac{1}{4}}$$

The 2 large bottles contained $\boxed{5\frac{1}{4}}$ ℓ of fruit juice.

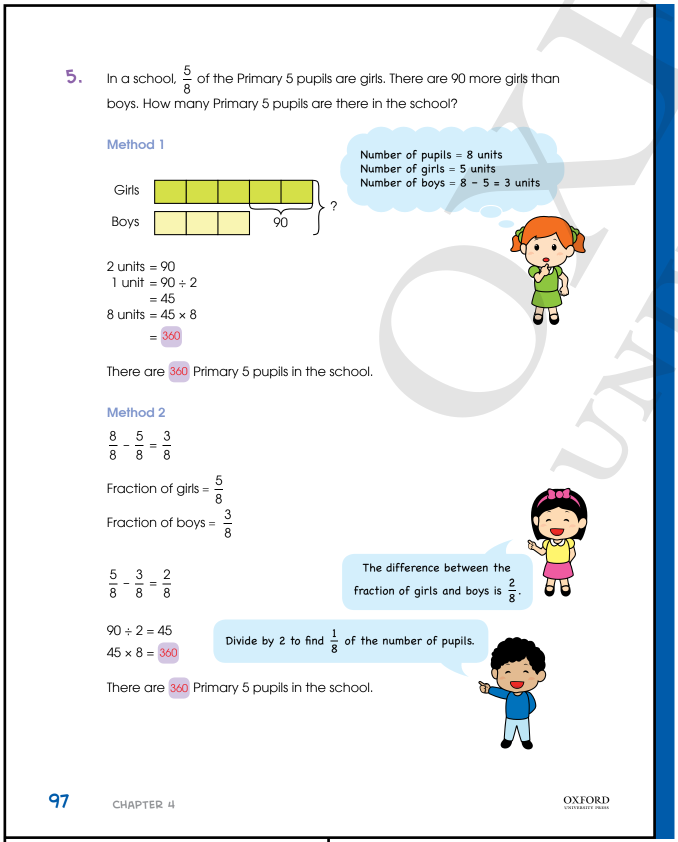
$$1\frac{1}{4} + \boxed{5\frac{1}{4}} = \boxed{6\frac{1}{2}}$$

Mrs Jamal bought $\boxed{6\frac{1}{2}}$ ℓ of drinks altogether.

OXFORD UNIVERSITY PRESS FRACTIONS 96

Textbook 5 P96

For Let's Learn 4, give pupils sufficient time to work out the solutions before going through. Allow pupils to use their calculators for this example.



5. In a school, $\frac{5}{8}$ of the Primary 5 pupils are girls. There are 90 more girls than boys. How many Primary 5 pupils are there in the school?

Method 1

Number of pupils = 8 units
Number of girls = 5 units
Number of boys = 8 − 5 = 3 units

2 units = 90
1 unit = 90 ÷ 2
= 45
8 units = 45 × 8
= $\boxed{360}$

There are $\boxed{360}$ Primary 5 pupils in the school.

Method 2

$$\frac{8}{8} - \frac{5}{8} = \frac{3}{8}$$

Fraction of girls = $\frac{5}{8}$

Fraction of boys = $\frac{3}{8}$

$$\frac{5}{8} - \frac{3}{8} = \frac{2}{8}$$

The difference between the fraction of girls and boys is $\frac{2}{8}$.

90 ÷ 2 = 45
45 × 8 = $\boxed{360}$

Divide by 2 to find $\frac{1}{8}$ of the number of pupils.

There are $\boxed{360}$ Primary 5 pupils in the school.

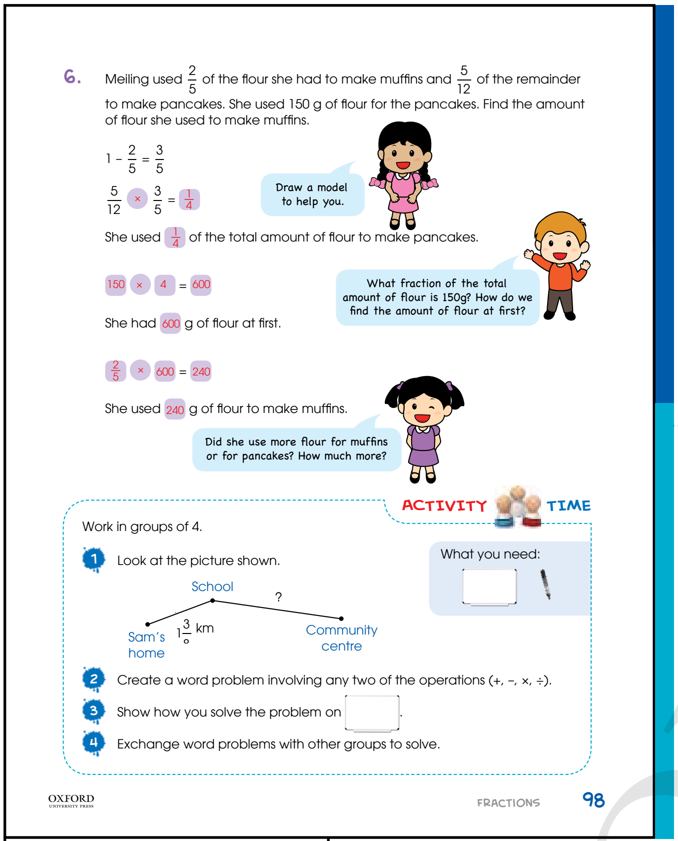
97 CHAPTER 4 OXFORD UNIVERSITY PRESS

Textbook 5 P97

For Let's Learn 5, guide pupils through the two methods shown. For the first method, prompt pupils with these questions:

- What kind of model should you draw? Why?
- What information do you know?
- What do you need to find out?

For the second method, guide pupils to see that 1 whole is made up of 8 eighths. This method involves the subtraction of two related fractions. Lead pupils to see that the difference between the number of girls and boys is represented by two units. For class discussion, highlight common mistakes and correct pupils' misconceptions.



6. Meiling used $\frac{2}{5}$ of the flour she had to make muffins and $\frac{5}{12}$ of the remainder to make pancakes. She used 150 g of flour for the pancakes. Find the amount of flour she used to make muffins.

$1 - \frac{2}{5} = \frac{3}{5}$

$\frac{5}{12} \times \frac{3}{5} = \frac{1}{4}$

She used $\frac{1}{4}$ of the total amount of flour to make pancakes.

$150 \times 4 = 600$

She had 600 g of flour at first.

$\frac{2}{5} \times 600 = 240$

She used 240 g of flour to make muffins.

ACTIVITY TIME

Work in groups of 4.

What you need:

1. Look at the picture shown.

2. Create a word problem involving any two of the operations (+, −, ×, ÷).
3. Show how you solve the problem on .
4. Exchange word problems with other groups to solve.

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FRACTIONS 98

Textbook 5 P98

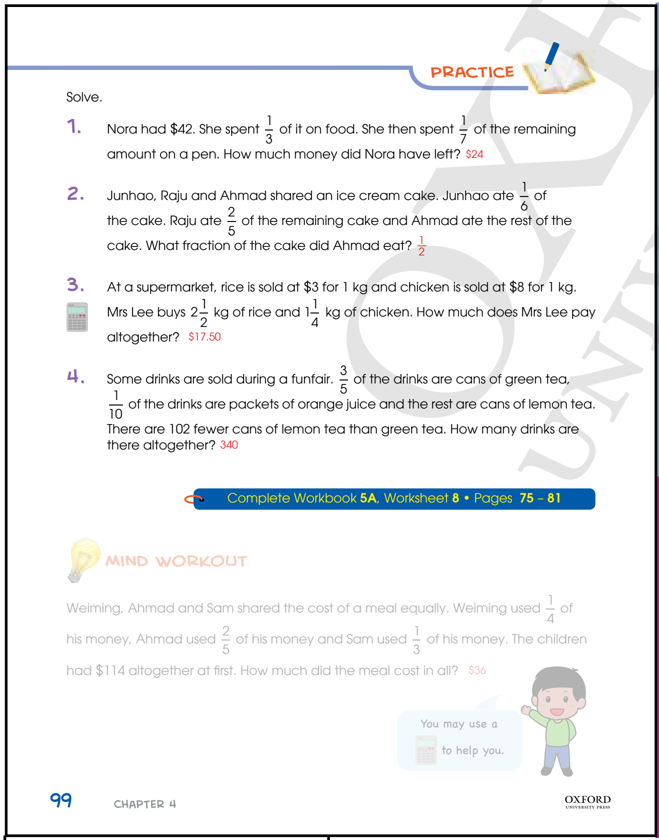
For Let's Learn 6, ask:

- How many units do you divide the model into?
- How many units represent the amount of flour used to make muffins?
- How many units represent the remainder?
- $\frac{5}{12}$ of the remaining flour is used to make pancakes. How many parts do you need to further divide the remainder into?
- What other information do you have?
- Can you solve the problem in another way?

ACTIVITY TIME

Get pupils to create word problems in groups based on the given information. A sample question is:

The distance between Sam's home and his school is $1\frac{3}{8}$ km. The distance between his school and the community centre is twice the distance between his home and his school. If Sam walks from his home to his school, then to the community centre, how far does he walk altogether?



PRACTICE

Solve.

1. Nora had \$42. She spent $\frac{1}{3}$ of it on food. She then spent $\frac{1}{7}$ of the remaining amount on a pen. How much money did Nora have left? \$24

2. Junhao, Raju and Ahmad shared an ice cream cake. Junhao ate $\frac{1}{6}$ of the cake. Raju ate $\frac{2}{5}$ of the remaining cake and Ahmad ate the rest of the cake. What fraction of the cake did Ahmad eat? $\frac{1}{2}$

3. At a supermarket, rice is sold at \$3 for 1 kg and chicken is sold at \$8 for 1 kg. Mrs Lee buys $2\frac{1}{2}$ kg of rice and $1\frac{1}{4}$ kg of chicken. How much does Mrs Lee pay altogether? \$17.50

4. Some drinks are sold during a funfair. $\frac{3}{5}$ of the drinks are cans of green tea, $\frac{1}{10}$ of the drinks are packets of orange juice and the rest are cans of lemon tea. There are 102 fewer cans of lemon tea than green tea. How many drinks are there altogether? 340

Complete Workbook **5A**, Worksheet **8** • Pages **75 – 81**

MIND WORKOUT

Weiming, Ahmad and Sam shared the cost of a meal equally. Weiming used $\frac{1}{4}$ of his money, Ahmad used $\frac{2}{5}$ of his money and Sam used $\frac{1}{3}$ of his money. The children had \$114 altogether at first. How much did the meal cost in all? \$36

99 CHAPTER 4

OXFORD UNIVERSITY PRESS

Textbook 5 P99

PRACTICE

Allow pupils to work in groups on the practice questions and selected examples from Worksheet 8.

Independent seatwork

Assign pupils to complete Worksheet 8 (Workbook 5A P75 – 81).

Answers Worksheet 8 (Workbook 5A P75 – 81)

1. $1 - \frac{5}{12} = \frac{7}{12}$

   $\frac{2}{7} \times \frac{7}{12} = \frac{1}{6}$

2. $3 \times 24 = 72$

   $1 - \frac{4}{9} = \frac{5}{9}$

   $\frac{5}{9} \times 72 = 40$

3. $1\frac{1}{2} \times \$22 = \$33$

   $2\frac{1}{5} \times \$10 = \$22$

   $\$33 + \$22 = \$55$

4. $1 - \frac{2}{5} = \frac{3}{5}$

   $\frac{3}{5} - \frac{3}{10} = \frac{3}{10}$

   $\frac{3}{10} \times \$3000 = \$900$

5. $1 - \frac{2}{3} = \frac{1}{3}$

   $1 - \frac{2}{5} = \frac{3}{5}$

   $\frac{3}{5} \times \frac{1}{3} = \frac{1}{5}$

6. $1 - \frac{3}{4} = \frac{1}{4}$

   $1 - \frac{1}{10} = \frac{9}{10}$

   $\frac{9}{10} \times \frac{1}{4} = \frac{9}{40}$

   $\frac{9}{40} \times 40 = 9$

7. $1 - \frac{3}{7} = \frac{4}{7}$

   $\frac{1}{2} \times \frac{4}{7} = \frac{2}{7}$

   $\frac{2}{7} \times 280 = 80$

8. $1 - \frac{2}{3} = \frac{1}{3}$

   $\frac{5}{6} \times \frac{1}{3} = \frac{5}{18}$

   $\frac{2}{3} - \frac{5}{18} = \frac{12}{18} - \frac{5}{18}$

   $= \frac{7}{18}$

   $\$35 \div 7 = \$5$

   $\$5 \times 18 = \$90$

9. 1 unit = 8

   10 units = 8 × 10

   = 80

10. $1\frac{4}{5}$ kg + $2\frac{1}{2}$ kg = $4\frac{3}{10}$ kg

    $3 \times 1\frac{4}{5}$ kg = $5\frac{2}{5}$ kg

    $5 \times 4\frac{3}{10}$ kg = $21\frac{1}{2}$ kg

    $5\frac{2}{5}$ kg ÷ $21\frac{1}{2}$ kg = $26\frac{9}{10}$ kg

11. $1 - \frac{9}{10} = \frac{1}{10}$

    $\frac{9}{10} - \frac{1}{10} = \frac{8}{10}$

    $72 \div 8 = 9$

    $9 \times 10 = 90$

12. $1 - \frac{1}{4} = \frac{3}{4}$

    $\frac{3}{4} - \frac{2}{5} = \frac{7}{20}$

    $\frac{7}{20} - \frac{1}{4} = \frac{1}{10}$

    $18 \times 10 = 180$

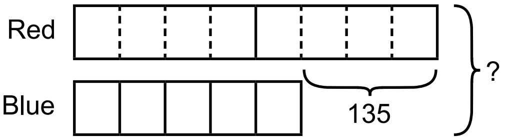
13. $1 - \frac{7}{9} = \frac{2}{9}$

    $\frac{2}{9} \times 1890 = 420$

    $420 \div 4 = 105$

    $105 \times 3 = 315$

14.



2 × 4 units = 8 units
8 units − 5 units = 3 units
3 units = 135
8 units + 5 units = 13 units
1 unit = 135 ÷ 3
= 45
13 units = 45 × 13
= 585

LESSON PLAN

Chapter 4
Lessons 4 & 8

Specific Learning Focus

- Solve word problems involving division of numbers to give fractions, adding mixed numbers and subtracting mixed numbers.
- Solve word problems involving fractions.

Suggested Duration

Lesson 4: 4 periods
Lesson 8: 8 periods

Prior Learning

Pupils have prior knowledge of solving word problems involving fractions.

Pre-emptive Pitfalls

In lessons 4 and 8, the word problems cannot be solved in just 1 step. Pupils will be required to carry out at least two operations to obtain the answer. Pupils may find it challenging to analyse the word problem and come up with the steps to solve the word problem. If they are not well-versed with carrying out the steps of each operation, they will likely face difficulty in these lessons.

Introduction

The same format and template applies when approaching any word problem, however the sums in these lessons require two steps. In Let's Learn 3 (Textbook 5 P80), the number of apple pies are first found out by subtraction, and then the answer found is added to the number of pecan pies provided in the question to get the total number of pies. Similarly in Let's Learn 1 of Lesson 8 (Textbook 5 P93), unitary method and bar modelling are applied to first find the total in fractional value then multiplied by the whole number to find the actual quantity. The remainder concept is also explored in this lesson. In Let's Learn 2 (Textbook 5 P94), the remainder fraction is first found by subtracting the fraction from one whole. This is then multiplied to the other fraction to get the answer. In Let's Learn 3 (Textbook 5 P95), since $\frac{3}{4}$ of the audience are adults, $\frac{3}{4}$ taken away from 1 whole gives $\frac{1}{4}$, which means $\frac{1}{4}$ of the audience are children, therefore there are $\frac{1}{4} \times 900 = 225$ children. Then, since $\frac{2}{5}$ of the children are girls, $\frac{2}{5}$ taken away from 1 whole gives $\frac{3}{5}$, which means $\frac{3}{5}$ of the children are boys. Lastly, taking $\frac{3}{5}$ of 225 gives the number of boys to be 135. Let's Learn 5 (Textbook 5 P97) requires unitary method as '90 more girls than boys' means that 2 units equals 90 hence 8 units in total equals 45×8. Guide the pupils to understand that $\frac{5}{8}$ of the pupils are girls means $\frac{3}{8}$ of the pupils are boys since $1 - \frac{5}{8} = \frac{3}{8}$.

Problem Solving

Word problems develop pupils' analytical skills and sharpen their logical and critical thinking.

Activities

Get pupils to roleplay the story described in the word problem using fraction bars, mini whiteboard, together with real-life objects.

Resources

- mini whiteboard
- markers
- 4-step approach to problem solving template (Activity Handbook 5 P20)

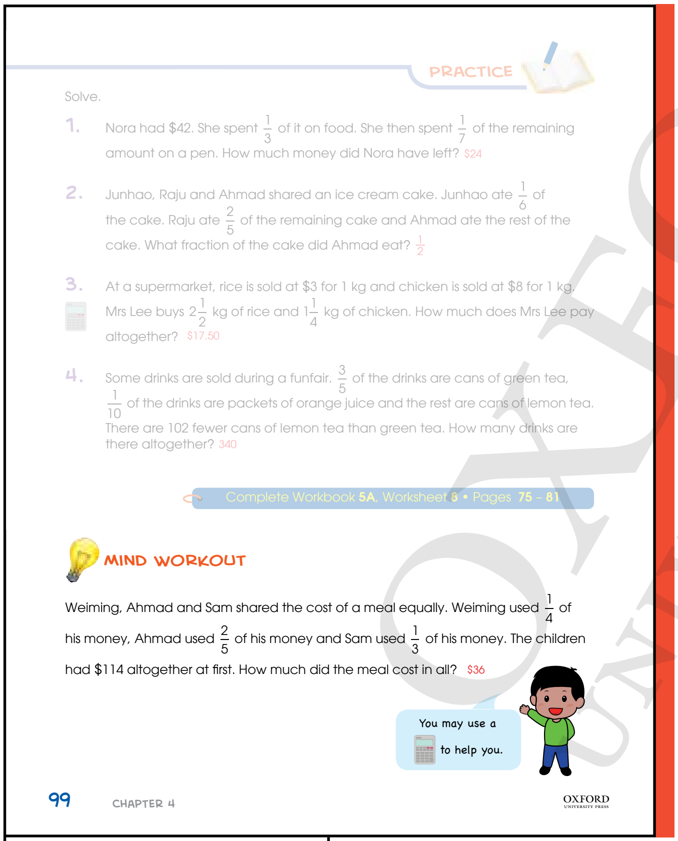
Mathematical Communication Support

Teach by asking pupils for the information given in the question. Encourage pupils to highlight the important information. Prompt them by asking:

- How many units do we divide the bar into?
- What operation should be used to find the answer?
- How many parts of the bar represent what?

Encourage class discussions for alternative strategies.

PROBLEM SOLVING, MATHS JOURNAL AND PUPIL REVIEW



PRACTICE

Solve.

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Complete Workbook **5A**, Worksheet **8** • Pages **75 – 81**

MIND WORKOUT

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99 CHAPTER 4 OXFORD UNIVERSITY PRESS

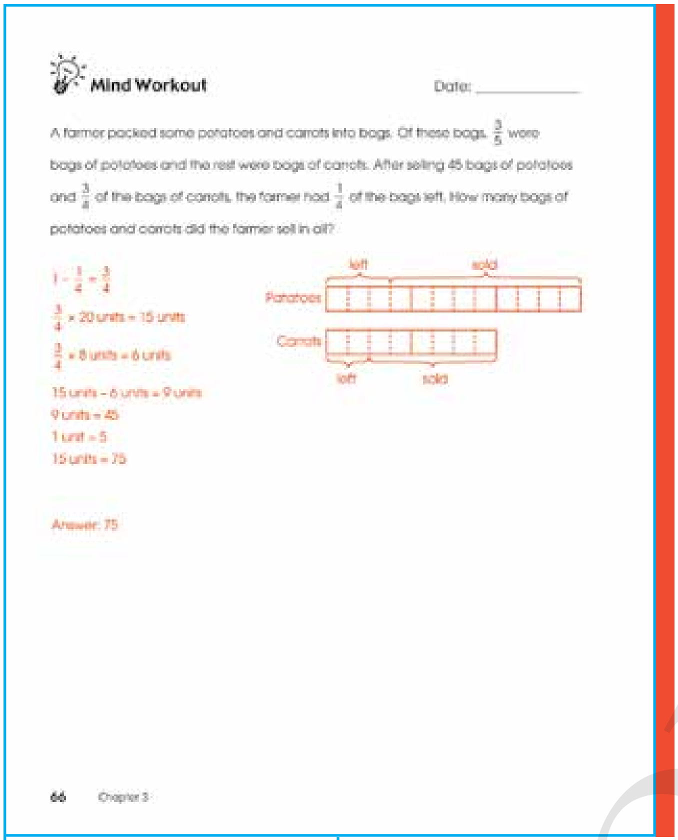
Textbook 5 P99

MIND WORKOUT

If pupils have difficulties solving the problem, facilitate by providing the following guidance:

- Draw a model showing that the 3 children paid the same amount of money for the meal.
- For Weiming, what fraction of his money does the bar represent? How many more parts must you draw to show his total amount of money? Repeat the steps for Sam and Ahmad.
- How many units are there altogether?

Pupils may work in groups to solve the problem. Allow pupils to check their answers using their calculators.



Mind Workout Date: ____________

A farmer packed some potatoes and carrots into bags. Of these bags, $\frac{3}{5}$ were bags of potatoes and the rest were bags of carrots. After selling 45 bags of potatoes and $\frac{3}{4}$ of the bags of carrots, the farmer had $\frac{1}{4}$ of the bags left. How many bags of potatoes and carrots did the farmer sell in all?

$1 - \frac{1}{4} = \frac{3}{4}$

$\frac{3}{4} \times 20$ units $= 15$ units

$\frac{3}{4} \times 8$ units $= 6$ units

15 units – 6 units = 9 units

9 units = 45

1 unit = 5

15 units = 75

Answer: 75

66 Chapter 3

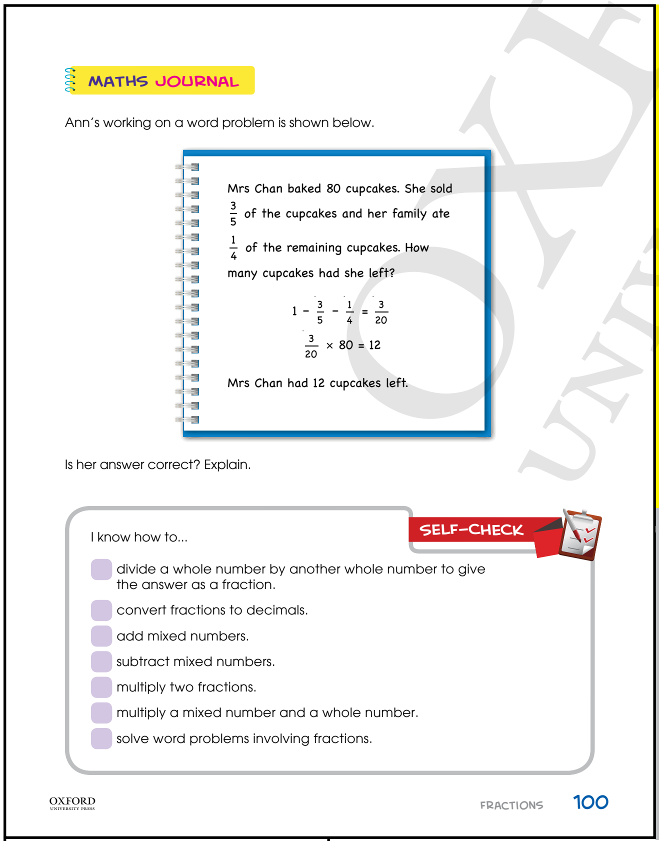
Workbook 5A P66

Mind Workout

If pupils face difficulties solving the problem, facilitate by providing the following guidance:

- How many units should you divide the model into?
- How many units represent the bags of potatoes?
- How many units represent the bags of carrots?
- $\frac{3}{4}$ of the bags of carrots are sold. How many parts do you need to further divide the 2 units into?
- How many parts are there in total?

- Pupils may work in groups to solve the problem.



MATHS JOURNAL

Ann's working on a word problem is shown below.

Mrs Chan baked 80 cupcakes. She sold $\frac{3}{5}$ of the cupcakes and her family ate $\frac{1}{4}$ of the remaining cupcakes. How many cupcakes had she left?

$1 - \frac{3}{5} - \frac{1}{4} = \frac{3}{20}$

$\frac{3}{20} \times 80 = 12$

Mrs Chan had 12 cupcakes left.

Is her answer correct? Explain.

SELF-CHECK

I know how to...

☐ divide a whole number by another whole number to give the answer as a fraction.
☐ convert fractions to decimals.
☐ add mixed numbers.
☐ subtract mixed numbers.
☐ multiply two fractions.
☐ multiply a mixed number and a whole number.
☐ solve word problems involving fractions.

OXFORD UNIVERSITY PRESS FRACTIONS 100

Textbook 5 P100

MATHS JOURNAL

Get pupils to illustrate the solution using a model. Give pupils sufficient time to solve the problem using the model. Then, get pupils to examine Ann's working and explain why it is wrong. Lead them to understand that $\frac{1}{4}$ of the total is not equal to $\frac{1}{4}$ of the remainder.

Ask pupils to write the correct working to the problem posed.

SELF-CHECK

Before pupils proceed to do the self-check, review the important concepts by asking for examples learnt for each objective.

The self-check can be done after pupils have completed **Review 4** (Workbook 5A P83 – 88).

Answers Review 4 (Workbook 5A P83 – 88)

1. (a) $\frac{5}{6}$
   (b) $\frac{1}{2}$
   (c) $1\frac{1}{5}$
   (d) $4\frac{1}{2}$
   (e) $1\frac{2}{3}$
   (f) $2\frac{1}{3}$

2. (a) 0.4
   (b) 0.75
   (c) 0.52
   (d) 1.5
   (e) 1.75
   (f) 2.7

3. (a) $3\frac{2}{3}$
   (b) $7\frac{3}{10}$
   (c) $7\frac{2}{15}$
   (d) $6\frac{7}{18}$
   (e) $1\frac{1}{3}$
   (f) $3\frac{13}{20}$
   (g) $2\frac{5}{21}$
   (h) $1\frac{13}{18}$

4. (a) 3
   (b) 12
   (c) 21
   (d) $74\frac{1}{5}$
   (e) $\frac{1}{28}$
   (f) $\frac{5}{16}$
   (g) $\frac{2}{3}$
   (h) $1\frac{1}{14}$

5. (a) 9
   (b) 66
   (c) $4\frac{4}{5}$
   (d) $1\frac{13}{36}$

6. $2 \text{ m} \div 5 = \frac{2}{5} \text{ m}$

7. $10\frac{4}{5} \text{ kg} - 6\frac{3}{10} \text{ kg} = 4\frac{1}{2} \text{ kg}$

8. $\frac{2}{5} \text{ kg} \times \$45 = \$18$

9. $7 \times 12 = 84$
   $1 - \frac{1}{12} = \frac{11}{12}$
   $\frac{11}{12} \times 84 = 77$

10. $1 - \frac{1}{7} = \frac{6}{7}$
    $\frac{6}{7} - \frac{1}{2} = \frac{5}{14}$

11. $1 - \frac{5}{8} = \frac{3}{8}$
    $\frac{1}{6} \times \frac{3}{8} = \frac{1}{16}$
    $1 - \frac{1}{6} = \frac{5}{6}$
    $\frac{5}{6} \times \frac{3}{8} = \frac{5}{16}$
    $\frac{5}{8} - \frac{5}{16} = \frac{5}{16}$
    $90 \div 5 = 18$
    $18 \times 16 = 288$

12. $1 - \frac{2}{3} = \frac{3}{5}$
    $\frac{3}{5} \times \frac{3}{5} = \frac{9}{25}$
    $\frac{2}{5} - \frac{9}{25} = \frac{1}{25}$
    $24 \times 25 = 600$

Answers Revision 1A (Workbook 5A P89 – 95)

1. (a) 137 000; one hundred and thirty-seven thousand; one lakh, thirty-seven thousand
   (b) 2 050 146; two million, fifty thousand, one hundred and forty-six; twenty lakhs, fifty thousand, one hundred and forty-six
   (c) 4 000 099; four million and ninety-nine; forty lakhs and ninety-nine

2. (a) 365 631
   (b) 812 085
   (c) 1 940 766
   (d) 3 015 002

3. (a) Four hundred and ninety-nine thousand, eight hundred and forty-six
   (b) Five lakhs, eleven thousand, two hundred and nine
   (c) Three million, one hundred and fifty-six thousand, nine hundred and thirty-nine
   (d) Seventy-six lakhs, six thousand and one hundred

4. (a) 300
   (b) 705
   (c) 4 000 000
   (d) 60 000

5. (a) 40
   (b) 50 000

6. (a) 97 543
   (b) 123 457
   (c) odd

7. (a) 14
   (b) 924

8. (a) 100
   (b) 1000
   (c) 10
   (d) 100

9. (a) 5410
   (b) 6900
   (c) 270 000
   (d) 22 000
   (e) 9800
   (f) 360 000
   (g) 9400
   (h) 5400
   (i) 66 000
   (j) 140 600
   (k) 465 000
   (l) 7560

10. (a) 90
   (b) 688
   (c) 17
   (d) 43
   (e) 6010
   (f) 255
   (g) 81
   (h) 56
   (i) 2700
   (j) 19
   (k) 161
   (l) 37

Answers Revision 1B (Workbook 5A P96 – 101)

1. (a) 86
   (b) 114
   (c) 56
   (d) 105
   (e) 142
   (f) 240

2. (a) $6m + 5$
   (b) $23 – 7n$
   (c) $4 + 15r$
   (d) $9s + 14$

3. (a) $1\frac{2}{3}$
   (b) $\frac{3}{7}$
   (c) $\frac{2}{9}$
   (d) $\frac{3}{5}$
   (e) $2\frac{4}{5}$
   (f) $1\frac{2}{7}$

4. (a) $6\frac{1}{6}$
   (b) $11\frac{5}{8}$
   (c) $4\frac{5}{18}$
   (d) $1\frac{3}{4}$
   (e) $4\frac{17}{20}$
   (f) $4\frac{1}{6}$

5. (a) 9
   (b) 63
   (c) 81
   (d) 209
   (e) $\frac{4}{15}$
   (f) $\frac{7}{16}$
   (g) 1
   (h) $1\frac{2}{33}$

6. (a) $1\frac{5}{7}$
   (b) $3\frac{1}{9}$
   (c) 87
   (d) 272

7. $4326 - 144 = 4182$
   $4182 \div 2 = 2091$
   $2091 + 144 = 2235$
   $2235 \div 5 = 447$

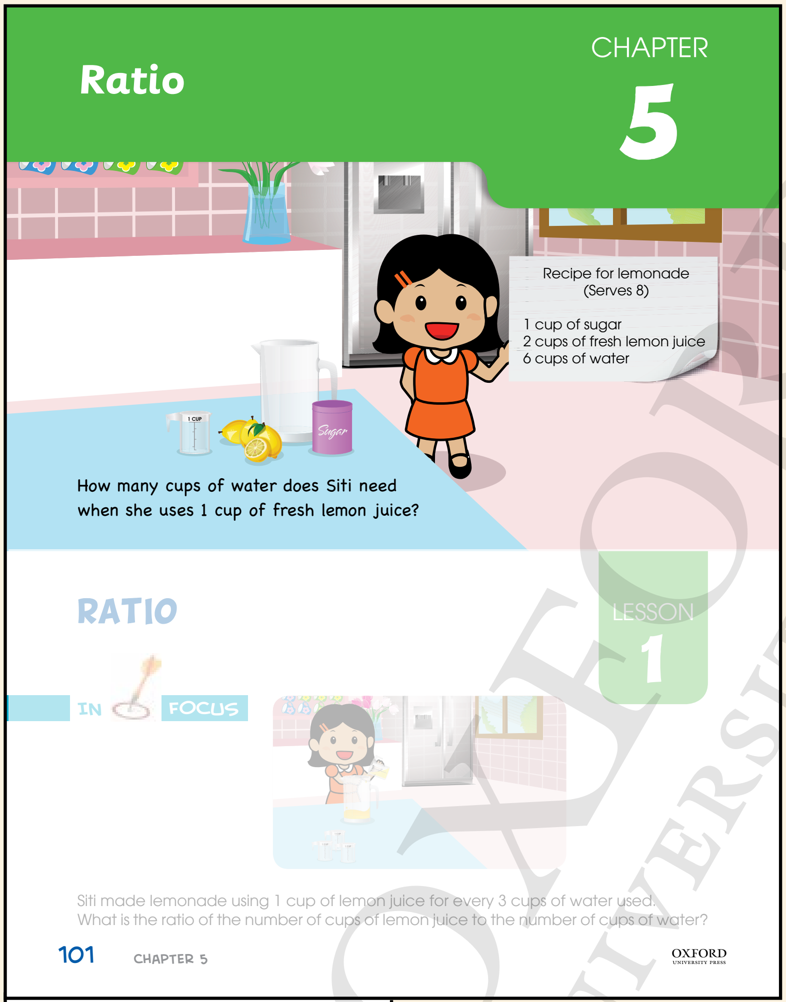
8. $\frac{7q - 2}{2}$

9. $1 - \frac{1}{3} = \frac{2}{3}$
   $\frac{3}{5} \times \frac{2}{3} = \frac{2}{5}$
   $\frac{2}{5} \times 240 = 96$
   $96 \div 4 = 24$

10. $1 - \frac{3}{8} = \frac{5}{8}$
    $\frac{5}{7} \times \frac{5}{8} = \frac{25}{56}$
    $\frac{2}{7} \times \frac{5}{8} = \frac{5}{28}$
    $\frac{25}{56} - \frac{5}{28} = \frac{15}{56}$
    $\frac{15}{56} = \$1125$
    $\frac{1}{56} = \$1125 \div 15$
    $= \$75$
    $\frac{56}{56} = \$75 \times \$56$
    $= \$4200$

RATIO

CHAPTER 5



Ratio

CHAPTER 5

Recipe for lemonade
(Serves 8)

1 cup of sugar
2 cups of fresh lemon juice
6 cups of water

How many cups of water does Siti need when she uses 1 cup of fresh lemon juice?

RATIO

LESSON 1

IN FOCUS

Siti made lemonade using 1 cup of lemon juice for every 3 cups of water used.
What is the ratio of the number of cups of lemon juice to the number of cups of water?

101 CHAPTER 5 OXFORD

Textbook 5 P101

Related Resources

NSPM Textbook 5 (P101 − 119)
NSPM Workbook 5A (P102 − 116)

Materials

Counters, magnetic buttons, equivalent ratio cards, cups, measuring beakers, water, lemon juice

Lesson

Lesson 1	Ratio
Lesson 2	Equivalent Ratios
Lesson 3	Solving Word Problems

Problem Solving, Maths Journal and Pupil Review

INTRODUCTION

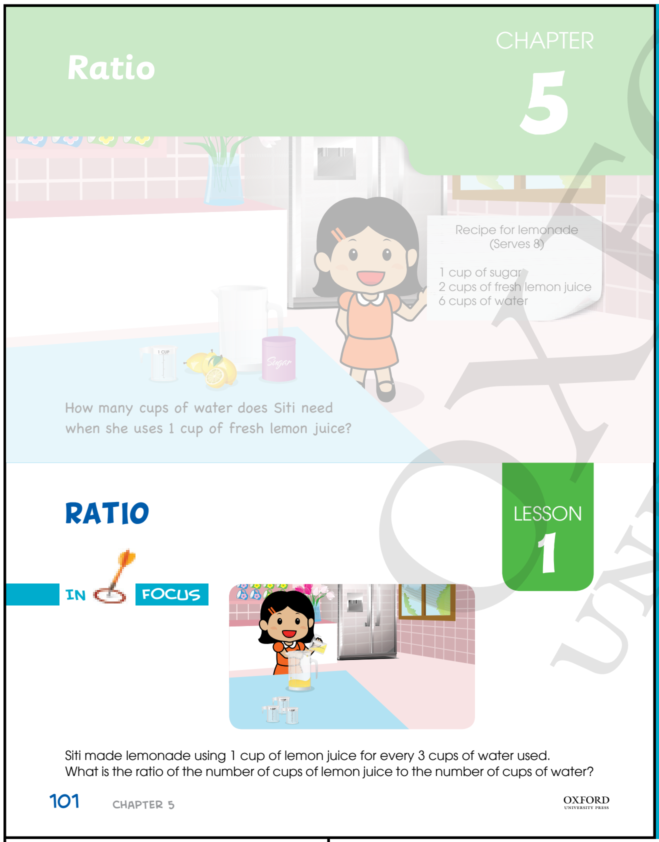
This is the first time pupils learn the concept of ratio. It will be helpful to relate ratio to real-life situations (e.g. in recipes, comparing number of items etc). Some common errors include getting the order of the quantities wrong, assuming an additive relationship between equivalent ratios rather than a multiplicative relationship and comparing quantities with different units. It will be helpful to address these errors when teaching.

LESSON
1

RATIO

LEARNING OBJECTIVES

1. Understand notation and representations of ratios.
2. Interpret a:b and a:b:c, where a, b and c are whole numbers.
3. Find the ratio of two or more given quantities.



Ratio

CHAPTER
5

Recipe for lemonade
(Serves 8)

1 cup of sugar
2 cups of fresh lemon juice
6 cups of water

How many cups of water does Siti need when she uses 1 cup of fresh lemon juice?

RATIO

LESSON
1

IN FOCUS

Siti made lemonade using 1 cup of lemon juice for every 3 cups of water used.
What is the ratio of the number of cups of lemon juice to the number of cups of water?

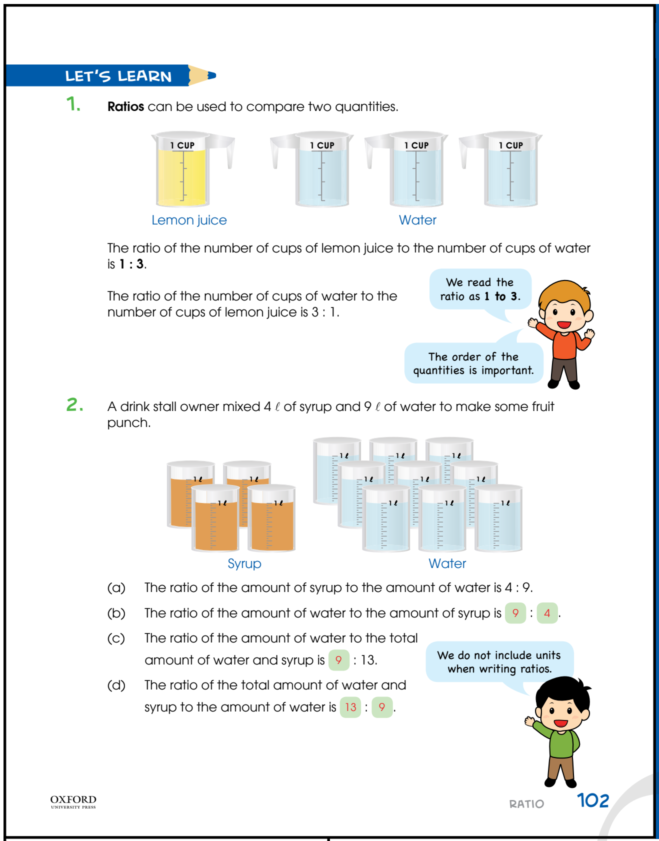
101 CHAPTER 5 OXFORD

Textbook 5 P101

IN FOCUS

Using the Chapter Opener, discuss how many cups of water Siti needs when she uses 1 cup of fresh lemon juice. Teacher can guide pupils to see that since 1 cup of fresh lemon juice is half of the 2 cups stated in the recipe, hence the number of cups of water needed should also be half of what is stated in the recipe.

Refer to the In Focus and ask pupils if they have come across the word ‘ratio’ before.



LET'S LEARN

1. **Ratios** can be used to compare two quantities.

The ratio of the number of cups of lemon juice to the number of cups of water is **1 : 3**.

The ratio of the number of cups of water to the number of cups of lemon juice is 3 : 1.

2. A drink stall owner mixed 4 ℓ of syrup and 9 ℓ of water to make some fruit punch.

(a) The ratio of the amount of syrup to the amount of water is 4 : 9.

(b) The ratio of the amount of water to the amount of syrup is 9 : 4.

(c) The ratio of the amount of water to the total amount of water and syrup is 9 : 13.

(d) The ratio of the total amount of water and syrup to the amount of water is 13 : 9.

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RATIO 102

Textbook 5 P102

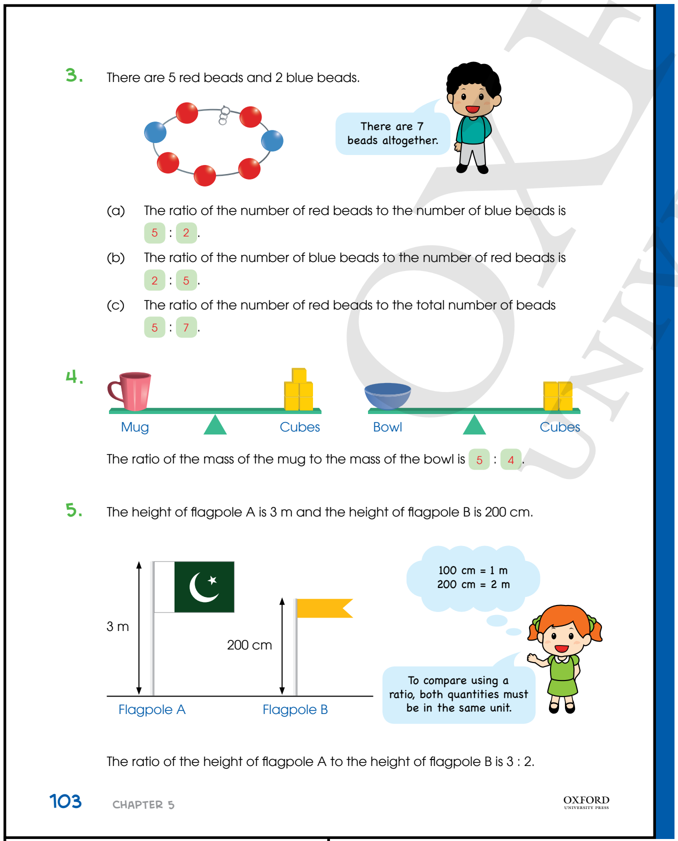
LET'S LEARN

Tell pupils that ratio is used to compare quantities. Since 1 cup of lemon juice is used for every 3 cups of water, the ratio of the number of cups of fresh lemon juice to the number of cups of water is written as 1 : 3. Teach pupils how to read the ratio (1 to 3). The ratio can also be read as 1 is to 3.

Emphasise that the order the quantities are written is important. If pupils write the ratio of the number of cups of fresh lemon juice to the number of cups of water as 3 : 1, it means that 3 cups of lemon juice are used for every cup of water which will make the lemonade too sour.

With the aid of the diagram in Let's Learn 2, guide pupils through the process. Ask:
- What is the amount of syrup needed?
- What is the amount of water needed?
- What is the total amount of water and syrup?

Tell pupils that units are not included when writing ratios.



3. There are 5 red beads and 2 blue beads.

(a) The ratio of the number of red beads to the number of blue beads is 5 : 2.

(b) The ratio of the number of blue beads to the number of red beads is 2 : 5.

(c) The ratio of the number of red beads to the total number of beads 5 : 7.

4\.

The ratio of the mass of the mug to the mass of the bowl is 5 : 4.

5. The height of flagpole A is 3 m and the height of flagpole B is 200 cm.

The ratio of the height of flagpole A to the height of flagpole B is 3 : 2.

103 CHAPTER 5

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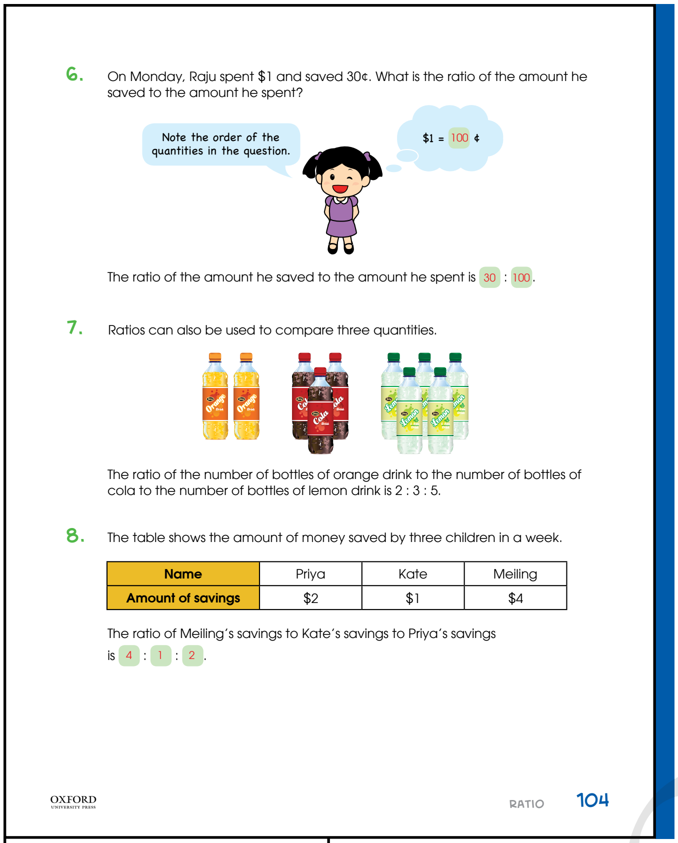
Textbook 5 P103

Guide pupils through Let's Learn 3(a) slowly and prompt the class for answers for each blank. Then give pupils sufficient time to work through 3(b) and (c) before going through with the class.

For Let's Learn 4, prompt pupils to fill in the blanks with guiding questions. Ask:
- The mass of the mug is equal to that of how many cubes?
- The mass of the bowl is equal to that of how many cubes?

For Let's Learn 5, teacher should reinforce the concept that comparison using ratio requires both quantities to be of the same unit. Guide pupils through conversion of units and tell them that they can either convert the height of Flagpole A to centimetres or the height of Flagpole B to metres as long as the units used are standardised. Remind them that 1 m is equivalent to 100 cm.



6. On Monday, Raju spent $1 and saved 30¢. What is the ratio of the amount he saved to the amount he spent?

Note the order of the quantities in the question.

$1 = 100 ¢

The ratio of the amount he saved to the amount he spent is 30 : 100.

7. Ratios can also be used to compare three quantities.

The ratio of the number of bottles of orange drink to the number of bottles of cola to the number of bottles of lemon drink is 2 : 3 : 5.

8. The table shows the amount of money saved by three children in a week.

Name	Priya	Kate	Meiling
Amount of savings	$2	$1	$4

The ratio of Meiling's savings to Kate's savings to Priya's savings is 4 : 1 : 2.

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RATIO 104

Textbook 5 P104

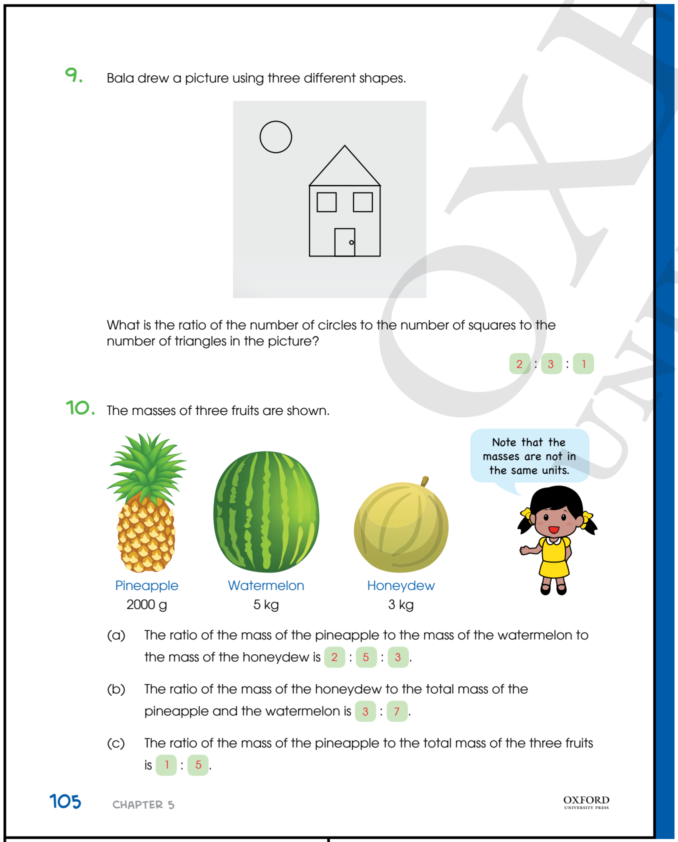
Guide pupils to fill in the blanks in Let's Learn 6. Hint:

- $1 is equivalent to 100¢

Remind pupils that the units of quantities will have to be the same when comparing using a ratio.

Let's Learn 7 involves using ratio to compare 3 quantities. Guide pupils to understand that ratio works the same way even when more than 2 quantities are involved.

Allow pupils to spend some time to solve the problem and fill in the blanks in Let's Learn 8 before going through with the class.



9. Bala drew a picture using three different shapes.

What is the ratio of the number of circles to the number of squares to the number of triangles in the picture?

2 : 3 : 1

10. The masses of three fruits are shown.

Note that the masses are not in the same units.

Pineapple	Watermelon	Honeydew
2000 g	5 kg	3 kg

(a) The ratio of the mass of the pineapple to the mass of the watermelon to the mass of the honeydew is 2 : 5 : 3.

(b) The ratio of the mass of the honeydew to the total mass of the pineapple and the watermelon is 3 : 7.

(c) The ratio of the mass of the pineapple to the total mass of the three fruits is 1 : 5.

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Textbook 5 P105

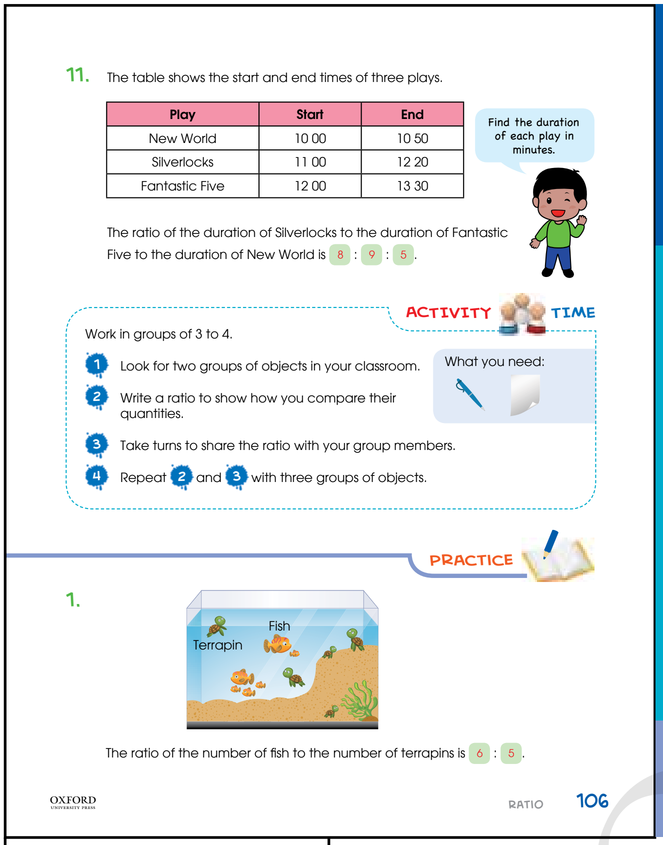
Prompt pupils to fill in the blanks in Let's Learn 9 with some guiding questions. Ask:

- What are the shapes in the diagram?
- How many of each of them are there?

For Let's Learn 10, allow pupils to work in pairs. Guide pupils through the process. Hint:

- Convert the masses to the same units. 1 kg is equivalent to 1000 g.

Give pupils sufficient time to work on the problem before going through with the class.



11. The table shows the start and end times of three plays.

Play	Start	End
New World	10 00	10 50
Silverlocks	11 00	12 20
Fantastic Five	12 00	13 30

Find the duration of each play in minutes.

The ratio of the duration of Silverlocks to the duration of Fantastic Five to the duration of New World is 8 : 9 : 5.

ACTIVITY TIME

Work in groups of 3 to 4.

1. Look for two groups of objects in your classroom.
2. Write a ratio to show how you compare their quantities.
3. Take turns to share the ratio with your group members.
4. Repeat 2 and 3 with three groups of objects.

What you need:

PRACTICE

1\.

The ratio of the number of fish to the number of terrapins is 6 : 5.

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Textbook 5 P106

For Let's Learn 11, ask pupils to find the duration for each play. Tell pupils to convert the duration to minutes. Remind pupils that the units of all quantities have to be the same when doing ratio. In this example, converting to hours is not preferred since it will give rise to mixed numbers which will make for more problematic calculations. Have pupils understand that converting to minutes results in whole numbers which will be clearer and easier to work with.

ACTIVITY TIME

Pupils are to look for things in the classrooms and compare their quantities using ratios in their groups.

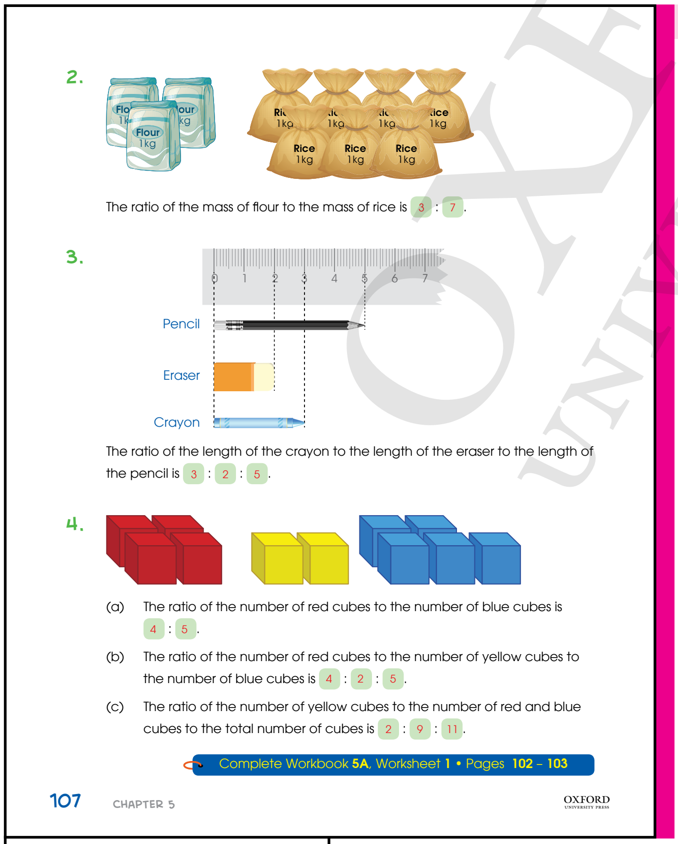
Teacher may show one or two examples to guide pupils. For example, the ratio of the number of pupils with glasses to the number of pupils without glasses is ___ : ___ .

Some of the possible errors pupils make include:

- "The ratio of my height to my mass is 147 : 38."
  This is wrong because height and mass are measured in different units and cannot be compared using ratio.
- "The ratio of boys to girls is 18 : 22." The language needs to be more precise i.e. The ratio of the number of boys to the number of girls is 18 : 22.

PRACTICE

Work with pupils on the practice questions.



2\.

The ratio of the mass of flour to the mass of rice is 3 : 7.

3\.

The ratio of the length of the crayon to the length of the eraser to the length of the pencil is 3 : 2 : 5.

4\.

(a) The ratio of the number of red cubes to the number of blue cubes is 4 : 5.

(b) The ratio of the number of red cubes to the number of yellow cubes to the number of blue cubes is 4 : 2 : 5.

(c) The ratio of the number of yellow cubes to the number of red and blue cubes to the total number of cubes is 2 : 9 : 11.

Complete Workbook **5A**, Worksheet **1** • Pages **102 – 103**

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Textbook 5 P107

Independent seatwork

Assign pupils to complete Worksheet 1 (Workbook 5A P102 – 103).

Answers Worksheet 1 (Workbook 5A P102 – 103)

1. (a) 3 : 4
   (b) 4 : 3

2. (a) 6 : 8
   (b) 8 : 6

3. (a) 20 : 30
   (b) 30 : 20
   (c) 20 : 50

4. (a) 3 : 4 : 2
   (b) 2 : 9

5. (a) 2 : 3 : 1
   (b) 1 : 3 : 2

LESSON PLAN

Chapter 5
Lesson 1

Specific Learning Focus

- Understand notation and representations of ratios.
- Interpret a:b and a:b:c, where a, b and c are whole numbers.
- Find the ratio of two or three given quantities.

Suggested Duration

4 periods

Prior Learning

In this lesson, pupils will be introduced to the topic of ratios for the first time. It will be helpful for pupils to relate this concept to real-life examples.

Pre-emptive Pitfalls

Ratios should be relatively easy to understand. However, there are some common mistakes that pupils tend to make when learning ratios. Some of these include (i) expressing quantities in different units in a ratio, (ii) wrong order of quantities in a ratio, and (iii) misconception that ratios are additive when they are actually multiplicative.

Introduction

Introducing this topic with a recipe for lemonade will be beneficial for pupils in the understanding of this topic. Lemon juice and water can be brought into class so that the topic can be introduced with an activity using the items. The teacher can make lemonade according to the 1 : 3 ratio of the number of cups of lemon juice to the number of cups of water, and then serve every pupil in the class lemonade. In this case, lead pupils to see that the amount of lemon juice and water must be increased in order to make enough for every pupil. For example, the ratio could be quadrupled. In 'Let's Learn' (Textbook 5 P102), pupils are introduced to the a : b concept of ratios through the C-P-A approach. Emphasise that the order of the quantities in the ratio should be according to the statement. That is, if the ratio of the number of cups of water to the number of cups of lemon juice is asked, then the ratio would be 3 : 1. In Let's Learn 4 (Textbook 5 P103), the significance of units is emphasised, whereby the units of quantities have to be the same when expressing a ratio. In Let's Learn 7 (Textbook 5 P104) introduces pupils to ratios comparing 3 quantities. It may be emphasised that ratios can be used to express more than two quantities.

Problem Solving

Since the units of quantities have to be the same when expressing a ratio, conversion of units will be revisited. If a larger unit (e.g. kilograms) is converted to a smaller unit (e.g. grams), multiplication is applied and we get a whole number. Thus, pupils should be advised to convert the larger unit to the smaller unit in order to avoid having mixed numbers or decimals. Mixed numbers and decimals cannot be used in ratios. These are some examples of conversion of a larger unit to a smaller unit:

$\text{hr} \xrightarrow{\times 60} \text{min},\ \ell \xrightarrow{\times 1000} \text{ml},\ \text{km} \xrightarrow{\times 1000} \text{m},\ \text{m} \xrightarrow{\times 100} \text{cm},\ \text{kg} \xrightarrow{\times 1000} \text{g}$

In addition, point out that quantities of different types of measurements cannot form ratios (e.g. we cannot form a ratio between the height and weight of a person because height and weight are different types of measurements).

Activities

Ask pupils to write on chart paper the dos and don'ts of ratios. Similarly, 'Activity Time' (Textbook 5 P106) can also be done in pairs.

Resources

- cups
- water
- measuring beakers
- lemon juice

Mathematical Communication Support

Lead pupils to the correct ratio expression by asking the following questions:

- How many circles and squares can you see?
- What is the unit of measurement for mass/length/distance? Are the units the same?
- What unit should be converted? Why is it more workable to convert the larger unit to the smaller unit?
- Can you have mixed numbers or decimals in ratios? How can you avoid them?

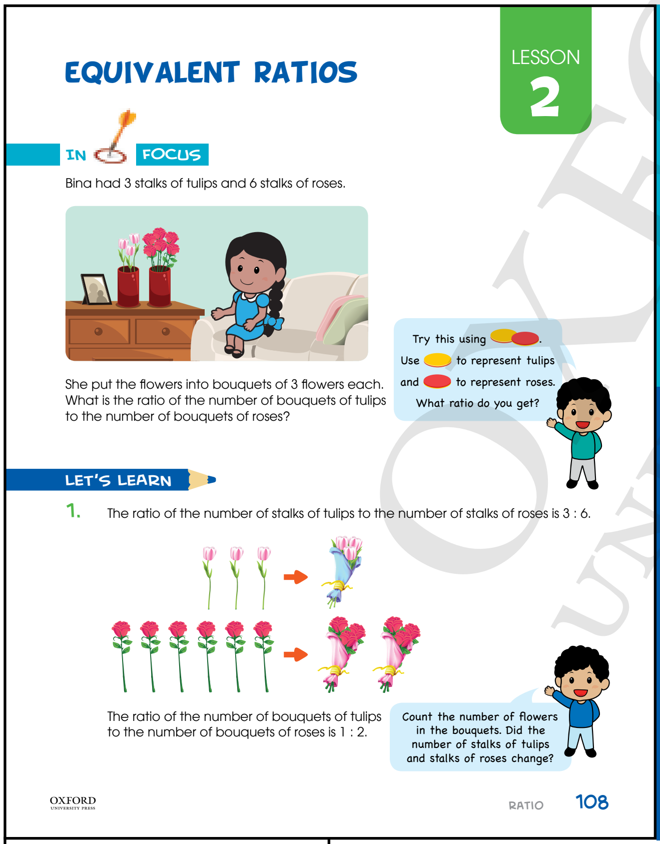
Do lots of practice on the board and encourage class discussions and elicit individual responses.

LESSON
2

EQUIVALENT RATIOS

LEARNING OBJECTIVES

1. Find equivalent ratios of a given ratio.
2. Express a ratio in its simplest form.
3. Find the missing term in a pair of equivalent ratios.



EQUIVALENT RATIOS

LESSON
2

IN FOCUS

Bina had 3 stalks of tulips and 6 stalks of roses.

She put the flowers into bouquets of 3 flowers each. What is the ratio of the number of bouquets of tulips to the number of bouquets of roses?

Try this using ●●.
Use ● to represent tulips
and ● to represent roses.
What ratio do you get?

LET'S LEARN

1. The ratio of the number of stalks of tulips to the number of stalks of roses is 3 : 6.

The ratio of the number of bouquets of tulips to the number of bouquets of roses is 1 : 2.

Count the number of flowers in the bouquets. Did the number of stalks of tulips and stalks of roses change?

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RATIO 108

Textbook 5 P108

IN FOCUS

Distribute counters of two different colours to pupils. One colour will represent the tulips and the other colour will represent the roses.

Ask:
- How many groups of tulips do you have?
- How many groups of roses do you have?
- What is the ratio of the number of groups of tulips to the number of groups of roses?

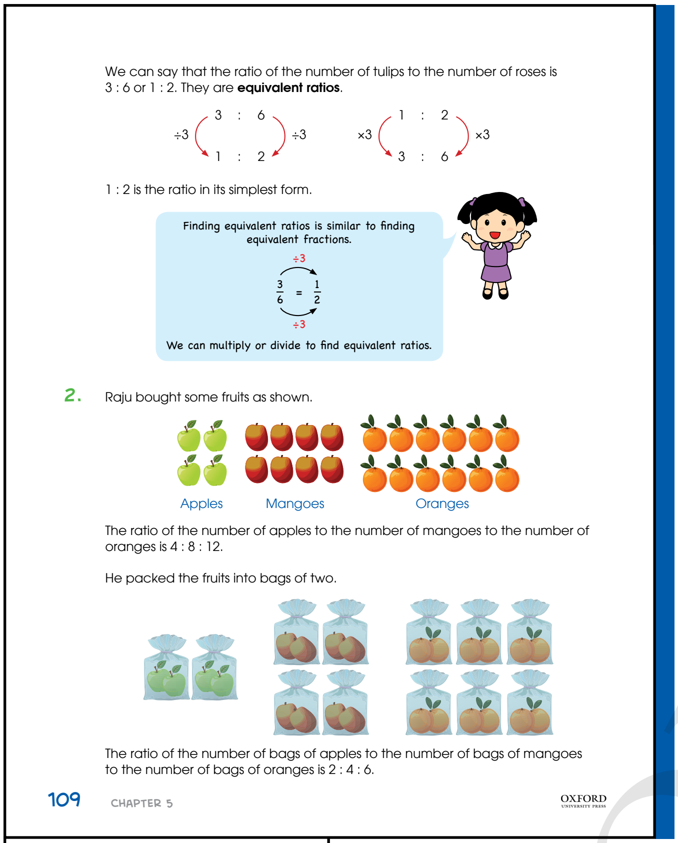
LET'S LEARN

For Let's Learn 1, say "The number of bouquets of tulips to the number of bouquets of roses is 1 : 2." Write the following on the board:

Tulips : Roses
1 : 2

Ask pupils what the ratio of the number of stalks of tulips to the number of stalks of roses is. Add 3 : 6 on the board:

Tulips : Roses
1 : 2
3 : 6



We can say that the ratio of the number of tulips to the number of roses is 3 : 6 or 1 : 2. They are **equivalent ratios**.

$$\begin{tikzcd} 3 : 6 \arrow[d, "\div 3"'] \\ 1 : 2 \end{tikzcd} \qquad \begin{tikzcd} 1 : 2 \arrow[d, "\times 3"'] \\ 3 : 6 \end{tikzcd}$$

1 : 2 is the ratio in its simplest form.

Finding equivalent ratios is similar to finding equivalent fractions.

$$\frac{3}{6} \xrightarrow{\div 3} \frac{1}{2}$$

We can multiply or divide to find equivalent ratios.

2. Raju bought some fruits as shown.

The ratio of the number of apples to the number of mangoes to the number of oranges is 4 : 8 : 12.

He packed the fruits into bags of two.

The ratio of the number of bags of apples to the number of bags of mangoes to the number of bags of oranges is 2 : 4 : 6.

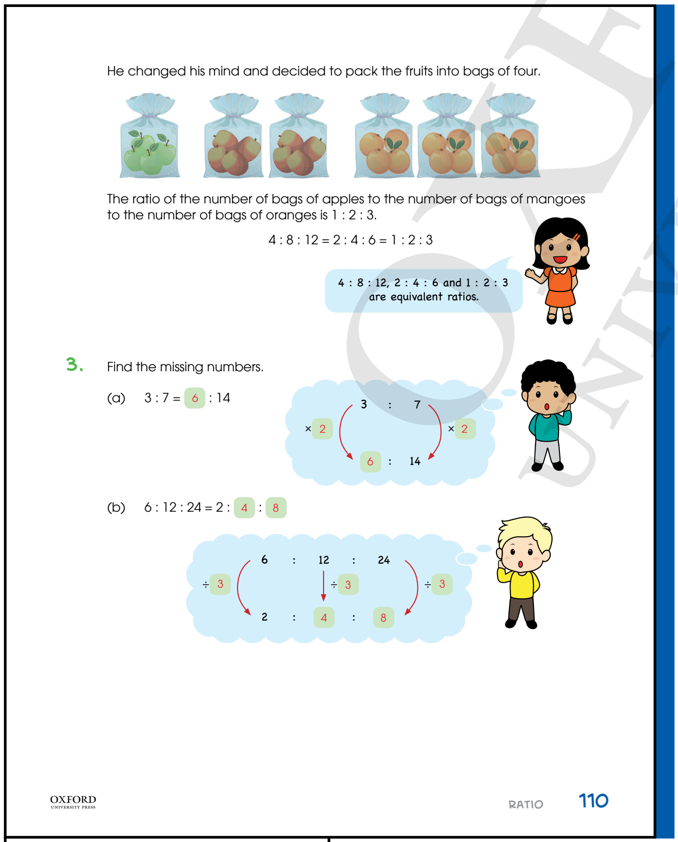
109 CHAPTER 5 OXFORD

Textbook 5 P109

Tell pupils that since the number of tulips and the number of roses have not changed, the two ratios are equal and are called equivalent ratios. Relate ratios to fractions and demonstrate how 3 : 6 can be simplified to 1 : 2 and how 1 : 2 can be written as 3 : 6. Introduce the term simplest form in relation to ratio and related to simplest form in fractions. Ask questions such as “How do you know $\frac{1}{2}$ is the simplest form of $\frac{3}{6}$?” and relate it to ratio.

For Let’s Learn 2, use magnetic buttons to show the repacking of the fruits.

Ask:
- What is the ratio of the number of apples to the number of mangoes to the number of oranges?
- (After repacking into bags of two) What is the ratio of the number of bags of apples to the number of bags of mangoes to the number of bags of oranges? Did the number of apples, mangoes and oranges change? What can you say about 4 : 8 : 12 and 2 : 4 : 6?



He changed his mind and decided to pack the fruits into bags of four.

The ratio of the number of bags of apples to the number of bags of mangoes to the number of bags of oranges is 1 : 2 : 3.

4 : 8 : 12 = 2 : 4 : 6 = 1 : 2 : 3

4 : 8 : 12, 2 : 4 : 6 and 1 : 2 : 3 are equivalent ratios.

3. Find the missing numbers.

(a) 3 : 7 = $\boxed{6}$: 14

$$\begin{tikzcd} 3 : 7 \arrow[d, "\times \boxed{2}"'] \\ \boxed{6} : 14 \end{tikzcd}$$

(b) 6 : 12 : 24 = 2 : $\boxed{4}$: $\boxed{8}$

$$\begin{tikzcd} 6 : 12 : 24 \arrow[d, "\div \boxed{3}"'] \\ 2 : \boxed{4} : \boxed{8} \end{tikzcd}$$

OXFORD RATIO 110

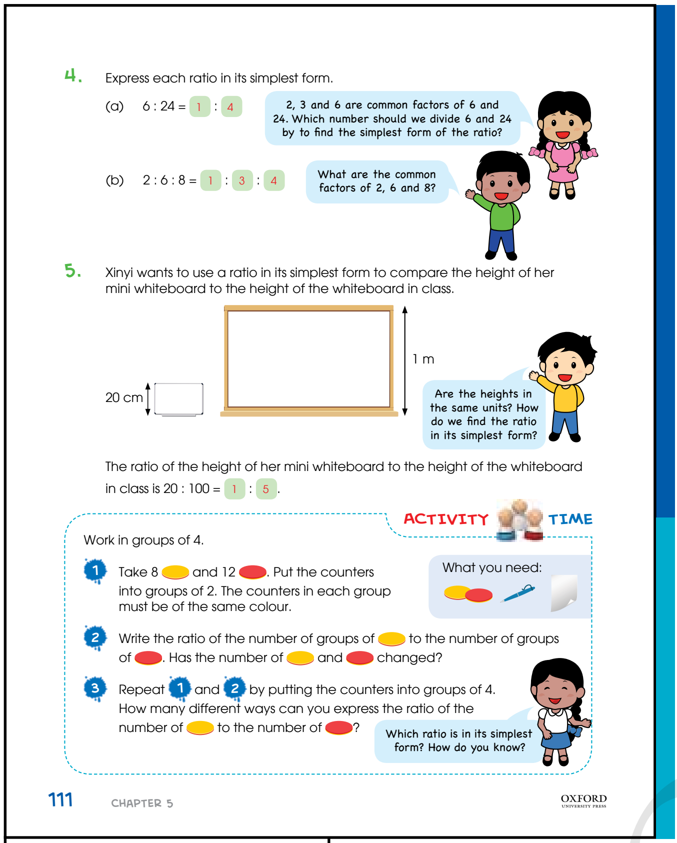
Textbook 5 P110

Ask:
- (After repacking into bags of four) What is the ratio of the number of bags of apples to the number of bags of mangoes to the number of bags of oranges? Did the number of apples, mangoes and oranges change? What can you say about the 3 ratios?

Highlight the term “equivalent ratios”.

For Let’s Learn 3, elicit from pupils that they need to multiply or divide each quantity in a ratio by the same number. For 3(a), ask:
- What must you multiply 7 by to get 14?
- Since you multiply 7 by 2, what must you multiply 3 by?

Ask similar questions for 3(b).



4. Express each ratio in its simplest form.

(a) 6 : 24 = 1 : 4

(b) 2 : 6 : 8 = 1 : 3 : 4

5. Xinyi wants to use a ratio in its simplest form to compare the height of her mini whiteboard to the height of the whiteboard in class.

The ratio of the height of her mini whiteboard to the height of the whiteboard in class is 20 : 100 = 1 : 5.

ACTIVITY TIME

Work in groups of 4.

What you need: 🟡🔴

1 Take 8 🟡 and 12 🔴. Put the counters into groups of 2. The counters in each group must be of the same colour.

2 Write the ratio of the number of groups of 🟡 to the number of groups of 🔴. Has the number of 🟡 and 🔴 changed?

3 Repeat 1 and 2 by putting the counters into groups of 4. How many different ways can you express the ratio of the number of 🟡 to the number of 🔴?

111 CHAPTER 5 OXFORD UNIVERSITY PRESS

Textbook 5 P111

For Let's Learn 4, pose the question in the speech bubble and ask pupils to explain their answer. Ask:

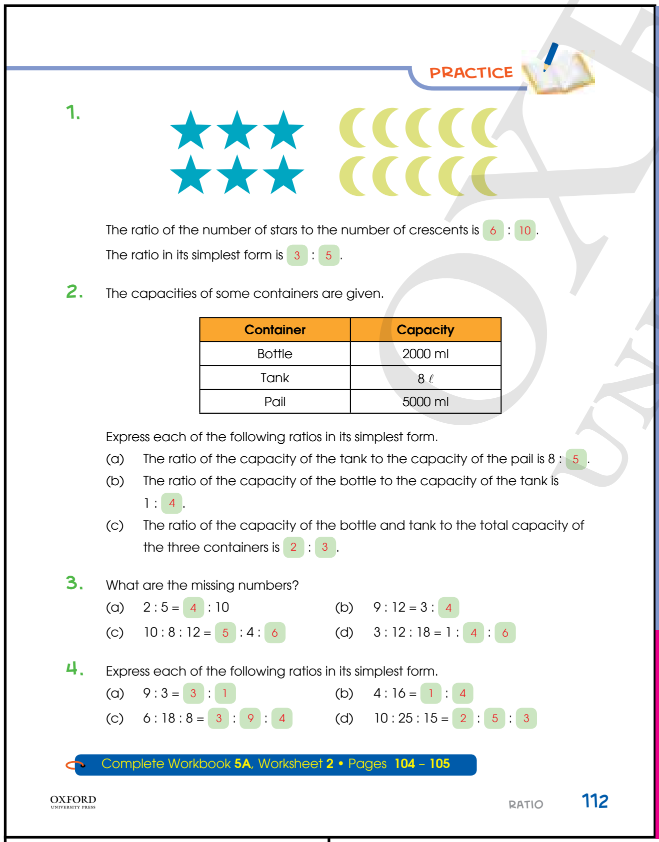
- When you divide 6 and 24 by 2, you will get the ratio 3 : 12. How do you know this is not the simplest form?

For Let's Learn 5, ask pupils to find the ratio by converting 1 m into 100 cm first, then write the ratio as 20 : 100. Ask:

- What number divides 20 and 100?
- How do you know if the answer is already in its simplest form?

ACTIVITY TIME

Give out counters and guide pupils to do the activity as explained.



PRACTICE

1. ★★★ ★★★

The ratio of the number of stars to the number of crescents is 6 : 10.

The ratio in its simplest form is 3 : 5.

2. The capacities of some containers are given.

Container	Capacity
Bottle	2000 ml
Tank	8 ℓ
Pail	5000 ml

Express each of the following ratios in its simplest form.

(a) The ratio of the capacity of the tank to the capacity of the pail is 8 : 5.

(b) The ratio of the capacity of the bottle to the capacity of the tank is 1 : 4.

(c) The ratio of the capacity of the bottle and tank to the total capacity of the three containers is 2 : 3.

3. What are the missing numbers?

(a) 2 : 5 = 4 : 10

(b) 9 : 12 = 3 : 4

(c) 10 : 8 : 12 = 5 : 4 : 6

(d) 3 : 12 : 18 = 1 : 4 : 6

4. Express each of the following ratios in its simplest form.

(a) 9 : 3 = 3 : 1

(b) 4 : 16 = 1 : 4

(c) 6 : 18 : 8 = 3 : 9 : 4

(d) 10 : 25 : 15 = 2 : 5 : 3

Complete Workbook **5A**, Worksheet **2** • Pages **104 – 105**

OXFORD UNIVERSITY PRESS RATIO 112

Textbook 5 P112

PRACTICE

Work with pupils on the practice questions.

Independent seatwork

Assign pupils to complete Worksheet 2 (Workbook 5A P104 – 105).

Answers Worksheet 2 (Workbook 5A P104 – 105)

1. (a) 8 : 4
   (b) 4 : 2
   (c) 2 : 1
   (d) 8 : 4 = 4 : 2 = 2 : 1

2. 9, 1 : 3

3. 6 : 2 : 4, 3 : 1 : 2

4. (a) 8
   (b) 1
   (c) 5, 20
   (d) 4, 6

5. (a) 1 : 3
   (b) 2 : 1
   (c) 9 : 10
   (d) 1 : 9 : 4
   (e) 2 : 6 : 3
   (f) 14 : 4 : 7

LESSON PLAN

Chapter 5
Lesson 2

Specific Learning Focus

- Find equivalent ratios of a given ratio.
- Express a ratio in its simplest form.
- Find the missing term in a pair of equivalent ratios.

Suggested Duration

4 periods

Prior Learning

Pupils have been introduced to ratios in Lesson 1. This lesson is a continuation of Lesson 1 and links equivalence to ratios.

Pre-emptive Pitfalls

Lead pupils to see that just like fractions, equivalence can also be applied to ratios. While we double, triple, quadruple, or half a fraction, we can do the same to ratios as well. It should be emphasised that when finding equivalent ratios of a given ratio, the factor should be multiplied to all the quantities in the ratio to obtain equivalence.

Introduction

Equivalence is explained well in Textbook 5 P108, where the number of stalks of tulips and the number of stalks of roses triple, making the ratio 1 : 2 to become 3 : 6. Point out that for ratios with more than two quantities, equivalent ratios can be found in the same way. Another concept that is emphasised from Let's Learn 2 onwards (Textbook 5 P109 – 111) is that when we multiply or divide the ratios, we multiply or divide each quantity in a ratio by the same number.

Problem Solving

Emphasise the multiplication and division aspect of equivalent ratios. Emphasise the importance of multiplying or dividing each quantity in a ratio by the same number. In Let's Learn 3 (Textbook 5 P110), pupils are required to find equivalent ratios, whereby one quantity of the equivalent ratio is given while the other quantity is missing. With the given quantity, pupils would be able to find the number that each quantity in the ratio is multiplied or divided by to obtain the equivalent ratio. This can be done by first dividing 14 by 7 to find the number and then multiply 3 by the number to find the missing value.

Activities

Encourage a lot of group activities and class discussions. Cut out and laminate equivalent ratio cards and divide the class into pairs and let them work out the questions given in the cards and keep track of the duration that they take to complete. They will have fun doing "rapid five" rounds and then create their own equivalent ratios with missing quantity for their partner to solve.

Resources

- counters
- magnetic buttons
- equivalent ratio cards (Activity Handbook 5 P22)

Mathematical Communication Support

Elicit individual responses by asking the following questions while working on the sums (Workbook 5A P104 – 105) on the board:

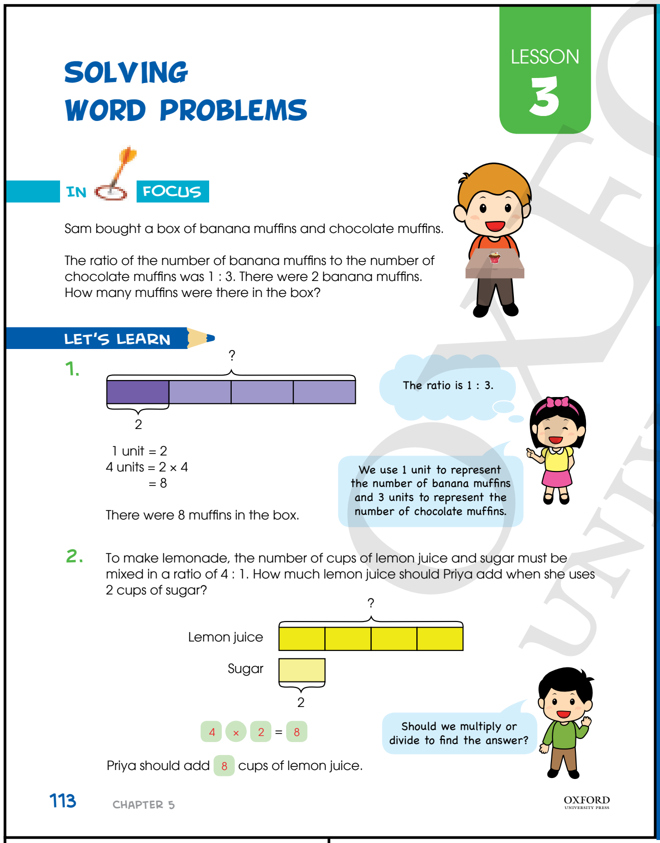
- What number is being used to multiply or divide the quantities by to obtain the equivalent ratio?
- How do we decide which operation to use?
- Which operation should we use to find the missing quantity in the equivalent ratio?

LESSON
3

SOLVING WORD PROBLEMS

LEARNING OBJECTIVES

1. Divide a quantity in a given ratio.
2. Find one quantity given the other quantity and their ratio.
3. Solve up to 2-step word problems involving ratio.



SOLVING WORD PROBLEMS

LESSON
3

IN FOCUS

Sam bought a box of banana muffins and chocolate muffins.

The ratio of the number of banana muffins to the number of chocolate muffins was 1 : 3. There were 2 banana muffins. How many muffins were there in the box?

LET'S LEARN

1\.

?

2

The ratio is 1 : 3.

1 unit = 2
4 units = 2 × 4
= 8

We use 1 unit to represent the number of banana muffins and 3 units to represent the number of chocolate muffins.

There were 8 muffins in the box.

2\. To make lemonade, the number of cups of lemon juice and sugar must be mixed in a ratio of 4 : 1. How much lemon juice should Priya add when she uses 2 cups of sugar?

?

Lemon juice

Sugar

2

4 × 2 = 8

Should we multiply or divide to find the answer?

Priya should add 8 cups of lemon juice.

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Textbook 5 P113

IN FOCUS

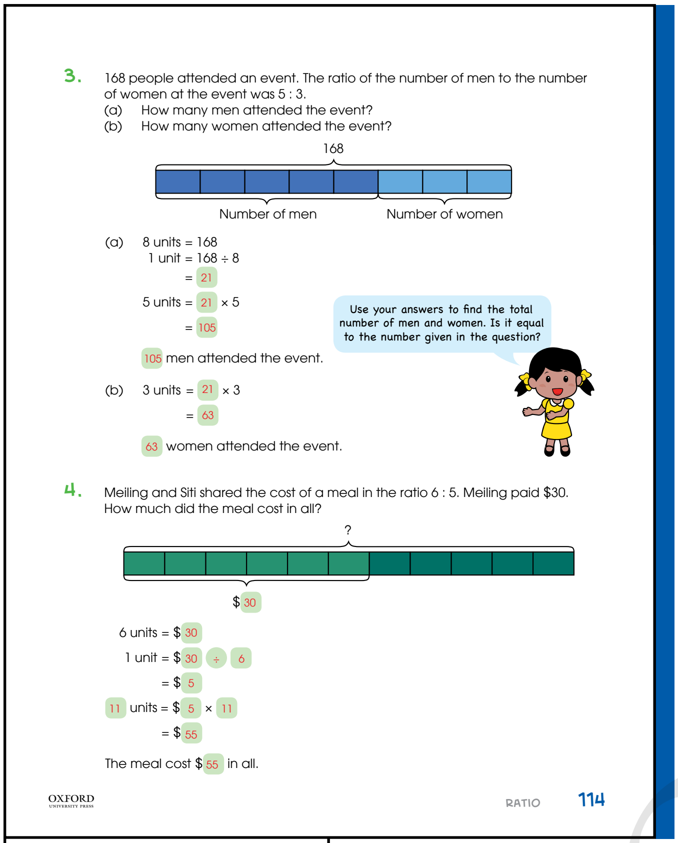
Discuss with pupils how the problem can be solved. Show pupils that this is related to what they have learnt about equivalent ratios in Lesson 2 i.e. 1 : 3 = 2 : ____. Ask pupils to draw a model representing the information.

LET'S LEARN

Ask pupils to check if their models are the same as the one drawn on P113.

Emphasise that 1 unit represents the number of banana muffins and 3 units represent the number of chocolate muffins since the ratio given is 1 : 3. Lead pupils to see that 4 units represent the total number of muffins.

For Let's Learn 2, guide pupils to draw the model. Ask how many units represent the lemon juice.



3. 168 people attended an event. The ratio of the number of men to the number of women at the event was 5 : 3.
(a) How many men attended the event?
(b) How many women attended the event?

168
Number of men
Number of women

(a) 8 units = 168
1 unit = 168 ÷ 8
= 21
5 units = 21 × 5
= 105
105 men attended the event.

(b) 3 units = 21 × 3
= 63
63 women attended the event.

Use your answers to find the total number of men and women. Is it equal to the number given in the question?

4. Meiling and Siti shared the cost of a meal in the ratio 6 : 5. Meiling paid $30.
How much did the meal cost in all?

?
$ 30

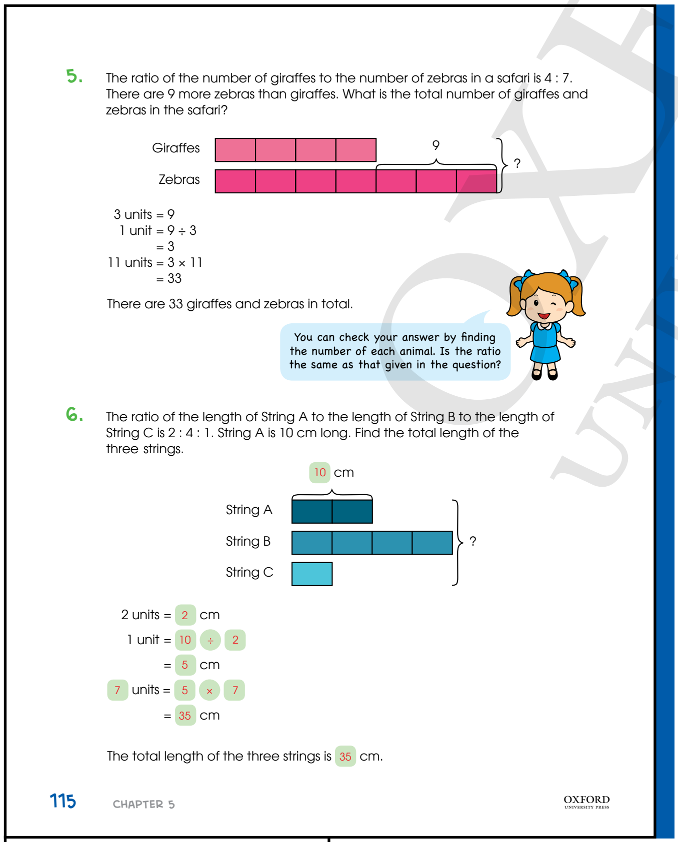
6 units = $ 30
1 unit = $ 30 ÷ 6
= $ 5
11 units = $ 5 × 11
= $ 55
The meal cost $ 55 in all.

RATIO 114

Textbook 5 P114

For Let's Learn 3, guide pupils to draw the model and ask how many units represent the number of men and the number of women respectively.

For Let's Learn 4, guide pupils to draw the model and ask how many units represent Meiling's share, Siti's share and the total cost of the meal. Guide pupils to fill in the missing information.



5. The ratio of the number of giraffes to the number of zebras in a safari is 4 : 7. There are 9 more zebras than giraffes. What is the total number of giraffes and zebras in the safari?

Giraffes
Zebras
9
?

3 units = 9
1 unit = 9 ÷ 3
= 3
11 units = 3 × 11
= 33
There are 33 giraffes and zebras in total.

You can check your answer by finding the number of each animal. Is the ratio the same as that given in the question?

6. The ratio of the length of String A to the length of String B to the length of String C is 2 : 4 : 1. String A is 10 cm long. Find the total length of the three strings.

10 cm
String A
String B
String C
?

2 units = 2 cm
1 unit = 10 ÷ 2
= 5 cm
7 units = 5 × 7
= 35 cm

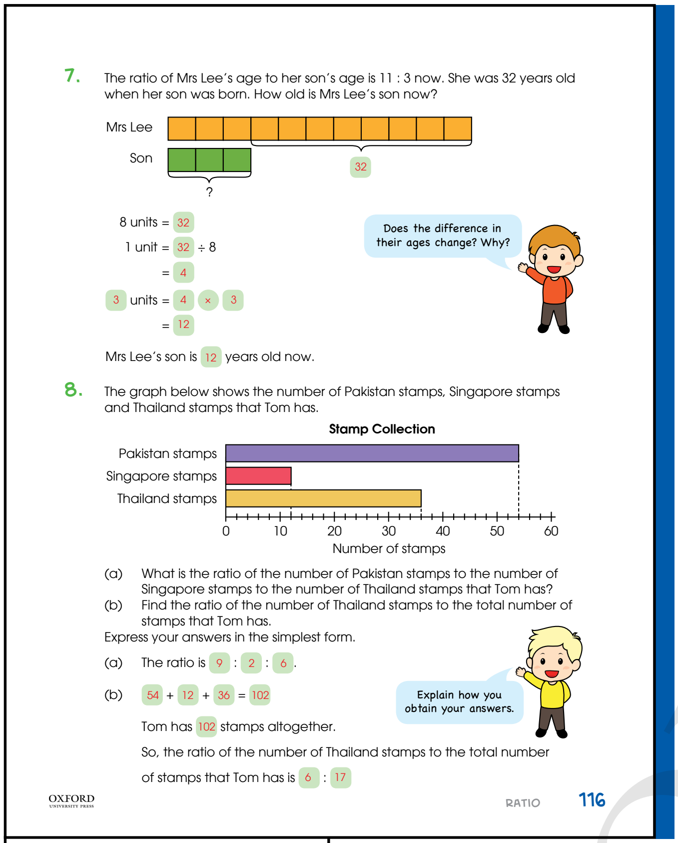
The total length of the three strings is 35 cm.

115 CHAPTER 5

Textbook 5 P115

For Let's Learn 5, guide pupils to draw the model. Discuss whether the part-whole model or the comparison model is more effective.

For Let's Learn 6, ask pupils what is the best way to present the key information. Draw the model and label the known and unknown information. Give pupils sufficient time to work through the example before going through.



7. The ratio of Mrs Lee's age to her son's age is 11 : 3 now. She was 32 years old when her son was born. How old is Mrs Lee's son now?

8 units = 32
1 unit = 32 ÷ 8
= 4
3 units = 4 × 3
= 12

Mrs Lee's son is 12 years old now.

8. The graph below shows the number of Pakistan stamps, Singapore stamps and Thailand stamps that Tom has.

Stamp Collection

(a) What is the ratio of the number of Pakistan stamps to the number of Singapore stamps to the number of Thailand stamps that Tom has?
(b) Find the ratio of the number of Thailand stamps to the total number of stamps that Tom has.

Express your answers in the simplest form.

(a) The ratio is 9 : 2 : 6.

(b) 54 + 12 + 36 = 102

Tom has 102 stamps altogether.

So, the ratio of the number of Thailand stamps to the total number of stamps that Tom has is 6 : 17

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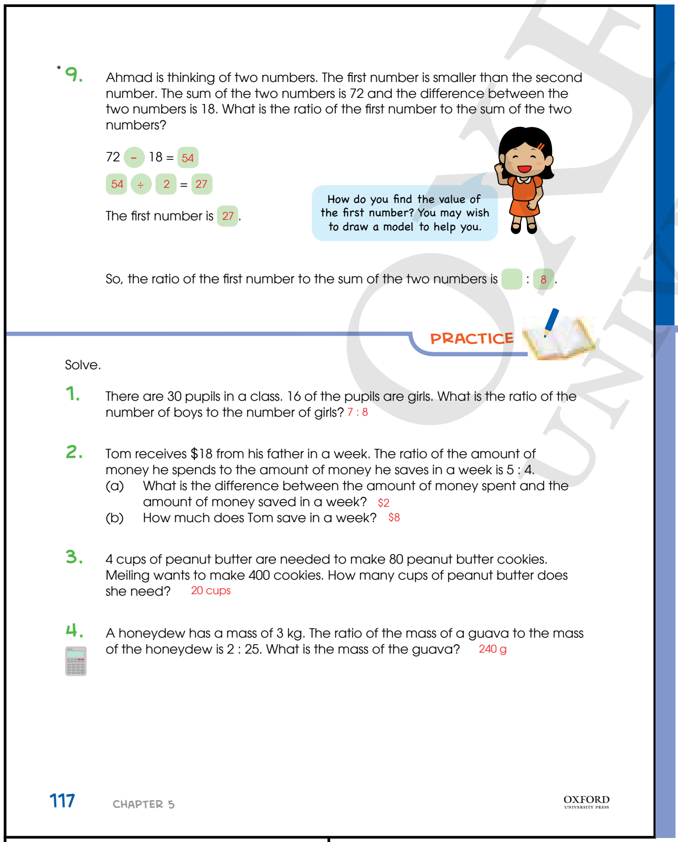
RATIO 116

Textbook 5 P116

For Let's Learn 7, discuss age difference and why it does not change. Allow pupils to work in pairs to solve the problem before going through with the class.

Let's Learn 8 is presented in a different way. Guide pupils to find out the number of each type of stamps by reading off the graph to find the ratios required.



*__9.__ Ahmad is thinking of two numbers. The first number is smaller than the second number. The sum of the two numbers is 72 and the difference between the two numbers is 18. What is the ratio of the first number to the sum of the two numbers?

72 – 18 = 54
54 ÷ 2 = 27

The first number is 27.

So, the ratio of the first number to the sum of the two numbers is : 8.

PRACTICE

Solve.

1. There are 30 pupils in a class. 16 of the pupils are girls. What is the ratio of the number of boys to the number of girls? 7 : 8

2. Tom receives $18 from his father in a week. The ratio of the amount of money he spends to the amount of money he saves in a week is 5 : 4.
(a) What is the difference between the amount of money spent and the amount of money saved in a week? $2
(b) How much does Tom save in a week? $8

3. 4 cups of peanut butter are needed to make 80 peanut butter cookies. Meiling wants to make 400 cookies. How many cups of peanut butter does she need? 20 cups

4. A honeydew has a mass of 3 kg. The ratio of the mass of a guava to the mass of the honeydew is 2 : 25. What is the mass of the guava? 240 g

117 CHAPTER 5

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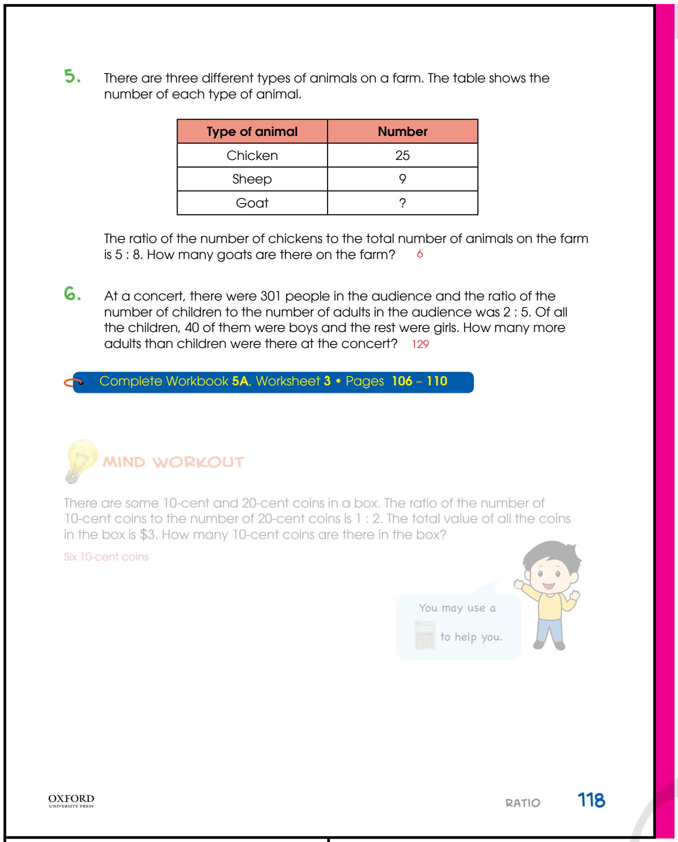
Textbook 5 P117

Ask pupils to find out the 2 numbers in Let's Learn 9 by drawing a model. Allow pupils to work in pairs to solve the problem before going through with the class.

PRACTICE

Let pupils work in pairs or individually on the practice questions.



5. There are three different types of animals on a farm. The table shows the number of each type of animal.

Type of animal	Number
Chicken	25
Sheep	9
Goat	?

The ratio of the number of chickens to the total number of animals on the farm is 5 : 8. How many goats are there on the farm? 6

6. At a concert, there were 301 people in the audience and the ratio of the number of children to the number of adults in the audience was 2 : 5. Of all the children, 40 of them were boys and the rest were girls. How many more adults than children were there at the concert? 129

Complete Workbook **5A**, Worksheet **3** • Pages **106 – 110**

MIND WORKOUT

There are some 10-cent and 20-cent coins in a box. The ratio of the number of 10-cent coins to the number of 20-cent coins is 1 : 2. The total value of all the coins in the box is $3. How many 10-cent coins are there in the box?

Six 10-cent coins

You may use a 🖩 to help you.

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RATIO 118

Textbook 5 P118

Independent seatwork

Assign pupils to complete Worksheet 3 (Workbook 5A P106 – 110).

Answers

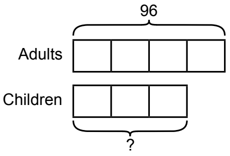
Worksheet 3 (Workbook 5A P106 – 109)

1. $20 - 13 = 7$
The ratio of number of roses to the number of sunflowers is 7 : 13

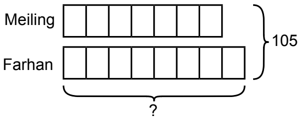
2. $20 + 30 = 50$
The ratio of the number of Science books to the total number of books is 2 : 5.

3. 1 unit = 200 ml
4 units = 200 ml × 4
= 800 ml

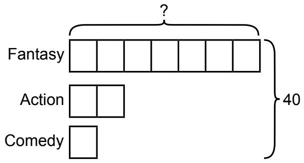
4. 4 units = 96
1 unit = 96 ÷ 4
= 24
3 units = 24 × 3
= 72



5. 15 units = 105 cards
1 unit = 105 ÷ 15
= 7 cards
8 units = 7 × 8
= 56 cards



6. 10 units = 40 pupils
1 units = 40 ÷ 10
= 4 pupils
7 units = 4 × 7
= 28 pupils

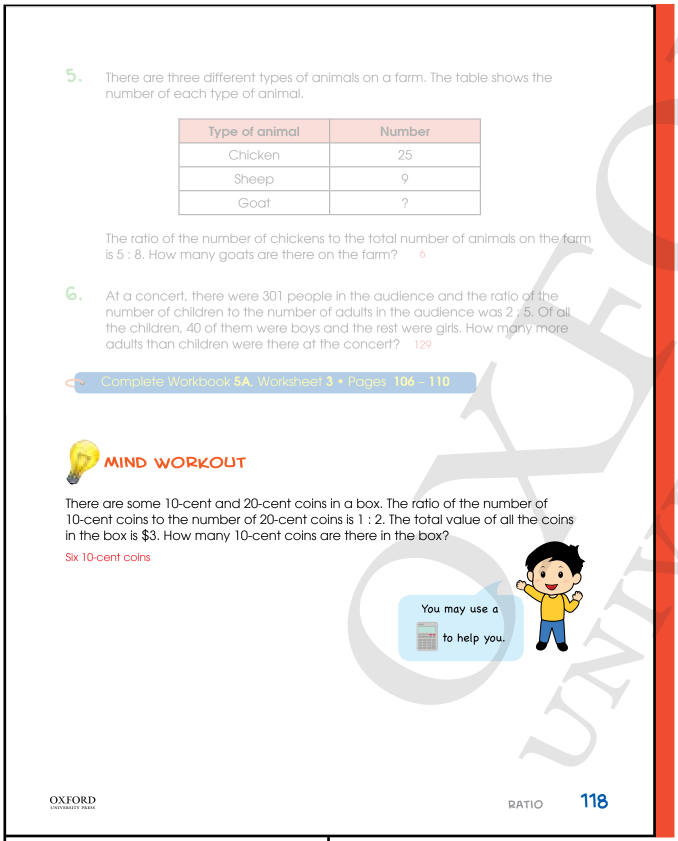


7. $28 + 24 = 52$
$100 - 52 = 48$
28 : 52 : 20 = 7 : 13 : 5
The ratio of the number of stickers Kate has to the number of stickers Nora has to the number of stickers Xinyi has is 7 : 13 : 5.

8. $15 - 9 = 6$
$6 \times 3 = 18$
The ratio of the number of apples to the number of oranges he has is 5 : 6

9. 10 : 15 : 12

PROBLEM SOLVING, MATHS JOURNAL AND PUPIL REVIEW



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Complete Workbook **5A**, Worksheet **3** • Pages **106 – 110**

MIND WORKOUT

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Six 10-cent coins

You may use a 🖩 to help you.

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RATIO 118

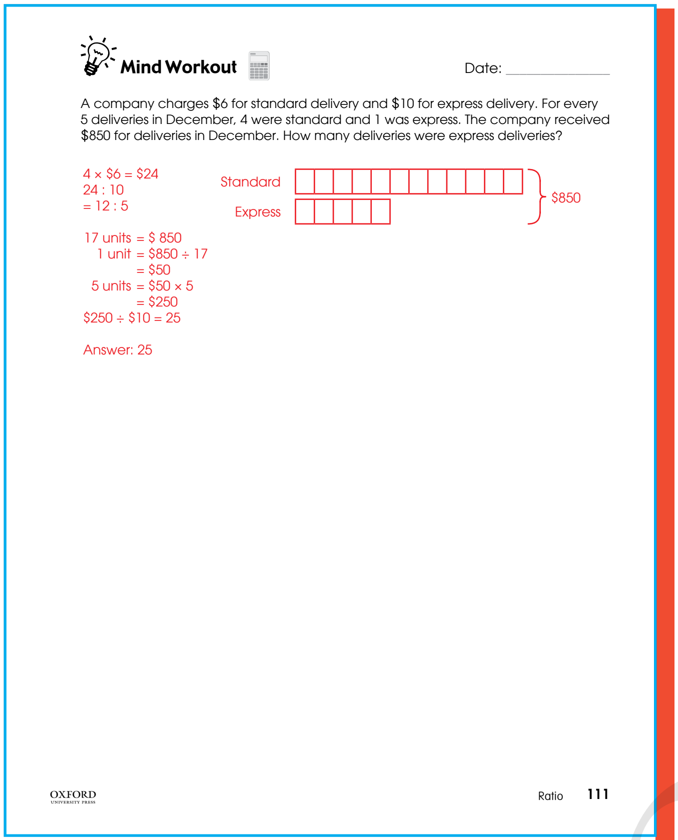
Textbook 5 P118

MIND WORKOUT

If pupils are having difficulties with the problem, facilitate by providing the following guidance:

- Say “For every 10-cent coin, there are two 20-cent coins.” Demonstrate using real coins.
- Ask “What is the ratio of the value of the 10-cent coins to the total value of the two 20-cent coins?” (1 : 4)
- Ask pupils to draw the model showing that 1 unit represents the value of the 10-cent coins and 4 units represent the value of the 20-cent coins.
- Guide pupils to see that 5 units represent $3.
- To find the value of the 10-cent coins, find 1 unit.
- Convert the value of 1 unit into cents.
- Divide the value in cents by 10 to get the number of 10-cents coins.

Pupils may work in groups to solve the problem.



Mind Workout Date: ____________

A company charges $6 for standard delivery and $10 for express delivery. For every 5 deliveries in December, 4 were standard and 1 was express. The company received $850 for deliveries in December. How many deliveries were express deliveries?

4 × $6 = $24
24 : 10
= 12 : 5

17 units = $ 850
1 unit = $850 ÷ 17
= $50
5 units = $50 × 5
= $250
$250 ÷ $10 = 25

Answer: 25

OXFORD
Ratio 111

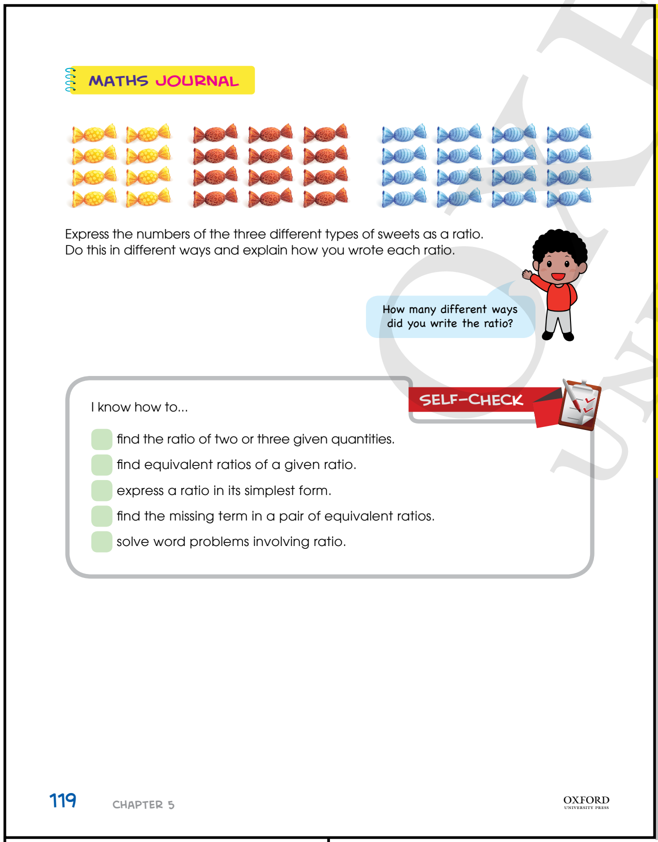
Workbook 5A P111

Mind Workout

If pupils are having difficulites with the problem, facilitate by providing the following guidance:

- Say “For every express delivery, there are four standard deliveries.”
- Ask “What is the ratio of the value of the standard delivery to the value of the express delivery?” (12 : 5)
- Ask pupils to draw the model showing that 12 unit represents the value of the standard deliveries and 5 units represent the value of the express deliveries.
- Guide pupils to see that 17 units represent $850.
- To find the value of the express deliveries, find 5 units.
- Divide the value by $10 to get the final answer.

Pupils may work in groups to solve the problem.



MATHS JOURNAL

Express the numbers of the three different types of sweets as a ratio.
Do this in different ways and explain how you wrote each ratio.

SELF-CHECK

I know how to...

☐ find the ratio of two or three given quantities.
☐ find equivalent ratios of a given ratio.
☐ express a ratio in its simplest form.
☐ find the missing term in a pair of equivalent ratios.
☐ solve word problems involving ratio.

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Textbook 5 P119

MATHS JOURNAL

Allow pupils sufficient time to write the ratios. Pupils should easily be able to obtain the ratio 8 : 12 : 16 by counting the number of different coloured sweets. If pupils are unable to come up with the other equivalent ratios, ask pupils to group the sweets in twos, then fours and find the ratio of the number of groups of yellow sweets to the number of groups of red sweets to the number of groups of blue sweets. This will lead them to get the ratios 4 : 6 : 8 and 2 : 3 : 4 respectively. Teacher can also show pupils that they can divide each quantity in the ratio by the same number to arrive at equivalent ratios.

SELF-CHECK

Before pupils proceed to do the self-check, review the important concepts by asking for examples learnt for each objective.

This self-check can be done after pupils have completed **Review 5** (Workbook 5A P112 – 116) as consolidation of understanding for the chapter.

Answers Review 5 (Workbook 5A P106 – 110)

1. (a) 3 : 5
   (b) 5 : 3
   (c) 3 : 8
   (d) 5 : 8

2. (a) 5 : 1 : 2
   (b) 5 : 4 : 2
   (c) 2 : 11

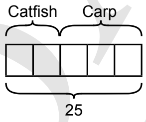
3. (a) 12
   (b) 40
   (c) 4, 8
   (d) 20
   (e) 7
   (f) 8, 12

4. (a) 1 : 9
   (b) 5 : 8
   (c) 11 : 8
   (d) 1 : 6
   (e) 2 : 5 : 1
   (f) 4 : 7 : 9
   (g) 2 : 9 : 10
   (h) 6 : 4 : 3

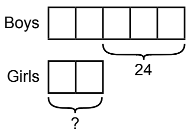
5. 3 : 2 : 2

6. 52 − 40 = 12
   The ratio of the number of girls to the number of boys in the school choir is 10 : 3.

7. (a) 5 units = 25
   1 unit = 25 ÷ 5
   = 5
   2 units = 5 × 2
   = 10
   (b) 3 units = 5 × 3
   = 15

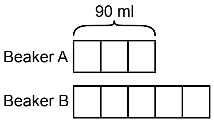


8. 3 units = 24
   1 unit = 24 ÷ 3
   = 80
   2 units = 8 × 2
   = 16



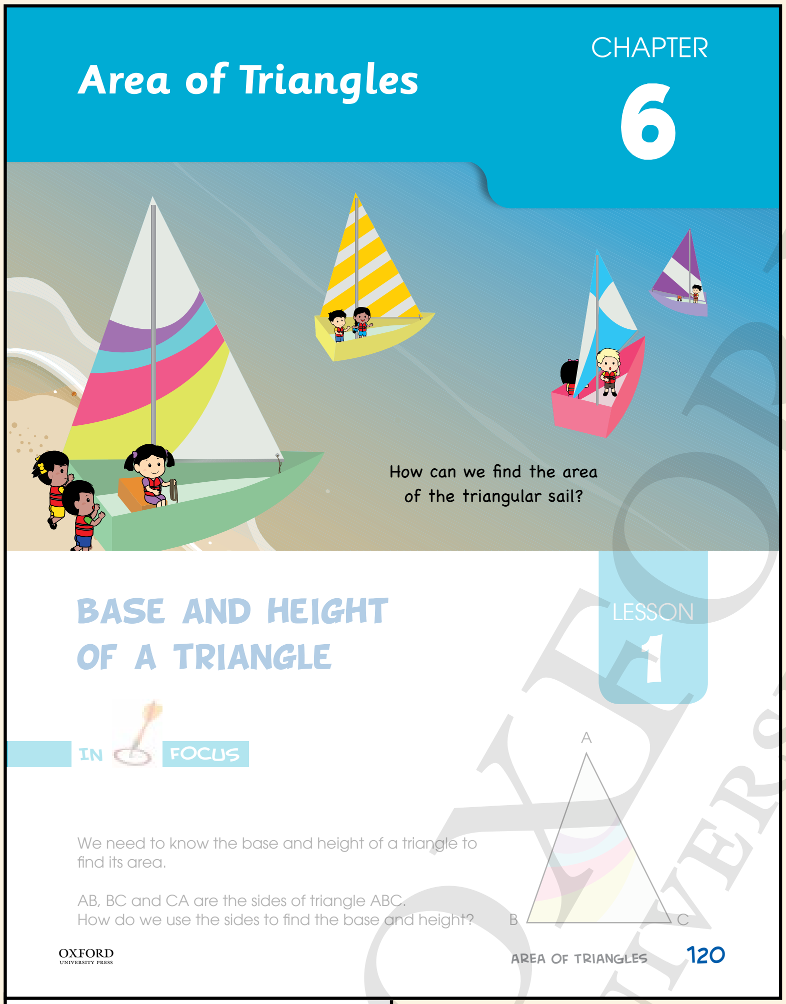
9. $12 + $4 + $16 = $32
   The ratio of the amount of money Bala had to the total amount of money the three children had is 3 : 8.

*10 (a) The ratio of the volume of water in Beaker A to the volume of water in Beaker B is 3 : 5.
   (b) 3 units = 90 ml
   1 unit = 90 ml ÷ 3
   = 30 ml
   5 units = 30 ml × 5
   = 150 ml
   150 ml − 100 ml = 50 ml



AREA OF TRIANGLES

CHAPTER 6



Area of Triangles

CHAPTER 6

How can we find the area of the triangular sail?

BASE AND HEIGHT OF A TRIANGLE

LESSON 1

IN FOCUS

We need to know the base and height of a triangle to find its area.

AB, BC and CA are the sides of triangle ABC.
How do we use the sides to find the base and height?

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AREA OF TRIANGLES 120

Textbook 5 P120

Related Resources

NSPM Textbook 5 (P120 − 142)
NSPM Workbook 5A (P117 − 136)

Materials

Set squares, scissors, square grid paper, cut-outs of triangles, squares and rectangles, paper, ruler, set squares

Lesson

Lesson 1	Base and Height of a Triangle
Lesson 2	Area of Triangles
Lesson 3	Area of Composite Figures

Problem Solving, Maths Journal and Pupil Review

INTRODUCTION

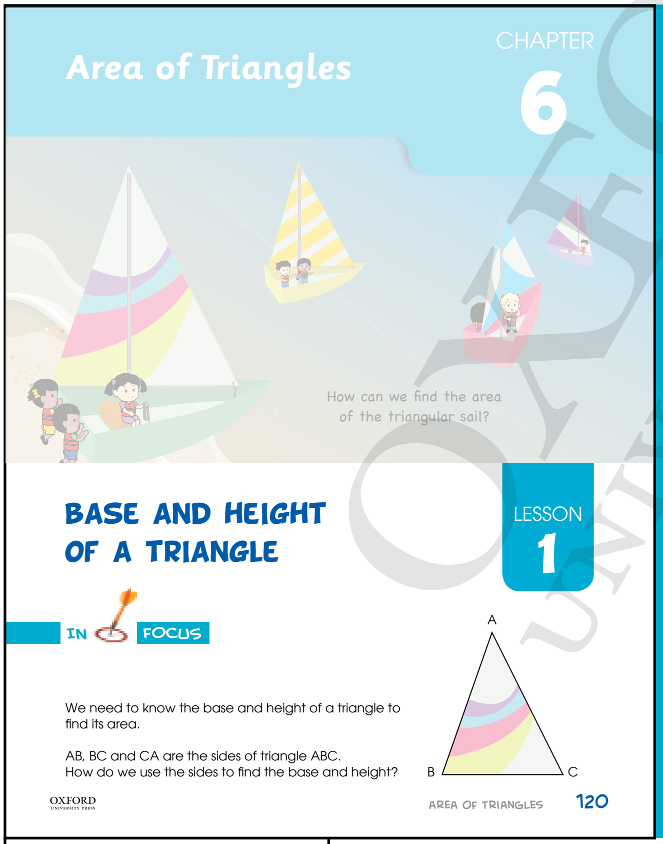
In Grade Four, pupils have learnt to find areas of squares, rectangles and their related figures. This chapter establishes the concept of the area of a triangle as half the related rectangle that leads to the formula for area of a triangle. The learning experiences include drawing different triangles to identify in each, the corresponding height to a given base; and making composite figures using cut-outs of triangles, squares and rectangles. This helps pupils visualise how a figure can be partitioned into its basic shapes.

LESSON
1

BASE AND HEIGHT OF A TRIANGLE

LEARNING OBJECTIVE

1. Identify the base of a triangle and its corresponding height.



Area of Triangles

CHAPTER
6

How can we find the area of the triangular sail?

BASE AND HEIGHT OF A TRIANGLE

LESSON
1

IN FOCUS

We need to know the base and height of a triangle to find its area.

AB, BC and CA are the sides of triangle ABC.
How do we use the sides to find the base and height?

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AREA OF TRIANGLES 120

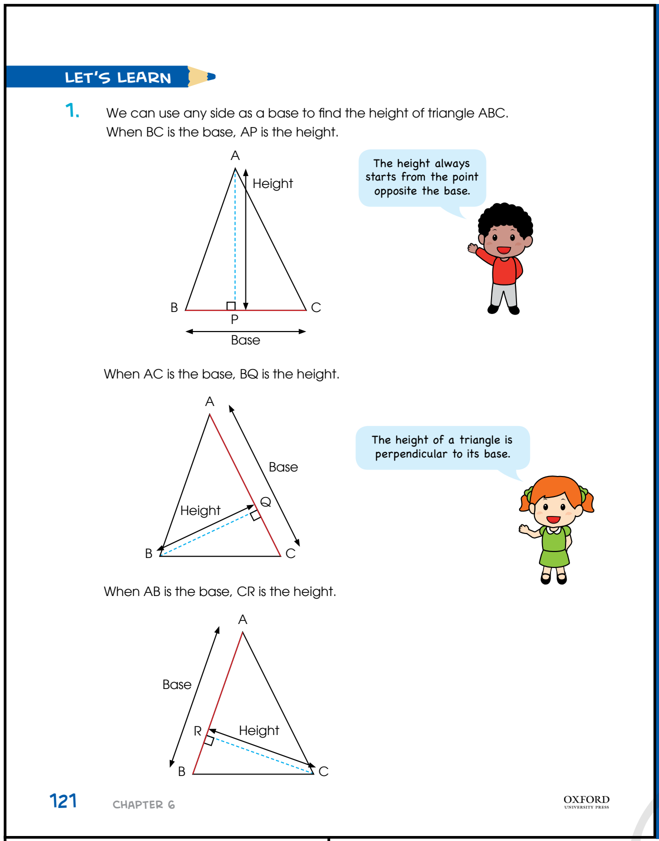
Textbook 5 P120

IN FOCUS

Using the Chapter Opener, ask:

- What activities are the children doing?
- What is the use of the sail in each boat?
- What is the shape of the sail?
- How can we find the area of the triangular sail?

Draw triangle ABC on the board and ask pupils to try to identify the base and height of triangle ABC.



LET'S LEARN

1. We can use any side as a base to find the height of triangle ABC.
When BC is the base, AP is the height.

The height always starts from the point opposite the base.

When AC is the base, BQ is the height.

The height of a triangle is perpendicular to its base.

When AB is the base, CR is the height.

121 CHAPTER 6 OXFORD

Textbook 5 P121

LET'S LEARN

Ask pupils to name the side of triangle ABC. Focus pupils' attention to the side BC. Highlight the word 'base'. Ask:

- If BC is the base, which line is the height?

Draw pupils' attention to point A opposite to the base, BC and the line AP. Review the concept of perpendicular lines and the perpendicular symbol and relate it to the triangle. Teacher reinforces the concept using a set square, placing it over the line AP and PC.

Show triangle ABC and highlight the base AC. Ask:

- When AC is the base, which line is the height?
- Use the set square to show pupils the line, BQJ is perpendicular to the base AC.

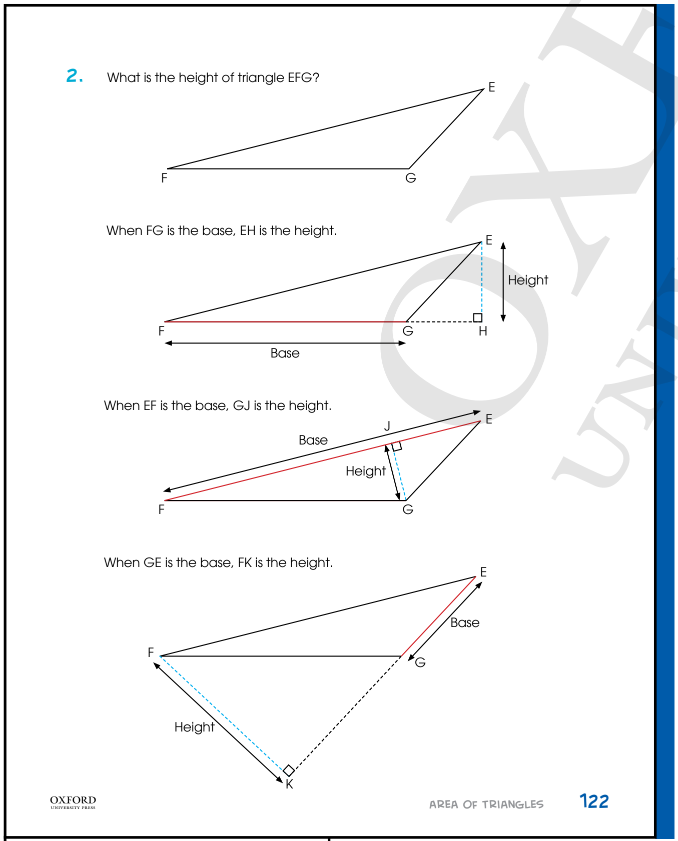
Get pupils to verbalise:

- The height of the triangle is perpendicular to the base.

Using the same triangle ABC, highlight the base AB. Ask:

- When AB is the base, which line is the height?
- Which point is opposite the base, AB?

Get a pupil to draw the height with the help of the set square.



2. What is the height of triangle EFG?

When FG is the base, EH is the height.

When EF is the base, GJ is the height.

When GE is the base, FK is the height.

OXFORD AREA OF TRIANGLES 122

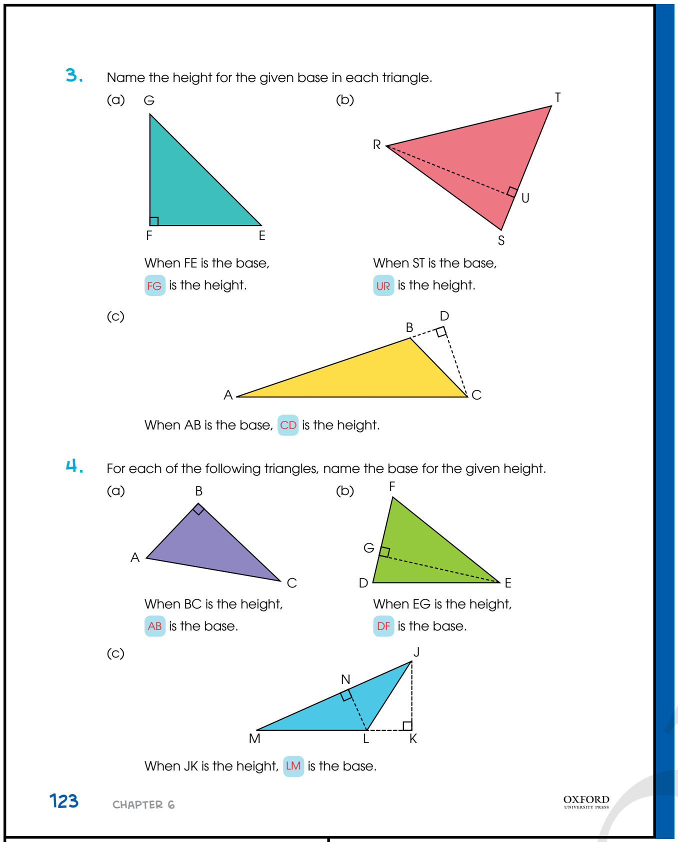
Textbook 4A P122

For Let's Learn 2, draw and label the triangle EFG. Ask pupils to note the difference between triangle EFG and triangle ABC from Let's Learn 1. Lead them to see that triangle EFG has an angle that is more than 90° whereas triangle ABC has all acute angles. Review what pupils have learnt about right angles (Grade Three) if necessary.

Show triangle EFG and highlight the base FG. Teacher illustrates with a set square to show that the height is EH:
Step 1: Extend the line FG
Step 2: Place the set square as shown. Draw the height from the point E.

Similarly, illustrate the respective heights for bases, EF and GE.

Guide pupils to see that the base of a triangle is always one of the sides of the triangle but the height does not have to be a side of the triangle.



3. Name the height for the given base in each triangle.

(a) When FE is the base, FG is the height.

(b) When ST is the base, UR is the height.

(c) When AB is the base, CD is the height.

4. For each of the following triangles, name the base for the given height.

(a) When BC is the height, AB is the base.

(b) When EG is the height, DF is the base.

(c) When JK is the height, LM is the base.

123 CHAPTER 6 OXFORD

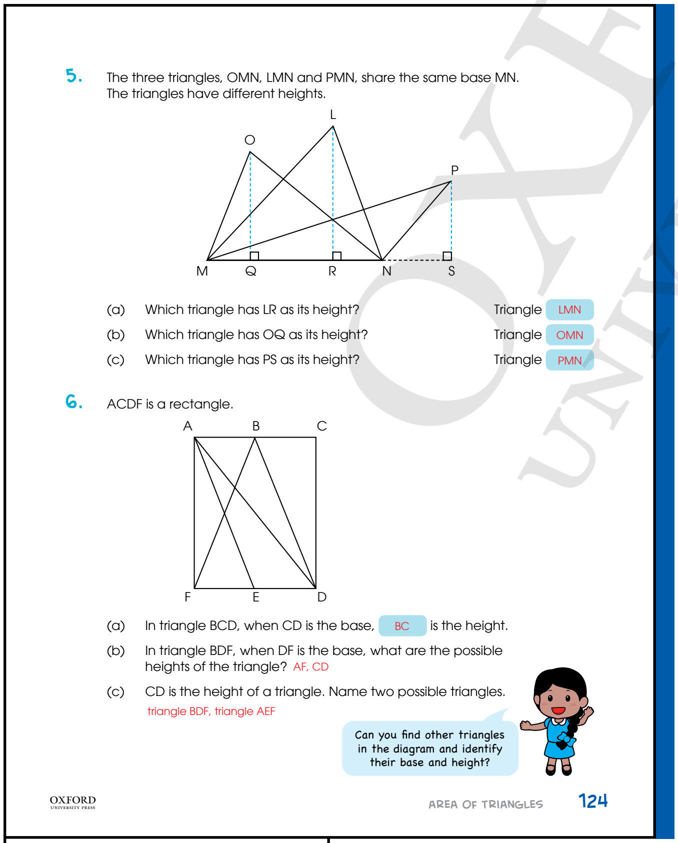
Textbook 5 P123

For Let's Learn 3, three types of triangles: right-angled, acute and obtuse triangles are shown. For each triangle, guide pupils to look for the point opposite the given base and then the line from that point which is perpendicular to the base.

For Let's Learn 3(c), ask pupils why the line BC cannot be the height of the triangle.

For Let's Learn 4, remind pupils that the height of a triangle is always perpendicular to the base. Guide pupils to look for the side of the triangle that is perpendicular to the given height.

For Let's Learn 4(c), ask pupils why line MK is not the base when it is perpendicular to the given height, JK.



5. The three triangles, OMN, LMN and PMN, share the same base MN.
The triangles have different heights.

(a) Which triangle has LR as its height? Triangle LMN

(b) Which triangle has OQ as its height? Triangle OMN

(c) Which triangle has PS as its height? Triangle PMN

6. ACDF is a rectangle.

(a) In triangle BCD, when CD is the base, BC is the height.

(b) In triangle BDF, when DF is the base, what are the possible heights of the triangle? AF, CD

(c) CD is the height of a triangle. Name two possible triangles.
triangle BDF, triangle AEF

OXFORD AREA OF TRIANGLES 124

Textbook 5 P124

For Let's Learn 5(a), with LR as the height, guide the pupils to identify the base of the particular triangle that has L as its vertex. Do the same for 5(b) and 5(c).

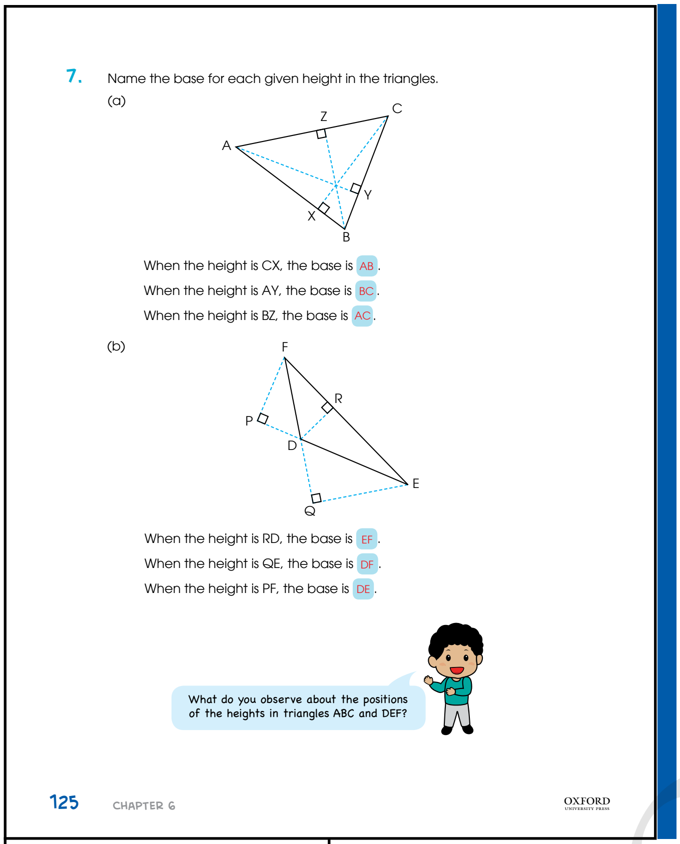
For Let's Learn 6, review with pupils the properties of a rectangle. Ask pupils to identify the sides of the rectangle ACDF that are perpendicular to each other, and the equal opposite sides.

For Let's Learn 6(a), lead pupils to see that triangle BCD is a right-angled triangle. When CD is the base, then BC must be the height.

For Let's Learn 6(b), lead pupils to see that the height from point B, perpendicular to the base FD, is equal to the two sides of the rectangle, AF and CD.

For Let's Learn 6(c), allow pupils to work in pairs to identify other triangles and their respective bases and heights.

In addition, lead pupils to see that triangle ADE has an obtuse angle. Get them to identify the perpendicular line from opposite point A to meet the base DE extended from point E. This line is AF.



7. Name the base for each given height in the triangles.

(a)

When the height is CX, the base is AB.

When the height is AY, the base is BC.

When the height is BZ, the base is AC.

(b)

When the height is RD, the base is EF.

When the height is QE, the base is DF.

When the height is PF, the base is DE.

What do you observe about the positions of the heights in triangles ABC and DEF?

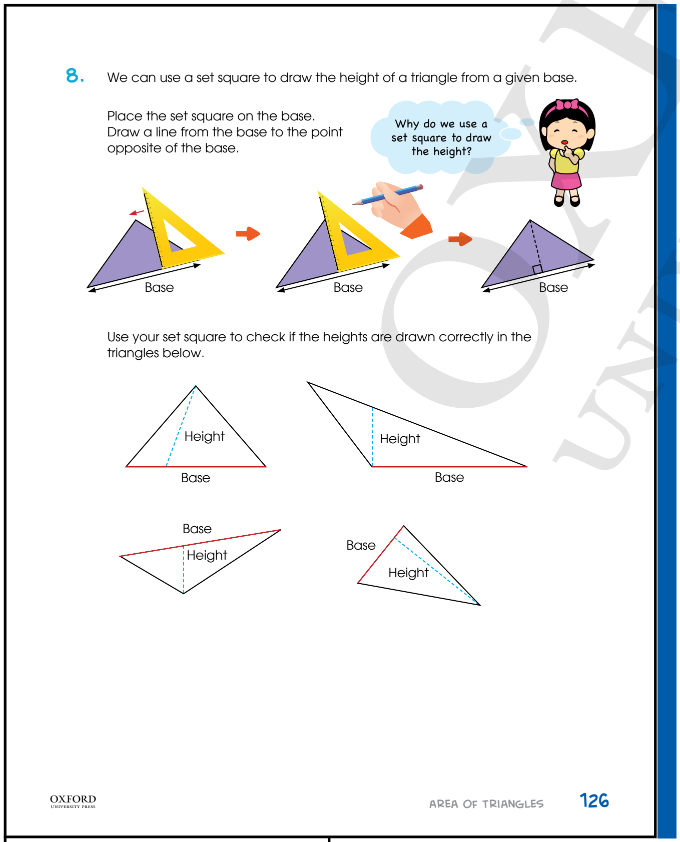
125 CHAPTER 6 OXFORD

Textbook 5 P125

Let's Learn 7 reinforces the concept of base and height of two types of triangles: acute and obtuse triangles.

Within each triangle, each of the three sides can be a base with its related height.

At the end of the task, guide pupils to conclude that:
- The height is perpendicular to the related base.
- The height must pass through the vertex opposite the base.
- The base can be any side of the triangle.
- The height may lie outside the triangle.



8. We can use a set square to draw the height of a triangle from a given base.

Place the set square on the base.
Draw a line from the base to the point opposite of the base.

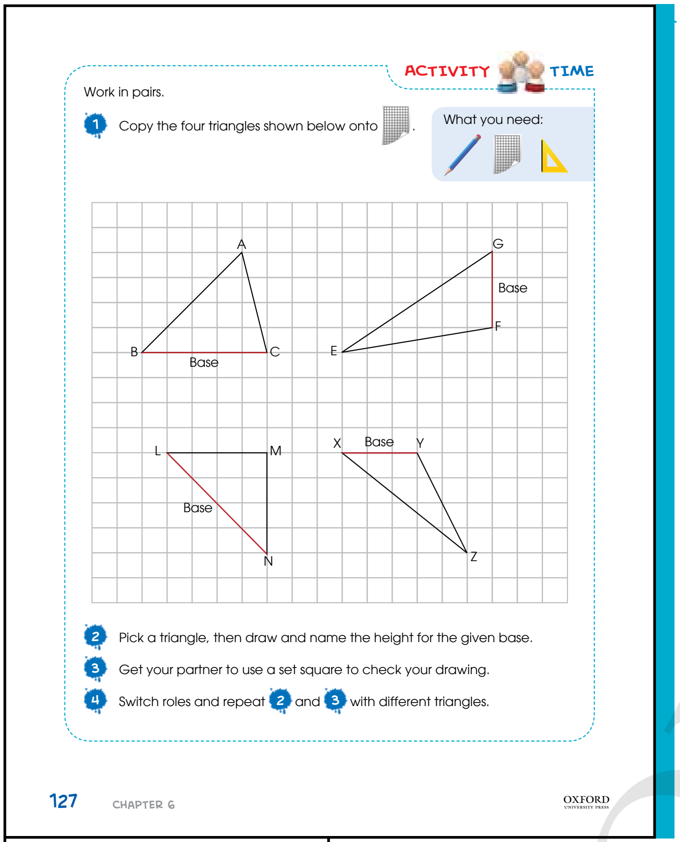
Why do we use a set square to draw the height?

Use your set square to check if the heights are drawn correctly in the triangles below.

OXFORD AREA OF TRIANGLES 126

Textbook 5 P126

For Let's Learn 8, use the visualiser to demonstrate the use of a set square to draw the height from a given base. Allow pupils to work in pairs for this activity. Ask them to copy each triangle on a piece of paper and draw in the correct height from the given base.



ACTIVITY TIME

Work in pairs.

1 Copy the four triangles shown below onto ▦.

What you need:

2 Pick a triangle, then draw and name the height for the given base.

3 Get your partner to use a set square to check your drawing.

4 Switch roles and repeat 2 and 3 with different triangles.

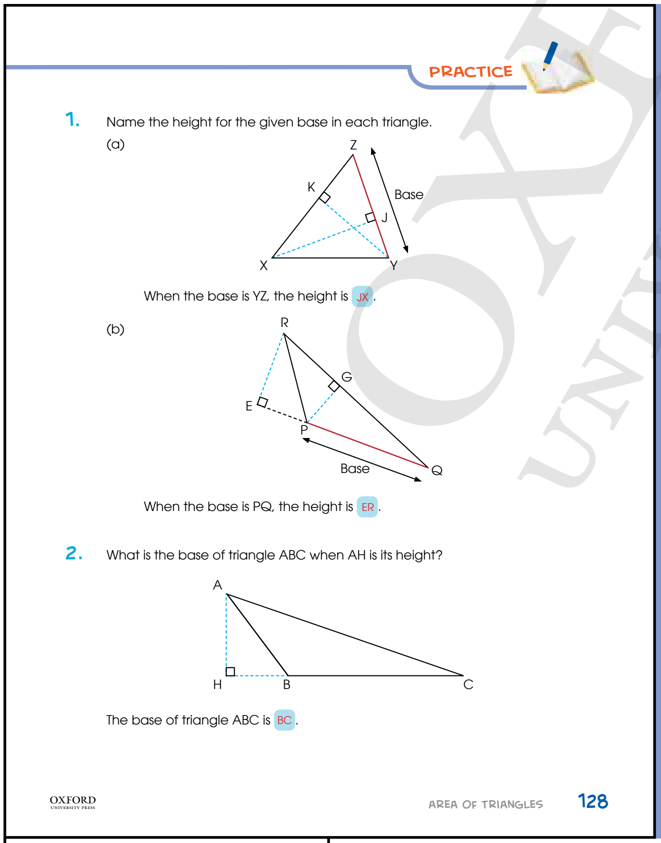
127 CHAPTER 6 OXFORD UNIVERSITY PRESS

Textbook 5 P127

ACTIVITY TIME

This learning experience enables pupils to draw different triangles on a square grid and identify the height of each triangle corresponding to a given base.

First, ask the pupils to examine the perpendicular lines in the square grid paper. Check that pupils know how to draw a line perpendicular to any given horizontal or vertical line on the grid paper. Pupils may need more guidance for the triangle LMN. Intuitively they may see that the height is drawn along the diagonal of the unit squares from the point M. Allow pupils to check their answers with a set square.



PRACTICE

1. Name the height for the given base in each triangle.

(a)

When the base is YZ, the height is JX.

(b)

When the base is PQ, the height is ER.

2. What is the base of triangle ABC when AH is its height?

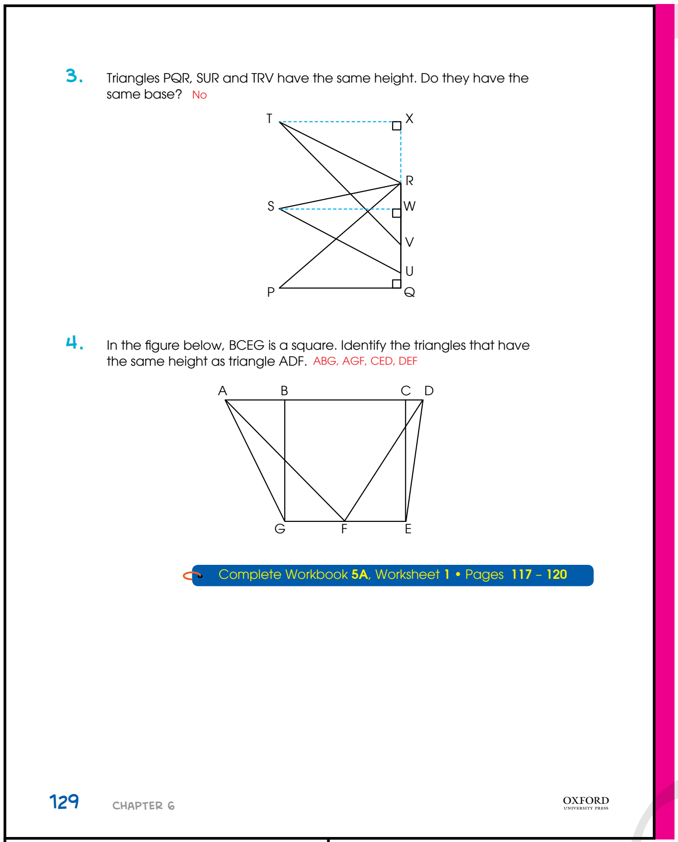
The base of triangle ABC is BC.

OXFORD UNIVERSITY PRESS AREA OF TRIANGLES 128

Textbook 5 P128

PRACTICE

Work with pupils on the practice questions. Invite pupils to explain how they arrive at their answers.



3. Triangles PQR, SUR and TRV have the same height. Do they have the same base? No

4. In the figure below, BCEG is a square. Identify the triangles that have the same height as triangle ADF. ABG, AGF, CED, DEF

Complete Workbook **5A**, Worksheet **1** • Pages **117 – 120**

129 CHAPTER 6 OXFORD UNIVERSITY PRESS

Textbook 5 P129

Independent seatwork

Assign pupils to complete Worksheet 1 (Workbook 5A P117 – 120).

Answers

Workbook 5A (P117 – 120)

1. (a) AD
   (b) AD
   (c) BC
   (d) AD
   (e) CD
   (f) CF

2. (a) BC
   (b) BC
   (c) AC
   (d) BC
   (e) BC
   (f) AC

LESSON PLAN

Chapter 6
Lesson 1

Specific Learning Focus

- Identify the base of a triangle and its corresponding height.

Suggested Duration

3 periods

Prior Learning

Pupils should be well-versed with spatial sense and the concept of area. They should know how to find the area of squares and rectangles. In this lesson, pupils will learn to find the area of triangles.

Pre-emptive Pitfalls

The area of a rectangle has a direct correlation with area of triangles as two congruent triangles form a rectangle. The terms ‘breadth’ and ‘height’ will be addressed in this lesson.

Introduction

This is an extremely important lesson. The formulae for areas of shapes can be given to the pupils, attention should be given to see whether pupils are able to identify the correct dimensions to be used in the formula. Pupils will be introduced to various triangles in this lesson and asked to identify the base and height. Emphasise that the height of a triangle is the line from a vertex that is opposite the base, to the base, where the height is at right angle (perpendicular) to the base. Hence, the use of a set square to find the height is a very important concept to be taught to the pupils. The correct placement and alignment of the set square with the base to the vertex will lead to the measurement of the perpendicular line (height). Let’s Learn 2 (Textbook 5 P122) explains that the base can be extended to find the perpendicular height. Explain to pupils that a right angle will be formed when the base is extended since the triangle is obtuse-angled (at ∠EGF). Tell pupils to be mindful of the fact that although the base is extended, its length is the length of the original base (before extension). In Let’s Learn 5 (Textbook 5 P124), elaborate the fact that given the height, pupils have to look for the vertex and the base of each triangle to identify the triangle. Let’s Learn 6 (Textbook 5 P124) can be used to enhance pupils’ critical thinking skills and can be worked out on the board. Provide pupils with the cut-outs and ask them to identify and colour multiple triangles to find the base and height.

Problem Solving

Develop pupils’ problem-solving skills by working on the practice questions on the board with cut-outs. At the end of the lesson, guide pupils to come to the following conclusions:

- The height of a triangle is always perpendicular to the base.
- The perpendicular height of a triangle is the line from a vertex that is opposite the base, to the base.
- The base can be any side of the triangle.
- The perpendicular height can be found outside the triangle by extending the base.

Activities

‘Activity Time’ (Textbook 5 P127) can be carried out in pairs. Provide pupils with square grid paper. Ask pupils to use a set square to identify the base and height. Point out that the perpendicular height of triangle ABC can lie inside the triangle, whereas the perpendicular heights of triangles EFG and XYZ will lie outside the triangle. Lead pupils to see that in triangle LMN, LM and MN are at right angles to each other.

Resources

- square grid paper (Activity Handbook 5 P25)
- shape cut-outs (Activity Handbook 5 P23, 25)
- set squares
- triangles on square grid (Activity Handbook 5 P24)

Mathematical Communication Support

Elicit individual responses from pupils and do lots of practice (Workbook 5A P117 – 120) and class discussions, while identifying the base and height of triangles. For Question 4 (Textbook 5 P129), ask leading questions, guiding pupils to identify triangles and their dimensions:

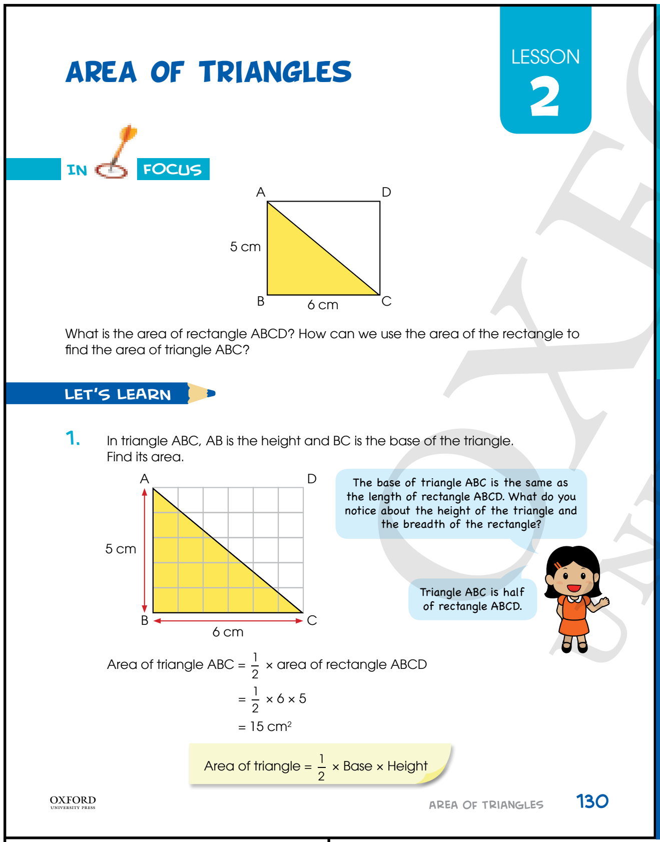
- Can you see base GF? Do you think it forms a triangle?
- Can you extend GF outside the shape and find the height of the triangle?
- What will be the vertex of this triangle?
- When you extend the base, what angle do you form with the vertex opposite to the base?
- Is the height of this triangle the same as the height of any other triangle in this shape?

LESSON
2

AREA OF TRIANGLES

LEARNING OBJECTIVES

1. Determine that the area of triangle is half the area of its related rectangle.
2. Use formula to find the area of a triangle.



AREA OF TRIANGLES

LESSON
2

IN FOCUS

What is the area of rectangle ABCD? How can we use the area of the rectangle to find the area of triangle ABC?

LET'S LEARN

1. In triangle ABC, AB is the height and BC is the base of the triangle. Find its area.

Area of triangle ABC $= \frac{1}{2} \times$ area of rectangle ABCD

$= \frac{1}{2} \times 6 \times 5$

$= 15\ \text{cm}^2$

Area of triangle $= \frac{1}{2} \times$ Base $\times$ Height

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AREA OF TRIANGLES 130

Textbook 5 P130

IN FOCUS

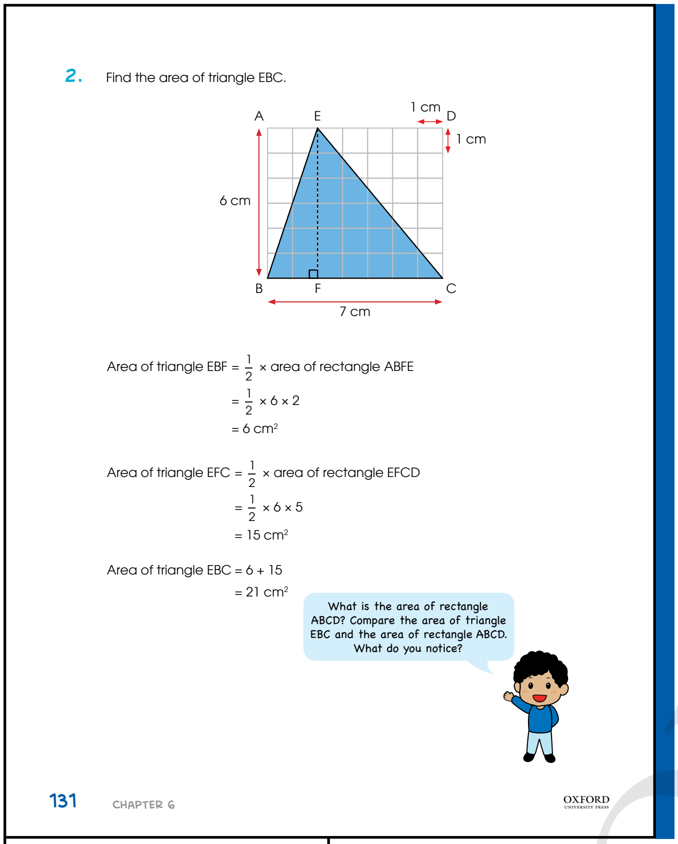
Review with pupils the area of a rectangle using the example of rectangle ABCD. Ask:

- What is the length/breadth of the rectangle?
- What is the area?
- Look at triangle ABC in the figure. What do you think is the area of this triangle?

LET'S LEARN

Let's Learn 1 involves finding the area of a right-angled triangle ABC. Put a 1-cm square grid on the visualiser. Draw a triangle ABC indicating the base (6 cm) and height (5 cm).

Draw and highlight the rectangle ABCD on the square grid. Lead pupils to see that the length and breadth of the rectangle becomes the base and height respectively of the triangle. Guide pupils to conclude that the area of the triangle is half the area of the rectangle.



2. Find the area of triangle EBC.

Area of triangle EBF = $\frac{1}{2}$ × area of rectangle ABFE
= $\frac{1}{2}$ × 6 × 2
= 6 cm^2

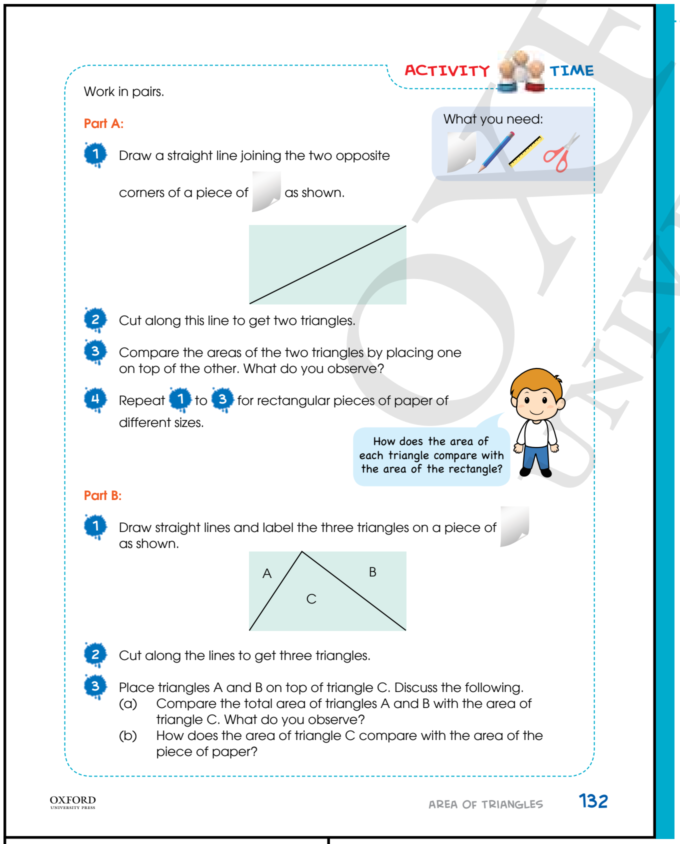
Area of triangle EFC = $\frac{1}{2}$ × area of rectangle EFCD
= $\frac{1}{2}$ × 6 × 5
= 15 cm^2

Area of triangle EBC = 6 + 15
= 21 cm^2

131 CHAPTER 6 OXFORD

Textbook 5 P131

Let's Learn 2 involves finding the area of an acute triangle EBC. In the same way as Let's Learn 1, using a square grid on the visualiser, guide pupils to deduce the formula for area of triangle in relation to the area of related rectangle. Help pupils to see the base and height of each of the dissected triangles in relation to their respective related rectangles.



ACTIVITY TIME

Work in pairs.

Part A:

What you need:

1. Draw a straight line joining the two opposite corners of a piece of ▯ as shown.
2. Cut along this line to get two triangles.
3. Compare the areas of the two triangles by placing one on top of the other. What do you observe?
4. Repeat 1 to 3 for rectangular pieces of paper of different sizes.

Part B:

1. Draw straight lines and label the three triangles on a piece of ▯ as shown.

2. Cut along the lines to get three triangles.
3. Place triangles A and B on top of triangle C. Discuss the following.
   (a) Compare the total area of triangles A and B with the area of triangle C. What do you observe?
   (b) How does the area of triangle C compare with the area of the piece of paper?

OXFORD AREA OF TRIANGLES 132

Textbook 5 P132

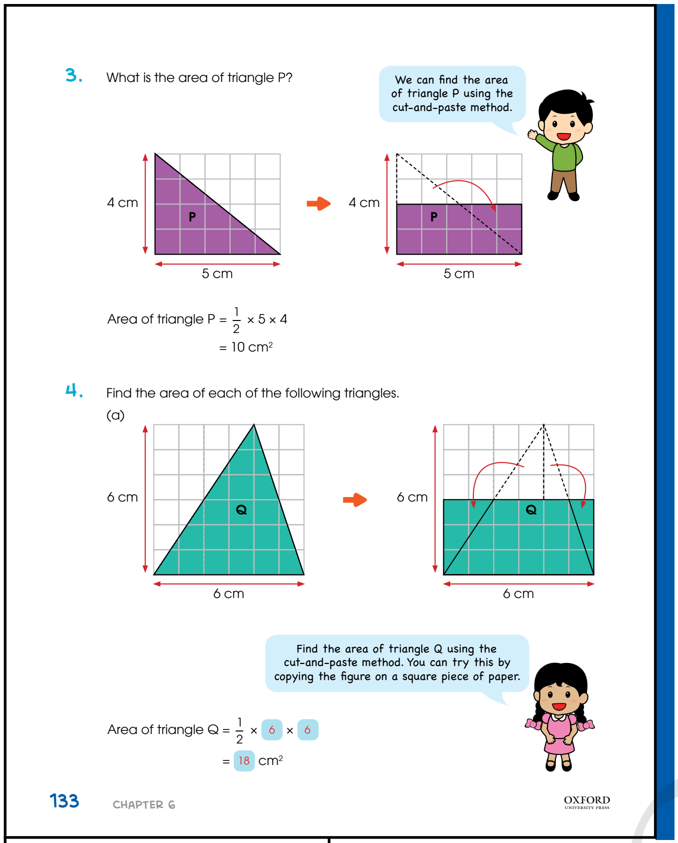
ACTIVITY TIME

This is a hands-on activity for pupils to affirm the relationship between the area of a triangle and its related rectangle.

Part A
Pupils explore with various right-angled triangles cut out diagonally from different rectangles.

Part B
Pupils explore the relationship of the area of an acute triangle with the area of its related rectangle.

After the activity, have a whole class discussion to elicit some conclusions from the pupils.



3. What is the area of triangle P?

We can find the area of triangle P using the cut-and-paste method.

Area of triangle P = $\frac{1}{2} \times 5 \times 4$

= 10 cm²

4. Find the area of each of the following triangles.

(a)

Find the area of triangle Q using the cut-and-paste method. You can try this by copying the figure on a square piece of paper.

Area of triangle Q = $\frac{1}{2} \times \boxed{6} \times \boxed{6}$

= $\boxed{18}$ cm²

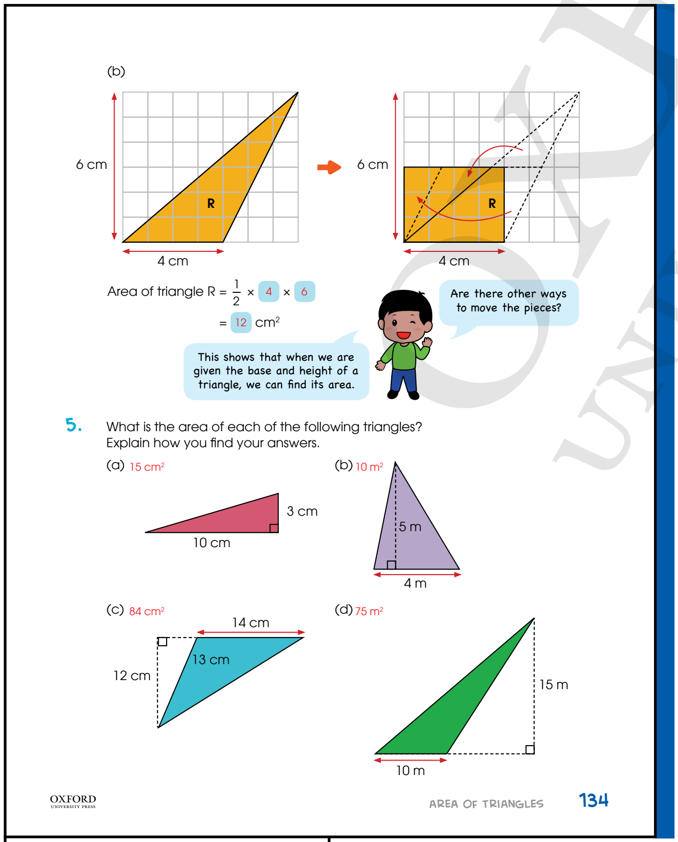
133 CHAPTER 6 OXFORD

Textbook 5 P133

For Let's Learn 3, demonstrate the cut-and-paste method using 1-cm square grid paper and with the aid of a visualiser. This shows the relationship between area of the triangle and its related rectangle, when the base and height of the triangle are known.

Allow pupils to work in pairs for Let's Learn 4.

For Let's Learn 4(a), get pupils to draw the acute triangle Q on a square grid paper. Highlight the base and height of the triangle. Guide them to cut the triangle into 3 pieces as shown. Rearrange the pieces to form a rectangle as shown. Give pupils sufficient time to fill in the blanks before going through with the class.



(b)

Area of triangle R = $\frac{1}{2} \times \boxed{4} \times \boxed{6}$

= $\boxed{12}$ cm²

Are there other ways to move the pieces?

This shows that when we are given the base and height of a triangle, we can find its area.

5. What is the area of each of the following triangles? Explain how you find your answers.

(a) 15 cm²

(b) 10 m²

(c) 84 cm²

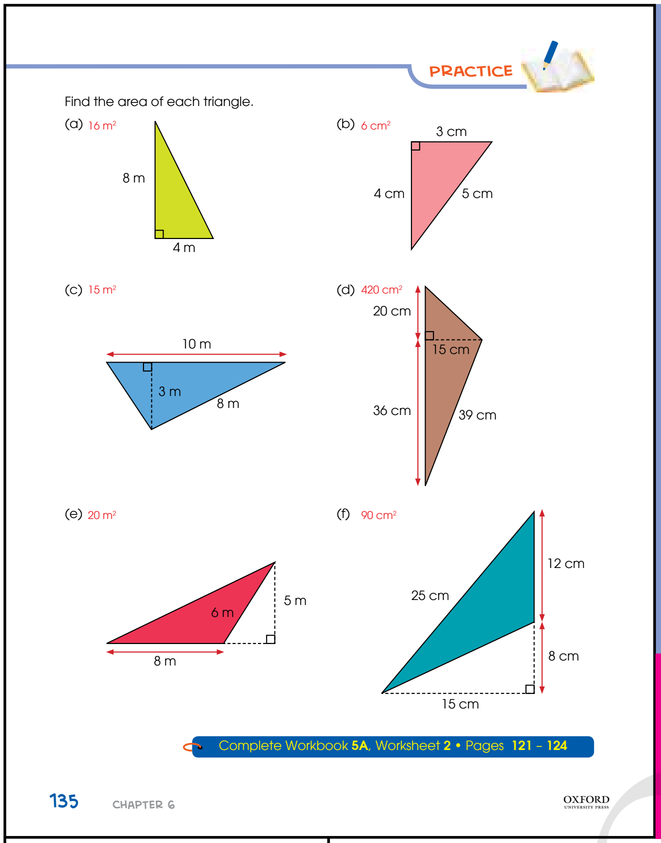
(d) 75 m²

OXFORD AREA OF TRIANGLES 134

Textbook 5 P134

For Let's Learn 4(b), using the same steps, guide pupils to cut and paste the pieces of obtuse triangle R. Give pupils sufficient time to fill in the blanks before going through with the class. Finally, elicit from pupils the general formula for area of a triangle when the base and height are known (Area of triangle = $\frac{1}{2}$ × b × h).

For Let's Learn 5, ask pupils to identify the base and height of each triangle first. Get pupils to explain how they apply the formula for finding the area of each triangle.



PRACTICE

Find the area of each triangle.

(a) 16 m²

(b) 6 cm²

(c) 15 m²

(d) 420 cm²

(e) 20 m²

(f) 90 cm²

Complete Workbook **5A**, Worksheet **2** • Pages **121 – 124**

135 CHAPTER 6 OXFORD

Textbook 5 P135

PRACTICE

Ask pupils to identify the different types of triangles in the practice. Allow pair work on the practice questions. Pupils take turns to do an example each and then check their partner's work.

Independent seatwork

Assign pupils to complete Worksheet 2 (Workbook 5A P121 – 124)

Answers

Worksheet 2 (Workbook 5A P121 – 124)

1. (a) 15
   (b) 10
   (c) 20
   (d) 17.5

2. (a) $\frac{1}{2} \times 6 \times 8$
   $= 24\text{ cm}^2$

   (b) $\frac{1}{2} \times 10 \times 12$
   $= 60\text{ cm}^2$

   (c) $\frac{1}{2} \times 6 \times 10$
   $= 30\text{ cm}^2$

   (d) $\frac{1}{2} \times 24 \times 20$
   $= 240\text{ cm}^2$

   (e) $\frac{1}{2} \times 9 \times 8$
   $= 36\text{ cm}^2$

   (f) $\frac{1}{2} \times 6 \times 15$
   $= 45\text{ cm}^2$

   (g) $\frac{1}{2} \times 15 \times 8$
   $= 60\text{ cm}^2$

   (h) $\frac{1}{2} \times 14 \times 8$
   $= 56\text{ cm}^2$

   $\frac{1}{2} \times 10 \times 8$
   $= 40\text{ cm}^2$

   $56\text{ cm}^2 - 40\text{ cm}^2$
   $= 16\text{ cm}^2$

LESSON PLAN

Chapter 6
Lesson 2

Specific Learning Focus

- Determine that the area of triangle is half the area of its related rectangle.
- Use formula to find the area of a triangle.

Suggested Duration

2 periods

Prior Learning

Pupils should be able to identify the dimensions of a triangle to find the area of a triangle. In this lesson, pupils are introduced to the concept of area of triangles.

Pre-emptive Pitfalls

In ‘In Focus’ (Textbook 5 P130), pupils should not have difficulty seeing that triangle ABC is half of rectangle ABCD, so the area of triangle ABC is half the area of rectangle ABCD, and hence the derivation of the formula of the area of a triangle. However, they may face some difficulty in identifying the correct base and height of a triangle.

Introduction

Emphasise to pupils that in the concept of area of triangles, a rectangle can be drawn around a triangle such that the vertices of the triangle lie on the sides of the rectangle and so the length and breadth of a rectangle are the base and height of the triangle. The length and breadth of a rectangle are at right angles to each other and so are the base and height of a triangle. The cut-and-paste method is best to emphasise the relationship between area of the triangle and its related rectangle. Let’s Learn 3 and 4 (Textbook 5 P133) explain this relationship by cutting and pasting on a square grid.

Problem Solving

Emphasise the formula: Area of a triangle = $\frac{1}{2}$ × base × height, where base is related to the length of a rectangle and height is related to the breadth of a rectangle. Identify the triangle’s related rectangle and then explain that the area of the triangle is half of the area of its related rectangle.

Activities

‘Activity Time’ (Textbook 5 P132) can also be done individually. In Part B, the activity requires high-order thinking skills where pupils are required to deduce that the area of triangle C is half of the area of the rectangle and hence the total area of triangles A and B is the area of the other half of the rectangle, which is equal to the area of triangle C.

Resources

- paper
- scissors
- ruler
- set squares
- triangles on square grid (Activity Handbook 5 P27)

Mathematical Communication Support

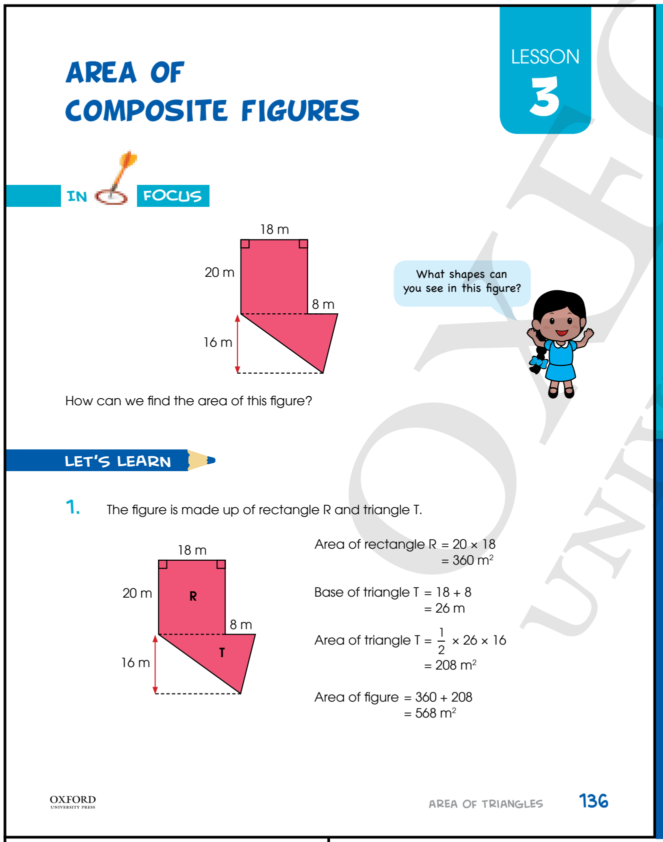
‘Mind Workout’ and ‘Maths Journal’ (Textbook 5 P142) can be done as class discussions. Ask questions to guide pupils to correctly identify the dimensions of a triangle and hence its area.

LESSON
3

AREA OF COMPOSITE FIGURES

LEARNING OBJECTIVE

1. Find the area of composite figures made up of squares, rectangles and triangles.



AREA OF COMPOSITE FIGURES

LESSON
3

IN FOCUS

How can we find the area of this figure?

LET'S LEARN

1. The figure is made up of rectangle R and triangle T.

Area of rectangle R = 20×18
= 360 m^2

Base of triangle T = 18 + 8
= 26 m

Area of triangle T = $\frac{1}{2} \times 26 \times 16$
= 208 m^2

Area of figure = 360 + 208
= 568 m^2

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AREA OF TRIANGLES 136

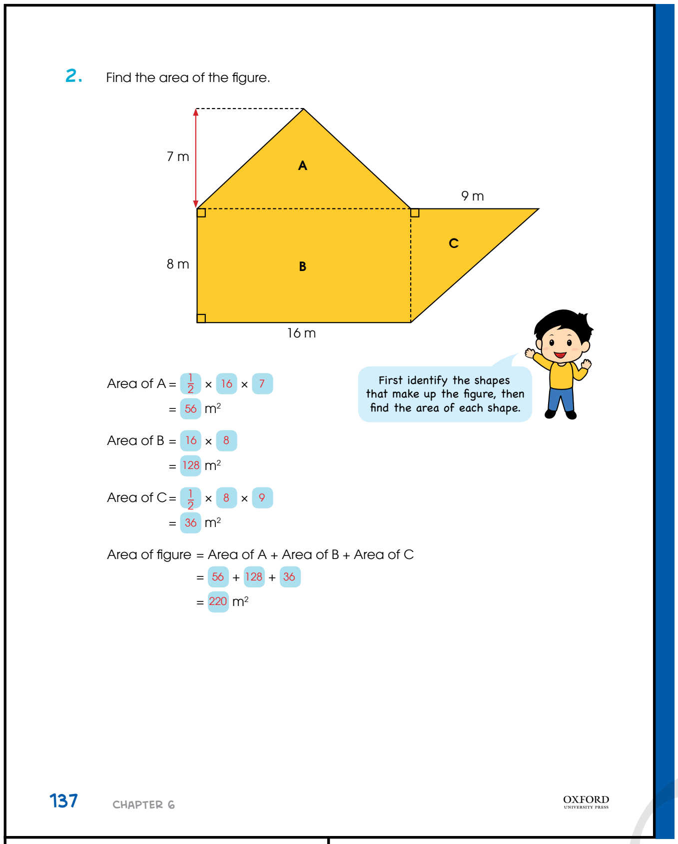
Textbook 5 P136

IN FOCUS

Show the figure on a visualiser. Ask:
- Can you find the area of this figure?
- What method would you use?
- What familiar shapes do you see in the figure?

LET'S LEARN

For Let's Learn 1, introduce the figure as a composite figure. Get pupils to identify the basic shapes that made up the composite figure. Get them to identify the dimensions of the rectangle, R, and the base and height of the triangle, T.



2. Find the area of the figure.

Area of A = $\frac{1}{2} \times 16 \times 7$

= 56 m²

Area of B = 16 × 8

= 128 m²

Area of C = $\frac{1}{2} \times 8 \times 9$

= 36 m²

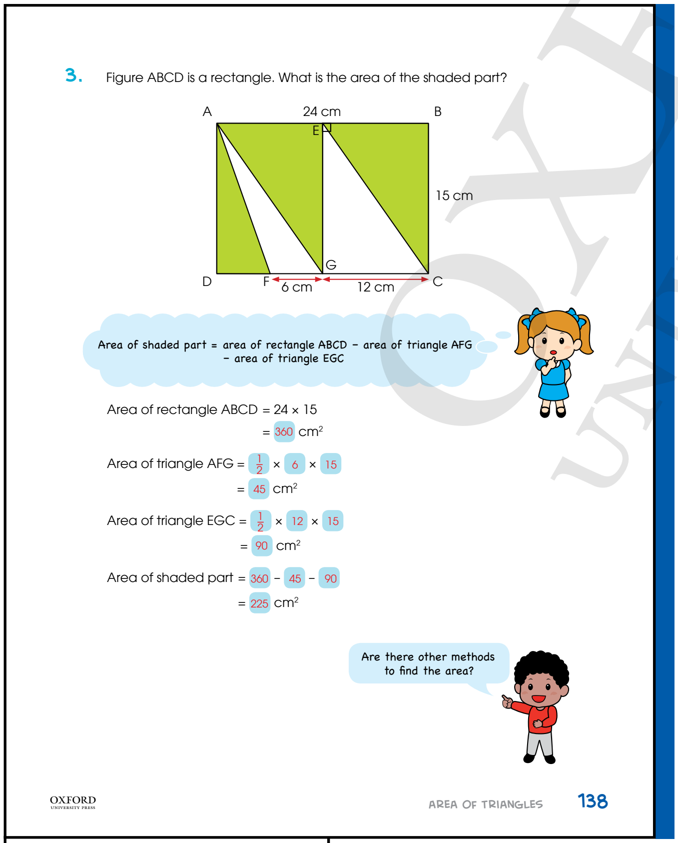
Area of figure = Area of A + Area of B + Area of C

= 56 + 128 + 36

= 220 m²

Textbook 5 P137

Let's Learn 2 reinforces the skills learnt in Let's Learn 1. Get pupils to identify the shapes that made up this composite figure and the dimensions of each shape. Ask them to apply the formulae for area of rectangle and area of triangle to find the total area of the given figure. Give pupils sufficient time to work through the example before going through.



3. Figure ABCD is a rectangle. What is the area of the shaded part?

Area of rectangle ABCD = 24 × 15

= 360 cm²

Area of triangle AFG = $\frac{1}{2} \times 6 \times 15$

= 45 cm²

Area of triangle EGC = $\frac{1}{2} \times 12 \times 15$

= 90 cm²

Area of shaded part = 360 – 45 – 90

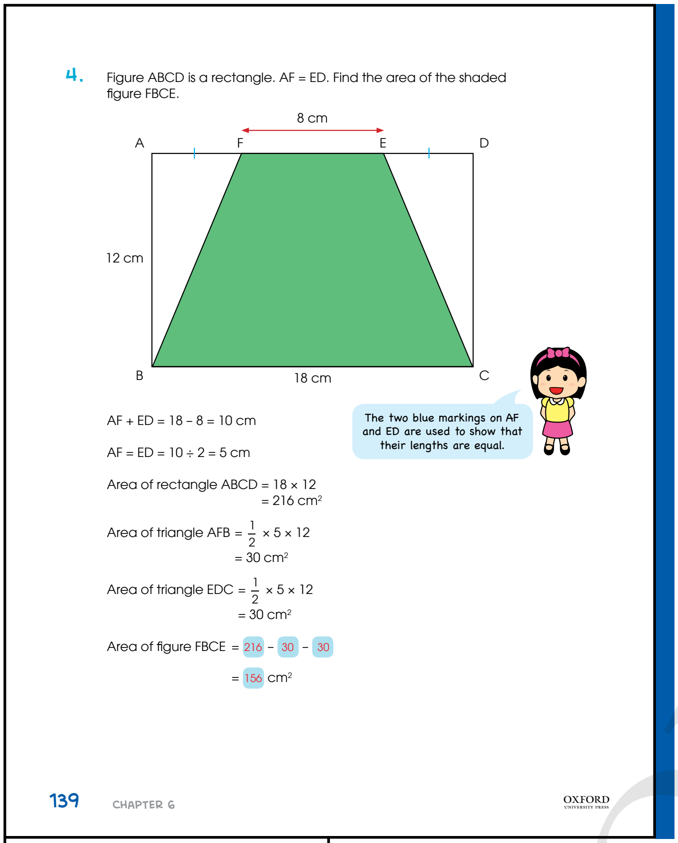
= 225 cm²

Textbook 5 P138

For Let's Learn 3, discuss with pupils what they see in the figure. Ask:

- What shapes make up the shaded part?
- What shapes make up the unshaded part?
- What is the base and height of each of the triangles?
- How many ways can you find the area of the shaded part?

Allow pair work and ask pupils to use two different methods to find the answer to the question. Invite pupils to show their various methods.



4. Figure ABCD is a rectangle. AF = ED. Find the area of the shaded figure FBCE.

AF + ED = 18 − 8 = 10 cm

AF = ED = 10 ÷ 2 = 5 cm

Area of rectangle ABCD = 18 × 12
= 216 cm^2

Area of triangle AFB = $\frac{1}{2}$ × 5 × 12
= 30 cm^2

Area of triangle EDC = $\frac{1}{2}$ × 5 × 12
= 30 cm^2

Area of figure FBCE = 216 − 30 − 30
= 156 cm^2

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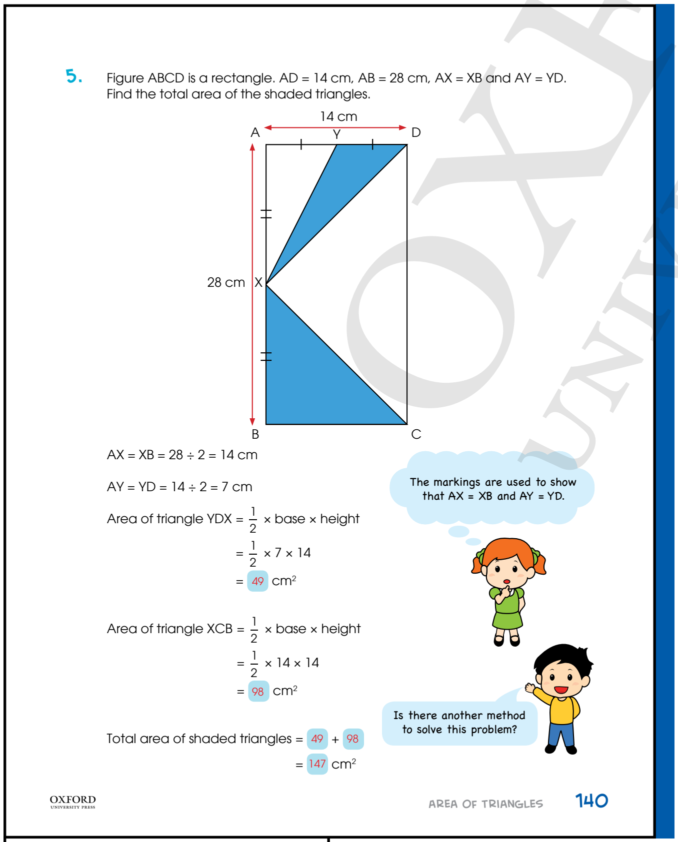
Textbook 5 P139

For Let's Learn 4, guide pupils to find the length of AF and ED. Work through the example with them. Encourage pupils to solve the problem in another way by dissecting the shaded figure to find its area. Hint:

- Shaded figure can be partitioned into two triangles and one rectangle by drawing the perpendicular lines from F and E to BC.



5. Figure ABCD is a rectangle. AD = 14 cm, AB = 28 cm, AX = XB and AY = YD. Find the total area of the shaded triangles.

AX = XB = 28 ÷ 2 = 14 cm

AY = YD = 14 ÷ 2 = 7 cm

Area of triangle YDX = $\frac{1}{2}$ × base × height
= $\frac{1}{2}$ × 7 × 14
= 49 cm^2

Area of triangle XCB = $\frac{1}{2}$ × base × height
= $\frac{1}{2}$ × 14 × 14
= 98 cm^2

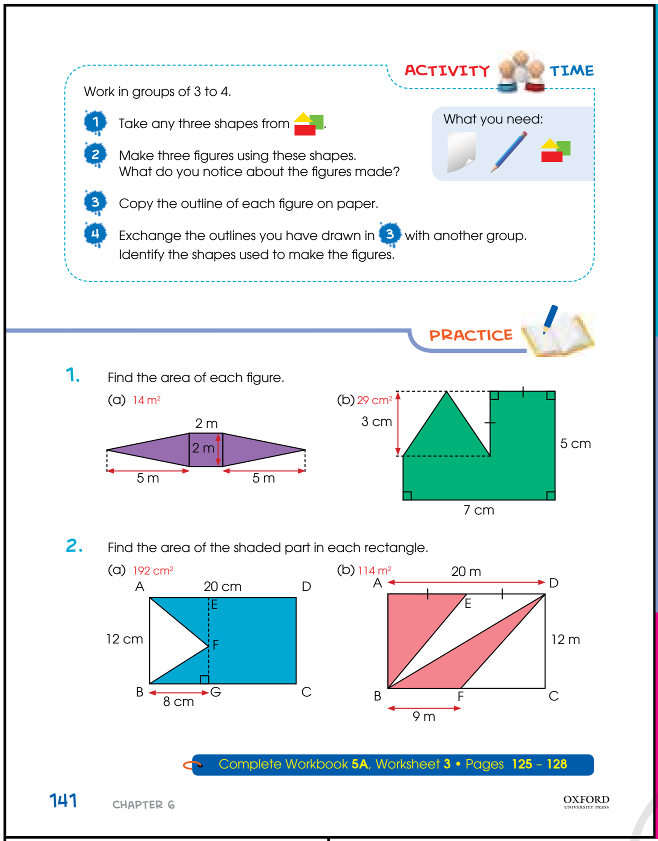
Total area of shaded triangles = 49 + 98
= 147 cm^2

OXFORD UNIVERSITY PRESS AREA OF TRIANGLES 140

Textbook 5 P140

For Let's Learn 5, guide pupils to find the unknown dimensions and get them to identify the base and height for each shaded triangle.

Allow pupils to work in pairs to find another method to solve the problem before going through with the class.



ACTIVITY TIME

Work in groups of 3 to 4.

1. Take any three shapes from ▲🟩🟥.
2. Make three figures using these shapes.
   What do you notice about the figures made?
3. Copy the outline of each figure on paper.
4. Exchange the outlines you have drawn in ③ with another group.
   Identify the shapes used to make the figures.

What you need:

PRACTICE

1. Find the area of each figure.

(a) 14 m²

(b) 29 cm²

2. Find the area of the shaded part in each rectangle.

(a) 192 cm²

(b) 114 m²

Complete Workbook **5A**, Worksheet **3** • Pages **125 – 128**

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Textbook 5 P141

ACTIVITY TIME

This is a hands-on activity to help pupils visualise how composite figures can be formed and partitioned into basic shapes of squares, rectangles and triangles. Teacher can prepare cut-outs of the basic shapes or use pattern blocks of these shapes.

PRACTICE

Allow pupils to work in pairs on the practice questions. For each question, select a pair to show their working on the board for the class to evaluate. Ask for alternative methods if any.

Independent seatwork

Assign pupils to complete Worksheet 3 (Workbook 5A P125 – 128).

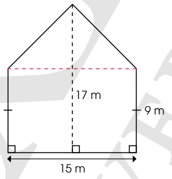
Answers

Worksheet 3 (Workbook 5A P125 – 128)

1. (a) Area of rectangle = 15 × 9

= 135 m²

17 m − 9 m = 8 m



Area of triangle = $\frac{1}{2}$ × 15 × 8

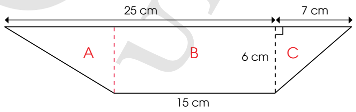
= 60 m²

Area of figure = 135 + 60

= 195 m²

(b) Area of A = $\frac{1}{2}$ × 10 × 6

= 30 cm²



Area of B = 15 × 16

= 90 cm²

Area of C = $\frac{1}{2}$ × 7 × 6

= 21 cm²

Area of figure = Area of A + Area of B + Area of C

= 30 + 90 + 21

= 141 cm²

2. (a) Area of shaded part = $\frac{1}{2}$ × 10 × 6

= 30 cm²

(b) Area of rectangle ABCD = 26 × 20

= 520 cm²

Area of triangle BEC = $\frac{1}{2}$ × 26 × 10

= 130 cm²

Area of shaded part = 520 − 130

= 390 cm²

(c) Area of tringle AEB = $\frac{1}{2}$ × 16 × 8

= 64 m²

Area of triangle CED = $\frac{1}{2}$ × 16 × 12

= 96 m²

Area of shaded part = 64 × 96

= 160 m²

(d) Area of rectangle ABCD = 40 × 24

= 960 m²

EF = 40 − 16 − 11

= 13 m

Area of triangle GEF = $\frac{1}{2}$ × 13 × 24

= 156 m²

Area shaded part = 960 − 156

= 804 m²

LESSON PLAN

Chapter 6
Lesson 3

Specific Learning Focus

- Find the area of composite figures made up of squares, rectangles and triangles.

Suggested Duration

4 periods

Prior Learning

Pupils should be able to identify triangles in their respective related rectangles, as well as able to identify the triangle's base and height. They should also be well-versed with finding the areas of rectangle, square and triangle.

Pre-emptive Pitfalls

Pupils might face difficulty in visualising and identifying the different shapes that make a composite figure. This requires higher-order thinking where pupils are expected to partition composite figures into rectangles, squares and triangles. They are also required to identify their dimensions and find the area.

Introduction

Firstly, guide pupils to identify the shapes that make up a composite figure. Next, get them to identify the dimensions of each shape and then write the formula for the area of each shape. Ensure that pupils substitute the correct values into the formulae. Lastly, lead pupils to see that depending on the composite figure, we either add or subtract the areas of the shapes to get the area of the composite shape (see Let's Learn 2 – 4 in Textbook 5 P137 – 139).

Problem Solving

Pupils should be guided to develop spatial and visual skills to identify the shapes. In Let's Learn 4 (Textbook 5 P139), figure FBCE is a trapezium. As shown in the textbook, to find its area, we dissect the figure into shapes to find the area of each shape and then add the areas to find the area of figure FBCE. Lead pupils to see that there is an alternative method to find the area of figure FBCE. Ask pupils to extend line FE and then draw two perpendicular lines to vertices B and C respectively to form the rectangle that encompasses figure FBCE. Observe if they are able to do so correctly. Then, guide them to find the area of rectangle ABCD, triangles ABF and CDE. Then, we subtract the areas of the two triangles from the area of rectangle ABCD to find the area of figure FBCE.

Activities

For 'Activity Time' (Textbook 5 P141), provide pupils with laminated shape cut-outs. Get pupils to work in groups of 3 or 4. Allow pupils to use more than one of each shape to make the figures. Get the groups to share the figures made with one another and identify the shapes used to make the figure.

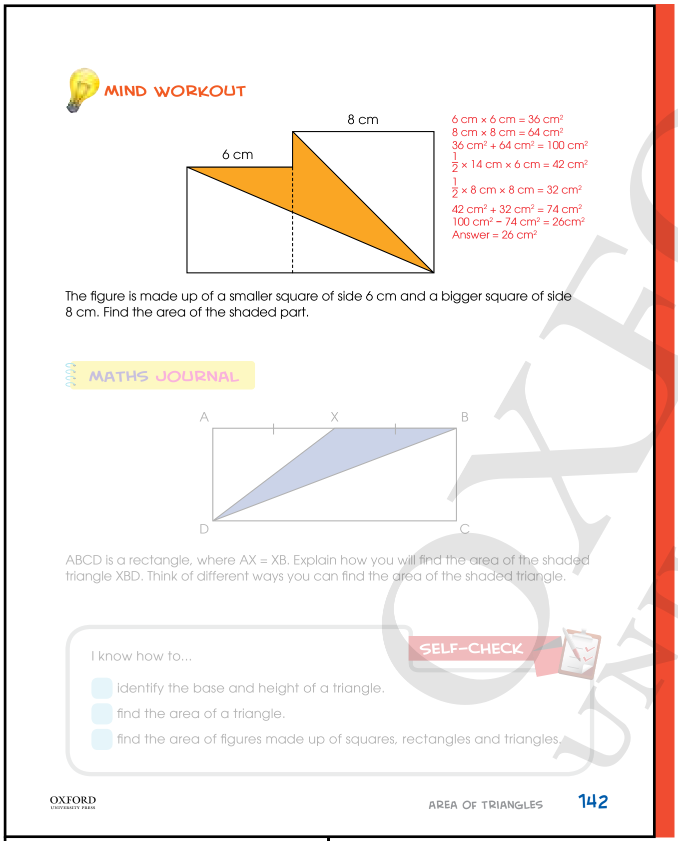
Resources

- cut-outs of triangles, squares and rectangles (Activity Handbook 5 P28)

Mathematical Communication Support

Ask important questions while guiding pupils to identify the shapes that make up a composite figure, dimensions of the shapes, formulae of areas and the strategy to be applied to get the area of the composite figure. Do sums on the board and elicit pupils to find different ways of partitioning the composite figure.

PROBLEM SOLVING, MATHS JOURNAL AND PUPIL REVIEW



MIND WORKOUT

$6\text{ cm} \times 6\text{ cm} = 36\text{ cm}^2$
$8\text{ cm} \times 8\text{ cm} = 64\text{ cm}^2$
$36\text{ cm}^2 + 64\text{ cm}^2 = 100\text{ cm}^2$
$\frac{1}{2} \times 14\text{ cm} \times 6\text{ cm} = 42\text{ cm}^2$
$\frac{1}{2} \times 8\text{ cm} \times 8\text{ cm} = 32\text{ cm}^2$
$42\text{ cm}^2 + 32\text{ cm}^2 = 74\text{ cm}^2$
$100\text{ cm}^2 - 74\text{ cm}^2 = 26\text{cm}^2$
Answer = 26 cm^2

The figure is made up of a smaller square of side 6 cm and a bigger square of side 8 cm. Find the area of the shaded part.

MATHS JOURNAL

ABCD is a rectangle, where AX = XB. Explain how you will find the area of the shaded triangle XBD. Think of different ways you can find the area of the shaded triangle.

SELF-CHECK

I know how to...

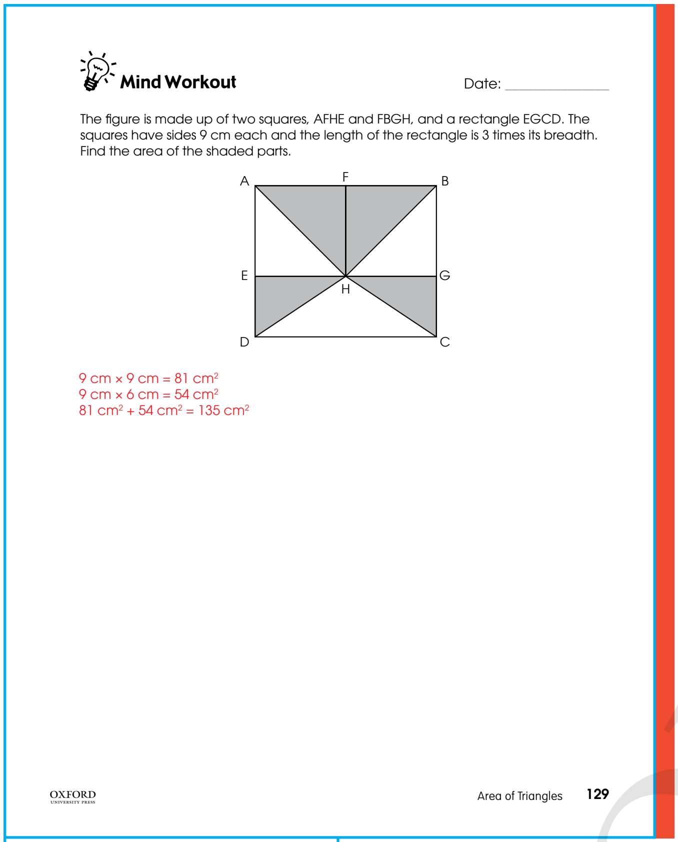
☐ identify the base and height of a triangle.
☐ find the area of a triangle.
☐ find the area of figures made up of squares, rectangles and triangles.

AREA OF TRIANGLES 142

Textbook 5 P142

MIND WORKOUT

Pupils would have difficulty if they just dissect the shaded part into two triangles and try to calculate their area directly. Guide pupils to see that they can obtain the area of the shaded part by subtracting the areas of the unshaded triangles from the sum of areas of the two squares.



Mind Workout Date: ______________

The figure is made up of two squares, AFHE and FBGH, and a rectangle EGCD. The squares have sides 9 cm each and the length of the rectangle is 3 times its breadth. Find the area of the shaded parts.

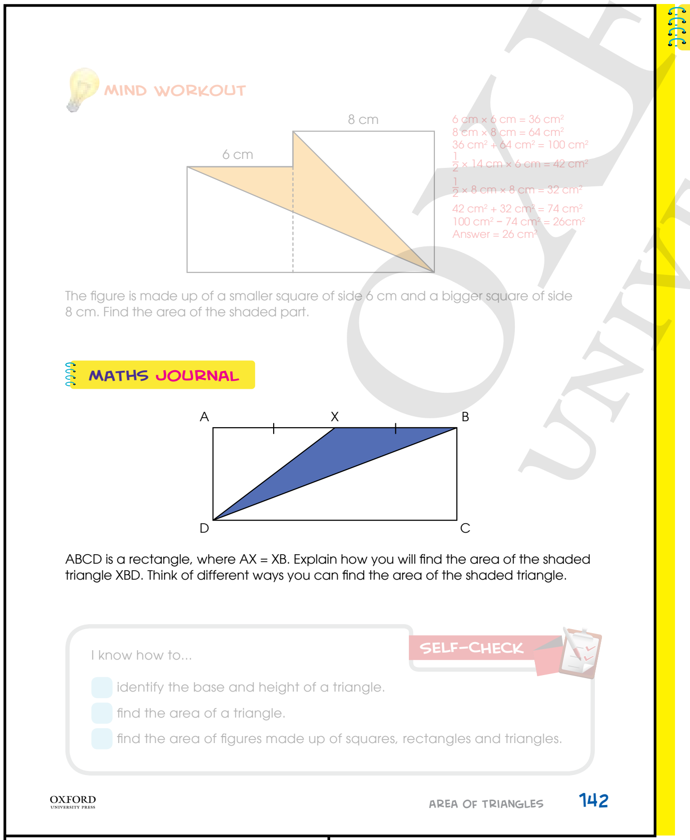
9 cm × 9 cm = 81 cm²
9 cm × 6 cm = 54 cm²
81 cm² + 54 cm² = 135 cm²

OXFORD UNIVERSITY PRESS Area of Triangles 129

Workbook 5A P129

Mind Workout

Most pupils will obtain the solution with the routine method using area of triangles. Some pupils may be able to see that the shaded parts are made up of a square AFHE and half of rectangle EGCD.



MIND WORKOUT

6 cm × 6 cm = 36 cm²
8 cm × 8 cm = 64 cm²
36 cm² + 64 cm² = 100 cm²
$\frac{1}{2}$ × 14 cm × 6 cm = 42 cm²
$\frac{1}{2}$ × 8 cm × 8 cm = 32 cm²
42 cm² + 32 cm² = 74 cm²
100 cm² − 74 cm² = 26cm²
Answer = 26 cm²

The figure is made up of a smaller square of side 6 cm and a bigger square of side 8 cm. Find the area of the shaded part.

MATHS JOURNAL

ABCD is a rectangle, where AX = XB. Explain how you will find the area of the shaded triangle XBD. Think of different ways you can find the area of the shaded triangle.

SELF-CHECK

I know how to...

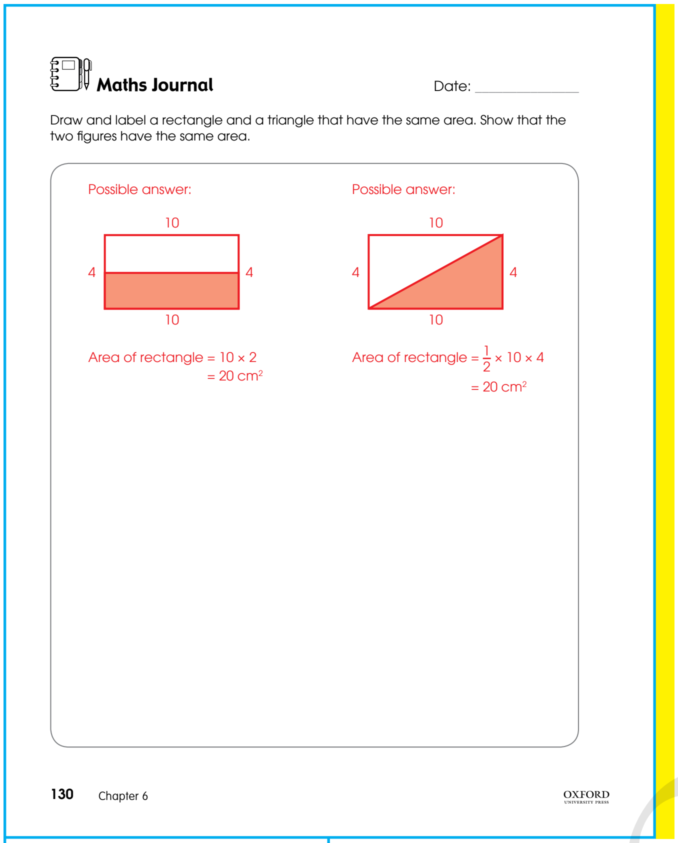
☐ identify the base and height of a triangle.
☐ find the area of a triangle.
☐ find the area of figures made up of squares, rectangles and triangles.

OXFORD UNIVERSITY PRESS AREA OF TRIANGLES 142

Textbook 5 P142

MATHS JOURNAL

This journal task allows pupils to show their understanding and application of the skills and concepts taught using their own explanations.



Maths Journal Date: ______________

Draw and label a rectangle and a triangle that have the same area. Show that the two figures have the same area.

Possible answer:

Area of rectangle = 10 × 2
= 20 cm^2

Possible answer:

Area of rectangle = $\frac{1}{2}$ × 10 × 4
= 20 cm^2

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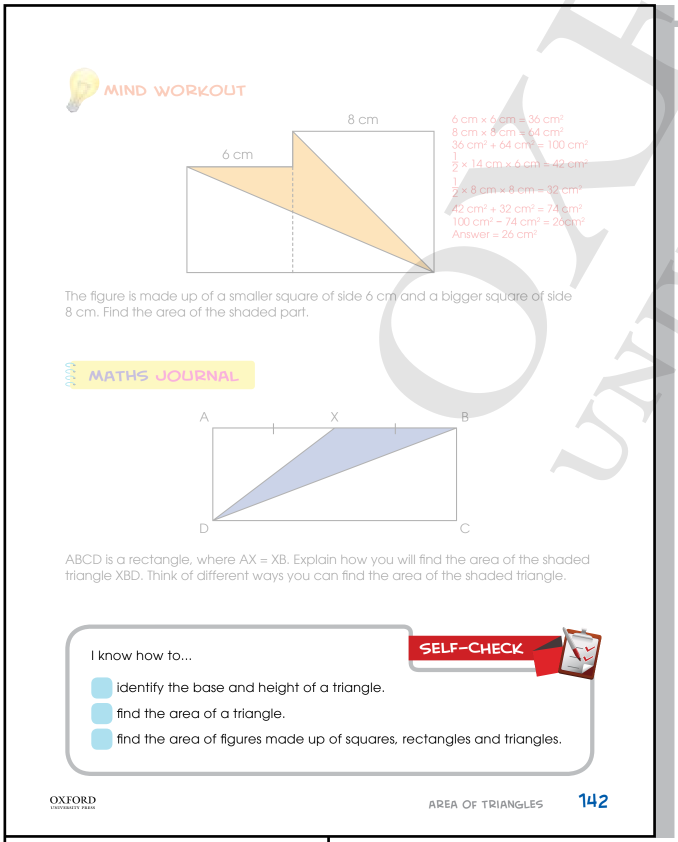
Workbook 5A P130

Maths Journal

This journal task allows pupils to show their understanding of the relationship between area of triangle and area of rectangle as well as their application of the formulae to find area of the two shapes. Accept other possible answers.



MIND WORKOUT

6 cm × 6 cm = 36 cm^2
8 cm × 8 cm = 64 cm^2
36 cm^2 + 64 cm^2 = 100 cm^2
$\frac{1}{2}$ × 14 cm × 6 cm = 42 cm^2
$\frac{1}{2}$ × 8 cm × 8 cm = 32 cm^2
42 cm^2 + 32 cm^2 = 74 cm^2
100 cm^2 – 74 cm^2 = 26cm^2
Answer = 26 cm^2

The figure is made up of a smaller square of side 6 cm and a bigger square of side 8 cm. Find the area of the shaded part.

MATHS JOURNAL

ABCD is a rectangle, where AX = XB. Explain how you will find the area of the shaded triangle XBD. Think of different ways you can find the area of the shaded triangle.

SELF-CHECK

I know how to...

☐ identify the base and height of a triangle.
☐ find the area of a triangle.
☐ find the area of figures made up of squares, rectangles and triangles.

OXFORD UNIVERSITY PRESS AREA OF TRIANGLES 142

Textbook 5 P142

SELF-CHECK

Before the pupils do the self-check, review the important concepts once more by asking for examples learnt for each objectives.

The self-check can be done after pupils have completed **Review 6** (Workbook 5A P131 – 136).

Answers Review 6 (Workbook 5A P131 – 136)

1. (a) CE
   (b) BC

2. (a) 12 cm^2
   (b) 9 cm^2
   (c) 10 cm^2

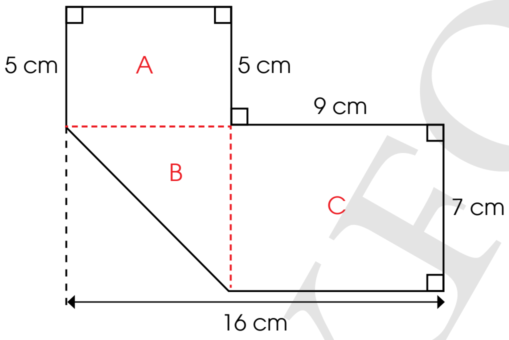
3. (a) $\frac{1}{2} \times 12 \times 6$
   $= 36\ cm^2$

   (b) $\frac{1}{2} \times 10 \times 12$
   $= 60\ cm^2$

   (c) $\frac{1}{2} \times 24 \times 5$
   $= 60\ cm^2$

   (d) $\frac{1}{2} \times 32 \times 9$
   $= 144\ cm^2$

4. (a)



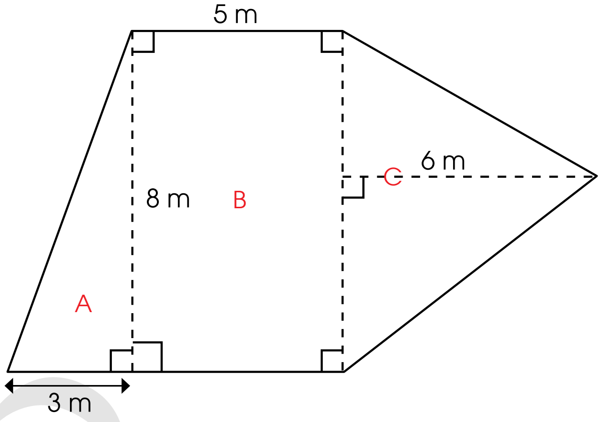
Area of A = 7×5
$= 35\ cm^2$

Area of B = $\frac{1}{2} \times 7 \times 7$
$= 24\frac{1}{2}\ cm^2$

Area of C = 9×7
$= 63\ cm^2$

Area of figure = Area of A + Area of B + Area of C
$= 35\ cm^2 + 24\frac{1}{2}\ cm^2 + 63\ cm^2$
$= 122\frac{1}{2}\ cm^2$

(b)



Area of A = $\frac{1}{2} \times 3 \times 8$
$= 35\ cm^2$

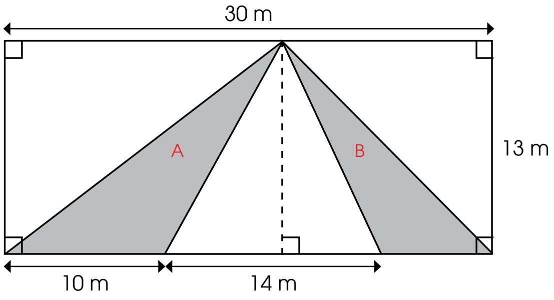
Area of B = 8×5
$= 40\ m^2$

Area of C = $\frac{1}{2} \times 8 \times 6$
$= 24\ cm^2$

Area of figure = Area of A + Area of B + Area of C
$= 12\ m^2 + 40\ m^2 + 24\ m^2$
$= 76\ m^2$

5. (a) $40\ cm \times 20\ cm = 800\ cm^2$
   $20\ cm - 8\ cm = 12\ cm$
   $\frac{1}{2} \times 40\ cm \times 12\ cm = 240\ cm^2$
   $800\ cm^2 - 240\ cm^2 = 560\ cm^2$

   (b)



Area of A = $\frac{1}{2} \times 10\ m \times 13\ m$
$= 65\ m^2$

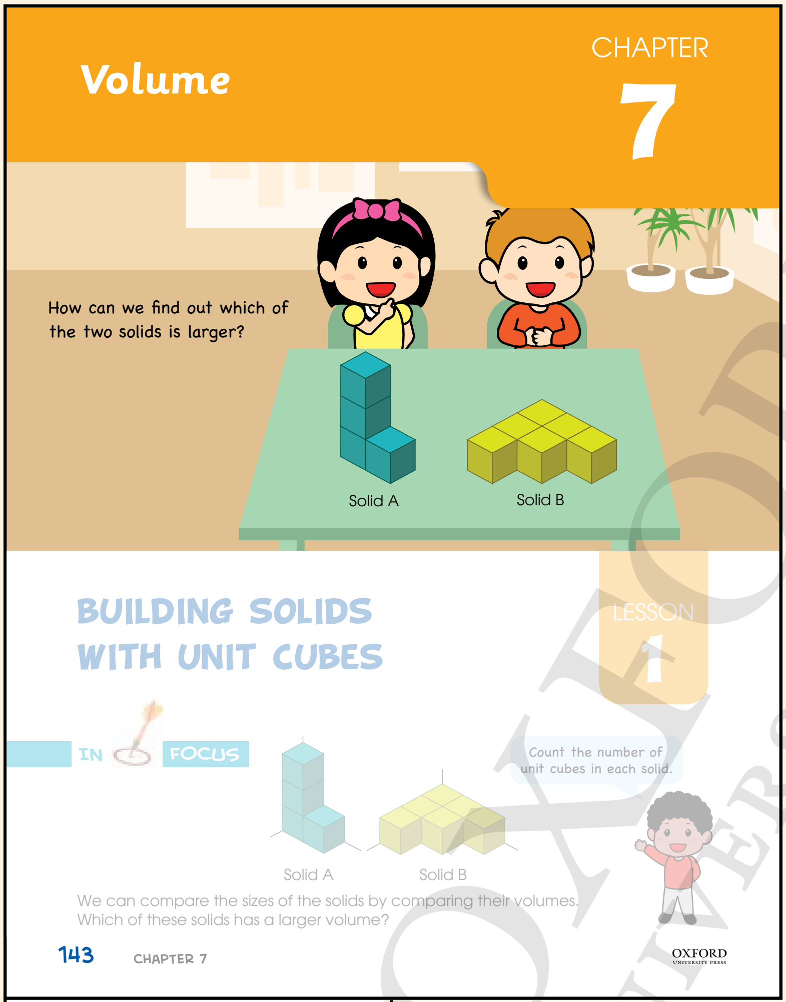
$30\ m - 10\ m - 14\ m = 6\ m$

Area of B = $\frac{1}{2} \times 6\ m \times 13\ m$
$= 39\ m^2$

Area of shaded part = Area of A + Area of B
$= 65 + 39$
$= 104\ m^2$

VOLUME

CHAPTER 7



Volume

CHAPTER 7

How can we find out which of the two solids is larger?

Solid A

Solid B

BUILDING SOLIDS WITH UNIT CUBES

LESSON 1

IN FOCUS

Count the number of unit cubes in each solid.

Solid A

Solid B

We can compare the sizes of the solids by comparing their volumes. Which of these solids has a larger volume?

143 CHAPTER 7

OXFORD

Textbook 5 P143

Related Resources

NSPM Textbook 5 (P143 − 164)
NSPM Workbook 5A (P137 − 160)

Materials

Unit cubes, 1-cm cubes, multilink cubes, 10 cm × 10 cm × 10 cm container, cubical containers, 1-litre bottle, water, metre rule, isometric grid paper, square grid paper, scissors, tape, newspapers, vanguard paper, formula for volume card, conversion of unit of volume card, mini whiteboard, markers

Lesson

Lesson 1	Building Solids with Unit Cubes
Lesson 2	Drawing Cubes and Cuboids
Lesson 3	Volume in cm^3 and m^3
Lesson 4	Volume of Liquid

Problem Solving, Maths Journal and Pupil Review

INTRODUCTION

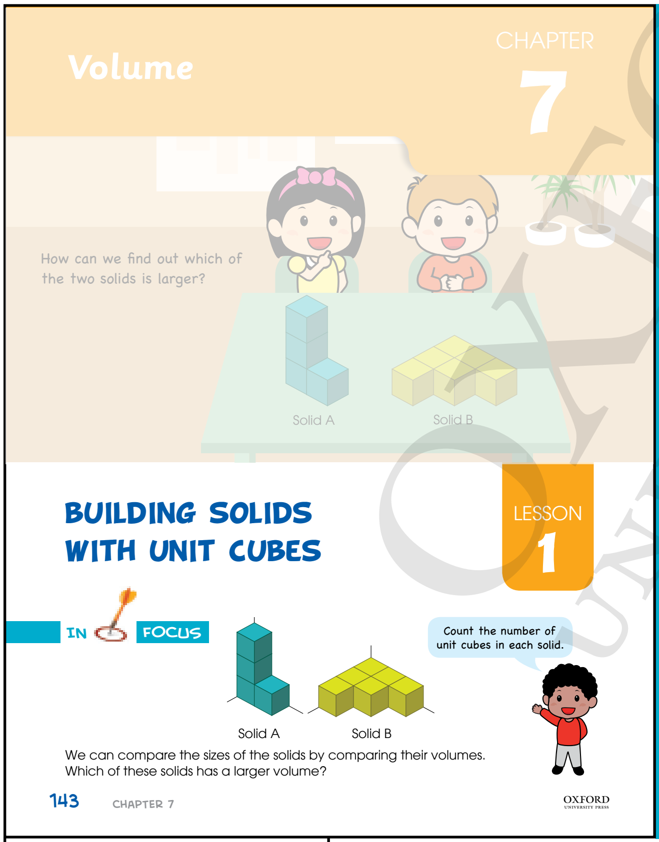
In Grade Two and Grade Three, pupils have learnt the concept of liquid volume, comparing volumes and the use of the standard unit, litre. They also learnt the concept of capacity of a container, the millilitre (ml) as another standard unit for measuring small volumes and that 1 litre is equivalent to 1000 millilitres. In this chapter, pupils are introduced to volumes of solids and learn to compare the sizes of solids in terms of their volumes. Pupils extend the concept of volume by building solids and the calculation of volume of a cuboid given its length, breadth and height. Pupils also deal with finding the volume of liquid in a rectangular container and the capacity of the container. Pupils should recognise the equivalence of 1 litre (1000 ml) and 1000 cm^3. They also learn to draw cubes and cuboids of different sizes and orientations on isometric grid papers.

LESSON
1

BUILDING SOLIDS WITH UNIT CUBES

LEARNING OBJECTIVES

1. Build solids with unit cubes.
2. Express volume of a solid in cubic units.



Volume

CHAPTER
7

How can we find out which of the two solids is larger?

Solid A

Solid B

BUILDING SOLIDS WITH UNIT CUBES

LESSON
1

IN FOCUS

Count the number of unit cubes in each solid.

Solid A

Solid B

We can compare the sizes of the solids by comparing their volumes. Which of these solids has a larger volume?

143 CHAPTER 7

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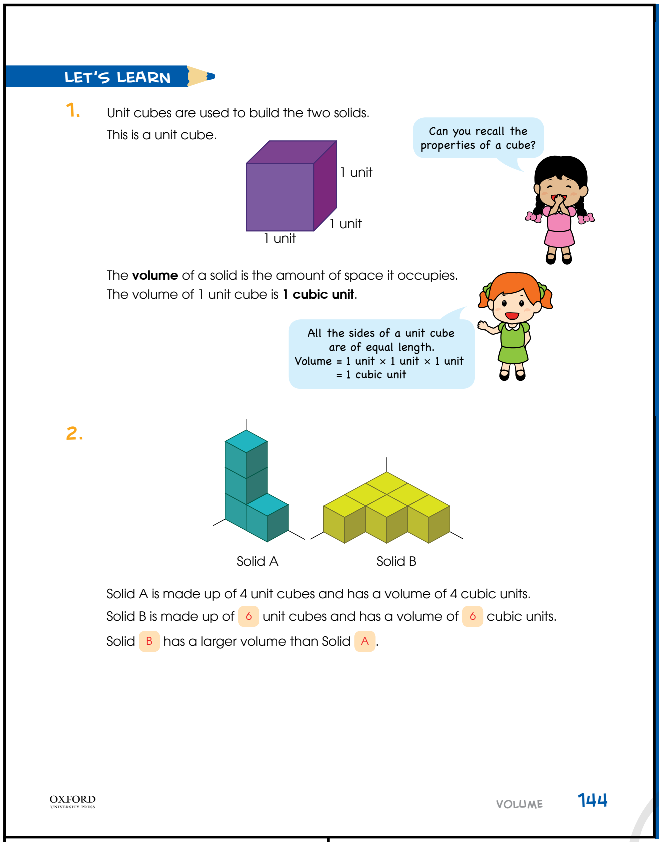
Textbook 5 P143

IN FOCUS

Use the Chapter Opener for pupils to make a guess on whether solid A or B is larger. Ask:

- How can we compare the size of these two solids?
- Can we count the number of cubes that make up each solid?
- Can we compare their volumes?
- What are some of the things you have learnt about volume previously?



LET'S LEARN

1. Unit cubes are used to build the two solids.

This is a unit cube.

1 unit

1 unit

1 unit

Can you recall the properties of a cube?

The **volume** of a solid is the amount of space it occupies.

The volume of 1 unit cube is **1 cubic unit**.

All the sides of a unit cube are of equal length.
Volume = 1 unit × 1 unit × 1 unit
= 1 cubic unit

2.

Solid A

Solid B

Solid A is made up of 4 unit cubes and has a volume of 4 cubic units.

Solid B is made up of 6 unit cubes and has a volume of 6 cubic units.

Solid B has a larger volume than Solid A.

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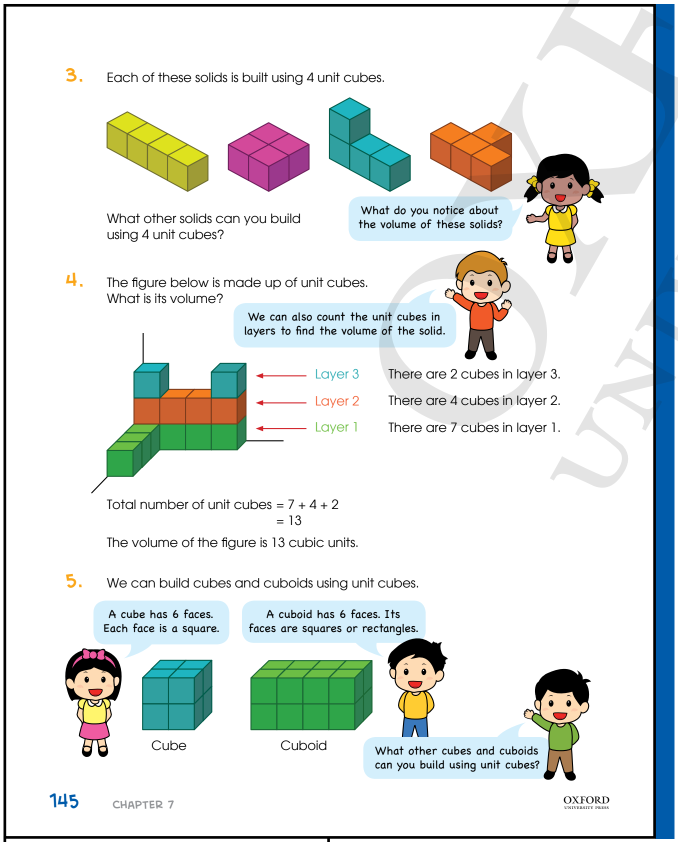
VOLUME 144

Textbook 5 P144

LET'S LEARN

For Let's Learn 1, show a unit cube on a visualiser. Tell pupils that the unit cube is a solid and the amount of space it occupies is known as its volume. Guide them to see that the volume of this cube is 1 cubic unit by reviewing the property of a cube. Then lead pupils to see that another way to express volume of 1 unit cube is 1 cubic unit.

For Let's Learn 2, distribute unit cubes for pupils to build the two solids in groups. Teacher can work with the class to count the number of unit cubes used for each solid. Express and compare their volumes in cubic units.



3. Each of these solids is built using 4 unit cubes.

What other solids can you build using 4 unit cubes?

What do you notice about the volume of these solids?

4. The figure below is made up of unit cubes.
What is its volume?

We can also count the unit cubes in layers to find the volume of the solid.

Layer 3 There are 2 cubes in layer 3.

Layer 2 There are 4 cubes in layer 2.

Layer 1 There are 7 cubes in layer 1.

Total number of unit cubes = 7 + 4 + 2
= 13

The volume of the figure is 13 cubic units.

5. We can build cubes and cuboids using unit cubes.

A cube has 6 faces. Each face is a square.

A cuboid has 6 faces. Its faces are squares or rectangles.

Cube

Cuboid

What other cubes and cuboids can you build using unit cubes?

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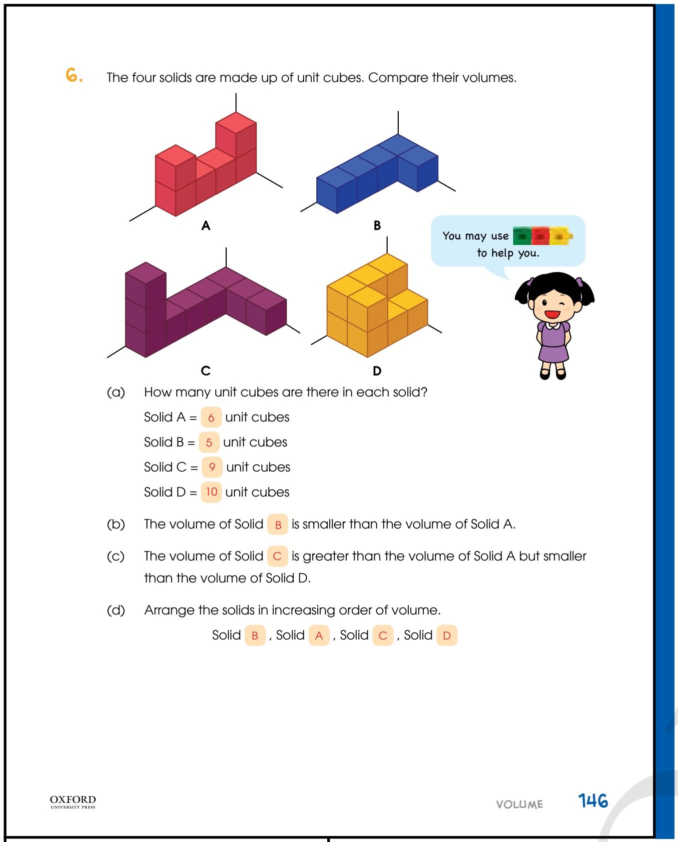
Textbook 5 P145

For Let's Learn 3, allow pupils to work in groups. Distribute sufficient unit cubes for pupils to build these 4 models and more. Ask them to build other models using 4 unit cubes and to state the volume for each model built. Guide pupils to conclude that all different models have the same volume as they are made up of the same number of unit cubes.

For Let's Learn 4, show the drawing of the model on the visualiser. First ask pupils for the ways to count the unit cubes to find the volume of the solid. Then guide them to count by layers. Note: From the drawing, some pupils will only count what they see in layer 1 (6 cubes). Teacher builds the solid on a visualiser layer by layer to show pupils the hidden unit cube that they have to count even though it is not visible in the drawing.

For Let's Learn 5, allow pupils to work in groups. Distribute sufficient unit cubes for pupils to make cubes of 2 × 2 × 2, 3 × 3 × 3 and 4 × 4 × 4 and cuboids of various dimensions. This activity reinforces their understanding of the property of cubes and cuboids. Pupils are to see that cubes have 6 square faces while cuboids also have 6 faces which can be all rectangles or rectangles and squares.



6\. The four solids are made up of unit cubes. Compare their volumes.

(a) How many unit cubes are there in each solid?

Solid A = 6 unit cubes

Solid B = 5 unit cubes

Solid C = 9 unit cubes

Solid D = 10 unit cubes

(b) The volume of Solid B is smaller than the volume of Solid A.

(c) The volume of Solid C is greater than the volume of Solid A but smaller than the volume of Solid D.

(d) Arrange the solids in increasing order of volume.

Solid B , Solid A , Solid C , Solid D

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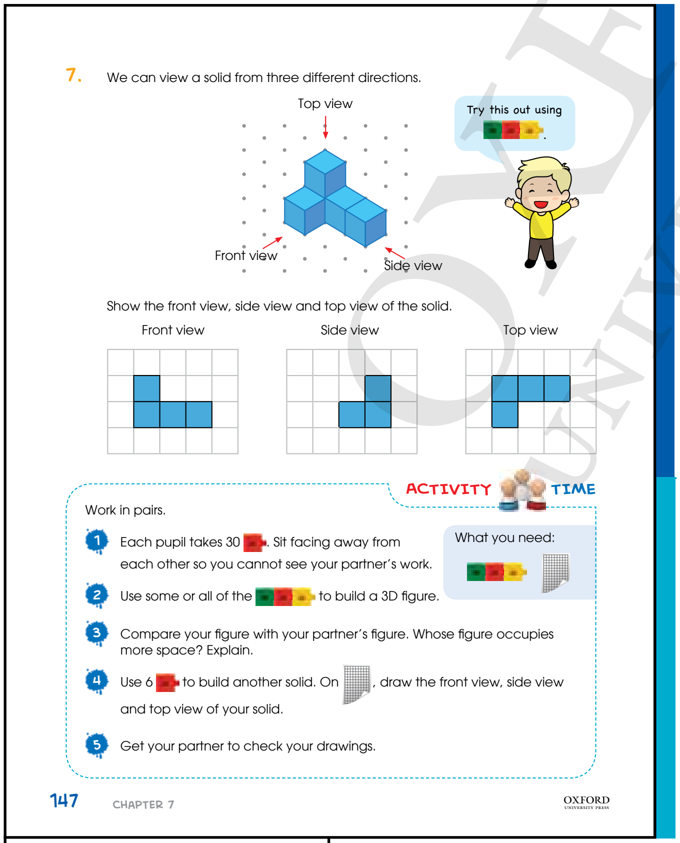
Textbook 5 P146

For Let's Learn 6, allow pupils to work in pairs.

For Let's Learn 6(a), ask pupils to find the volume of each solid first by just using the diagram. Count the unit cubes layer by layer.

Then check their answers by building each actual solid layer by layer with unit cubes. Work through the rest of the example with the class. Remind pupils to check that they have counted the number of unit cubes of each solid in the diagram carefully, focusing their attention on the unit cubes that are hidden in the first layer, as in solid D.



7\. We can view a solid from three different directions.

Show the front view, side view and top view of the solid.

ACTIVITY TIME

Work in pairs.

What you need: 🟩🟥🟨

1. Each pupil takes 30 🟥. Sit facing away from each other so you cannot see your partner's work.
2. Use some or all of the 🟩🟥🟨 to build a 3D figure.
3. Compare your figure with your partner's figure. Whose figure occupies more space? Explain.
4. Use 6 🟥 to build another solid. On ▨, draw the front view, side view and top view of your solid.
5. Get your partner to check your drawings.

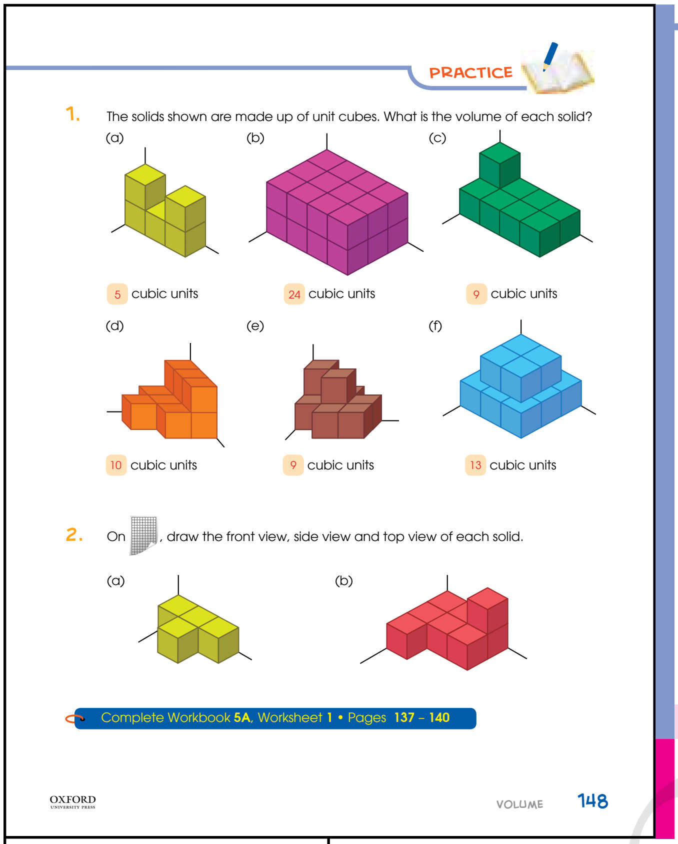
147 CHAPTER 7 OXFORD UNIVERSITY PRESS

Textbook 5 P147

Let's Learn 7 helps pupils to see a solid from different perspectives in three directions. Allow pupils to work in pairs. Build the solid using unit cubes and put it on the table. Let pupils take turn to view the solid from the top, front and side. Ask pupils to describe and draw what they see to their partner and have them check their drawings against the ones illustrated on P147.

ACTIVITY TIME

This activity allows pupils to create their own solid models with unit cubes. Compare their volumes first visually and then check by counting the cubes. Pupils may observe that when a solid is built compactly it may look small but on counting the unit cubes it actually occupies a larger volume than expected. The skill learnt in Let's Learn 7 is further reinforced when pupils draw different perspectives of their solids.



PRACTICE

1. The solids shown are made up of unit cubes. What is the volume of each solid?

(a) 5 cubic units
(b) 24 cubic units
(c) 9 cubic units
(d) 10 cubic units
(e) 9 cubic units
(f) 13 cubic units

2. On ▦, draw the front view, side view and top view of each solid.

(a)
(b)

Complete Workbook 5A, Worksheet 1 • Pages 137 – 140

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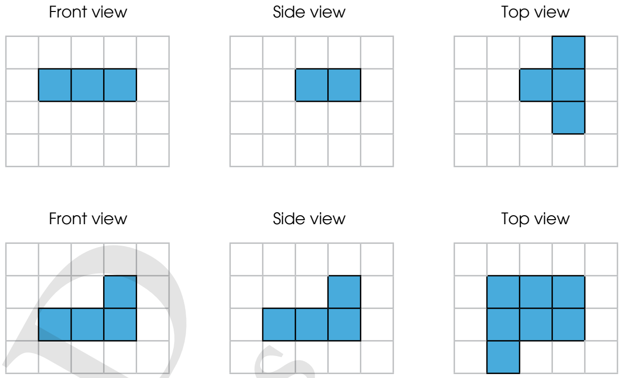
Textbook 5 P148

PRACTICE

Square grid paper is to be distributed to pupils. Work through the practice questions with pupils. If necessary, allow pupils to use unit cubes to check their answers.

2.



Independent seatwork

Assign pupils to complete Worksheet 1 (Workbook 5A P137 – 140).

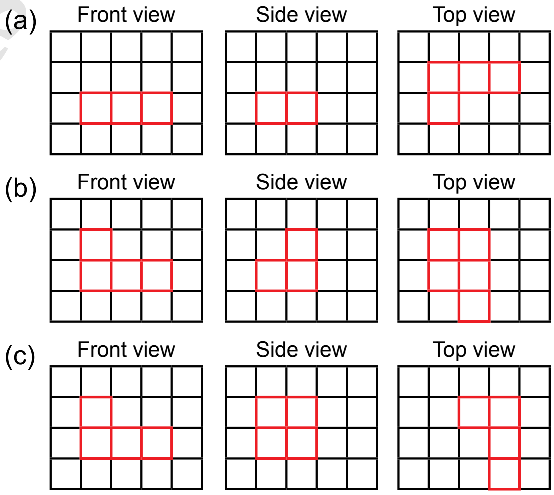
Answers

Worksheet 1 (Workbook 5A P137 – 140)

1. (a) 4
   (b) 5
   (c) 6
   (d) 14
   (e) 10
   (f) 25

2. (a) 6
   (b) 7
   (c) 5
   (d) 10
   (e) 10
   (f) 17
   (g) 8
   (h) 11

3.



LESSON PLAN

Chapter 7
Lesson 1

Specific Learning Focus

- Build solids with unit cubes.
- Express volume of a solid in cubic units.

Suggested Duration

2 periods

Prior Learning

Pupils should be well-versed with the concept of volume, capacity and its unit litres. They should understand the concept of capacity and the fact that 1000 millilitres make a litre.

Pre-emptive Pitfalls

The concept of volume is an extension of the concept of area, i.e. area is two-dimensional and when a third dimension (depth) is added, a three-dimensional space is created, and the amount of this space occupied by an object is its volume. Pupils may have difficulty associating area to volume. In this lesson, the concept of building solids with unit cubes may be a bit challenging for pupils to visualise and comprehend.

Introduction

Explain the concept of cubic units by first introducing the 1 × 1 × 1 cube. Then, expand this concept with 2 × 2 × 2, 3 × 3 × 3 and so on. Help them visualise the layers of cubes that are used to build solids and hence come up with the total volume of the built solid in cubic units. Differentiate between cubes and cuboids, and emphasise the fact that a unit cube can build both a cube and a cuboid. Point out that a solid can be viewed from three different directions: (i) top, (ii) front, and (iii) side.

Problem Solving

In Question 1 of ‘Practice’ (Textbook 5 P148), when analysing the solids, guide pupils to see the unit cubes that make up the solid from different angles to find the volume of the solid.

Activities

In ‘Activity Time’ (Textbook 5 P147), provide pupils with multilink cubes and square grid paper. Encourage pupils to view the figure from the front, side and top, to strengthen pupils’ visual skills. Explain that they can check by counting the unit cubes.

Resources

- unit cubes
- square grid paper (Activity Handbook 5 P25)
- multilink cubes
- 1-cm cubes

Mathematical Communication Support

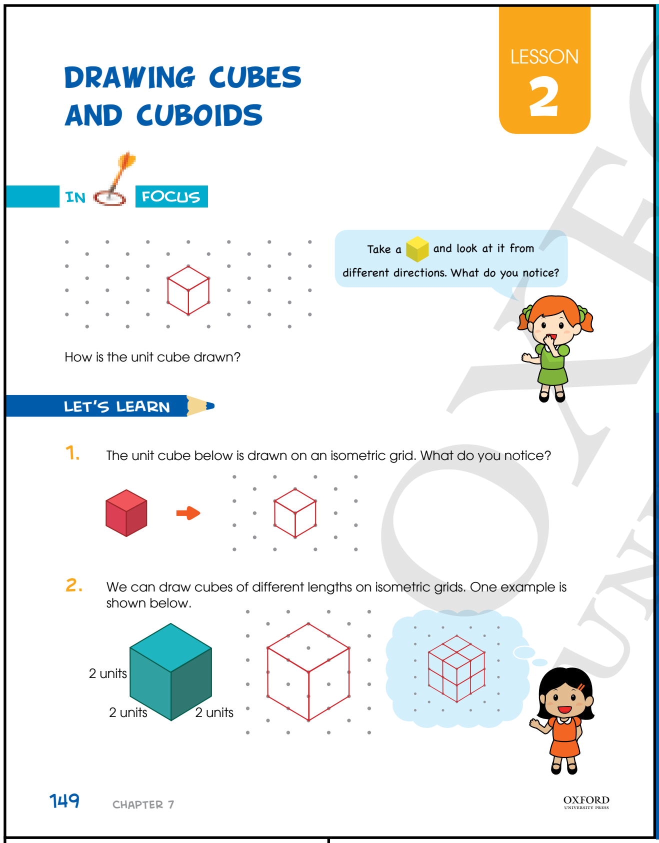
In Let’s Learn 7 (Textbook 5 P147), encourage pupils to look at the solid from different perspectives in three directions. Ask pupils to draw the 3 different views on square grid paper and then describe in words what they are able to see and comprehend. Guide pupils to then gather all the information and find the correct volume in cubic centimetres.

LESSON
2

DRAWING CUBES AND CUBOIDS

LEARNING OBJECTIVE

1. Draw cubes and cuboids on an isometric grid.



DRAWING CUBES AND CUBOIDS

LESSON
2

IN FOCUS

Take a cube and look at it from different directions. What do you notice?

How is the unit cube drawn?

LET'S LEARN

1. The unit cube below is drawn on an isometric grid. What do you notice?

2. We can draw cubes of different lengths on isometric grids. One example is shown below.

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Textbook 5 P149

IN FOCUS

Give each pupil a unit cube. Together, count the number of faces, edges and vertices. Tell them to put the unit cube at eye-level. Ask:

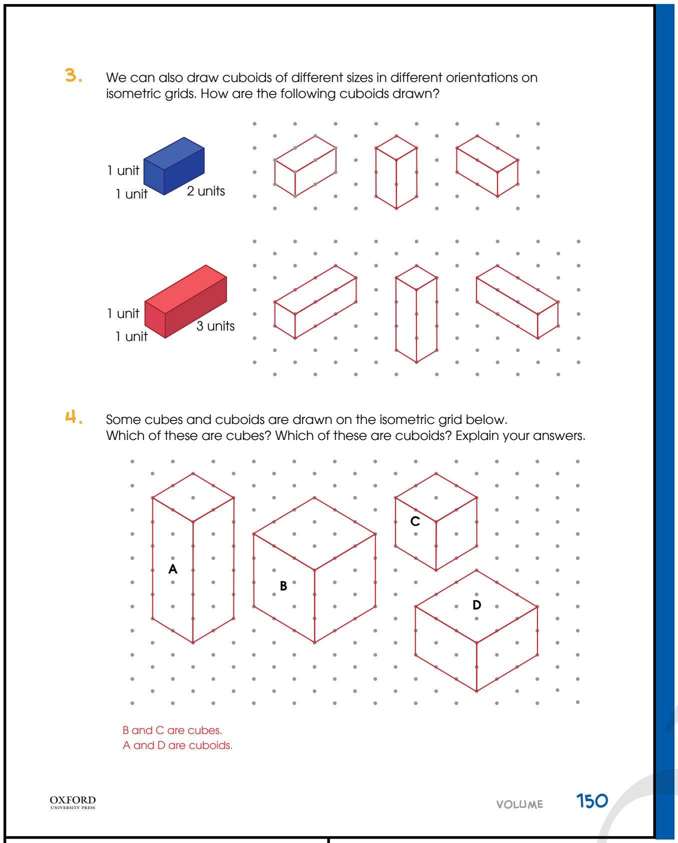
- From what position do you need to look at the cube for it to look like the figure?

Get pupils to see that the faces of the cube are no longer squares on the drawing.

LET'S LEARN

Distribute isometric grid paper to pupils. Let's Learn 1 introduces the isometric grid. Show and tell pupils that the grid has dots to help them make drawings of cubes and cuboids. Teacher demonstrates on a visualiser and guides pupils in joining the dots for the unit cube.

For Let's Learn 2, introduce a larger cube with sides that are 2 units. In the same way, demonstrate and guide pupils as they draw on the grid.



3. We can also draw cuboids of different sizes in different orientations on isometric grids. How are the following cuboids drawn?

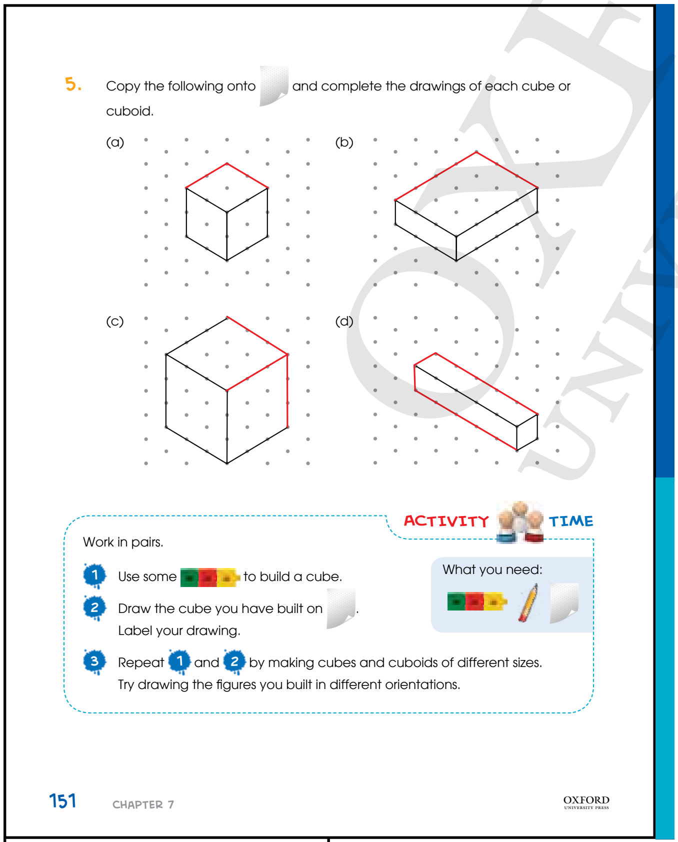
4. Some cubes and cuboids are drawn on the isometric grid below. Which of these are cubes? Which of these are cuboids? Explain your answers.

B and C are cubes.
A and D are cuboids.

Textbook 5 P150

For Let's Learn 3, unit cubes can be used to build the cuboid for clearer demonstration. Arrange the cuboid in three orientations on the visualiser. Then demonstrate and guide pupil to draw each orientation. Focus pupils' attention to the dimensions by counting and joining the appropriate dots.

Let's Learn 4 enables pupils to recognise cubes and cuboids from isometric drawings. Their attention will be focused on the faces and edges of each drawing. For example for the cubes they can recognise that all the edges are of the same length and the faces are the same shape (rhombus).



5. Copy the following onto and complete the drawings of each cube or cuboid.

Work in pairs.

① Use some to build a cube.

② Draw the cube you have built on . Label your drawing.

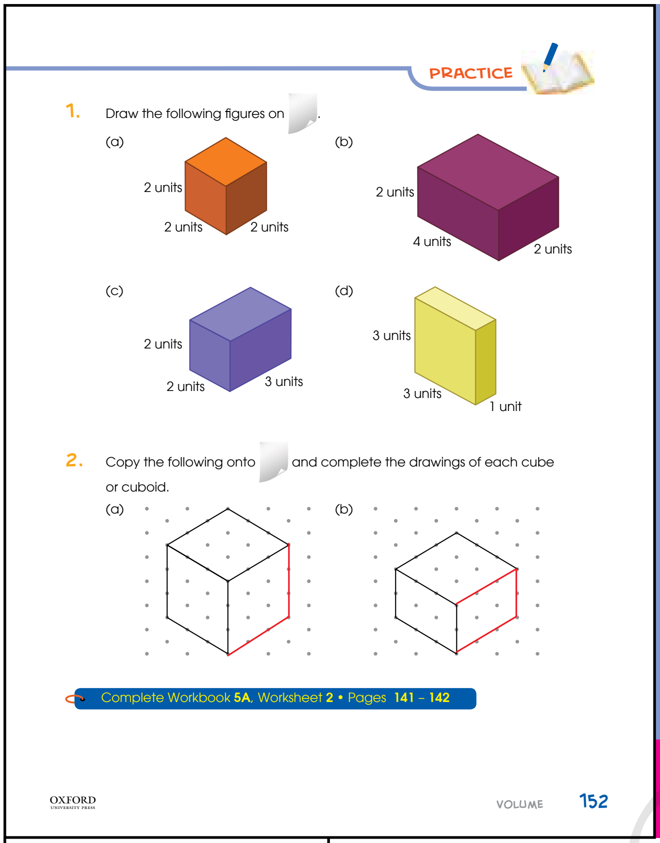
③ Repeat ① and ② by making cubes and cuboids of different sizes. Try drawing the figures you built in different orientations.

Textbook 5 P151

Allow pupils to work in pairs for Let's Learn 5. Ask pupils to first recognise the faces and the lengths of edges in the partial drawing then visualise the cube or cuboid in their mind. Give pupils sufficient time to complete their drawing then ask them to compare and check with their partners. Teacher can demonstrate using one of the examples.

ACTIVITY TIME

The activity allows pupils to create their own cubes and cuboids and then translate them into isometric drawings in different orientations.



PRACTICE

1. Draw the following figures on .

2. Copy the following onto and complete the drawings of each cube or cuboid.

Complete Workbook **5A**, Worksheet **2** • Pages **141 – 142**

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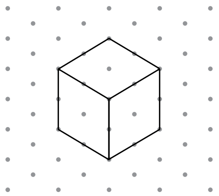
VOLUME 152

Textbook 5 P152

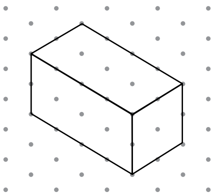
PRACTICE

Allow pupils sufficient time to draw individually. Guide pupils if they have any difficulties. Select pupils to demonstrate their drawings to the class. Work through the solution with the class and highlight common mistakes.

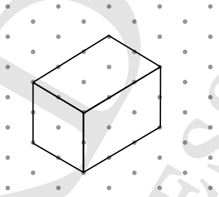
1. (a)



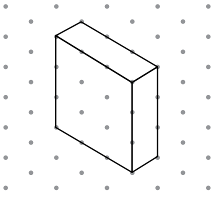
(b)



(c)



(d)



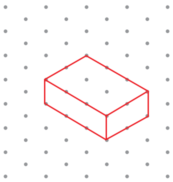
Independent seatwork

Assign pupils to complete Worksheet 2 (Workbook 5A P141 – 142).

Answers

Worksheet 2 (Workbook 5A P141 – 142)

1. (a)



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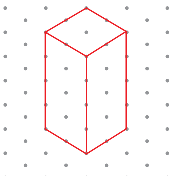

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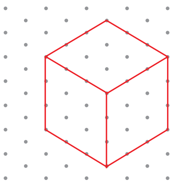
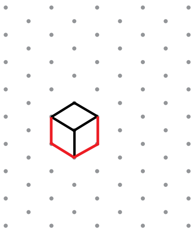
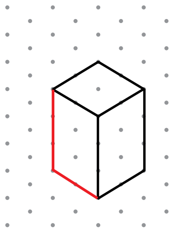


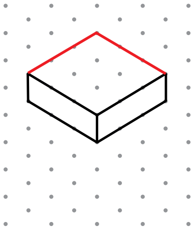
2. (a)



(b)



(c)



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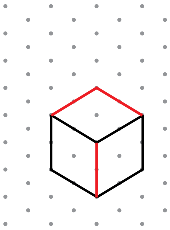
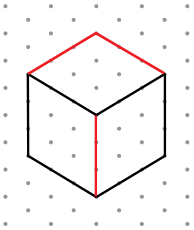


(e)



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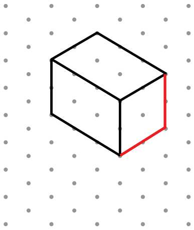


LESSON PLAN

Specific Learning Focus

- Draw cubes and cuboids on an isometric grid.

Suggested Duration

2 periods

Prior Learning

This is in continuation of the earlier lesson. After identifying the unit cubes in a solid, in this lesson, pupils will learn how to draw the solids.

Pre-emptive Pitfalls

Visualisation and orientation come into play in this lesson. The next step is to then put to paper and draw the solid. This requires drawing skills too. Lots of practice on isometric grid paper will be needed to master this lesson.

Introduction

Before starting to draw the solid, get pupils to first identify the vertices, faces and edges of each solid. If they are using concrete materials, ask them to view them from all 3 directions. While attempting the questions in Let's Learn 3 and 4 (Textbook 5 P150), emphasise the following:

- the isometric grid and the orientation of the shapes on paper,
- count the number of unit cubes that make up the shape and then count the number of dots on the isometric grid that make the dimensions of the shape,
- draw lines that join the dots to draw the cubes and cuboids.

Problem Solving

Emphasise the three dimensions of a cube and a cuboid. It is likely easier for pupils to find the volume of a cube, as all the edges of a cube are of the same length. However, to find the volume of a cuboid, pupils must understand that not all the edges of a cuboid are of the same length.

Activities

In 'Activity Time' (Textbook 5 P151), provide pupils with multilink cubes and isometric grid paper. Get them to work in pairs.

Resources

- multilink cubes
- 1-cm cubes
- isometric grid paper (Activity Handbook 5 P31)
- drawings of cuboids on isometric grids (Activity Handbook 5 P30)

Mathematical Communication Support

Ask pupils to draw the solids and enunciate key terms like 'vertices', 'faces', 'edges', 'length', 'breadth', 'height' and 'volume'. Describe in words the view in each of the three orientations and encourage pupils to discuss the dimensions in the drawings of the solids.

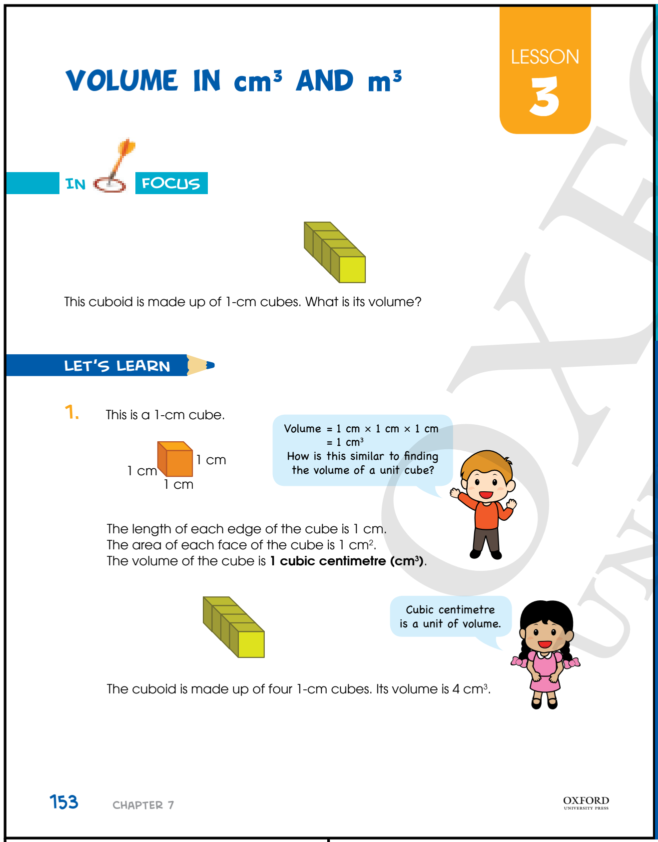
LESSON

3

VOLUME IN cm^3 AND m^3

LEARNING OBJECTIVES

1. Measure volumes in cm^3 and m^3.
2. Use formula to find the volume of a cube/cuboid.



VOLUME IN cm^3 AND m^3

LESSON 3

IN FOCUS

This cuboid is made up of 1-cm cubes. What is its volume?

LET'S LEARN

1. This is a 1-cm cube.

1 cm
1 cm
1 cm

Volume = 1 cm × 1 cm × 1 cm
= 1 cm^3
How is this similar to finding the volume of a unit cube?

The length of each edge of the cube is 1 cm.
The area of each face of the cube is 1 cm^2.
The volume of the cube is **1 cubic centimetre (cm^3)**.

Cubic centimetre is a unit of volume.

The cuboid is made up of four 1-cm cubes. Its volume is 4 cm^3.

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Textbook 5 P153

IN FOCUS

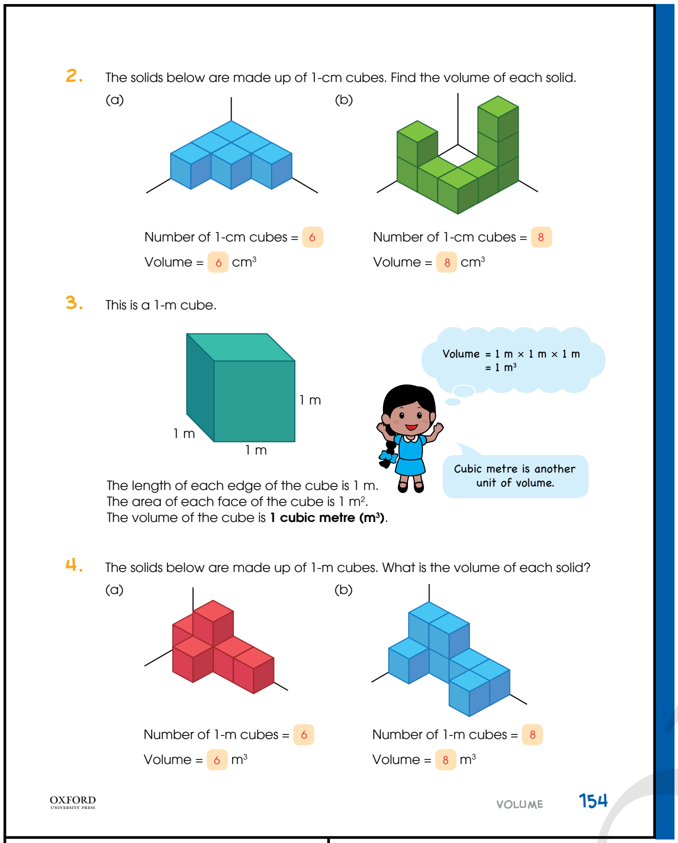
Introduce the cube. Get a pupil up to the front to measure the edges of the cube which are 1 cm long. Form the cuboid in the In Focus with cubes. Ask pupils to guess the volume of this cuboid.

LET'S LEARN

Making connection to the pupils' prior knowledge that the volume of a unit cube is 1 cubic unit, teacher leads pupils to deduce that the volume of a 1-cm cube is 1 cubic centimetre or 1 cm^3.

Ask pupils to count the number of 1-cm cubes to find the volume of the solid in cm^3.

Make known to pupils that cm^3 is a standard unit of measure for volume.



2. The solids below are made up of 1-cm cubes. Find the volume of each solid.

(a)

Number of 1-cm cubes = 6

Volume = 6 cm³

(b)

Number of 1-cm cubes = 8

Volume = 8 cm³

3. This is a 1-m cube.

The length of each edge of the cube is 1 m.
The area of each face of the cube is 1 m².
The volume of the cube is **1 cubic metre (m³)**.

4. The solids below are made up of 1-m cubes. What is the volume of each solid?

(a)

Number of 1-m cubes = 6

Volume = 6 m³

(b)

Number of 1-m cubes = 8

Volume = 8 m³

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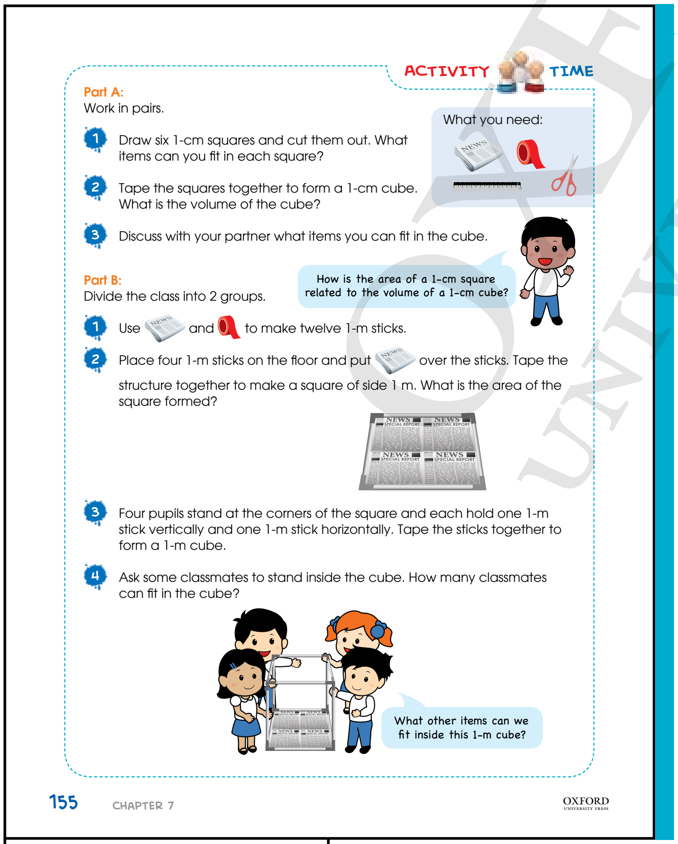
VOLUME 154

Textbook 5 P154

Let's Learn 2 involves finding volumes of solids made up of 1-cm cubes. Get pupils to explain their answers and listen for the appropriate unit of measure used in their responses.

For Let's Learn 3, a metre rule can be used to show pupils the magnitude of 1 m. Ask them to visualise the size of a cube if the edges are 1 m long. Making connection to the pupils' prior knowledge of volume of a 1-cm cube, help pupils to deduce that the volume of a 1-m cube is 1 cubic metre or 1 m³.

Let's Learn 4 involves finding volumes of solids made up of 1-m cubes. Get pupils to explain their answers and listen for the appropriate unit of measure used in their responses.



ACTIVITY TIME

Part A:
Work in pairs.

1. Draw six 1-cm squares and cut them out. What items can you fit in each square?
2. Tape the squares together to form a 1-cm cube. What is the volume of the cube?
3. Discuss with your partner what items you can fit in the cube.

What you need:

Part B:
Divide the class into 2 groups.

1. Use and to make twelve 1-m sticks.
2. Place four 1-m sticks on the floor and put over the sticks. Tape the structure together to make a square of side 1 m. What is the area of the square formed?
3. Four pupils stand at the corners of the square and each hold one 1-m stick vertically and one 1-m stick horizontally. Tape the sticks together to form a 1-m cube.
4. Ask some classmates to stand inside the cube. How many classmates can fit in the cube?

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Textbook 5 P155

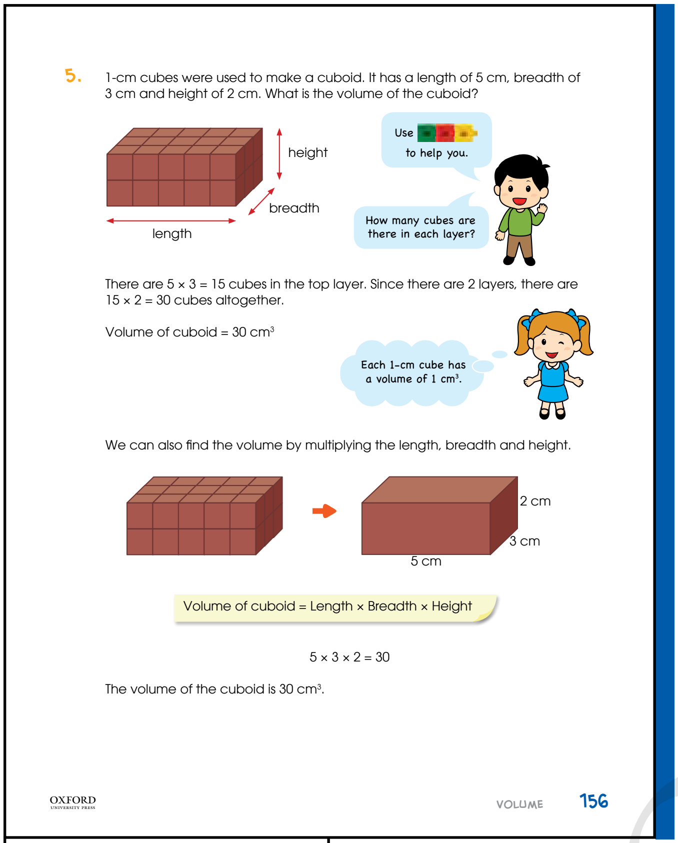
ACTIVITY TIME

This activity gives pupils a sense of how big 1 cm³ (cubic centimetre) and 1 m³ (cubic metre) are in relation to the common objects around them.

Part A
Provide vanguard paper for pupils to cut out 1-cm squares. Guide pupils to form the cube as pupils may face difficulty given its small size. Show pupils a 1-cm cube for comparison with their completed cube.

Part B
Teacher demonstrates how to roll up the newspapers to make 1-m long sticks before allowing pupils to do it on their own.

After the activity, discuss with class to get feedback from pupils their sense of the sizes of 1 cm³ and 1 m³.



5. 1-cm cubes were used to make a cuboid. It has a length of 5 cm, breadth of 3 cm and height of 2 cm. What is the volume of the cuboid?

There are 5 × 3 = 15 cubes in the top layer. Since there are 2 layers, there are 15 × 2 = 30 cubes altogether.

Volume of cuboid = 30 cm^3

We can also find the volume by multiplying the length, breadth and height.

Volume of cuboid = Length × Breadth × Height

5 × 3 × 2 = 30

The volume of the cuboid is 30 cm^3.

VOLUME 156

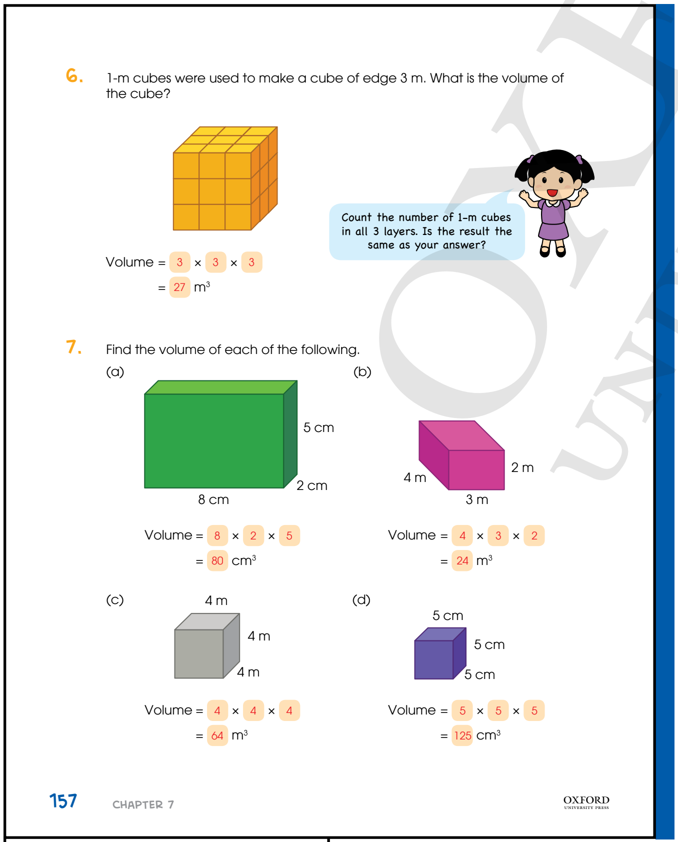
Textbook 5 P156

Let's Learn 5 introduces the formula for finding the volume of a cuboid.

Guide pupils to build the cuboid layer by layer, noting the length, breadth and height (in cm) as well as the number of 1-cm cubes used in the process. Ask:

- What is the length of the cuboid?
- What is the breadth of the cuboid?
- What is the height of the cuboid?
- What is the result if we multiply the length, breadth and height?
- Is the answer the same as the total number of 1-cm cubes used to build the cuboid?

Teacher writes out the formula on the board and gets pupils to articulate it:
Volume of a cuboid = Length × breadth × height



6. 1-m cubes were used to make a cube of edge 3 m. What is the volume of the cube?

Volume = 3 × 3 × 3
= 27 m^3

7. Find the volume of each of the following.

(a)

Volume = 8 × 2 × 5
= 80 cm^3

(b)

Volume = 4 × 3 × 2
= 24 m^3

(c)

Volume = 4 × 4 × 4
= 64 m^3

(d)

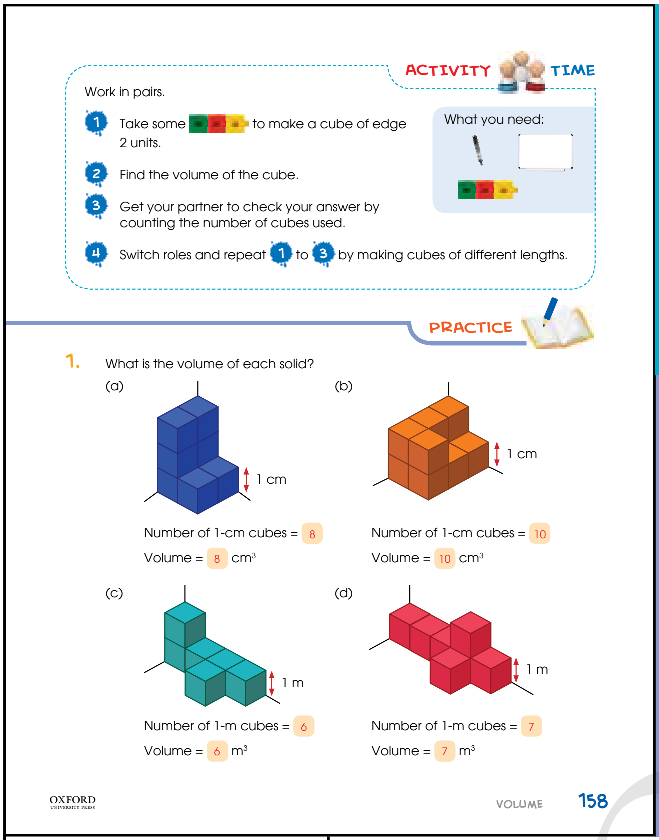
Volume = 5 × 5 × 5
= 125 cm^3

157 CHAPTER 7

Textbook 5 P157

Repeat the process used in Let's Learn 5 for Let's Learn 6 to find the volume of the 3 × 3 × 3 cube.

Let's Learn 7 gives pupils the opportunity to use the formula for finding volumes of cubes and cuboids in cm^3 and m^3 based on the given dimensions. Work through the example together with pupils.



ACTIVITY TIME

Work in pairs.

1. Take some 🟩🟥🟨 to make a cube of edge 2 units.
2. Find the volume of the cube.
3. Get your partner to check your answer by counting the number of cubes used.
4. Switch roles and repeat 1 to 3 by making cubes of different lengths.

What you need:

PRACTICE

1. What is the volume of each solid?

(a) 1 cm

Number of 1-cm cubes = 8

Volume = 8 cm^3

(b) 1 cm

Number of 1-cm cubes = 10

Volume = 10 cm^3

(c) 1 m

Number of 1-m cubes = 6

Volume = 6 m^3

(d) 1 m

Number of 1-m cubes = 7

Volume = 7 m^3

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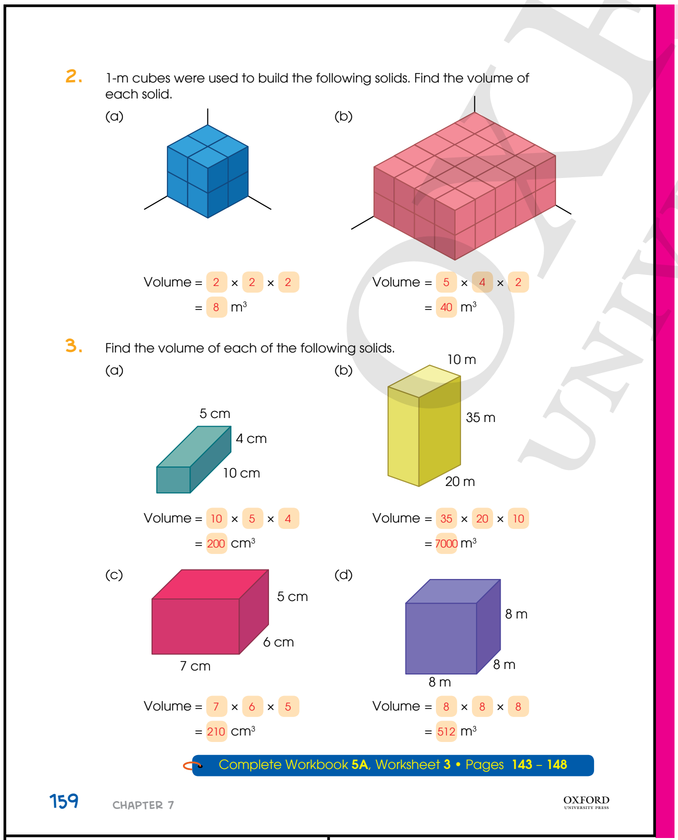
Textbook 5 P158

ACTIVITY TIME

The activity allows pupils to make their own cubes of various dimensions. Pupils are to find the volume of each cube by calculation and then check by counting the total number of cubes used. Teacher can ask pupils for the least number of cubes needed to build the next larger cube.

PRACTICE

Give pupils sufficient time to work in pairs and check each other's answers. Invite pupils to show their working on the board. Go through the solution with the class and highlight common mistakes.



2. 1-m cubes were used to build the following solids. Find the volume of each solid.

(a) Volume = 2 × 2 × 2

= 8 m^3

(b) Volume = 5 × 4 × 2

= 40 m^3

3. Find the volume of each of the following solids.

(a) 5 cm, 4 cm, 10 cm

Volume = 10 × 5 × 4

= 200 cm^3

(b) 10 m, 35 m, 20 m

Volume = 35 × 20 × 10

= 7000 m^3

(c) 5 cm, 6 cm, 7 cm

Volume = 7 × 6 × 5

= 210 cm^3

(d) 8 m, 8 m, 8 m

Volume = 8 × 8 × 8

= 512 m^3

Complete Workbook **5A**, Worksheet **3** • Pages **143 – 148**

159 CHAPTER 7

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Textbook 5 P159

Independent seatwork

Assign pupils to complete Worksheet 3 (Workbook 5A P143 – 148).

Worksheet 3 (Workbook 5A P143 – 148)

1. (a) 9
   (b) 12

2. (a) 10
   (b) 20

3. (a) Length = 5 cm
   Breadth = 1 cm
   Height = 2 cm
   Volume = 5 × 1 × 2
   = 10 cm^3
   (b) Length = 3 cm
   Breadth = 3 cm
   Height = 3 cm
   Volume = 3 × 3 × 3
   = 27 cm^3
   (c) Length = 4 cm
   Breadth = 4 cm
   Height = 2 cm
   Volume = 4 × 4 × 2
   = 32 cm^3

4. (a) Length = 4 m
   Breadth = 4 m
   Height = 4 m
   Volume = 4 × 4 × 4
   = 64 m^3
   (b) Length = 5 m
   Breadth = 2 m
   Height = 3 m
   Volume = 5 × 2 × 3
   = 30 m^3
   (c) Length = 4 m
   Breadth = 2 m
   Height = 4 m
   Volume = 4 × 2 × 4
   = 32 m^3

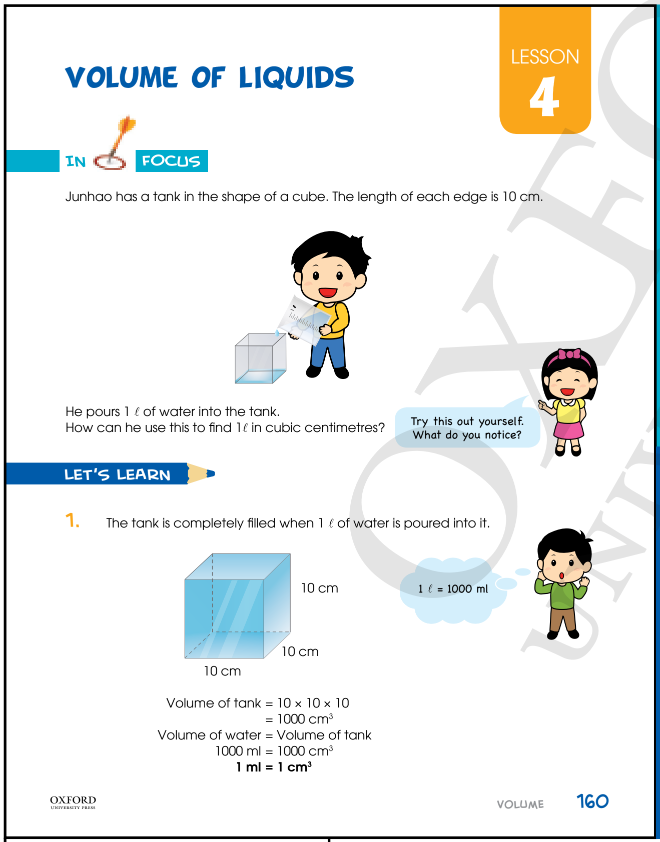
5. (a) 7 cm × 5 cm × 3 cm = 105 cm^3
   Volume = 105 cm^3
   (b) 9 cm × 3 cm × 11 cm = 297 cm^3
   Volume = 297 cm^3
   (c) 8 cm × 8 cm × 8 cm = 512 cm^3
   Volume = 512 cm^3
   (d) 6 m × 7 m × 3 m = 126 m^3
   Volume = 126 m^3
   (e) 20 cm × 6 cm × 6 cm = 720 cm^3
   Volume = 720 cm^3
   (f) 11 cm × 11 cm × 11 cm = 1331 cm^3
   Volume = 1331 cm^3

LESSON
4

VOLUME OF LIQUIDS

LEARNING OBJECTIVES

1. Find the volume of liquid in a rectangular tank.
2. Convert between ℓ, ml and cm^3.



VOLUME OF LIQUIDS

LESSON
4

IN FOCUS

Junhao has a tank in the shape of a cube. The length of each edge is 10 cm.

He pours 1 ℓ of water into the tank.
How can he use this to find 1ℓ in cubic centimetres?

Try this out yourself.
What do you notice?

LET'S LEARN

1. The tank is completely filled when 1 ℓ of water is poured into it.

Volume of tank = 10 × 10 × 10
= 1000 cm^3
Volume of water = Volume of tank
1000 ml = 1000 cm^3
1 ml = 1 cm^3

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Textbook 5 P160

IN FOCUS

Teacher brings a 1 litre bottle of water and a cubical container for class demonstration. Tell pupils that the container represents the tank in the question. Ask:

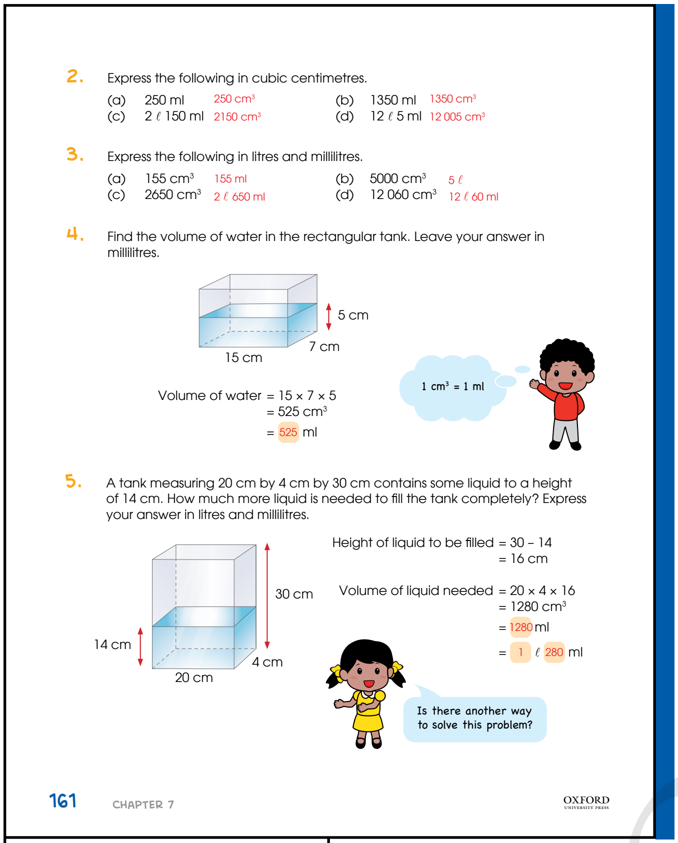
- Have you bought soft drinks or water in a bottle of this size?
- What is the volume of the liquid?
- This empty container is in the shape of a cube with sides 10 cm. How can we find its volume?
- What do you observe now that I have poured all the water into the container?

LET'S LEARN

For Let's Learn 1, ask:

- How can we find the volume of the tank in cm^3?

Lead pupils to observe that 1000 cm^3 of water is equivalent to 1 litre. Recall 1 ℓ = 1000ml.
1000 ml = 1000 cm^3; 1 ml = 1 cm^3.



2. Express the following in cubic centimetres.

(a) 250 ml 250 cm^3 (b) 1350 ml 1350 cm^3
(c) 2 ℓ 150 ml 2150 cm^3 (d) 12 ℓ 5 ml 12 005 cm^3

3. Express the following in litres and millilitres.

(a) 155 cm^3 155 ml (b) 5000 cm^3 5 ℓ
(c) 2650 cm^3 2 ℓ 650 ml (d) 12 060 cm^3 12 ℓ 60 ml

4. Find the volume of water in the rectangular tank. Leave your answer in millilitres.

Volume of water = 15 × 7 × 5
= 525 cm^3
= 525 ml

5. A tank measuring 20 cm by 4 cm by 30 cm contains some liquid to a height of 14 cm. How much more liquid is needed to fill the tank completely? Express your answer in litres and millilitres.

Height of liquid to be filled = 30 – 14
= 16 cm

Volume of liquid needed = 20 × 4 × 16
= 1280 cm^3
= 1280 ml
= 1 ℓ 280 ml

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Textbook 5 P161

For Let's Learn 2, guide pupils to do the conversion using the equivalence: 1ℓ = 1000 ml; 1 ml = 1 cm^3

For Let's Learn 3, guide pupils to do the conversion using the equivalence: 1 cm^3 = 1 ml; 1000 cm^3 = 1 ℓ

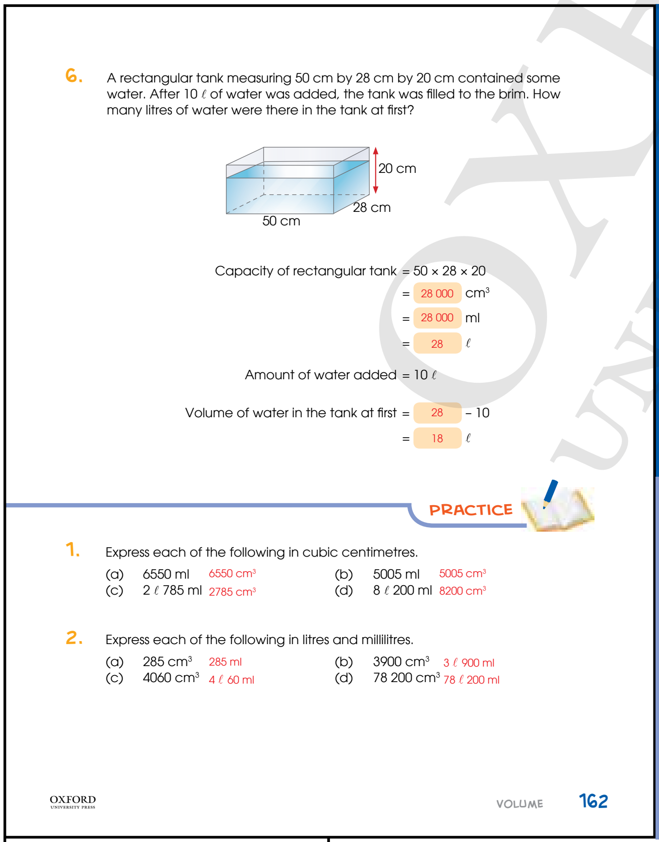
For Let's Learn 4, lead pupils to see that the space occupied by the water is in the shape of a cuboid. Ask:

- What is the length?
- What is the breadth?
- What is the height of the water?
- Do you remember how we can find volume of a cuboid?

Allow time for pupils to read the problem in Let's Learn 5 first. Guide them to understand the problem with questioning:

- What do we need to find?
- What do we already know?
- What is the relationship between these two heights to help us find the volume of water needed?
- What steps do we take to find the solution?

Guide pupils through the worked example.



6. A rectangular tank measuring 50 cm by 28 cm by 20 cm contained some water. After 10 ℓ of water was added, the tank was filled to the brim. How many litres of water were there in the tank at first?

Capacity of rectangular tank = 50 × 28 × 20
= 28 000 cm^3
= 28 000 ml
= 28 ℓ

Amount of water added = 10 ℓ

Volume of water in the tank at first = 28 – 10
= 18 ℓ

PRACTICE

1. Express each of the following in cubic centimetres.

(a) 6550 ml 6550 cm^3 (b) 5005 ml 5005 cm^3
(c) 2 ℓ 785 ml 2785 cm^3 (d) 8 ℓ 200 ml 8200 cm^3

2. Express each of the following in litres and millilitres.

(a) 285 cm^3 285 ml (b) 3900 cm^3 3 ℓ 900 ml
(c) 4060 cm^3 4 ℓ 60 ml (d) 78 200 cm^3 78 ℓ 200 ml

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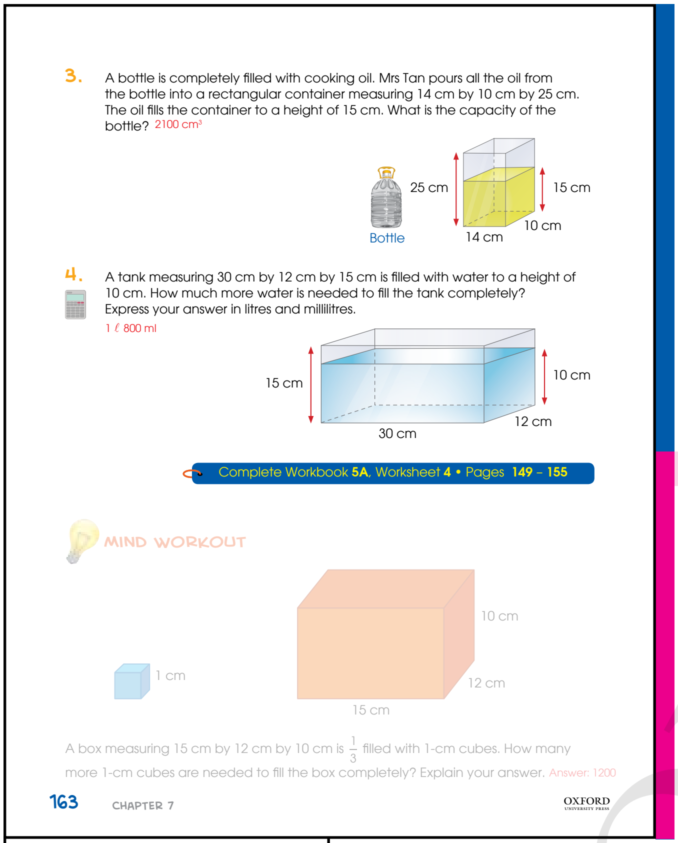
Textbook 5 P162

For Let's Learn 6, guide pupils using the same approach as in Let's Learn 5. Revise the term 'capacity' as the amount of liquid a container can hold. Give pupils sufficient time to fill in the blanks before going through with the class.

PRACTICE

Invite pupils to show their working for practice questions 1 and 2 on the board. Get the class to check and identify errors.



3. A bottle is completely filled with cooking oil. Mrs Tan pours all the oil from the bottle into a rectangular container measuring 14 cm by 10 cm by 25 cm. The oil fills the container to a height of 15 cm. What is the capacity of the bottle? 2100 cm^3

4. A tank measuring 30 cm by 12 cm by 15 cm is filled with water to a height of 10 cm. How much more water is needed to fill the tank completely? Express your answer in litres and millilitres.
1 ℓ 800 ml

Complete Workbook **5A**, Worksheet **4** • Pages **149 – 155**

MIND WORKOUT

A box measuring 15 cm by 12 cm by 10 cm is $\frac{1}{3}$ filled with 1-cm cubes. How many more 1-cm cubes are needed to fill the box completely? Explain your answer. Answer: 1200

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Textbook 5 P163

Allow pupils to work in pairs for practice questions 3 and 4. For more practice on problem solving, select items from Worksheet 4 and work these out with the pupils.

Independent seatwork

Assign pupils to complete Worksheet 4 (Workbook 5A P149 – 155).

Answers Worksheet 4 (Workbook 5A P149 – 155)

1. (a) 70
   (b) 540
   (c) 2505
   (d) 34 240
   (e) 9035
   (f) 10 010

2. (a) 650
   (b) 6
   (c) 3, 465
   (d) 5, 505
   (e) 6, 900
   (f) 3, 8

3. (a) 12 cm × 8 cm × 6 cm
   = 576 cm^3
   = 576 ml
   (b) 10 cm × 10 cm × 15 cm
   = 1500 cm^3
   = 1 ℓ 500 ml
   (c) 30 cm × 22 cm × 11 cm
   = 7260 cm^3
   = 7 ℓ 260 ml
   (d) 20 cm × 15 cm × 18 cm
   = 5400 cm^3
   = 5 ℓ 400 ml

4. 25 cm × 25 cm × 20 cm
   = 12 500 cm^3
   = 12 500 ml
   = 12.5 ℓ

5. 30 cm − 13 cm = 17 cm
   20 cm × 4 cm × 17 cm
   = 1360 cm^3
   = 1360 ml
   = 1 ℓ 360 ml

6. 3 ℓ = 3000 ml
   = 3000 cm^3
   12 cm × 12 cm × 12 cm = 1728 cm^3
   3000 cm^3 − 1728 cm^3 = 1272 cm^3
   = 1272 ml
   = 1 ℓ 272 ml

7. (a) 15 cm × 7 cm × 6 cm = 630 cm^3
   20 cm × 10 cm × 3 cm = 600 cm^3
   630 cm^3 + 600 cm^3 = 1230 cm^3
   = 1230 ml
   = 1 ℓ 230 ml
   (b) 15 cm × 10 cm × 30 cm = 4500 cm^3
   4500 cm^3 − 1230 cm^3 = 3270 cm^3
   = 3270 ml
   = 3 ℓ 270 ml

8. 28 cm × 15 cm × 12 cm = 5040 cm^3
   4 ℓ = 4000 ml
   = 4000 cm^3
   5040 cm^3 − 4000 cm^3 = 1040 cm^3
   = 1040 ml
   = 1 ℓ 40 ml

9. 40 cm × 20 cm × 30 cm = 24 000 cm^3
   = 24 000 ml
   = 24 ℓ
   $\frac{3}{4}$ × 24 ℓ = 18 ℓ

LESSON PLAN

Chapter 7
Lessons 3 & 4

Specific Learning Focus

- Measure volumes in cm^3 and m^3.
- Use formula to find the volume of a cube/cuboid.
- Find the volume of liquid in a rectangular tank.
- Convert between ℓ, ml and cm^3.

Suggested Duration

Lesson 3: 4 periods
Lesson 4: 4 periods

Prior Learning

Pupils should be well-versed in identifying the unit cubes that make a solid. In this lesson, the concept of volume is formally introduced, where pupils learn the formula for volume.

Pre-emptive Pitfalls

In Chapter 6, pupils have learnt to identify the dimensions of a triangle. In the earlier lessons of this chapter, pupils have learnt the drawing and recognising of the dimensions of three-dimensional shapes. Therefore, pupils should not find it challenging to identify the length, breadth and height of three-dimensional shapes and substituting the values into the formula of volume.

Introduction

In Lesson 3, the concept and formula for volume are introduced through the volume of a unit cube. Recap with pupils the formula for the volume of a cube and since all the edges of a cube are of the same length, it should be quite easy to calculate the amount of space occupied by a solid by finding the number of cubes that make up the solid and then multiplying the number by the volume of a cube. To find the volume of a cuboid, get pupils to visualise the views from all three directions and count the number of 1-cm cubes that make up the cuboid. Since the length of each edge of a 1-cm cube is given in cm, when the lengths of all three edges are multiplied to find the volume of the cube, the unit of volume is given as cm^3. Similarly, if a solid is made up of a 1-m cubes, the unit of the volume of the solid would be m^3 or cubic metres. Volumes of cubes, cuboids and composite solids are hence found by the abovementioned steps.
In Lesson 4, if a container is completely filled (to the brim) with liquid, the volume of the liquid is equivalent to the volume of the container. The units of volume and their conversions are explained in this lesson, e.g. 1 ℓ = 1000 ml. Explain that the capacity of a container is the amount of liquid the container can hold. Lead pupils to see that to find the volume of liquid in a rectangular tank (shape of a cuboid), the formula for volume of cuboid is used, giving the volume in cubic centimetres, which is then converted to millilitres or litres as the unit for volume of liquid in the tank. Point out that 1 cm^3 = 1 ml and 1000 cm^3 = 1 ℓ. Since 1 cm^3 = 1 ml, conversion between cm^3 and ml is easy. However, converting volume in cm^3 to litres involves dividing the volume in cm^3 by 1000.

Problem Solving

It should be emphasised that volume is the amount of space occupied by a solid and the capacity of a container is the amount of liquid the container can hold. Both have different units of measurement, where volumes are expressed in cm^3 and m^3, while capacities are expressed in ℓ and ml.

Activities

For Lesson 3, 'Activity Time' (Textbook 5 P155) can be an activity carried out as a collective class effort, where one or two big cuboids or cubes can be constructed with the help of 1-m sticks made using newspaper and tape. For Lesson 4, bring into the classroom a cubical container (if not available, draw the net and cut out to make cuboid cut-outs) to carry out questions 3 and 4 in 'Practice' (Textbook 5 P163) and fill it with water. Ask pupils to measure the dimensions of the container with a ruler or measuring tape and then calculate the volume of the tank and water by applying the formula.

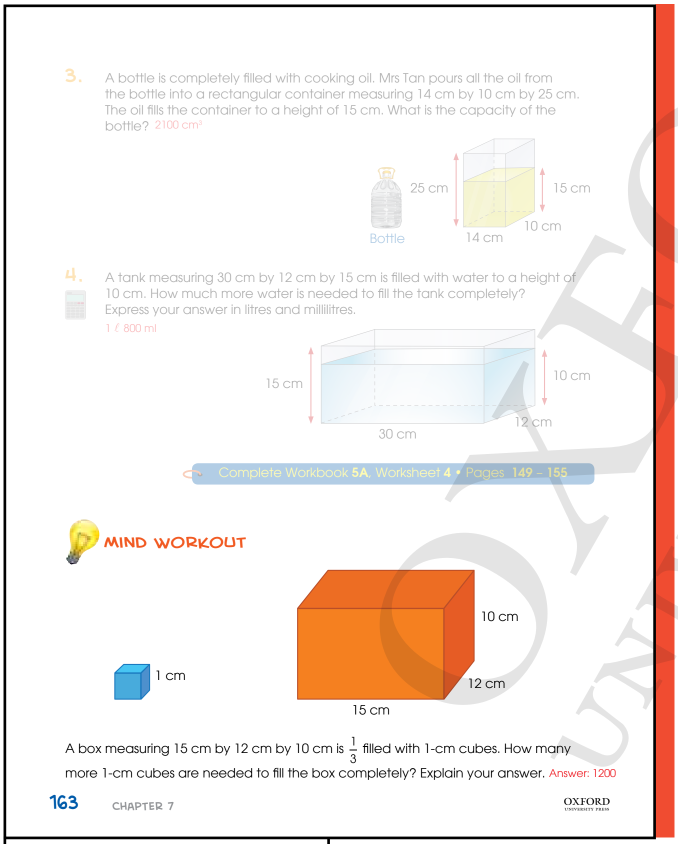
Resources

- vanguard paper
- scissors
- cubical containers
- metre rule
- markers
- water
- tape
- newspapers
- multilink cubes
- 1-litre bottle
- 10 cm × 10 cm × 10 cm container (shape of a cube)
- conversion of unit of volume card (Activity Handbook 5 P33)
- formula for volume card (Activity Handbook 5 P32)
- mini whiteboard

Mathematical Communication Support

Make connections with Lesson 1 of this chapter and emphasise that a cubic unit is a unit of measurement of volume 1 cubic centimetre (1 cm^3) or 1 cubic metre (1 m^3). Elicit individual responses when converting cubic centimetres to litres and millilitres. Emphasise key terms with their correct concepts, formulae and conversions, i.e. 'volume', 'capacity', 'cubic centimetre and metre', 'litres' and 'millilitres'.

PROBLEM SOLVING, MATHS JOURNAL AND PUPIL REVIEW



3. A bottle is completely filled with cooking oil. Mrs Tan pours all the oil from the bottle into a rectangular container measuring 14 cm by 10 cm by 25 cm. The oil fills the container to a height of 15 cm. What is the capacity of the bottle? 2100 cm³

4. A tank measuring 30 cm by 12 cm by 15 cm is filled with water to a height of 10 cm. How much more water is needed to fill the tank completely? Express your answer in litres and millilitres.
1 ℓ 800 ml

Complete Workbook **5A**, Worksheet **4** • Pages **149 – 155**

MIND WORKOUT

A box measuring 15 cm by 12 cm by 10 cm is $\frac{1}{3}$ filled with 1-cm cubes. How many more 1-cm cubes are needed to fill the box completely? Explain your answer. Answer: 1200

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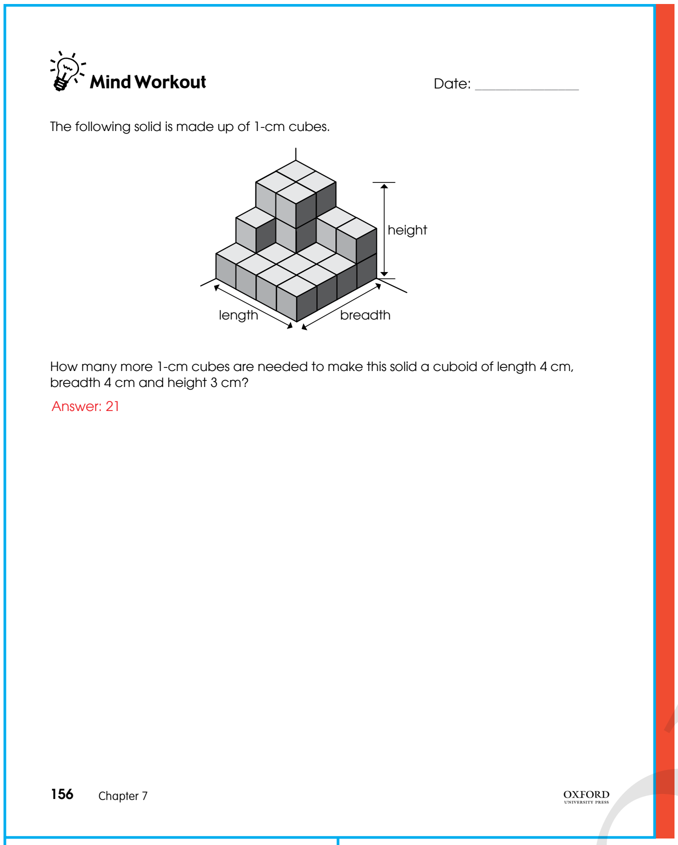
Textbook 5 P163

MIND WORKOUT

Since 1-cm cubes are used to fill the box, pupils can simply find two-thirds of the volume of the box for the answer.



Mind Workout Date: ______________

The following solid is made up of 1-cm cubes.

How many more 1-cm cubes are needed to make this solid a cuboid of length 4 cm, breadth 4 cm and height 3 cm?

Answer: 21

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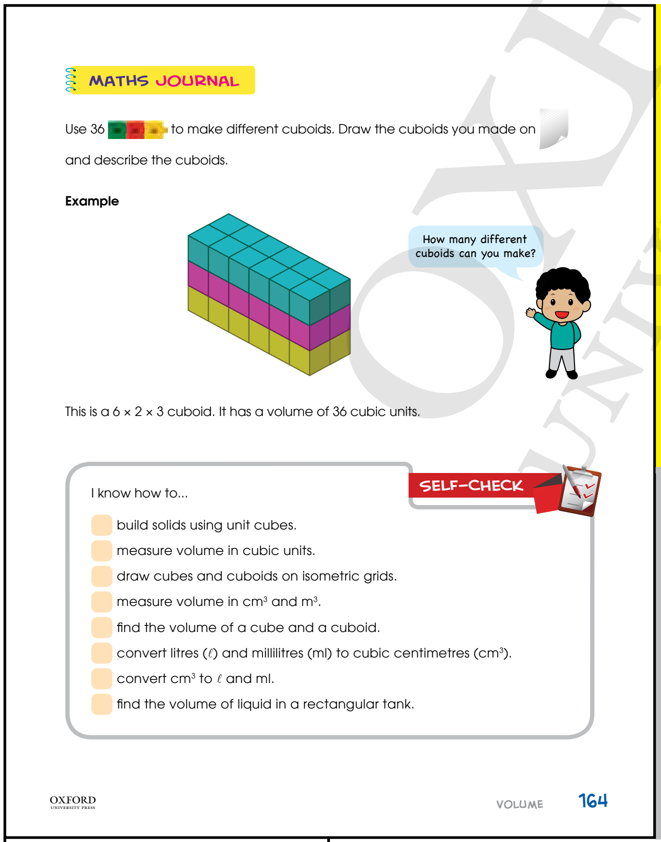
Workbook 5A P156

Mind Workout

Tell pupils to count the number of cubes layer by layer and then subtract from the volume of the cuboid for the answer. There are different ways to count the cubes at each layer.



MATHS JOURNAL

Use 36 to make different cuboids. Draw the cuboids you made on and describe the cuboids.

Example

This is a 6 × 2 × 3 cuboid. It has a volume of 36 cubic units.

SELF-CHECK

I know how to...

- ☐ build solids using unit cubes.
- ☐ measure volume in cubic units.
- ☐ draw cubes and cuboids on isometric grids.
- ☐ measure volume in cm³ and m³.
- ☐ find the volume of a cube and a cuboid.
- ☐ convert litres (ℓ) and millilitres (ml) to cubic centimetres (cm³).
- ☐ convert cm³ to ℓ and ml.
- ☐ find the volume of liquid in a rectangular tank.

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Textbook 5 P164

MATHS JOURNAL

Pupils' examples may not be exhaustive. Accept answers as long as they can provide at least 3 cuboids and know how to draw them on isometric grid. Pupils may use their knowledge of factors to break 36 into 3 factors that can make the cuboids. For example:

- 6 × 6 × 1
- 3 × 6 × 2
- 3 × 3 × 4
- 2 × 3 × 6
- 2 × 2 × 9
- 2 × 1 × 18

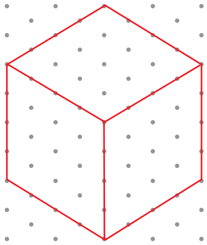
SELF-CHECK

Before the pupils do the self-check, review the important concepts once more by asking for examples learnt for each objective.

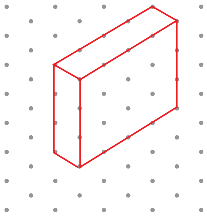
The self-check can be done after pupils have completed **Review 7** (Workbook 5A P157 – 160) as consolidation of understanding for the chapter.

Answers Review 7 (Workbook 5A P157 – 160)

1. (a)



(b)



2. 10

3. (a) 4704 cm^3
(b) 0.072 m^3

4. (a) 265
(b) 5206
(c) 7024
(d) 3007

5. (a) 809
(b) 7, 800
(c) 5, 63
(d) 24, 45

6. 25 cm × 20 cm × 15 cm = 7500 cm^3
7500 cm^3 ÷ 8 = 937.5 cm^3

7. (a) 20 cm × 15 cm × 2 cm = 600 cm^3
= 600 ml
(b) 20 cm × 15 cm × 15 cm = 4500 cm^3
= 4500 ml
4500 ml − 600 ml = 3900 ml
= 3 ℓ 900 ml

8. 25 cm × 15 cm × 20 cm = 7500 cm^3
= 7500 ml
$\frac{1}{4}$ × 7500 ml = 1875 ml
= 1 ℓ 875 ml
4.5 ℓ + 1 ℓ 875 ml = 6 ℓ 375 ml

1. (a) 5 : 1: 6
   (b) 1 : 2

2. (a) 4 : 7
   (b) 3 : 5
   (c) 8 : 6
   (d) 9 : 5 : 14
   (e) 5 : 4 : 8
   (f) 11 : 13 : 25

3. (a) 15
   (b) 20
   (c) 9
   (d) 35
   (e) 9
   (f) 36, 1

4. AE

5. (a) $\frac{1}{2} \times 36 \text{ cm} \times 15 \text{ cm}$
   $= 270 \text{ cm}^2$
   (b) $\frac{1}{2} \times 15 \text{ cm} \times 6 \text{ cm}$
   $= 45 \text{ cm}^2$
   (c) $\frac{1}{2} \times 4 \text{ m} \times 4 \text{ m}$
   $= 8 \text{ m}^2$

6. (a) Area of triangle A = $\frac{1}{2} \times 6 \text{ cm} \times 3 \text{ cm}$
   $= 9 \text{ cm}^2$

   Area of triangle B = $\frac{1}{2} \times 2 \text{ cm} \times 3 \text{ cm}$
   $= 3 \text{ cm}^2$

   $9 \text{ cm}^2 + 3 \text{ cm}^2 = 12 \text{ cm}^2$

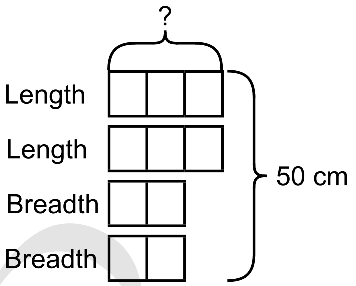
   (b) Area of triangle A = $\frac{1}{2} \times 4 \text{ cm} \times 3 \text{ cm}$
   $= 6 \text{ cm}^2$

   Area of triangle B = $\frac{1}{2} \times 2 \text{ cm} \times 3 \text{ cm}$
   $= 3 \text{ cm}^2$

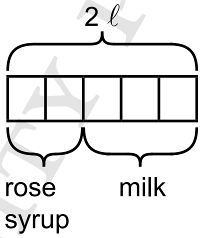
   Area of triangle C = $\frac{1}{2} \times 2 \text{ cm} \times 1 \text{ cm}$
   $= 1 \text{ cm}^2$

   $6 \text{ cm}^2 + 3 \text{ cm}^2 + 1 \text{ cm}^2 = 10 \text{ cm}^2$

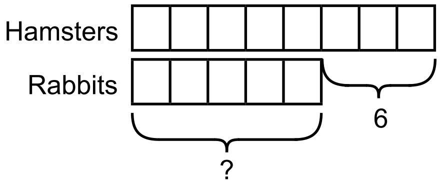
7. 10 units = 50 cm
   1 unit = 50 cm ÷ 10
   = 5 cm
   3 units = 5 cm × 3
   = 15 cm



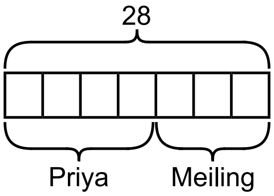
8. 5 units = 2 ℓ
   = 2000 ml
   1 unit = 2000 ml ÷ 5
   = 400 ml
   4 units = 400 ml × 4
   = 1600 ml
   = 1 ℓ 600 ml



9. 3 units = 6
   1 unit = 6 ÷ 3
   = 2
   5 units = 2 × 5
   = 10



10. 7 units = 28
    1 units = 28 ÷ 7
    = 4
    3 units = 4 × 3
    = 12



1. (a) 6
   (b) 40
   (c) 13
   (d) 180, 2

2. 20

3. 13

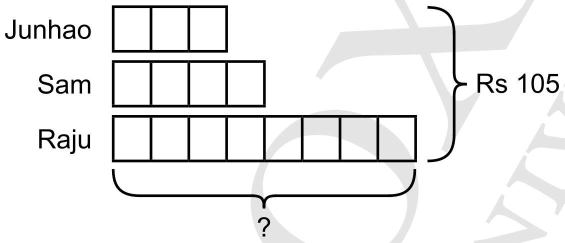
4. (a) 125
   (b) 351

5. 16 cm − 6 cm = 10 cm
   30 cm × 7 cm × 10 cm = 2100 cm^3

6. \$35 − \$5 = \$30
   \$35 + \$30 = \$65
   \$65 × 4 = \$260

7. \$1050 ÷ \$70 = 15
   \$400 ÷ \$80 = 5
   5 : 15 = 1 : 3

8. 15 units = Rs 105
   1 unit = Rs 105 ÷ 15
   = Rs 7
   8 units = Rs 7 × 8
   = 56



9. Area of square = 64 cm^2
   = 8 cm × 8 cm
   Length of square = 8 cm
   Length of triangle A = $\frac{1}{2} \times 8 \times (26 - 8)$
   = 72 cm^2
   Length of triangle B = $\frac{1}{2} \times 8 \times (15 - 8)$
   = 28 cm^2
   Total area of figure = 64 cm^2 + 72 cm^2 + 28 cm^2
   = 164 cm^2

10. 16 cm × 10 cm × 22 cm = 3520 cm^3
    Number of 1-cm cubes = 3520

1. 2

2. 4

3. 3

4. 1

5. 4

6. 3

7. 4

8. 1

9. 3

10. 4

11. 3

12. 4

13. 3

14. 2

15. 3

16. 3 504 873

17. Seven million, three hundred and seventy thousand, seven hundred and three

18. $520 = 2 \times 2 \times 2 \times 5 \times 13$

19. 280 000

20. 984 312

21. 705

22. $\frac{1}{2}$

23. 12

24. 3 : 2 : 4

25. $45 \times 100 = 4500$
    $4500 \div 50 = 90$

26. $\$165\,000 - \$20\,000 - \$145\,000$
    $\$145\,000 \div \$5\,000 = 29$ months

27. $6\frac{2}{5}$ kg × 2 = $12\frac{4}{5}$ kg

28. $\frac{5}{8} \times \frac{4}{5} = \frac{1}{2}$

29. $1\frac{1}{4}\,\ell \times 2 = 2\frac{1}{2}\,\ell$
    $2\frac{1}{2}\,\ell - 1\frac{2}{5}\,\ell = 1\frac{1}{10}\,\ell$

30.
$$\begin{aligned} 11 \text{ units} &= 132 \\ 1 \text{ unit} &= 132 \div 11 \\ &= 12 \\ 8 \text{ units} &= 12 \times 8 \\ &= 96 \end{aligned}$$

31. Cost of 4 pens = $\$4q$
    Cost of 3 notebooks = $\$2 \times 3$
    = $\$6$
    Cost of 4 pens and 3 notebooks = $\$(4q + 6)$

32. Mass of butter at first = $7p + 18p + p + 11$
    = $26p + 11$
    Substituting $p = 9$,
    $26p + 11 = 26 \times 9 + 11$
    = 245
    Nora had 245 g of butter at first.

33. Area of big triangle
    = $\frac{1}{2} \times 9 \text{ cm} \times 6 \text{ cm}$
    = 27 cm^2
    Area of unshaded triangle
    = $\frac{1}{2} \times 7 \text{ cm} \times 3 \text{ cm}$
    = 10.5 cm^2
    Total shaded area = 27 cm^2 − 10.5 cm^2
    = 16.5 cm^2

34. 40 cm ÷ 2 = 20 cm

Area of 1 triangle = $\frac{1}{2}$ × 20 cm × 10 cm

= 100 cm^2

Area of figure = Area of 5 triangles

= 100 cm^2 × 5

= 500 cm^2

35. Area of rectangle ABCD = 20 cm × 16 cm

= 320 cm^2

Area of trianlge CDE = $\frac{1}{2}$ × 9 cm × 16 cm

= 72 cm^2

AF = FB = 8 cm

Area of triangle FGC = $\frac{1}{2}$ × 12 cm × 8 cm

= 48 cm^2

Total area of shaded part = 320 cm^2 − 72 cm^2 − 48 cm^2

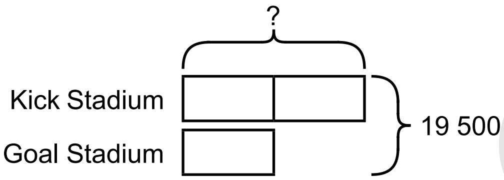
= 200 cm^2

36. 3 units = 19 500

1 unit = 19 500 ÷ 3

= 6500

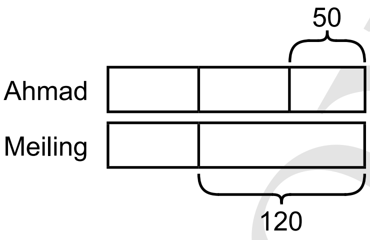
2 units = 13 000



37. 1 unit = 120 − 50

= 70

120 + 70 = 190



38. 39 − 3 = 36

36 × 1 = 36

3 bags = 36 sweets

1 bag = 36 ÷ 3

= 12 sweets

39 bags = 12 × 39

= 468 sweets

39. 18 × 2 points = 36 points

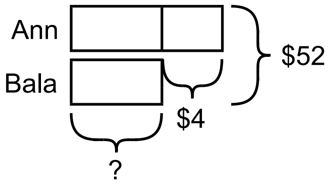
2 × 1 point = 2 points

36 points − 2 points = 34 points

Therefore, he answered 18 questions correctly.

40. \$52 − \$4 = \$48

\$48 ÷ 2 = \$24



41. AE = ED = 2 cm

AF = FB

= 2 × AE

= 4 cm

Area of rectangle ABCD = 8 cm × 4 cm

= 32 cm^2

Area of triangle AFE = $\frac{1}{2}$ × 2 cm × 4 cm

= 4 cm^2

Area of triangle CDE = $\frac{1}{2}$ × 2 cm × 8 cm

= 8 cm^2

Area of triangle CBF = $\frac{1}{2}$ × 4 cm × 4 cm

= 8 cm^2

Area of tringle EFC = 32 cm^2 − 4 cm^2 − 8 cm^2 − 8 cm^2

= 12 cm^2

Fraction shaded = $\frac{12}{32}$

= $\frac{3}{8}$

42. $\frac{2}{7} \times \frac{5}{8} = \frac{5}{28}$

$1 - \frac{5}{28} = \frac{23}{28}$

$\frac{23}{28}$ = 92 cupcakes

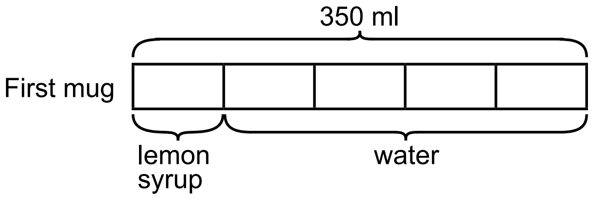
$\frac{1}{28}$ = 92 ÷ 23

= 4 cupcakes

$\frac{28}{28}$ = 4 × 28

= 112 cupcakes

43.



5 units = 350 ml

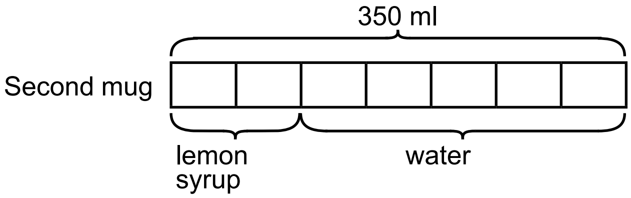
1 unit = 350 ml ÷ 5

= 70 ml

4 units = 70 ml × 4

= 280 ml

280 ml − 250 ml = 30 ml



For the second mug,

7 units = 350 ml

1 unit = 350 ml ÷ 7
= 50 ml

5 units = 50 ml × 5
= 250 ml

280 ml − 250 ml = 30 ml

44. AD = 100 ÷ 20
= 5 cm

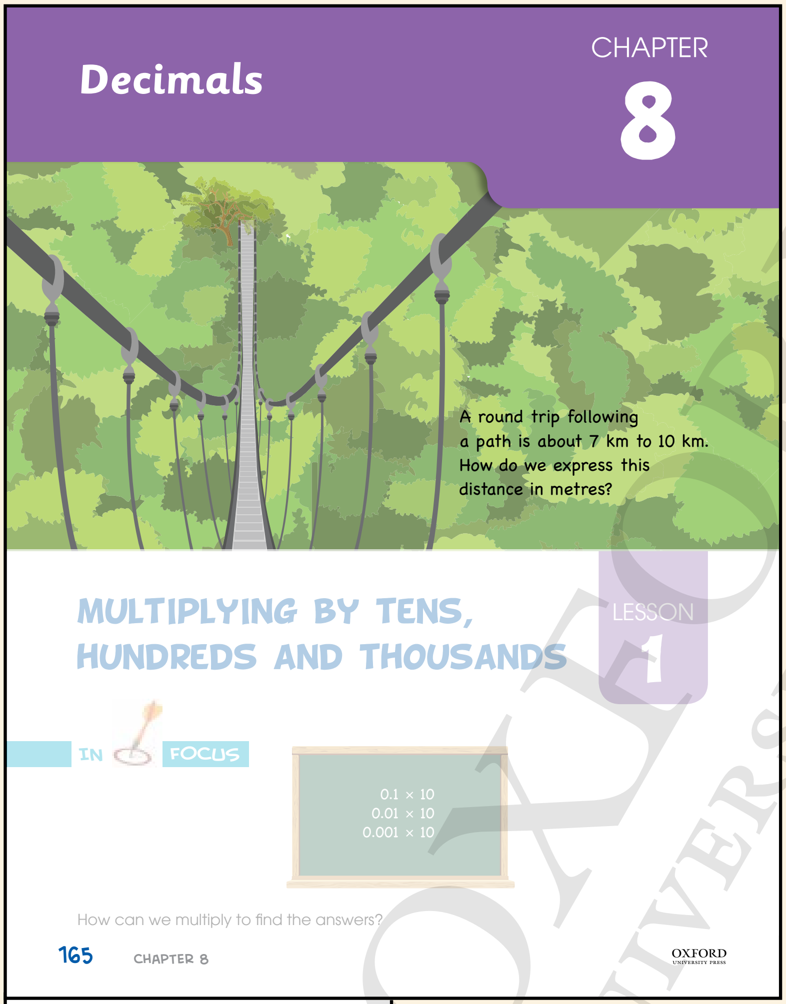
Area of triangle ADF = $\frac{1}{2} \times 5 \text{ cm} \times 6 \text{ cm}$
= 15 cm^2

45. CD = 360 ÷ 20
= 18 cm

Area of shaded part = Area of triangle CDF
= $\frac{1}{2} \times 18 \text{ cm} \times 20 \text{ cm}$
= 180 cm^2

DECIMAL

CHAPTER 8



Decimals

CHAPTER 8

A round trip following a path is about 7 km to 10 km. How do we express this distance in metres?

MULTIPLYING BY TENS, HUNDREDS AND THOUSANDS

LESSON 1

IN FOCUS

0.1 × 10
0.01 × 10
0.001 × 10

How can we multiply to find the answers?

165 CHAPTER 8 OXFORD

Textbook 5 P165

Related Resources

NSPM Textbook 5 (P165 − 191)
NSPM Workbook 5B (P1 − 30)

Materials

Number discs, decimal discs, place-value chart, mini whiteboard, markers, unit of measurement conversion cards, decimal cards, number lines, conversion of unit cards, computer (ICT), newspapers, magazines

Lesson

Lesson 1	Multiplying by Tens, Hundreds and Thousands
Lesson 2	Dividing by Tens, Hundreds and Thousands
Lesson 3	Converting Measurements
Lesson 4	Solving Word Problems

Problem Solving, Maths Journal and Pupil Review

INTRODUCTION

This chapter aims to help pupils visualise and perform multiplication and division of decimals by tens, hundreds and thousands. It also allows pupils to understand the equivalence of amount based on different units of measurement and subsequently be able to convert between smaller and bigger units of measurement in decimals.

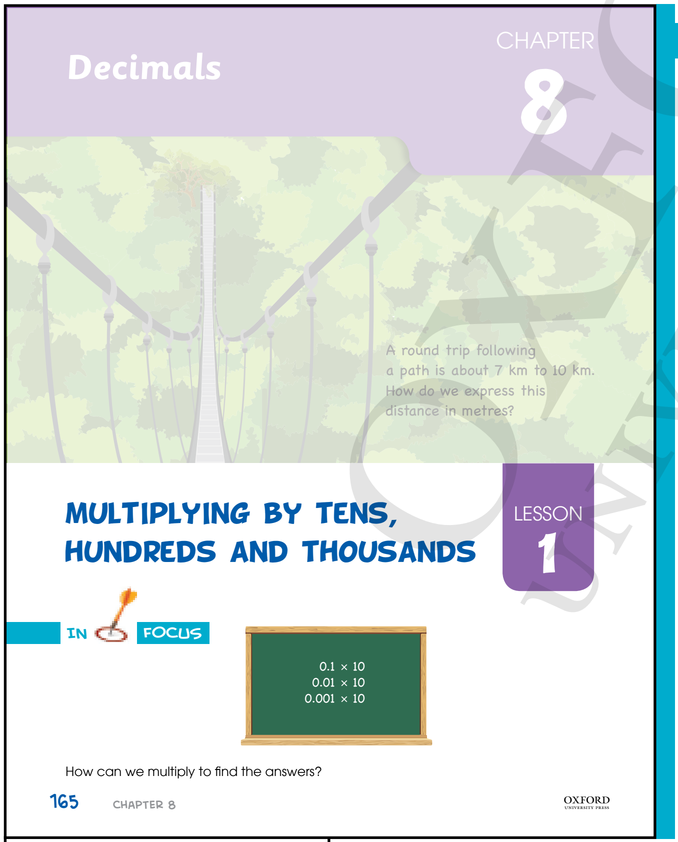
Pupils also learn to apply the skills of four operations in decimals to solve word problems, including the use of bar models and heuristics for non-routine questions.

LESSON
1

MULTIPLYING BY TENS, HUNDREDS AND THOUSANDS

LEARNING OBJECTIVES

1. Multiply decimals by tens.
2. Multiply decimals by hundreds.
3. Multiply decimals by thousands.



Decimals

CHAPTER
8

A round trip following a path is about 7 km to 10 km. How do we express this distance in metres?

MULTIPLYING BY TENS, HUNDREDS AND THOUSANDS

LESSON
1

IN FOCUS

0.1 × 10
0.01 × 10
0.001 × 10

How can we multiply to find the answers?

165 CHAPTER 8

OXFORD

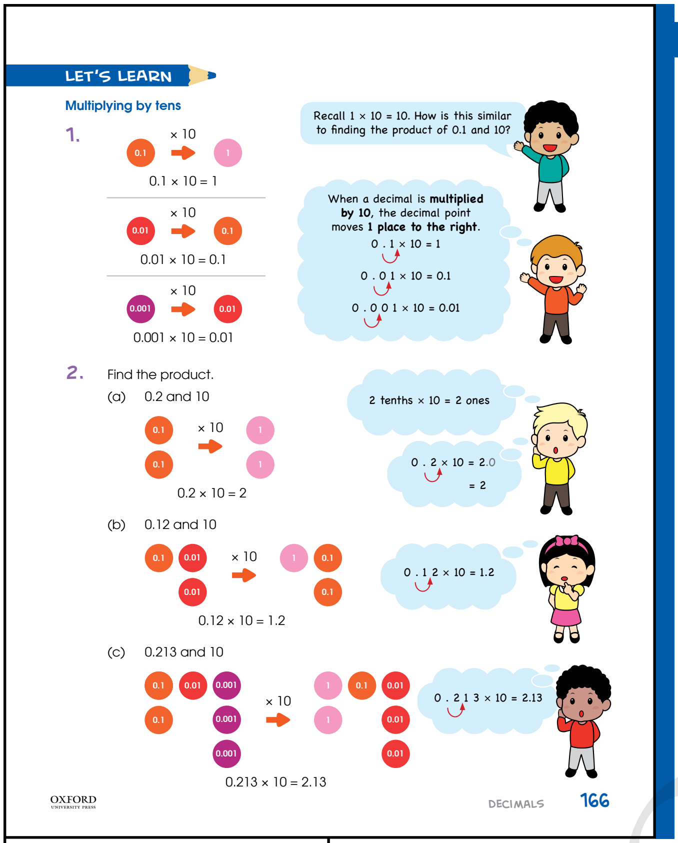
Textbook 5 P165

IN FOCUS

Get pupils to relate to a situation involving the multiplication of decimals with 10/100/1000. Referring to the Chapter Opener, tells pupils that distance in kilometres can be converted to metres by multiplying the distance in kilometres by 1000. Provide pupils with other examples to help them relate better to the lesson. For instance:

- Given that a sweet costs $0.10, how can you find the cost of 10 such sweets?
- How can you find the cost of 100 sweets? How much would 1000 sweets cost?

Repeat the problem with 10/100/1000 sweets while changing the cost of the sweet to $0.30 each. Using the In Focus, ask pupils to multiply 0.1/0.01/0.001 by 10. Get pupils to explain how it is done. Ask them how is it similar or different to multiplying 10/100/1000 by 10.



LET'S LEARN

Multiplying by tens

1\.

0.1 × 10 = 1

0.01 × 10 = 0.1

0.001 × 10 = 0.01

Recall 1 × 10 = 10. How is this similar to finding the product of 0.1 and 10?

When a decimal is **multiplied by 10**, the decimal point moves **1 place to the right**.

0 . 1 × 10 = 1

0 . 0 1 × 10 = 0.1

0 . 0 0 1 × 10 = 0.01

2\. Find the product.

(a) 0.2 and 10

0.2 × 10 = 2

2 tenths × 10 = 2 ones

0 . 2 × 10 = 2.0
= 2

(b) 0.12 and 10

0.12 × 10 = 1.2

0 . 1 2 × 10 = 1.2

(c) 0.213 and 10

0.213 × 10 = 2.13

0 . 2 1 3 × 10 = 2.13

DECIMALS 166

Textbook 5 P166

LET'S LEARN

With the use of number and decimal discs, help pupils visualise and understand the products of 10 and 0.1/0.01/0.001 in Let's Learn 1. Guide pupils to observe the shifting of the decimal point. Ask if they can identify a pattern in the answers obtained. Lead pupils to arrive at the strategy of shifting the decimal point 1 place to the right when multiplying by 10.

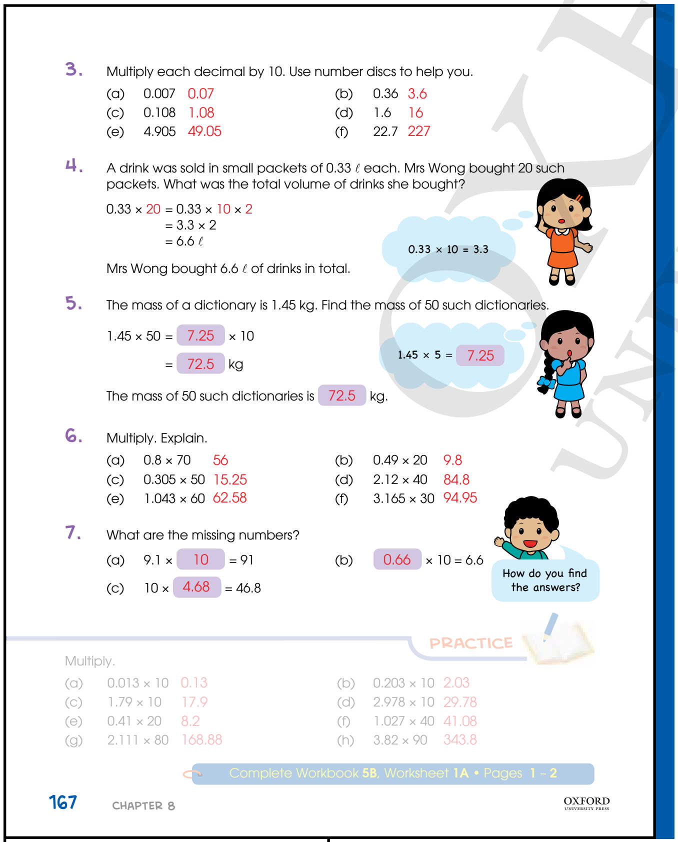
Let's Learn 2 extends pupil's learning by going further to products of other decimals with 1, 2 or 3 decimal places and 10.

Get the pupils to visualise through the use of number discs and work out the product between:

- A decimal with 1 decimal place and 10
- A decimal with 2 decimal places and 10
- A decimal with 3 decimal places and 10

Explain to pupils that the products can also be worked out by multiplying each digit in its place values by 10. Show pupils that when multiplying by 10:

- tenths become ones
- hundredths become tenths
- thousandths become hundredths



3\. Multiply each decimal by 10. Use number discs to help you.

(a) 0.007 0.07
(b) 0.36 3.6
(c) 0.108 1.08
(d) 1.6 16
(e) 4.905 49.05
(f) 22.7 227

4\. A drink was sold in small packets of 0.33 ℓ each. Mrs Wong bought 20 such packets. What was the total volume of drinks she bought?

0.33 × 20 = 0.33 × 10 × 2
= 3.3 × 2
= 6.6 ℓ

0.33 × 10 = 3.3

Mrs Wong bought 6.6 ℓ of drinks in total.

5\. The mass of a dictionary is 1.45 kg. Find the mass of 50 such dictionaries.

1.45 × 50 = 7.25 × 10
= 72.5 kg

1.45 × 5 = 7.25

The mass of 50 such dictionaries is 72.5 kg.

6\. Multiply. Explain.

(a) 0.8 × 70 56
(b) 0.49 × 20 9.8
(c) 0.305 × 50 15.25
(d) 2.12 × 40 84.8
(e) 1.043 × 60 62.58
(f) 3.165 × 30 94.95

7\. What are the missing numbers?

(a) 9.1 × 10 = 91
(b) 0.66 × 10 = 6.6
(c) 10 × 4.68 = 46.8

How do you find the answers?

PRACTICE

Multiply.

(a) 0.013 × 10 0.13
(b) 0.203 × 10 2.03
(c) 1.79 × 10 17.9
(d) 2.978 × 10 29.78
(e) 0.41 × 20 8.2
(f) 1.027 × 40 41.08
(g) 2.111 × 80 168.88
(h) 3.82 × 90 343.8

Complete Workbook **5B**, Worksheet **1A** • Pages **1 – 2**

167 CHAPTER 8

Textbook 5 P167

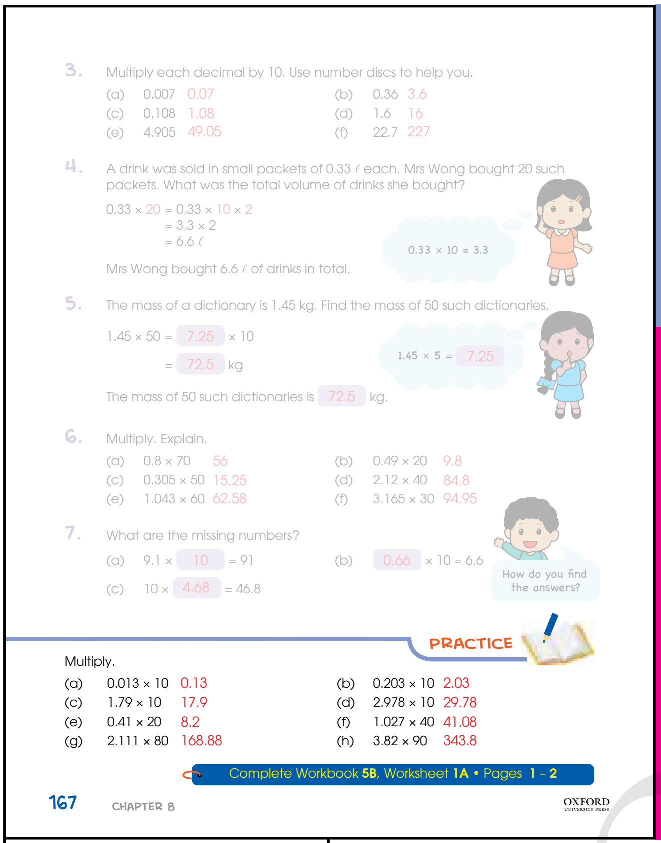
Get pupils to work on the questions in Let's Learn 3. Facilitate and guide pupils in step-by-step working if they are unsure. Pupils may use decimal and number discs to help them find the answers if necessary. Get pupils to explain how they obtain the answers.

For Let's Learn 4, guide pupils in solving a word problem involving multiplication of decimals with a multiple of 10. Explain to pupils that they can find the product of 0.33 and 20 by multiplying 0.33 with 10 first and then 2. Get pupils to show how the answer can be found by multiplying 0.33 with 2 first and then 10. Decimal and number discs can be used to help pupils visualise both methods. Ask pupils to compare the two methods.

Let's Learn 5 allows pupils to practise multiplying 1.45 and 50 using the method they have learnt in Let's Learn 4. Ask pupils how they can solve the problem using a different method.

Let's Learn 6 gets pupils to multiply decimals with 1/2/3 decimal places by a multiple of 10. Allow pupils to work in pairs. Give them sufficient time to work on the questions before going through.

Let's Learn 7 reinforces the concept of multiplying decimals by 10. Get pupils to explain their answers.



3. Multiply each decimal by 10. Use number discs to help you.
(a) 0.007 0.07 (b) 0.36 3.6
(c) 0.108 1.08 (d) 1.6 16
(e) 4.905 49.05 (f) 22.7 227

4. A drink was sold in small packets of 0.33 ℓ each. Mrs Wong bought 20 such packets. What was the total volume of drinks she bought?

0.33 × 20 = 0.33 × 10 × 2
= 3.3 × 2
= 6.6 ℓ

Mrs Wong bought 6.6 ℓ of drinks in total.

5. The mass of a dictionary is 1.45 kg. Find the mass of 50 such dictionaries.

1.45 × 50 = 7.25 × 10
= 72.5 kg

The mass of 50 such dictionaries is 72.5 kg.

6. Multiply. Explain.
(a) 0.8 × 70 56 (b) 0.49 × 20 9.8
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(e) 1.043 × 60 62.58 (f) 3.165 × 30 94.95

7. What are the missing numbers?
(a) 9.1 × 10 = 91 (b) 0.66 × 10 = 6.6
(c) 10 × 4.68 = 46.8

PRACTICE

Multiply.
(a) 0.013 × 10 0.13 (b) 0.203 × 10 2.03
(c) 1.79 × 10 17.9 (d) 2.978 × 10 29.78
(e) 0.41 × 20 8.2 (f) 1.027 × 40 41.08
(g) 2.111 × 80 168.88 (h) 3.82 × 90 343.8

Complete Workbook **5B**, Worksheet **1A** • Pages **1 – 2**

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Textbook 5 P167

PRACTICE

Allow pupils to discuss and work in pairs. Give pupils sufficient time to work through the practice before going through.

Independent seatwork

Assign pupils to complete Worksheet 1A (Workbook 5B P1 – 2).

Answers

Worksheet 1A (Workbook 5B P1 – 2)

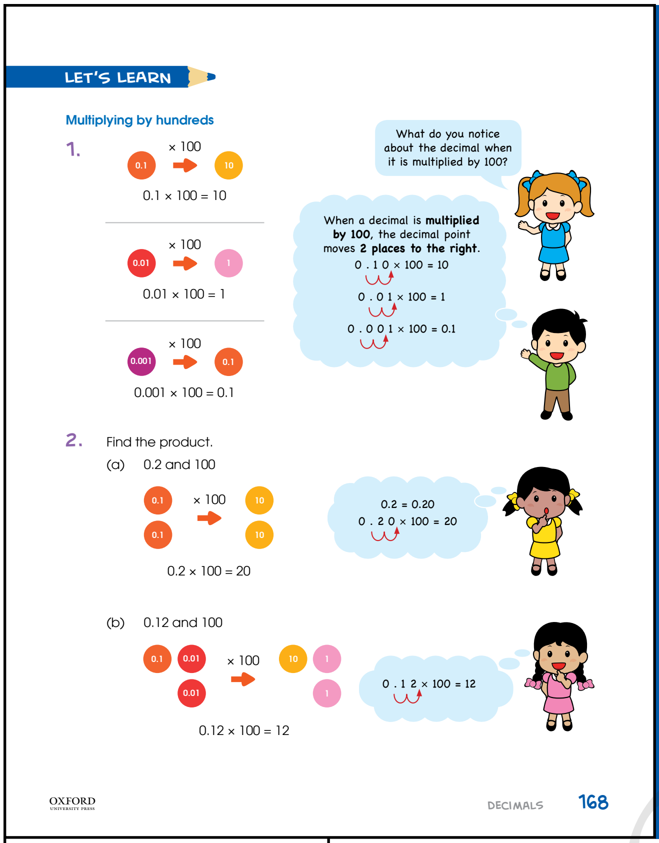
1. (a) 34
   (b) 2.5
   (c) 8.12
   (d) 43.25
   (e) 98.91
   (f) 0.9

2. (a) 8
   (b) 40.9, 204.5
   (c) 3.1 × 20 = 3.1 × 2 × 10
   = 6.2 × 10
   = 62
   (d) 0.51 × 60 = 0.51 × 10 × 6
   = 5.1 × 6
   = 30.6
   (e) 0.173 × 30 = 0.173 × 10 × 3
   = 1.73 × 3
   = 5.19
   (f) 8.46 × 20 = 8.46 × 10 × 2
   = 84.6 × 2
   = 169.2

3. (a) 10
   (b) 10
   (c) 8.82
   (d) 4.34
   (e) 0.045
   (f) 0.023

4. $0.90 × 10 = $9

5. 2.3 cm × 80 = 184 cm



LET'S LEARN

Multiplying by hundreds

1\. × 100

0.1 × 100 = 10

× 100

0.01 × 100 = 1

× 100

0.001 × 100 = 0.1

What do you notice about the decimal when it is multiplied by 100?

When a decimal is **multiplied by 100**, the decimal point moves **2 places to the right**.

0 . 1 0 × 100 = 10

0 . 0 1 × 100 = 1

0 . 0 0 1 × 100 = 0.1

2\. Find the product.

(a) 0.2 and 100

× 100

0.2 × 100 = 20

0.2 = 0.20

0 . 2 0 × 100 = 20

(b) 0.12 and 100

× 100

0.12 × 100 = 12

0 . 1 2 × 100 = 12

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DECIMALS 168

Textbook 5 P168

LET'S LEARN

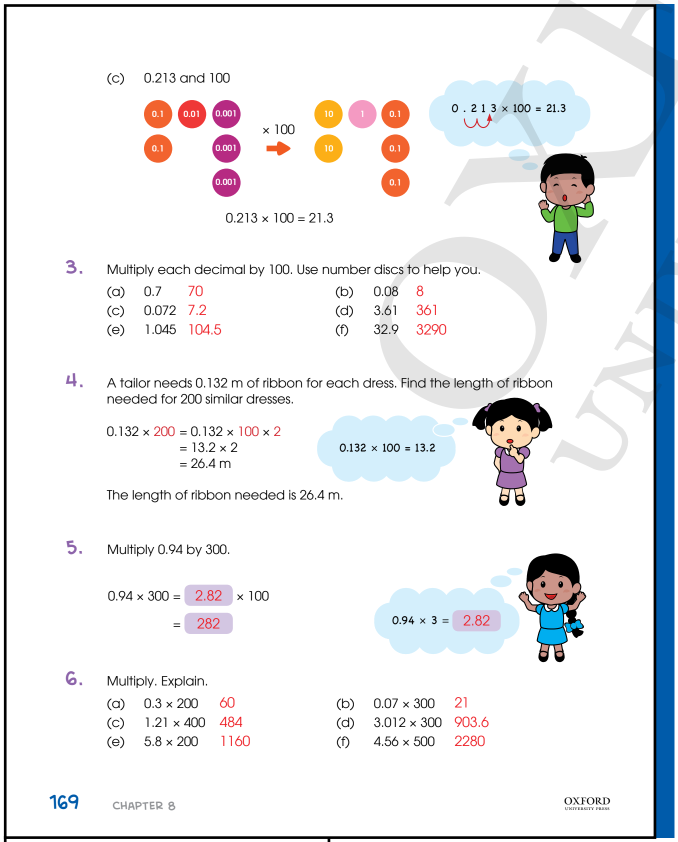
With the use of number and decimal discs, help pupils visualise and understand the products of 100 and 0.1/0.01/0.001 in Let's Learn 1. Guide pupils to observe the shifting of the decimal point. Ask if they can identify a pattern in the answers obtained. Lead pupils to arrive at the strategy of shifting the decimal point 2 places to the right when multiplying by 100.

Let's Learn 2 extends pupil's learning by going further to products of other decimals with 1, 2 or 3 decimal places and 100.
Get the pupils to visualise through the use of number discs and work out the product between:

- A decimal with 1 decimal place and 100
- A decimal with 2 decimal places and 100
- A decimal with 3 decimal places and 100

Explain to pupils that the products can also be worked out by multiplying each digit in its place values by 100.
Show pupils that when multiplying by 10:

- tenths become tens
- hundredths become ones
- thousandths become tenths



(c) 0.213 and 100

× 100

0.213 × 100 = 21.3

0 . 2 1 3 × 100 = 21.3

3\. Multiply each decimal by 100. Use number discs to help you.

(a) 0.7 70
(b) 0.08 8
(c) 0.072 7.2
(d) 3.61 361
(e) 1.045 104.5
(f) 32.9 3290

4\. A tailor needs 0.132 m of ribbon for each dress. Find the length of ribbon needed for 200 similar dresses.

0.132 × 200 = 0.132 × 100 × 2
= 13.2 × 2
= 26.4 m

0.132 × 100 = 13.2

The length of ribbon needed is 26.4 m.

5\. Multiply 0.94 by 300.

0.94 × 300 = 2.82 × 100
= 282

0.94 × 3 = 2.82

6\. Multiply. Explain.

(a) 0.3 × 200 60
(b) 0.07 × 300 21
(c) 1.21 × 400 484
(d) 3.012 × 300 903.6
(e) 5.8 × 200 1160
(f) 4.56 × 500 2280

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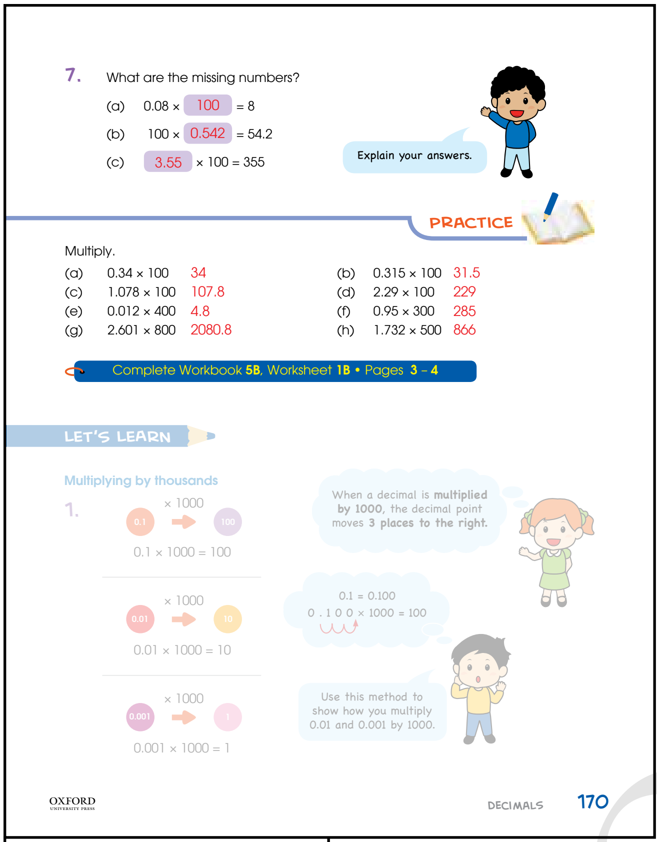
Textbook 5 P169

Get pupils to work on the questions in Let's Learn 3 with guidance and discussions. Pupils may use decimal and number discs to help them find the answers if necessary.

For Let's Learn 4, guide pupils in solving a word problem involving multiplication of decimals with a multiple of 100. Elicit response from pupils how the multiplication can be done. While some pupils may choose to apply the multiplication algorithm, explain to pupils that 0.132 × 200 can be seen as 2 sets of 0.132 x 100. Therefore, the pupils can find the product of 0.132 and 200 by multiplying 0.132 with 100 first and then 2. Ask pupils if there are any other methods to find the product. Get pupils to see that it can also be 100 sets of 0.132 × 2. Therefore, the answer can be found by multiplying 0.132 with 2 first and then 100. Decimal and number discs can be used to help pupils visualise both methods. Get pupils to compare the two methods. Ask them if the two methods give the same meaning to the multiplication.

Let's Learn 5 allows pupils to practise multiplying 0.94 and 300 using the method they have learnt in Let's Learn 4. Ask pupils how they can solve the problem using a different method.

Let's Learn 6 gets pupils to multiply decimals with 1/2/3 decimal places by a multiple of 100. Allow pupils to work in pairs. Give them sufficient time to work on the questions before going through.



7. What are the missing numbers?

(a) 0.08 × 100 = 8

(b) 100 × 0.542 = 54.2

(c) 3.55 × 100 = 355

Explain your answers.

PRACTICE

Multiply.

(a)	0.34 × 100	34	(b)	0.315 × 100	31.5
(c)	1.078 × 100	107.8	(d)	2.29 × 100	229
(e)	0.012 × 400	4.8	(f)	0.95 × 300	285
(g)	2.601 × 800	2080.8	(h)	1.732 × 500	866

Complete Workbook **5B**, Worksheet **1B** • Pages **3 – 4**

LET'S LEARN

Multiplying by thousands

1.

0.1 × 1000 = 100

0.01 × 1000 = 10

0.001 × 1000 = 1

When a decimal is **multiplied by 1000**, the decimal point moves **3 places to the right.**

0.1 = 0.100

0 . 1 0 0 × 1000 = 100

Use this method to show how you multiply 0.01 and 0.001 by 1000.

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DECIMALS 170

Textbook 5 P170

Let's Learn 7 reinforces the concept of multiplying decimals by 100. Get pupils to explain their answers.

PRACTICE

Allow pupils to discuss and work in pairs. Give pupils sufficient time to work through the practice before going through.

Independent seatwork

Assign pupils to complete Worksheet 1B (Workbook 5B P3 – 4).

Answers

Worksheet 1B (Workbook 5B P3 – 4)

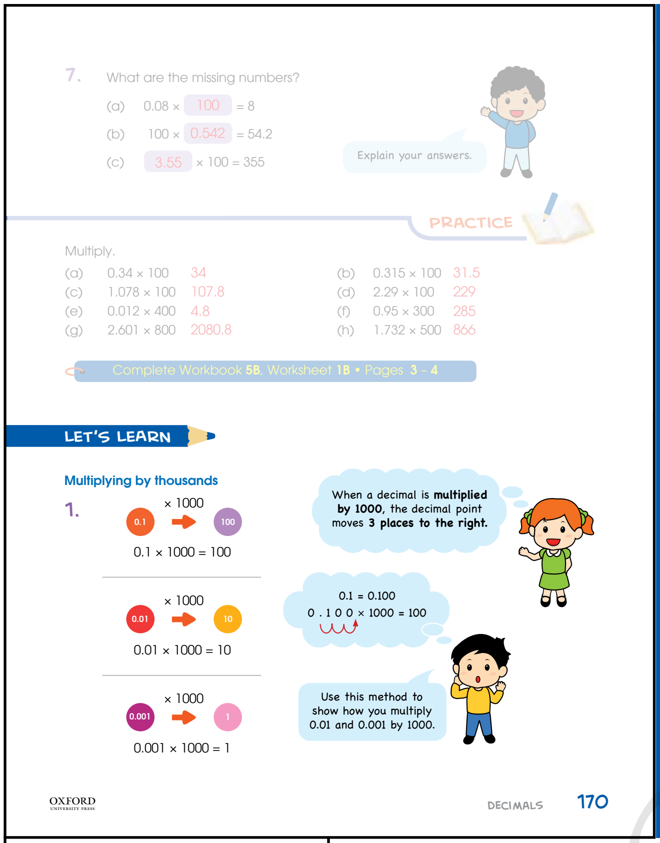
1. (a) 0.3
   (b) 5.2
   (c) 19.2
   (d) 480
   (e) 650.4
   (f) 709.9

2. (a) 2.1 × 300 = 2.1 × 3 × 100
   = 6.3 × 100
   = 630
   (b) 0.48 × 200 = 0.48 × 100 × 2
   = 48 × 2
   = 96
   (c) 1.092 × 500 = 1.092 × 100 × 5
   = 109.2 × 5
   = 546

3. (a) 100
   (b) 0.054
   (c) 0.099
   (d) 100

4. 2.05 × 300 = 615 g

5. 3.75 km × 100 = 375 km



7. What are the missing numbers?

(a) 0.08 × 100 = 8

(b) 100 × 0.542 = 54.2

(c) 3.55 × 100 = 355

Explain your answers.

PRACTICE

Multiply.

(a) 0.34 × 100 34

(b) 0.315 × 100 31.5

(c) 1.078 × 100 107.8

(d) 2.29 × 100 229

(e) 0.012 × 400 4.8

(f) 0.95 × 300 285

(g) 2.601 × 800 2080.8

(h) 1.732 × 500 866

Complete Workbook 5B, Worksheet 1B • Pages 3 – 4

LET'S LEARN

Multiplying by thousands

1.

0.1 × 1000 = 100

0.01 × 1000 = 10

0.001 × 1000 = 1

When a decimal is **multiplied by 1000**, the decimal point moves **3 places** to **the right.**

0.1 = 0.100

0 . 1 0 0 × 1000 = 100

Use this method to show how you multiply 0.01 and 0.001 by 1000.

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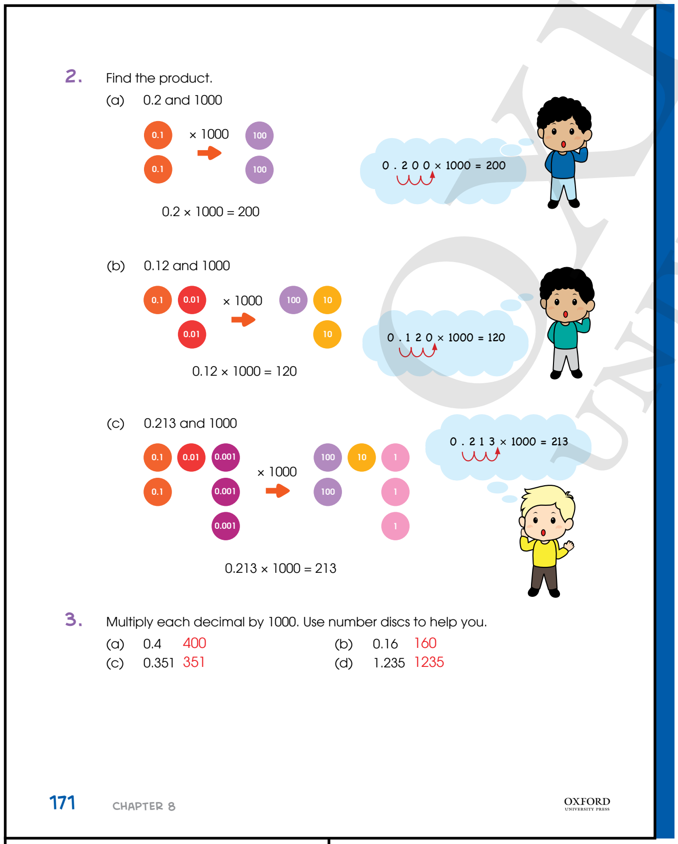
DECIMALS 170

Textbook 5 P170

LET'S LEARN

With the use of number and decimal discs, help pupils visualise and understand the products of 1000 and 0.1/0.01/0.001 in Let's Learn 1. Guide pupils to observe the shifting of the decimal point. Ask if they can identify a pattern in the answers obtained. Lead pupils to arrive at the strategy of shifting the decimal point 3 places to the right when multiplying by 1000.



2. Find the product.

(a) 0.2 and 1000

0 . 2 0 0 × 1000 = 200

0.2 × 1000 = 200

(b) 0.12 and 1000

0 . 1 2 0 × 1000 = 120

0.12 × 1000 = 120

(c) 0.213 and 1000

0 . 2 1 3 × 1000 = 213

0.213 × 1000 = 213

3. Multiply each decimal by 1000. Use number discs to help you.

(a) 0.4 400

(b) 0.16 160

(c) 0.351 351

(d) 1.235 1235

171 CHAPTER 8

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Textbook 5 P171

Let's Learn 2 extends pupils' learning by going further to products of other decimals with 1, 2 or 3 decimal places and 1000.

Get the pupils to visualise through the use of number discs and work out the product between:

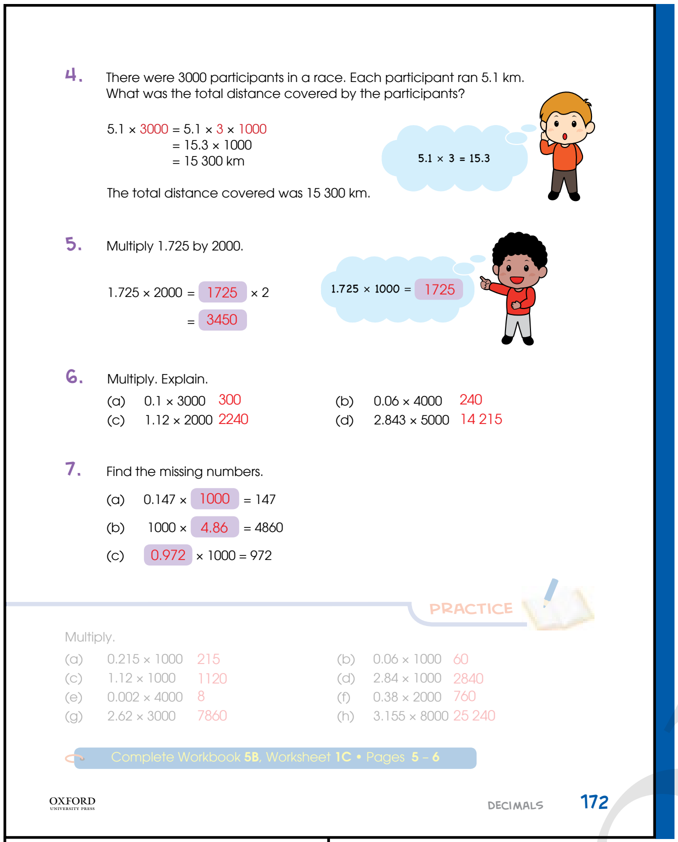
- A decimal with 1 decimal place and 1000
- A decimal with 2 decimal places and 1000
- A decimal with 3 decimal places and 1000

Explain to pupils that the products can also be worked out by multiplying each digit in its place values by 1000.

Show pupils that when multiplying by 1000:

- tenths become hundreds
- hundredths become tens
- thousandths become ones

Get pupils to work on the questions in Let's Learn 3 with guidance and discussions. Pupils may use decimal and number discs to help them find the answers if necessary.



4. There were 3000 participants in a race. Each participant ran 5.1 km. What was the total distance covered by the participants?

5.1 × 3000 = 5.1 × 3 × 1000
= 15.3 × 1000
= 15 300 km

5.1 × 3 = 15.3

The total distance covered was 15 300 km.

5. Multiply 1.725 by 2000.

1.725 × 2000 = 1725 × 2
= 3450

1.725 × 1000 = 1725

6. Multiply. Explain.

(a) 0.1 × 3000 300
(b) 0.06 × 4000 240
(c) 1.12 × 2000 2240
(d) 2.843 × 5000 14 215

7. Find the missing numbers.

(a) 0.147 × 1000 = 147
(b) 1000 × 4.86 = 4860
(c) 0.972 × 1000 = 972

PRACTICE

Multiply.

(a) 0.215 × 1000 215
(b) 0.06 × 1000 60
(c) 1.12 × 1000 1120
(d) 2.84 × 1000 2840
(e) 0.002 × 4000 8
(f) 0.38 × 2000 760
(g) 2.62 × 3000 7860
(h) 3.155 × 8000 25 240

Complete Workbook 5B, Worksheet 1C • Pages 5 – 6

OXFORD UNIVERSITY PRESS DECIMALS 172

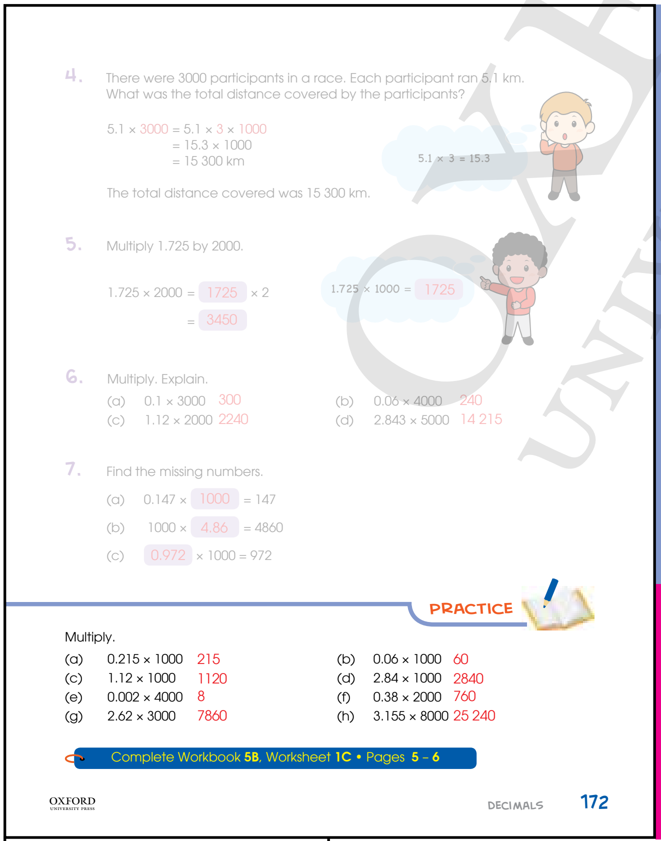
Textbook 5 P172

For Let's Learn 4, guide pupils in solving a word problem involving multiplication of decimals by a multiple of 1000. Explain to pupils that they can find the product of 5.1 and 3000 by multiplying 5.1 with 3 first and then 1000. Get pupils to show how the answer can be found by multiplying 5.1 with 1000 first and then 3. Decimal and number discs can be used to help pupils visualise both methods. Ask pupils to compare the two methods.

Let's Learn 5 allows pupils to practise multiplying 1.725 and 2000 using the method they have learnt in Let's Learn 4. Ask pupils if they can solve the problem using a different method.

Let's Learn 6 gets pupils to multiply decimals with 1/2/3 decimal places by a multiple of 1000. Allow pupils to work in pairs. Give them sufficient time to work on the questions before going through.

Let's Learn 7 reinforces the concept of multiplying decimals by 1000. Get pupils to explain their answers.



4. There were 3000 participants in a race. Each participant ran 5.1 km. What was the total distance covered by the participants?

5.1 × 3000 = 5.1 × 3 × 1000
= 15.3 × 1000
= 15 300 km

5.1 × 3 = 15.3

The total distance covered was 15 300 km.

5. Multiply 1.725 by 2000.

1.725 × 2000 = 1725 × 2
= 3450

1.725 × 1000 = 1725

6. Multiply. Explain.

(a) 0.1 × 3000 300
(b) 0.06 × 4000 240
(c) 1.12 × 2000 2240
(d) 2.843 × 5000 14 215

7. Find the missing numbers.

(a) 0.147 × 1000 = 147
(b) 1000 × 4.86 = 4860
(c) 0.972 × 1000 = 972

PRACTICE

Multiply.

(a) 0.215 × 1000 215
(b) 0.06 × 1000 60
(c) 1.12 × 1000 1120
(d) 2.84 × 1000 2840
(e) 0.002 × 4000 8
(f) 0.38 × 2000 760
(g) 2.62 × 3000 7860
(h) 3.155 × 8000 25 240

Complete Workbook 5B, Worksheet 1C • Pages 5 – 6

OXFORD UNIVERSITY PRESS DECIMALS 172

Textbook 5 P172

PRACTICE

Allow pupils to discuss and work in pairs. Give pupils sufficient time to work on the practice before going through.

Independent seatwork

Assign pupils to complete Worksheet 1C (Workbook 5B P5 – 6).

Answers Worksheet 1C (Workbook 5B P5 – 6)

1. (a) 8
   (b) 23
   (c) 121
   (d) 1409
   (e) 5390
   (f) 7900

2. (a) 0.012 × 3000 = 0.012 × 1000 × 3
   = 12 × 3
   = 36
   (b) 0.892 × 6000 = 0.892 × 1000 × 6
   = 892 × 6
   = 5352
   (c) 0.73 × 4000 = 0.73 × 1000 × 4
   = 730 × 4
   = 2920

3. (a) 1000
   (b) 0.012
   (c) 0.105
   (d) 1000
   (e) 0.008
   (f) 4.8

4. (a) 5.2
   (b) 332
   (c) 2152
   (d) 280
   (e) 6.3 × 4000 = 6.3 × 4 × 1000
   = 25.2 × 1000
   = 25 200
   (f) 0.07 × 5000 = 0.07 × 1000 × 5
   = 70 × 5
   = 350
   (g) 2000 × 0.696 = 2 × 1000 × 0.696
   = 2 × 696
   = 1392
   (h) 5.25 × 3000 = 5.25 × 1000 × 3
   = 5250 × 3
   = 15 750

LESSON PLAN

Chapter 8
Lesson 1

Specific Learning Focus

- Multiply decimals by tens.
- Multiply decimals by hundreds.
- Multiply decimals by thousands.

Suggested Duration

3 periods

Prior Learning

Pupils were formally introduced to decimals in Grade 4. They should also be well-versed with the decimal notation of money in dollars and cents.

Pre-emptive Pitfalls

Revisit the concept of decimals, where decimals are numbers with a decimal point as the separator between the whole and the fractional parts. Link fractions to decimals and revise the place values of tenths, hundredths and thousandths. Use place-value charts, decimal bars and decimal discs to revise comparing of decimals. Number lines can be drawn to arrange the decimals in ascending or descending order. Revision is important to move on to this chapter and build on to the concepts. Pupils have worked with four operations with decimals.

Introduction

When a decimal is multiplied by 10/100/1000, the decimal point is shifted to the right depending on the number of zeroes in the multiplicand. The number of places the decimal point is shifted to the right is equivalent to the number of zeroes in the multiplicand. In other words, the digits of the number have larger place values after being multiplied. Conclude that when multiplying by 10, tenths become ones; when multiplying by 100, tenths becomes tens; when multiplying by 1000, tenths becomes hundreds. Hence:

$0.12 \times 10 = 1.2$
$0.12 \times 100 = 12$
$0.12 \times 1000 = 120$

Problem Solving

If a decimal is multiplied by a multiple of 10, 100 or 1000, then we first multiply the 1-digit number and then the movement of the decimal point is done. For example, to find 2.62 × 3000:

$2.62 \times 1000 \times 3$ or $2.62 \times 3 \times 1000$
$= 2620 \times 3$ $= 7.86 \times 1000$
$= 7860$ $= 7860$

Activities

Get pupils to work out the sums in 'Practice' in pairs. Get them to work on their whiteboards using number and decimal discs.

Resources

- place-value chart (Activity Handbook 5 P34)
- decimal discs (Activity Handbook 5 P35)
- number discs (Activity Handbook 5 P1)
- mini whiteboard
- markers

Mathematical Communication Support

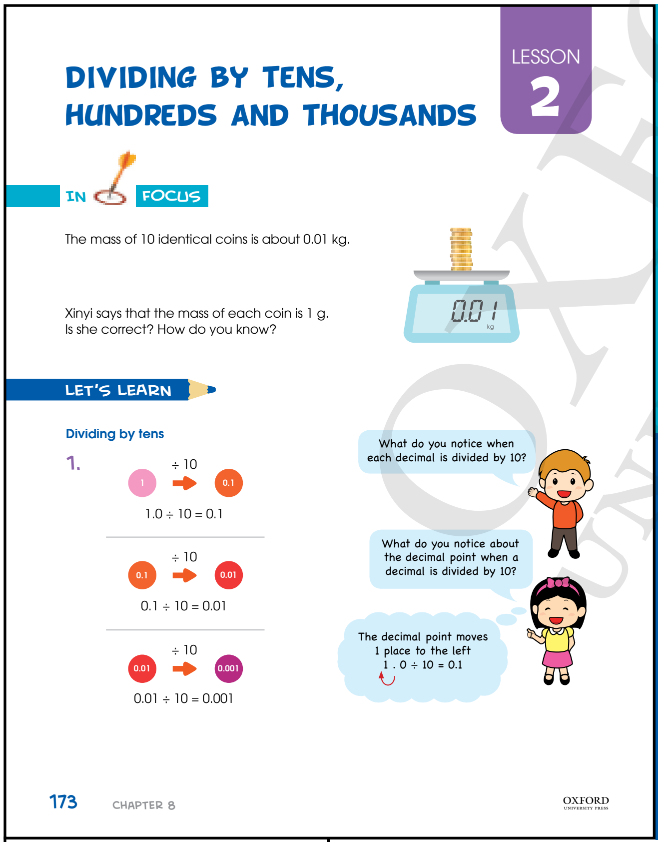
Emphasise that in multiplying decimals by 10/100/1000, the number of places the decimal point is shifted to the right is equivalent to the number of zeroes in the multiplicand. For example, when a decimal is multiplied by 100, tenths become tens, hundredths become ones, thousandths become tenths. Discuss strategies of multiplying decimals by 10/100/1000: (i) expressing multiplicand as a product of a 1-digit number and 10/100/1000 (e.g. 200 = 2 × 100), or (ii) using multiplication algorithm.

LESSON
2

DIVIDING BY TENS, HUNDREDS AND THOUSANDS

LEARNING OBJECTIVES

1. Divide decimals by tens.
2. Divide decimals by hundreds.
3. Divide decimals by thousands.



DIVIDING BY TENS, HUNDREDS AND THOUSANDS

LESSON 2

IN FOCUS

The mass of 10 identical coins is about 0.01 kg.

Xinyi says that the mass of each coin is 1 g.
Is she correct? How do you know?

LET'S LEARN

Dividing by tens

1\.

÷ 10
1 → 0.1
1.0 ÷ 10 = 0.1

÷ 10
0.1 → 0.01
0.1 ÷ 10 = 0.01

÷ 10
0.01 → 0.001
0.01 ÷ 10 = 0.001

What do you notice when each decimal is divided by 10?

What do you notice about the decimal point when a decimal is divided by 10?

The decimal point moves 1 place to the left
1 . 0 ÷ 10 = 0.1

173 CHAPTER 8 OXFORD UNIVERSITY PRESS

Textbook 5 P173

IN FOCUS

Pose the problem to the pupils. Get pupils to relate to a situation involving the division of numbers with 10/100/1000.

In the example of finding the mass of 1 coin from a total mass of 10 coins, pupils are to see that it involves division.

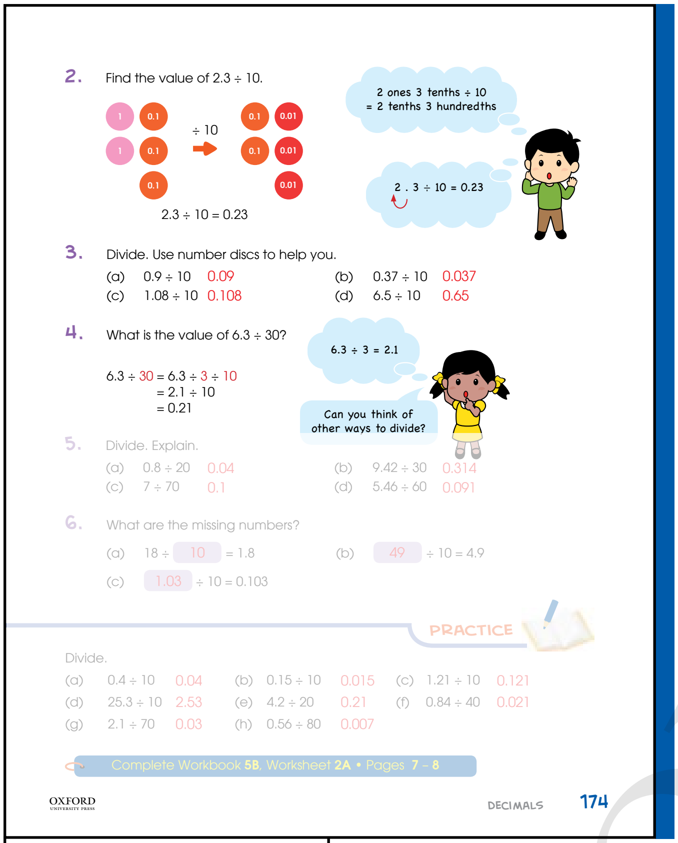
Elicit response from pupils on how they would find the answer based on their prior knowledge.

LET'S LEARN

With the use of number discs, help pupils visualise and understand the division of 1.0/0.1/0.01 by 10 in Let's Learn 1. Ask pupils:

- How does the value of a number change when divided by 10? Does it become greater or smaller?
- How is the answer related to the number before it is divided by 10?

For instance, let them see that 1 ÷ 10 = 0.1, and that 10 x 0.1 = 1. Guide pupils to observe the shifting of the decimal point. Ask if they can identify a pattern in the answers obtained. Lead pupils to arrive at the strategy of shifting the decimal 1 place to the left when dividing by 10.



2. Find the value of 2.3 ÷ 10.

2.3 ÷ 10 = 0.23

3. Divide. Use number discs to help you.
(a) 0.9 ÷ 10 0.09 (b) 0.37 ÷ 10 0.037
(c) 1.08 ÷ 10 0.108 (d) 6.5 ÷ 10 0.65

4. What is the value of 6.3 ÷ 30?

6.3 ÷ 30 = 6.3 ÷ 3 ÷ 10
= 2.1 ÷ 10
= 0.21

5. Divide. Explain.
(a) 0.8 ÷ 20 0.04 (b) 9.42 ÷ 30 0.314
(c) 7 ÷ 70 0.1 (d) 5.46 ÷ 60 0.091

6. What are the missing numbers?
(a) 18 ÷ $\boxed{10}$ = 1.8 (b) $\boxed{49}$ ÷ 10 = 4.9
(c) $\boxed{1.03}$ ÷ 10 = 0.103

PRACTICE

Divide.
(a) 0.4 ÷ 10 0.04 (b) 0.15 ÷ 10 0.015 (c) 1.21 ÷ 10 0.121
(d) 25.3 ÷ 10 2.53 (e) 4.2 ÷ 20 0.21 (f) 0.84 ÷ 40 0.021
(g) 2.1 ÷ 70 0.03 (h) 0.56 ÷ 80 0.007

Complete Workbook 5B, Worksheet 2A • Pages 7 – 8

OXFORD DECIMALS 174

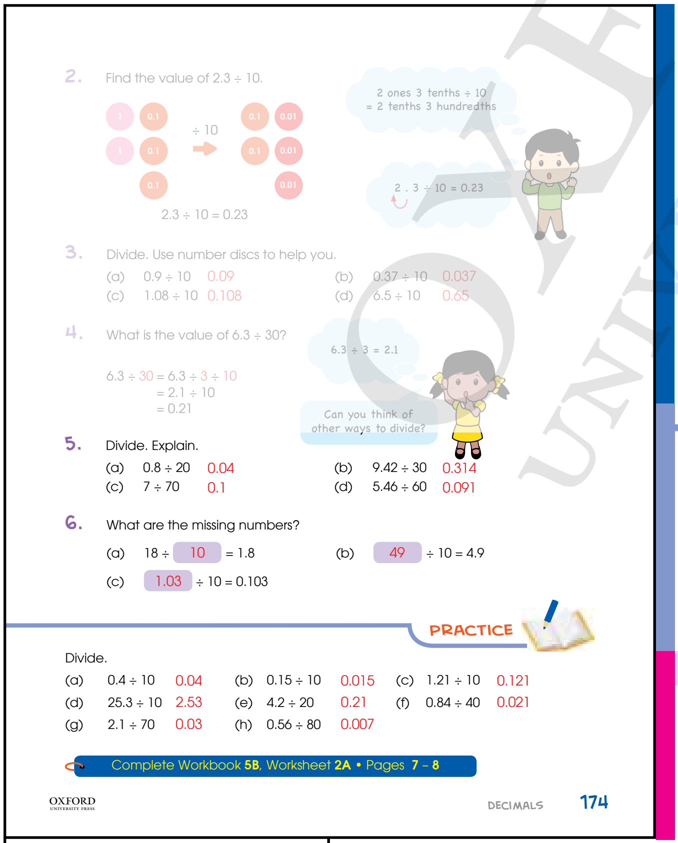
Textbook 5 P174

Let's Learn 2 extends pupils' learning by going further to division of other decimals by 10.
Explain to pupils that the products can also be worked out by dividing each digit in its place values by 10.
Show pupils that when dividing by 10:

- ones become tenths
- tenths become hundredths
- hundredths become thousandths

Get pupils to work on the questions in Let's Learn 3 with guidance and discussions. Pupils may use decimal and number discs to help them find the answers if necessary.

For Let's Learn 4, guide pupils in division of decimals by a multiple of 10. Explain to pupils that they can divide 6.3 by 30 by dividing 6.3 by 3 first and then by 10. Get pupils to show how the answer can be found by dividing 6.3 by 10 first and then by 3. Decimal and number discs can be used to help pupils visualise both methods. Ask pupils to compare the two methods.



2. Find the value of 2.3 ÷ 10.

2.3 ÷ 10 = 0.23

3. Divide. Use number discs to help you.
(a) 0.9 ÷ 10 0.09 (b) 0.37 ÷ 10 0.037
(c) 1.08 ÷ 10 0.108 (d) 6.5 ÷ 10 0.65

4. What is the value of 6.3 ÷ 30?

6.3 ÷ 30 = 6.3 ÷ 3 ÷ 10
= 2.1 ÷ 10
= 0.21

5. Divide. Explain.
(a) 0.8 ÷ 20 0.04 (b) 9.42 ÷ 30 0.314
(c) 7 ÷ 70 0.1 (d) 5.46 ÷ 60 0.091

6. What are the missing numbers?
(a) 18 ÷ 10 = 1.8 (b) 49 ÷ 10 = 4.9
(c) 1.03 ÷ 10 = 0.103

PRACTICE

Divide.
(a) 0.4 ÷ 10 0.04 (b) 0.15 ÷ 10 0.015 (c) 1.21 ÷ 10 0.121
(d) 25.3 ÷ 10 2.53 (e) 4.2 ÷ 20 0.21 (f) 0.84 ÷ 40 0.021
(g) 2.1 ÷ 70 0.03 (h) 0.56 ÷ 80 0.007

Complete Workbook 5B, Worksheet 2A • Pages 7 – 8

OXFORD DECIMALS 174

Textbook 5 P174

Let's Learn 5 gets pupils to calculate the division of decimals with 1 or 2 decimal places by a multiple of 10. Allow pupils to work in pairs. Give them sufficient time to work on the questions before going through.

Let's Learn 6 reinforces the concept of dividing decimals by 10. Get pupils to explain their answers.

PRACTICE

Allow pupils to discuss and work in pairs. Give pupils sufficient time to work through the practice before going through.

Independent seatwork

Assign pupils to complete Worksheet 2A (Workbook 5B P7 − 8).

Worksheet 2A (Workbook 5B P7 – 8)

1.

Number	Divide by 10
0.02	0.002
0.61	0.061
4.25	0.425
7.08	0.708
56.3	5.63
490.3	49.03

2. (a) 0.23

   (b) 29.4 ÷ 60 = 29.4 ÷ 10 ÷ 6
   = 2.94 ÷ 6
   = 0.49

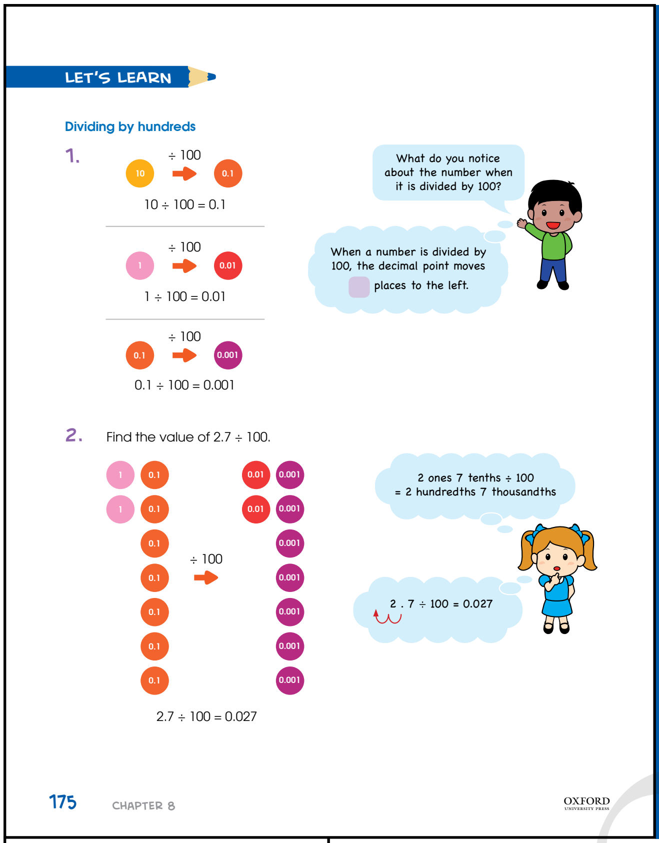
   (c) 375 ÷ 50 = 375 ÷ 10 ÷ 5
   = 37.5 ÷ 5
   = 7.5

3. (a) 10
   (b) 10
   (c) 15.07
   (d) 32.7
   (e) 10
   (f) 2

4. 26 m ÷ 10 = 2.6 m

5. $272 ÷ 40 = $6.80

LET'S LEARN



LET'S LEARN

Dividing by hundreds

1.

10 ÷ 100 = 0.1

1 ÷ 100 = 0.01

0.1 ÷ 100 = 0.001

2. Find the value of 2.7 ÷ 100.

2.7 ÷ 100 = 0.027

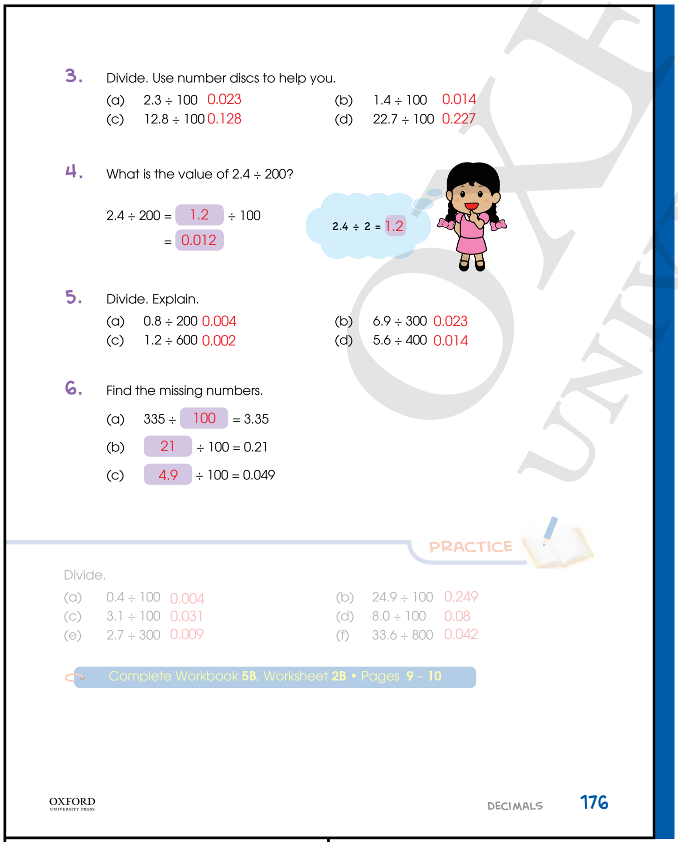
175 CHAPTER 8 OXFORD UNIVERSITY PRESS

Textbook 5 P175

With the use of number discs, help pupils visualise and understand the division of 10/1/0.1 by 100 in Let's Learn 1. Guide pupils to observe the shifting of the decimal point. Ask if they can identify a pattern in the answers obtained. Lead pupils to arrive at the strategy of shifting the decimal 2 places to the left when dividing by 100.

Let's Learn 2 extends pupils' learning by going further to division of other decimals by 100.
Explain to pupils that the products can also be worked out by dividing each digit in its place values by 100.
Show pupils that when dividing by 100:

- tens become tenths
- ones become hundredths
- tenths become thousandths



3. Divide. Use number discs to help you.

(a) 2.3 ÷ 100 0.023
(b) 1.4 ÷ 100 0.014
(c) 12.8 ÷ 100 0.128
(d) 22.7 ÷ 100 0.227

4. What is the value of 2.4 ÷ 200?

2.4 ÷ 200 = 1.2 ÷ 100
= 0.012

5. Divide. Explain.

(a) 0.8 ÷ 200 0.004
(b) 6.9 ÷ 300 0.023
(c) 1.2 ÷ 600 0.002
(d) 5.6 ÷ 400 0.014

6. Find the missing numbers.

(a) 335 ÷ 100 = 3.35
(b) 21 ÷ 100 = 0.21
(c) 4.9 ÷ 100 = 0.049

PRACTICE

Divide.

(a) 0.4 ÷ 100 0.004
(b) 24.9 ÷ 100 0.249
(c) 3.1 ÷ 100 0.031
(d) 8.0 ÷ 100 0.08
(e) 2.7 ÷ 300 0.009
(f) 33.6 ÷ 800 0.042

Complete Workbook **5B**, Worksheet **2B** • Pages **9 – 10**

OXFORD UNIVERSITY PRESS DECIMALS 176

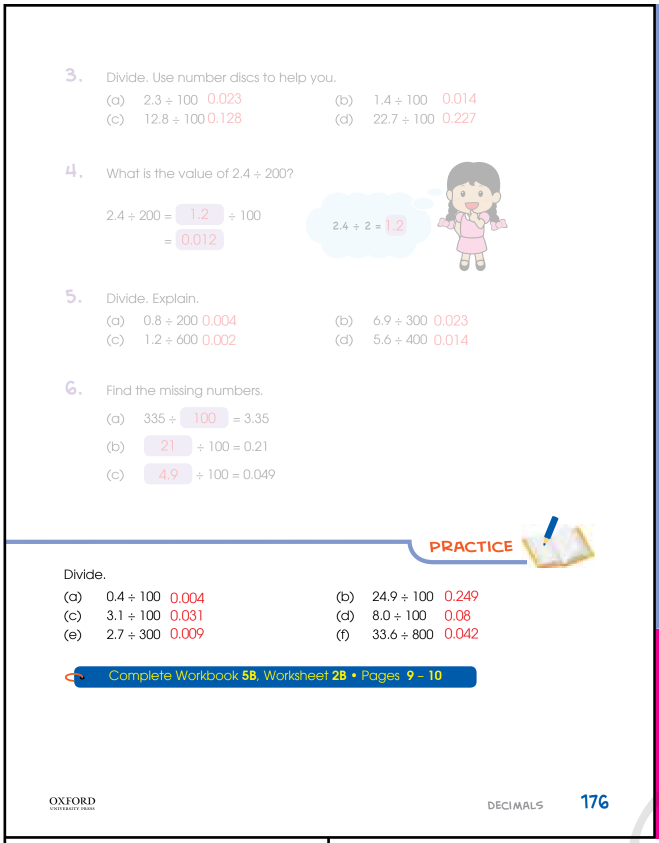
Textbook 5 P176

Get pupils to work on the questions in Let's Learn 3 with guidance and discussions. Pupils may use decimal and number discs to help them find the answers if necessary.

For Let's Learn 4, guide pupils in division of decimals by a multiple of 100. Explain to pupils that they can divide 2.4 by 200 by dividing 2.4 by 2 first and then by 100. Get pupils to show how the answer can be found by dividing 2.4 by 100 first and then by 2. Decimal and number discs can be used to help pupils visualise both methods. Ask pupils to compare the two methods.

Let's Learn 5 gets pupils to calculate the division of decimals with 1 decimal place by a multiple of 100. Allow pupils to work in pairs. Give them sufficient time to work on the questions before going through.

Let's Learn 6 reinforces the concept of dividing decimals by 100. Get pupils to explain their answers.



3. Divide. Use number discs to help you.

(a) 2.3 ÷ 100 0.023 (b) 1.4 ÷ 100 0.014
(c) 12.8 ÷ 100 0.128 (d) 22.7 ÷ 100 0.227

4. What is the value of 2.4 ÷ 200?

2.4 ÷ 200 = 1.2 ÷ 100
= 0.012

2.4 ÷ 2 = 1.2

5. Divide. Explain.

(a) 0.8 ÷ 200 0.004 (b) 6.9 ÷ 300 0.023
(c) 1.2 ÷ 600 0.002 (d) 5.6 ÷ 400 0.014

6. Find the missing numbers.

(a) 335 ÷ 100 = 3.35
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PRACTICE

Divide.

(a) 0.4 ÷ 100 0.004 (b) 24.9 ÷ 100 0.249
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Complete Workbook **5B**, Worksheet **2B** • Pages **9 – 10**

OXFORD UNIVERSITY PRESS DECIMALS 176

Textbook 5 P176

PRACTICE

Allow pupils to discuss and work in pairs. Give pupils sufficient time to work through the practice before going through.

Independent seatwork

Assign pupils to complete Worksheet 2B (Workbook 5B P9 – 10).

Answers

Worksheet 2B (Workbook 5B P9 – 10)

1.

Number	Divide by 10
0.7	0.007
1.9	0.019
21	0.21
46	0.46
135.7	1.357
509.9	5.099

2. (a) 32.4 ÷ 400 = 32.4 ÷ 4 ÷ 100
= 8.1 ÷ 100
= 0.081

(b) 10 ÷ 500 = 10 ÷ 5 ÷ 100
= 0.02

(c) 703 ÷ 200 = 703 ÷ 2 ÷ 100
= 351.5 ÷ 100
= 3.515

(d) 490 ÷ 400 = 490 ÷ 4 ÷ 100
= 122.5 ÷ 100
= 1.225

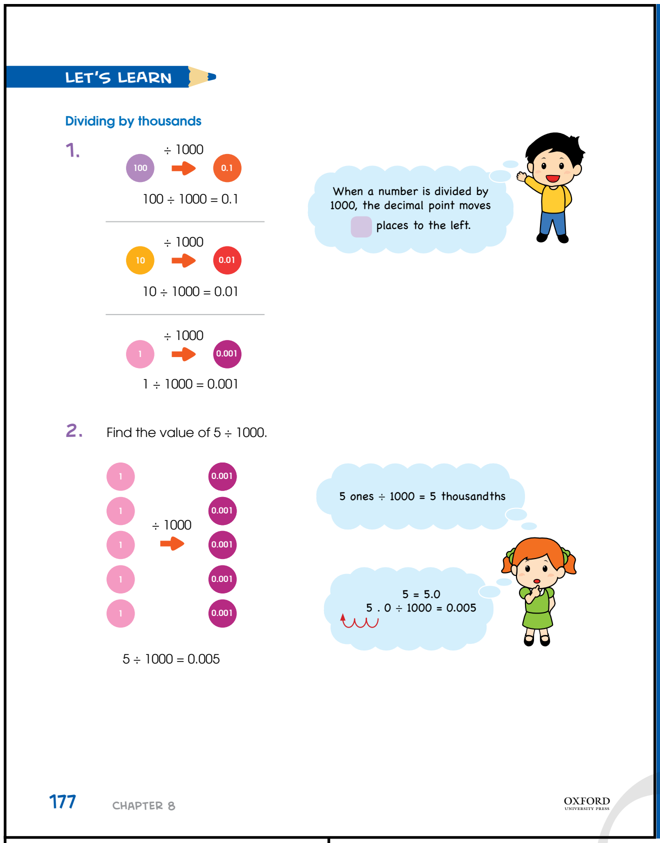
(e) 309.9 ÷ 300 = 309.9 ÷ 3 ÷ 100
= 103.3 ÷ 100
= 1.033

(f) 981.4 ÷ 700 = 981.4 ÷ 7 ÷ 100
= 140.2 ÷ 100
= 1.402

3. (a) 100
(b) 100
(c) 15.8
(d) 7.1

4. 21 ℓ ÷ 300 = 0.07 ℓ

5. 1390 cm ÷ 500 = 2.78 cm



LET'S LEARN

Dividing by thousands

1.

÷ 1000
100 → 0.1
100 ÷ 1000 = 0.1

÷ 1000
10 → 0.01
10 ÷ 1000 = 0.01

÷ 1000
1 → 0.001
1 ÷ 1000 = 0.001

When a number is divided by 1000, the decimal point moves ☐ places to the left.

2. Find the value of 5 ÷ 1000.

1 1 1 1 1 ÷ 1000 → 0.001 0.001 0.001 0.001 0.001

5 ÷ 1000 = 0.005

5 ones ÷ 1000 = 5 thousandths

5 = 5.0
5 . 0 ÷ 1000 = 0.005

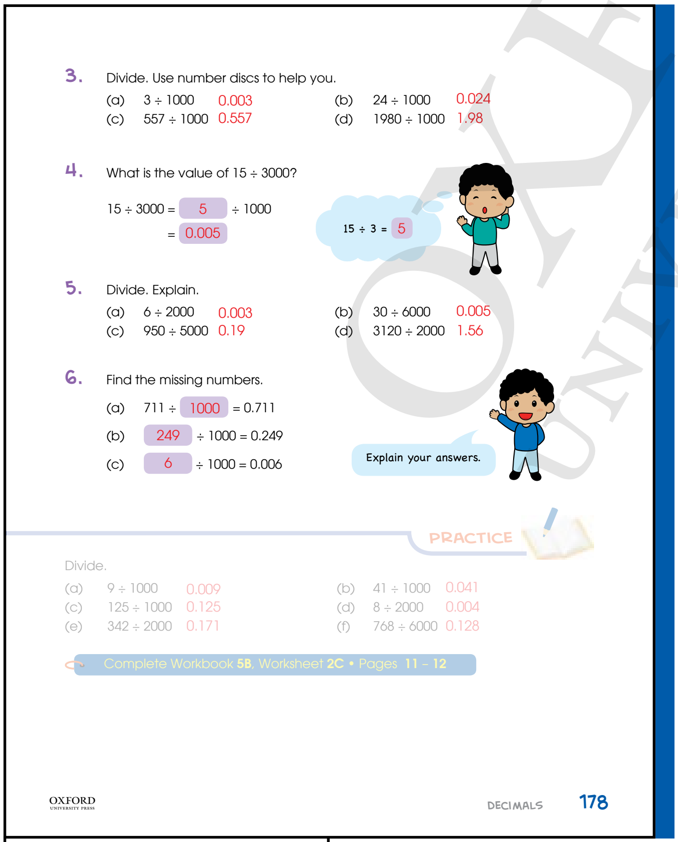
177 CHAPTER 8 OXFORD

Textbook 5 P177

LET'S LEARN

With the use of number discs, help pupils visualise and understand the division of 100/10/1 by 1000 in Let's Learn 1. Guide pupils to observe the shifting of the decimal point. Ask if they can identify a pattern in the answers obtained. Lead pupils to arrive at the strategy of shifting the decimal 3 places to the left when dividing by 1000.

Let's Learn 2 extends pupils' learning by going further to division of other whole numbers by 1000.
Explain to pupils that the products can also be worked out by dividing each digit in its place values by 1000.
Show pupils that when dividing by 1000:
- hundreds become tenths
- tens become hundredths
- ones become thousandths



3. Divide. Use number discs to help you.
(a) 3 ÷ 1000 0.003 (b) 24 ÷ 1000 0.024
(c) 557 ÷ 1000 0.557 (d) 1980 ÷ 1000 1.98

4. What is the value of 15 ÷ 3000?

15 ÷ 3000 = 5 ÷ 1000
= 0.005

15 ÷ 3 = 5

5. Divide. Explain.
(a) 6 ÷ 2000 0.003 (b) 30 ÷ 6000 0.005
(c) 950 ÷ 5000 0.19 (d) 3120 ÷ 2000 1.56

6. Find the missing numbers.
(a) 711 ÷ 1000 = 0.711
(b) 249 ÷ 1000 = 0.249
(c) 6 ÷ 1000 = 0.006

Explain your answers.

PRACTICE

Divide.
(a) 9 ÷ 1000 0.009 (b) 41 ÷ 1000 0.041
(c) 125 ÷ 1000 0.125 (d) 8 ÷ 2000 0.004
(e) 342 ÷ 2000 0.171 (f) 768 ÷ 6000 0.128

Complete Workbook **5B**, Worksheet **2C** • Pages **11 – 12**

OXFORD DECIMALS 178

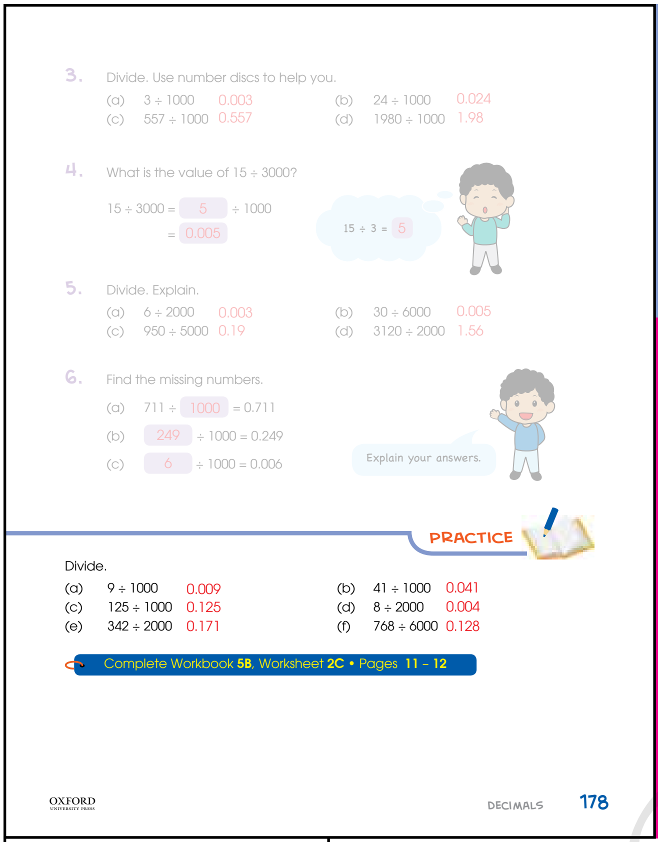
Textbook 5 P178

Get pupils to work on the questions in Let's Learn 3 with guidance and discussions. Pupils may use decimal and number discs to help them find the answers if necessary.

For Let's Learn 4, guide pupils in division of a whole number by a multiple of 1000. Explain to pupils that they can divide 15 by 3000 by dividing 15 by 3 first and then by 1000. Get pupils to show how the answer can be found by dividing 15 by 1000 first and then by 3. Decimal and number discs can be used to help pupils visualise both methods. Ask pupils to compare the two methods.

Let's Learn 5 gets pupils to divide 1/2/3/4-digit numbers by a multiple of 1000. Allow pupils to work in pairs. Give them sufficient time to work on the questions before going through.

Let's Learn 6 reinforces the concept of dividing whole numbers by 1000. Get pupils to explain their answers.



3. Divide. Use number discs to help you.
(a) 3 ÷ 1000 0.003 (b) 24 ÷ 1000 0.024
(c) 557 ÷ 1000 0.557 (d) 1980 ÷ 1000 1.98

4. What is the value of 15 ÷ 3000?
15 ÷ 3000 = 5 ÷ 1000
= 0.005

5. Divide. Explain.
(a) 6 ÷ 2000 0.003 (b) 30 ÷ 6000 0.005
(c) 950 ÷ 5000 0.19 (d) 3120 ÷ 2000 1.56

6. Find the missing numbers.
(a) 711 ÷ 1000 = 0.711
(b) 249 ÷ 1000 = 0.249
(c) 6 ÷ 1000 = 0.006

PRACTICE

Divide.
(a) 9 ÷ 1000 0.009 (b) 41 ÷ 1000 0.041
(c) 125 ÷ 1000 0.125 (d) 8 ÷ 2000 0.004
(e) 342 ÷ 2000 0.171 (f) 768 ÷ 6000 0.128

Complete Workbook 5B, Worksheet 2C • Pages 11 – 12

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Textbook 5 P178

PRACTICE

Allow pupils to discuss and work in pairs. Give pupils sufficient time to work through the practice before going through.

Independent seatwork

Assign pupils to complete Worksheet 2C (Workbook 5B P11 − 12).

Answers Worksheet 2C (Workbook 5B P11 − 12)

1. (a) 0.008
(b) 0.015
(c) 0.197
(d) 0.25
(e) 6.784
(f) 3.8

2. (a) 1200 ÷ 2000 = 120 ÷ 2 ÷ 1000
= 600 ÷ 1000
= 0.6
(b) 5400 ÷ 9000 = 5400 ÷ 9 ÷ 1000
= 600 ÷ 1000
= 0.6
(c) 74 000 ÷ 8000 = 74 000 ÷ 1000 ÷ 8
= 74 ÷ 8
= 9.25
(d) 23 600 ÷ 5000 = 23 600 ÷ 1000 ÷ 5
= 23.6 ÷ 5
= 4.72

3. (a) 1000
(b) 1710
(c) 7941
(d) 1000

4. (a) 0.032
(b) 0.067
(c) 0.6
(d) 0.299
(e) 14 ÷ 7000 = 14 ÷ 7 ÷ 1000
= 2 ÷ 1000
= 0.002
(f) 9630 ÷ 3000 = 9630 ÷ 3 ÷ 1000
= 3210 ÷ 1000
= 3.21
(g) 66 ÷ 6000 = 66 ÷ 6 ÷ 1000
= 11 ÷ 1000
= 0.011
(h) 8850 ÷ 5000 = 8850 ÷ 5 ÷ 1000
= 1770 ÷ 1000
= 1.77

LESSON PLAN

Chapter 8
Lesson 2

Specific Learning Focus

- Divide decimals by tens.
- Divide decimals by hundreds.
- Divide decimals by thousands.

Suggested Duration

3 periods

Prior Learning

This lesson is in continuation from Lesson 2 on multiplication of decimals.

Pre-emptive Pitfalls

When a decimal is divided by 10/100/1000, the decimal point is shifted to the left instead of to the right in the case of multiplication. Pupils might get confused when multiplying and dividing decimals.

Introduction

Explain to the pupils that division means sharing equally, hence the value of the number would become smaller after it is divided. Lead pupils to notice that when a decimal is divided by 10/100/1000, the place values of the digits become smaller. Show the difference between division and multiplication using examples (e.g. 1 ÷ 10 = 0.1 and 10 × 0.1 = 1). Explain that when dividing a decimal by 10/100/1000, the number of places the decimal point is shifted to the left is equivalent to the number of zeroes in the divisor. Conclude that when dividing by 10, tenths become hundredths; when dividing by 100, tenths become thousandths; when dividing by 1000, tenths become ten thousandths. Similarly, when dividing by 10, ones become tenths, tenths becomes hundredths, hundredths becomes thousandths.

Problem Solving

Like in multiplication, when a decimal is divided by a multiple of 10 (e.g. 30), to make it easier to divide, express 30 as a product of a 1-digit number and 10 (30 = 3 × 10). After which, divide by 3 and then shift the decimal point to the left by 1 place. The same strategy can be used when dividing by a multiple of 100 or 1000. Use number discs for pupils to visualise and then encourage verbalisation of the concept of division with decimals. The movement and shift of place value and decimal point can be emphasised using place-value charts.

Activities

Provide pupils with number and decimal discs and place-value chart. Get pupils to work in pairs to work out the questions in ‘Practice’ on their mini whiteboards. They can take turns in doing the sums and checking the answers.

Resources

- number discs (Activity Handbook 5 P1)
- decimal discs (Activity Handbook 5 P35)
- place-value chart (Activity Handbook 5 P34)
- mini whiteboard
- markers

Mathematical Communication Support

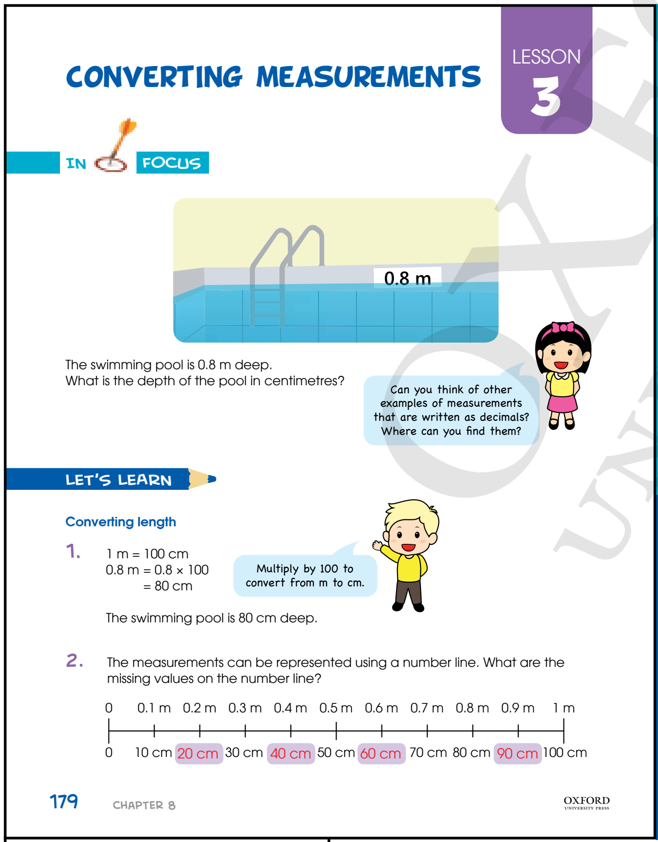
Ask pupils important questions and guide them to derive the correct answers. Verbalise the concept of division of decimals by 10/100/1000 and the shift of the decimal point to the left, where the number of places the decimal point is shifted to the left is equivalent to the number of zeroes in the divisor. Use key terms like ‘tenths’, ‘hundredths’, ‘thousandths’, ‘quotient’, ‘dividend’, ‘divisor’, ‘product’ and ‘multiples’. Elicit individual responses from pupils and discuss strategies while doing the sums on the board.

LESSON 3

CONVERTING MEASUREMENTS

LEARNING OBJECTIVE

1. Convert a measurement from a smaller unit to a larger unit in decimal form, and vice versa.
   Units of measurements include:
   - kilometres and metres
   - metres and centimetres
   - kilograms and grams
   - litres and millilitres



CONVERTING MEASUREMENTS

LESSON 3

IN FOCUS

The swimming pool is 0.8 m deep.
What is the depth of the pool in centimetres?

LET'S LEARN

Converting length

1. 1 m = 100 cm
   0.8 m = 0.8 × 100
   = 80 cm

   The swimming pool is 80 cm deep.

2. The measurements can be represented using a number line. What are the missing values on the number line?

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Textbook 5 P179

IN FOCUS

The example of the depth of a swimming pool in metres to be expressed in centimetres is a good real-life example of conversion unit.

Other examples include the height of a person, converted from m to cm, and vice versa.

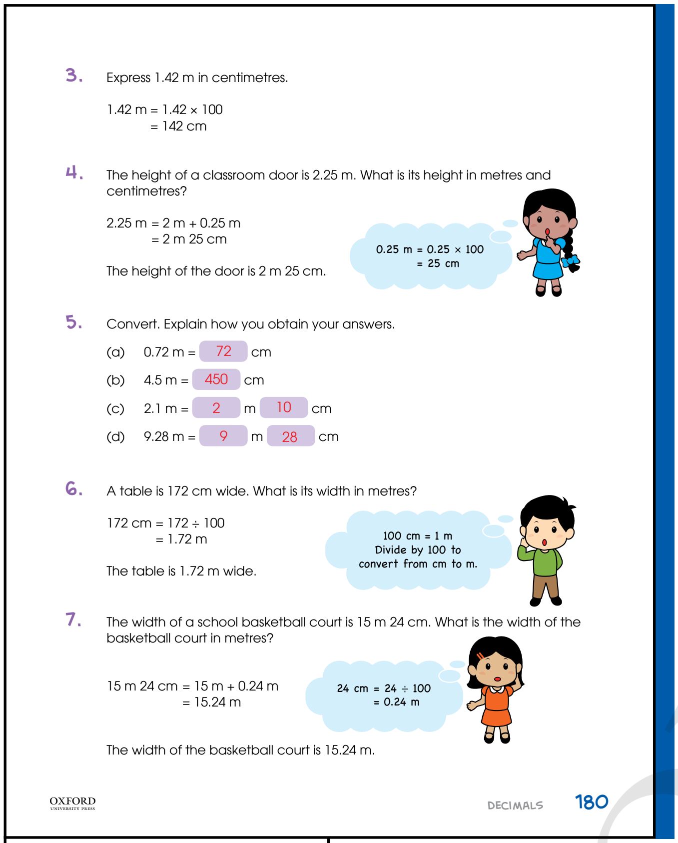
Get pupils to relate to and state other real-life examples where measurements are written as decimals.

Elicit response from pupils on how they would find the answer based on their prior knowledge.

LET'S LEARN

For Let's Learn 1, show pupils that 1 m is equivalent to 100 cm and that measurements in decimal form expressed in m can be converted to cm by simply multiplying the decimals in m by 100. Give more examples to illustrate this conversion.

Referring to what pupils have learnt in Let's Learn 1, guide them to fill in the blanks in Let's Learn 2. Review what pupils have learnt in multiplying decimals by 100 (Lesson 1) if necessary.



3. Express 1.42 m in centimetres.

1.42 m = 1.42 × 100
= 142 cm

4. The height of a classroom door is 2.25 m. What is its height in metres and centimetres?

2.25 m = 2 m + 0.25 m
= 2 m 25 cm

0.25 m = 0.25 × 100
= 25 cm

The height of the door is 2 m 25 cm.

5. Convert. Explain how you obtain your answers.

(a) 0.72 m = 72 cm

(b) 4.5 m = 450 cm

(c) 2.1 m = 2 m 10 cm

(d) 9.28 m = 9 m 28 cm

6. A table is 172 cm wide. What is its width in metres?

172 cm = 172 ÷ 100
= 1.72 m

100 cm = 1 m
Divide by 100 to convert from cm to m.

The table is 1.72 m wide.

7. The width of a school basketball court is 15 m 24 cm. What is the width of the basketball court in metres?

15 m 24 cm = 15 m + 0.24 m
= 15.24 m

24 cm = 24 ÷ 100
= 0.24 m

The width of the basketball court is 15.24 m.

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Textbook 5 P180

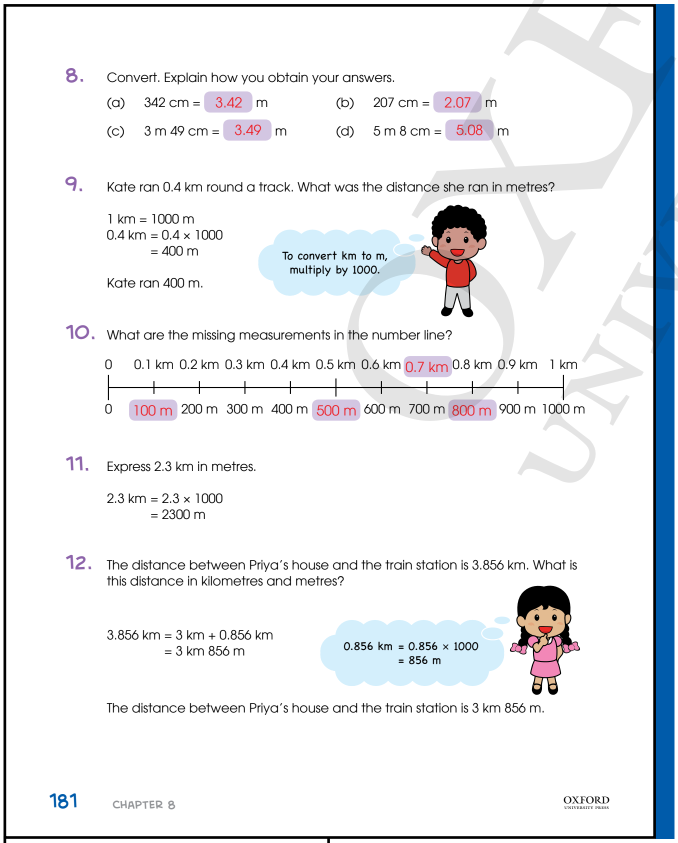
For Let's Learn 3, show pupils that measurements with 1/2/3 decimal places expressed in m can be converted to cm by multiplying the decimals in m by 100.

For Let's Learn 4, guide pupils to convert length in m to m and cm. Show how the length in m is made up by the whole number and the decimal components. In the case of Let's Learn 4, 2.25 m is made up of 2 m and 0.25 m. Tell pupils that the decimal component (0.25 m) can be converted into cm by multiplying the decimal in m by 100.

Get pupils to discuss Let's Learn 5. Invite pupils to explain how they do the conversions.

For Let's Learn 6, show pupils that 100 cm is equivalent to 1 m and that measurements expressed in cm can be converted to m by dividing the numbers in cm by 100. Review dividing a number by 100 (Lesson 2) if necessary.

For Let's Learn 7, guide pupils to convert length in m and cm to m. Show that in measurements with m and cm, only the cm component is converted to m. Then the whole number and the decimal are added to form the final answer in m. In the case of Let's Learn 7, 15 m 24 cm is made up of 15 m and 24 cm. 24 cm can be converted into m by dividing by 100.



8. Convert. Explain how you obtain your answers.

(a) 342 cm = 3.42 m

(b) 207 cm = 2.07 m

(c) 3 m 49 cm = 3.49 m

(d) 5 m 8 cm = 5.08 m

9. Kate ran 0.4 km round a track. What was the distance she ran in metres?

1 km = 1000 m
0.4 km = 0.4 × 1000
= 400 m

To convert km to m, multiply by 1000.

Kate ran 400 m.

10. What are the missing measurements in the number line?

0	0.1 km	0.2 km	0.3 km	0.4 km	0.5 km	0.6 km	0.7 km	0.8 km	0.9 km	1 km
0	100 m	200 m	300 m	400 m	500 m	600 m	700 m	800 m	900 m	1000 m

11. Express 2.3 km in metres.

2.3 km = 2.3 × 1000
= 2300 m

12. The distance between Priya's house and the train station is 3.856 km. What is this distance in kilometres and metres?

3.856 km = 3 km + 0.856 km
= 3 km 856 m

0.856 km = 0.856 × 1000
= 856 m

The distance between Priya's house and the train station is 3 km 856 m.

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Textbook 5 P181

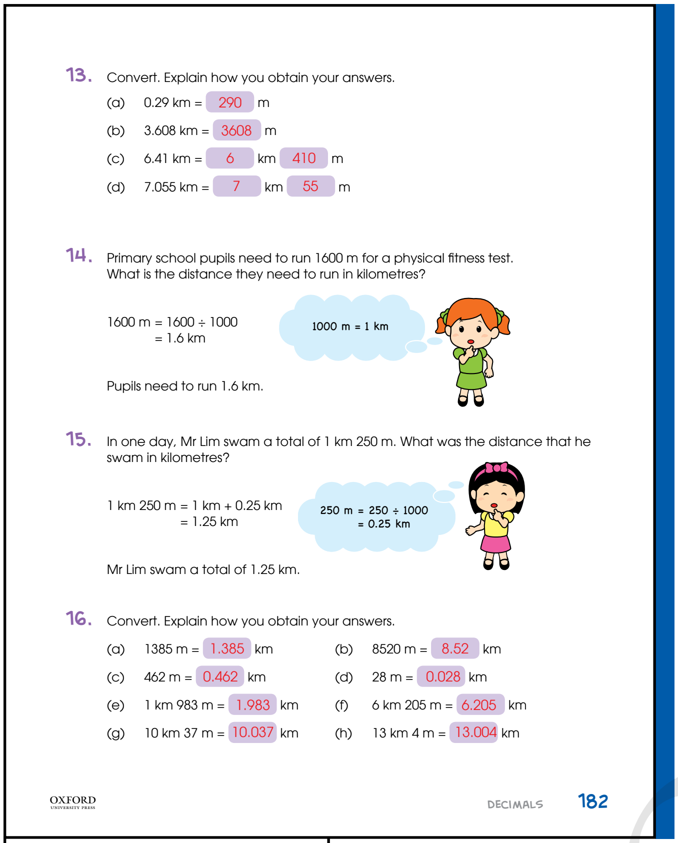
Get pupils to work on the questions in Let's Learn 8 with guidance and discussions. Invite pupils to explain how they do the conversions.

For Let's Learn 9, show pupils that 1 km is equivalent to 1000 m and that decimals in tenths expressed in km can be converted to m by multiplying the decimals in km by 1000. Give more examples to illustrate this conversion.

Referring to what pupils have learnt in Let's Learn 9, guide them to fill in the blanks in Let's Learn 10. Review what pupils have learnt in multiplying decimals by 1000 (Lesson 1) if necessary.

For Let's Learn 11, show pupils that measurements with 1/2/3 decimal places expressed in km can be converted to m by multiplying the decimals in km by 1000.

For Let's Learn 12, guide pupils to convert length in km to km and m. Show how the length in km is made up by the whole number and the decimal components. In the case of Let's Learn 12, 3.856 km is made up of 3 km and 0.856 km. Tell pupils that the decimal component (0.856 km) can be converted into m by multiplying the decimal in km by 1000.



13. Convert. Explain how you obtain your answers.

(a) 0.29 km = 290 m

(b) 3.608 km = 3608 m

(c) 6.41 km = 6 km 410 m

(d) 7.055 km = 7 km 55 m

14. Primary school pupils need to run 1600 m for a physical fitness test. What is the distance they need to run in kilometres?

1600 m = 1600 ÷ 1000
= 1.6 km

1000 m = 1 km

Pupils need to run 1.6 km.

15. In one day, Mr Lim swam a total of 1 km 250 m. What was the distance that he swam in kilometres?

1 km 250 m = 1 km + 0.25 km
= 1.25 km

250 m = 250 ÷ 1000
= 0.25 km

Mr Lim swam a total of 1.25 km.

16. Convert. Explain how you obtain your answers.

(a) 1385 m = 1.385 km
(b) 8520 m = 8.52 km
(c) 462 m = 0.462 km
(d) 28 m = 0.028 km
(e) 1 km 983 m = 1.983 km
(f) 6 km 205 m = 6.205 km
(g) 10 km 37 m = 10.037 km
(h) 13 km 4 m = 13.004 km

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DECIMALS 182

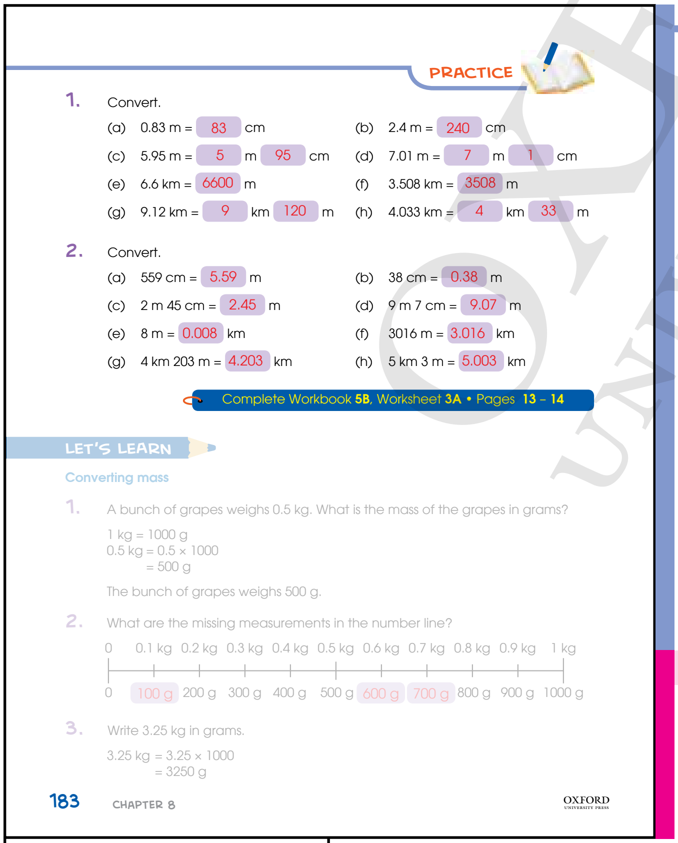
Textbook 5 P182

Get pupils to work on the questions in Let's Learn 13 with guidance and discussions. Invite pupils to explain how they do the conversions.

For Let's Learn 14, show pupils that 1000 m is equivalent to 1 km and that numbers expressed in m can be converted to km by dividing the numbers in m by 1000. Review dividing a number by 1000 (Lesson 2) if necessary.

For Let's Learn 15, guide pupils to convert length in km and m to km. Show that in a measurement with km and m, only the m component is converted to km. Then the whole number and the decimal are added to form the final answer in km. In the case of Let's Learn 15, 1 km 250 m is made up of 1 km and 250 m. 250 m can be converted into km by dividing by 1000.

Get pupils to work on the questions in Let's Learn 16 with guidance and discussions. Invite pupils to explain how they do the conversions.



PRACTICE

1. Convert.

(a) 0.83 m = 83 cm
(b) 2.4 m = 240 cm
(c) 5.95 m = 5 m 95 cm
(d) 7.01 m = 7 m 1 cm
(e) 6.6 km = 6600 m
(f) 3.508 km = 3508 m
(g) 9.12 km = 9 km 120 m
(h) 4.033 km = 4 km 33 m

2. Convert.

(a) 559 cm = 5.59 m
(b) 38 cm = 0.38 m
(c) 2 m 45 cm = 2.45 m
(d) 9 m 7 cm = 9.07 m
(e) 8 m = 0.008 km
(f) 3016 m = 3.016 km
(g) 4 km 203 m = 4.203 km
(h) 5 km 3 m = 5.003 km

Complete Workbook 5B, Worksheet 3A • Pages 13 – 14

LET'S LEARN

Converting mass

1. A bunch of grapes weighs 0.5 kg. What is the mass of the grapes in grams?

1 kg = 1000 g
0.5 kg = 0.5 × 1000
= 500 g

The bunch of grapes weighs 500 g.

2. What are the missing measurements in the number line?

0 0.1 kg 0.2 kg 0.3 kg 0.4 kg 0.5 kg 0.6 kg 0.7 kg 0.8 kg 0.9 kg 1 kg

0 100 g 200 g 300 g 400 g 500 g 600 g 700 g 800 g 900 g 1000 g

3. Write 3.25 kg in grams.

3.25 kg = 3.25 × 1000
= 3250 g

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Textbook 5 P183

PRACTICE

Allow pupils to discuss and work in pairs. Give pupils sufficient time to work on the practice before going through.

Independent seatwork

Assign pupils to complete Worksheet 3A (Workbook 5B P13 – 14).

Worksheet 3A (Workbook 5B P13 – 14)

1. (a) 200
   (b) 63
   (c) 830
   (d) 1290

2. (a) 4, 19
   (b) 2, 8
   (c) 5, 20
   (d) 1, 9

3. (a) 0.04
   (b) 0.52
   (c) 0.091
   (d) 0.137
   (e) 4.6
   (f) 3.07

4. (a) 500
   (b) 7140
   (c) 1, 202
   (d) 6, 50
   (e) 0.453
   (f) 9.009
   (g) 2.193
   (h) 3.042

5. (a)

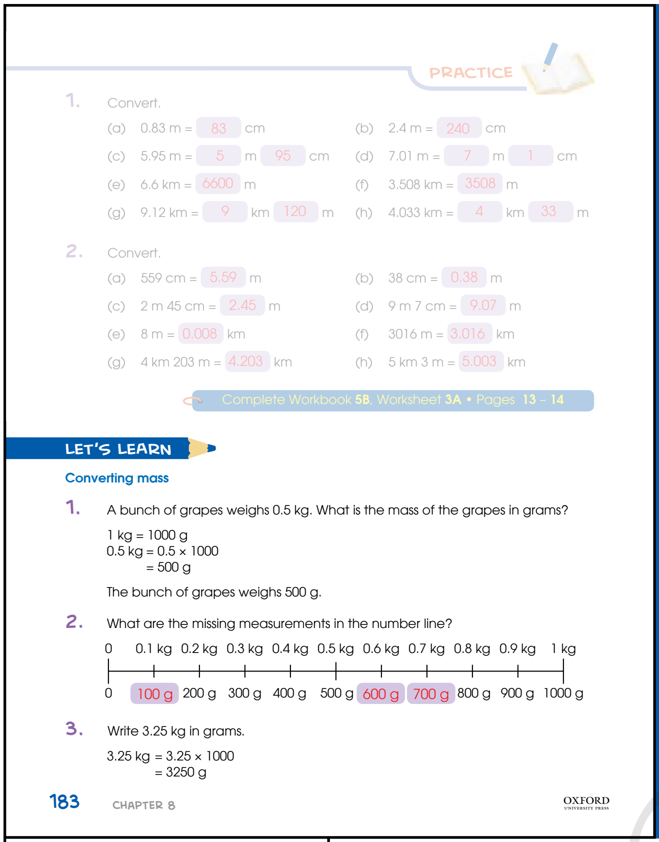
Metres	Metres and Centimetres	Centimetres
2.24	2 m 24 cm	224 cm
1.8 m	1 m 80 cm	180 cm
4.56 m	4 m 56 cm	456 cm

(b)

Kilometres	Kilometres and metres	Metres
6.4 km	6 km 400 m	6400 m
2.059 km	2 m 59 cm	2059 m
7.008 km	7 km 8 m	7008 m

6. 90 cm

7. 0.28



PRACTICE

1. Convert.

(a) 0.83 m = 83 cm
(b) 2.4 m = 240 cm
(c) 5.95 m = 5 m 95 cm
(d) 7.01 m = 7 m 1 cm
(e) 6.6 km = 6600 m
(f) 3.508 km = 3508 m
(g) 9.12 km = 9 km 120 m
(h) 4.033 km = 4 km 33 m

2. Convert.

(a) 559 cm = 5.59 m
(b) 38 cm = 0.38 m
(c) 2 m 45 cm = 2.45 m
(d) 9 m 7 cm = 9.07 m
(e) 8 m = 0.008 km
(f) 3016 m = 3.016 km
(g) 4 km 203 m = 4.203 km
(h) 5 km 3 m = 5.003 km

Complete Workbook **5B**, Worksheet **3A** • Pages **13 – 14**

LET'S LEARN

Converting mass

1. A bunch of grapes weighs 0.5 kg. What is the mass of the grapes in grams?

1 kg = 1000 g
0.5 kg = 0.5 × 1000
= 500 g

The bunch of grapes weighs 500 g.

2. What are the missing measurements in the number line?

0	0.1 kg	0.2 kg	0.3 kg	0.4 kg	0.5 kg	0.6 kg	0.7 kg	0.8 kg	0.9 kg	1 kg
0	100 g	200 g	300 g	400 g	500 g	600 g	700 g	800 g	900 g	1000 g

3. Write 3.25 kg in grams.

3.25 kg = 3.25 × 1000
= 3250 g

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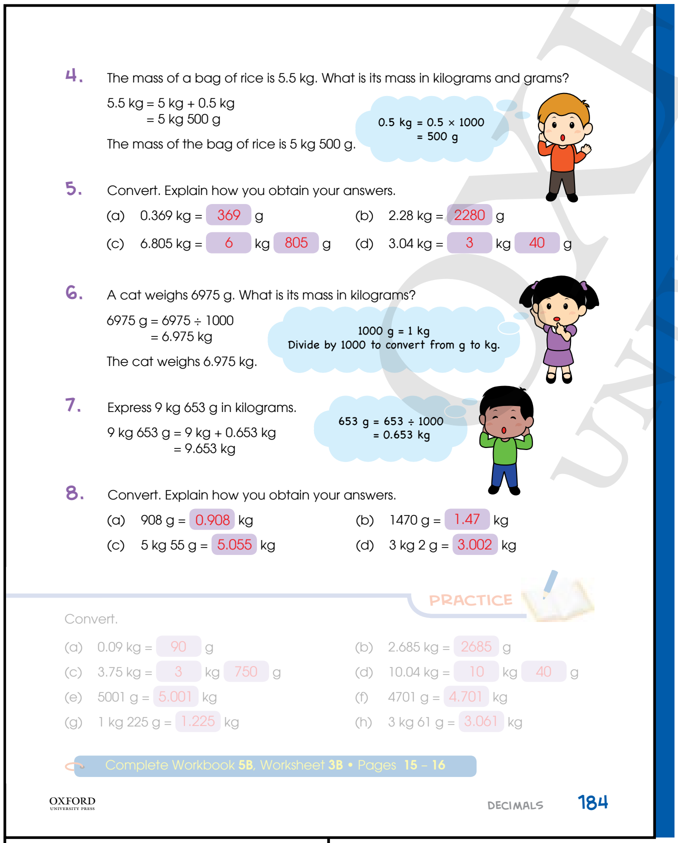
Textbook 5 P183

LET'S LEARN

For Let's Learn 1, show pupils that 1 kg is equivalent to 1000 g and that masses in decimal form expressed in kg can be converted to g by simply multiplying the decimals in kg by 1000. Give more examples to illustrate this conversion.

Referring to what pupils have learnt in Let's Learn 1, guide them to fill in the blanks in Let's Learn 2. Remind pupils that when a decimal is multiplied by 1000, the decimal point shifts 3 places to the right.

For Let's Learn 3, show pupils that masses with 1/2/3 decimal places expressed in kg can be converted to g by multiplying the decimals in kg by 1000.



4. The mass of a bag of rice is 5.5 kg. What is its mass in kilograms and grams?

5.5 kg = 5 kg + 0.5 kg
= 5 kg 500 g

The mass of the bag of rice is 5 kg 500 g.

0.5 kg = 0.5 × 1000
= 500 g

5. Convert. Explain how you obtain your answers.

(a) 0.369 kg = 369 g
(b) 2.28 kg = 2280 g
(c) 6.805 kg = 6 kg 805 g
(d) 3.04 kg = 3 kg 40 g

6. A cat weighs 6975 g. What is its mass in kilograms?

6975 g = 6975 ÷ 1000
= 6.975 kg

The cat weighs 6.975 kg.

1000 g = 1 kg
Divide by 1000 to convert from g to kg.

7. Express 9 kg 653 g in kilograms.

9 kg 653 g = 9 kg + 0.653 kg
= 9.653 kg

653 g = 653 ÷ 1000
= 0.653 kg

8. Convert. Explain how you obtain your answers.

(a) 908 g = 0.908 kg
(b) 1470 g = 1.47 kg
(c) 5 kg 55 g = 5.055 kg
(d) 3 kg 2 g = 3.002 kg

PRACTICE

Convert.

(a) 0.09 kg = 90 g
(b) 2.685 kg = 2685 g
(c) 3.75 kg = 3 kg 750 g
(d) 10.04 kg = 10 kg 40 g
(e) 5001 g = 5.001 kg
(f) 4701 g = 4.701 kg
(g) 1 kg 225 g = 1.225 kg
(h) 3 kg 61 g = 3.061 kg

Complete Workbook **5B**, Worksheet **3B** • Pages **15 – 16**

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Textbook 5 P184

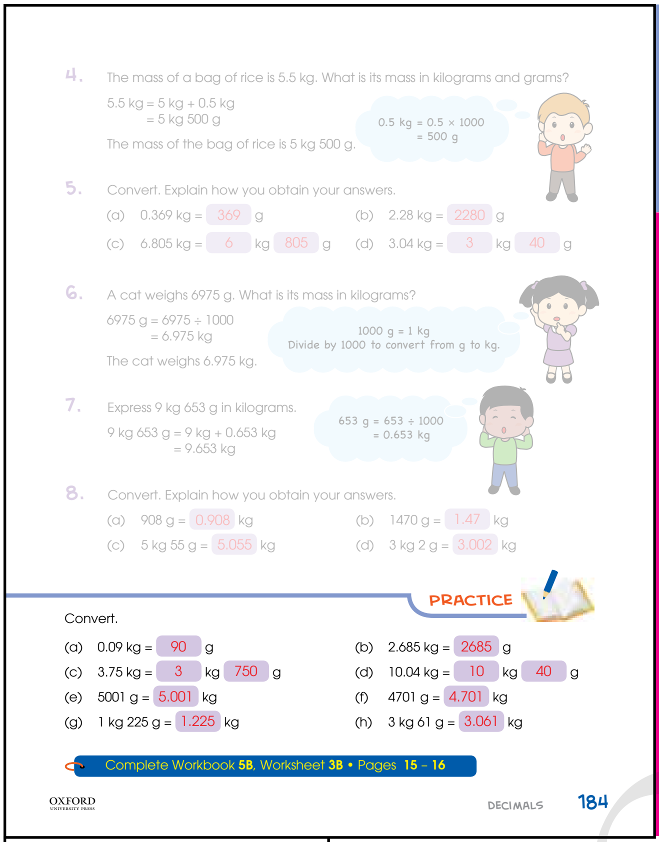
For Let's Learn 4, guide pupils to convert mass in kg to kg and g. Show how the mass in kg is made up by the whole number and the decimal components. In the case of Let's Learn 4, 5.5 kg is made up of 5 kg and 0.5 kg. Tell pupils that the decimal component (0.5 kg) can be converted into g by multiplying the decimal in kg by 1000.

Get pupils to discuss Let's Learn 5. Invite pupils to explain how they do the conversions.

For Let's Learn 6, show pupils that 1000 g is equivalent to 1 kg and that masses expressed in g can be converted to kg by dividing the numbers in g by 1000. Remind pupils that when a number is divided by 1000, the decimal point shifts three places to the left.

For Let's Learn 7, guide pupils to convert mass in kg and g to kg. Show that in a measurement with kg and g, only the g component is converted to kg. Then the whole number and the decimal are added to form the final answer in kg. In the case of Let's Learn 7, 9 kg 653 g is made up of 9 kg and 653 g. 653 g can be converted into kg by dividing by 1000.

Get pupils to work on the questions in Let's Learn 8 with guidance and discussions. Invite pupils to explain how they do the conversions.



4. The mass of a bag of rice is 5.5 kg. What is its mass in kilograms and grams?

5.5 kg = 5 kg + 0.5 kg
= 5 kg 500 g

The mass of the bag of rice is 5 kg 500 g.

0.5 kg = 0.5 × 1000
= 500 g

5. Convert. Explain how you obtain your answers.

(a) 0.369 kg = 369 g
(b) 2.28 kg = 2280 g
(c) 6.805 kg = 6 kg 805 g
(d) 3.04 kg = 3 kg 40 g

6. A cat weighs 6975 g. What is its mass in kilograms?

6975 g = 6975 ÷ 1000
= 6.975 kg

The cat weighs 6.975 kg.

1000 g = 1 kg
Divide by 1000 to convert from g to kg.

7. Express 9 kg 653 g in kilograms.

9 kg 653 g = 9 kg + 0.653 kg
= 9.653 kg

653 g = 653 ÷ 1000
= 0.653 kg

8. Convert. Explain how you obtain your answers.

(a) 908 g = 0.908 kg
(b) 1470 g = 1.47 kg
(c) 5 kg 55 g = 5.055 kg
(d) 3 kg 2 g = 3.002 kg

PRACTICE

Convert.

(a) 0.09 kg = 90 g
(b) 2.685 kg = 2685 g
(c) 3.75 kg = 3 kg 750 g
(d) 10.04 kg = 10 kg 40 g
(e) 5001 g = 5.001 kg
(f) 4701 g = 4.701 kg
(g) 1 kg 225 g = 1.225 kg
(h) 3 kg 61 g = 3.061 kg

Complete Workbook **5B**, Worksheet **3B** • Pages **15 – 16**

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DECIMALS 184

Textbook 5 P184

PRACTICE

Allow pupils to discuss and work in pairs. Give pupils sufficient time to work on the practice before going through.

Independent seatwork

Assign pupils to complete Worksheet 3B (Workbook 5B P15 − 16).

Answers

Worksheet 3B (Workbook 5B P15 − 16)

1.

Kilograms	Grams
0.231	231
0.47	470
4.3	4300
8.09	8090
20.423	20 423
397	397 000

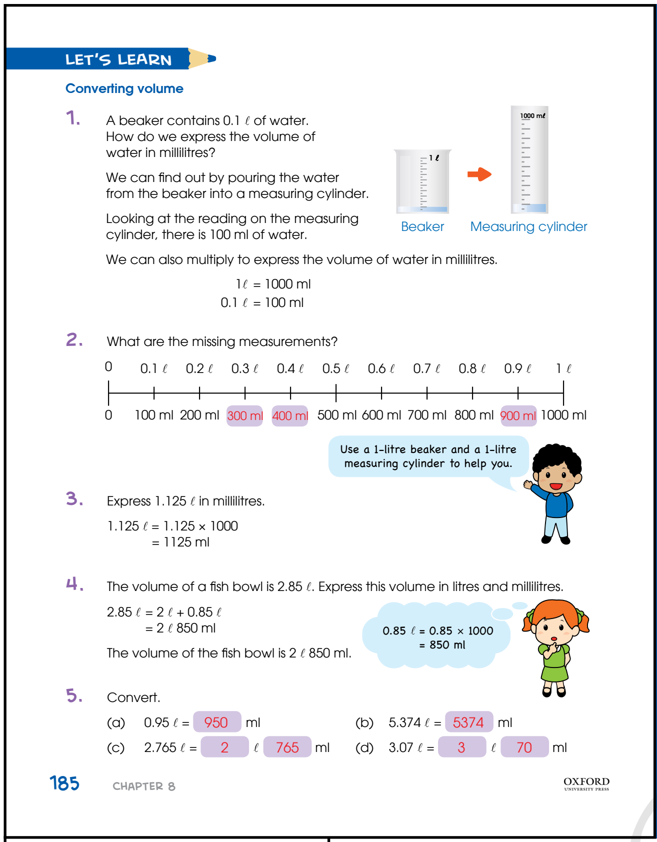
2.

Grams	Kilograms
5	0.005
33	0.033
51	0.051
219	0.219
500	0.5
397	0.397

3. (a) 6, 200
(b) 3, 150
(c) 9, 380
(d) 2, 75
(e) 1.23
(f) 4.8
(g) 7.01
(h) 5.003

4. 0.43 kg

5. 28 160 g



LET'S LEARN

Converting volume

1. A beaker contains 0.1 ℓ of water.
How do we express the volume of water in millilitres?

We can find out by pouring the water from the beaker into a measuring cylinder.

Looking at the reading on the measuring cylinder, there is 100 ml of water.

We can also multiply to express the volume of water in millilitres.

1ℓ = 1000 ml
0.1 ℓ = 100 ml

2. What are the missing measurements?

0 0.1 ℓ 0.2 ℓ 0.3 ℓ 0.4 ℓ 0.5 ℓ 0.6 ℓ 0.7 ℓ 0.8 ℓ 0.9 ℓ 1 ℓ

0 100 ml 200 ml 300 ml 400 ml 500 ml 600 ml 700 ml 800 ml 900 ml 1000 ml

Use a 1-litre beaker and a 1-litre measuring cylinder to help you.

3. Express 1.125 ℓ in millilitres.

1.125 ℓ = 1.125 × 1000
= 1125 ml

4. The volume of a fish bowl is 2.85 ℓ. Express this volume in litres and millilitres.

2.85 ℓ = 2 ℓ + 0.85 ℓ
= 2 ℓ 850 ml

The volume of the fish bowl is 2 ℓ 850 ml.

0.85 ℓ = 0.85 × 1000
= 850 ml

5. Convert.

(a) 0.95 ℓ = 950 ml
(b) 5.374 ℓ = 5374 ml
(c) 2.765 ℓ = 2 ℓ 765 ml
(d) 3.07 ℓ = 3 ℓ 70 ml

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Textbook 5 P185

LET'S LEARN

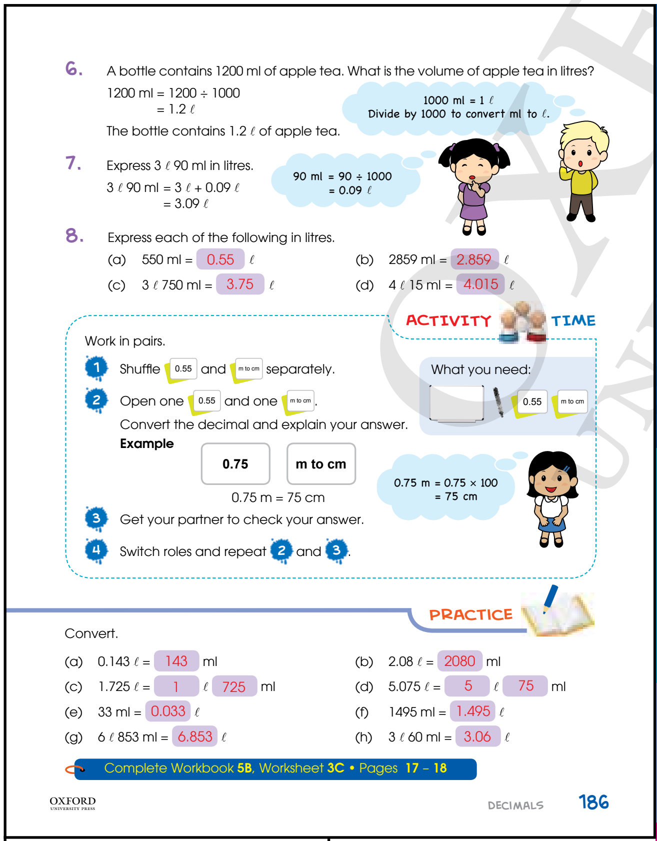
For Let's Learn 1, show pupils that 1 ℓ is equivalent to 1000 ml and that volumes in decimal form expressed in ℓ can be converted to ml by simply multiplying the decimals in ℓ by 1000. Get pupils to develop a sense of such a quantity by using beakers and measuring cylinders. Give more examples to illustrate this conversion.

Referring to what pupils have learnt in Let's Learn 1, guide them to fill in the blanks in Let's Learn 2. Remind pupils that when a decimal is multiplied by 1000, the decimal point shifts 3 places to the right.

Let's Learn 3 shows pupils that volumes with 1/2/3 decimal places expressed in ℓ can be converted to ml by simply multiplying the decimals in ℓ by 1000.

For Let's Learn 4, guide pupils to convert volume in ℓ to ℓ and ml. Show how the volume in ℓ is made up by the whole number and the decimal components. In the case of Let's Learn 4, 2.85 ℓ is made up of 2 ℓ and 0.85ℓ. Tell pupils that the decimal component (0.85 ℓ) can be converted into ml by multiplying the decimal in ℓ by 1000.

Get pupils to work on the questions in Let's Learn 5 with guidance and discussions. Invite pupils to explain how they do the conversions.



6. A bottle contains 1200 ml of apple tea. What is the volume of apple tea in litres?

1200 ml = 1200 ÷ 1000
= 1.2 ℓ

The bottle contains 1.2 ℓ of apple tea.

1000 ml = 1 ℓ
Divide by 1000 to convert ml to ℓ.

7. Express 3 ℓ 90 ml in litres.

3 ℓ 90 ml = 3 ℓ + 0.09 ℓ
= 3.09 ℓ

90 ml = 90 ÷ 1000
= 0.09 ℓ

8. Express each of the following in litres.

(a) 550 ml = 0.55 ℓ
(b) 2859 ml = 2.859 ℓ
(c) 3 ℓ 750 ml = 3.75 ℓ
(d) 4 ℓ 15 ml = 4.015 ℓ

ACTIVITY TIME

Work in pairs.

① Shuffle 0.55 and m to cm separately.

② Open one 0.55 and one m to cm.
Convert the decimal and explain your answer.

Example

0.75 **m to cm**

0.75 m = 75 cm

0.75 m = 0.75 × 100
= 75 cm

③ Get your partner to check your answer.

④ Switch roles and repeat ② and ③.

What you need:

PRACTICE

Convert.

(a) 0.143 ℓ = 143 ml
(b) 2.08 ℓ = 2080 ml
(c) 1.725 ℓ = 1 ℓ 725 ml
(d) 5.075 ℓ = 5 ℓ 75 ml
(e) 33 ml = 0.033 ℓ
(f) 1495 ml = 1.495 ℓ
(g) 6 ℓ 853 ml = 6.853 ℓ
(h) 3 ℓ 60 ml = 3.06 ℓ

Complete Workbook **5B**, Worksheet **3C** • Pages **17 – 18**

OXFORD UNIVERSITY PRESS DECIMALS 186

Textbook 5 P186

For Let's Learn 6, show pupils that 1000 ml is equivalent to 1 ℓ and that numbers expressed in ml can be converted to ℓ by dividing the numbers in ml by 1000. Remind pupils that when a number is divided by 1000, the decimal point shifts three places to the left.

For Let's Learn 7, guide pupils to convert volume in ℓ and ml to ℓ. Show that in a measurement with ℓ and ml, only the ml component is converted to ℓ. Then the whole number and the decimal are added to form the final answer in ℓ. In the case of Let's Learn 7, 3 ℓ 90 ml is made up of 3 ℓ and 90 ml. 90 ml can be converted into ℓ by dividing by 1000.

Get pupils to work on the questions in Let's Learn 8 with guidance and discussions. Invite pupils to explain how they do the conversions.

ACTIVITY TIME

Assign pupils to work in pairs. The activity helps pupils to reinforce their understanding and ability in converting from one unit of measurement to another. Pupils also hone their conversion skills when they check their partners' answers.

PRACTICE

Allow pupils to discuss and work in pairs. Give pupils sufficient time to work on the practice before going through.

Independent seatwork

Assign pupils to complete Worksheet 3C (Workbook 5B P17 − 18).

Answers Worksheet 3C (Workbook 5B P17 − 18)

1. (a) 72
   (b) 344
   (c) 90
   (d) 1280
   (e) 4587
   (f) 10 200

2. (a) 0.005
   (b) 0.019
   (c) 0.067
   (d) 0.124
   (e) 0.420
   (f) 8.033

3. (a) 6, 698
   (b) 4, 170
   (c) 5, 500
   (d) 2, 90
   (e) 1.9
   (f) 3.106
   (g) 7.085
   (h) 1.011

4.

Litres	Litres and Millilitres	Millilitres
0.016 ℓ		16 ml
9.2 ℓ	9 ℓ 200 ml	9200 ml
6.05 ℓ	6 ℓ 50 ml	6050 ml
3.058 ℓ	3 ℓ 58 ml	3058 ml
7.101 ℓ	7 ℓ 101 ml	7101 ml

5. 0.33 ℓ

6. 150 150 ml

LESSON PLAN

Chapter 8
Lesson 3

Specific Learning Focus

- Convert a measurement from a smaller unit to a larger unit in decimal form, and vice versa.
  Units of measurements include:
  - kilometres and metres
  - metres and centimetres
  - kilograms and grams
  - litres and millilitres

Suggested Duration

6 periods

Prior Learning

Pupils should be aware of quantities expressed in specific units of measurements and that they can be converted to bigger or smaller units of measurements.

Pre-emptive Pitfalls

Pupils should be able to learn the conversions easily as they are in hundreds or thousands. However, when converting from bigger to smaller units or vice versa, they may be confused as to whether to multiply or divide.

Introduction

In this lesson, pupils will learn the conversions between m and cm, m and km, g and kg, l and ml:
1 m = 100 cm
1 km = 1000 m
1 kg = 1000 g
1 ℓ = 1000 ml
Pupils should be well-versed with conversions of units for length, mass and capacity. Revise with pupils the fact that when converting a bigger unit to a smaller unit, multiplication is employed. Inversely, when converting a smaller unit to a bigger unit, division is employed. Since the conversions taught in this lesson involve decimals, the concept of shifting the decimal point to the right in multiplication and to the left in division will have to be revisited. Conversions involving compound units (e.g. 10 km and 37 m = 10.037 km or 5 kg 55 g = 5.055 kg or 1 ℓ 725 ml = 1.725 ℓ) are also done in this lesson.

Problem Solving

Emphasise the fact that in 10.037 km, there are 10 kilometres and a fraction of a kilometre which is $\frac{37}{1000}$.
Since 1 km equals to 1000 m, 0.037 km is 37 m. Similarly, in 1.725 litres, there are 1 litre and 725 millilitres since 0.725 × 1000 = 725 millilitres. For such conversions, ask pupils to partition the decimal into the whole number and the decimal components, and then convert the unit of the decimal component only to the smaller unit (e.g. km to m).

Activities

In 'Activity Time' (Textbook 5 P186), since pupils work in pairs, have them take turns to convert the decimal and check the answer. Such peer-checking helps pupils learn.

Resources

- decimal cards (Activity Handbook 5 P37)
- mini whiteboard
- markers
- conversion of unit cards (Activity Handbook 5 P39)
- number lines (Activity Handbook 5 P36)
- unit of measurement conversion cards (Activity Handbook 5 P38)

Mathematical Communication Support

Do practice sums on the board and encourage individual responses. Prompt pupils by asking for the answers to various conversions. Guide them by asking for the mode of operation (× or ÷). Then, ask whether the decimal point should be shifted to the right (×) or left (÷).

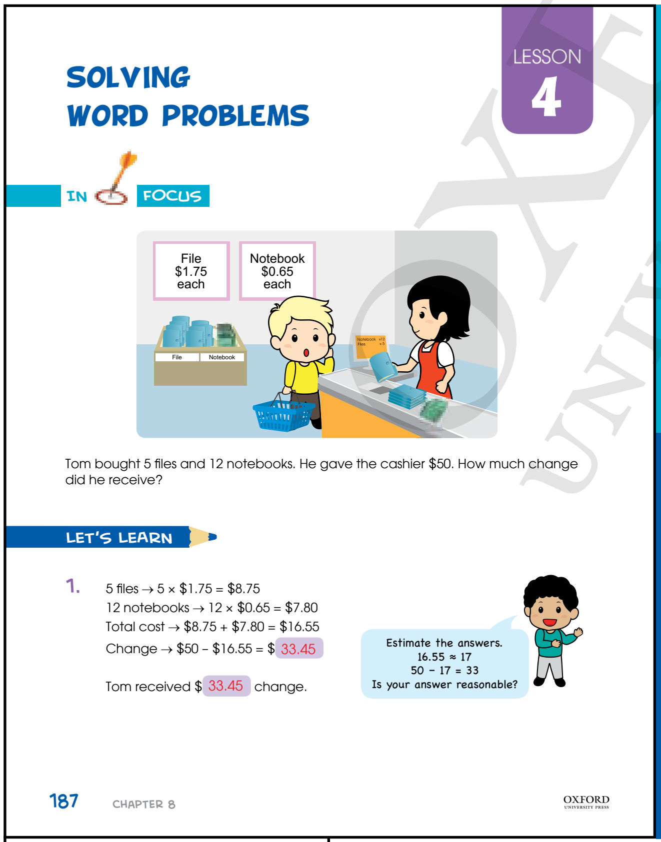
LESSON
4

SOLVING WORD PROBLEMS

LEARNING OBJECTIVE

1. Solve word problems involving the 4 operations of decimals.

*Note to teachers:
Refer to the 4-step approach to problem solving template (Activity Handbook 5 P20) which can be used for all such lessons involving problem solving. Encourage pupils to first read and comprehend the question. Emphasise to pupils to sift the data and create diagrams or flowcharts or bar models. Then, decide and strategise the mode(s) of operation and lastly attempt the abstract part of the learning by carrying out the procedure taught in the earlier lessons to carry out the mathematical computation.



SOLVING WORD PROBLEMS

LESSON
4

IN FOCUS

Tom bought 5 files and 12 notebooks. He gave the cashier $50. How much change did he receive?

LET'S LEARN

1. 5 files → 5 × $1.75 = $8.75
12 notebooks → 12 × $0.65 = $7.80
Total cost → $8.75 + $7.80 = $16.55
Change → $50 – $16.55 = $ 33.45

Tom received $ 33.45 change.

Estimate the answers.
16.55 ≈ 17
50 – 17 = 33
Is your answer reasonable?

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Textbook 5 P187

IN FOCUS

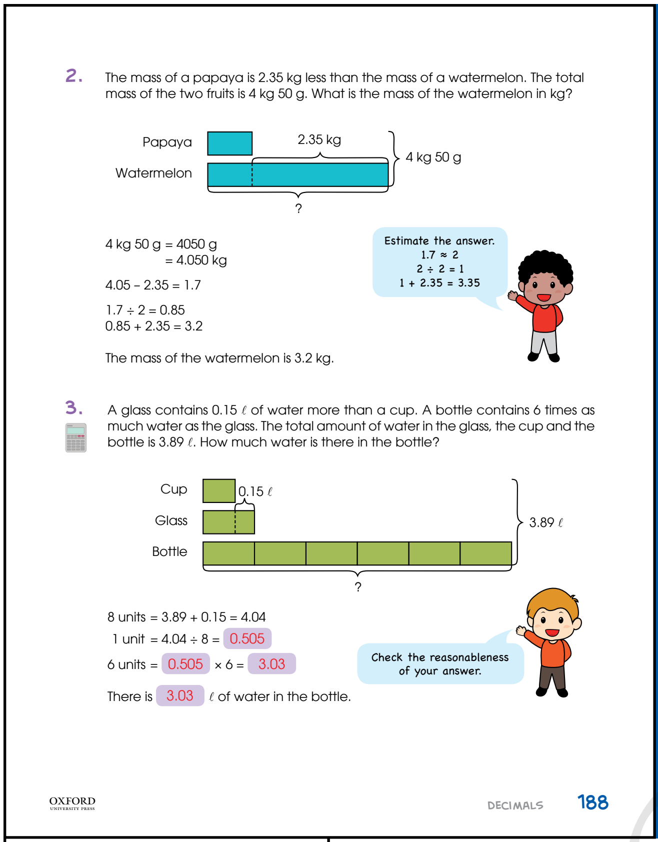
Discuss the problem with the class. Ask pupils what information they can gather from the question.

Introduce money which is a good topic used for 4 operations of decimals as it is usually expressed in decimals of dollars. This will help pupils to relate better to the topic.

Elicit responses on how the question can be solved.

LET'S LEARN

Proceeding from the In Focus, guide pupils in understanding the information provided in the word problem. Get pupils to estimate their answers before performing the full calculation, in order to ensure the reasonableness of the answers found later.



2. The mass of a papaya is 2.35 kg less than the mass of a watermelon. The total mass of the two fruits is 4 kg 50 g. What is the mass of the watermelon in kg?

4 kg 50 g = 4050 g
= 4.050 kg

4.05 – 2.35 = 1.7

1.7 ÷ 2 = 0.85
0.85 + 2.35 = 3.2

The mass of the watermelon is 3.2 kg.

3. A glass contains 0.15 ℓ of water more than a cup. A bottle contains 6 times as much water as the glass. The total amount of water in the glass, the cup and the bottle is 3.89 ℓ. How much water is there in the bottle?

8 units = 3.89 + 0.15 = 4.04
1 unit = 4.04 ÷ 8 = 0.505
6 units = 0.505 × 6 = 3.03

There is 3.03 ℓ of water in the bottle.

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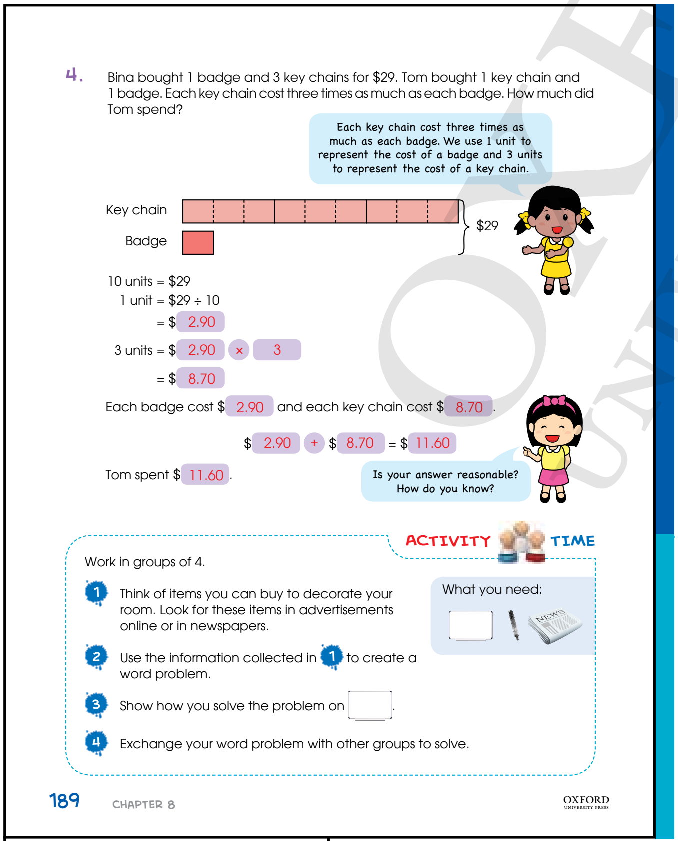
Textbook 5 P188

LET'S LEARN

For Let's Learn 2, help pupils learn how to solve a decimal word problem with the use of bar models. Show and explain to pupils how the comparison model is drawn and what essential labels are to be included in the model. Explain to pupils how the comparison model is used to help solve the problem, i.e. the bar model helps pupils to see the information clearly and solve for the unknown parts. Guide pupils to solve the problem using the unitary method. Discuss how the answer obtained can be checked for reasonableness.

For Let's Learn 3, guide pupils in understanding the question before solving it. Allow sufficient time for pupils to attempt drawing a model before asking them to check their models against the one illustrated in the textbook. A comparison bar model enables pupils to make a comparison in the number of units representing the amount of water in the three different containers. Guide pupils to solve the problem by unitary method. Go through the operations involved and ask pupils to check the reasonableness of the answers obtained by comparing it with the estimated value.



4. Bina bought 1 badge and 3 key chains for $29. Tom bought 1 key chain and 1 badge. Each key chain cost three times as much as each badge. How much did Tom spend?

10 units = $29
1 unit = $29 ÷ 10
= $ 2.90
3 units = $ 2.90 × 3
= $ 8.70

Each badge cost $ 2.90 and each key chain cost $ 8.70.

$ 2.90 + $ 8.70 = $ 11.60

Tom spent $ 11.60.

ACTIVITY TIME

Work in groups of 4.

① Think of items you can buy to decorate your room. Look for these items in advertisements online or in newspapers.

② Use the information collected in ① to create a word problem.

③ Show how you solve the problem on ☐.

④ Exchange your word problem with other groups to solve.

What you need:

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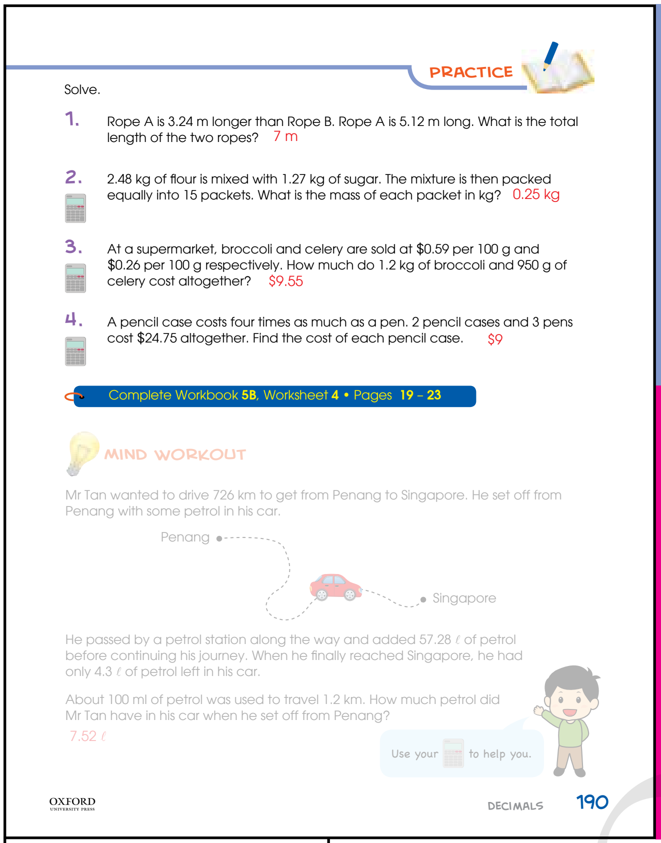
Textbook 5 P189

Get pupils to explain how the comparison model is drawn in Let's Learn 4. Guide pupils to see that if each badge is represented by 1 unit, then each key chain is represented by 3 units, with a total of 9 units for 3 similar key chains. Work together with the pupils to find the answer using the unitary method. Ask pupils to check their answer against their estimate.

ACTIVITY TIME

Assign pupils to work in groups of 4. With the use of information found in the newspaper advertisements, pupils get to create their own word problem with solutions. The activity allows pupils to be creative and also, to practice problem solving techniques with their group members.



PRACTICE

Solve.

1. Rope A is 3.24 m longer than Rope B. Rope A is 5.12 m long. What is the total length of the two ropes? 7 m

2. 2.48 kg of flour is mixed with 1.27 kg of sugar. The mixture is then packed equally into 15 packets. What is the mass of each packet in kg? 0.25 kg

3. At a supermarket, broccoli and celery are sold at $0.59 per 100 g and $0.26 per 100 g respectively. How much do 1.2 kg of broccoli and 950 g of celery cost altogether? $9.55

4. A pencil case costs four times as much as a pen. 2 pencil cases and 3 pens cost $24.75 altogether. Find the cost of each pencil case. $9

Complete Workbook **5B**, Worksheet **4** • Pages **19 – 23**

MIND WORKOUT

Mr Tan wanted to drive 726 km to get from Penang to Singapore. He set off from Penang with some petrol in his car.

He passed by a petrol station along the way and added 57.28 ℓ of petrol before continuing his journey. When he finally reached Singapore, he had only 4.3 ℓ of petrol left in his car.

About 100 ml of petrol was used to travel 1.2 km. How much petrol did Mr Tan have in his car when he set off from Penang?

7.52 ℓ

Use your to help you.

OXFORD UNIVERSITY PRESS DECIMALS 190

Textbook 5 P190

PRACTICE

Allow pupils to discuss and work in pairs. Give pupils sufficient time to work on the practice before going through.

Independent seatwork

Assign pupils to complete Worksheet 4 (Workbook 5B P19 − 23).

Answers Worksheet 4 (Workbook 5B P19 − 23)

1. $0.35 × 12 = $7
$1.75 × 10 = $17.50
$7 + $17.50 = $24.50

2. $4.25 − $3.50 = $0.75
$0.75 + $2.30 = $3.05

3. 3.7 ℓ + 1.4 ℓ = 5.1 ℓ
5.1 ℓ ÷ 300 ml = 5100 ml ÷ 300 ml
= 17

4. 1 kg → $35
950 g = 0.95 kg
0.95 kg → $35 × 0.95
= $33.25

5. $5.70 − $5 = $0.70
2 × $0.70 = $1.40

6. 6150 g − 5150 g = 1000g
1000 g ÷ 50 = 20 g
300 × 20 g = 6000 g
6150 g − 6000 g = 150 g

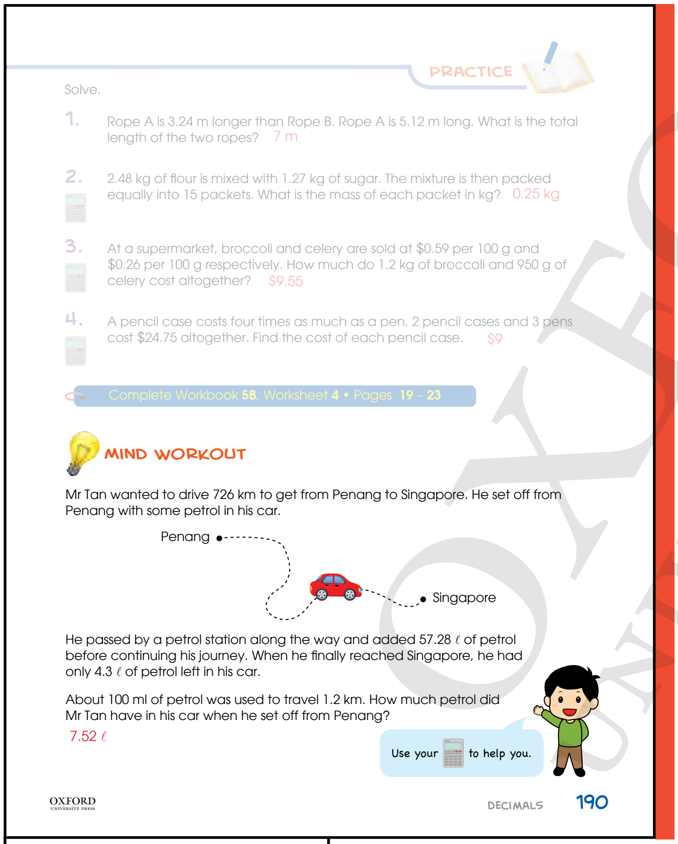
7. (a) 2 × 500 g = 1000 g
2250 g − 1000 g = 1250 g
1250 g ÷ 5 = 250 g
(b) 250 g + 500 g = 750 g

8. 1.4 m = 140 cm
2 units = 140 cm − 60 cm
= 80 cm
1 unit = 80 ÷ 2
= 40 cm
60 cm − 40 cm = 20 cm

9. 1 apple and 1 pear → 40¢ + 60¢
= $1
7 apples and 7 pears → 7 × $1
= $7
$7.40 − $7 = 40¢

10. 80 20-cent coins → 80 × $0.20
= $16
$29.80 − $16 = $13.80
$13.80 ÷ $0.30 = 46

PROBLEM SOLVING, MATHS JOURNAL AND PUPIL REVIEW



PRACTICE

Solve.

1. Rope A is 3.24 m longer than Rope B. Rope A is 5.12 m long. What is the total length of the two ropes? 7 m

2. 2.48 kg of flour is mixed with 1.27 kg of sugar. The mixture is then packed equally into 15 packets. What is the mass of each packet in kg? 0.25 kg

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Complete Workbook **5B**, Worksheet **4** • Pages **19 – 23**

MIND WORKOUT

Mr Tan wanted to drive 726 km to get from Penang to Singapore. He set off from Penang with some petrol in his car.

Penang

Singapore

He passed by a petrol station along the way and added 57.28 ℓ of petrol before continuing his journey. When he finally reached Singapore, he had only 4.3 ℓ of petrol left in his car.

About 100 ml of petrol was used to travel 1.2 km. How much petrol did Mr Tan have in his car when he set off from Penang?

7.52 ℓ

Use your ▦ to help you.

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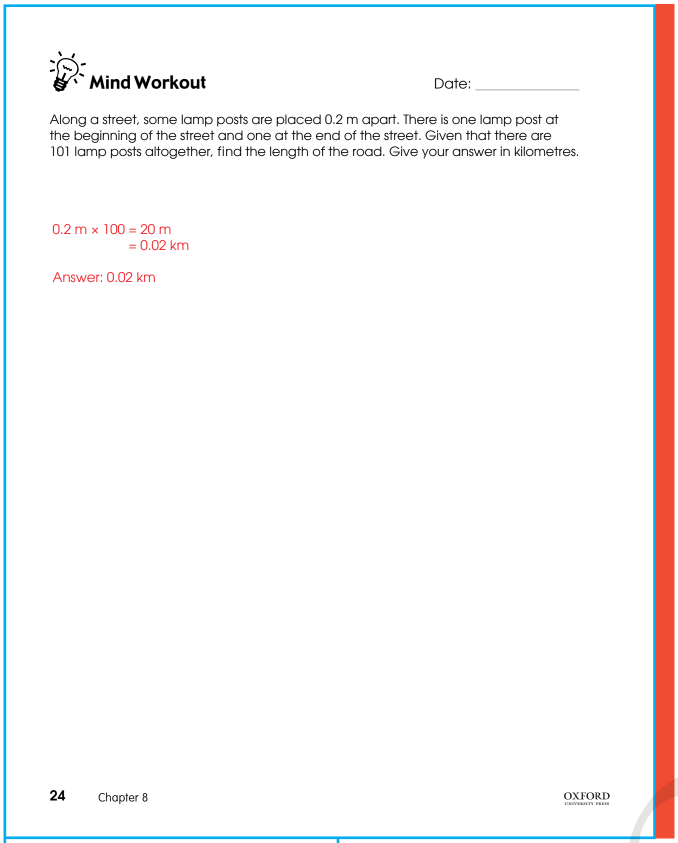
DECIMALS 190

Textbook 5 P190

MIND WORKOUT

This problem involves operations of decimals with different units of measurement. It challenges pupils to visualise the sequence of events to determine the order of operations to use in their calculations.



Mind Workout Date: ____________

Along a street, some lamp posts are placed 0.2 m apart. There is one lamp post at the beginning of the street and one at the end of the street. Given that there are 101 lamp posts altogether, find the length of the road. Give your answer in kilometres.

0.2 m × 100 = 20 m
= 0.02 km

Answer: 0.02 km

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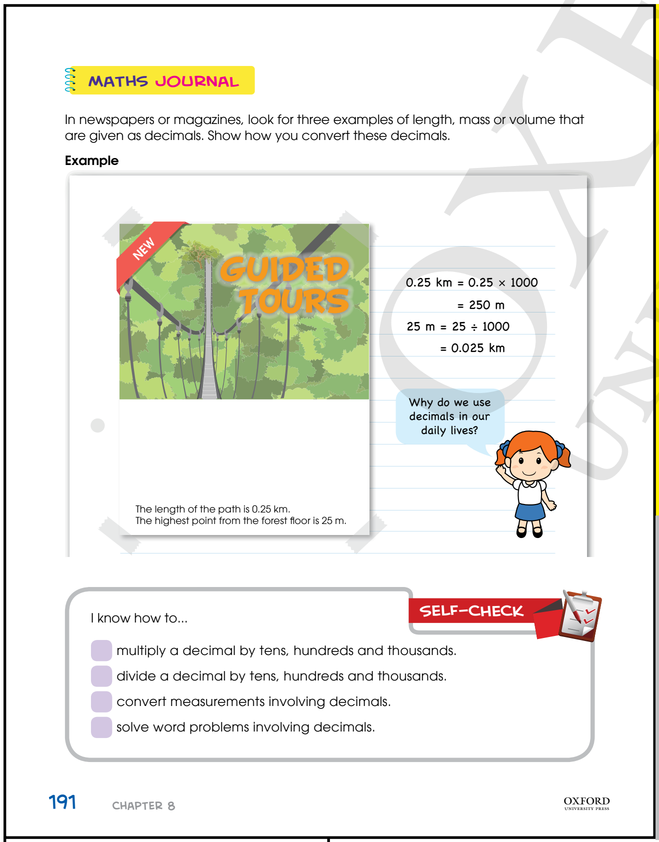
Workbook 5B P24

Mind Workout

This problem challenges pupils to think logically and apply their visual-spatial ability, while reinforcing their unit conversion skills at the same time. Some pupils may not be able to see that there are only 100 intervals when there are 101 lamps. Teacher can illustrate this using an example with only a small specific number of lamps.



MATHS JOURNAL

In newspapers or magazines, look for three examples of length, mass or volume that are given as decimals. Show how you convert these decimals.

Example

The length of the path is 0.25 km.
The highest point from the forest floor is 25 m.

0.25 km = 0.25 × 1000
= 250 m
25 m = 25 ÷ 1000
= 0.025 km

SELF-CHECK

I know how to...

☐ multiply a decimal by tens, hundreds and thousands.
☐ divide a decimal by tens, hundreds and thousands.
☐ convert measurements involving decimals.
☐ solve word problems involving decimals.

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Textbook 5 P191

MATHS JOURNAL

The task allows pupils to practice conversion of units with authentic measurements found in newspapers and magazines.

SELF-CHECK

Before the pupils do the self-check, review the important concepts once more by asking for examples learnt for each objective.

The self-check can be done after pupils have completed **Review 8** (Workbook 5B P25 − 30).

Answers Review 8 (Workbook 5B P25 − 30)

1. (a) 61.46
   (b) 0.9
   (c) 570
   (d) 30.96
   (e) 9
   (f) 17 460

2. (a) 0.162
   (b) 0.049
   (c) 0.006
   (d) 0.006
   (e) 1.36
   (f) 0.062

3. (a) 3500
   (b) 790
   (c) 904
   (d) 1.2
   (e) 0.38
   (f) 0.575
   (g) 4, 100
   (h) 2.02

4. 10.5 ℓ = 10 500 ml
   1 ℓ 50 ml = 1050 ml
   10 500 ml ÷ 1050 ml = 10

5. 5.22 m = 522 cm
   522 ÷ 58 = 9 minutes

6. 3 × $1.70 = $5.10
   5 × $5.90 = $11.80
   10 × $3.20 = $32
   $50 − $5.10 − $11.80 − $32
   = $1.10

7. (a) $4.20 − $2.45 = $1.75
   (b) $1.95 × 2 = $3.90
   $3.90 = $2.90 = $1
   (c) $4.20 − $1.50 = $2.70
   The two drinks are fruit juice and soft drink, with a difference of $2.70.

8. (a) 0.32 ℓ + 0.3 ℓ + 0.18 ℓ + 0.1 ℓ 0.08 ℓ + 0.07 ℓ
   = 1.05 ℓ
   (b) 1 ℓ 800 ml = 1.8 ℓ
   1.8 ℓ − 1.05 ℓ = 0.75 ℓ
   0.75 ℓ ÷ 3 = 0.25 ℓ

9. (a) 5 m = 500 cm
   500 cm ÷ 12 = $41\frac{2}{3}$
   Greatest number she could wrap = 41
   (b) 41 × 12 cm = 492 cm
   500 cm − 492 cm = 8 cm

10. 500 g = 0.5 kg
    3.53 kg − 0.5 kg = 3.03 kg
    $\frac{1}{2}$ × 3.03 kg = 1.515 kg

11. 3.45 kg − 0.2 kg = 3.25 kg
    3.25 kg ÷ 0.25 kg = 13
    Sam has 15 paper bags.
    15 × 0.5 kg = 7.5 kg
    7.5 kg + 0.3 kg = 7.8 kg

PERCENTAGE

CHAPTER 9

Percentage

CHAPTER 9

What percentage of the books are red?
What are some other percentages that you can see around you?

PERCENT

LESSON 1

IN FOCUS

There are 100 books on the shelf and 60 books are red. How do we express the number of red books as a percentage of the total number of books?

OXFORD

PERCENTAGE 192

Textbook 5 P192

Related Resources

NSPM Textbook 5 (P192 – 214)
NSPM Workbook 5B (P31 – 46)

Materials

Calculator, 10 × 10 square grid papers, fraction cards, decimal cards, percentage cards, percentage bars, colour pencils, receipts, newspapers, mini whiteboard

Lesson

Lesson 1	Percent
Lesson 2	Finding a Percentage Part of a Whole
Lesson 3	Solving Word Problems

Problem Solving, Maths Journal and Pupil Review

INTRODUCTION

The key idea in this chapter is that “percent” refers to “out of 100”. Pupils should have the opportunity to discuss the usage of percentage in real-life and be led to see how percentage, decimals and fractions are related. Pupils encounter real-life applications of percentage when they learn how to find discount, GST and annual interest. They also learn to solve word problems of up to 2 steps.

LESSON
1

PERCENT

LEARNING OBJECTIVES

1. Express a part of a whole as a percentage.
2. Express a fraction as a percentage.
3. Express a decimal as a percentage.

CHAPTER
9

Percentage

20% off
all stationery

What percentage of the books are red?
What are some other percentages that you can see around you?

PERCENT

LESSON
1

IN FOCUS

There are 100 books on the shelf and 60 books are red. How do we express the number of red books as a percentage of the total number of books?

OXFORD

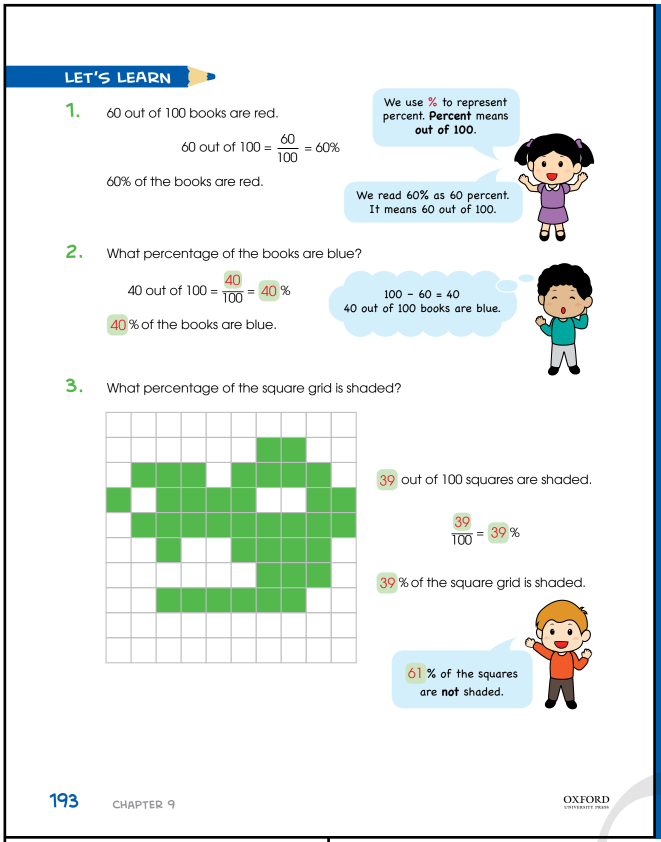
PERCENTAGE 192

Textbook 5 P192

IN FOCUS

Use the Chapter Opener to discuss examples of percentage in real-life. Ask pupils how they can find the percentage of books that are red. Elicit the total number of books and number of red books.

Refer to the In Focus and ask pupils how they can find the percentage when given the total number of books and the number of red books.



LET'S LEARN

1. 60 out of 100 books are red.

60 out of 100 = $\frac{60}{100}$ = 60%

60% of the books are red.

We use % to represent percent. **Percent** means **out of 100**.

We read 60% as 60 percent. It means 60 out of 100.

2. What percentage of the books are blue?

40 out of 100 = $\frac{40}{100}$ = 40 %

40 % of the books are blue.

100 − 60 = 40
40 out of 100 books are blue.

3. What percentage of the square grid is shaded?

39 out of 100 squares are shaded.

$\frac{39}{100}$ = 39 %

39 % of the square grid is shaded.

61 % of the squares are **not** shaded.

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Textbook 5 P193

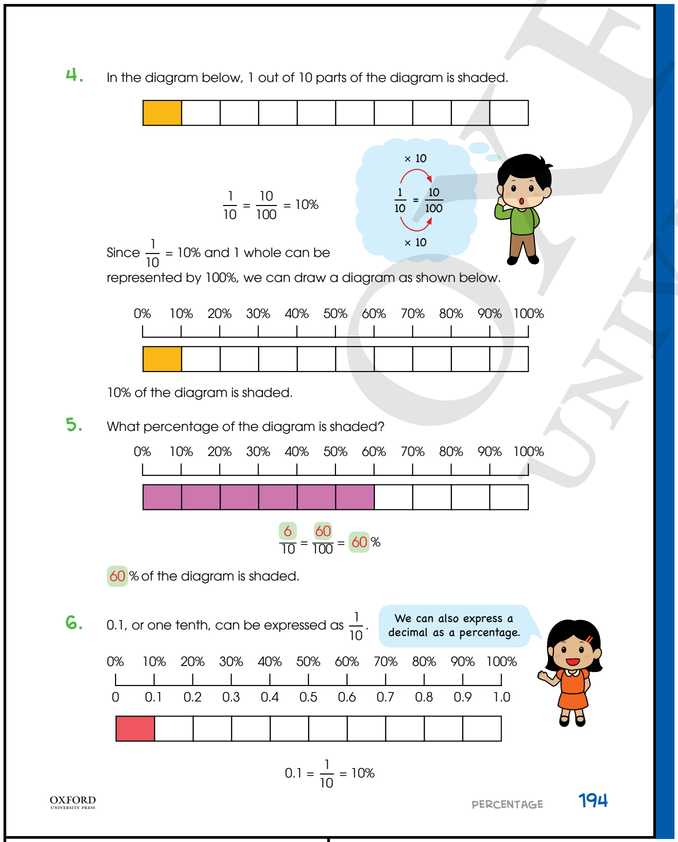
LET'S LEARN

For Let's Learn 1, reiterate that % means out of 100, thus 60% can be read as 60 out of 100 etc.

Repeat the same process for Let's Learn 2 and give pupils some time to fill in the blanks before checking their answers.

For Let's Learn 3, ask pupils how many squares there are in the whole square grid. It is important to establish that there are 100 squares in the grid. Then, ask them to count the number of squares that are shaded. Lead pupils to see that the percentage of squares that are not shaded is equivalent to 100% − percentage of squares that are shaded.

As an extension to Let's Learn 3, consider giving pupils an empty 10 × 10 square grid paper and ask pupils to colour the squares in different colours. Pupils can count the number of different coloured squares and write statements such as "__ out of 100 squares are blue" and " ___% of the squares are blue".



4. In the diagram below, 1 out of 10 parts of the diagram is shaded.

$\frac{1}{10} = \frac{10}{100}$ = 10%

× 10
$\frac{1}{10} = \frac{10}{100}$
× 10

Since $\frac{1}{10}$ = 10% and 1 whole can be represented by 100%, we can draw a diagram as shown below.

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

10% of the diagram is shaded.

5. What percentage of the diagram is shaded?

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

$\frac{6}{10} = \frac{60}{100}$ = 60 %

60 % of the diagram is shaded.

6. 0.1, or one tenth, can be expressed as $\frac{1}{10}$.

We can also express a decimal as a percentage.

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0

0.1 = $\frac{1}{10}$ = 10%

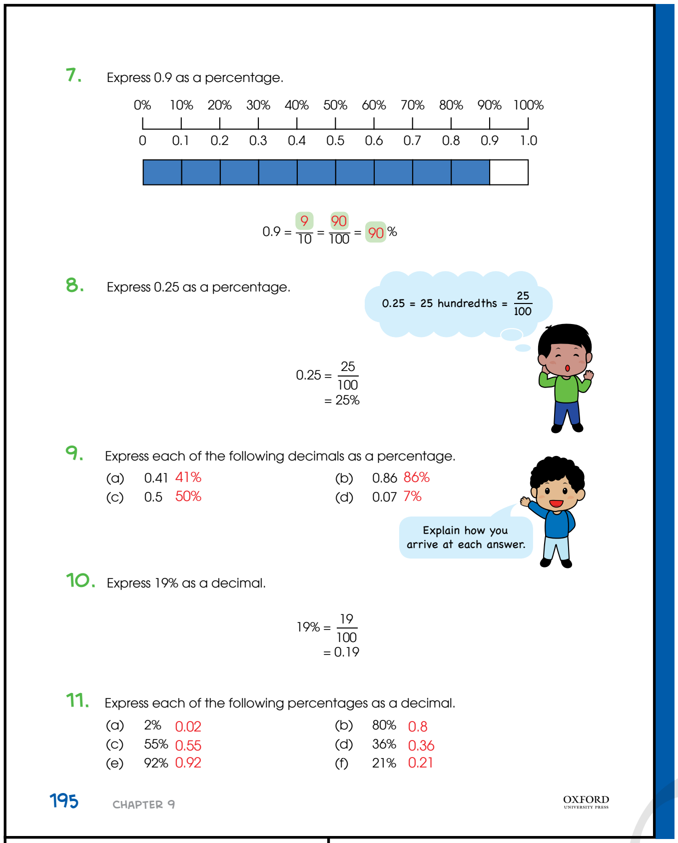
OXFORD PERCENTAGE 194

Textbook 5 P194

For Let's Learn 4, help pupils recall that a fraction with denominator 10 can be expressed as a fraction with denominator 100 and a fraction with denominator 100 can easily be expressed as a percentage.

Repeat the same process for Let's Learn 5. Give pupils some time to fill in the blanks before checking their answers.

For Let's Learn 6, help pupils recall that 0.1 can be read as 1 tenth. This can be expressed as a fraction with denominator 10. The subsequent steps are similar to those in Let's Learn 4 and 5.



7. Express 0.9 as a percentage.

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0

$0.9 = \frac{9}{10} = \frac{90}{100} = 90\%$

8. Express 0.25 as a percentage.

0.25 = 25 hundredths = $\frac{25}{100}$

$0.25 = \frac{25}{100}$
$= 25\%$

9. Express each of the following decimals as a percentage.

(a) 0.41 41%
(b) 0.86 86%
(c) 0.5 50%
(d) 0.07 7%

Explain how you arrive at each answer.

10. Express 19% as a decimal.

$19\% = \frac{19}{100}$
$= 0.19$

11. Express each of the following percentages as a decimal.

(a) 2% 0.02
(b) 80% 0.8
(c) 55% 0.55
(d) 36% 0.36
(e) 92% 0.92
(f) 21% 0.21

195 CHAPTER 9

Textbook 5 P195

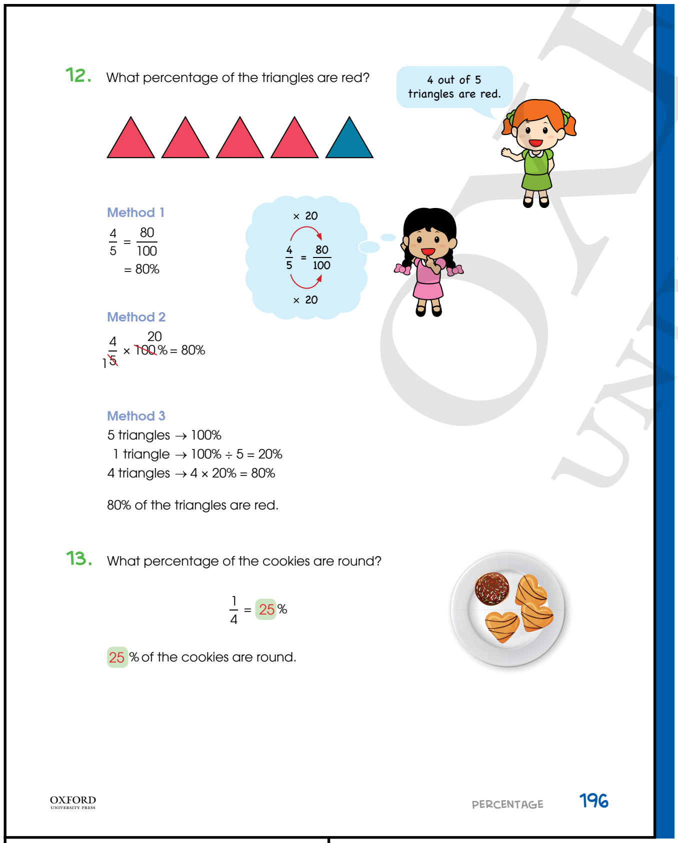
For Let's Learn 7, help pupils recall that 0.9 can be read as 9 tenths. Repeat the same process as in Let's Learn 6. Check for any errors in pupils' answers.

For Let's Learn 8, guide pupils to see that decimals can easily be converted to percentages when you read decimals as hundredths or tenths and write them as fractions with denominators 10 or 100.

Allow pupils to work in pairs for Let's Learn 9. Give pupils sufficient time to work on the solutions before going through with the class.

For Let's Learn 10, guide pupils to see that x% means x out of 100, which can be written as $\frac{x}{100}$ (or x hundredths), then converted to a decimal.

Allow pupils to work in pairs for Let's Learn 11. Give pupils sufficient time to work on the solutions before going through with the class.



12. What percentage of the triangles are red?

4 out of 5 triangles are red.

Method 1

$\frac{4}{5} = \frac{80}{100}$
$= 80\%$

$\frac{4}{5} \xrightarrow{\times 20} \frac{80}{100}$

Method 2

$\frac{4}{\cancel{5}_1} \times \cancel{100}^{20}\% = 80\%$

Method 3

5 triangles → 100%
1 triangle → 100% ÷ 5 = 20%
4 triangles → 4 × 20% = 80%

80% of the triangles are red.

13. What percentage of the cookies are round?

$\frac{1}{4} = 25\%$

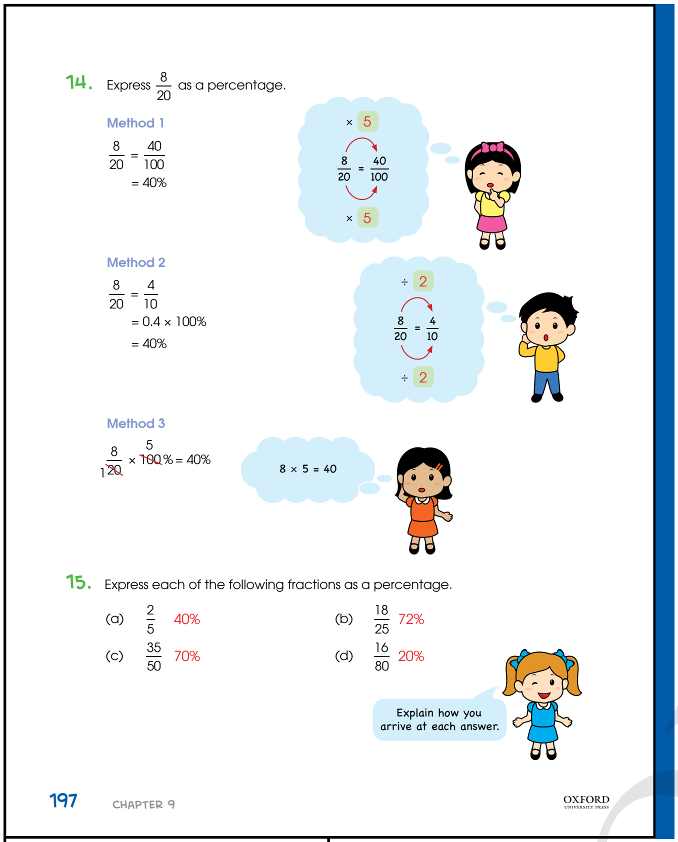
25 % of the cookies are round.

PERCENTAGE 196

Textbook 5 P196

In Let's Learn 12, guide pupils to see that there are various methods to calculate percentage. Method 1 involves converting a fraction to one with denominator of 100. Method 2 is a more straightforward method where pupils multiply the fraction by 100%. Method 3 uses a systematic, unitary method to solve for the answer. Ask pupils to compare the three methods.

Ask pupils to work on Let's Learn 13 using any of the three methods taught in Let's Learn 12.



14. Express $\frac{8}{20}$ as a percentage.

Method 1

$\frac{8}{20} = \frac{40}{100}$

$= 40\%$

$\frac{8}{20} \xrightarrow{\times 5} \frac{40}{100}$

Method 2

$\frac{8}{20} = \frac{4}{10}$

$= 0.4 \times 100\%$

$= 40\%$

$\frac{8}{20} \xrightarrow{\div 2} \frac{4}{10}$

Method 3

$\frac{8}{\cancel{20}_{1}} \times \overset{5}{\cancel{100}}\% = 40\%$

8 × 5 = 40

15. Express each of the following fractions as a percentage.

(a) $\frac{2}{5}$ 40%
(b) $\frac{18}{25}$ 72%
(c) $\frac{35}{50}$ 70%
(d) $\frac{16}{80}$ 20%

Explain how you arrive at each answer.

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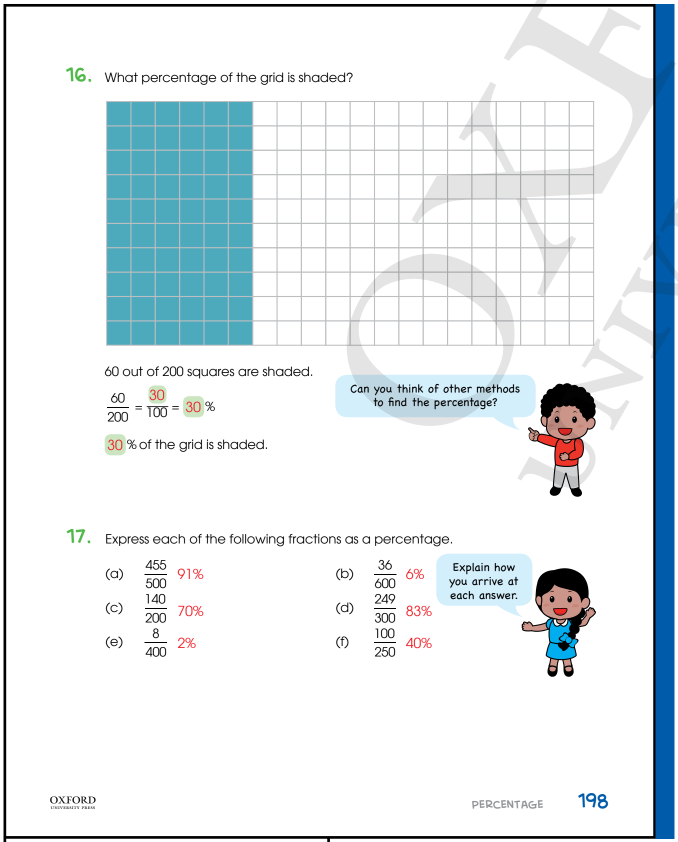
Textbook 5 P197

Go through the three methods illustrated in Let's Learn 14.

For Let's Learn 15, allow sufficient time for pupils to work on their solutions before going through with the class. Ask pupils which method did they use in each instance and to explain their reasons.



16. What percentage of the grid is shaded?

60 out of 200 squares are shaded.

$\frac{60}{200} = \frac{\boxed{30}}{100} = \boxed{30}\,\%$

$\boxed{30}$ % of the grid is shaded.

Can you think of other methods to find the percentage?

17. Express each of the following fractions as a percentage.

(a) $\frac{455}{500}$ 91%
(b) $\frac{36}{600}$ 6%
(c) $\frac{140}{200}$ 70%
(d) $\frac{249}{300}$ 83%
(e) $\frac{8}{400}$ 2%
(f) $\frac{100}{250}$ 40%

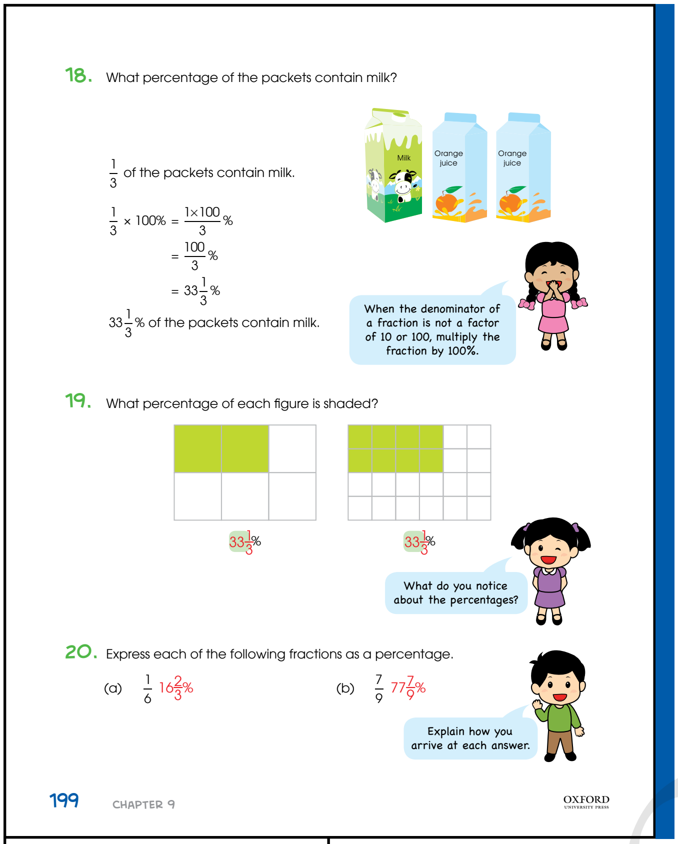
Explain how you arrive at each answer.

OXFORD UNIVERSITY PRESS PERCENTAGE 198

Textbook 5 P198

For Let's Learn 16, only one method is shown. Ask pupils if the methods used in Let's Learn 12 to 15 apply to Let's Learn 16 and to explain their answer.

Let pupils work out their answers individually for Let's Learn 17. Ask them to explain how they arrived at their answers. Go through different methods and discuss the efficiency of each method.



18. What percentage of the packets contain milk?

$\frac{1}{3}$ of the packets contain milk.

$$\frac{1}{3} \times 100\% = \frac{1 \times 100}{3}\%$$
$$= \frac{100}{3}\%$$
$$= 33\frac{1}{3}\%$$

$33\frac{1}{3}\%$ of the packets contain milk.

19. What percentage of each figure is shaded?

$33\frac{1}{3}\%$ $33\frac{1}{3}\%$

20. Express each of the following fractions as a percentage.

(a) $\frac{1}{6}$ $16\frac{2}{3}\%$ (b) $\frac{7}{9}$ $77\frac{7}{9}\%$

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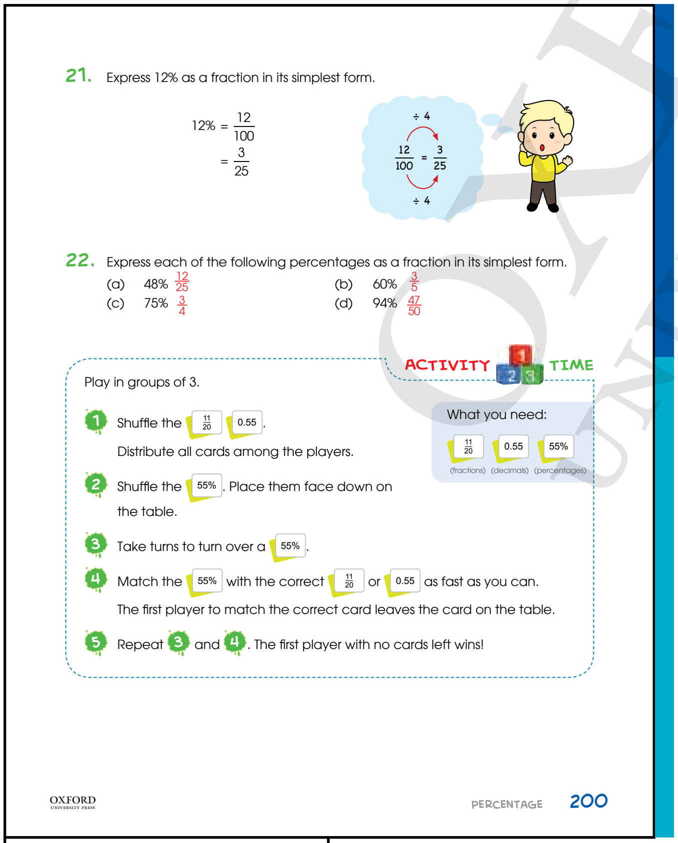
Textbook 5 P199

Let's Learn 18 involves a fraction where the denominator is neither a factor of 10 nor 100. Guide pupils to see that the method to solving such problems involves multiplying the fractions by 100%. Remind pupils to leave their answers as exact figures unless stated in the questions.

Allow some time for pupils to fill in the blanks in Let's Learn 19. Ask them if they notice anything about the percentages.

For Let's Learn 20, allow pupils to work in pairs. Give pupils sufficient time to work on their solutions before going through with the class.



21. Express 12% as a fraction in its simplest form.

$$12\% = \frac{12}{100}$$
$$= \frac{3}{25}$$

22. Express each of the following percentages as a fraction in its simplest form.

(a) 48% $\frac{12}{25}$ (b) 60% $\frac{3}{5}$
(c) 75% $\frac{3}{4}$ (d) 94% $\frac{47}{50}$

ACTIVITY TIME

Play in groups of 3.

What you need: $\frac{11}{20}$ (fractions) 0.55 (decimals) 55% (percentages)

1. Shuffle the $\frac{11}{20}$ 0.55. Distribute all cards among the players.
2. Shuffle the 55%. Place them face down on the table.
3. Take turns to turn over a 55%.
4. Match the 55% with the correct $\frac{11}{20}$ or 0.55 as fast as you can. The first player to match the correct card leaves the card on the table.
5. Repeat 3 and 4. The first player with no cards left wins!

OXFORD UNIVERSITY PRESS PERCENTAGE 200

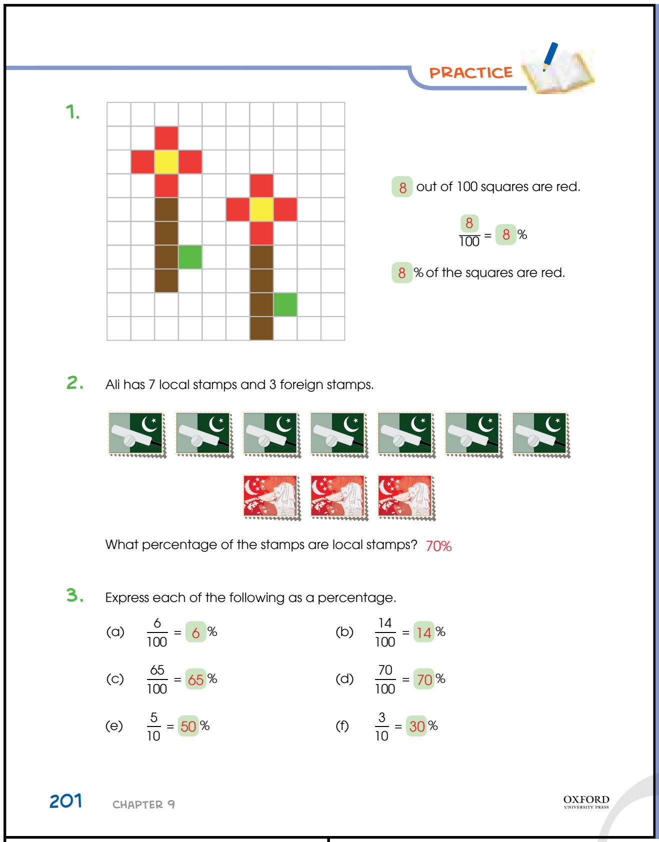
Textbook 5 P200

For Let's Learn 21, guide pupils to write x% as $\frac{x}{100}$ and help pupils to recall how to simplify a fraction.

Repeat the same process for Let's Learn 22. Give pupils sufficient time to work on the questions. Invite pupils to show their working on the board.

ACTIVITY TIME

Get 2 pupil volunteers and demonstrate how the game is played. Distribute the materials and get pupils to play within a stipulated time.



PRACTICE

1.

8 out of 100 squares are red.

$\frac{8}{100} = 8\%$

8 % of the squares are red.

2. Ali has 7 local stamps and 3 foreign stamps.

What percentage of the stamps are local stamps? 70%

3. Express each of the following as a percentage.

(a) $\frac{6}{100} = 6\%$ (b) $\frac{14}{100} = 14\%$

(c) $\frac{65}{100} = 65\%$ (d) $\frac{70}{100} = 70\%$

(e) $\frac{5}{10} = 50\%$ (f) $\frac{3}{10} = 30\%$

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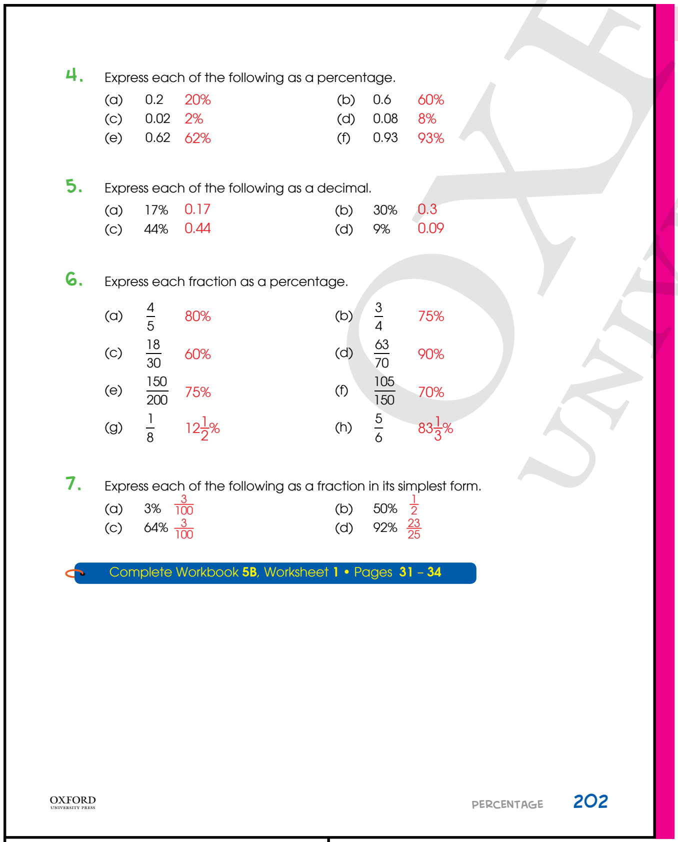
Textbook 5 P201

PRACTICE

Work with pupils on the practice questions. Use pupils' errors for class discussion to rectify them.



4. Express each of the following as a percentage.

(a) 0.2 20% (b) 0.6 60%

(c) 0.02 2% (d) 0.08 8%

(e) 0.62 62% (f) 0.93 93%

5. Express each of the following as a decimal.

(a) 17% 0.17 (b) 30% 0.3

(c) 44% 0.44 (d) 9% 0.09

6. Express each fraction as a percentage.

(a) $\frac{4}{5}$ 80% (b) $\frac{3}{4}$ 75%

(c) $\frac{18}{30}$ 60% (d) $\frac{63}{70}$ 90%

(e) $\frac{150}{200}$ 75% (f) $\frac{105}{150}$ 70%

(g) $\frac{1}{8}$ $12\frac{1}{2}\%$ (h) $\frac{5}{6}$ $83\frac{1}{3}\%$

7. Express each of the following as a fraction in its simplest form.

(a) 3% $\frac{3}{100}$ (b) 50% $\frac{1}{2}$

(c) 64% $\frac{3}{100}$ (d) 92% $\frac{23}{25}$

Complete Workbook **5B**, Worksheet **1** • Pages **31 – 34**

OXFORD UNIVERSITY PRESS PERCENTAGE 202

Textbook 5 P202

Independent seatwork

Assign pupils to complete Worksheet 1 (Workbook 5B P31 – 34).

Answers Worksheet 1 (Workbook 5B P31 – 34)

1. (a) $\boxed{40}$ out of 100 squares are shaded.

   $\frac{\boxed{40}}{100} = \boxed{40}$ %

   $\boxed{40}$ % of the squares are shaded.

   (b) $\boxed{3}$ out of 10 strips are shaded.

   $\frac{\boxed{3}}{10} = \frac{\boxed{30}}{100} = \boxed{30}$ %

   $\boxed{30}$ % of the strips are shaded.

2. (a) 21
   (b) 53
   (c) 9
   (d) 99

3. (a) 60
   (b) 80
   (c) 30
   (d) 50

4. (a) 0.7
   (b) 0.83
   (c) 0.24
   (d) 0.07

5. (a) 40
   (b) 16
   (c) 70
   (d) 84
   (e) $66\frac{2}{3}$
   (f) $37\frac{1}{2}$

6. (a) $\frac{3}{50}$
   (b) $\frac{1}{10}$
   (c) $\frac{8}{25}$
   (d) $\frac{39}{50}$
   (e) $\frac{11}{20}$
   (f) $\frac{99}{100}$

7. $\frac{35}{100} = 35\%$

8. $\frac{12}{20} = \frac{60}{100} = 60\%$

9. $\frac{24}{40} \times 100\% = 60\%$

LESSON PLAN

Chapter 9
Lesson 1

Specific Learning Focus

- Express a part of a whole as a percentage.
- Express a decimal as a percentage.
- Express a fraction as a percentage.

Suggested Duration

4 periods

Prior Learning

Pupils would have come across the usage of percentage in real life (e.g. report cards, newspaper advertisements). They should have an idea that percent (%) means out of 100.

Pre-emptive Pitfalls

This chapter should be relatively easy for pupils.

Introduction

In Let's Learn 3 (Textbook 5 P193), a square grid of 100 squares is used to explain the concept of percentage. Explain to pupils that out of the total number of squares, the number of squares that are shaded is 30. We say that 30 out of 100 squares are shaded, and hence the percentage of squares that are shaded is $\frac{30}{100}$ = 30%. In Let's Learn 4 to 7 (Textbook 5 P194 – 195), the equivalence concept will have to be revisited as any value expressed out of 10 can be converted (using equivalence concept) to out of 100 which then becomes a percentage of the total value. The concept of percentage is introduced through a real-life example in 'In Focus'. Elicit pupils for more real-life examples of percentage through group discussions. Discuss with pupils the example of percentage in the score of a quiz. That is, if one pupil scores 20 out of 25 marks, the score in percentage is calculated by expressing this as a fraction $\frac{20}{25}$, and then finding the equivalent fraction with denominator 100. Since 4 multiplied by 25 gives 100 (i.e. there are four 25s in a 100), the percentage can be calculated as $\frac{20}{25} = \frac{80}{100}$ = 80%. This concept of calculating percentage is then introduced: $\frac{{}^{4}\cancel{20}}{{}_{5}\cancel{25}} \times 100\% = 4 \times 20 = 80\%$ Emphasise that when a value is expressed as a percentage, it means the value is out of 100 (e.g. 40% means 40 out of 100). Use number line and bars to help pupils express a fraction or a decimal as a percentage.

Problem Solving

Emphasise the following for the various conversions:

(i) Converting decimal to percentage
It is simpler to convert a decimal to a percentage since a decimal with 1 or 2 decimal places when expressed as a fraction has a denominator of 10 or 100. It should be emphasised that to convert to percentage, the fraction must have a denominator of 100 (e.g. 0.07 = $\frac{7}{100}$ = 7%, 0.7 = $\frac{7}{10} = \frac{70}{100}$ = 70%)

(ii) Converting fraction to decimal
Emphasise the concept of equivalence of converting the fraction to a fraction with a denominator of 100 and then convert the fraction to a decimal.

(iii) Converting percentage to decimal
This should be relatively simpler as percentage is expressed as a fraction with denominator of 100 and then converted to a decimal.

(iv) Converting percentage to fraction
Reiterate that % means out of 100, so 3% = $\frac{3}{100}$ or 50% = $\frac{50}{100}$. When converting percentage to fraction, make sure pupils reduce the fraction to its simplest form (50% = $\frac{5\cancel{0}}{10\cancel{0}} = \frac{5}{10} = \frac{1}{2}$).

Activities

In 'Activity Time' (Textbook 5 P200), provide pupils with the cards. Prompt pupils with multiple questions to keep the momentum going.

Resources

- mini whiteboard
- markers
- colour pencils
- 10 × 10 square grid papers (Activity Handbook 5 P40)
- decimal cards (Activity Handbook 5 P43)
- percentage cards (Activity Handbook 5 P44)
- fraction cards (Activity Handbook 5 P42)
- percentage bars (Activity Handbook 5 P41)

Mathematical Communication Support

Encourage class discussions using key terms like 'out of 100', 'equivalence', 'multiples', 'factors', 'converting decimals to percentage', and 'converting fractions to percentage' (and vice versa). Elicit pupils for real-life examples to enunciate the concept of percentage (e.g. population of Pakistan as a percentage of the population of Asia, discount of an item on sale, increase in salary, tax on restaurant bill, etc.).

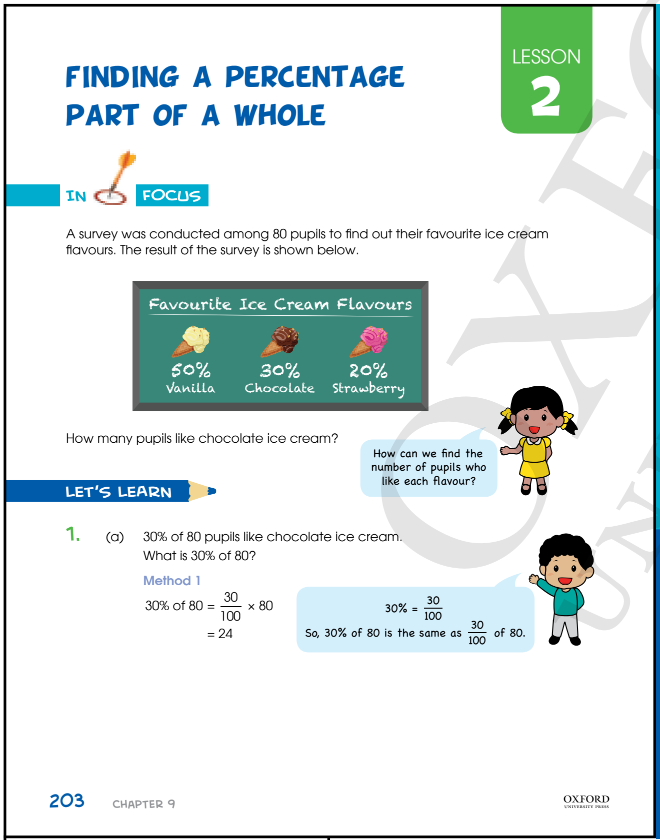
LESSON

2

FINDING A PERCENTAGE PART OF A WHOLE

LEARNING OBJECTIVES

1. Find a percentage part of a whole.
2. Find discount, GST and annual interest.



LESSON 2

FINDING A PERCENTAGE PART OF A WHOLE

IN FOCUS

A survey was conducted among 80 pupils to find out their favourite ice cream flavours. The result of the survey is shown below.

Favourite Ice Cream Flavours

50% Vanilla

30% Chocolate

20% Strawberry

How many pupils like chocolate ice cream?

How can we find the number of pupils who like each flavour?

LET'S LEARN

1. (a) 30% of 80 pupils like chocolate ice cream.
What is 30% of 80?

Method 1

$$30\% \text{ of } 80 = \frac{30}{100} \times 80$$
$$= 24$$

$30\% = \frac{30}{100}$

So, 30% of 80 is the same as $\frac{30}{100}$ of 80.

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Textbook 5 P203

IN FOCUS

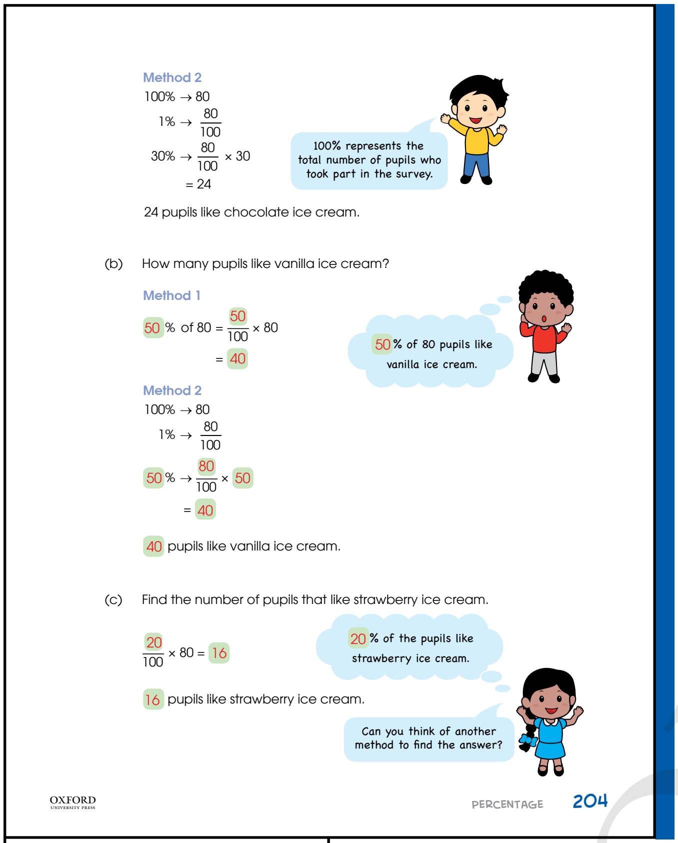
Ask:

- What percentage of the pupils like chocolate ice cream?
- What does this mean?

Say "If there were 100 pupils, 30 would like chocolate ice cream. However, there are 80 pupils. How do you find out how many of the 80 pupils like chocolate ice cream?"

LET'S LEARN

For Let's Learn 1, say "30% of the pupils like chocolate ice cream. That means 30% of 80 pupils like chocolate ice cream. 30% is the same as $\frac{30}{100}$. So, 30% of 80 = $\frac{30}{100}$ of 80. We have learnt in fractions that $\frac{30}{100}$ of 80 is $\frac{30}{100}$ × 80. You can now calculate the number of pupils who like chocolate ice cream."



Method 2

$100\% \rightarrow 80$

$1\% \rightarrow \frac{80}{100}$

$30\% \rightarrow \frac{80}{100} \times 30$

$= 24$

100% represents the total number of pupils who took part in the survey.

24 pupils like chocolate ice cream.

(b) How many pupils like vanilla ice cream?

Method 1

$\boxed{50}\%$ of $80 = \frac{\boxed{50}}{100} \times 80$

$= \boxed{40}$

$\boxed{50}$% of 80 pupils like vanilla ice cream.

Method 2

$100\% \rightarrow 80$

$1\% \rightarrow \frac{80}{100}$

$\boxed{50}\% \rightarrow \frac{\boxed{80}}{100} \times \boxed{50}$

$= \boxed{40}$

$\boxed{40}$ pupils like vanilla ice cream.

(c) Find the number of pupils that like strawberry ice cream.

$\frac{\boxed{20}}{100} \times 80 = \boxed{16}$

$\boxed{20}$% of the pupils like strawberry ice cream.

$\boxed{16}$ pupils like strawberry ice cream.

Can you think of another method to find the answer?

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PERCENTAGE 204

Textbook 5 P204

For the second method, guide pupils to draw a model. 80 pupils form the whole. The whole is also represented by 100%. Thus, 100% represents 80. Consequently, 1% represents $\frac{80}{100}$. Since 30% of the pupils like chocolate ice cream, find 30% by calculating $\frac{80}{100} \times 30$.

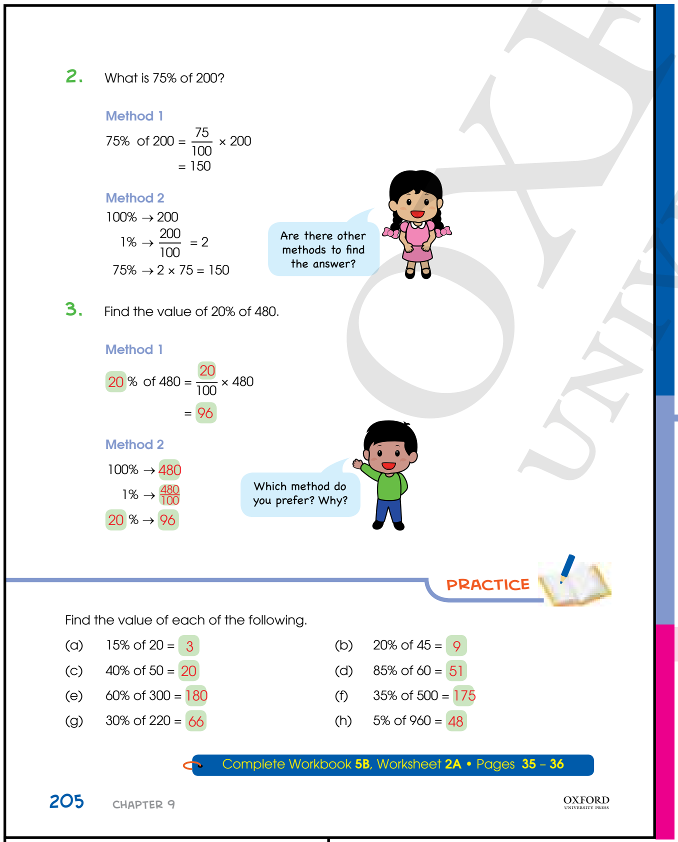
For Let's Learn 1(b), guide pupils using the same teacher language as Let's Learn 1(a). Ask:

- What percentage of the pupils like vanilla ice cream?

Elicit the response that 50% of 80 pupils like vanilla ice cream. Ask pupils to express 50% as a fraction. Help pupils to see that 50% of 80 = $\frac{50}{100}$ of 80 = $\frac{50}{100} \times 80$.

For the second method, guide pupils to refer to the model drawn earlier. 100% represents 80. 1% represents $\frac{80}{100}$. 50% represents $\frac{80}{100} \times 50$.

Guide pupils to solve the Let's Learn 1(c) using similar processes from previous examples. Ask pupils if they can think of alternative ways of solving the problem.



2. What is 75% of 200?

Method 1

75% of $200 = \frac{75}{100} \times 200$

$= 150$

Method 2

$100\% \rightarrow 200$

$1\% \rightarrow \frac{200}{100} = 2$

$75\% \rightarrow 2 \times 75 = 150$

Are there other methods to find the answer?

3. Find the value of 20% of 480.

Method 1

$\boxed{20}\%$ of $480 = \frac{\boxed{20}}{100} \times 480$

$= \boxed{96}$

Method 2

$100\% \rightarrow \boxed{480}$

$1\% \rightarrow \boxed{\frac{480}{100}}$

$\boxed{20}\% \rightarrow \boxed{96}$

Which method do you prefer? Why?

PRACTICE

Find the value of each of the following.

(a) 15% of 20 = 3
(b) 20% of 45 = 9
(c) 40% of 50 = 20
(d) 85% of 60 = 51
(e) 60% of 300 = 180
(f) 35% of 500 = 175
(g) 30% of 220 = 66
(h) 5% of 960 = 48

Complete Workbook **5B**, Worksheet **2A** • Pages **35 – 36**

205 CHAPTER 9

OXFORD UNIVERSITY PRESS

Textbook 5 P205

Go through the two methods of calculating percentage in Let's Learn 2. Show pupils it is also possible to change 75% to $\frac{3}{4}$ and draw models to answer the question.

For Let's Learn 3, give pupils sufficient time to fill in the blanks before going through with the class. Ask pupils to explain their preferred method. Show pupils it is also possible to change 20% to $\frac{1}{5}$ and draw models to answer the questions.

PRACTICE

Assign pupils to work on the practice questions individually. Go through the solutions with the class and discuss the methods used in each instance.

Independent seatwork

Assign pupils to complete Worksheet 2A (Workbook 5B P35 – 36).

Answers Worksheet 2A (Workbook 5B P35 − 36)

1. (a) $\frac{20}{100} \times 40 = 8$

   (b) $\frac{10}{100} \times 10 = 1$

   (c) $\frac{1}{100} \times 200 = 2$

   (d) $\frac{35}{100} \times 60 = 21$

   (e) $\frac{15}{100} \times 80 = 12$

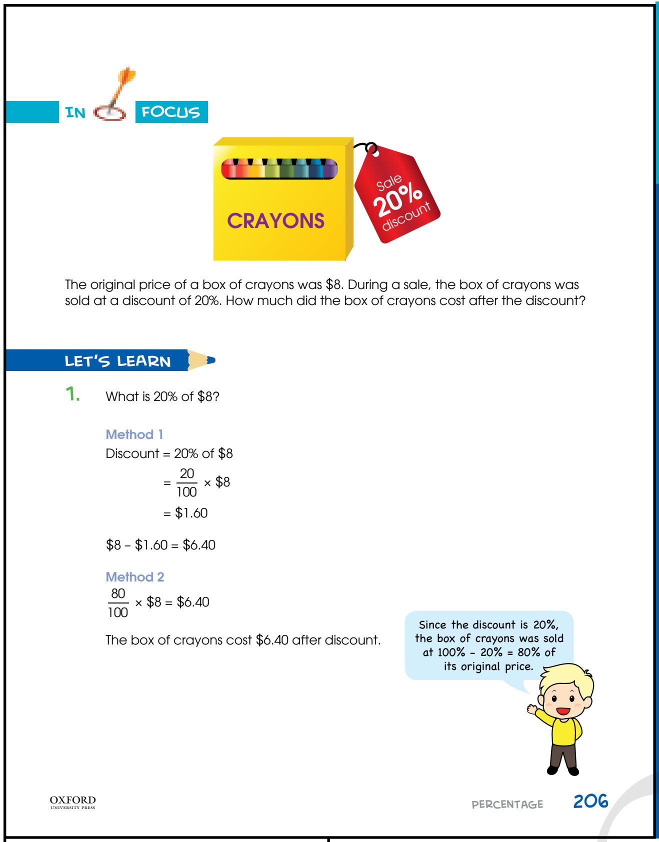
   (f) $\frac{9}{100} \times 600 = 54$

2. (a) $\frac{15}{100} \times 120 = 18$

   (b) $\frac{60}{100} \times 120 = 72$

   (c) $\frac{25}{100} \times 120 = 30$

   $72 - 30 = 42$



IN FOCUS

CRAYONS

Sale 20% discount

The original price of a box of crayons was $8. During a sale, the box of crayons was sold at a discount of 20%. How much did the box of crayons cost after the discount?

LET'S LEARN

1. What is 20% of $8?

Method 1

Discount = 20% of $8

$= \frac{20}{100} \times \$8$

$= \$1.60$

$\$8 - \$1.60 = \$6.40$

Method 2

$\frac{80}{100} \times \$8 = \$6.40$

The box of crayons cost $6.40 after discount.

Since the discount is 20%, the box of crayons was sold at 100% – 20% = 80% of its original price.

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PERCENTAGE 206

Textbook 5 P206

IN FOCUS

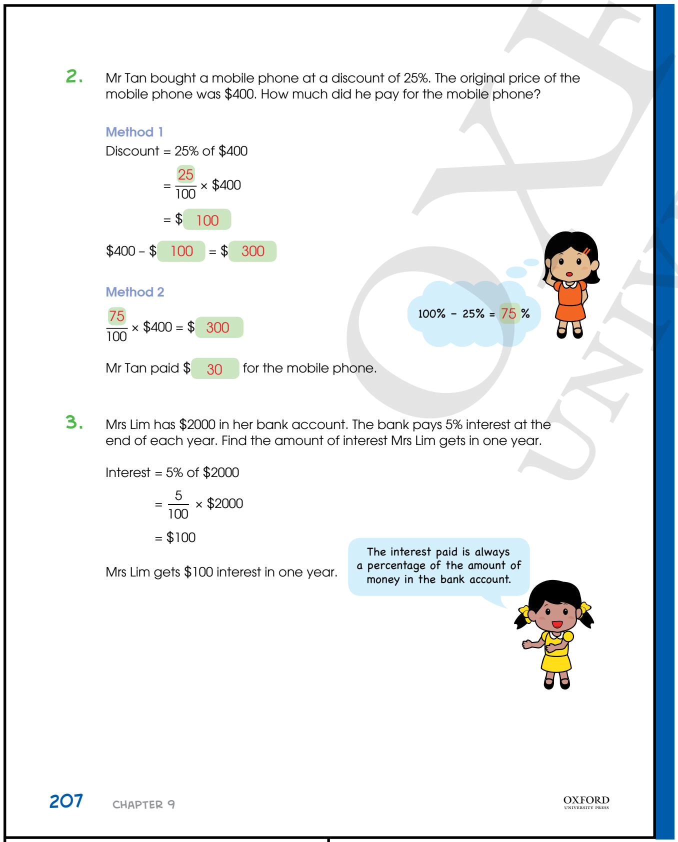
Discuss what discount means and ask pupils to share their experiences with discounts when buying things. Ask pupils whether the price is reduced or increased when a discount is given.

LET'S LEARN

Go through Let's Learn 1 with the class.
For method 1, ask:

- What percentage of the cost price is the discount?

Elicit that the discount is 20% of the original price and 20% $= \frac{20}{100}$. Thus, discount $= \frac{20}{100} \times$ original price. The price paid is $8 – discount. For method 2, elicit that since the discount given is 20% of the original price, the amount paid is 80% of the original price. To calculate the amount paid, use 80% of the original price, which is $\frac{80}{100} \times \$8$. Ask pupils which method they prefer and to explain their choices.



2. Mr Tan bought a mobile phone at a discount of 25%. The original price of the mobile phone was $400. How much did he pay for the mobile phone?

Method 1

Discount = 25% of $400

$= \frac{25}{100} \times \$400$

$= \$100$

$\$400 - \$100 = \$300$

Method 2

$\frac{75}{100} \times \$400 = \$300$

Mr Tan paid $30 for the mobile phone.

100% – 25% = 75 %

3. Mrs Lim has $2000 in her bank account. The bank pays 5% interest at the end of each year. Find the amount of interest Mrs Lim gets in one year.

Interest = 5% of $2000

$= \frac{5}{100} \times \$2000$

$= \$100$

Mrs Lim gets $100 interest in one year.

The interest paid is always a percentage of the amount of money in the bank account.

207 CHAPTER 9

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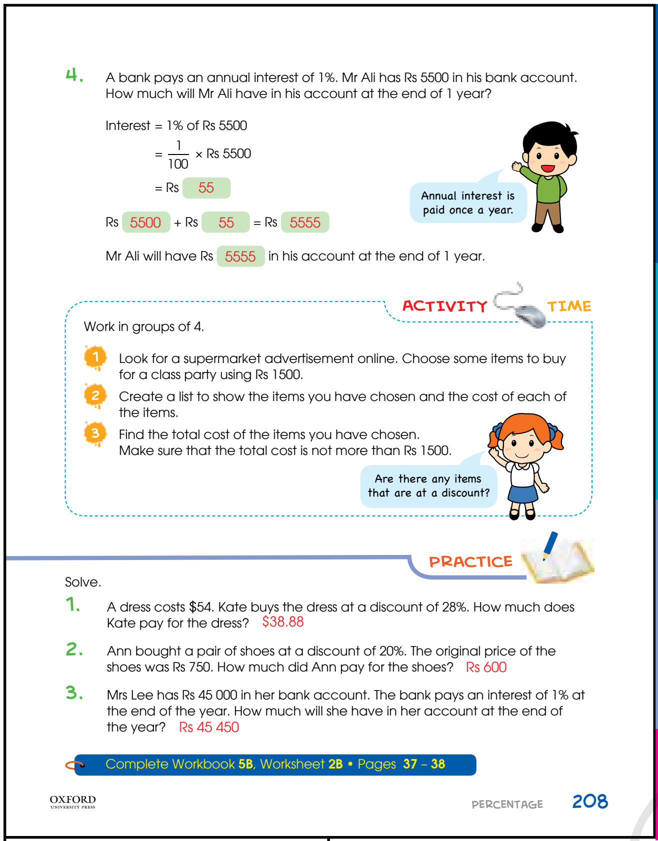
Textbook 5 P207

Allow pupils to work in pairs for Let's Learn 2. Give them sufficient time to discuss and to fill in the blanks before inviting them to present their answers. Guide pupils using the same teacher language as in Let's Learn 1. Ask pupils if they have a preferred method to solve the problem.

For Let's Learn 3, discuss what interest means and ask pupils to share their experiences with interests. Ask pupils if they know the percentage of the amount of money in the bank representing the interest. Say "The interest is 5% of $2000. 5% is $\frac{5}{100}$. Thus, the interest can be calculated by $\frac{5}{100} \times \$2000$."



4. A bank pays an annual interest of 1%. Mr Ali has Rs 5500 in his bank account. How much will Mr Ali have in his account at the end of 1 year?

Interest = 1% of Rs 5500

$= \frac{1}{100} \times \text{Rs } 5500$

= Rs 55

Rs 5500 + Rs 55 = Rs 5555

Mr Ali will have Rs 5555 in his account at the end of 1 year.

Annual interest is paid once a year.

ACTIVITY TIME

Work in groups of 4.

1. Look for a supermarket advertisement online. Choose some items to buy for a class party using Rs 1500.
2. Create a list to show the items you have chosen and the cost of each of the items.
3. Find the total cost of the items you have chosen. Make sure that the total cost is not more than Rs 1500.

Are there any items that are at a discount?

PRACTICE

Solve.

1. A dress costs $54. Kate buys the dress at a discount of 28%. How much does Kate pay for the dress? $38.88
2. Ann bought a pair of shoes at a discount of 20%. The original price of the shoes was Rs 750. How much did Ann pay for the shoes? Rs 600
3. Mrs Lee has Rs 45 000 in her bank account. The bank pays an interest of 1% at the end of the year. How much will she have in her account at the end of the year? Rs 45 450

Complete Workbook **5B**, Worksheet **2B** • Pages **37 – 38**

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PERCENTAGE 208

Textbook 5 P208

Elicit the percentage used for calculating interest in Let's Learn 4. Lead pupils to understand that annual interest is paid only once a year. Remind pupils to add the amount calculated for interest to the original. Give pupils sufficient time to work on their solutions before going through with the class.

ACTIVITY TIME

Give examples of supermarket advertisments online and demonstrate how the activity is done. It may be helpful to prepare a worksheet with tables for pupils to fill up.

PRACTICE

Work with pupils on the practice questions.

Independent seatwork

Assign pupils to complete Worksheet 2B (Workbook 5B P37 − 38).

Answers

Worksheet 2B (Workbook 5B P37 − 38)

1. 100% → $50
   1% → $50 ÷ 100
   = $0.50
   93% = $0.50 × 93
   = $46.50

2. 100% → $91
   1% → $91 ÷ 100
   = $0.91
   95% = $0.91 × 95
   = $86.45

3. 100% → $65
   1% → $65 ÷ 100
   = $0.65
   80% = $0.65 × 80
   = $52

4. $1.20 × 6 = $7.20
   100% → $7.20
   1% → $7.20 ÷ 100
   = $0.072
   90% = $0.072 × 90
   = $6.48

5. 100% → Rs 500 000
   1% → Rs 500 000 ÷ 100
   = Rs 50 000
   Rs 500 000 + Rs 50 000 = Rs 550 000

6. 100% → Rs 5000
   1% → Rs 5000 ÷ 100
   = Rs 50
   Rs 5000 + Rs 50 = Rs 5050

LESSON PLAN

Chapter 9
Lesson 2

Specific Learning Focus

- Find a percentage part of a whole.
- Find discount and annual interest.

Suggested Duration

4 periods

Prior Learning

This lesson is in continuation from Lesson 1 where percentage was introduced.

Pre-emptive Pitfalls

In this lesson, pupils will need to employ the concept of equivalence in conversions as in the earlier lesson. Lots of practice questions would help to prevent any careless mistakes made during mathematical computations.

Introduction

Explain to pupils that in this lesson, they will learn to find the value when its percentage is given. Elicit pupils for real-life examples of percentage. Explain to pupils that to solve the problem in 'In Focus' (Textbook 5 P206), two steps should be taken:

(i) find the amount of discount by finding the percentage part of the whole,

$\frac{20}{100} \times \$8 = \$1.60$

(ii) subtract the discount from the original price.

$\$8 - \$1.60 = \$6.40$

Problem Solving

In Let's Learn 4 (Textbook 5 P208), explain to pupils that if a bank pays a certain percentage of interest, then the total amount of money a person would have in his bank account after the interest is paid, would be the total amount of money in his account (whole) and the interest (part) added together.

Activities

The teacher can conduct multiple activities for this lesson. For example, provide pupils with examples of menu and get them to calculate the total bill for an 'order', or provide them with newspaper advertisements with percentages, etc.

Resources

- newspapers
- mini whiteboard
- markers
- calculator
- receipts
- computer (ICT)

Mathematical Communication Support

Encourage class discussions and roleplay (e.g. banker, cashier, etc.). Get pupils to present on chart paper some real-life examples of percentage, e.g. newspaper advertisements and articles showing real-life percentages.

LESSON

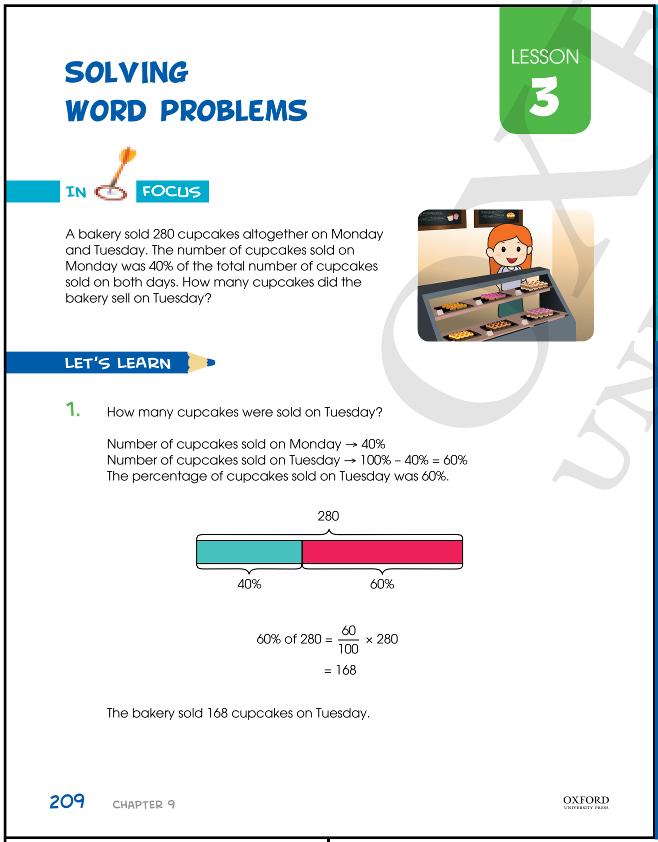
3

SOLVING WORD PROBLEMS

LEARNING OBJECTIVE

1. Solve up to 2-step word problems involving percentage.

*Note to teacher:
Refer to the 4-step approach to problem solving template (Activity Handbook 5 P20) which can be used for all such lessons involving problem solving.



SOLVING WORD PROBLEMS

LESSON 3

IN FOCUS

A bakery sold 280 cupcakes altogether on Monday and Tuesday. The number of cupcakes sold on Monday was 40% of the total number of cupcakes sold on both days. How many cupcakes did the bakery sell on Tuesday?

LET'S LEARN

1. How many cupcakes were sold on Tuesday?

Number of cupcakes sold on Monday → 40%
Number of cupcakes sold on Tuesday → 100% – 40% = 60%
The percentage of cupcakes sold on Tuesday was 60%.

280

40% 60%

$$60\% \text{ of } 280 = \frac{60}{100} \times 280$$
$$= 168$$

The bakery sold 168 cupcakes on Tuesday.

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Textbook 5 P209

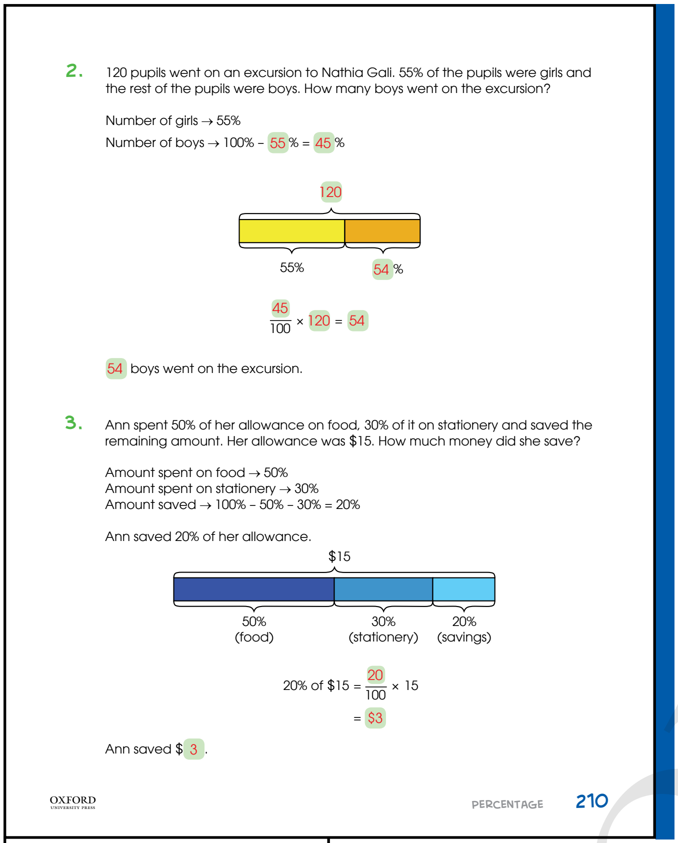
IN FOCUS

Discuss with pupils how the problem can be solved.
Ask pupils to draw a model representing the information.

LET'S LEARN

Ask pupils to check if their models are the same as the one drawn on P209.

Emphasise that since the total number of cupcakes is presented by 100%, the number of cupcakes sold on Tuesday is 100% − 40% = 60%. Thus, the number of cupcakes sold on Tuesday is 60% of 280, which is in turn = $\frac{60}{100}$ × 280.



2. 120 pupils went on an excursion to Nathia Gali. 55% of the pupils were girls and the rest of the pupils were boys. How many boys went on the excursion?

Number of girls → 55%

Number of boys → 100% – 55 % = 45 %

120

55% 54 %

$\frac{45}{100} \times 120 = 54$

54 boys went on the excursion.

3. Ann spent 50% of her allowance on food, 30% of it on stationery and saved the remaining amount. Her allowance was $15. How much money did she save?

Amount spent on food → 50%
Amount spent on stationery → 30%
Amount saved → 100% – 50% – 30% = 20%

Ann saved 20% of her allowance.

$15

50% (food) 30% (stationery) 20% (savings)

20% of \$15 = $\frac{20}{100} \times 15$

= \$3

Ann saved $ 3 .

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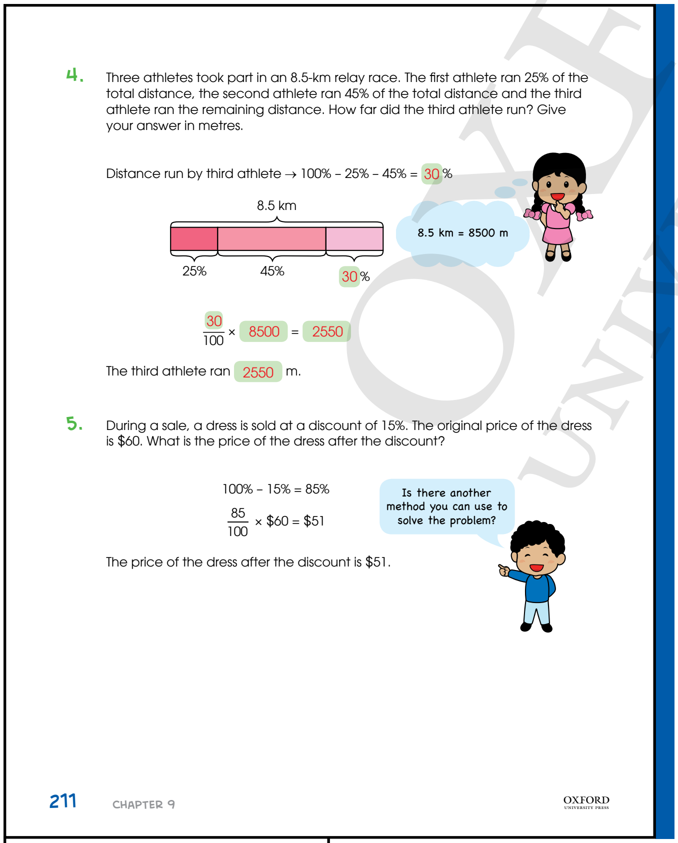
PERCENTAGE 210

Textbook 5 P210

Let's Learn 2 is similar to Let's Learn 1. The percentage of boys could be easily found using 100% − 55%. Thereafter, to find the number of boys, use 45% of 120, which is equivalent to $\frac{45}{100} \times 120$.

Let's Learn 3 is similar to Let's Learn 1 and 2, except that there are now 3 parts that make up the whole, so the amount saved is represented by: 100% − the percentage spent on food − the percentage spent on stationery.



4. Three athletes took part in an 8.5-km relay race. The first athlete ran 25% of the total distance, the second athlete ran 45% of the total distance and the third athlete ran the remaining distance. How far did the third athlete run? Give your answer in metres.

Distance run by third athlete → 100% – 25% – 45% = 30 %

8.5 km

8.5 km = 8500 m

25% 45% 30 %

$\frac{30}{100} \times 8500 = 2550$

The third athlete ran 2550 m.

5. During a sale, a dress is sold at a discount of 15%. The original price of the dress is $60. What is the price of the dress after the discount?

100% – 15% = 85%

$\frac{85}{100} \times \$60 = \$51$

Is there another method you can use to solve the problem?

The price of the dress after the discount is $51.

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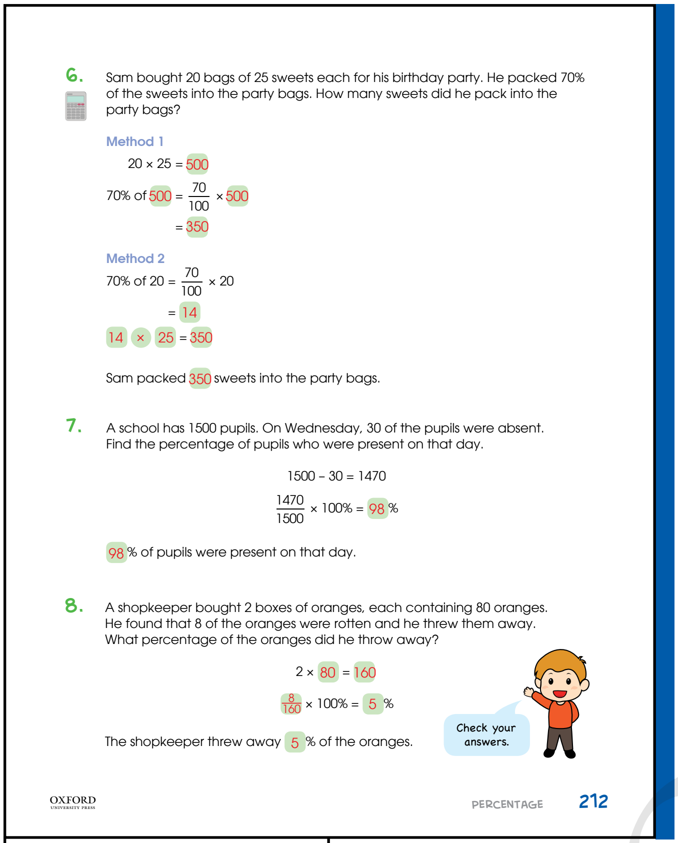
OXFORD UNIVERSITY PRESS

Textbook 5 P211

Let's Learn 4 is similar to Let's Learn 3, with 3 parts making up the whole. Give pupils some time to work on their solutions before going through with the class.

Let's Learn 5 requires pupils to find the price of a dress after 15% discount. The method presented requires pupils to find out the percentage to be paid after the discount. An alternative method would be to find the discount, then subtract that from the original price of the dress (i.e. Discount → $\frac{15}{100} \times 60 = 9$, Price after the discount → 60 – 9 = 51).



6. Sam bought 20 bags of 25 sweets each for his birthday party. He packed 70% of the sweets into the party bags. How many sweets did he pack into the party bags?

Method 1

$20 \times 25 = 500$

70% of $500 = \frac{70}{100} \times 500$

$= 350$

Method 2

70% of $20 = \frac{70}{100} \times 20$

$= 14$

$14 \times 25 = 350$

Sam packed 350 sweets into the party bags.

7. A school has 1500 pupils. On Wednesday, 30 of the pupils were absent. Find the percentage of pupils who were present on that day.

$1500 - 30 = 1470$

$\frac{1470}{1500} \times 100\% = 98\%$

98 % of pupils were present on that day.

8. A shopkeeper bought 2 boxes of oranges, each containing 80 oranges. He found that 8 of the oranges were rotten and he threw them away. What percentage of the oranges did he throw away?

$2 \times 80 = 160$

$\frac{8}{160} \times 100\% = 5\%$

The shopkeeper threw away 5 % of the oranges.

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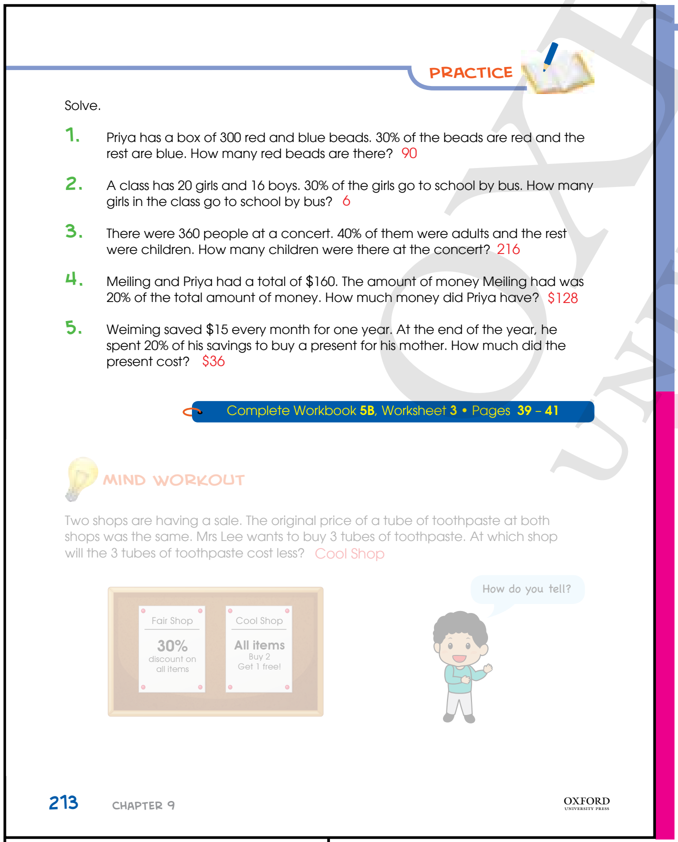
PERCENTAGE 212

Textbook 5 P212

Go through the methods illustrated in Let's Learn 6. In method 2, pupils need to multiply the number of bags packed by the number of sweets in each bag. Ask pupils which method they prefer and why.

For Let's Learn 7, tell pupils that they need to find the number of pupils who were present before they can find the percentage of pupils who were present. Percentage of pupils present = $\frac{\text{number of pupils present}}{\text{total number of pupils}} \times 100\%$.

For Let's Learn 8, pupils need to find the total number of oranges. The percentage of oranges thrown away will be $\frac{\text{number of oranges thrown away}}{\text{total number of oranges}} \times 100\%$.



PRACTICE

Solve.

1. Priya has a box of 300 red and blue beads. 30% of the beads are red and the rest are blue. How many red beads are there? 90
2. A class has 20 girls and 16 boys. 30% of the girls go to school by bus. How many girls in the class go to school by bus? 6
3. There were 360 people at a concert. 40% of them were adults and the rest were children. How many children were there at the concert? 216
4. Meiling and Priya had a total of $160. The amount of money Meiling had was 20% of the total amount of money. How much money did Priya have? $128
5. Weiming saved $15 every month for one year. At the end of the year, he spent 20% of his savings to buy a present for his mother. How much did the present cost? $36

Complete Workbook **5B**, Worksheet **3** • Pages **39 – 41**

MIND WORKOUT

Two shops are having a sale. The original price of a tube of toothpaste at both shops was the same. Mrs Lee wants to buy 3 tubes of toothpaste. At which shop will the 3 tubes of toothpaste cost less? Cool Shop

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Textbook 5 P213

PRACTICE

Work with pupils on the practice questions.

Independent seatwork

Assign pupils to complete Worksheet 3 (Workbook 5B P39 – 41).

Worksheet 3 (Workbook 5B P39 − 41)

1. 100% − 30% = 70%

   $\frac{70}{100} \times 150 = 105$

2. 100% − 70% − 20% = 10%

   $\frac{10}{100} \times 40 = 4$

3. $\frac{85}{100} \times 80 = 68$

   \$ 1.50 × 68 = \$102

4. 100% → \$1.50

   1% → \$1.50 ÷ 100

   = \$0.015

   90% = \$0.015 × 90

   = \$1.35

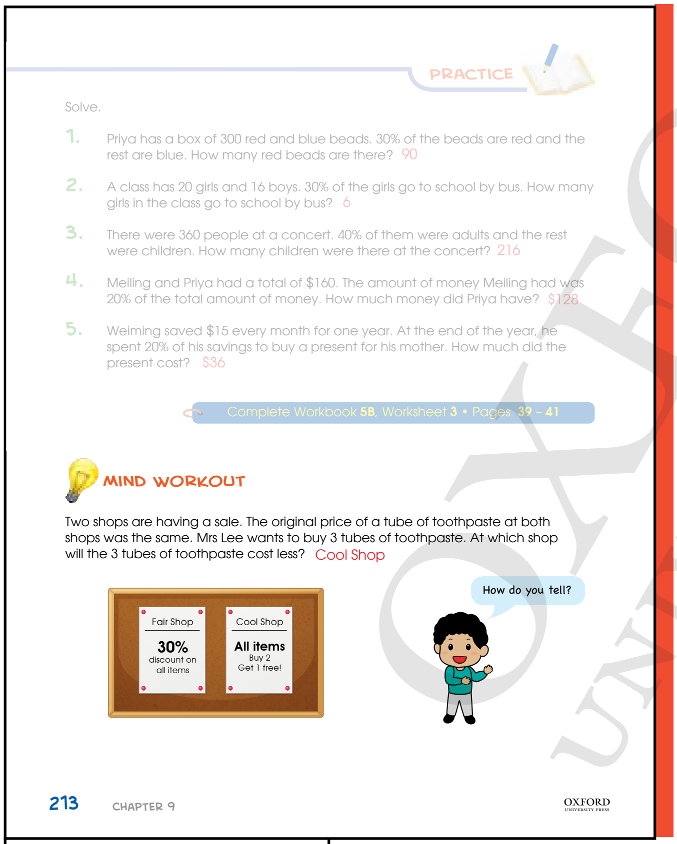
5. $\frac{60}{100} \times 120 = 72$ cm

   72 cm ÷ 4 = 18 cm

6. $\frac{70}{100} \times 40$ cm = 28 cm

   28 cm ÷ 2 = 14 cm

PROBLEM SOLVING, MATHS JOURNAL AND PUPIL REVIEW



PRACTICE

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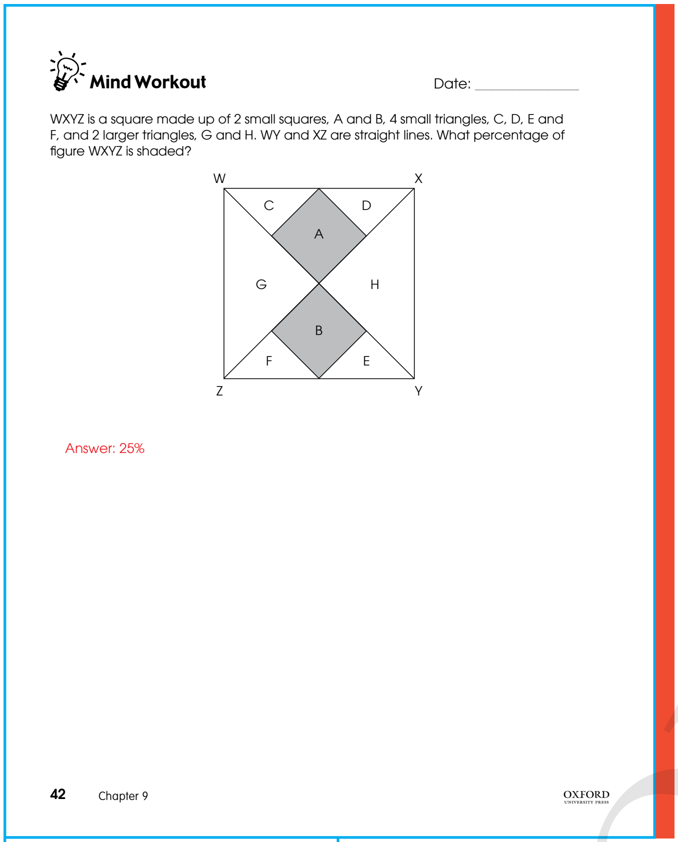
Textbook 5 P213

MIND WORKOUT

Pupils may work in groups to solve the problem. If pupils have difficulty approaching the question, suggest that they try it out using a few specific prices.



Mind Workout Date: ____________

WXYZ is a square made up of 2 small squares, A and B, 4 small triangles, C, D, E and F, and 2 larger triangles, G and H. WY and XZ are straight lines. What percentage of figure WXYZ is shaded?

Answer: 25%

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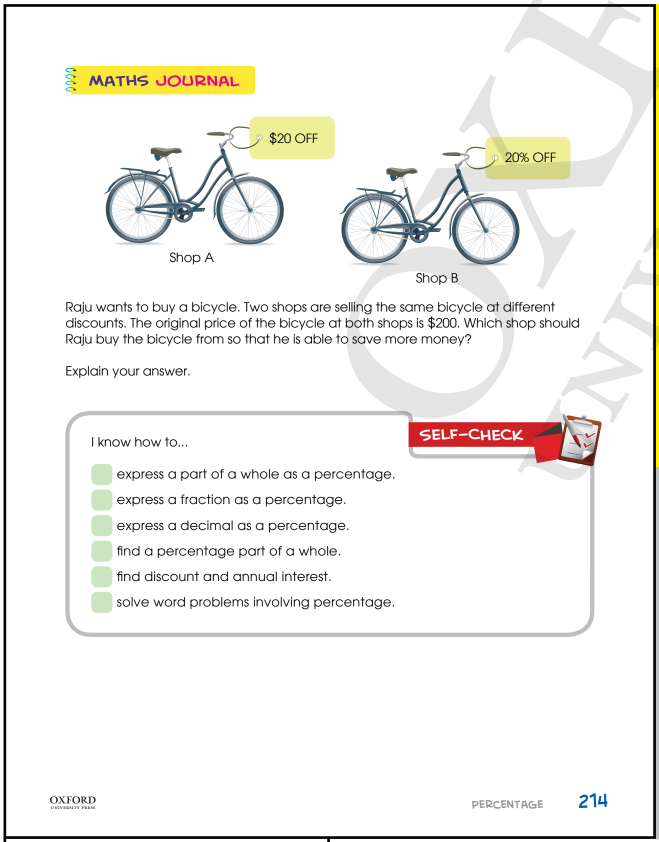
Workbook 5B P42

Mind Workout

Guide pupils by asking them to subdivide the figure such that WXYZ is made up of only small triangles. Pupils may work in groups to solve the problem.



MATHS JOURNAL

Raju wants to buy a bicycle. Two shops are selling the same bicycle at different discounts. The original price of the bicycle at both shops is $200. Which shop should Raju buy the bicycle from so that he is able to save more money?

Explain your answer.

SELF-CHECK

I know how to...

- ☐ express a part of a whole as a percentage.
- ☐ express a fraction as a percentage.
- ☐ express a decimal as a percentage.
- ☐ find a percentage part of a whole.
- ☐ find discount and annual interest.
- ☐ solve word problems involving percentage.

OXFORD UNIVERSITY PRESS PERCENTAGE 214

Textbook 5 P214

MATHS JOURNAL

Allow pupils to discuss in pairs. Ask:

- Will the conclusion still be the same if the original price of the bicycle is $90?
- What if the original price is $100?

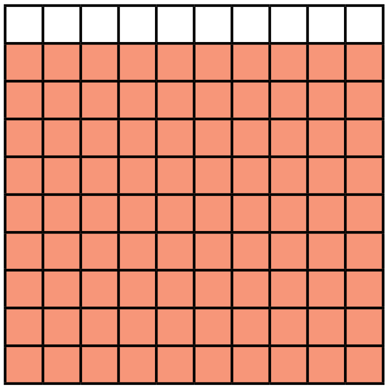
SELF-CHECK

Before the pupils do the self-check, review the important concepts once more by asking for examples learnt for each objective.

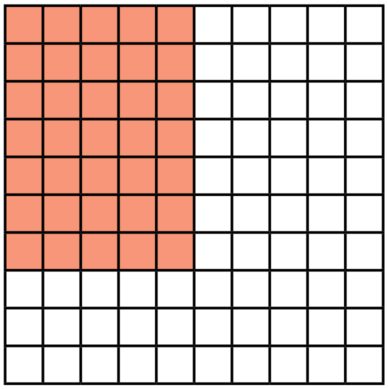
The self-check can be done after pupils have completed **Review 9** (Workbook 5B P43 – 46).

Answers Review 9 (Workbook 5B P43 − 46)

1. (a)



(b)



2. (a) $\frac{1}{4}$, 25%

(b) $\frac{17}{100}$, 17%

(c) $\frac{1}{20}$, 5%

(d) $\frac{24}{25}$, 96%

3. (a) 90
(b) 36
(c) $87\frac{1}{2}$
(d) $16\frac{2}{3}$

4. (a) 40
(b) 3
(c) 21
(d) 74

5. (a) 0.02
(b) 0.35
(c) 0.76
(d) 0.81

6. (a) $\frac{1}{20}$

(b) $\frac{1}{4}$

(c) $\frac{33}{50}$

(d) $\frac{9}{10}$

7. 2 kg = 2000 g

$\frac{700}{2000} \times 100\% = 35\%$

8. $\frac{20}{100} \times 1200 = 240$

9. 100% → \$1750
1% → \$1750 ÷ 100
= \$17.50
85% = \$17.50 × 85
= \$1487.50

10. 60% − 40% = 20%

$\frac{20}{100} \times 2500 = 500$

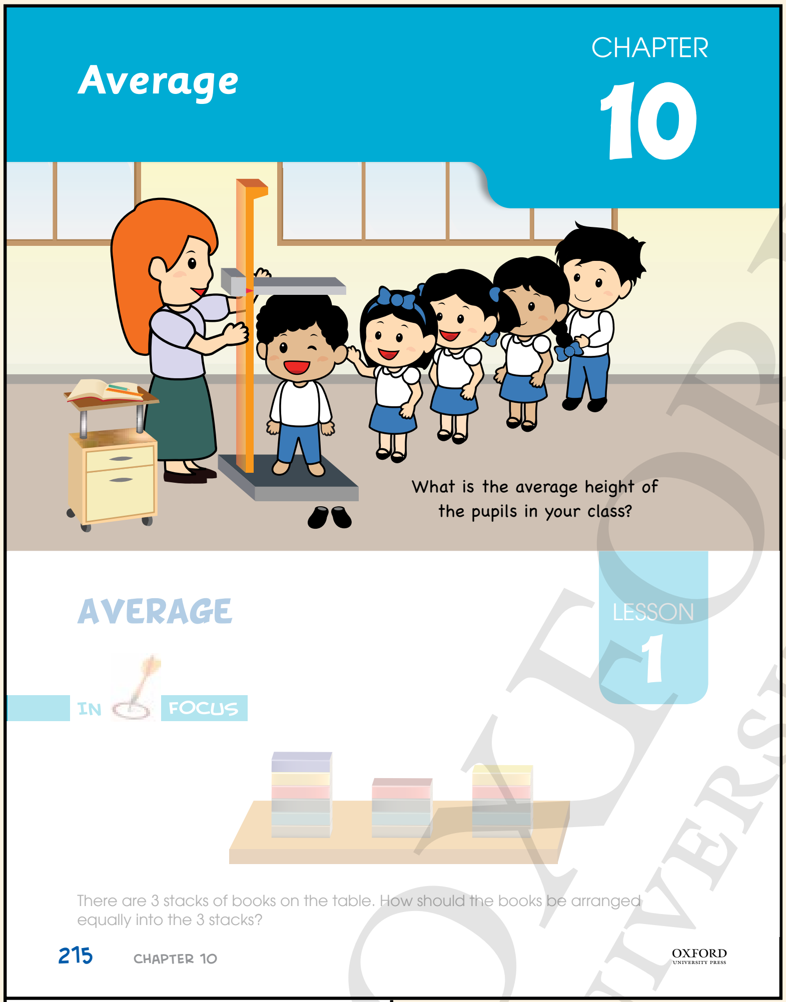
11. $\frac{65}{100} \times 500 = 325$

12. 100% − 60% − 15% = 25%

$\frac{25}{100} \times 1400 = 350$

AVERAGE

CHAPTER 10



Average

CHAPTER 10

What is the average height of the pupils in your class?

AVERAGE

LESSON 1

IN FOCUS

There are 3 stacks of books on the table. How should the books be arranged equally into the 3 stacks?

215 CHAPTER 10

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Textbook 5 P215

Related Resources

NSPM Textbook 5 (P215 − 223)
NSPM Workbook 5B (P47 − 54)

Materials

Multilink cubes, paper plates, mini whiteboard, markers, formula for average card, computer (ICT)

Lesson

Lesson 1 Average

Problem Solving, Maths Journal and Pupil Review

INTRODUCTION

This chapter covers another topic on statistics. Previously pupils have already learnt the different types of graphs - picture graph, bar chart and line graph. Finding average is a component in statistics where data is further explored and processed to find meaningful information. Therefore, it is important for pupils to understand the concept of average and not just the computation skills.

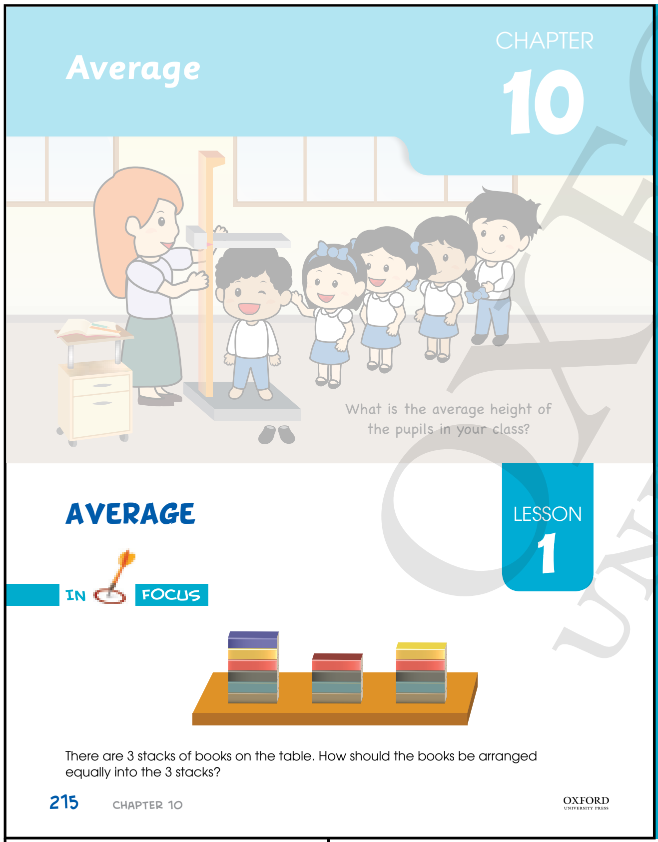
LESSON

1

AVERAGE

LEARNING OBJECTIVES

1. Find average by dividing total value by the number of data.
2. Understand the relationship between average, total value and number of data.
3. Find either average, total value or number of data, given the other two quantities.
4. Solve word problems involving average.



Average

CHAPTER

10

What is the average height of the pupils in your class?

AVERAGE

LESSON

1

IN FOCUS

There are 3 stacks of books on the table. How should the books be arranged equally into the 3 stacks?

215 CHAPTER 10

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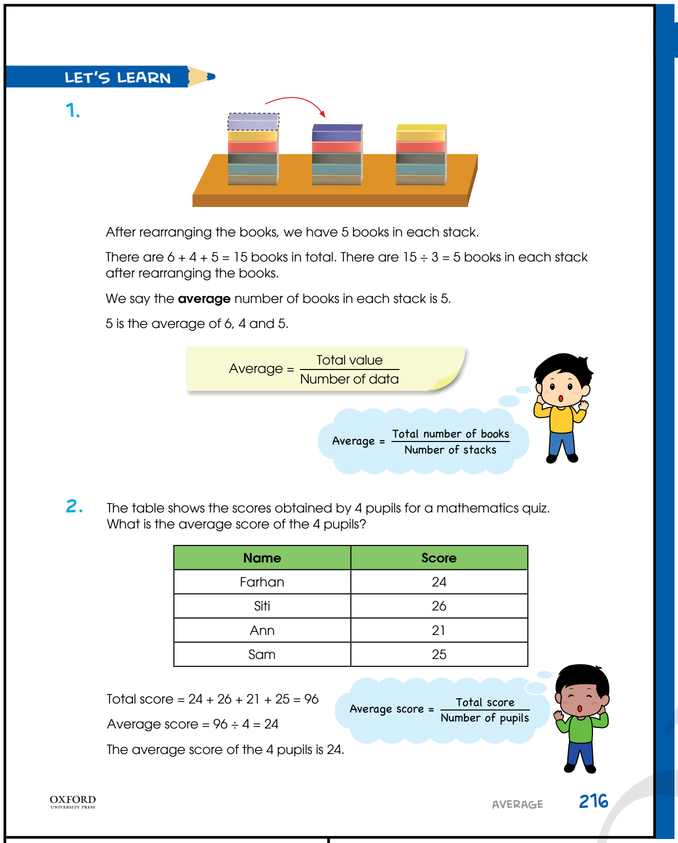
Textbook 5 P215

IN FOCUS

Arranging the books into equal stacks is a good opening activity to introduce the concept of average, that is to divide a number equally into a specific number of groups.

Solicit response from pupils on how they would find the answer based on their prior knowledge. Teacher and pupils can also act it out to find the answer, and translate that action into mathematical statements.



LET'S LEARN

1.

After rearranging the books, we have 5 books in each stack.

There are 6 + 4 + 5 = 15 books in total. There are 15 ÷ 3 = 5 books in each stack after rearranging the books.

We say the **average** number of books in each stack is 5.

5 is the average of 6, 4 and 5.

$$\text{Average} = \frac{\text{Total value}}{\text{Number of data}}$$

$$\text{Average} = \frac{\text{Total number of books}}{\text{Number of stacks}}$$

2. The table shows the scores obtained by 4 pupils for a mathematics quiz. What is the average score of the 4 pupils?

Name	Score
Farhan	24
Siti	26
Ann	21
Sam	25

Total score = 24 + 26 + 21 + 25 = 96

Average score = 96 ÷ 4 = 24

$$\text{Average score} = \frac{\text{Total score}}{\text{Number of pupils}}$$

The average score of the 4 pupils is 24.

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AVERAGE 216

Textbook 5 P216

LET'S LEARN

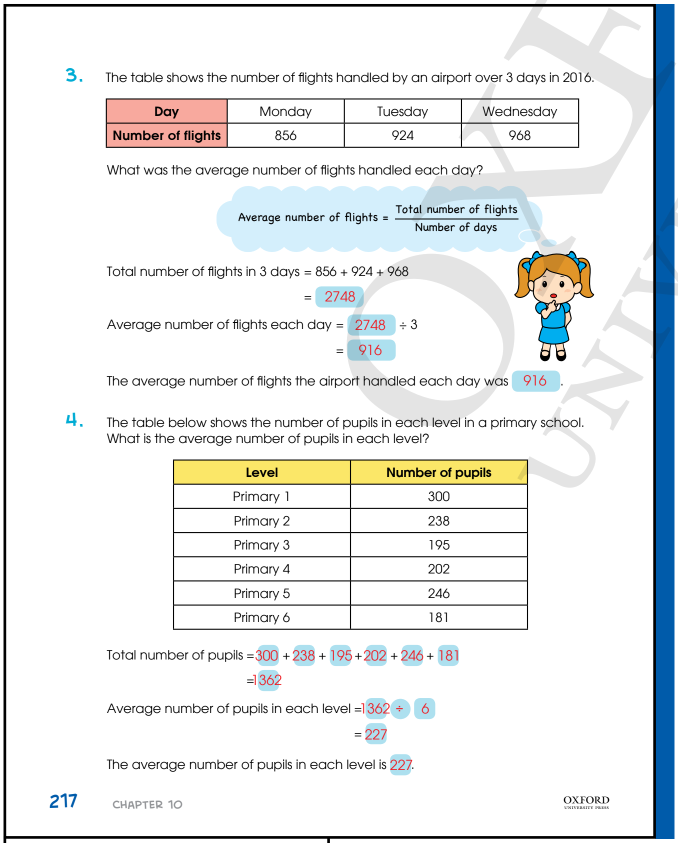
Referring to the In Focus, explain how the books are rearranged in Let's Learn 1.

Show pupils that the number of books in each stack can be found by dividing the total number of books by the number of stacks. Tell pupils that the number of books in each stack is also known as the average number of books in a stack.

Lead pupils to see that average can be found by dividing total value by the number of data. Provide other examples to calculate average. Some examples include average height, average number of items, average mass and average age.

Let's Learn 2 involves reading data from a table to obtain information necessary to calculate average. Ask:

- How can you find the total score?
- How can you find the number of pupils?
- How can you find average score given the above information?



3. The table shows the number of flights handled by an airport over 3 days in 2016.

Day	Monday	Tuesday	Wednesday
Number of flights	856	924	968

What was the average number of flights handled each day?

$$\text{Average number of flights} = \frac{\text{Total number of flights}}{\text{Number of days}}$$

Total number of flights in 3 days = 856 + 924 + 968

= 2748

Average number of flights each day = 2748 ÷ 3

= 916

The average number of flights the airport handled each day was 916.

4. The table below shows the number of pupils in each level in a primary school. What is the average number of pupils in each level?

Level	Number of pupils
Primary 1	300
Primary 2	238
Primary 3	195
Primary 4	202
Primary 5	246
Primary 6	181

Total number of pupils = 300 + 238 + 195 + 202 + 246 + 181

= 1362

Average number of pupils in each level = 1362 ÷ 6

= 227

The average number of pupils in each level is 227.

217 CHAPTER 10

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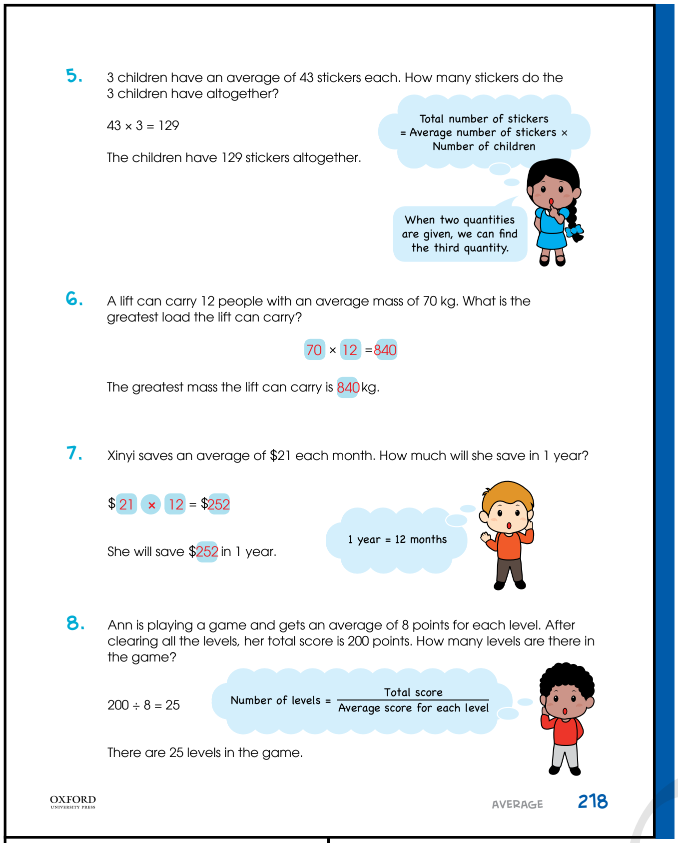
Textbook 5 P217

Guide pupils to fill in the blanks in Let's Learn 3 using the same approach.

Let's Learn 4 allows pupils to practise reading data from a table to obtain the information needed to calculate the average.

Explain to pupils that the method of calculating average is the same, regardless of the number of data points.



5. 3 children have an average of 43 stickers each. How many stickers do the 3 children have altogether?

43 × 3 = 129

The children have 129 stickers altogether.

Total number of stickers
= Average number of stickers × Number of children

When two quantities are given, we can find the third quantity.

6. A lift can carry 12 people with an average mass of 70 kg. What is the greatest load the lift can carry?

70 × 12 = 840

The greatest mass the lift can carry is 840 kg.

7. Xinyi saves an average of $21 each month. How much will she save in 1 year?

$ 21 × 12 = $252

She will save $252 in 1 year.

1 year = 12 months

8. Ann is playing a game and gets an average of 8 points for each level. After clearing all the levels, her total score is 200 points. How many levels are there in the game?

200 ÷ 8 = 25

$$\text{Number of levels} = \frac{\text{Total score}}{\text{Average score for each level}}$$

There are 25 levels in the game.

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AVERAGE 218

Textbook 5 P218

For Let's Learn 5, show pupils the different ways the three quantities are related given the formula for calculating average.

$$\text{Average} = \frac{\text{total value}}{\text{number of data}}$$

Total value = average × number of data

$$\text{Number of data} = \frac{\text{total value}}{\text{average}}$$

Explain that when two quantities are given, the third quantity can be found. Provide examples for better understanding.

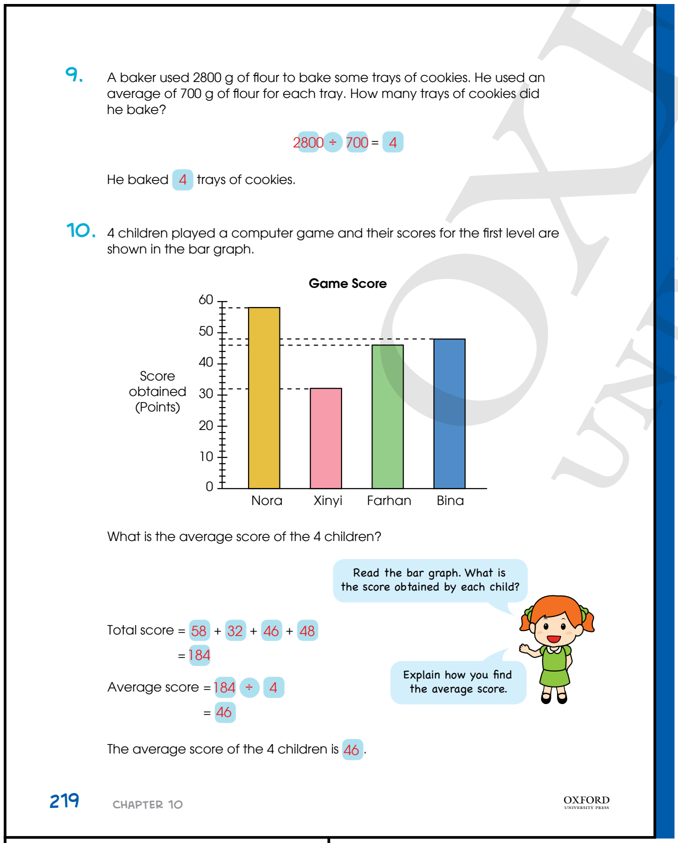
For Let's Learn 6, guide pupils to find the total load given the number of people and the average mass. Get pupils to explain how the answer is found.

For Let's Learn 7, prompt pupils to fill in the blanks by asking:

- What are the quantities given?
- What is the average amount she saves in a month?
- How many months are there in a year?
- What is the relationship between average amount she saves, number of months and total amount she saves?
- How can we find the total amount saved in a year?

Remind pupils that average = $\frac{\text{total value}}{\text{number of data}}$.

For Let's Learn 8, given average and total value, guide pupils to find number of data. Get pupils to recall the three different ways the three quantities are related.



9. A baker used 2800 g of flour to bake some trays of cookies. He used an average of 700 g of flour for each tray. How many trays of cookies did he bake?

2800 ÷ 700 = 4

He baked 4 trays of cookies.

10. 4 children played a computer game and their scores for the first level are shown in the bar graph.

What is the average score of the 4 children?

Read the bar graph. What is the score obtained by each child?

Total score = 58 + 32 + 46 + 48
= 184

Average score = 184 ÷ 4
= 46

Explain how you find the average score.

The average score of the 4 children is 46.

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Textbook 5 P219

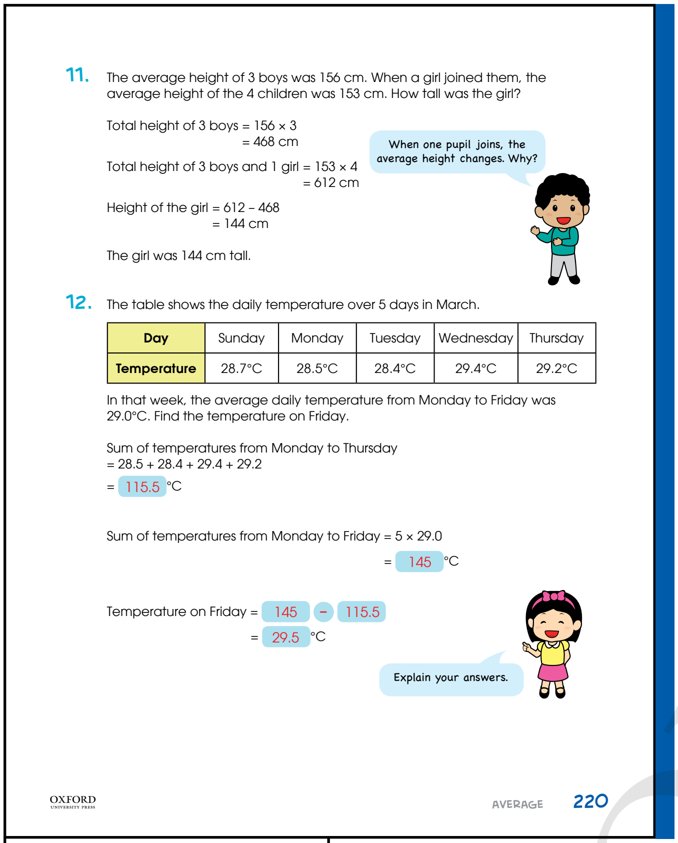
For Let's Learn 9, prompt pupils to fill in the blanks by asking:

- What are the quantities given?
- What is the average amount of flour for each tray?
- What is the total amount of flour?
- What is the relationship between average amount of flour for each tray, number of trays and total amount of flour?

How can we find number of trays?

Let's Learn 10 shows pupils that bar graphs can also be used to display data that is used to find average. Pupils need to be able to read bar graphs to get information about the total value and the number of data to calculate the average.

Get pupils to explain how to read the graph and how the data found is used to find the average.



11. The average height of 3 boys was 156 cm. When a girl joined them, the average height of the 4 children was 153 cm. How tall was the girl?

Total height of 3 boys = 156 × 3
= 468 cm

Total height of 3 boys and 1 girl = 153 × 4
= 612 cm

Height of the girl = 612 − 468
= 144 cm

The girl was 144 cm tall.

12. The table shows the daily temperature over 5 days in March.

Day	Sunday	Monday	Tuesday	Wednesday	Thursday
Temperature	28.7°C	28.5°C	28.4°C	29.4°C	29.2°C

In that week, the average daily temperature from Monday to Friday was 29.0°C. Find the temperature on Friday.

Sum of temperatures from Monday to Thursday
= 28.5 + 28.4 + 29.4 + 29.2
= 115.5 °C

Sum of temperatures from Monday to Friday = 5 × 29.0
= 145 °C

Temperature on Friday = 145 − 115.5
= 29.5 °C

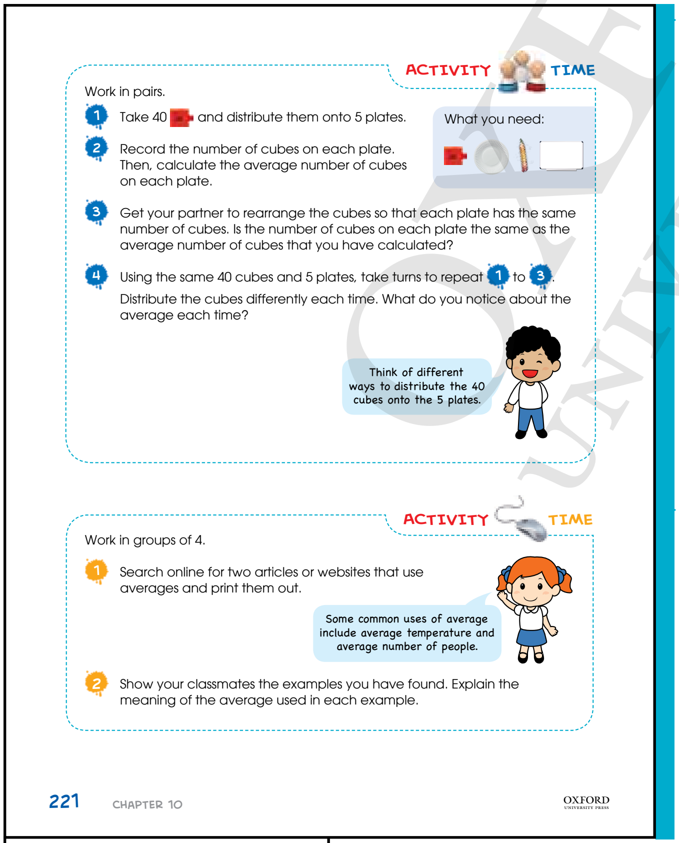
Textbook 5 P220

For Let's Learn 11, guide pupils to read and understand the question. Lead them to see that a change in total value and number of data leads to a change in average. Explain how the difference between two total values shows the quantity of a given data point.

Teacher can provide illustrations to help pupils see that the difference between the total height of 3 boys and the total height of 3 boys and a girl gives the height of the girl.

Let's Learn 12 requires pupils to read data from a table. Guide pupils to see that the temperature on Friday can be found by calculating the difference between the sum of temperatures from Monday to Friday and the sum of temperatures from Monday to Thursday.

Invite pupils to show and explain their workings to the class.



ACTIVITY TIME

Work in pairs.

1. Take 40 🟥 and distribute them onto 5 plates.
2. Record the number of cubes on each plate. Then, calculate the average number of cubes on each plate.
3. Get your partner to rearrange the cubes so that each plate has the same number of cubes. Is the number of cubes on each plate the same as the average number of cubes that you have calculated?
4. Using the same 40 cubes and 5 plates, take turns to repeat 1 to 3. Distribute the cubes differently each time. What do you notice about the average each time?

What you need:

ACTIVITY TIME

Work in groups of 4.

1. Search online for two articles or websites that use averages and print them out.
2. Show your classmates the examples you have found. Explain the meaning of the average used in each example.

Textbook 5 P221

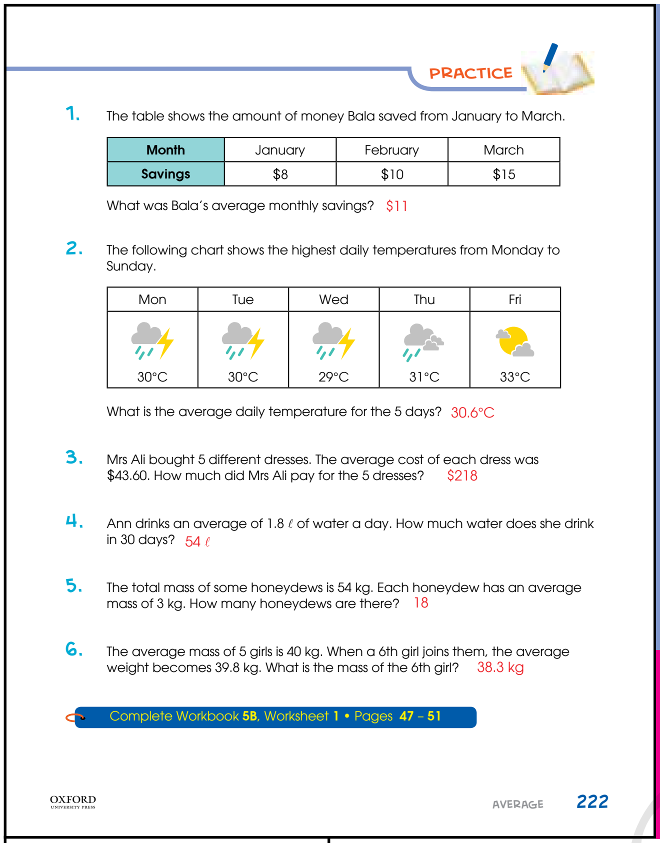
ACTIVITY TIME

Assign pupils to work in pairs.The activity shows pupils that regardless of the ways the cubes are distributed, the total number of cubes is the same. Since the total value is used to calculate the average, the average remains the same no matter how the cubes are distributed.

Get pupils to explain why the average remains unchanged.

ACTIVITY TIME

Assign pupils to work in groups of 4. The activity helps pupils relate the use of average to everyday life. Pupils need to understand and explain the meaning of average found in different contexts and examples.



PRACTICE

1. The table shows the amount of money Bala saved from January to March.

Month	January	February	March
Savings	$8	$10	$15

What was Bala's average monthly savings? $11

2. The following chart shows the highest daily temperatures from Monday to Sunday.

Mon	Tue	Wed	Thu	Fri
30°C	30°C	29°C	31°C	33°C

What is the average daily temperature for the 5 days? 30.6°C

3. Mrs Ali bought 5 different dresses. The average cost of each dress was $43.60. How much did Mrs Ali pay for the 5 dresses? $218

4. Ann drinks an average of 1.8 ℓ of water a day. How much water does she drink in 30 days? 54 ℓ

5. The total mass of some honeydews is 54 kg. Each honeydew has an average mass of 3 kg. How many honeydews are there? 18

6. The average mass of 5 girls is 40 kg. When a 6th girl joins them, the average weight becomes 39.8 kg. What is the mass of the 6th girl? 38.3 kg

Complete Workbook **5B**, Worksheet **1** • Pages **47 – 51**

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AVERAGE 222

Textbook 5 P222

PRACTICE

Allow pupils to discuss and work in pairs. Give pupils sufficient time to work through the practice before going through with them.

Independent seatwork

Assign pupils to complete Worksheet 1 (Workbook 5B P47 − 51).

Answers

Worksheet 1 (Workbook 5B P47 − 51)

1. $4.90 + $5.45 + $6.65 + $6.80 + $6.65 = 23.80
   $23.80 ÷ 4 = $5.95

2. 50 kg × 9 = 450 kg

3. $13.50 × 4 = $54

4. 10 s × 20 = 200 s

5. 5250 ml ÷ 750 ml = 7

6. 13 + 11 + 8 + 16 = 48

7. 165 × 5 = 825 cm
   825 + 135 = 960 cm
   960 cm ÷ 6 = 160 cm

8. $3.50 × 12 = $42
   $202.50 − $42 = $160.50
   $160.50 ÷ 15 = $10.70

9. 29 × 9 = 261
   261 − 210 = 51

10. 65 × 6 = 390
    72 × 5 = 360
    390 − 360 = 30

11. 38 + 25 + 32 + 21 = 116
    116 ÷ 4 = 29

LESSON PLAN

Chapter 10
Lesson 1

Specific Learning Focus

- Find average by dividing total value by the number of data.
- Understand the relationship between average, total value and number of data.
- Find either average, total value or number of data, given the other two quantities.
- Solve word problems involving average.

Suggested Duration

8 periods

Prior Learning

Average is part of the statistics strand of Mathematics, in continuation from bar graphs, line graphs and picture graphs learnt in previous grades.

Pre-emptive Pitfalls

Average should be a relatively simple concept to grasp.

Introduction

Average is the first step to data analysis. Remind pupils that they have previously learnt to interpret and represent data in the form of bar graph, line graph and picture graph. The purpose of finding the average of data is to process, organise and make the information/data more meaningful and analytical. Give real-life examples of average such as the average test score, average temperature of a city, average salary, average weight, average age, average game score, average revenue, etc. Point out to pupils the formula for calculating average: Average = $\frac{\text{total value}}{\text{number of data}}$ Total value = average × number of data, Number of data = $\frac{\text{total value}}{\text{average}}$. In Let's Learn 10 (Textbook 5 P219), encourage pupils to extract the information from the bar graphs needed to calculate the average. Lead them to see that to calculate the average, they first need to find the total value by reading off each bar for the score of each child and then add up the values. Then, divide the total value by the number of data to find the average (in this case, the number of data is the total number of children).

Problem Solving

'Mind Workout' and 'Maths Journal' (Textbook 5 P223) develop pupils' critical-thinking skills as they require pupils to first apply the concept taught and then substitute the values into the formula for calculating average. To solve 'Mind Workout', guide pupils to find the answer to the question by using the formula for average to work backwards as the average is already given in the question. In 'Maths Journal', the concept of finding average through dividing the total value by the number of data is reinforced. Explain to pupils that given the two averages, first find the total height of boys and total height of girls respectively. Add the two values to get the total value. Then, to find the average height, divide the total value by the number of data (in this case, total number of children), which is 6. Emphasise that the overall average should not be found by taking the average of two averages.

Activities

For the second activity (Textbook 5 P221), cut out and laminate the formula cards for each group of pupils. Encourage pupils to present the data collected on chart paper, and then find the average of the data. Prompt pupils to apply the formula for average and write on their mini whiteboards. Get pupils to do online research and present their findings to the class.

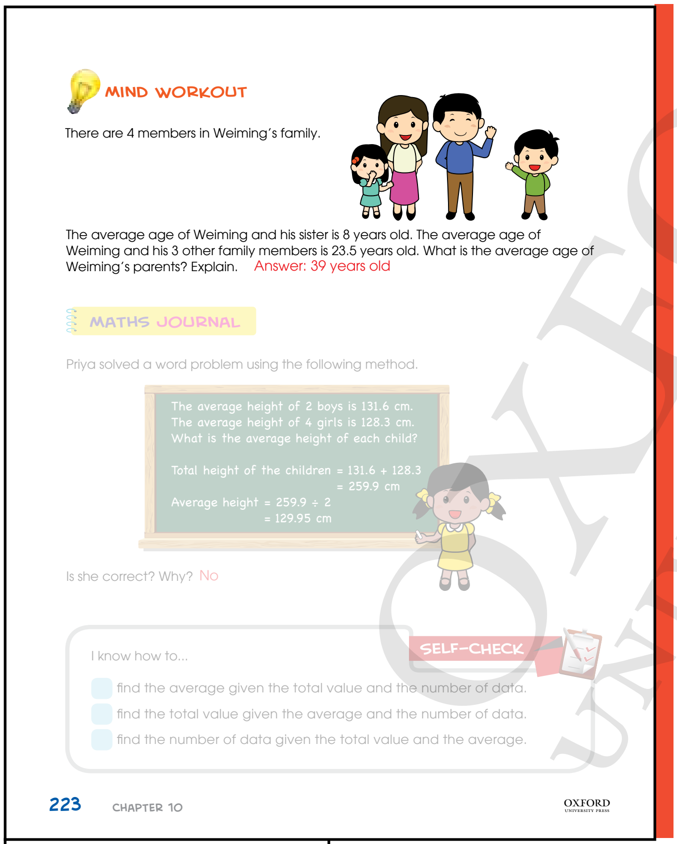
Resources

- multilink cubes
- markers
- paper plates
- mini whiteboard
- formula for average card (Activity Handbook 5 P45)
- computer (ICT)

Mathematical Communication Support

Encourage pupils to research online and come up with articles with average as statistical data. Ask pupils to give class presentation of their research. Encourage pupils to ask questions during each presentation.

PROBLEM SOLVING, MATHS JOURNAL AND PUPIL REVIEW



MIND WORKOUT

There are 4 members in Weiming's family.

The average age of Weiming and his sister is 8 years old. The average age of Weiming and his 3 other family members is 23.5 years old. What is the average age of Weiming's parents? Explain. Answer: 39 years old

MATHS JOURNAL

Priya solved a word problem using the following method.

The average height of 2 boys is 131.6 cm.
The average height of 4 girls is 128.3 cm.
What is the average height of each child?

Total height of the children = 131.6 + 128.3
= 259.9 cm
Average height = 259.9 ÷ 2
= 129.95 cm

Is she correct? Why? No

SELF-CHECK

I know how to...

- ☐ find the average given the total value and the number of data.
- ☐ find the total value given the average and the number of data.
- ☐ find the number of data given the total value and the average.

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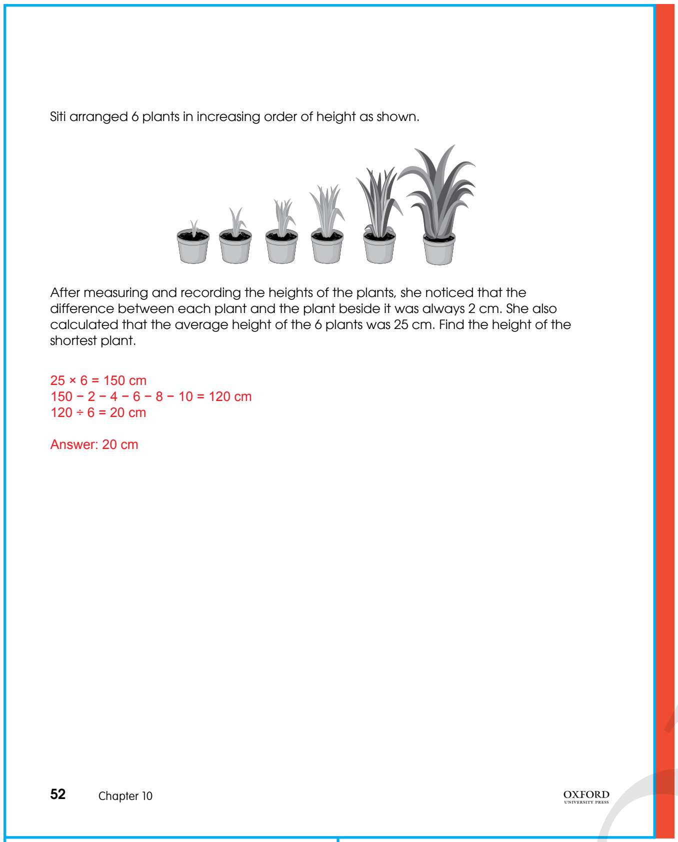
Textbook 5 P223

MIND WORKOUT

Guide pupils to find the total value of different number of data, and then compare these different total values to find a particular data point.



Siti arranged 6 plants in increasing order of height as shown.

After measuring and recording the heights of the plants, she noticed that the difference between each plant and the plant beside it was always 2 cm. She also calculated that the average height of the 6 plants was 25 cm. Find the height of the shortest plant.

25 × 6 = 150 cm
150 − 2 − 4 − 6 − 8 − 10 = 120 cm
120 ÷ 6 = 20 cm

Answer: 20 cm

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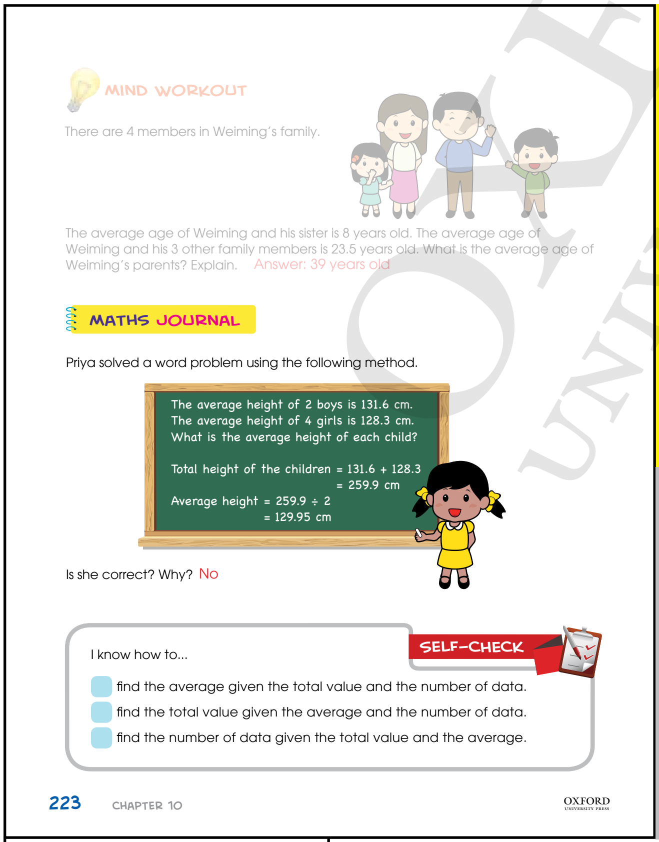
Workbook 5B P52

Mind Workout

It is easier for pupils to visualise and solve the question by model drawing. Pupils will then be able to solve the problem using the unitary method.



MIND WORKOUT

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= 259.9 cm
Average height = 259.9 ÷ 2
= 129.95 cm

Is she correct? Why? No

SELF-CHECK

I know how to...

☐ find the average given the total value and the number of data.
☐ find the total value given the average and the number of data.
☐ find the number of data given the total value and the average.

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Textbook 5 P223

MATHS JOURNAL

The maths journal question reinforces the concept of finding average, through dividing the total value by the number of data. A common mistake might be taking the average of two averages to find the overall average.

Get pupils to explain why Priya is not correct and invite pupils to share the correct answer.

SELF-CHECK

Before doing the self-check, review important concepts.

The self-check can be done after pupils have completed **Review 10** (Workbook 5B P53 – 54) as a consolidation of understanding for the chapter.

Review 10 (Workbook 5B P53 – 54)

1. 10 + 11 + 14 + 17 = 52
   52 ÷ 4 = 13

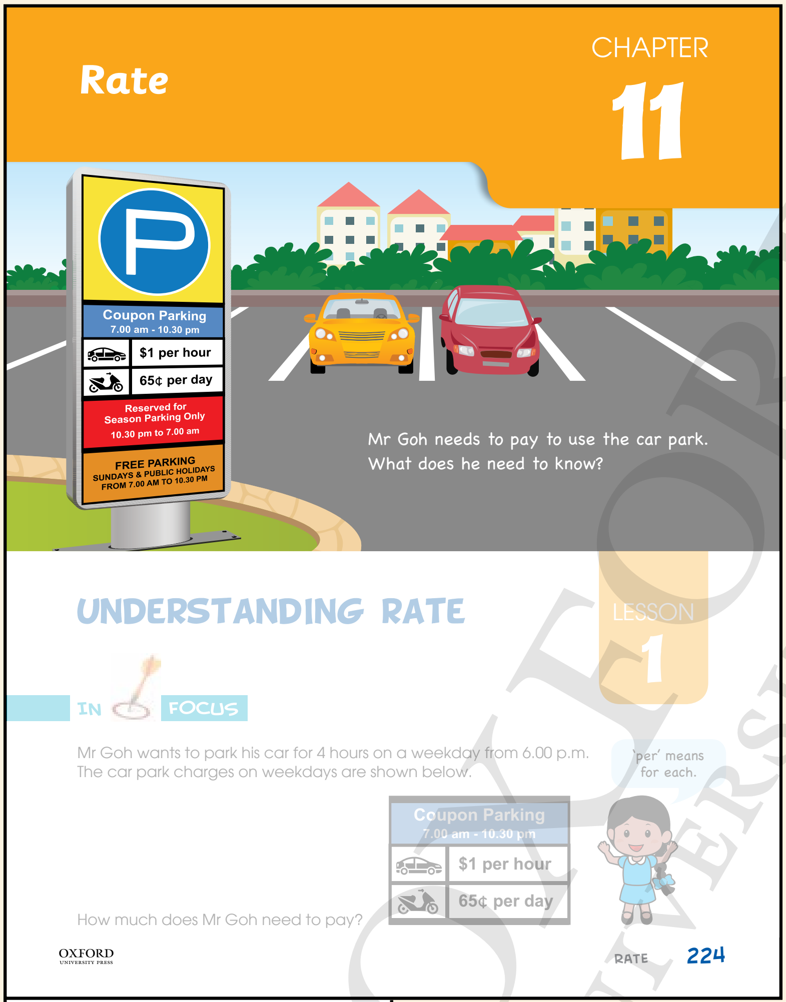
2. For food store A, \$205 + \$238 + \$253 = \$696
   For food store B, \$345 + \$162 + \$184 = \$691
   For food store C, \$158 + \$206 + \$288 = \$652
   Answer: A

3. 17 + 33 + 59 + 55 + 21 = 185
   185 ÷ 5 = 37

4. \$3.20 × 3 = \$9.60
   \$3.50 × 5 = \$17.50
   \$17.50 – \$9.60 = \$7.90

RATE

CHAPTER 11



Rate

CHAPTER

11

Coupon Parking
7.00 am - 10.30 pm

	$1 per hour
	65¢ per day

Reserved for
Season Parking Only
10.30 pm to 7.00 am

FREE PARKING
SUNDAYS & PUBLIC HOLIDAYS
FROM 7.00 AM TO 10.30 PM

Mr Goh needs to pay to use the car park.
What does he need to know?

UNDERSTANDING RATE

LESSON

1

IN FOCUS

Mr Goh wants to park his car for 4 hours on a weekday from 6.00 p.m.
The car park charges on weekdays are shown below.

'per' means for each.

Coupon Parking
7.00 am - 10.30 pm

	$1 per hour
	65¢ per day

How much does Mr Goh need to pay?

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RATE 224

Textbook 5 P224

Related Resources

NSPM Textbook 5 (P224 – 237)
NSPM Workbook 5B (P55 – 68)

Materials

Computer (ICT), newspapers, mini whiteboard, markers

Lesson

Lesson 1	Understanding Rate
Lesson 2	Solving Word Problems

Problem Solving, Maths Journal and Pupil Review

INTRODUCTION

The key idea in this chapter is that rate is an amount of quantity per unit of another quantity. Pupils are required to find rate given the total amount and number of units, the total amount given the rate and number of units and the number of units given the rate and the total amount. Pupils should be given the opportunity to discuss examples of rate in real life.

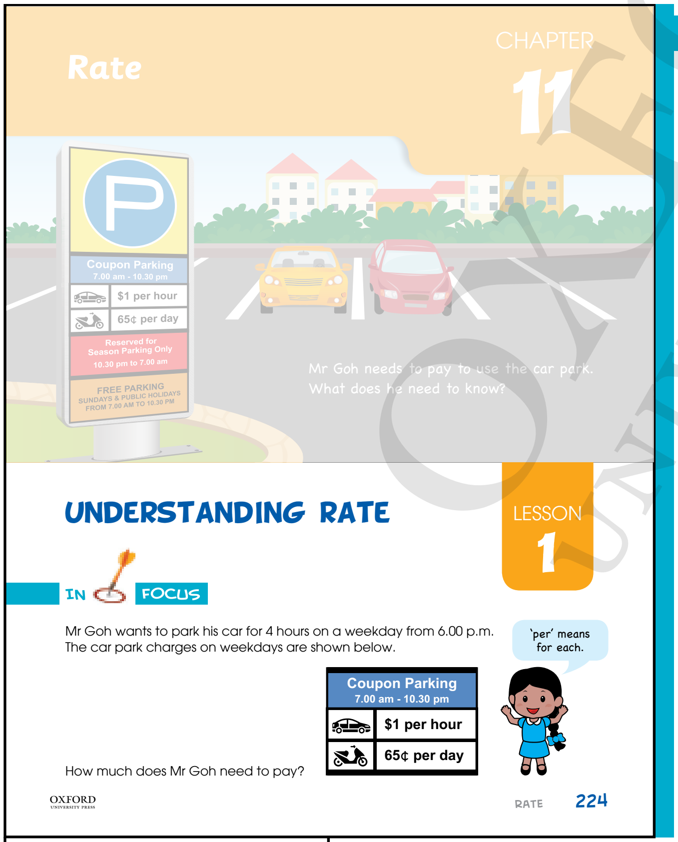
LESSON

1

UNDERSTANDING RATE

LEARNING OBJECTIVES

1. Express rate as an amount of quantity per unit of another quantity.
2. Find rate given the total amount and number of units.
3. Find the total amount given the rate and number of units.
4. Find the number of units given the rate and the total amount.



Mr Goh needs to pay to use the car park. What does he need to know?

UNDERSTANDING RATE

LESSON 1

IN FOCUS

Mr Goh wants to park his car for 4 hours on a weekday from 6.00 p.m. The car park charges on weekdays are shown below.

Coupon Parking 7.00 am - 10.30 pm	
🚗	$1 per hour
🛵	65¢ per day

'per' means for each.

How much does Mr Goh need to pay?

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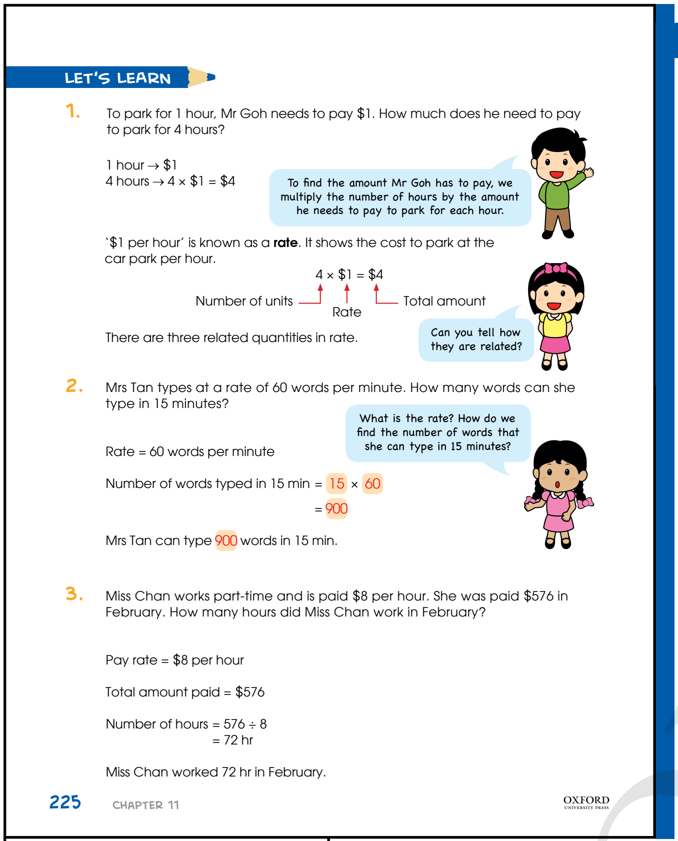
RATE 224

Textbook 5 P224

IN FOCUS

Use the Chapter Opener to discuss parking charges. Pose the problem to the pupils and ask if they have seen such parking signage. Guide pupils with these questions:

- What time does Mr Goh park his car until?
- Should you look at the rate for cars or motorcycles to find out Mr Goh's parking charges?
- How much does he need to pay every hour?



LET'S LEARN

1. To park for 1 hour, Mr Goh needs to pay $1. How much does he need to pay to park for 4 hours?

1 hour → $1
4 hours → 4 × $1 = $4

To find the amount Mr Goh has to pay, we multiply the number of hours by the amount he needs to pay to park for each hour.

'$1 per hour' is known as a **rate**. It shows the cost to park at the car park per hour.

4 × $1 = $4
Number of units
Rate
Total amount

There are three related quantities in rate.

Can you tell how they are related?

2. Mrs Tan types at a rate of 60 words per minute. How many words can she type in 15 minutes?

What is the rate? How do we find the number of words that she can type in 15 minutes?

Rate = 60 words per minute

Number of words typed in 15 min = 15 × 60
= 900

Mrs Tan can type 900 words in 15 min.

3. Miss Chan works part-time and is paid $8 per hour. She was paid $576 in February. How many hours did Miss Chan work in February?

Pay rate = $8 per hour

Total amount paid = $576

Number of hours = 576 ÷ 8
= 72 hr

Miss Chan worked 72 hr in February.

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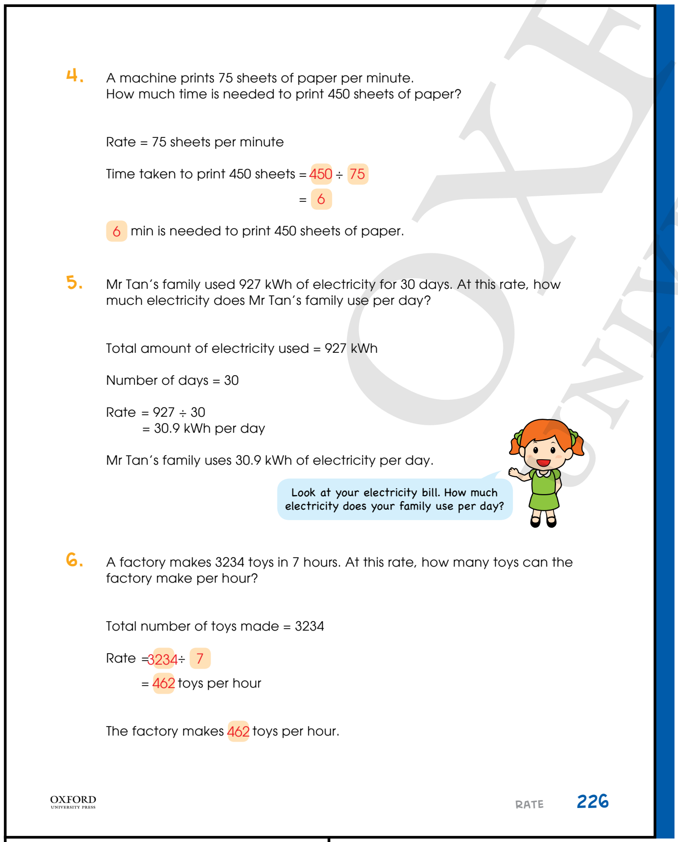
Textbook 5 P225

LET'S LEARN

For Let's Learn 1, use the unitary method to show that the parking charge for 1 hr is $1 so the charges will be 4 times as much for 4 hr. Explain what rate means and the different quantities in rate. Establish that rate = total amount ÷ number of units.

For Let's Learn 2, elicit that the rate is 60 words per minute. Guide pupils by writing on the board:
1 min → 60 words
15 min → 60 x 15 = ___ words
Ask pupils to verbalise their answers.

Let's Learn 3 involves solving for the number of units while providing the total amount and rate. Elicit the rate and total amount used in this problem. Lead pupils to conclude that number of units = total amount ÷ rate.



4. A machine prints 75 sheets of paper per minute.
How much time is needed to print 450 sheets of paper?

Rate = 75 sheets per minute

Time taken to print 450 sheets = 450 ÷ 75
= 6

6 min is needed to print 450 sheets of paper.

5. Mr Tan's family used 927 kWh of electricity for 30 days. At this rate, how much electricity does Mr Tan's family use per day?

Total amount of electricity used = 927 kWh

Number of days = 30

Rate = 927 ÷ 30
= 30.9 kWh per day

Mr Tan's family uses 30.9 kWh of electricity per day.

Look at your electricity bill. How much electricity does your family use per day?

6. A factory makes 3234 toys in 7 hours. At this rate, how many toys can the factory make per hour?

Total number of toys made = 3234

Rate = 3234 ÷ 7
= 462 toys per hour

The factory makes 462 toys per hour.

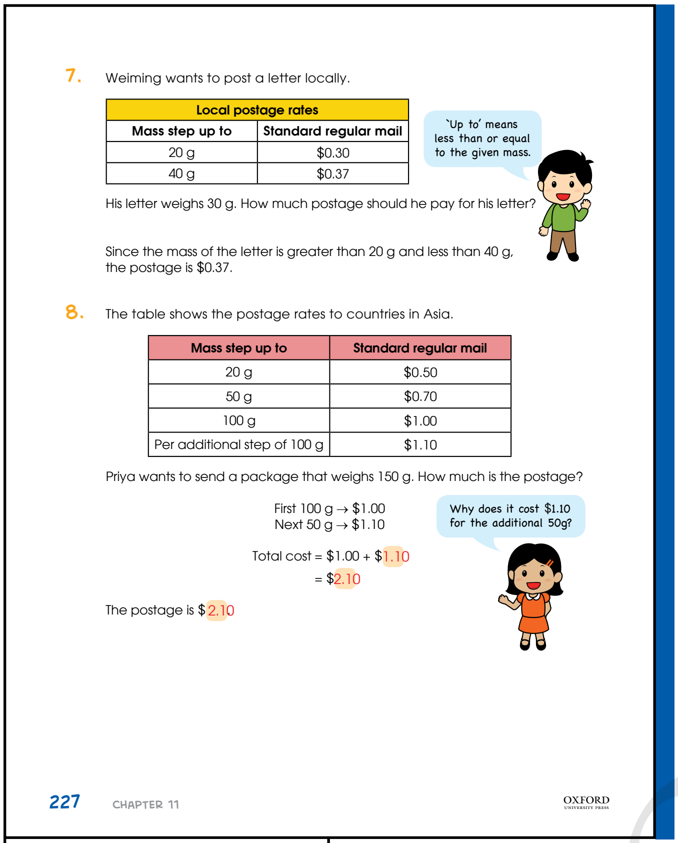
OXFORD UNIVERSITY PRESS RATE 226

Textbook 5 P226

Let's Learn 4 enables pupils to apply what they have learnt in Let's Learn 3. Give pupils sufficient time to work out their solutions before going through.

For Let's Learn 5, the total amount and number of units are given. Help pupils deduce that rate = total amount ÷ number of units. For class discussion, ask pupils if they know the amount of electricity their family uses per day. Invite pupils to share their responses.

For Let's Learn 6, get pupils to work out the solution using the formula of rate learnt in Let's Learn 5 before going through.



7. Weiming wants to post a letter locally.

Local postage rates	
Mass step up to	**Standard regular mail**
20 g	$0.30
40 g	$0.37

'Up to' means less than or equal to the given mass.

His letter weighs 30 g. How much postage should he pay for his letter?

Since the mass of the letter is greater than 20 g and less than 40 g, the postage is $0.37.

8. The table shows the postage rates to countries in Asia.

Mass step up to	Standard regular mail
20 g	$0.50
50 g	$0.70
100 g	$1.00
Per additional step of 100 g	$1.10

Priya wants to send a package that weighs 150 g. How much is the postage?

First 100 g → $1.00
Next 50 g → $1.10

Why does it cost $1.10 for the additional 50g?

Total cost = $1.00 + $1.10
= $2.10

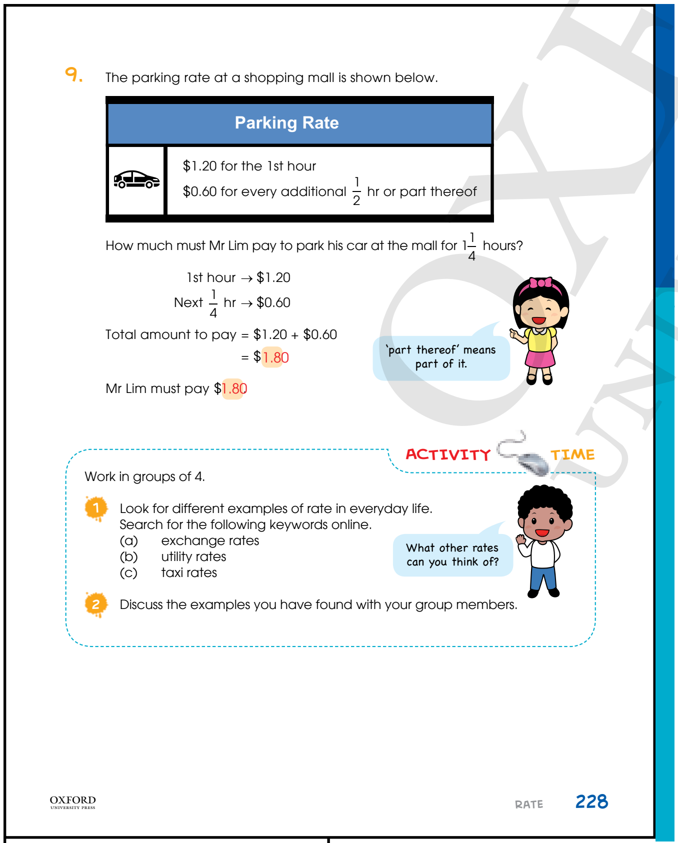
The postage is $2.10

227 CHAPTER 11 OXFORD

Textbook 5 P227

For Let's Learn 7, discuss what "mass step up to" means. Consider bringing a weighing scale to weigh an actual letter and ask pupils which row in the table they should look at.

For Let's Learn 8, consider giving other examples of masses and ask pupils to calculate the postage charges.



9. The parking rate at a shopping mall is shown below.

Parking Rate

$1.20 for the 1st hour
$0.60 for every additional $\frac{1}{2}$ hr or part thereof

How much must Mr Lim pay to park his car at the mall for $1\frac{1}{4}$ hours?

1st hour → $1.20
Next $\frac{1}{4}$ hr → $0.60

Total amount to pay = $1.20 + $0.60
= $1.80

'part thereof' means part of it.

Mr Lim must pay $1.80

ACTIVITY TIME

Work in groups of 4.

1. Look for different examples of rate in everyday life. Search for the following keywords online.
   (a) exchange rates
   (b) utility rates
   (c) taxi rates

What other rates can you think of?

2. Discuss the examples you have found with your group members.

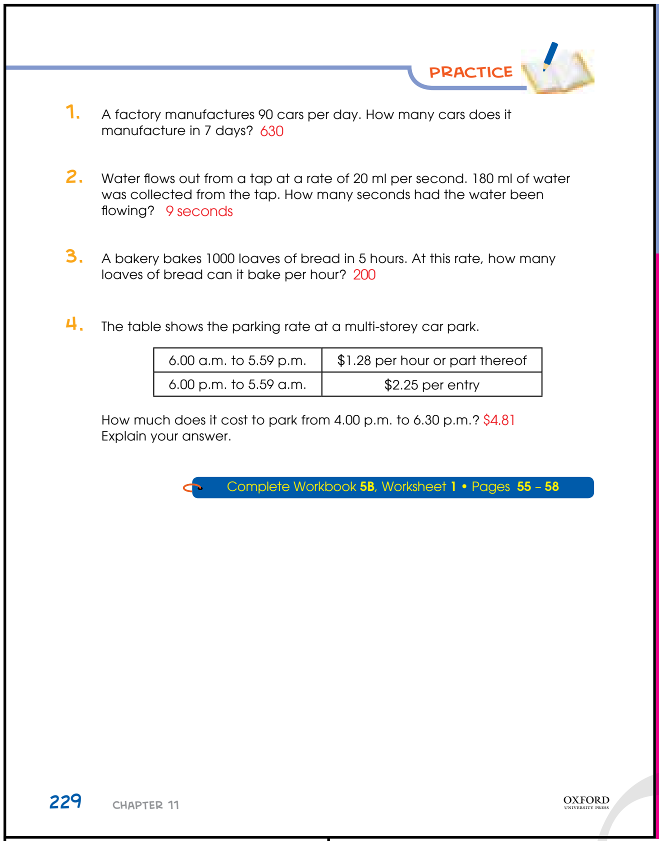
OXFORD RATE 228

Textbook 5 P228

For Let's Learn 9, explain that $1.20 is charged for the first hour and $0.60 is charged for the additional $\frac{1}{4}$ hour since it does not exceed $\frac{1}{2}$ hour. Explain that part thereof means part of the stated time. Consider giving more examples of parking duration and ask pupils to calculate parking costs.

ACTIVITY TIME

The activity enables pupils to relate and gain better understanding as they get to search for examples of applications of rate in everyday life. Let pupils try to search for examples of exchange rates, utility rates and taxi rates. Pupils may discuss their findings and present them to the class. Ask pupils if such rates remain the same or change from time to time.



PRACTICE

1. A factory manufactures 90 cars per day. How many cars does it manufacture in 7 days? 630

2. Water flows out from a tap at a rate of 20 ml per second. 180 ml of water was collected from the tap. How many seconds had the water been flowing? 9 seconds

3. A bakery bakes 1000 loaves of bread in 5 hours. At this rate, how many loaves of bread can it bake per hour? 200

4. The table shows the parking rate at a multi-storey car park.

6.00 a.m. to 5.59 p.m.	$1.28 per hour or part thereof
6.00 p.m. to 5.59 a.m.	$2.25 per entry

How much does it cost to park from 4.00 p.m. to 6.30 p.m.? $4.81
Explain your answer.

Complete Workbook **5B**, Worksheet **1** • Pages **55 – 58**

Textbook 5 P229

PRACTICE

Work with pupils on the practice questions.

Independent seatwork

Assign pupils to complete Worksheet 1 (Workbook 5B P55 − 58).

Answers

Worksheet 1 (Workbook 5B P55 − 58)

1. 17 × $3 = $51

2. 45 × 60 = 2700

3. 500 × $0.20 = $100

4. 3240 ÷ 40 = 81 minutes

5. 600 ÷ 50 = 12 minutes

6. $30 ÷ 100 = $0.30

7. 36 ÷ 30 = 1.2

8. 42 ÷ 1.50 = 28

9. $2.25

10. 1st hour → $1.50
    Next $\frac{3}{4}$ hr → $1 × 2 = $2
    $1.50 + $2 = $3.50

LESSON PLAN

Chapter 11
Lesson 1

Specific Learning Focus

- Express rate as an amount of quantity per unit of another quantity.
- Find rate given the total amount and number of units.
- Find the total amount given the rate and number of units.
- Find the number of units given the rate and the total amount.

Suggested Duration

6 periods

Prior Learning

Rate is a new concept that pupils will learn in this chapter. This is a concept that is built up from the concepts of percentage and average learnt in previous chapters.

Pre-emptive Pitfalls

This should be a relatively simple chapter. However, conversions of units will have to be revisited.

Introduction

Introduce to pupils that the term “per” means for each. Define “rate” as the total amount per or for each unit. Write the equation Rate = total amount ÷ number of units. Link the concept of rate to the concept learnt in the topic on statistics, where on the scale of bar graphs and picture graphs, we find the number of units that 1 grading is equivalent to. In Let’s Learn 6 (Textbook 5 P226), explain that once the relationship between the number of toys and the number of hours needed to make the toys is established, we can find the rate. That is, 3234 toys → 7 hrs, □ → 1 hr, 3234 ÷ 7 = 462 toys per hr. Hence, the rate at which the factory makes the toys is 462 toys per hour.

Problem Solving

Emphasise to pupils that rate is an amount of quantity per unit of another quantity. For example, the heartbeat rate measures the number of heart beats per minute, where the word ‘per’ means for each. In this case, the two quantities involved are the number of heart beats and the amount of time in minutes.

Activities

In ‘Activity Time’ (Textbook 5 P228), ask pupils to collect as many examples of applications of rate in everyday life from newspapers, online resources, shopping malls and bus stands, etc. and then have a class presentation.

Resources

- computer (ICT)
- newspapers
- mini whiteboard
- markers

Mathematical Communication Support

Encourage pupils to come up to the board to solve questions. Ask them to be mindful of the units. For example, in a question like this – ‘If 300 words can be typed in 5 minutes, how many words can be typed in 2.5 hours?’, make sure they understand that hours will first have to be converted to minutes to find the rate of words per minute and then proceed to find the number of words typed within the duration asked.

LESSON

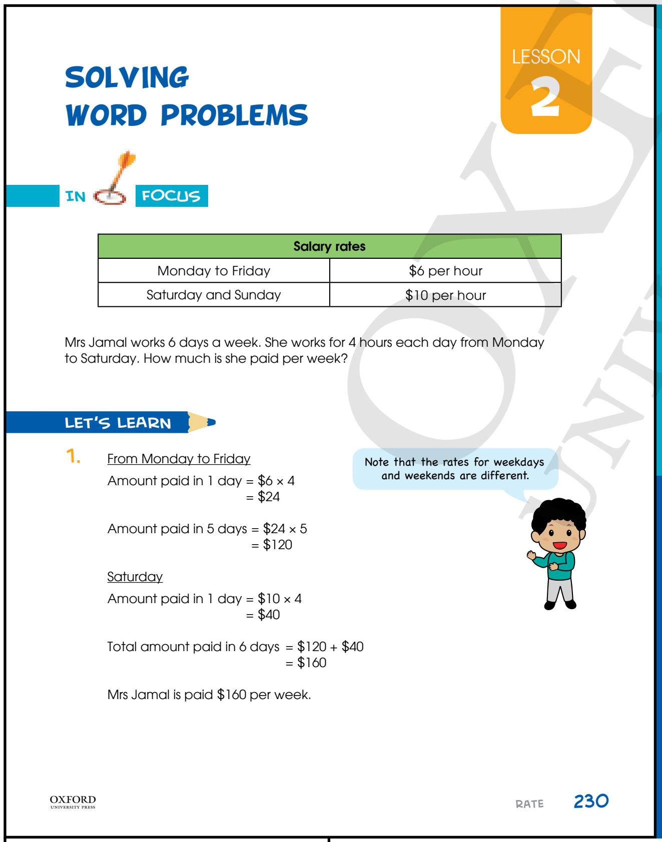
2

SOLVING WORD PROBLEMS

LEARNING OBJECTIVE

1. Solve word problems involving rate.

*Note to teacher:
Refer to the 4-step approach to problem solving template (Activity Handbook 5 P_) which can be used for all such lessons involving problem solving.



LESSON 2

SOLVING WORD PROBLEMS

IN FOCUS

Salary rates	
Monday to Friday	$6 per hour
Saturday and Sunday	$10 per hour

Mrs Jamal works 6 days a week. She works for 4 hours each day from Monday to Saturday. How much is she paid per week?

LET'S LEARN

1. From Monday to Friday
Amount paid in 1 day = $6 × 4
= $24

Amount paid in 5 days = $24 × 5
= $120

Saturday
Amount paid in 1 day = $10 × 4
= $40

Total amount paid in 6 days = $120 + $40
= $160

Mrs Jamal is paid $160 per week.

Note that the rates for weekdays and weekends are different.

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RATE 230

Textbook 5 P230

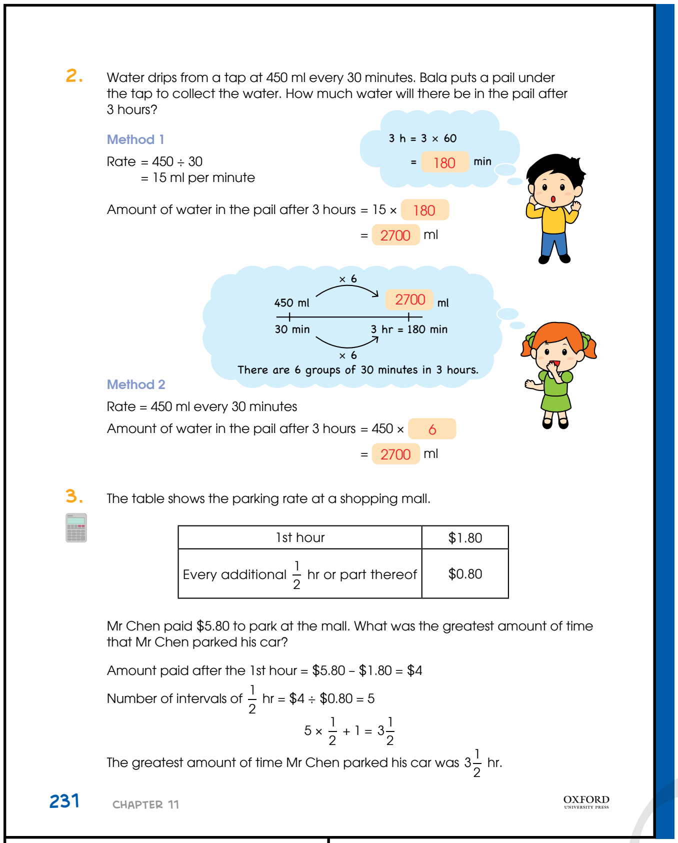
IN FOCUS

Allow pupils to work out the answer and discuss their approaches before revealing the answer. Ask:

- How many hours does Mrs Santosh work per day?
- How much is she paid on Saturday?
- Why do you think the salary rate is higher on weekends than weekdays?

LET'S LEARN

For Let's Learn 1, elicit the rates for weekdays and weekends respectively. Use the unitary method to show that the salary rate for 1 hr is $6 for a weekday and $10 for a weekend, so the charges will be 4 times as much for 4 hr. Repeat the unitary method to find the amount paid for working 5 weekdays.



2. Water drips from a tap at 450 ml every 30 minutes. Bala puts a pail under the tap to collect the water. How much water will there be in the pail after 3 hours?

Method 1

Rate = 450 ÷ 30
= 15 ml per minute

3 h = 3 × 60
= 180 min

Amount of water in the pail after 3 hours = 15 × 180
= 2700 ml

$$\begin{tikzcd} 450\text{ ml} \arrow[r, bend left, "\times 6"] & 2700\text{ ml} \\ 30\text{ min} \arrow[r, bend right, "\times 6"'] & 3\text{ hr} = 180\text{ min} \end{tikzcd}$$

There are 6 groups of 30 minutes in 3 hours.

Method 2

Rate = 450 ml every 30 minutes

Amount of water in the pail after 3 hours = 450 × 6
= 2700 ml

3. The table shows the parking rate at a shopping mall.

1st hour	$1.80
Every additional $\frac{1}{2}$ hr or part thereof	$0.80

Mr Chen paid $5.80 to park at the mall. What was the greatest amount of time that Mr Chen parked his car?

Amount paid after the 1st hour = $5.80 – $1.80 = $4

Number of intervals of $\frac{1}{2}$ hr = $4 ÷ $0.80 = 5

$5 \times \frac{1}{2} + 1 = 3\frac{1}{2}$

The greatest amount of time Mr Chen parked his car was $3\frac{1}{2}$ hr.

231 CHAPTER 11

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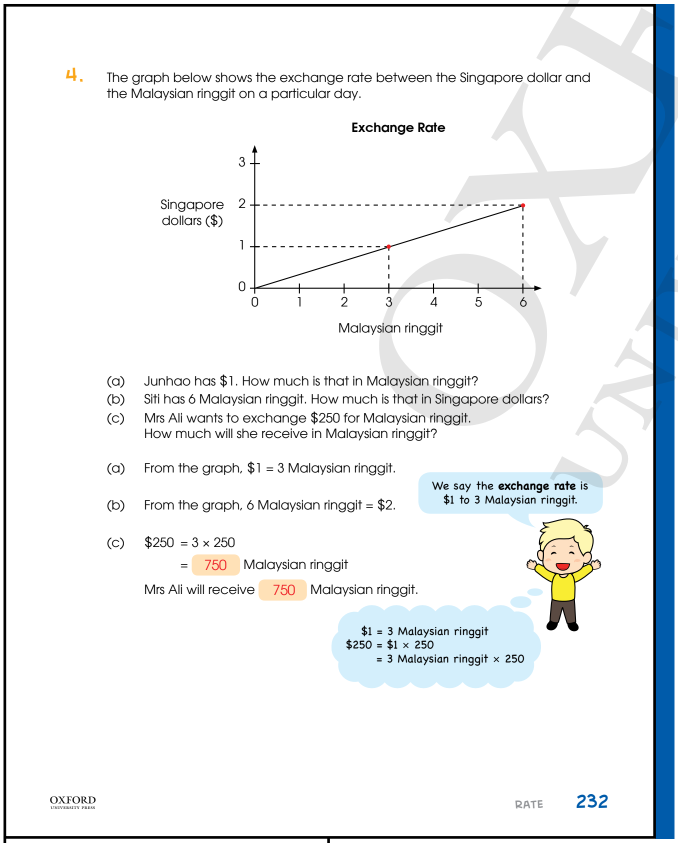
Textbook 5 P231

For Let's Learn 2, go through the two methods illustrated and guide pupils to fill in the blanks.

For method 1, ask questions such as "What is the rate that the water is dripping at?". Elicit that total amount = rate × number of units. Remind pupils that the rate is given in ml per min, while the time is given in hours, so they need to convert 3 hr to 180 min or convert the rate to 900 ml per hour first.

For method 2, show pupils that 3 hr is 6 times of 30 min, the volume of water in the pail after 3 hr is 6 times of 450 ml.

For Let's Learn 3, remind pupils to subtract the charge for the first hour from $5.80 before finding out how many blocks of $\frac{1}{2}$ hr there are after the first hour. Remind pupils to add the initial first hour to get the final answer.



4. The graph below shows the exchange rate between the Singapore dollar and the Malaysian ringgit on a particular day.

(a) Junhao has $1. How much is that in Malaysian ringgit?
(b) Siti has 6 Malaysian ringgit. How much is that in Singapore dollars?
(c) Mrs Ali wants to exchange $250 for Malaysian ringgit.
How much will she receive in Malaysian ringgit?

(a) From the graph, $1 = 3 Malaysian ringgit.

(b) From the graph, 6 Malaysian ringgit = $2.

We say the **exchange rate** is $1 to 3 Malaysian ringgit.

(c) $250 = 3 × 250
= 750 Malaysian ringgit

Mrs Ali will receive 750 Malaysian ringgit.

$1 = 3 Malaysian ringgit
$250 = $1 × 250
= 3 Malaysian ringgit × 250

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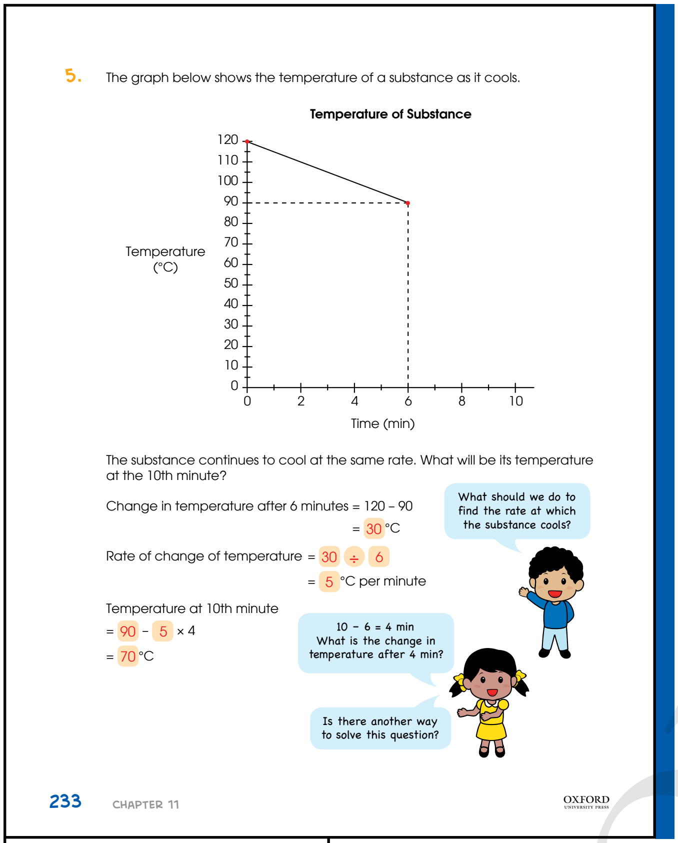
RATE 232

Textbook 5 P232

For Let's Learn 4, help pupils make sense of the line graph. Use the unitary method to help pupils solve 4(c). Consider extending the question by asking pupils how much a 60 Malaysian ringgit meal is worth in Singapore dollars.



5. The graph below shows the temperature of a substance as it cools.

The substance continues to cool at the same rate. What will be its temperature at the 10th minute?

Change in temperature after 6 minutes = 120 – 90
= 30 °C

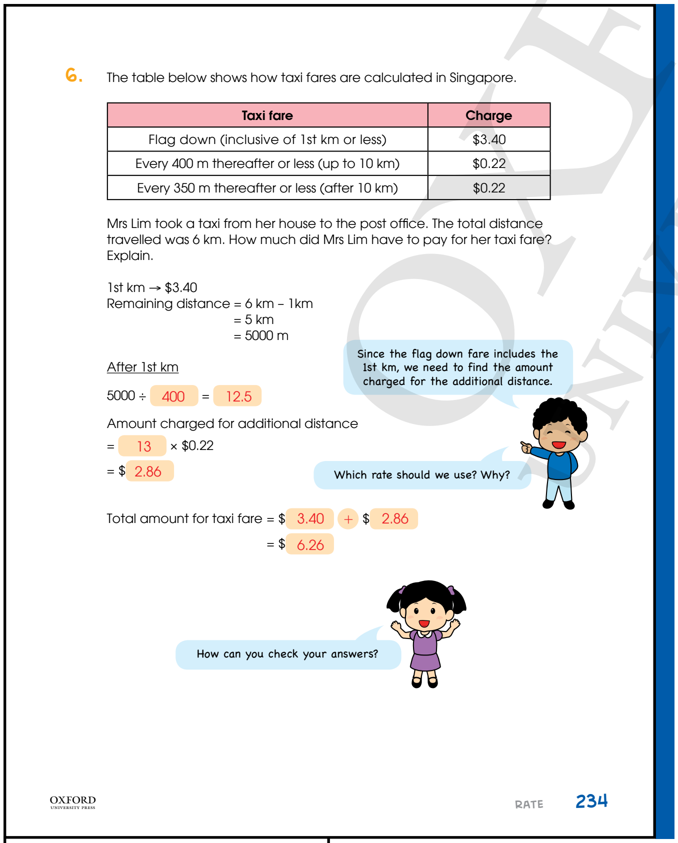
Rate of change of temperature = 30 ÷ 6
= 5 °C per minute

Temperature at 10th minute
= 90 – 5 × 4
= 70 °C

233 CHAPTER 11 OXFORD UNIVERSITY PRESS

Textbook 5 P233

For Let's Learn 5, ask pupils to calculate the rate of change of temperature. They can either find the decrease in temperature after 4 minutes or 10 minutes, then subtract the decrease after 4 minutes from 90°C or subtract the decrease after 10 minutes from 120°C to get the answer.



6. The table below shows how taxi fares are calculated in Singapore.

Taxi fare	Charge
Flag down (inclusive of 1st km or less)	$3.40
Every 400 m thereafter or less (up to 10 km)	$0.22
Every 350 m thereafter or less (after 10 km)	$0.22

Mrs Lim took a taxi from her house to the post office. The total distance travelled was 6 km. How much did Mrs Lim have to pay for her taxi fare? Explain.

1st km → $3.40
Remaining distance = 6 km – 1km
= 5 km
= 5000 m

After 1st km

5000 ÷ 400 = 12.5

Amount charged for additional distance
= 13 × $0.22
= $ 2.86

Total amount for taxi fare = $ 3.40 + $ 2.86
= $ 6.26

OXFORD UNIVERSITY PRESS RATE 234

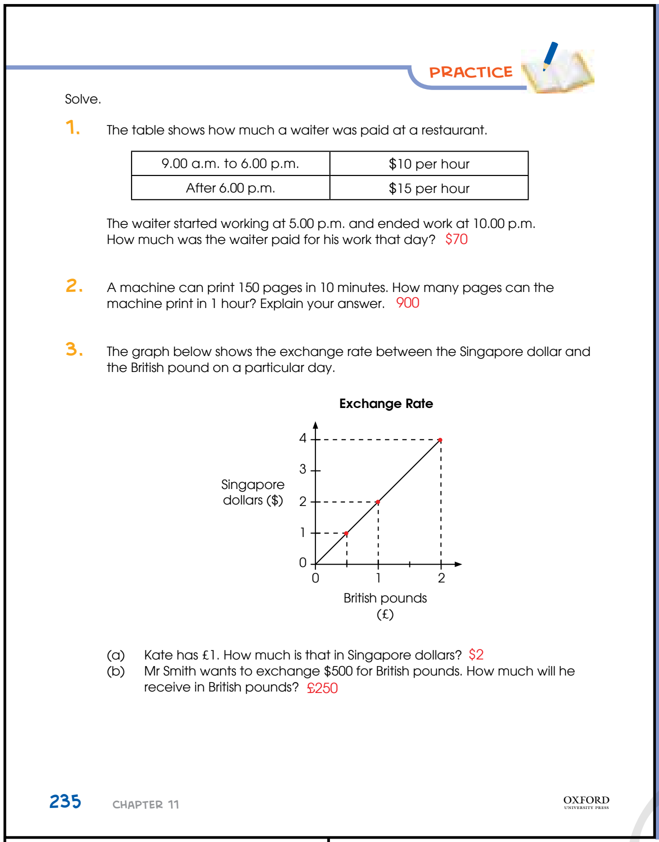
Textbook 5 P234

For Let's Learn 6, remind pupils to subtract the first km to find out the remaining distance Mrs Lim needs to travel.

For the remaining distance, ask pupils which rate they should choose and why. Lead pupils to understand that since the remaining distance is less than 10 km, they will use the rate on the second row. Pupils need to find how many sets of 400 m there are in 5 km. 5000 ÷ 400 will give 12.5.

Discuss why pupils cannot simply multiply 0.22 by 12.5. Discuss what "thereafter or less" means.

Remind pupils to add the initial $3.40. Ask pupils to check their answers for accuracy and reasonableness.



PRACTICE

Solve.

1. The table shows how much a waiter was paid at a restaurant.

9.00 a.m. to 6.00 p.m.	$10 per hour
After 6.00 p.m.	$15 per hour

The waiter started working at 5.00 p.m. and ended work at 10.00 p.m.
How much was the waiter paid for his work that day? $70

2. A machine can print 150 pages in 10 minutes. How many pages can the machine print in 1 hour? Explain your answer. 900

3. The graph below shows the exchange rate between the Singapore dollar and the British pound on a particular day.

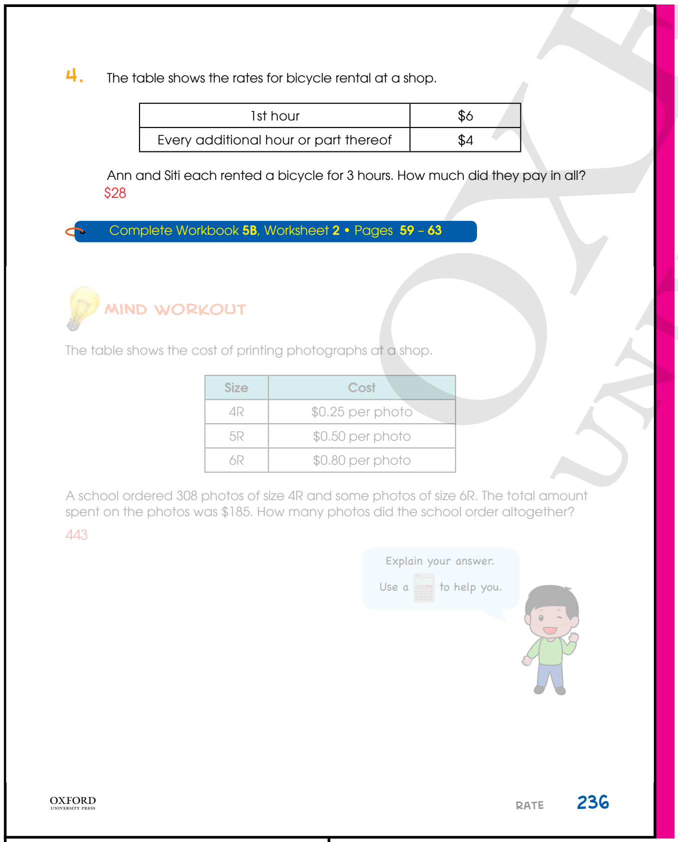
(a) Kate has £1. How much is that in Singapore dollars? $2
(b) Mr Smith wants to exchange $500 for British pounds. How much will he receive in British pounds? £250

235 CHAPTER 11 OXFORD

Textbook 5 P235

PRACTICE

Allow sufficient time for pupils to work out their answers and discuss the methods they used before going through.



4. The table shows the rates for bicycle rental at a shop.

1st hour	$6
Every additional hour or part thereof	$4

Ann and Siti each rented a bicycle for 3 hours. How much did they pay in all?
$28

Complete Workbook **5B**, Worksheet **2** • Pages **59 – 63**

MIND WORKOUT

The table shows the cost of printing photographs at a shop.

Size	Cost
4R	$0.25 per photo
5R	$0.50 per photo
6R	$0.80 per photo

A school ordered 308 photos of size 4R and some photos of size 6R. The total amount spent on the photos was $185. How many photos did the school order altogether?
443

OXFORD RATE 236

Textbook 5 P236

Independent seatwork

Assign pupils to complete Worksheet 2 (Workbook 5B P59 − 63).

Answers Worksheet 2 (Workbook 5B P59 − 63)

1. 8 × \$20 = \$160
   4 × \$30 = \$120
   \$160 + \$120 = \$280

2. 1st hour → \$3
   Next 3 hours → \$2 × 6
   = \$12
   \$3 + \$12 = \$15

3. 30 ÷ 2 = 15
   15 × 1.5 ℓ = 22.5 ℓ

4. \$4200 ÷ \$960 = $4\frac{3}{8}$ months
   The least number of months is 5 months.

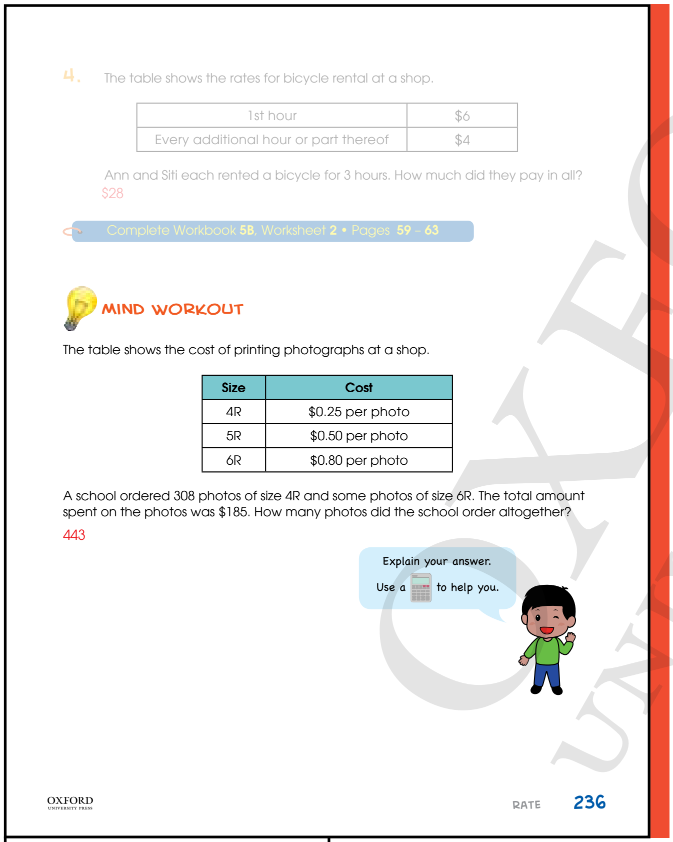
5. (a) 250 ÷ 1.3 = 192.31
   She received US\$192.31.
   (b) 10.40 × 1.3 = 13.52
   The book costs S\$13.52.

6. (a) For Machine A.
   30 minutes → 2700
   1 minute → 2700 ÷ 30
   = 90
   For Machine B,
   40 minutes → 3720
   1 minute → 3720 ÷ 40
   = 93
   Machine B is faster.
   (b) 93 − 90 = 3
   3 boxes per minute faster

7. 1st hour → \$5
   Next hour $2\frac{1}{2}$ hour → \$4 × 3
   = \$ 12
   \$5 + \$12 = \$17

8. Water drains at 2 litres per minute.
   16 ÷ 2 = 8 min
   4.55 p.m. + 8 min = 5.03 p.m.

PROBLEM SOLVING, MATHS JOURNAL AND PUPIL REVIEW



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A school ordered 308 photos of size 4R and some photos of size 6R. The total amount spent on the photos was $185. How many photos did the school order altogether?
443

Explain your answer.
Use a 🖩 to help you.

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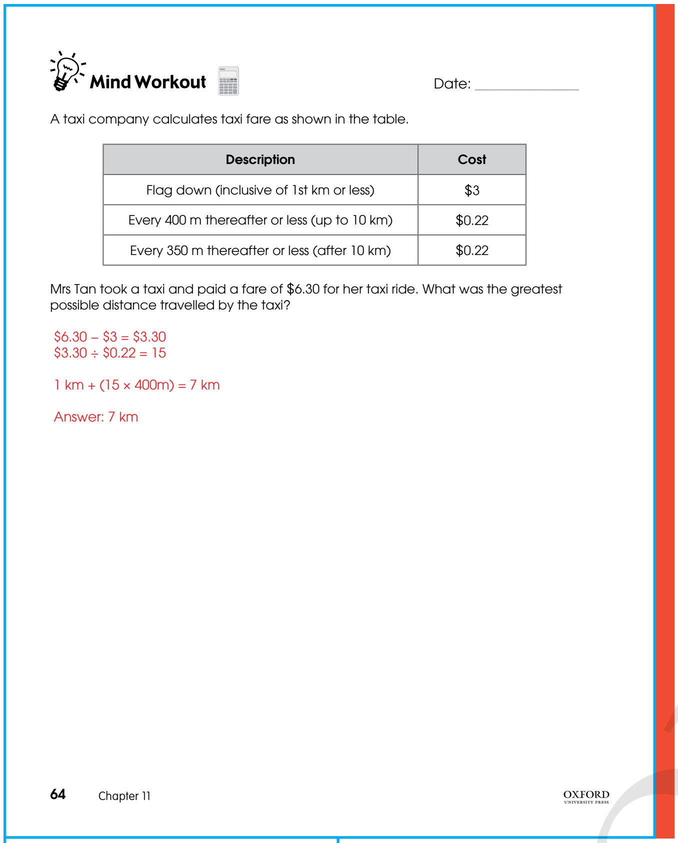
RATE 236

Textbook 5 P236

MIND WORKOUT

Allow sufficient time for pupils to work on the problem. Pupils can use guess and check or make a supposition to solve the problem. Invite pupils to present their solutions.



Mind Workout Date: ____________

A taxi company calculates taxi fare as shown in the table.

Description	Cost
Flag down (inclusive of 1st km or less)	$3
Every 400 m thereafter or less (up to 10 km)	$0.22
Every 350 m thereafter or less (after 10 km)	$0.22

Mrs Tan took a taxi and paid a fare of $6.30 for her taxi ride. What was the greatest possible distance travelled by the taxi?

$6.30 – $3 = $3.30
$3.30 ÷ $0.22 = 15

1 km + (15 x 400m) = 7 km

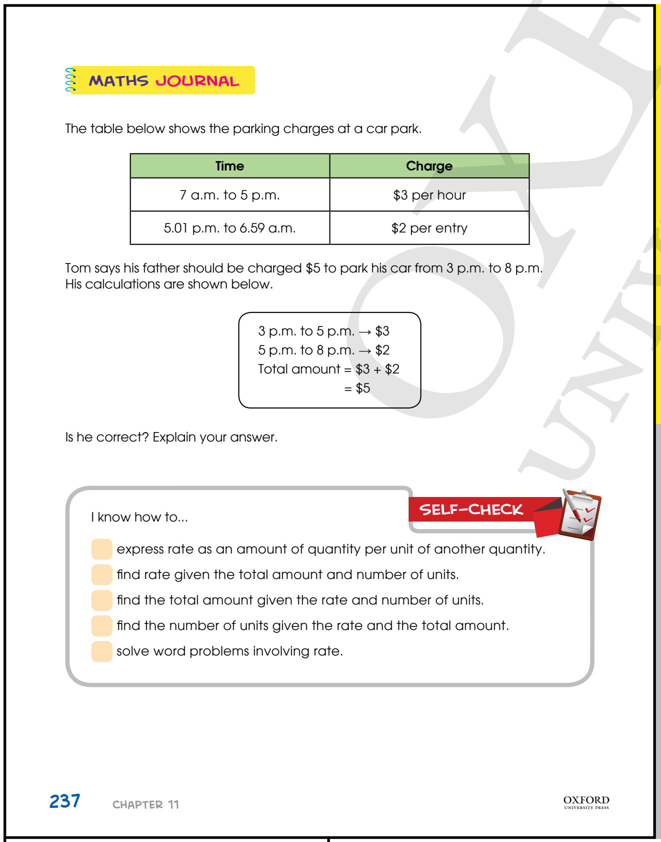
Answer: 7 km

64 Chapter 11 OXFORD UNIVERSITY PRESS

Workbook 5B P64

Mind Workout

Guide pupils by refering them to Let's Learn 6 on P234 of the textbook. The steps are similar.



MATHS JOURNAL

The table below shows the parking charges at a car park.

Time	Charge
7 a.m. to 5 p.m.	$3 per hour
5.01 p.m. to 6.59 a.m.	$2 per entry

Tom says his father should be charged $5 to park his car from 3 p.m. to 8 p.m. His calculations are shown below.

3 p.m. to 5 p.m. → $3
5 p.m. to 8 p.m. → $2
Total amount = $3 + $2
= $5

Is he correct? Explain your answer.

SELF-CHECK

I know how to...

☐ express rate as an amount of quantity per unit of another quantity.
☐ find rate given the total amount and number of units.
☐ find the total amount given the rate and number of units.
☐ find the number of units given the rate and the total amount.
☐ solve word problems involving rate.

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Textbook 5 P237

MATHS JOURNAL

Get pupils to discuss. Ask:
- Do you use the same rate from 3 p.m. to 8 p.m.? Why?
- What is the meaning of $2 per entry?
- What is the difference between per hour and per entry?

Get pupils to work out the correct answer.

SELF-CHECK

Before the pupils do the self-check, review the important concepts once more by asking for examples learnt for each objective.

The self-check can be done after pupils have completed **Review 11** (Workbook 5B P65 − 68).

Answers Review 11 (Workbook 5B P65 − 68)

1. 13 ℓ × 6 = 78 ℓ

2. 300 ÷ 5 = 60

3. 280 ÷ 40 = 7 minutes

4. 8 × $1.20 = $9.60

5. 42 ÷ 3.5 = $12

6. 1st hour → $8
Next 2 hours → $6 × 2 = $12
$8 + $12 = $20

7. 40 ℓ − 25 ℓ = 15 ℓ
15 ℓ → 135 km
1 ℓ → 135 ÷ 15
= 9 km
25 ℓ → 9 × 25
= 225 km

8. 10 presents → 20 minutes
1 present → 20 ÷ 10
= 2 minutes
15 presents → 15 × 2
= 30 minutes

9. 1st 500 copies → $0.35 × 500
= $175
Next 250 copies → $0.15 × 250
= $37.50
$175 + $37.50 = $212.50

10. Monday to Friday → ($12 × 4) × 5
= $240
Saturday → $18 × 4
= $72
$240 + $72 = $312

Answers Revision 3A (Workbook 5B P69 – 72)

1. (a) 7.3
   (b) 527
   (c) 2700
   (d) 242.7
   (e) 0.27
   (f) 5.079
   (g) 0.003
   (h) 0.055

2. (a) 10
   (b) 1000
   (c) 100
   (d) 1000

3. (a) 0.49
   (b) 182
   (c) 0.26
   (d) 505
   (e) 3.363
   (f) 7250
   (g) 8.58
   (h) 2.079

4. (a) 38
   (b) 9
   (c) 50
   (d) 76

5. (a) $\frac{3}{10}$
   (b) $\frac{21}{50}$
   (c) $\frac{3}{50}$
   (d) $\frac{4}{5}$

6. $37\frac{1}{2}$

7. 100% → $17
   1% → $17 ÷ 100
   = $0.17
   75% → $0.17 × 75
   = $12.75

8. $\frac{60}{100} \times 90 = 54$

9. 30 × $12.50 = $375
   $375 − $9.45 = $365.55

10. 2 × 1.17 kg = 2.34 kg
    3.95 kg − 2.34 kg = 1.61 kg
    1.61 kg ÷ 7 = 0.27 kg
    0.27 kg + 1.17 kg = 1.44 kg

Answers Revision 3B (Workbook 5B P73 – 78)

1. (a) 0.6
   (b) 1643 g
   (c) 1 ℓ 850 ml

2. (a) $\frac{10}{100} \times \$25 = \$2.50$
   (b) $\frac{60}{100} \times 40 = 24$
   (c) $\frac{10}{100} \times 800 = 80$

3. (a) 12 + 13 + 17 + 19 + 24 = 85
   (b) 85 ÷ 5 = 17

4. $\frac{20}{100} \times 1100 = 220$
   220 × $12 = $2640

5. $\frac{90}{100} \times \$120 = \$108$

6. $75 × 2 = $150
   $81 × 3 = $243
   $243 − $150 = $93

7. 5 p.m. to 6 p.m. → $1.20
   6 p.m. to 7.30 p.m. → $1.00 × 2 = $2.00
   $1.20 + $2.00 = $3.20

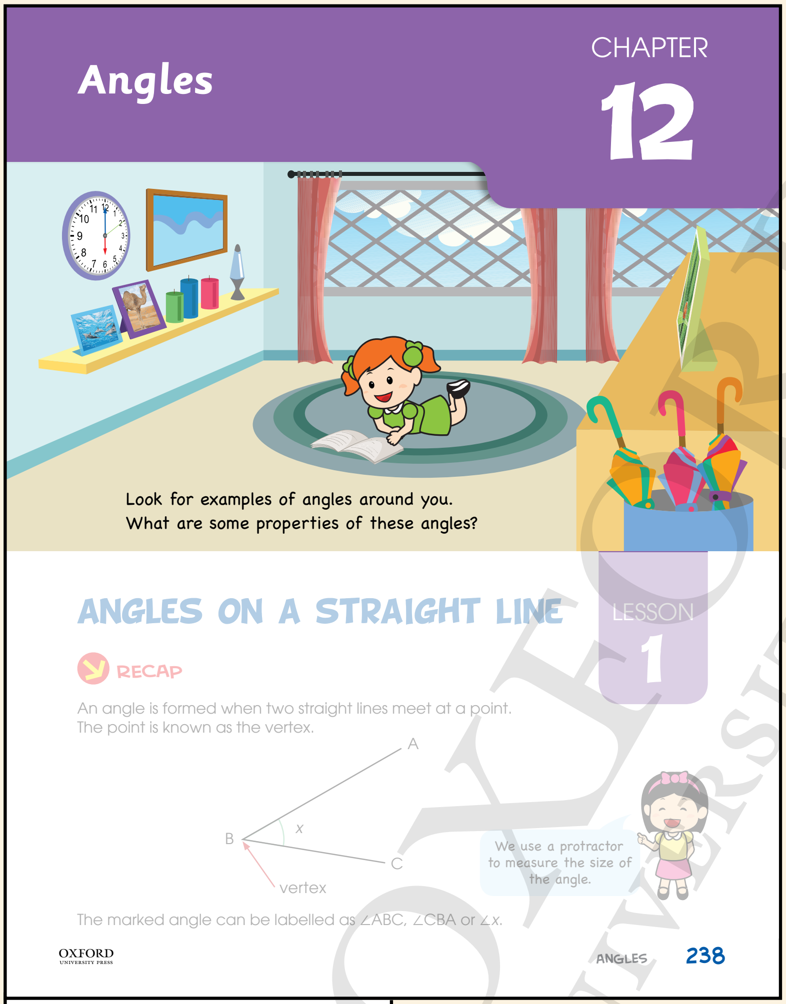
8. $427 − $25 = $402
   $402 ÷ $33.50 = 12 days

9. 5 × $80 = $400
   $440 − $400 = $40
   $40 ÷ $20 = 2
   She worked 3 weekdays and 2 weekends.

10. $33 − $21 = $12
    $12 ÷ $3 = 4
    2 hours + (4 × $\frac{1}{2}$ hr) = 4 hours

ANGLES

CHAPTER 12



Angles

CHAPTER
12

Look for examples of angles around you.
What are some properties of these angles?

ANGLES ON A STRAIGHT LINE

LESSON
1

RECAP

An angle is formed when two straight lines meet at a point.
The point is known as the vertex.

The marked angle can be labelled as ∠ABC, ∠CBA or ∠x.

Textbook 5 P238

Related Resources

NSPM Textbook 5 (P238 – 257)
NSPM Workbook 5B (P79 – 92)

Materials

Protractor, scissors, ruler and angle cut-outs

Lesson

Lesson 1	Angles on a Straight Line
Lesson 2	Angles at a Point
Lesson 3	Vertically Opposite Angles
Lesson 4	Finding Unknown Angles

Problem Solving, Maths Journal and Pupil Review

INTRODUCTION

In grades Three and Four, pupils have learnt the concepts of angles and right angles. They had been taught to name and label angles and also to measure and draw angles with a protractor using degree as the unit of measurement. In this chapter, pupils' concept of angles is extended to three angle properties: angles on a straight line, angles at a point and vertically opposite angles. Pupils will apply these angle properties appropriately to find unknown angles in geometric figures. Looking for examples of different types of angles in the environment will enhance pupils' visualisation of these angle properties.

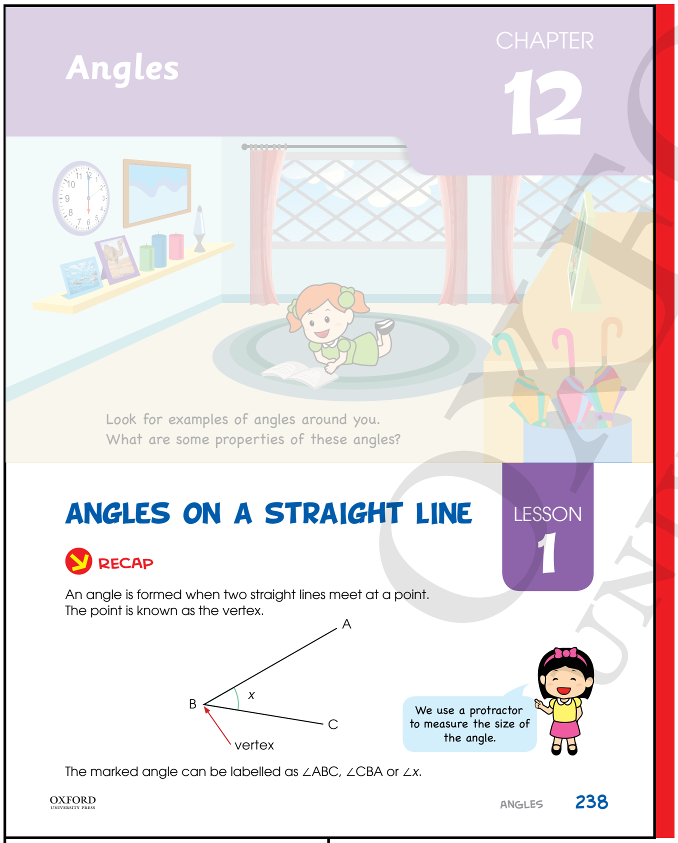
LESSON

1

ANGLES ON A STRAIGHT LINE

LEARNING OBJECTIVE

1. Use the property of ‘sum of angles on a straight line is 180°’ to find unknown angles.



Angles

CHAPTER

12

Look for examples of angles around you.
What are some properties of these angles?

ANGLES ON A STRAIGHT LINE

LESSON

1

RECAP

An angle is formed when two straight lines meet at a point.
The point is known as the vertex.

We use a protractor to measure the size of the angle.

The marked angle can be labelled as ∠ABC, ∠CBA or ∠x.

OXFORD

ANGLES 238

Textbook 5 P238

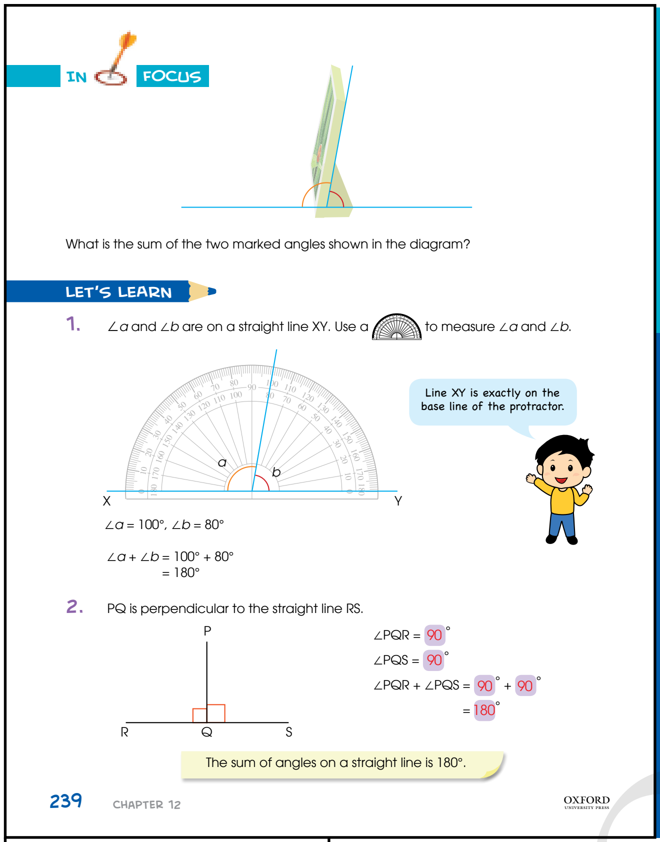
RECAP

Revise naming and the concepts of angles with these guiding questions:

- How is an angle formed?
- What do you call the point that the two lines meet?

Explain that an angle is formed when two arms (straight lines) meet at a point called a vertex, and the size of an angle is the amount of turning from one arm to the other. Ask:

- How many ways can you name and label an angle? What are the ways?
- What do we use to measure an angle?
- What is the unit of measurement for angles?



IN FOCUS

What is the sum of the two marked angles shown in the diagram?

LET'S LEARN

1. $\angle a$ and $\angle b$ are on a straight line XY. Use a protractor to measure $\angle a$ and $\angle b$.

Line XY is exactly on the base line of the protractor.

$\angle a = 100^\circ$, $\angle b = 80^\circ$

$\angle a + \angle b = 100^\circ + 80^\circ$
$= 180^\circ$

2. PQ is perpendicular to the straight line RS.

$\angle PQR = 90^\circ$
$\angle PQS = 90^\circ$
$\angle PQR + \angle PQS = 90^\circ + 90^\circ$
$= 180^\circ$

The sum of angles on a straight line is 180°.

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Textbook 5 P239

IN FOCUS

Using the Chapter Opener (P238), ask pupils to look for examples of angles in the picture. Accept pupils' various responses: the window grill, the clock-face, the picture frames etc. Then focus on the picture stand in the diagram, drawing the lines for pupils to see the angles. Ask:

- Can you estimate the two angles on the straight line? What are your estimates?
- What do you think is the sum of these two angles?

LET'S LEARN

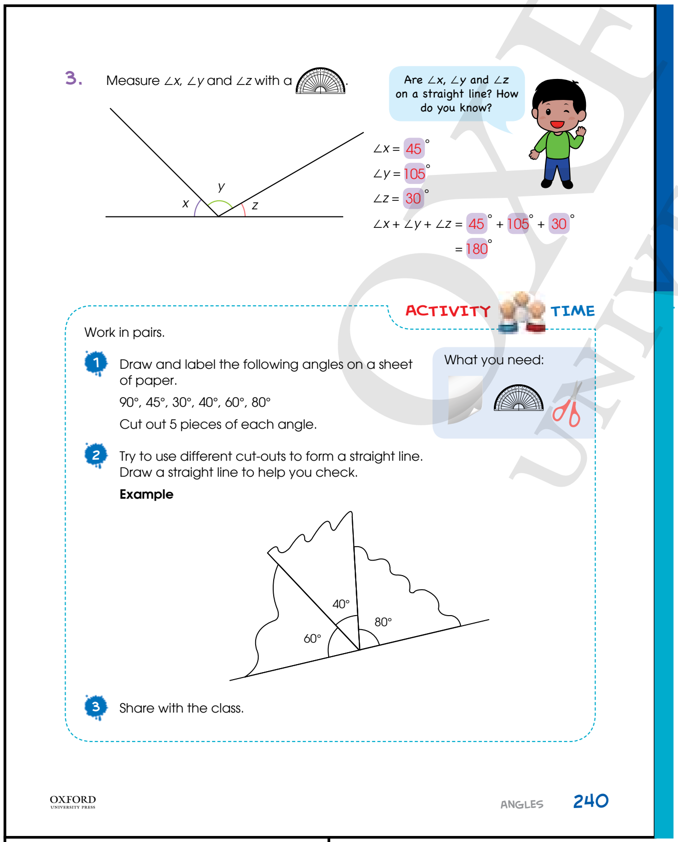
Using the example in the In Focus, label the two angles on the straight line XY on a visualiser. Tell pupils to measure the angles with a protractor and see how close their estimates are. Ask:

- What are the readings on the protractor for the size of $\angle a$ and $\angle b$?
- What is the sum when we add $\angle a$ and $\angle b$?

In Let's Learn 2, alert pupils to the perpendicular symbols at Q in the figure. Ask:

- What type of angles are ∠PQS and ∠PQR?
- What is the sum when we add these two angles on a straight line RS?

From Let's Learn 1 and 2, lead pupils to conclude:
The sum of angles on a straight line is 180°



3. Measure $\angle x$, $\angle y$ and $\angle z$ with a protractor.

Are $\angle x$, $\angle y$ and $\angle z$ on a straight line? How do you know?

$\angle x = 45^\circ$
$\angle y = 105^\circ$
$\angle z = 30^\circ$
$\angle x + \angle y + \angle z = 45^\circ + 105^\circ + 30^\circ$
$= 180^\circ$

ACTIVITY TIME

Work in pairs.

① Draw and label the following angles on a sheet of paper.
90°, 45°, 30°, 40°, 60°, 80°
Cut out 5 pieces of each angle.

② Try to use different cut-outs to form a straight line. Draw a straight line to help you check.
Example

③ Share with the class.

What you need:

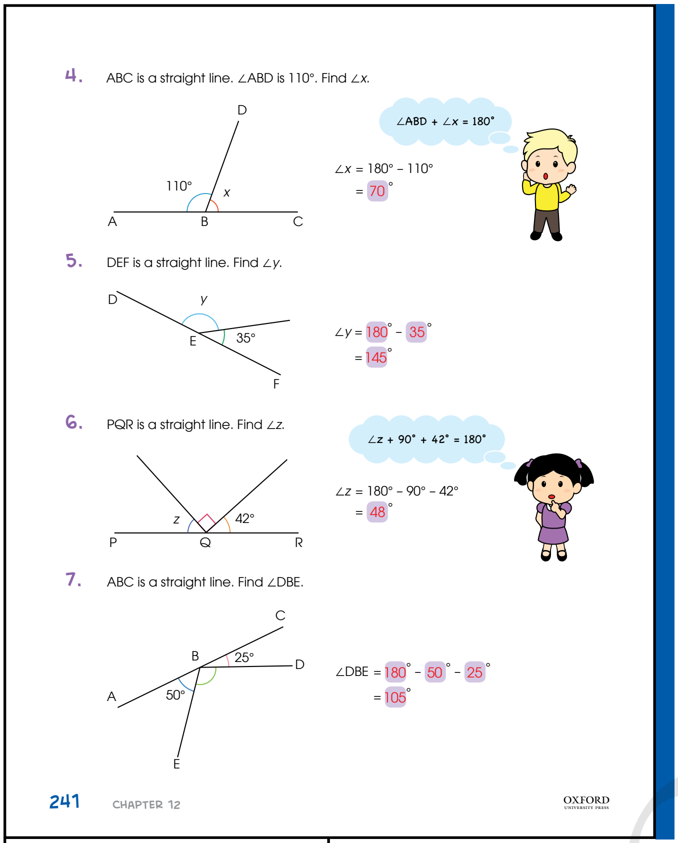
OXFORD UNIVERSITY PRESS ANGLES 240

Textbook 5 P240

For Let's Learn 3, ask pupils to guess if the three angles in the figure lie on a straight line. To check their guesses, measure the three angles with a protractor on a visualiser. Ask pupils to add up the three angles to find the sum. Ask pupils if they can conclude that these 3 angles are on a straight line and to explain their answer.

ACTIVITY TIME

In this activity, pupils investigate combinations of three (or more) angles that can be arranged to form angles on a straight line. Select some pupils to present their observations for discussion. Lead pupils to conclude that angles that can be arranged to form a straight line always add up to 180°.



4. ABC is a straight line. ∠ABD is 110°. Find ∠x.

$\angle x = 180° - 110°$

$= 70°$

5. DEF is a straight line. Find ∠y.

$\angle y = 180° - 35°$

$= 145°$

6. PQR is a straight line. Find ∠z.

$\angle z = 180° - 90° - 42°$

$= 48°$

7. ABC is a straight line. Find ∠DBE.

$\angle DBE = 180° - 50° - 25°$

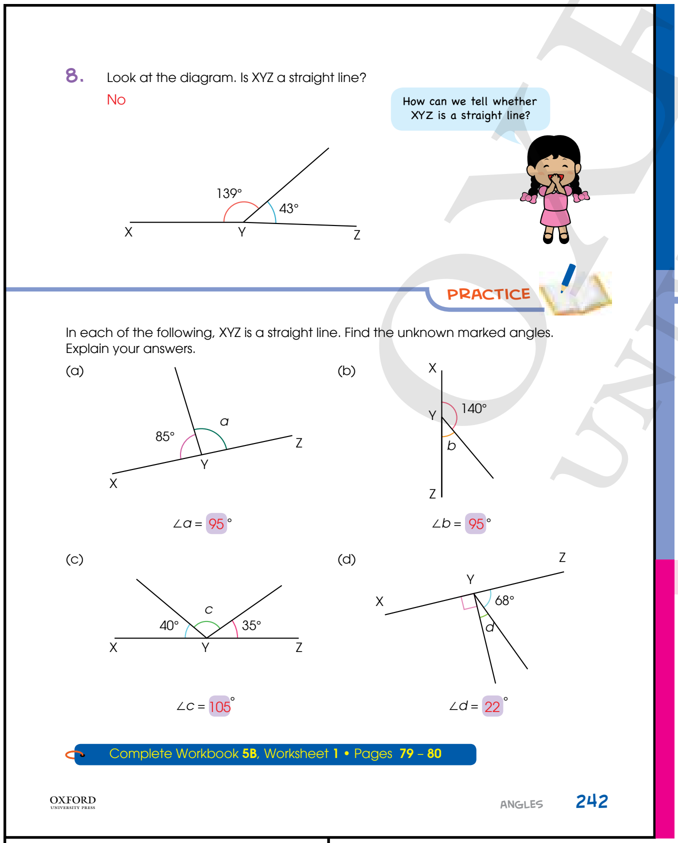
$= 105°$

241 CHAPTER 12

Textbook 5 P241

For Let's Learn 4 and 5, work through the solutions with the class and reinforce the property 'sum of angles on a straight line is 180°'.

For Let's Learn 6 and 7, allow pupils to work out the answers before going through with the class.



8. Look at the diagram. Is XYZ a straight line?

No

PRACTICE

In each of the following, XYZ is a straight line. Find the unknown marked angles. Explain your answers.

(a) ∠a = 95°

(b) ∠b = 95°

(c) ∠c = 105°

(d) ∠d = 22°

Complete Workbook **5B**, Worksheet **1** • Pages **79 – 80**

ANGLES 242

Textbook 5 P242

Let's Learn 8 allows pupils to deduce and verify if a line is straight using the property of angles on a straight line is 180°.

PRACTICE

Allow pupils to work in pairs and check each other's answers. Select some pupils to show and explain their work.

Independent seatwork

Assign pupils to complete Worksheet 1 (Workbook 5B P79 – 80).

Answers Worksheet 1 (Workbook 5B P79 – 80)

1. (a) 90
   (b) 82
   (c) 145
   (d) 43

2. (a) 45
   (b) 52
   (c) 104
   (d) 68

LESSON PLAN

Chapter 12
Lesson 1

Specific Learning Focus

- Use the property of ‘sum of angles on a straight line is 180°’ to find unknown angles.

Suggested Duration

2 periods

Prior Learning

Pupils should be well-versed with identifying various types of angles – acute, right, obtuse and reflex angles. They should also be able to construct angles using a protractor. In this chapter, pupils will learn to apply the property of ‘sum of angles on a straight line is 180°’ to find unknown angles.

Pre-emptive Pitfalls

This should be a simple lesson. In this lesson, pupils need to develop visual skills to see that the angles form a straight line.

Introduction

Use a protractor and show pupils that two right angles on either side of the protractor form an angle of 180° on a straight line. Permutate as many pairs of angles that form a straight line with angle of 180° (e.g. 120° + 60° = 80° + 100° = 180°). Emphasise that angles on a straight line add up to 180°. Ask pupils how we can tell if the angles lie on a straight line. They should be able to say that if the angles add up to 180°, they lie on a straight line.

Problem Solving

Explain to pupils that more than two angles (and not just a pair of angles) can add up to 180°, forming a straight line. Emphasise the visual skill of identifying an obtuse angle and an acute angle, and estimating the correct answer along with proper mathematical computation.

Activities

Work out the sums on the board and have a class quiz by dividing the class into two groups. Cut out and laminate the angles and let pupils have hands-on experience of angles forming a straight line.

Resources

- protractor
- scissors
- angle cut-out (Activity Handbook 5 P47)

Mathematical Communication Support

Emphasise the conclusion of this lesson – the sum of angles on a straight line is 180°. Elicit individual responses when asking pupils to verify or prove whether a line is straight. Ask pupils for examples of objects in the classroom that form angles on a straight line (e.g. window grill, clock hands, picture frames, etc.).

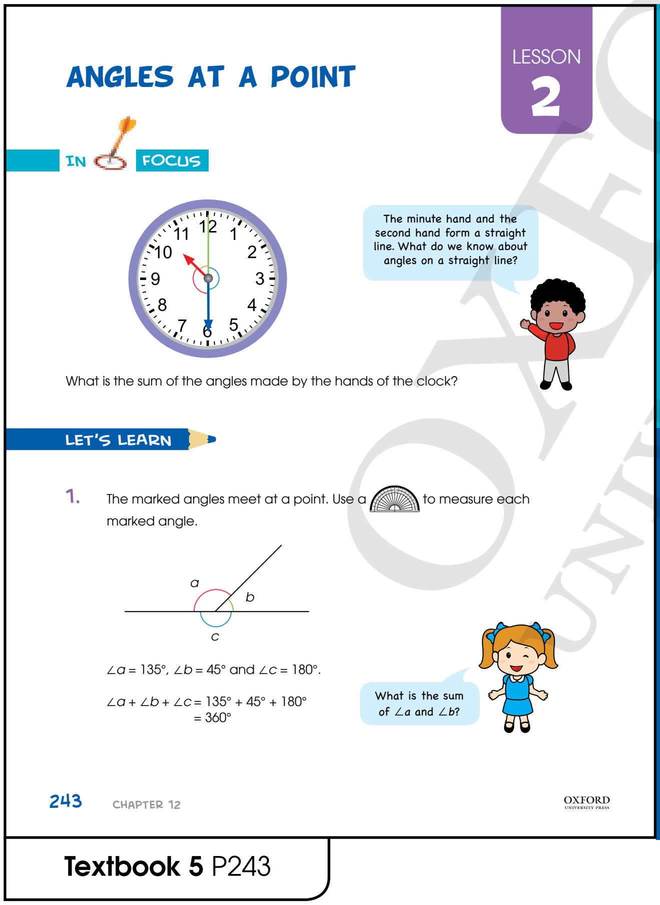
LESSON

2

ANGLES AT A POINT

LEARNING OBJECTIVE

1. Use the property of sum of angles at a point is 360° to find unknown angles.



LESSON 2

ANGLES AT A POINT

IN FOCUS

What is the sum of the angles made by the hands of the clock?

LET'S LEARN

1. The marked angles meet at a point. Use a protractor to measure each marked angle.

$\angle a = 135°$, $\angle b = 45°$ and $\angle c = 180°$.

$\angle a + \angle b + \angle c = 135° + 45° + 180°$
$= 360°$

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Textbook 5 P243

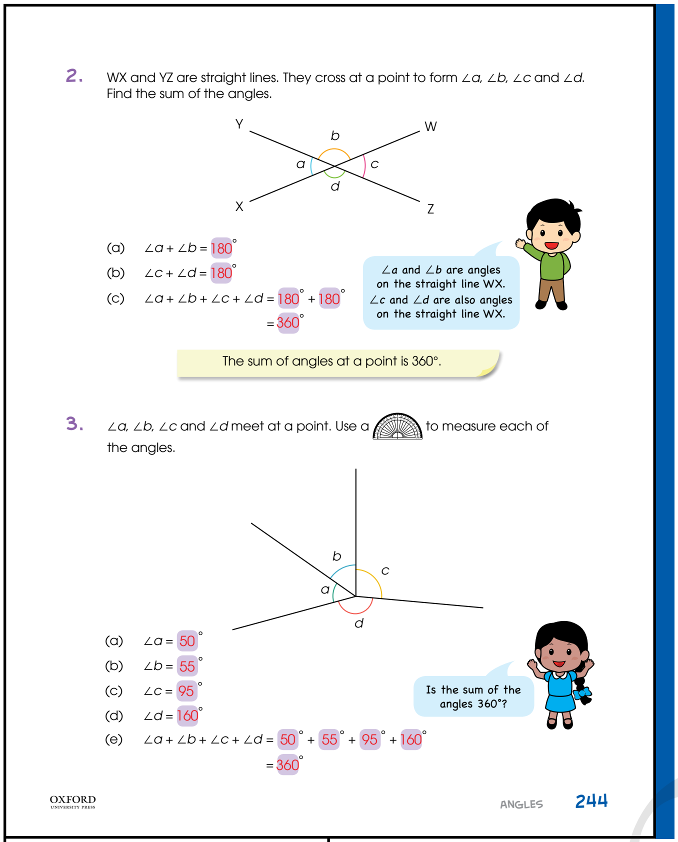
IN FOCUS

Teacher introduces the clock-face template on a visualiser. Ask:

- How many angles do you see on this clock-face?
- Name them $\angle a$, $\angle b$ and $\angle c$. Which angles lie on a straight line?
- What is the sum of angles on straight line?
- What do you think is the sum of $\angle a$, $\angle b$ and $\angle c$?

LET'S LEARN

Teacher writes on the board the term: angles at a point. Ask pupils to identify the angles at a point in this example. On a visualiser, teacher places a protractor over the figure and asks pupils to measure $\angle a$, $\angle b$ and $\angle c$. Tell pupils to find the sum of the 3 angles.



2. WX and YZ are straight lines. They cross at a point to form $\angle a$, $\angle b$, $\angle c$ and $\angle d$. Find the sum of the angles.

(a) $\angle a + \angle b = 180^\circ$

(b) $\angle c + \angle d = 180^\circ$

(c) $\angle a + \angle b + \angle c + \angle d = 180^\circ + 180^\circ$

$= 360^\circ$

$\angle a$ and $\angle b$ are angles on the straight line WX. $\angle c$ and $\angle d$ are also angles on the straight line WX.

The sum of angles at a point is 360°.

3. $\angle a$, $\angle b$, $\angle c$ and $\angle d$ meet at a point. Use a protractor to measure each of the angles.

(a) $\angle a = 50^\circ$

(b) $\angle b = 55^\circ$

(c) $\angle c = 95^\circ$

(d) $\angle d = 160^\circ$

(e) $\angle a + \angle b + \angle c + \angle d = 50^\circ + 55^\circ + 95^\circ + 160^\circ$

$= 360^\circ$

Is the sum of the angles 360°?

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ANGLES 244

Textbook 5 P244

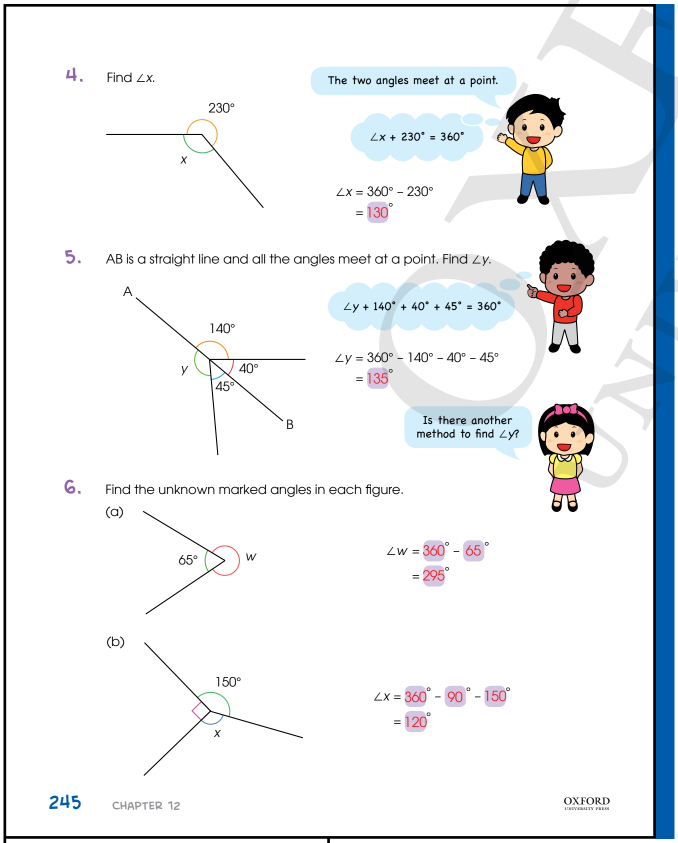
For Let's Learn 2, draw intersecting lines WX and YZ. Ask:

- How many angles at a point are there?
- How can you find the sum of these angles without using a protractor?
- How can you use the property 'sum of angles on a straight line is 180°' for this?

Guide pupils to use the property 'sum of angles on a straight line is 180°'to find the sum of $\angle a$, $\angle b$, $\angle c$ and $\angle d$.

Using Let's Learn 1 and 2, lead pupils to state the property: **The sum of angles at a point is 360°**

For Let's Learn 3, ask pupils to raise their hands if they think the sum of the 4 angles is 360°. Select 4 pupils to measure each of the angles for the class. Tell pupils to find the sum of the 4 angles measured and check if it corresponds with the property 'the sum of angles at a point is 360°'.



4. Find $\angle x$.

The two angles meet at a point.

$\angle x + 230^\circ = 360^\circ$

$\angle x = 360^\circ - 230^\circ$

$= 130^\circ$

5. AB is a straight line and all the angles meet at a point. Find $\angle y$.

$\angle y + 140^\circ + 40^\circ + 45^\circ = 360^\circ$

$\angle y = 360^\circ - 140^\circ - 40^\circ - 45^\circ$

$= 135^\circ$

Is there another method to find $\angle y$?

6. Find the unknown marked angles in each figure.

(a)

$\angle w = 360^\circ - 65^\circ$

$= 295^\circ$

(b)

$\angle x = 360^\circ - 90^\circ - 150^\circ$

$= 120^\circ$

245 CHAPTER 12

OXFORD UNIVERSITY PRESS

Textbook 5 P245

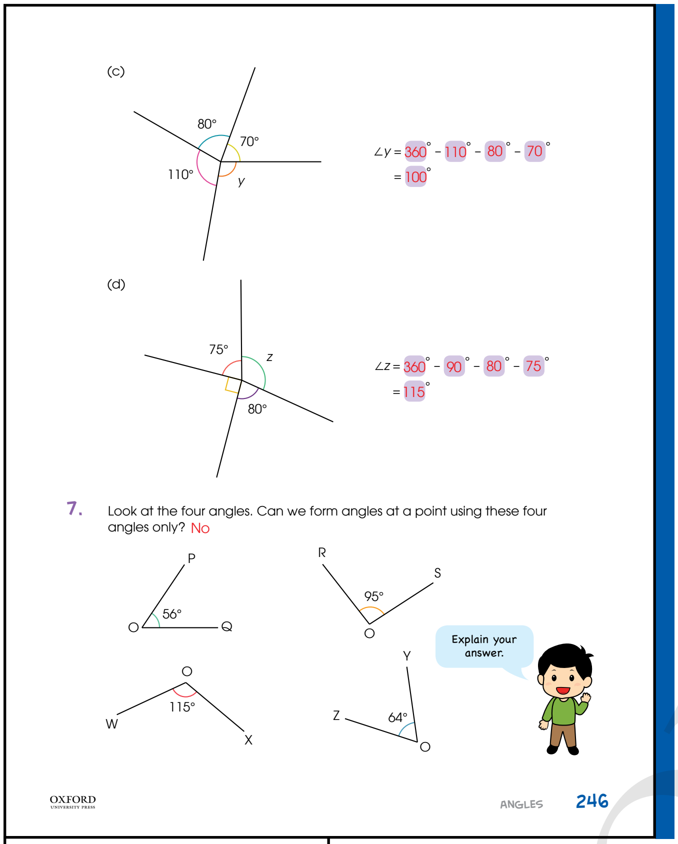
Let's Learn 4 to 6 allow pupils to use the property they have just learnt to solve for unknown angles.

For Let's Learn 4, guide pupils to fill in the blank. Reinforce the property 'sum of angles at a point is 360°'.

For Let's Learn 5, ask pupils for another method to find $\angle y$. Hint: Which angles are angles on a straight line and how can you use this to find the unknown angle?

For Let's Learn 6(a), ask pupils to estimate the unknown angle before working out the answer.

For Let's Learn 6(b), pupils should recognise the perpendicular symbol as 90°.



(c)

$\angle y = 360^\circ - 110^\circ - 80^\circ - 70^\circ$
$= 100^\circ$

(d)

$\angle z = 360^\circ - 90^\circ - 80^\circ - 75^\circ$
$= 115^\circ$

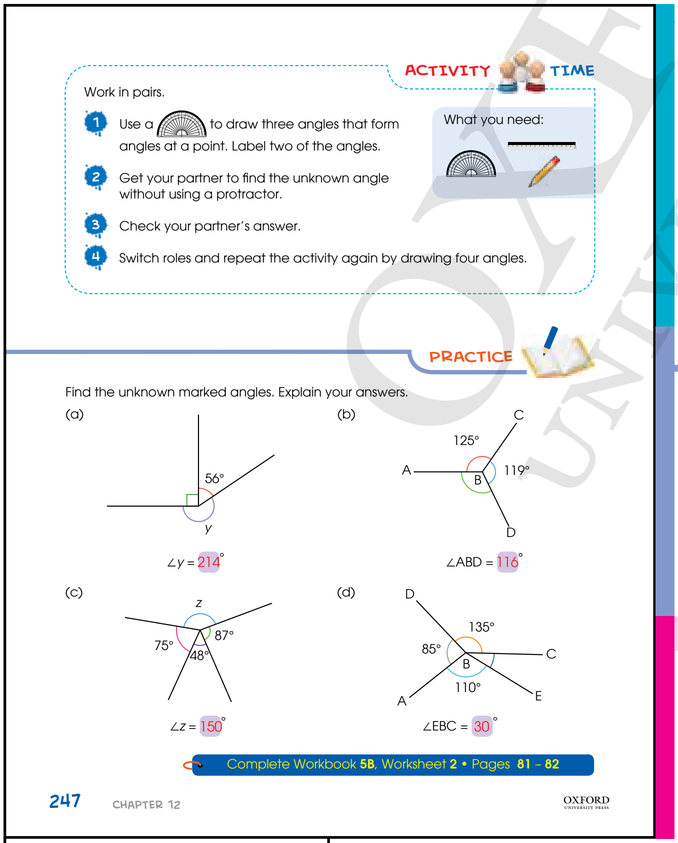
7. Look at the four angles. Can we form angles at a point using these four angles only? No

OXFORD UNIVERSITY PRESS ANGLES 246

Textbook 5 P246

For Let's Learn 6(d), remind pupils that the perpendicular symbol represents 90°.

For Let's Learn 7, lead pupils to deduce that this is a non-example of the property 'sum of angles at a point is 360°'.



ACTIVITY TIME

Work in pairs.

1. Use a protractor to draw three angles that form angles at a point. Label two of the angles.
2. Get your partner to find the unknown angle without using a protractor.
3. Check your partner's answer.
4. Switch roles and repeat the activity again by drawing four angles.

What you need:

PRACTICE

Find the unknown marked angles. Explain your answers.

(a)

$\angle y = 214^\circ$

(b)

$\angle ABD = 116^\circ$

(c)

$\angle z = 150^\circ$

(d)

$\angle EBC = 30^\circ$

Complete Workbook 5B, Worksheet 2 • Pages 81 – 82

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Textbook 5 P247

ACTIVITY TIME

In this activity, pupils work in pairs to create their own angles at a point. Each pupil will take turn to draw and measure 3 angles at a point but label only two angles then have their partner find the unknown angle using the property.

PRACTICE

Allow pupils to work in pairs and check each other's answers. Select some pupils to show and explain their work.

Independent seatwork

Assign pupils to complete Worksheet 2 (Workbook 5B P81 – 82).

Answers Worksheet 2 (Workbook 5B P81 – 82)

1. (a) 82
   (b) 130
   (c) 120
   (d) 136
   (e) 145
   (f) 100
   (g) 55
   (h) 45

LESSON PLAN

Chapter 12
Lesson 2

Specific Learning Focus

- Use the property of ‘sum of angles at a point is 360°’ to find unknown angles.

Suggested Duration

2 periods

Prior Learning

This lesson is in continuation of Lesson 1. Pupils have learnt to use visual skills to identify the property of angles to use to find the values of the unknown angles.

Pre-emptive Pitfalls

In this lesson, pupils will apply the properties of angles and also enhance their visual skills while working out the questions.

Introduction

In this lesson, pupils learn to use the property of ‘sum of angles at a point is 360°’ to find unknown angles. Revisit the property of ‘sum of angles on a straight line is 180°’ and use this property to lead pupils to see that the sum of angles at a point is 360°. They should understand this property experientially and visually. In Let’s Learn 1 (Textbook 5 P243), ask pupils to measure the angles with a protractor and write them down in a mathematical equation with the correct symbols (i.e. ∠ to name angles, ° to state the angle in degrees). They should note that the sum of all the angles is equal to 360°, reinforcing the property ‘sum of angles at a point is 360°.

Problem Solving

Encourage pupils to come up with multiple strategies to solve questions in ‘Practice’ (Textbook 5 P247). When finding unknown angles, encourage the use of visual skills to see the properties of angles without the use of protractor.

Activities

Encourage group work and switching roles to take turns in drawing and measuring angles. Use angle cut-out for additional practice.

Resources

- protractor
- ruler
- angle cut-out (Activity Handbook 5 P48)

Mathematical Communication Support

Elicit individual responses while doing the sums on the board. Emphasise the use of symbols while forming mathematical equations (∠, °). Ask pupils to write mathematical statements while working out the sums on their exercise books. For example, ‘angles on a straight line add up to 180°’ or ‘angles at a point add up to 360°’.

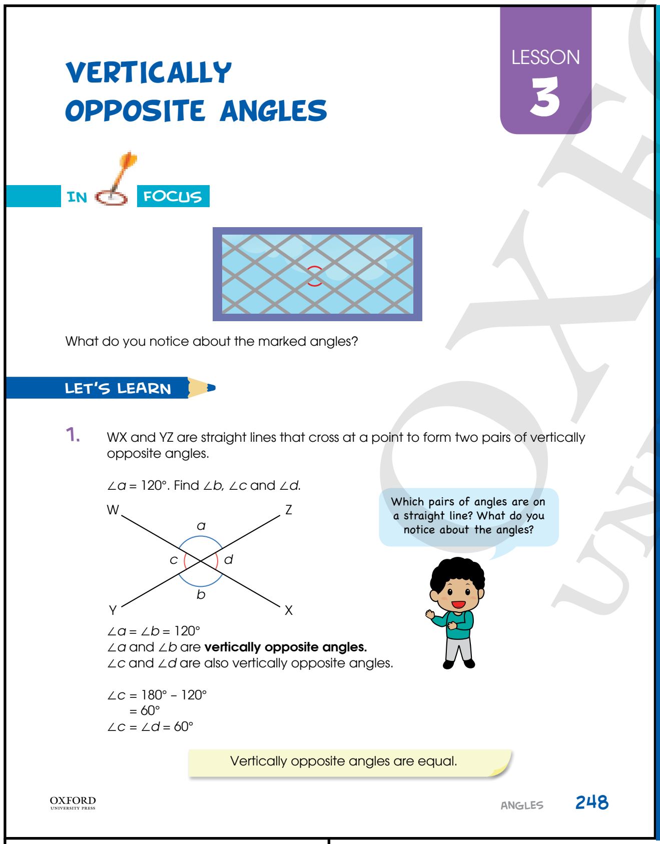
LESSON

3

VERTICALLY OPPOSITE ANGLES

LEARNING OBJECTIVE

1. Use the property of 'vertically opposite angles are equal' to find unknown angles.



VERTICALLY OPPOSITE ANGLES

LESSON 3

IN FOCUS

What do you notice about the marked angles?

LET'S LEARN

1. WX and YZ are straight lines that cross at a point to form two pairs of vertically opposite angles.

∠a = 120°. Find ∠b, ∠c and ∠d.

∠a = ∠b = 120°

∠a and ∠b are **vertically opposite angles.**

∠c and ∠d are also vertically opposite angles.

∠c = 180° – 120°

= 60°

∠c = ∠d = 60°

Vertically opposite angles are equal.

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ANGLES 248

Textbook 5 P248

IN FOCUS

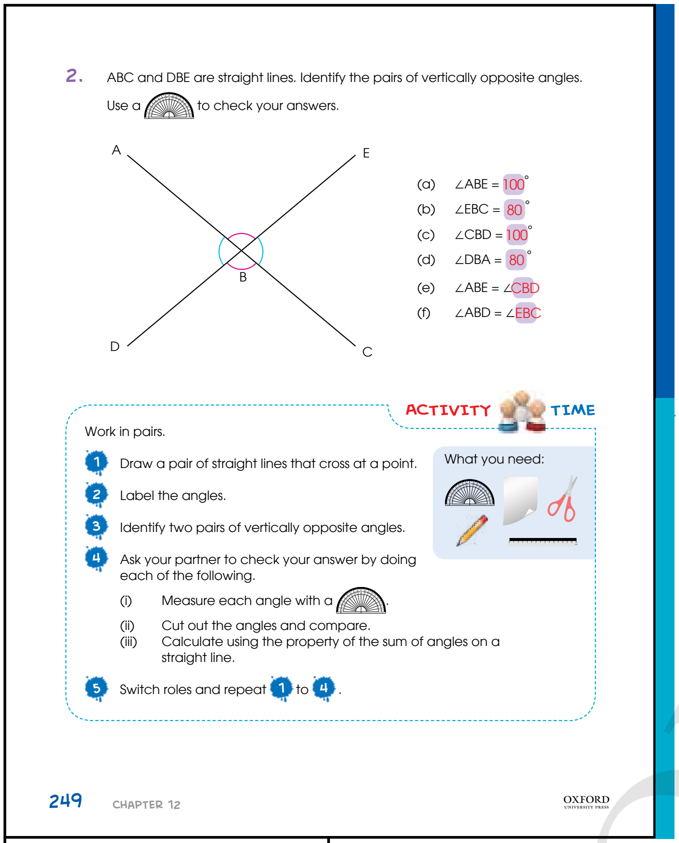
Show pictures of lattice pattern on window grills, gate or fence. Mark out pairs of vertically opposite angles and ask pupils what they notice about pairs of these angles.

LET'S LEARN

Teacher draws intersecting lines XW and YZ and marks out the four angles, ∠a, ∠b, ∠c and ∠d. Teacher then writes the term: vertically opposite angles. Explain that vertically opposite angles are formed when two straight lines cross at a point. Ask pupils to name each pair of opposite angles they see in the figure.

Ask pupils:

- Knowing that ∠a is 120°, how can we find the other angles without using a protractor?
- How can we use sum of angles on a straight line property? Guide pupils to find the unknown angles.
- Lead pupils to conclude that **each pair of vertically opposite angles are equal.**



2. ABC and DBE are straight lines. Identify the pairs of vertically opposite angles.

Use a protractor to check your answers.

(a) ∠ABE = 100°
(b) ∠EBC = 80°
(c) ∠CBD = 100°
(d) ∠DBA = 80°
(e) ∠ABE = ∠CBD
(f) ∠ABD = ∠EBC

ACTIVITY TIME

Work in pairs.

1. Draw a pair of straight lines that cross at a point.
2. Label the angles.
3. Identify two pairs of vertically opposite angles.
4. Ask your partner to check your answer by doing each of the following.
   - (i) Measure each angle with a protractor.
   - (ii) Cut out the angles and compare.
   - (iii) Calculate using the property of the sum of angles on a straight line.
5. Switch roles and repeat 1 to 4.

What you need:

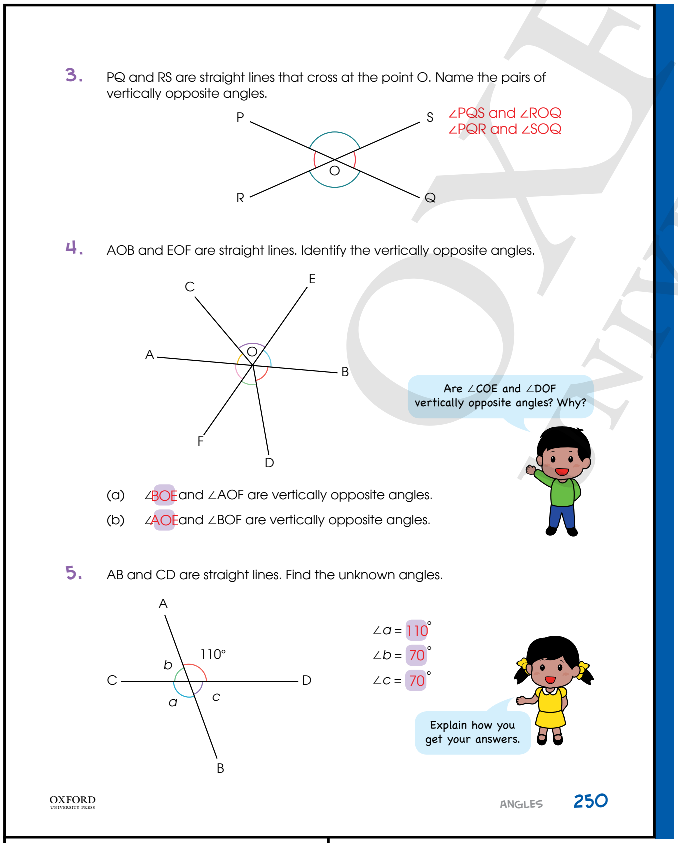
249 CHAPTER 12 OXFORD UNIVERSITY PRESS

Textbook 5 P249

For Let's Learn 2, show the figure on a visualiser. Get pupils to identify the two pairs of vertically opposite angles. Get four pupils to come up to the visualiser to measure each of the angles with a protractor. Conclude that each pair of vertically opposite angles are equal.

ACTIVITY TIME

The activity allows pupils to explore three different ways to verify pairs of vertically opposite angles. Working in pairs, they take turns to draw and to check. Teacher to walk around, observe and guide pupils as they work.



3. PQ and RS are straight lines that cross at the point O. Name the pairs of vertically opposite angles.

∠PQS and ∠ROQ
∠PQR and ∠SOQ

4. AOB and EOF are straight lines. Identify the vertically opposite angles.

(a) ∠BOE and ∠AOF are vertically opposite angles.
(b) ∠AOE and ∠BOF are vertically opposite angles.

5. AB and CD are straight lines. Find the unknown angles.

∠a = 110°
∠b = 70°
∠c = 70°

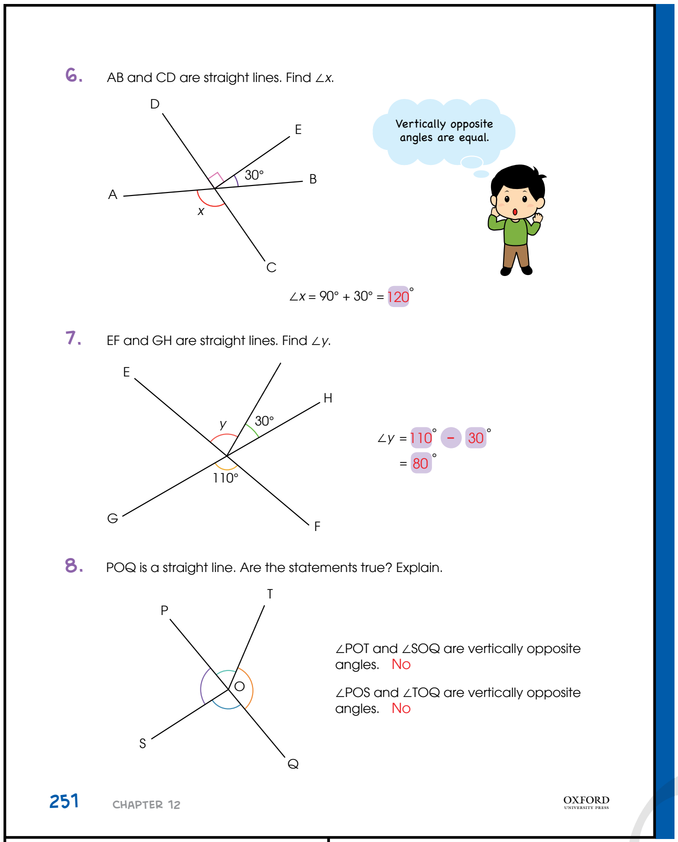
OXFORD UNIVERSITY PRESS ANGLES 250

Textbook 5 P250

Let's Learn 3 reinforces the property that vertically opposite angles must lie at the point where two straight lines cross each other.

Let's Learn 4 illustrate a non-example of vertically opposite angles, ∠COE and ∠DOF. To some pupils some angles may look like opposite angles but in fact they are not bounded by two straight lines. COD is not a straight line. Teacher needs to emphasise that to identify vertically opposite angles they need to first identify the straight lines, such as lines AB and EF that cross at a common point.

Let's Learn 5 allows pupils to use the property of 'vertically opposite angles are equal' and the property of 'sum of angles on a straight line is 180°' to find unknown angles. Work through the example with pupils and emphasise the importance of straight lines in identifying angles that are vertically opposite.



6. AB and CD are straight lines. Find $\angle x$.

$\angle x = 90^\circ + 30^\circ = 120^\circ$

7. EF and GH are straight lines. Find $\angle y$.

$\angle y = 110^\circ - 30^\circ$

$= 80^\circ$

8. POQ is a straight line. Are the statements true? Explain.

∠POT and ∠SOQ are vertically opposite angles. No

∠POS and ∠TOQ are vertically opposite angles. No

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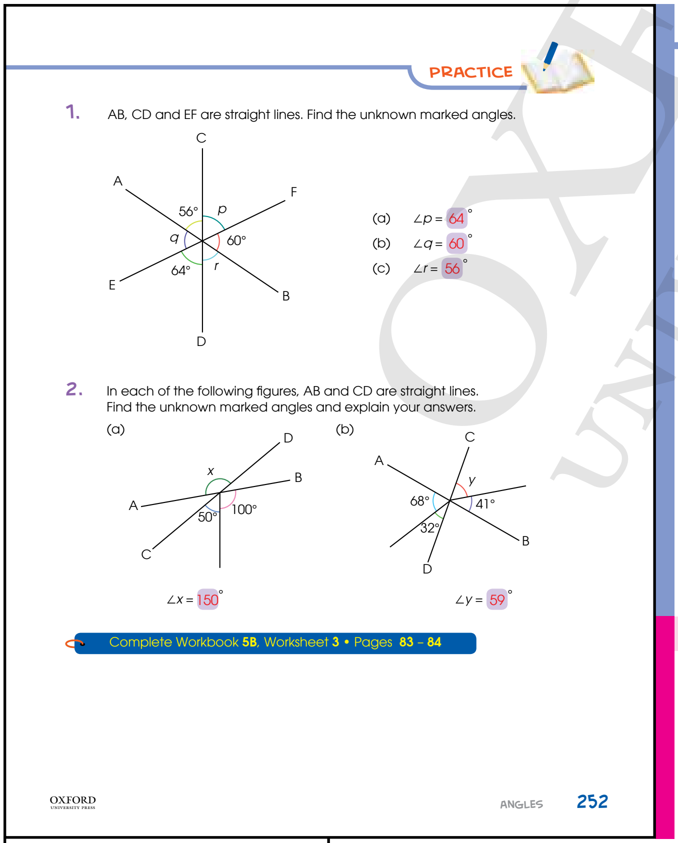
Textbook 5 P251

Allow sufficient time for pupils to work on Let's Learn 6 and 7. Remind pupils that vertically opposite angles are equal. Check that pupils identify the correct pairs of vertically opposite angles.

For Let's Learn 8, read out the statements and ask pupils to write "True" or "False" on their mini whiteboard. Pupils then raise their boards up for the teacher and the class to see. Select some pupils to explain why they think the statement is true or false before going through with the class.



PRACTICE

1. AB, CD and EF are straight lines. Find the unknown marked angles.

(a) $\angle p = 64^\circ$

(b) $\angle q = 60^\circ$

(c) $\angle r = 56^\circ$

2. In each of the following figures, AB and CD are straight lines. Find the unknown marked angles and explain your answers.

(a) (b)

$\angle x = 150^\circ$ $\angle y = 59^\circ$

Complete Workbook **5B**, Worksheet **3** • Pages **83 – 84**

OXFORD UNIVERSITY PRESS ANGLES 252

Textbook 5 P252

PRACTICE

Allow pupils to work in pairs.

Teacher walks around to monitor and check if pupils face any difficulties in identifying vertically opposite angles.

For practice question 2, get pupils to take turns to solve the problem and explain their answers to their partners.

Independent seatwork

Assign pupils to complete Worksheet 3 (Workbook 5B P83 – 84).

Answers Worksheet 3 (Workbook 5B P83 – 84)

1. (a) 90
   (b) 110
   (c) 25, 35

2. (a) 50
   (b) 51

3. 16

LESSON PLAN

Chapter 12
Lesson 3

Specific Learning Focus

- Use the property of ‘vertically opposite angles are equal’ to find unknown angles.

Suggested Duration

2 periods

Prior Learning

This lesson is in continuation from the previous two lessons on the properties of angles in a straight line and at a point. Revise with pupils the two properties – the sum of angles at a point is 360° and the sum of angles on a straight line is 180°.

Pre-emptive Pitfalls

The property of ‘vertically opposite angles are equal’ should be relatively easy to understand. However, to understand this property, it is important that pupils are able to identify the vertically opposite angles which are formed when two straight lines cross at a point.

Introduction

Encourage visual recognition of two straight lines crossing at a point found in objects in the classroom (e.g. window grills, gate, fence). Show using a protractor and cut-outs that vertically opposite angles are equal. Ask pupils to draw two lines that intersect and then ask them to measure the vertically opposite pairs of angles. They should find that the vertically opposite angles are equal. Introduce the mathematical statements that state the three properties of angles that are taught in lessons 1 to 3:

- Angles on a straight line add up to 180°.
- Angles at a point add up to 360°.
- Vertically opposite angles are equal.

Problem Solving

Pupils need to see and identify the correct pair of vertically opposite angles. Emphasise that for vertically opposite angles to be formed, the lines intersect at a point and the lines must be straight. Let’s Learn 4 (Textbook 5 P250) emphasises this fact. Point out that ∠COE and ∠DOF are not vertically opposite angles as COD is not a straight line. Emphasise that when finding unknown angles, pupils may need to employ more than one or all three properties of angles (see ‘Practice’ in Textbook 5 P252).

Activities

Encourage group work and switching roles to take turns in cutting, drawing and naming the angles.

Resources

- protractor
- angle cut-out (Activity Handbook 5 P49)
- ruler
- scissors

Mathematical Communication Support

Elicit individual responses and encourage discussions of multiple strategies to solve sums on the board. In Textbook 5 P257, ‘Mind Workout’ and ‘Maths Journal’ can be carried out as a paired/group activity. Ask pupils the following important questions:

1. Do you see a straight line?
2. What should two angles on a straight line add up to?
3. Are the two lines intersecting?
4. Are the two lines straight?
5. Can you identify vertically opposite angles?
6. Do the angles add up to 180° or are they equal?
7. How many angles can you see at a point formed by intersecting lines?
8. What should the angles at a point add up to?

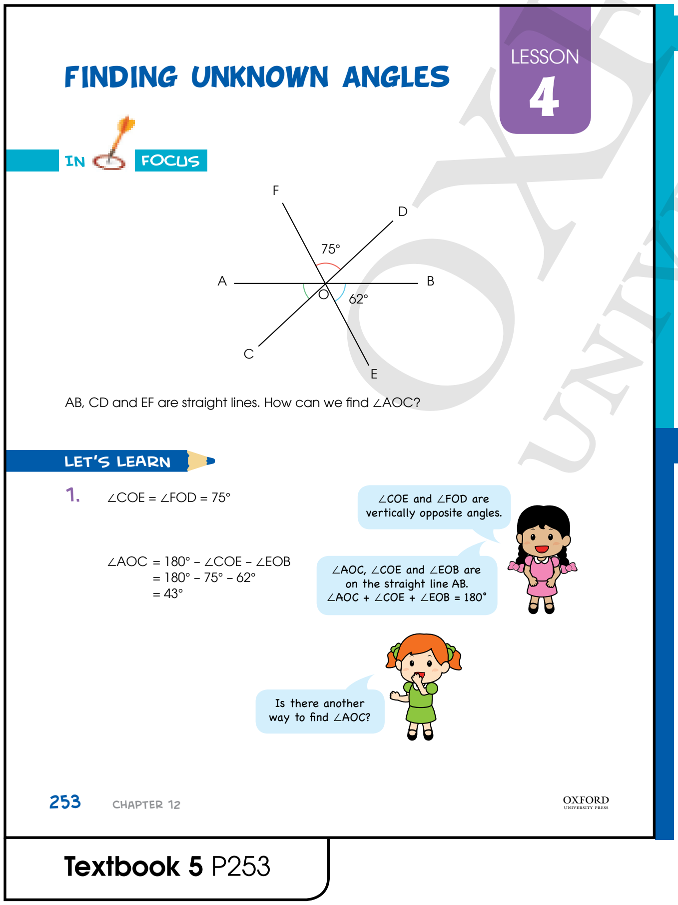
LESSON
4

FINDING UNKNOWN ANGLES

LEARNING OBJECTIVE

1. Find unknown angles involving angles on a straight line, angles at a point and vertically opposite angles.

*Note to teacher:
This lesson is a consolidation of lessons 1 to 3. Encourage pupils to use multiple strategies and emphasise all three properties of angles when finding the unknown angles.



FINDING UNKNOWN ANGLES

LESSON 4

IN FOCUS

AB, CD and EF are straight lines. How can we find ∠AOC?

LET'S LEARN

1. ∠COE = ∠FOD = 75°

∠COE and ∠FOD are vertically opposite angles.

∠AOC = 180° – ∠COE – ∠EOB
= 180° – 75° – 62°
= 43°

∠AOC, ∠COE and ∠EOB are on the straight line AB.
∠AOC + ∠COE + ∠EOB = 180°

Is there another way to find ∠AOC?

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Textbook 5 P253

IN FOCUS

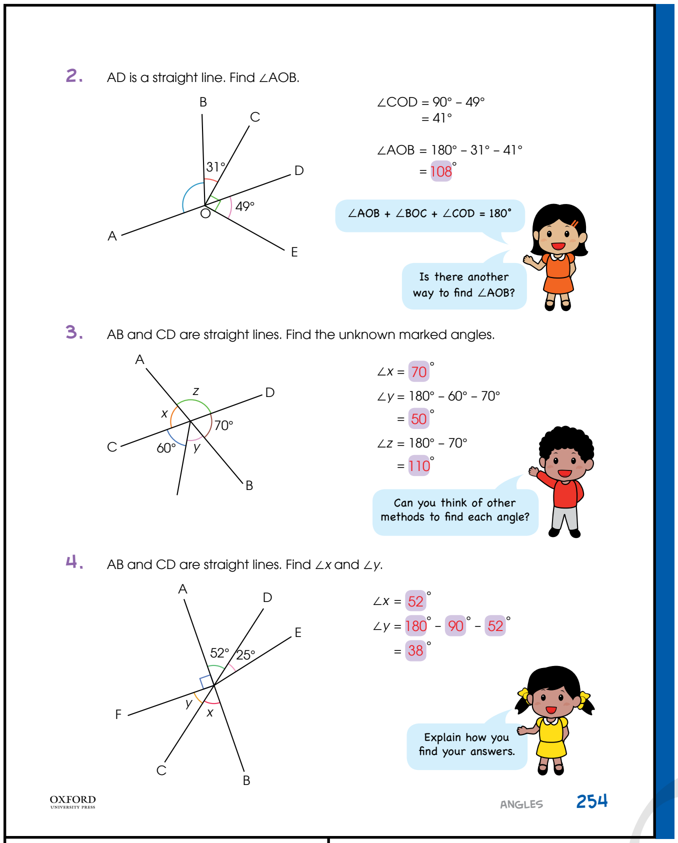
Introduce the question to the pupils. Allow time for pupils to discuss in pairs. Invite pupils to share their responses.

LET'S LEARN

Referring to the given figure, teacher helps pupils to see an overview of the problem from the In Focus by asking:

- Can we find ∠COE? Why?
- Now can we find ∠AOC? Why?

Teacher guides pupils through the worked example. Ask pupils to think of another way to find ∠AOC. Using pupils' responses, teacher works with pupils to solve the problem in other ways.



2. AD is a straight line. Find ∠AOB.

∠COD = 90° − 49°
= 41°

∠AOB = 180° − 31° − 41°
= 108°

∠AOB + ∠BOC + ∠COD = 180°

Is there another way to find ∠AOB?

3. AB and CD are straight lines. Find the unknown marked angles.

$\angle x$ = 70°
$\angle y$ = 180° − 60° − 70°
= 50°
$\angle z$ = 180° − 70°
= 110°

Can you think of other methods to find each angle?

4. AB and CD are straight lines. Find $\angle x$ and $\angle y$.

$\angle x$ = 52°
$\angle y$ = 180° − 90° − 52°
= 38°

Explain how you find your answers.

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ANGLES 254

Textbook 5 P254

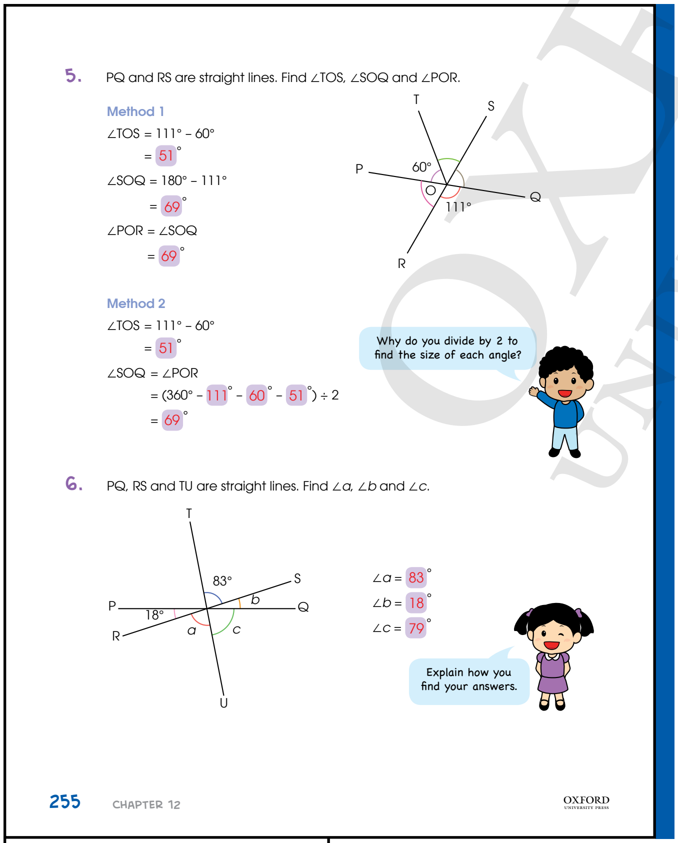
For Let's Learn 2, introduce the question on a visualiser. Help pupils to see an overview of the problem by asking:

- Since AOD is a straight line, is ∠AOB part of the sum of angles on a straight line?
- Since we know ∠DOE, can we find ∠COD? Why?
- Now can we find ∠AOB? How and why?

Work together with the pupils to find the unknown angle. Ask pupils to think of another way to find ∠AOB. Invite some pupils to share their method.

Let's Learn 3 involves solving more than one unknown. Using the same approach as above, guide pupils through questioning to see the relationship of each unknown angle with the given angles based on relevant angle properties. Allow time for pupils to read the question first. Then work together with pupils to apply the appropriate property to find the respective unknown angles.

For Let's Learn 4, address misconceptions of pupils who might see FE as a straight line and conclude wrongly that $\angle x$ and $\angle y$ are vertically opposite to the 52° and 25° angles respectively.



5. PQ and RS are straight lines. Find ∠TOS, ∠SOQ and ∠POR.

Method 1
∠TOS = 111° − 60°
= 51°
∠SOQ = 180° − 111°
= 69°
∠POR = ∠SOQ
= 69°

Method 2
∠TOS = 111° − 60°
= 51°
∠SOQ = ∠POR
= (360° − 111° − 60° − 51°) ÷ 2
= 69°

Why do you divide by 2 to find the size of each angle?

6. PQ, RS and TU are straight lines. Find $\angle a$, $\angle b$ and $\angle c$.

$\angle a$ = 83°
$\angle b$ = 18°
$\angle c$ = 79°

Explain how you find your answers.

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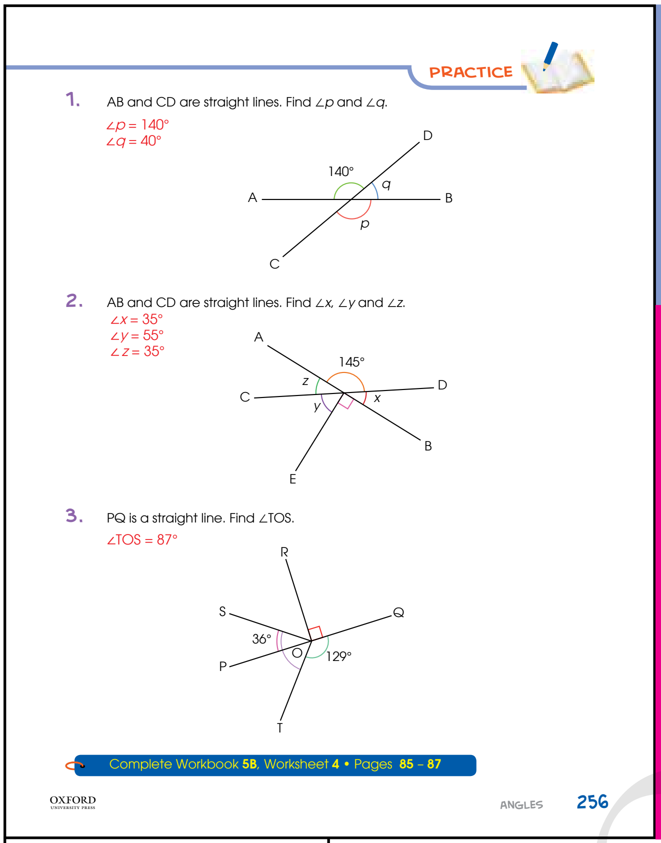
Textbook 5 P255

For Let's Learn 5, allow pupils to work in pairs. Get them to find the answer in more than one way. Discuss with the class the different ways that they have used. Work through method 2 which pupils may not have tried. Ask pupils to compare the two methods illustrated.

For Let's Learn 6, give pupils sufficient time to work out the solution before selecting a pupil to explain the solution.



PRACTICE

1. AB and CD are straight lines. Find ∠p and ∠q.
∠p = 140°
∠q = 40°

2. AB and CD are straight lines. Find ∠x, ∠y and ∠z.
∠x = 35°
∠y = 55°
∠z = 35°

3. PQ is a straight line. Find ∠TOS.
∠TOS = 87°

Complete Workbook 5B, Worksheet 4 • Pages 85 – 87

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ANGLES 256

Textbook 5 P256

PRACTICE

Allow pupils to work in pairs. Get them to explain to their partners the angle property that they are using to find the answer. Teacher walks around to monitor and check for pupils' errors and any difficulty they encounter.

Independent seatwork

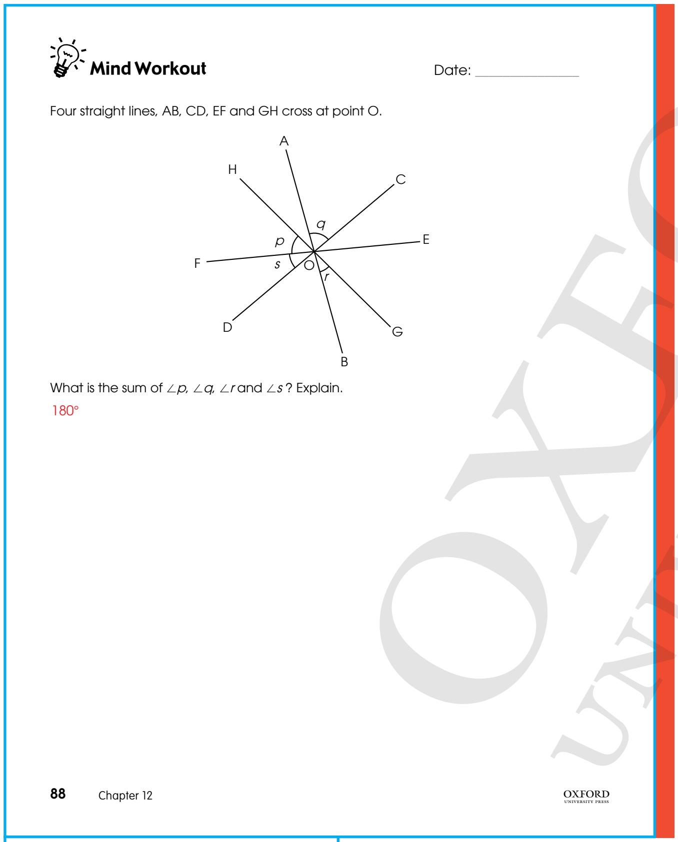
Assign pupils to complete Worksheet 4 (Workbook 5B P85 – 87).

Answers

Worksheet 4 (Workbook 5B P85 – 87)

1. 66
2. 199
3. 55, 55, 125
4. (a) 148, 122
   (b) 62, 98
   (c) 125, 20
5. 110, 160

PROBLEM SOLVING, MATHS JOURNAL AND PUPIL REVIEW



Mind Workout Date: ______________

Four straight lines, AB, CD, EF and GH cross at point O.

What is the sum of ∠*p*, ∠*q*, ∠*r* and ∠*s*? Explain.

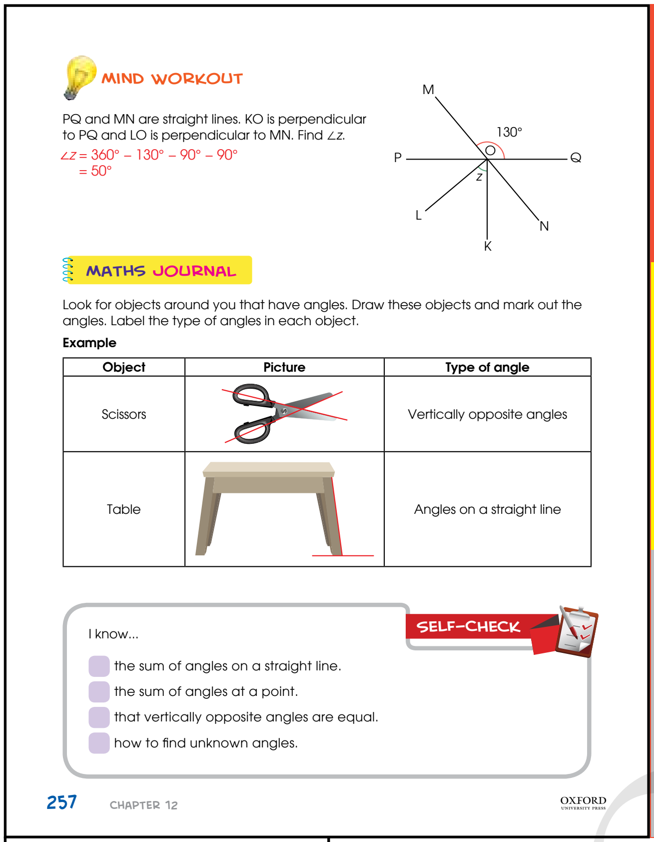
180°

88 Chapter 12 OXFORD

Workbook 5B P88

Mind Workout

Without calculation, pupils are to deduce that ∠HOA is equal to ∠*r* and that the 4 angles lie on the straight line DC.



MIND WORKOUT

PQ and MN are straight lines. KO is perpendicular to PQ and LO is perpendicular to MN. Find ∠z.

∠z = 360° − 130° − 90° − 90°
= 50°

MATHS JOURNAL

Look for objects around you that have angles. Draw these objects and mark out the angles. Label the type of angles in each object.

Example

Object	Picture	Type of angle
Scissors		Vertically opposite angles
Table		Angles on a straight line

SELF-CHECK

I know...

☐ the sum of angles on a straight line.
☐ the sum of angles at a point.
☐ that vertically opposite angles are equal.
☐ how to find unknown angles.

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Textbook 5 P257

MIND WORKOUT

Apply the property of ‘sum of angles at a point is 360°’. Pupils need to identify the two right angles at O and be able to see that the angles make up 360° when combined with ∠*z* and 130°.

MATHS JOURNAL

This is an open-ended task for pupils to recognise the various types of angles in real-life objects around them so that they can relate to the angle properties learnt in this chapter. Two examples are given to help them get started.

SELF-CHECK

Before the pupils do the self-check, review the important concepts once more by asking for examples learnt for each objective.

The self-check can be done after pupils have completed **Review 12** (Workbook 5B P89 – 92).

Answers

Review 12 (Workbook 5B P89 – 92)

1. (a) 109
   (b) 50
   (c) 92

2. 118

3. (a) $\angle p = 50°$, $\angle q = 50°$, $\angle r = 130°$
   (b) $\angle x = 115°$, $\angle y = 80°$, $\angle z = 65°$

4. $\angle p = 80°$, $\angle q = 45°$, $\angle r = 45°$, $\angle p = 55°$

5. ∠EOD = 50°, ∠COF = 50°, ∠DOF = 130°

PROPERTIES OF TRIANGLES

CHAPTER 13

Properties of Triangles

CHAPTER 13

What are the different types of triangles you can see around you?

TYPES OF TRIANGLES

LESSON 1

IN FOCUS

A B C D E F G H J K L M

We can sort them by their angles or by the lengths of their sides.

Look at these triangles. Can you sort them into three different groups?

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PROPERTIES OF TRIANGLES 258

Textbook 5 P258

Related Resources
NSPM Textbook 5 (P258 – 282)
NSPM Workbook 5B (P93 – 120)

Materials
Set squares, protractor, ruler, square grid paper, scissors, cut-outs of different triangles, mini whiteboard, markers

Lesson

Lesson 1	Types of Triangles
Lesson 2	Sum of Angles in a Triangle
Lesson 3	Drawing Triangles

Problem Solving, Maths Journal and Pupil Review

INTRODUCTION

In grades One and Two, pupils have learnt basic shapes including squares, rectangles, triangles and circles. In Grade Four, they learnt the properties of rectangles and squares, describing them using terms like ‘perpendicular’ and ‘parallel lines’. They learnt to draw squares and rectangles using ruler, protractor and set squares.

In this chapter they learn the properties of triangles by sorting and distinguishing among the three types of triangles: right-angled triangles, equilateral triangles and isosceles triangles. Terms such as ‘acute-angled triangle’ and ‘obtuse-angled triangle’ are also introduced. Pupils investigate the property of sum of angles in a triangle and use it to find unknown angles in geometric figures. They learn to sketch and draw different triangles using ruler, protractor and set squares as well to explore drawing special triangles on square grid.

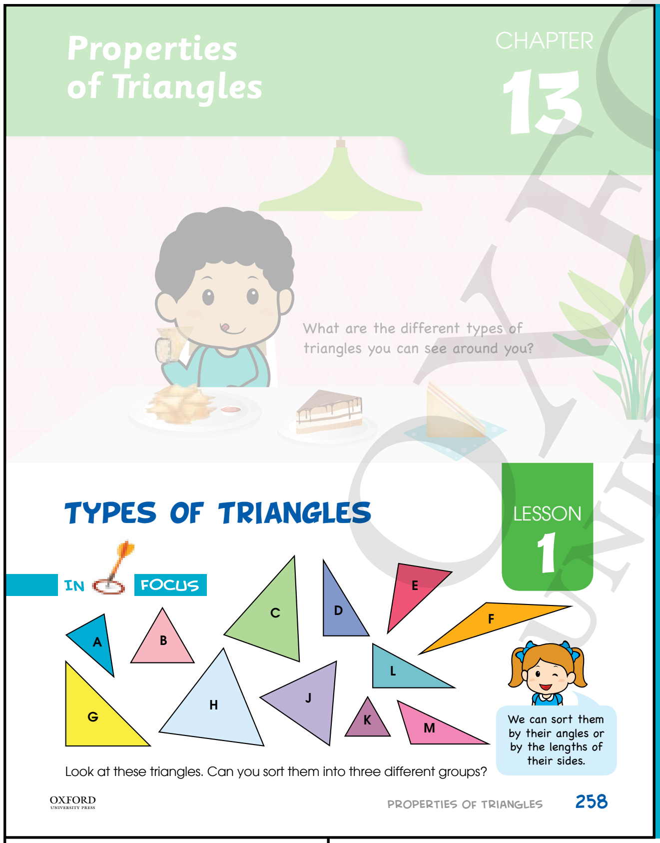
LESSON

1

TYPES OF TRIANGLES

LEARNING OBJECTIVE

1. Properties of right-angled triangle, isosceles triangle and equilateral triangle.



Properties of Triangles

CHAPTER 13

What are the different types of triangles you can see around you?

TYPES OF TRIANGLES

LESSON 1

IN FOCUS

We can sort them by their angles or by the lengths of their sides.

Look at these triangles. Can you sort them into three different groups?

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PROPERTIES OF TRIANGLES 258

Textbook 5 P258

IN FOCUS

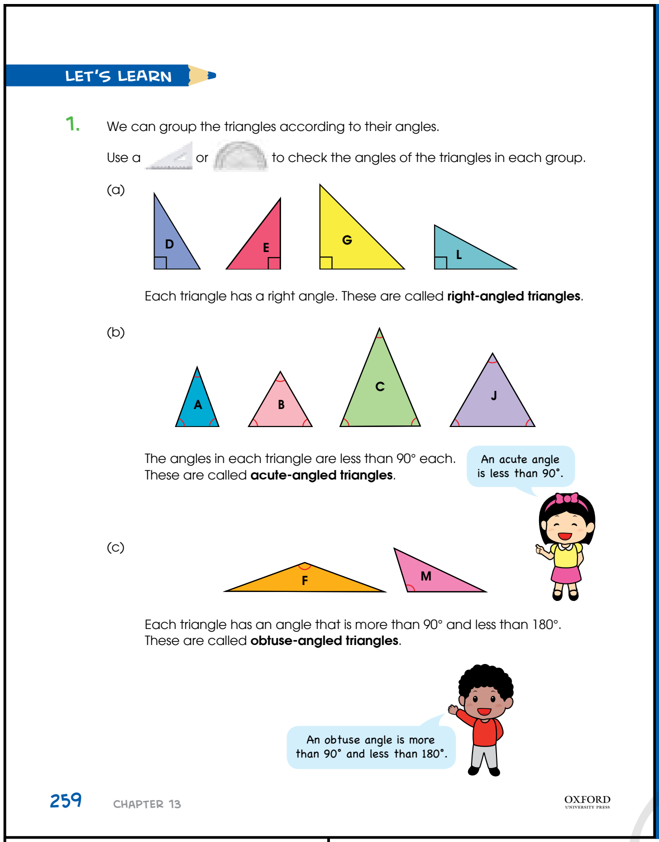
Use the Chapter Opener for discussion about the types of triangles that they see in the picture.

Then display a set of different triangle cut-outs on the visualiser as shown in the In Focus. Tell pupils that this activity involves finding out how many types of triangles there are.

Get pupils to work in groups with a set of triangle cut-outs. Suggest to the pupils that they can sort the triangles in three groups according to the angles or the length of the sides of the triangles. Allow time for the groups to do the sorting. Teacher asks:

- Why did you put these triangles in this group?
- What do these triangles have that are similar?

Teacher should accept pupils' reasoning as long as they classify the grouping according to some attributes as seen by the pupils e.g. colour.



LET'S LEARN

1. We can group the triangles according to their angles.

Use a set square or protractor to check the angles of the triangles in each group.

(a)

Each triangle has a right angle. These are called **right-angled triangles**.

(b)

The angles in each triangle are less than 90° each.
These are called **acute-angled triangles**.

(c)

Each triangle has an angle that is more than 90° and less than 180°.
These are called **obtuse-angled triangles**.

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Textbook 5 P259

LET'S LEARN

For Let's Learn 1, teacher demonstrates and guides pupils in sorting the triangles according to the angles using the set square or protractor to identify the following types of triangles:

For Let's Learn 1(a), ask:

- Can you sort out those triangles that has a right angle?

Tell pupils that these triangles are also known as **right-angled triangles** then write the term on the board.

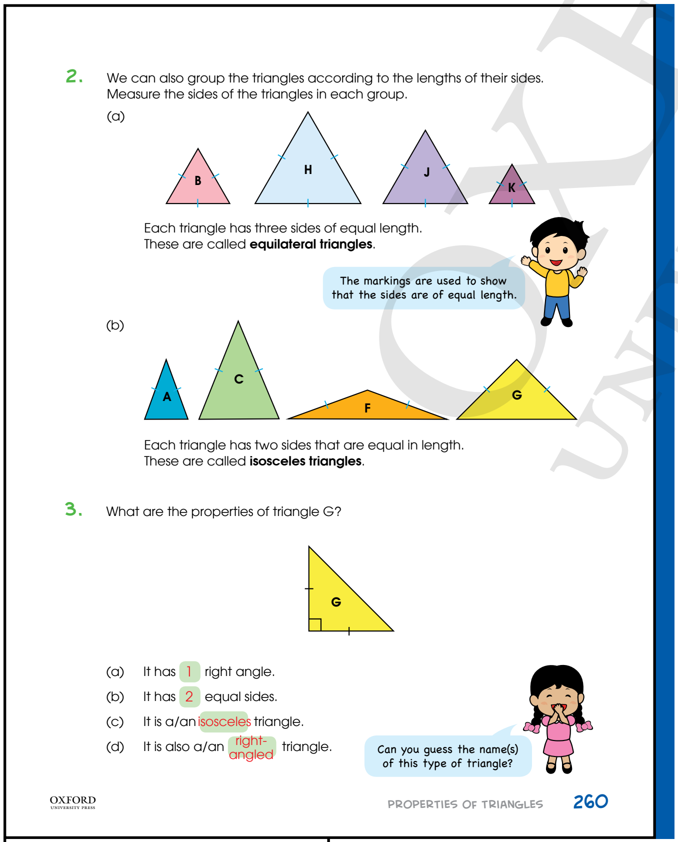
For Let's Learn 1(b), ask:

- Which are the triangles that have all their three angles less than 90°?
- What do we call this type of triangles?

Write the term '**acute-angled triangle**' on the board.

For Let's Learn 1(c), ask:

- Can we group these two triangles into 1 group?
- What do you notice about one of their angles? Is the angle more than 90°?
- Write the term '**obtuse-angled triangle**' on the board.



2. We can also group the triangles according to the lengths of their sides.
Measure the sides of the triangles in each group.

(a)

Each triangle has three sides of equal length.
These are called **equilateral triangles**.

(b)

Each triangle has two sides that are equal in length.
These are called **isosceles triangles**.

3. What are the properties of triangle G?

(a) It has 1 right angle.

(b) It has 2 equal sides.

(c) It is a/an isosceles triangle.

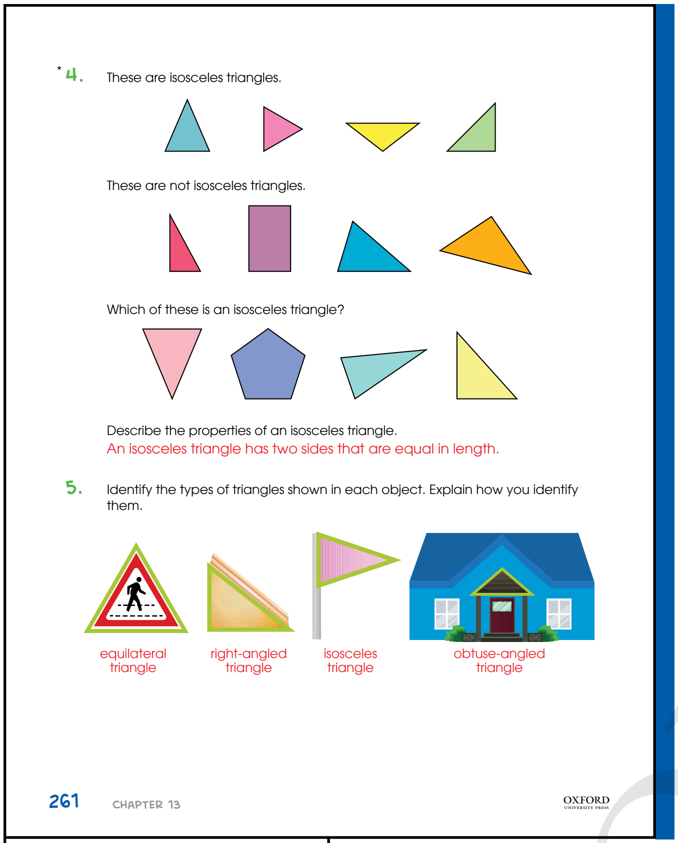
(d) It is also a/an right-angled triangle.

OXFORD PROPERTIES OF TRIANGLES 260

Textbook 5 P260

For Let's Learn 2, tell pupils that we can also sort the triangles according to the lengths of their sides. Get pupils in their groups to measure the sides of each triangle. Guide pupils to sort the triangles with all sides equal into one group; and those with two sides equal into another group. Introduce the names '**equilateral triangles**' and '**isosceles triangles**' on the board and ask pupils to guess which name belongs to which of the groups they had sorted.

Let's Learn 3 shows pupils that a triangle can have properties that belong to two types of triangles such as an isosceles triangle as well as a right-angled triangle. So it is called a **right-isosceles triangle**.



*4. These are isosceles triangles.

These are not isosceles triangles.

Which of these is an isosceles triangle?

Describe the properties of an isosceles triangle.
An isosceles triangle has two sides that are equal in length.

5. Identify the types of triangles shown in each object. Explain how you identify them.

equilateral triangle

right-angled triangle

isosceles triangle

obtuse-angled triangle

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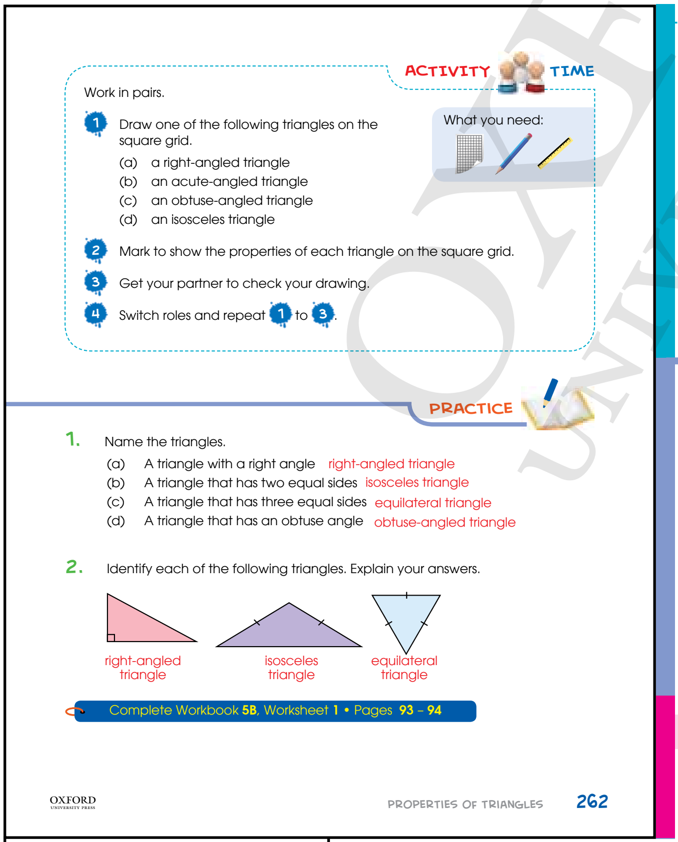
Textbook 5 P261

Let's Learn 4 develops pupils' ability to analyse the properties of a shape based on examples and non-examples. Allow pupils to use a ruler to check the length of the sides for confirmation. They should be able to identify that in the third row, the first and third triangles from the left are 'isosceles triangles'. They should be able to say that an isosceles triangle has two sides that are equal in length.

For Let's Learn 5, pupils should be able to relate these real-world objects to the types of triangles they have learnt.



ACTIVITY TIME

Work in pairs.

① Draw one of the following triangles on the square grid.
(a) a right-angled triangle
(b) an acute-angled triangle
(c) an obtuse-angled triangle
(d) an isosceles triangle

What you need:

② Mark to show the properties of each triangle on the square grid.

③ Get your partner to check your drawing.

④ Switch roles and repeat ① to ③.

PRACTICE

1. Name the triangles.
(a) A triangle with a right angle right-angled triangle
(b) A triangle that has two equal sides isosceles triangle
(c) A triangle that has three equal sides equilateral triangle
(d) A triangle that has an obtuse angle obtuse-angled triangle

2. Identify each of the following triangles. Explain your answers.

right-angled triangle

isosceles triangle

equilateral triangle

Complete Workbook 5B, Worksheet 1 • Pages 93 – 94

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Textbook 5 P262

ACTIVITY TIME

Pupils work in pairs to draw the triangles using the square grid to guide them in drawing right angles, angles less than or more than 90°; and lines that are equal.

They apply the properties of the different triangles as they draw and check their partner's work.

PRACTICE

Get all pupils to respond by writing their answers to question 1 on their mini whiteboard and raise them up for teacher to check their spelling.

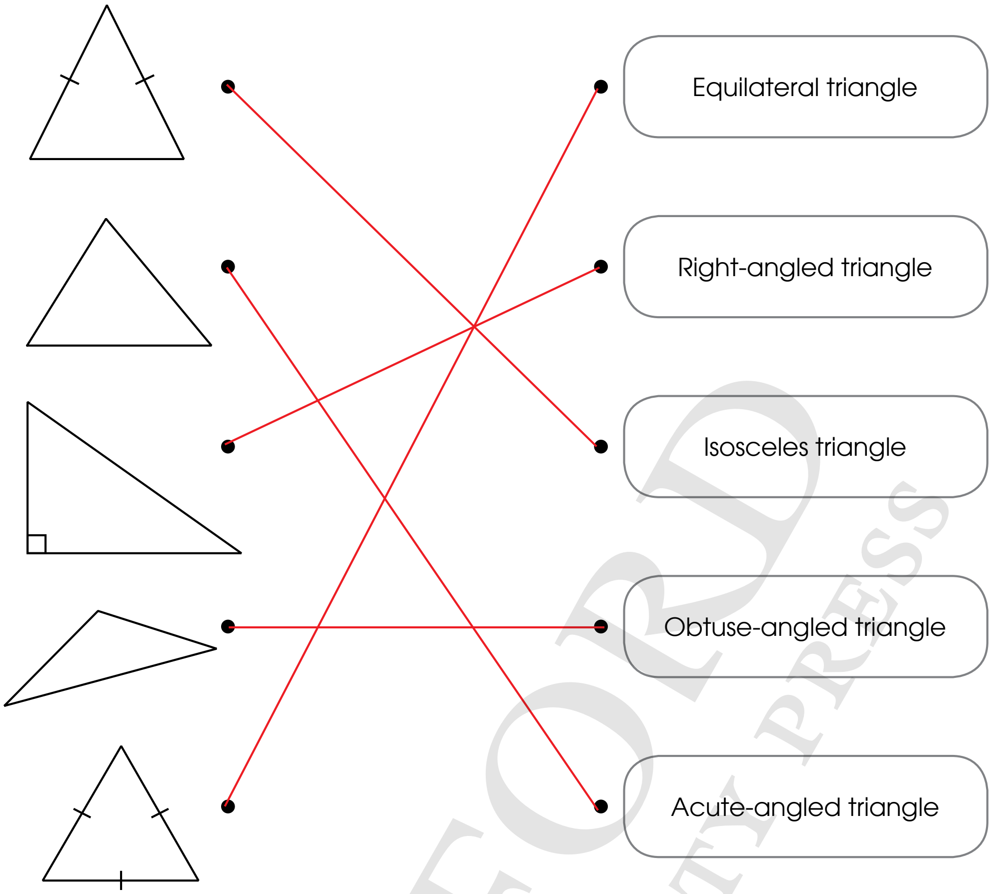
For question 2, invite some pupils to explain their answers to the class.

Independent seatwork

Assign pupils to complete Worksheet 1 (Workbook 5B P93 – 94).

Answers Worksheet 1 (Workbook 5B P93 – 94)

1.



2. (a) A
   (b) C and E
   (c) C, D and F
   (d) 2
   (e) equal

LESSON PLAN

Chapter 13
Lesson 1

Specific Learning Focus

- Properties of right-angled triangle, isosceles triangle and equilateral triangle.

Suggested Duration

4 periods

Prior Learning

Pupils should be well-versed with 2-D shapes (e.g. square, rectangle, triangle, trapezium, parallelogram, rhombus). They have learnt the properties of squares and rectangles using the terms ‘perpendicular’ and ‘parallel’.

Pre-emptive Pitfalls

This should be a relatively less challenging chapter. It is in continuation of Chapter 12 where pupils understand and investigate the properties of angles through visual and experiential learning.

Introduction

Introduce this chapter by guiding pupils to visually differentiate different types of triangles based on their sides and angles (see ‘In Focus’ in Textbook 5 P258). Use the triangle cut-outs to carry out this activity. In this lesson, pupils learn the different types of triangles and classify them according to their angles and sides:

1. right-angled triangle: triangle with a 90° angle (right angle),
2. acute-angled triangle: triangle with each angle less than 90° (acute angle),
3. obtuse-angled triangle: triangle with an angle more than 90° and less than 180° (obtuse angle),
4. equivalent triangle: triangle with three sides of equal length and each angle equal to 60°,
5. isosceles triangle: triangle with two sides of equal length and their corresponding two angles equal to each other.

Problem Solving

Develop pupils’ application skills by critically analysing each triangle. They should be able to visually differentiate an acute angle from an obtuse angle. Similarly, a right-angled triangle should be easy to identify.

Activities

‘Maths Journal’ (Textbook 5 P282) can be carried out as a class activity. Provide each group with a laminated table cut-out and ask them to draw the triangles with coloured markers. Have pupils give reasons if they think it is impossible for a triangle with the given clue to exist.

Resources

- square grid paper (Activity Handbook 5 P25)
- ruler
- protractor
- cut-outs of different triangles (Activity Handbook 5 P50 – 52)
- table cut-out (Activity Handbook 5 P58)
- mini whiteboard
- markers

Mathematical Communication Support

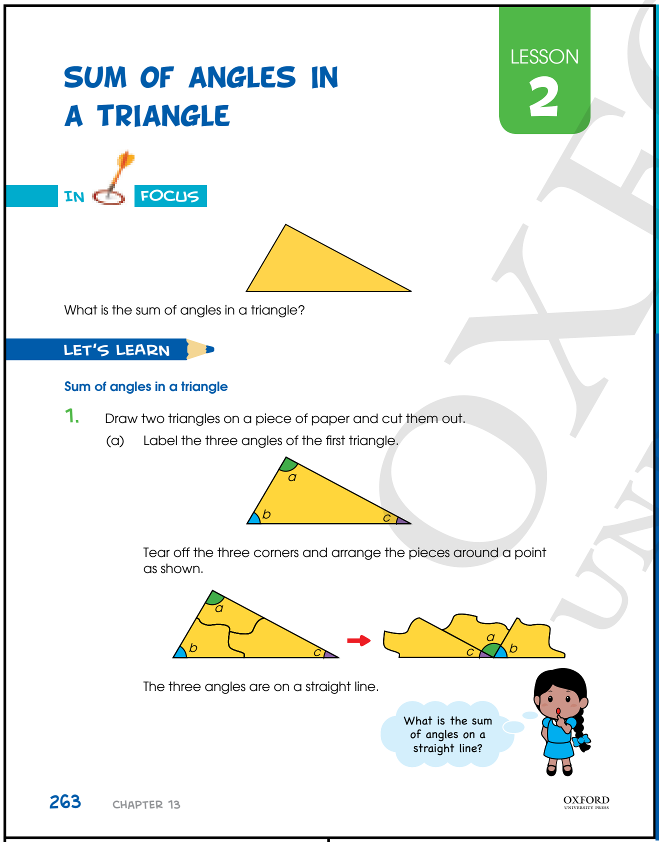
Ask pupils guided questions to lead them to correctly identify the triangles. Verbalise the property of each type of triangle and elicit individual responses when mathematical reasoning is asked. Ask them questions like “Why do you suggest that the triangle is an acute-angled triangle?”. Let’s Learn 4 and 5 (Textbook 5 P261) can be used to ask pupils questions.

LESSON
2

SUM OF ANGLES IN A TRIANGLE

LEARNING OBJECTIVES

1. Use the property of sum of angles in a triangle to find an unknown angle.
2. Use angle properties of various types of triangles to find unknown angles.


LESSON 2

SUM OF ANGLES IN A TRIANGLE

IN FOCUS

What is the sum of angles in a triangle?

LET'S LEARN

Sum of angles in a triangle

1. Draw two triangles on a piece of paper and cut them out.
   (a) Label the three angles of the first triangle.

Tear off the three corners and arrange the pieces around a point as shown.

The three angles are on a straight line.

What is the sum of angles on a straight line?

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Textbook 5 P263

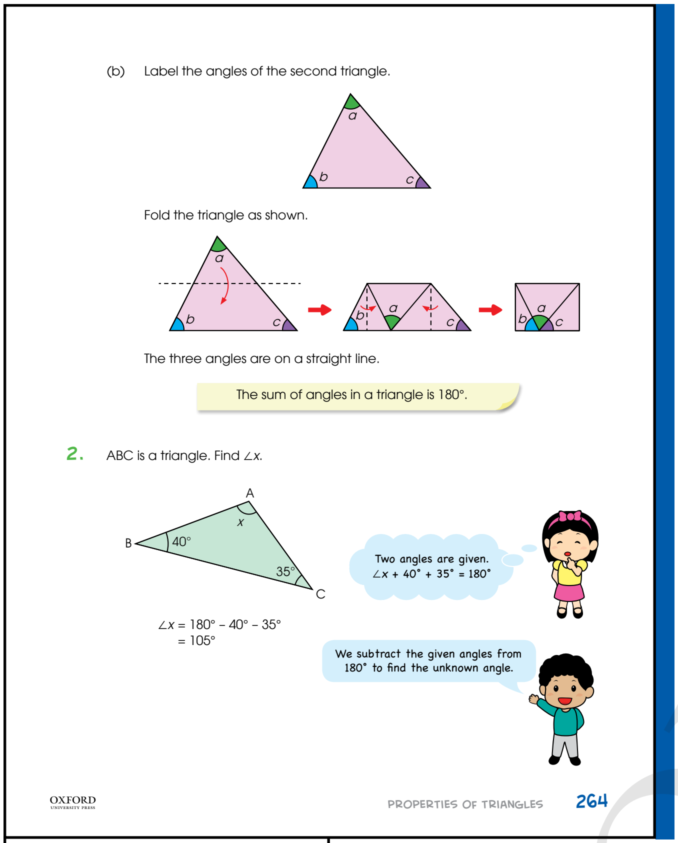
IN FOCUS

Ask pupils how many angles there are in a triangle. Get pupils to estimate the size of each angle and add them to find the sum of the angles in a triangle. Get some pupils to share their estimates. Tell them they will soon find out how close their estimates are to the actual answer.

LET'S LEARN

For Let's Learn 1, tell pupils they can use a 'cut-and-paste' method to find the sum of angles in a triangle without using a protractor. Get pupils to work in pairs with papers and scissors.

For Let's Learn 1(a), demonstrate and guide pupils along as they do the drawing, cutting and tearing of the triangle. Ask pupils to mark and label each angle in different colours. Tear out the angles, align and paste them along a drawn straight line as shown. Lead pupils to use the property of sum of angles on a straight line that they had already learnt to conclude that the sum of angles in a triangle is 180°.



(b) Label the angles of the second triangle.

Fold the triangle as shown.

The three angles are on a straight line.

The sum of angles in a triangle is 180°.

2. ABC is a triangle. Find ∠x.

∠x = 180° − 40° − 35°
= 105°

Two angles are given.
∠x + 40° + 35° = 180°

We subtract the given angles from 180° to find the unknown angle.

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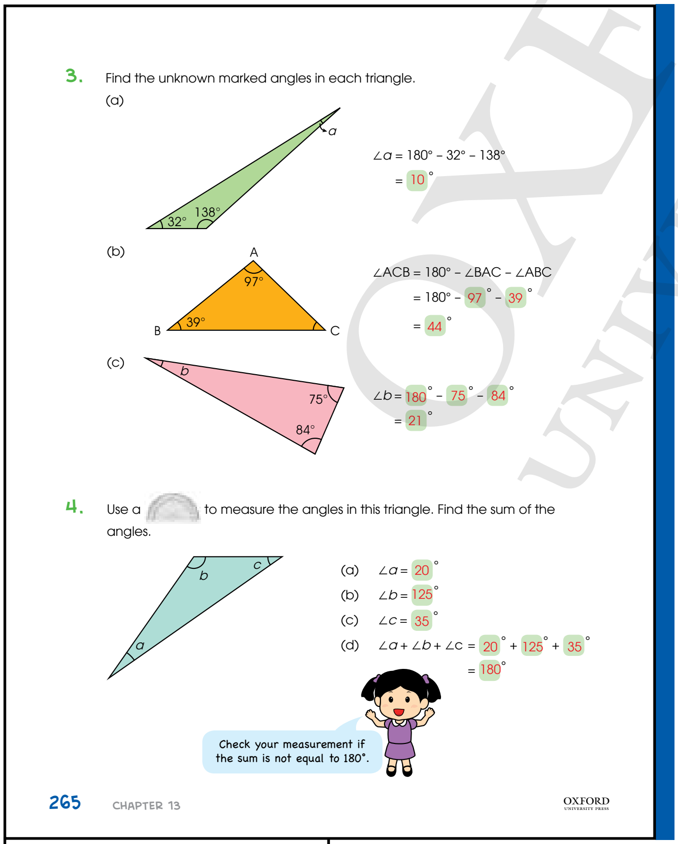
PROPERTIES OF TRIANGLES 264

Textbook 5 P264

For Let's Learn 1(b), demonstrate and guide pupils to confirm the property using an another triangle (an acute triangle). Get pupils to articulate aloud the property that they have investigated.

Let's Learn 2 uses the property of sum of angles in a triangle to find the unknown angle in it. Teacher works through the example with pupils, emphasising the property before writing out the equation to find the unknown.



3. Find the unknown marked angles in each triangle.

(a)

∠a = 180° − 32° − 138°
= 10°

(b)

∠ACB = 180° − ∠BAC − ∠ABC
= 180° − 97° − 39°
= 44°

(c)

∠b = 180° − 75° − 84°
= 21°

4. Use a protractor to measure the angles in this triangle. Find the sum of the angles.

(a) ∠a = 20°
(b) ∠b = 125°
(c) ∠c = 35°
(d) ∠a + ∠b + ∠c = 20° + 125° + 35°
= 180°

Check your measurement if the sum is not equal to 180°.

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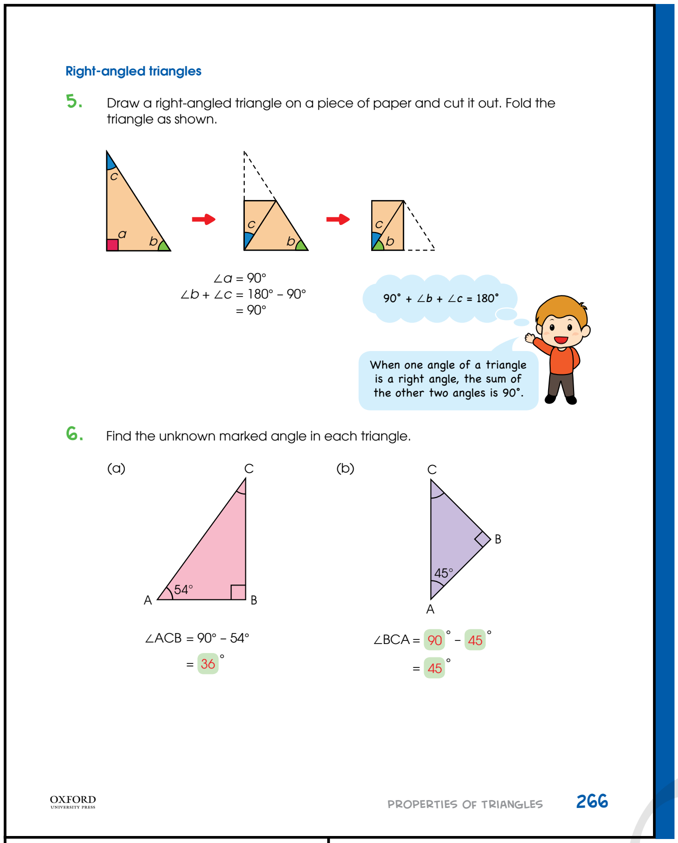
Textbook 5 P265

For Let's Learn 3, allow pupils to work in pairs before going through the solution with the class.

Let's Learn 4 allows pupils to confirm the property in a more concrete way by hands-on measurement of the angles with a protractor. Allow pupils to work in pairs to draw any triangle of their choice and measure the angles. Invite some pupils to share their findings.



Right-angled triangles

5. Draw a right-angled triangle on a piece of paper and cut it out. Fold the triangle as shown.

$\angle a = 90°$

$\angle b + \angle c = 180° - 90°$

$= 90°$

$90° + \angle b + \angle c = 180°$

When one angle of a triangle is a right angle, the sum of the other two angles is 90°.

6. Find the unknown marked angle in each triangle.

(a)

$\angle ACB = 90° - 54°$

$= 36°$

(b)

$\angle BCA = 90° - 45°$

$= 45°$

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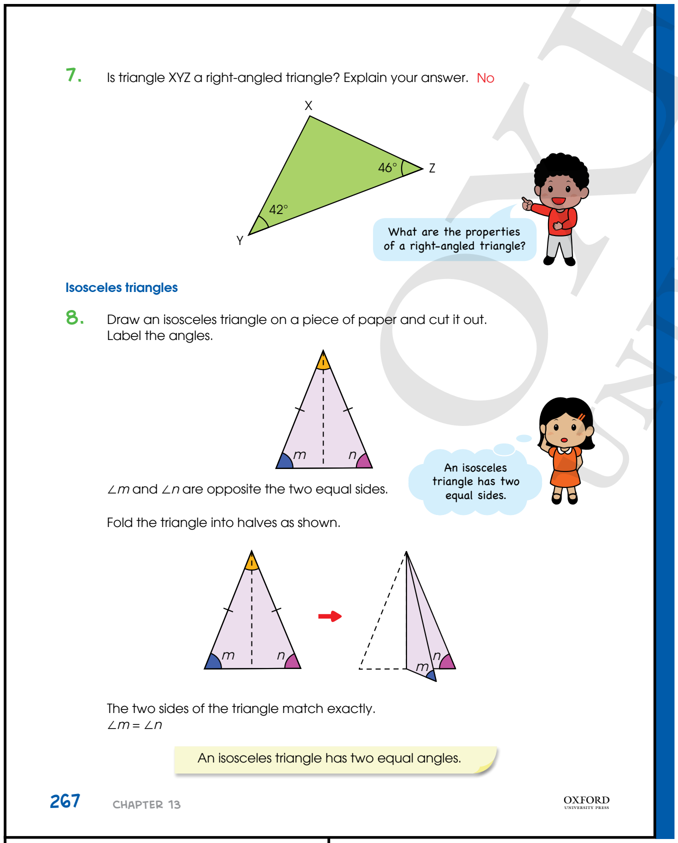
PROPERTIES OF TRIANGLES 266

Textbook 5 P266

For Let's Learn 5, teacher shows a right-angled triangle with the marked angles. Ask pupils what the sum of the other two angles is if one of the angles in the triangle is a right angle or 90°. Invite pupils to give the answers and write them on the board. Teacher demonstrates the folding method to check pupils' answers. Get pupils to conclude that in a right-angled triangle the sum of the other two angles is 90°.

Let's Learn 6 allows pupils to apply the property for a right-angled triangle to find the unknown angle. Teacher go through the working with pupils, reminding them that it is not necessary to work through the sum of the three angles is 180° if we know that the triangle is a right-angled triangle.



7. Is triangle XYZ a right-angled triangle? Explain your answer. No

What are the properties of a right-angled triangle?

Isosceles triangles

8. Draw an isosceles triangle on a piece of paper and cut it out. Label the angles.

$\angle m$ and $\angle n$ are opposite the two equal sides.

An isosceles triangle has two equal sides.

Fold the triangle into halves as shown.

The two sides of the triangle match exactly.

$\angle m = \angle n$

An isosceles triangle has two equal angles.

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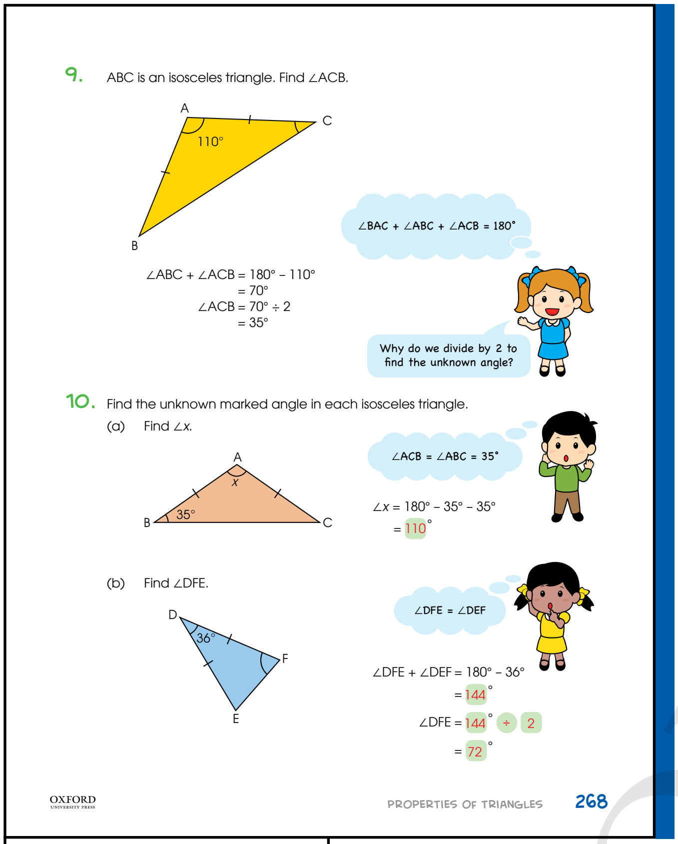
Textbook 5 P267

For Let's Learn 7, guide pupils to identify that this triangle is not a right-angled triangle since the sum of the other two angles do not add up to 90°.

For Let's Learn 8, recap pupils' knowledge of an isosceles triangle learnt in Lesson 1. Present an isosceles triangle cut-out identical to the figure in this example on a visualiser. Focus pupils on the angles opposite the equal sides. Ask pupils what they think the relationship is between the angles $\angle m$ and $\angle n$.
Teacher then folds the triangle in halves. Ask:

- Do the two halves of the triangle match exactly?
- What can you say about the two sides of the triangle?
- What can you say about the two angles, $\angle m$ and $\angle n$?

Lead pupils to conclude that an isosceles triangle has two equal angles.



9. ABC is an isosceles triangle. Find ∠ACB.

∠BAC + ∠ABC + ∠ACB = 180°

∠ABC + ∠ACB = 180° – 110°
= 70°
∠ACB = 70° ÷ 2
= 35°

Why do we divide by 2 to find the unknown angle?

10. Find the unknown marked angle in each isosceles triangle.

(a) Find ∠x.

∠ACB = ∠ABC = 35°

∠x = 180° – 35° – 35°
= 110°

(b) Find ∠DFE.

∠DFE = ∠DEF

∠DFE + ∠DEF = 180° – 36°
= 144°
∠DFE = 144° ÷ 2
= 72°

PROPERTIES OF TRIANGLES 268

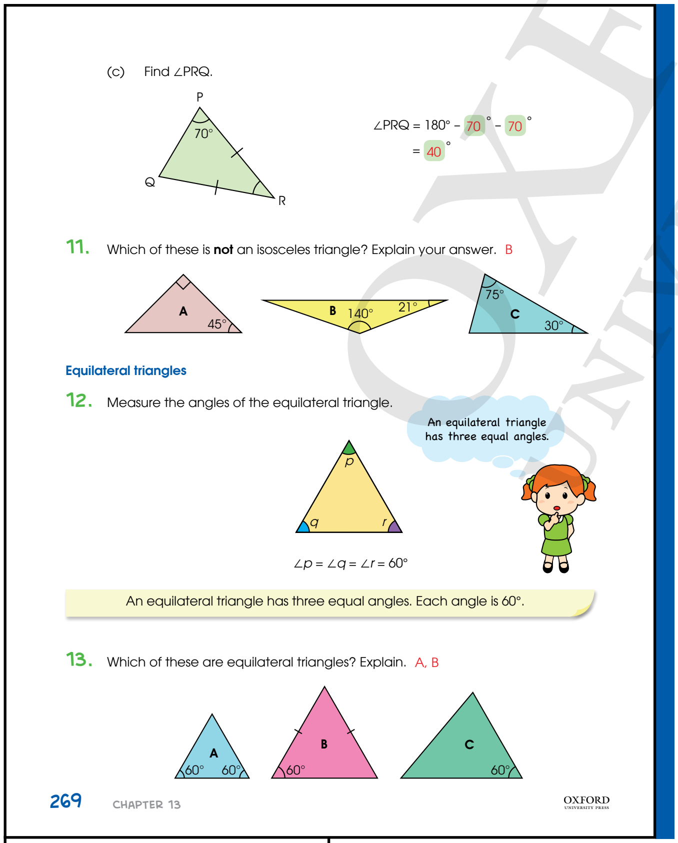
Textbook 5 P268

For Let's Learn 9, allow pupils to apply the sum of angles in an isosceles triangle to find unknown angles. The example involves solving for a base angle given a vertex angle.

For Let's Learn 10, help pupils to see the difference between the two types of questions:

a) given a base angle, find the vertex angle.
b) given a vertex angle, find a base angle.

Work through with them the calculation. Emphasise the sum of angles in a triangle property and the two equal base angles in an isosceles triangle for each worked example.



(c) Find ∠PRQ.

∠PRQ = 180° – 70° – 70°
= 40°

11. Which of these is **not** an isosceles triangle? Explain your answer. B

Equilateral triangles

12. Measure the angles of the equilateral triangle.

An equilateral triangle has three equal angles.

∠p = ∠q = ∠r = 60°

An equilateral triangle has three equal angles. Each angle is 60°.

13. Which of these are equilateral triangles? Explain. A, B

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Textbook 5 P269

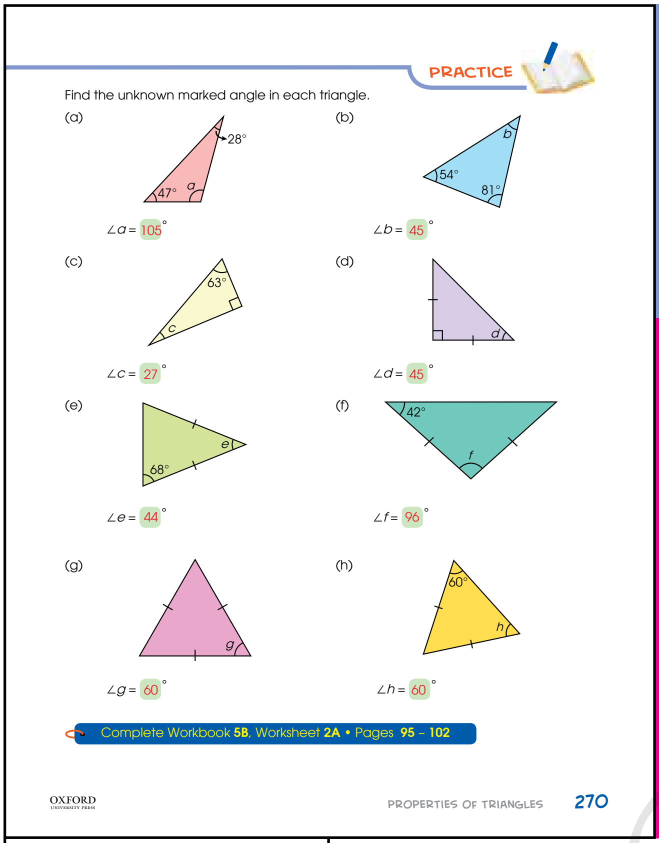
Let's Learn 11 enables pupils to identify examples and non-examples of an isosceles triangle by finding out whether the two base angles in the triangle are equal.

For Let's Learn 12, show an equilateral triangle cut-out with marked angles. Recap that equilateral triangle has all three sides equal. Ask:

- Do you know the sum of the three angles in the triangle?
- If all the three angles of an equilateral triangle are equal, what is the size of each angle?

Get some answers from the pupils. To check their answers, ask a pupil to measure the angles of the equilateral triangle on a visualiser.

Let's Learn 13 enables pupils to identify examples and non-examples of an equilateral triangle if they can show that all the angles in the triangle are equal to 60°.



PRACTICE

Find the unknown marked angle in each triangle.

(a) $\angle a = 105^\circ$

(b) $\angle b = 45^\circ$

(c) $\angle c = 27^\circ$

(d) $\angle d = 45^\circ$

(e) $\angle e = 44^\circ$

(f) $\angle f = 96^\circ$

(g) $\angle g = 60^\circ$

(h) $\angle h = 60^\circ$

Complete Workbook **5B**, Worksheet **2A** • Pages **95 – 102**

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PROPERTIES OF TRIANGLES 270

Textbook 5 P270

PRACTICE

Allow pupils to work in pairs and check each other's answers. Select some pupils to show and explain their work.

Independent seatwork

Assign pupils to complete Worksheet 2A (Workbook 5B P95 – 102).

Answers

Worksheet 2A (Workbook 5B P95 – 102)

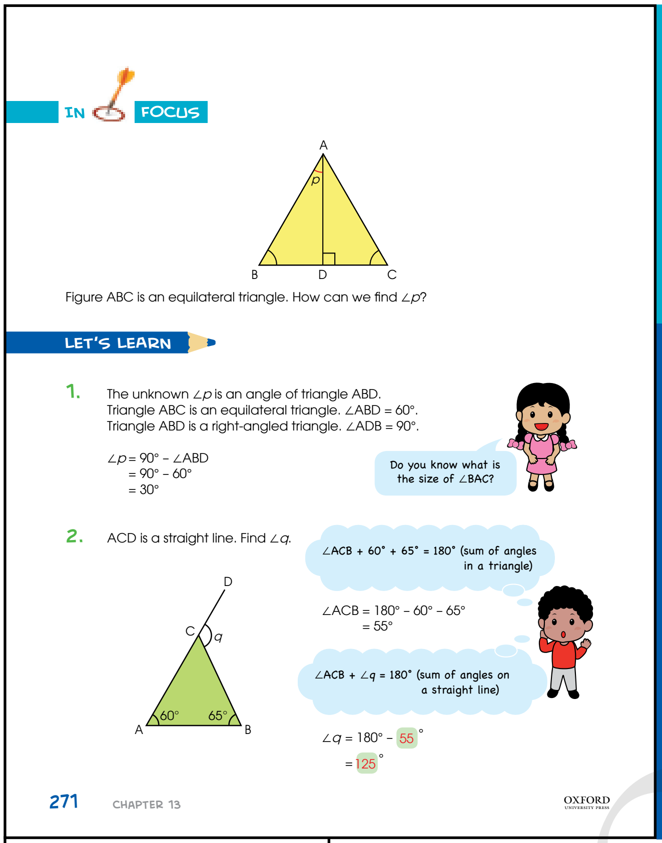
1. (a) $\angle a = 180^\circ - 75^\circ - 30^\circ$
   $= 75^\circ$
   (b) $\angle b = 180^\circ - 120^\circ - 27^\circ$
   $= 33^\circ$
   (c) $\angle c = 180^\circ - 45^\circ - 50^\circ$
   $= 85^\circ$
   (d) $\angle d = 180^\circ - 92^\circ - 44^\circ$
   $= 44^\circ$

2. (a) $\angle a = 90^\circ - 45^\circ$
   $= 45^\circ$
   (b) $\angle b = 90^\circ - 58^\circ$
   $= 32^\circ$
   (c) $\angle c = 90^\circ - 38^\circ$
   $= 52^\circ$
   (d) $\angle d = 90^\circ - 67^\circ$
   $= 23^\circ$

3. (a) $\angle a = 180^\circ - 65^\circ - 65^\circ$
   $= 50^\circ$
   (b) $\angle b = 180^\circ - 80^\circ - 80^\circ$
   $= 20^\circ$
   (c) $\angle c = (180^\circ - 130^\circ) \div 2$
   $= 25^\circ$
   (d) $\angle d = 180^\circ - 60^\circ - 60^\circ$
   $= 60^\circ$

4. (a) DEF
   (b) PQR

5. (a) $\angle w = 90^\circ \div 2$
   $= 45^\circ$
   (b) $\angle x = 60^\circ$
   (c) $\angle y = 90^\circ - 17^\circ$
   $= 73^\circ$
   (d) $\angle z = 180^\circ - 81^\circ - 62^\circ$
   $= 37^\circ$



IN FOCUS

Figure ABC is an equilateral triangle. How can we find ∠p?

LET'S LEARN

1. The unknown ∠p is an angle of triangle ABD.
Triangle ABC is an equilateral triangle. ∠ABD = 60°.
Triangle ABD is a right-angled triangle. ∠ADB = 90°.

∠p = 90° – ∠ABD
= 90° – 60°
= 30°

Do you know what is the size of ∠BAC?

2. ACD is a straight line. Find ∠q.

∠ACB + 60° + 65° = 180° (sum of angles in a triangle)

∠ACB = 180° – 60° – 65°
= 55°

∠ACB + ∠q = 180° (sum of angles on a straight line)

∠q = 180° – 55°
= 125°

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Textbook 5 P271

IN FOCUS

Pose the problem in the In Focus to the pupils. Ask:

- If we know that ABC is an equilateral triangle, do we know what is ∠p?
- If not, what do we need to find first?

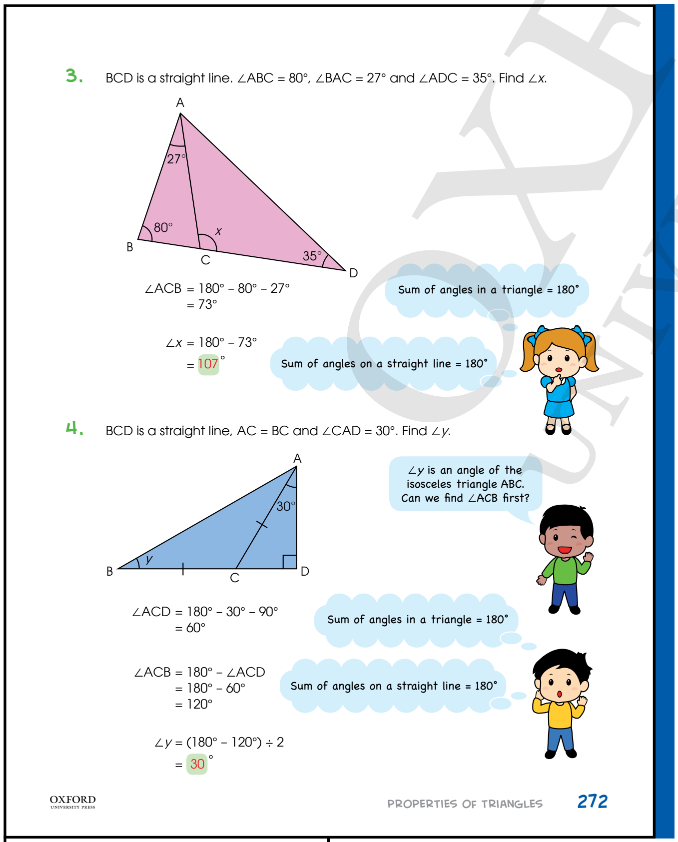
LET'S LEARN

For Let's Learn 1, guide pupils with the following questions:

- What do we have to find?
- In which triangle is ∠p?
- In triangle ABD, do we know the size of ∠ABD and ∠ADB? How and why?

For Let's Learn 2, guide pupils with the following questions:

- Which are the angles in the straight line ACD?
- What do we need to find in order to find ∠q?
- How can we find ∠ACB? Why?
- Now can we find ∠q? Why?



3. BCD is a straight line. ∠ABC = 80°, ∠BAC = 27° and ∠ADC = 35°. Find ∠x.

∠ACB = 180° – 80° – 27°
= 73°

Sum of angles in a triangle = 180°

∠x = 180° – 73°
= 107°

Sum of angles on a straight line = 180°

4. BCD is a straight line, AC = BC and ∠CAD = 30°. Find ∠y.

∠y is an angle of the isosceles triangle ABC. Can we find ∠ACB first?

∠ACD = 180° – 30° – 90°
= 60°

Sum of angles in a triangle = 180°

∠ACB = 180° – ∠ACD
= 180° – 60°
= 120°

Sum of angles on a straight line = 180°

∠y = (180° – 120°) ÷ 2
= 30°

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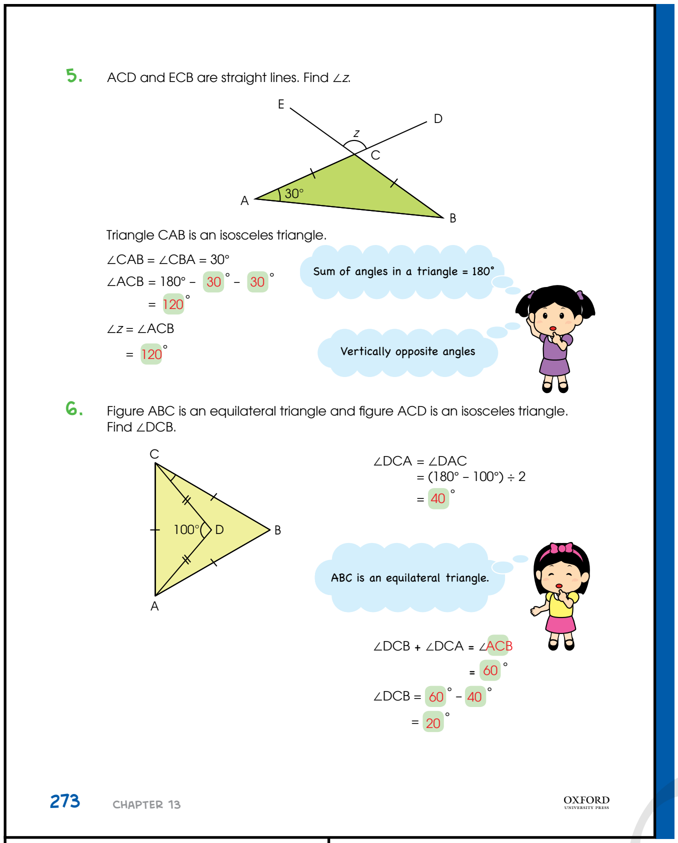
For Let's Learn 3,

- What do we need to find?
- What are the angles on the straight line BCD?
- Can we find ∠ACB first? How and why?
- Now can we find ∠x? Why?

For Let's Learn 4, repeat the same process as in Let's Learn 3. Help pupils to see that the unknown angle is in isosceles triangle ABC and guide them to solve the hidden problems leading to the solution.



5. ACD and ECB are straight lines. Find ∠z.

Triangle CAB is an isosceles triangle.

∠CAB = ∠CBA = 30°

∠ACB = 180° − 30° − 30°

= 120°

∠z = ∠ACB

= 120°

6. Figure ABC is an equilateral triangle and figure ACD is an isosceles triangle. Find ∠DCB.

∠DCA = ∠DAC

= (180° − 100°) ÷ 2

= 40°

∠DCB + ∠DCA = ∠ACB

= 60°

∠DCB = 60° − 40°

= 20°

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For Let's Learn 5, guide pupils with the following questions:

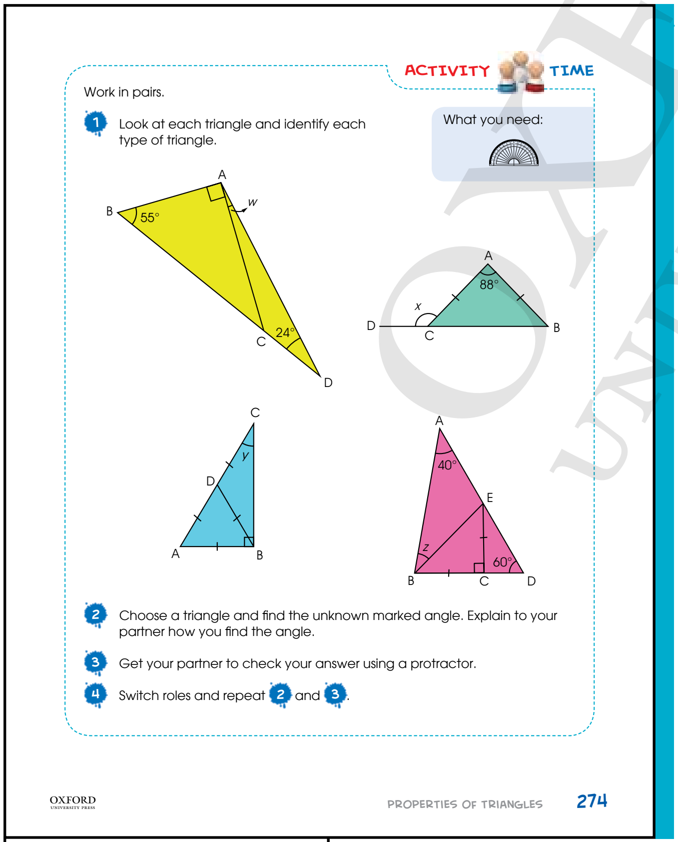
- Since ACD and ECB are straight lines, which angle is vertically opposite to the unknown ∠*z*?
- What type of triangle is CAB?
- How can we find the size of ∠ACB first?

Work through the solution with pupils. Ask pupils for the property that they had applied in each step.

For Let's Learn 6, ask:

- Which angle is the unknown ∠DCB a part of? What is the other angle to that part?
- Do we know the size of ∠ACB? How can we find it?
- What type of triangle is ACD?
- How can we find the size of ∠DCA?

Work through the solution with pupils. Ask pupils for the property that they had applied in each step.



ACTIVITY TIME

Work in pairs.

① Look at each triangle and identify each type of triangle.

What you need:

② Choose a triangle and find the unknown marked angle. Explain to your partner how you find the angle.

③ Get your partner to check your answer using a protractor.

④ Switch roles and repeat ② and ③.

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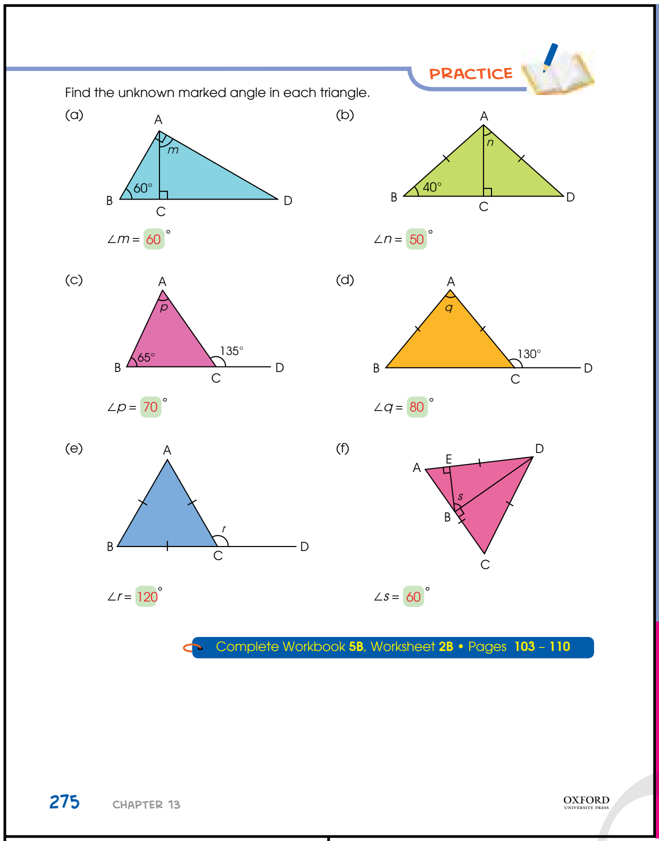
ACTIVITY TIME

The activity allows pupils to solve problems in pairs. Encourage pupils to guide their partners with questions to help him or her solve the problem.

Teacher walks around to check on the mathematical language and reasoning that pupils use in their discussion.

For class discussion, get some pupils to show and explain their solution.



PRACTICE

Find the unknown marked angle in each triangle.

(a) ∠m = 60°

(b) ∠n = 50°

(c) ∠p = 70°

(d) ∠q = 80°

(e) ∠r = 120°

(f) ∠s = 60°

Complete Workbook **5B**, Worksheet **2B** • Pages **103 – 110**

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Textbook 5 P275

PRACTICE

Allow sufficient time for pupils to solve the questions. Invite pupils to present their solutions on the board for the rest of the class to check their work. Highlight any errors or difficulty pupils might encounter.

For better understanding, select items from Worksheet 2B and work these out with pupils.

Independent seatwork

Assign pupils to complete Worksheet 2B (Workbook 5B P103 – 110).

Answers Worksheet 2B (Workbook 5B P103 – 110)

1. (a) $\angle ACB = 180^\circ - 125^\circ$
$= 55^\circ$
$\angle p = 180^\circ - 55^\circ - 90^\circ$
$= 35^\circ$

(b) $\angle q = 180^\circ - 90^\circ - 36^\circ - 36^\circ$
$= 18^\circ$

(c) $\angle ACD = 180^\circ - 50^\circ$
$= 130^\circ$
$\angle r = (180^\circ - 130^\circ) \div 2$
$= 25^\circ$

(d) $\angle s = 180^\circ - 70^\circ - 30^\circ - 41^\circ$
$= 39^\circ$

(e) $\angle ACB = 180^\circ - 90^\circ - 60^\circ$
$= 30^\circ$
$\angle t = 180^\circ - 100^\circ - 30^\circ$
$= 50^\circ$

(f) $\angle v = 180^\circ - 95^\circ - 35^\circ - 15^\circ$
$= 35^\circ$
$\angle u = 180^\circ - 15^\circ - 35^\circ$
$= 130^\circ$

(g) $\angle x = 180^\circ - 70^\circ - 30^\circ - 60^\circ$
$= 20^\circ$
$\angle w = 180^\circ - 60^\circ - 70^\circ$
$= 50^\circ$

(h) $\angle v = 180^\circ - 90^\circ - 65^\circ$
$= 25^\circ$
$\angle u = 180^\circ - 90^\circ - 25^\circ$
$= 65^\circ$

2. (a) $\angle ACB = 60^\circ$
$\angle p = 360^\circ - 60^\circ$
$= 300^\circ$

(b) $\angle ABD = \angle BAD = 60^\circ$
$\angle q = 180^\circ - 60^\circ - 60^\circ - 45^\circ$
$= 15^\circ$

(c) $\angle ADB = 60^\circ$
$\angle r = 180^\circ - 60^\circ - 20^\circ$
$= 100^\circ$

(d) $\angle CBE = \angle BCE$
$= 180^\circ - 130^\circ$
$= 50^\circ$
$\angle s = 180^\circ - 50^\circ - 50^\circ$
$= 80^\circ$

(e) $\angle u = (180^\circ - 90^\circ - 28^\circ) \div 2$
$= 31^\circ$

(f) $\angle CDE = 180^\circ - 90^\circ - 50^\circ$
$= 40^\circ$
$\angle v = (180^\circ - 40^\circ) \div 2$
$= 70^\circ$

(g) $\angle BCD = 60^\circ$
$\angle x = 180^\circ - 90^\circ - 60^\circ$
$= 30^\circ$
$\angle w = \angle x = 30^\circ$

(h) $\angle BCD = \angle BDC$
$= (180^\circ - 70^\circ) \div 2$
$= 55^\circ$
$\angle y = 180^\circ - 55^\circ$
$= 125^\circ$
$\angle y = 180^\circ - 90^\circ - 55^\circ$
$= 35^\circ$

LESSON PLAN

Chapter 13
Lesson 2

Specific Learning Focus

- Use the property of sum of angles in a triangle to find an unknown angle.
- Use angle properties of various types of triangles to find unknown angles.

Suggested Duration

6 periods

Prior Learning

This lesson is in continuation of Lesson 1 and Chapter 12. Pupils should be well-versed with the properties of angles on a straight line, angles at a point and vertically opposite angles.

Pre-emptive Pitfalls

This is a lesson to be conducted through experiential learning. If the pupils have hands-on experience of discovering the property of sum of angles in a triangle, they should not face any difficulty.

Introduction

Let's Learn 1 (Textbook 5 P263 – 264) can be done by a 'cut-and-paste' method. Get pupils to tear out the angles, align and paste them along a drawn straight line. Ask pupils to use the property of 'the sum of angles on a straight line is 180°', to come to the conclusion that the sum of angles in a triangle is 180°. This property of sum of angles in a triangle can be used to find the unknown angle of a triangle. Similarly the properties of different types of triangles can also be applied to find the unknown angle of a triangle:

1. right-angled triangle: one angle is 90°, where two sides (base and height) are perpendicular to each other,
2. isosceles triangle: the two sides are of equal length and their corresponding two angles are the same,
3. equilateral triangle: all three sides are equal in length and each angle is equal to 60°.

Problem Solving

In Let's Learn 8 (Textbook 5 P267), explain to pupils that to find $\angle m$ or $\angle n$, after subtracting the angle that is opposite the equal sides of the isosceles triangle, from 180°, divide the value by two to get the answer, since $\angle m = \angle n$. In an equivalent triangle, each angle is found by dividing 180° by 3 since all three angles are the same.

Activities

Use the cut-outs of triangles to carry out 'Activity Time' (Textbook 5 P274). The earlier lessons also involved cutting, pasting and folding, for pupils to learn experientially.

Resources

- protractor
- scissors
- cut-outs of different triangles (Activity Handbook 5 P53 – 57)

Mathematical Communication Support

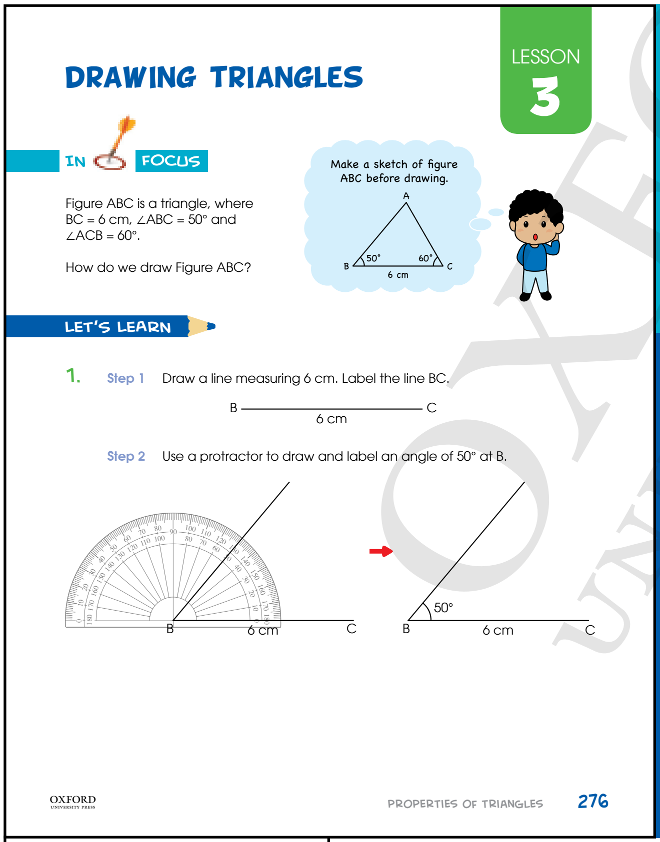
Emphasise the verbalising of the properties of each type of triangle, helping pupils to identify the type of triangle. Mathematical reasoning should be encouraged when applying the properties to find the unknown angle in a triangle. Elicit individual responses when pupils reach the final step of mathematical computation. Ask questions like "Why are you subtracting the angle from 180°? Why are you dividing the value by two? Why do you divide 180° by 3 to get the value of each angle of an equilateral triangle?". Encourage them to (i) identify, (ii) apply the properties, (iii) form a mathematical equation and (iv) carry out the mathematical computation.

LESSON
3

DRAWING TRIANGLES

LEARNING OBJECTIVE

1. Draw different triangles according to given dimensions.



DRAWING TRIANGLES

LESSON 3

IN FOCUS

Figure ABC is a triangle, where BC = 6 cm, ∠ABC = 50° and ∠ACB = 60°.

How do we draw Figure ABC?

Make a sketch of figure ABC before drawing.

A
B 50° 60° C
6 cm

LET'S LEARN

1. **Step 1** Draw a line measuring 6 cm. Label the line BC.

B C
6 cm

Step 2 Use a protractor to draw and label an angle of 50° at B.

B 6 cm C

50°
B 6 cm C

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Textbook 5 P276

IN FOCUS

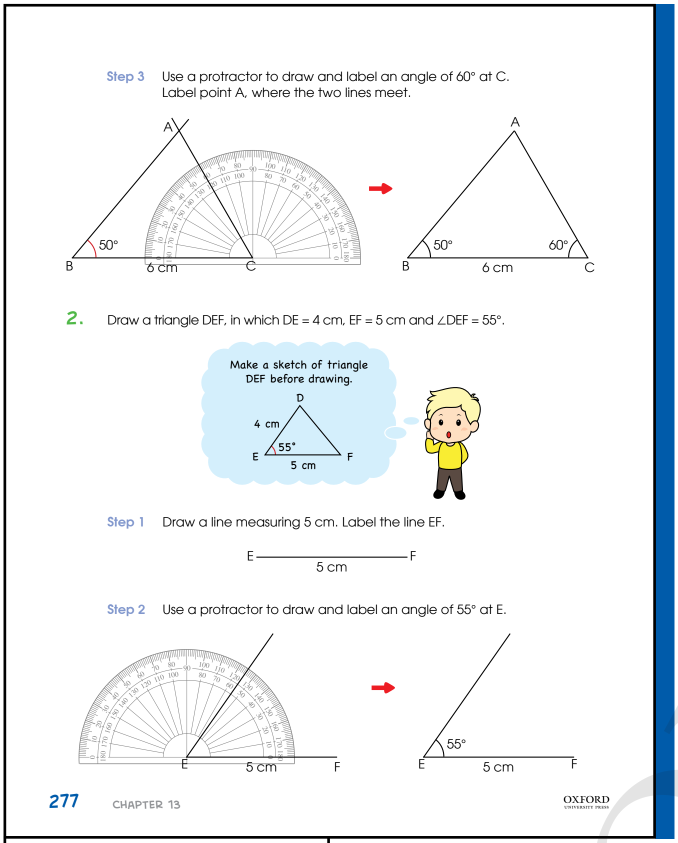
Present the information on triangle ABC and get pupils to make a sketch of it on their mini whiteboard. Teacher then makes a sketch of triangle ABC for pupils to compare against their sketches. Ask:

- How do we draw triangle ABC according to the exact dimensions given?

LET'S LEARN

For Let's Learn 1, get pupils to take out their drawing tools: a ruler and a protractor. Teacher demonstrates the steps in drawing triangle ABC, according to the given dimensions of two angles and one side, on a visualiser.

Assign pupils to work in pairs. Pupils take turns in helping their partners in following the steps to practise drawing the triangle on their paper.



Step 3 Use a protractor to draw and label an angle of 60° at C. Label point A, where the two lines meet.

2. Draw a triangle DEF, in which DE = 4 cm, EF = 5 cm and ∠DEF = 55°.

Make a sketch of triangle DEF before drawing.

Step 1 Draw a line measuring 5 cm. Label the line EF.

Step 2 Use a protractor to draw and label an angle of 55° at E.

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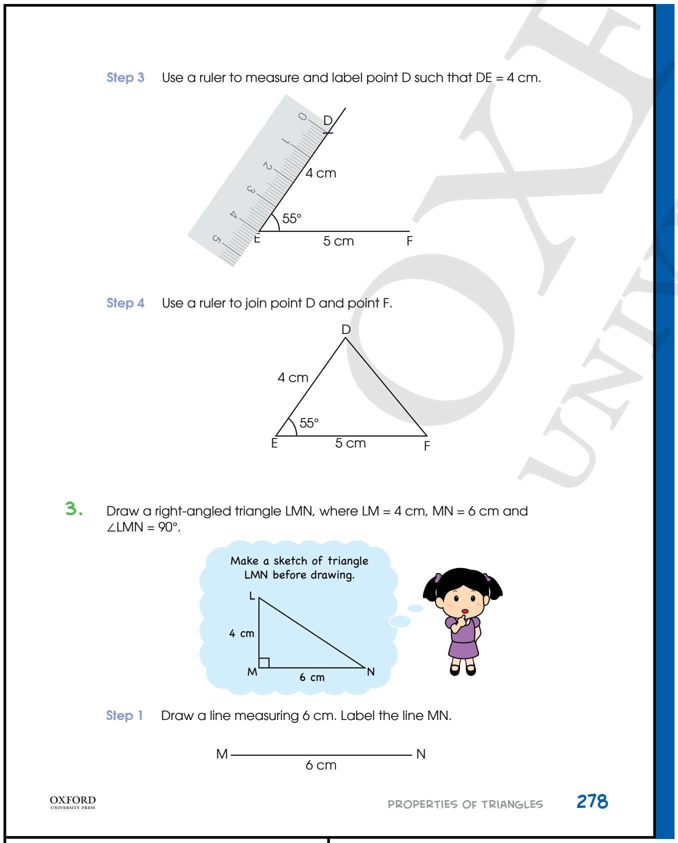
Textbook 5 P277

Remind pupils to label their completed triangles and check against the sketches that they had made earlier.

For Let's Learn 2, get pupils to make a sketch of triangle DEF. In this case the dimensions of one angle and two sides are given. Using the same process as in Let's Learn 1, teacher demonstrates and guides pupils along as they take turns to practise drawing the triangle according to the steps shown.



Step 3 Use a ruler to measure and label point D such that DE = 4 cm.

Step 4 Use a ruler to join point D and point F.

3. Draw a right-angled triangle LMN, where LM = 4 cm, MN = 6 cm and ∠LMN = 90°.

Make a sketch of triangle LMN before drawing.

Step 1 Draw a line measuring 6 cm. Label the line MN.

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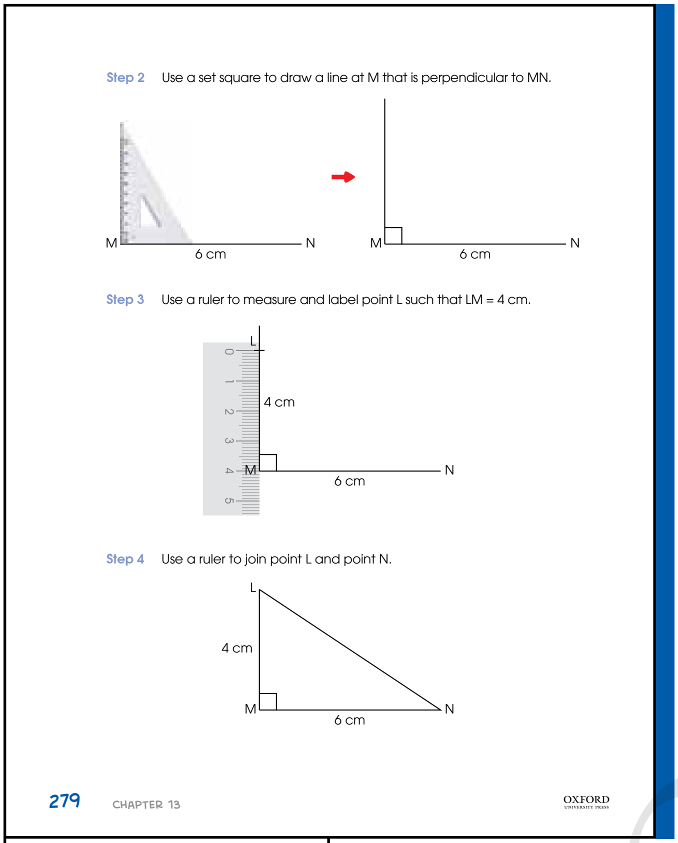
Textbook 5 P278

Remind pupils to label their completed triangles and check against the sketches that they had made earlier.

For Let's Learn 3, teacher demonstrates the steps for drawing a right-angled triangle using a ruler and set square. Ensure pupils take turns to practise drawing the triangle.



Step 2 Use a set square to draw a line at M that is perpendicular to MN.

Step 3 Use a ruler to measure and label point L such that LM = 4 cm.

Step 4 Use a ruler to join point L and point N.

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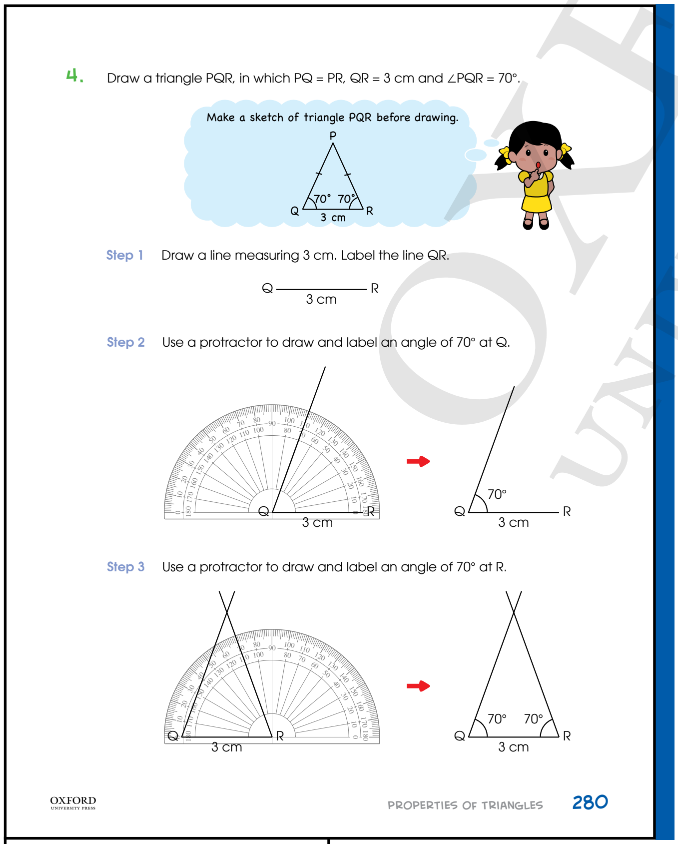
Textbook 5 P279

Remind pupils to label their completed triangles and check against the sketches that they had made earlier.



4. Draw a triangle PQR, in which PQ = PR, QR = 3 cm and ∠PQR = 70°.

Step 1 Draw a line measuring 3 cm. Label the line QR.

Step 2 Use a protractor to draw and label an angle of 70° at Q.

Step 3 Use a protractor to draw and label an angle of 70° at R.

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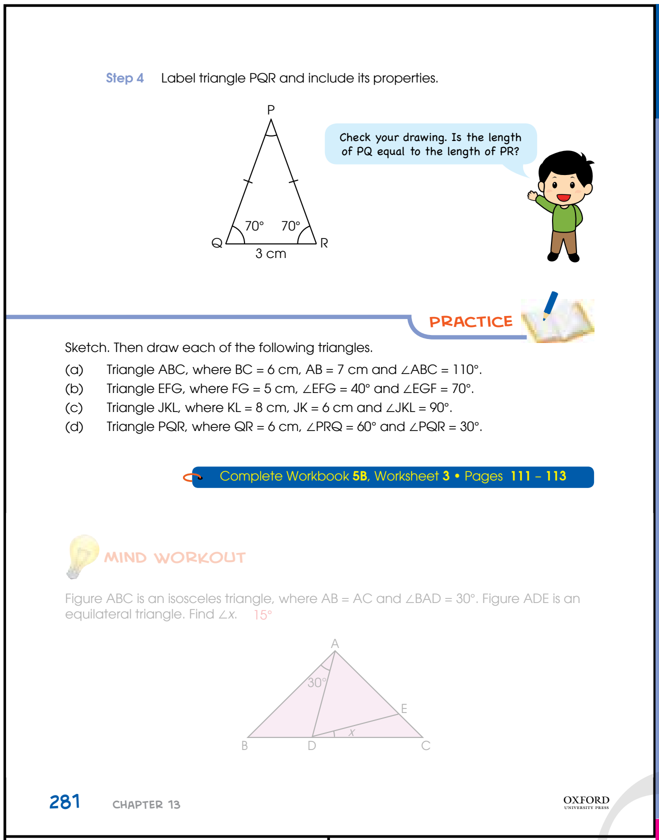
Textbook 5 P280

For Let's Learn 4, get pupils to sketch the triangle PQR. Ask pupils what type of triangle PQR is. Get them to mark the equal sides and equal angles on their sketches. Teacher demonstrates and guides pupils through the steps in drawing isosceles triangle PQR.



Step 4 Label triangle PQR and include its properties.

PRACTICE

Sketch. Then draw each of the following triangles.

(a) Triangle ABC, where BC = 6 cm, AB = 7 cm and ∠ABC = 110°.
(b) Triangle EFG, where FG = 5 cm, ∠EFG = 40° and ∠EGF = 70°.
(c) Triangle JKL, where KL = 8 cm, JK = 6 cm and ∠JKL = 90°.
(d) Triangle PQR, where QR = 6 cm, ∠PRQ = 60° and ∠PQR = 30°.

Complete Workbook **5B**, Worksheet **3** • Pages **111 – 113**

MIND WORKOUT

Figure ABC is an isosceles triangle, where AB = AC and ∠BAD = 30°. Figure ADE is an equilateral triangle. Find ∠x. 15°

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Textbook 5 P281

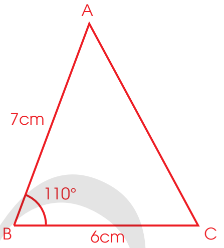
Get pupils to measure the sides PQ and PR to check if their drawing is correct. Remind pupils to label their completed triangle indicating the properties of an isosceles triangle.

PRACTICE

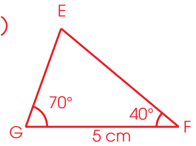
Allow pupils to work in pairs.

Give pupils sufficient time to work on the questions before going through with the class.

(a)



(b)



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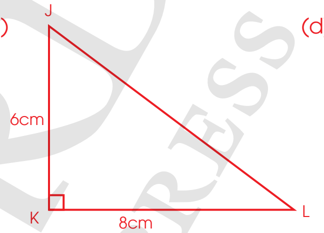
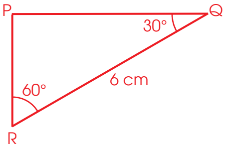


(d)



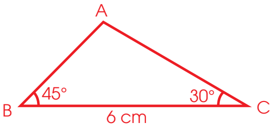
Independent seatwork

Assign pupils to complete Worksheet 3 (Workbook 5B P111 – 113).

Answers

Worksheet 3 (Workbook 5B P111 – 113)

1.



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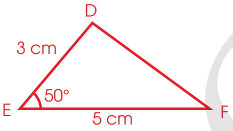

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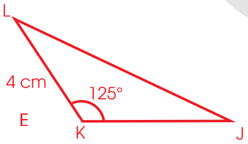

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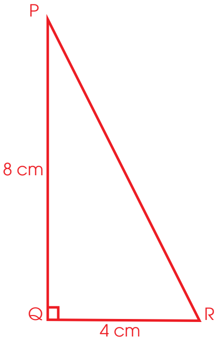

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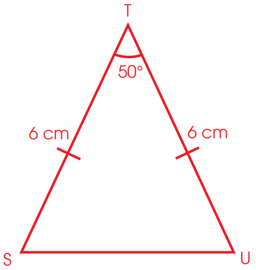

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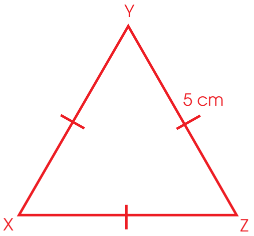


LESSON PLAN

Chapter 13
Lesson 3

Specific Learning Focus

- Draw different triangles according to given dimensions.

Suggested Duration

4 periods

Prior Learning

Pupils should be well-versed in using a protractor, ruler and set square.

Pre-emptive Pitfalls

This lesson requires pupils to develop dexterity and accuracy in drawing triangles. They should be able to use the protractor, ruler and set square with accurate alignment and reading of the values.

Introduction

The first step to drawing triangles is to understand the dimensions given and sketch the triangle accordingly. Pupils should be told to identify the type of triangle (learnt in Lesson 1) based on the dimensions given. Revise with pupils the use of the protractor. Remind them that when measuring the angle to draw one side of a triangle, the base line of the protractor should be aligned to the base of the triangle. Guide them to read off the correct value of the angle either from the left or right end of the protractor. Emphasise each step given in Let's Learn 2 (Textbook 5 P277 – 278) on the board. When drawing a right-angled triangle, emphasise the vertex at which the 90° angle has to be drawn, using a set square. Encourage and emphasise that the first step of drawing a triangle is to make a sketch of the triangle. In Let's Learn 4 (Textbook 5 P280), point out that making a sketch of the triangle before drawing helps us to conclude that the triangle is an isosceles triangle. This shows that sketching helps to make the drawing of the triangle simpler.

Problem Solving

The properties of different types of triangles play an important role in drawing triangles. Also, making a sketch of the triangle is the first step to guiding us to draw the triangle. If a triangle is an isosceles triangle, two equal base angles should be drawn, and then the two sides are extended until they intersect to form the third vertex of the triangle. Equilateral triangles can be drawn the same way with each angle drawn as 60°. Application of the properties of different types of triangles play a pivotal role in navigating the pupils to draw the triangles.

Activities

This is an activity-based lesson and each sum in the textbook and workbook can be done as group or pair work.

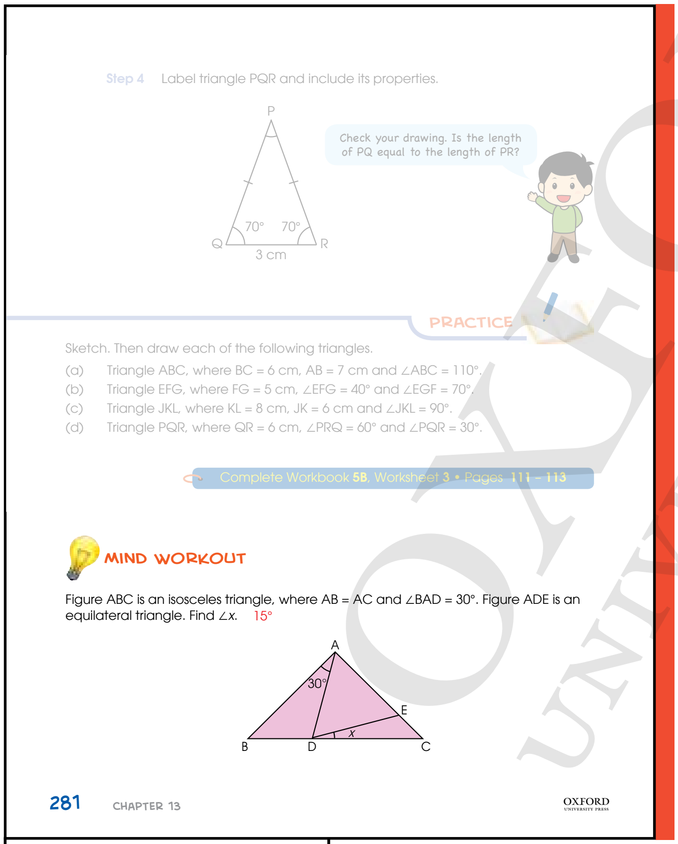
Resources

- protractor
- ruler
- set squares

Mathematical Communication Support

Help pupils identify the type of triangle by looking at the given dimensions of the triangle. Elicit individual responses while making a sketch of the triangle on the board. Emphasise that sketching the triangle is a crucial step before drawing the triangle. Ask them for the properties of the triangle to be drawn and then remind them the use of the correct mathematical tools (e.g. set square to draw 90° in a right-angled triangle, protractor to measure angles).

PROBLEM SOLVING, MATHS JOURNAL AND PUPIL REVIEW



Step 4 Label triangle PQR and include its properties.

Check your drawing. Is the length of PQ equal to the length of PR?

PRACTICE

Sketch. Then draw each of the following triangles.

(a) Triangle ABC, where BC = 6 cm, AB = 7 cm and ∠ABC = 110°.
(b) Triangle EFG, where FG = 5 cm, ∠EFG = 40° and ∠EGF = 70°.
(c) Triangle JKL, where KL = 8 cm, JK = 6 cm and ∠JKL = 90°.
(d) Triangle PQR, where QR = 6 cm, ∠PRQ = 60° and ∠PQR = 30°.

Complete Workbook **5B**, Worksheet **3** • Pages **111 – 113**

MIND WORKOUT

Figure ABC is an isosceles triangle, where AB = AC and ∠BAD = 30°. Figure ADE is an equilateral triangle. Find ∠x. 15°

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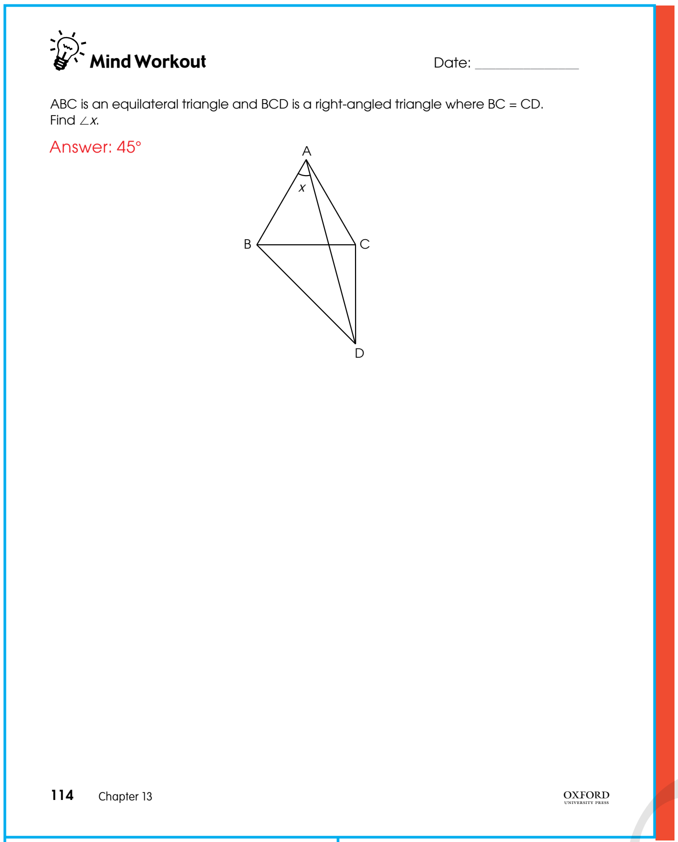
Textbook 5 P281

MIND WORKOUT

Pupils can solve for ∠x by using the properties of equilateral triangle, isosceles triangle, sum of angles on a straight line or sum of angles in a triangle.



Mind Workout

Date: ____________

ABC is an equilateral triangle and BCD is a right-angled triangle where BC = CD.
Find ∠x.

Answer: 45°

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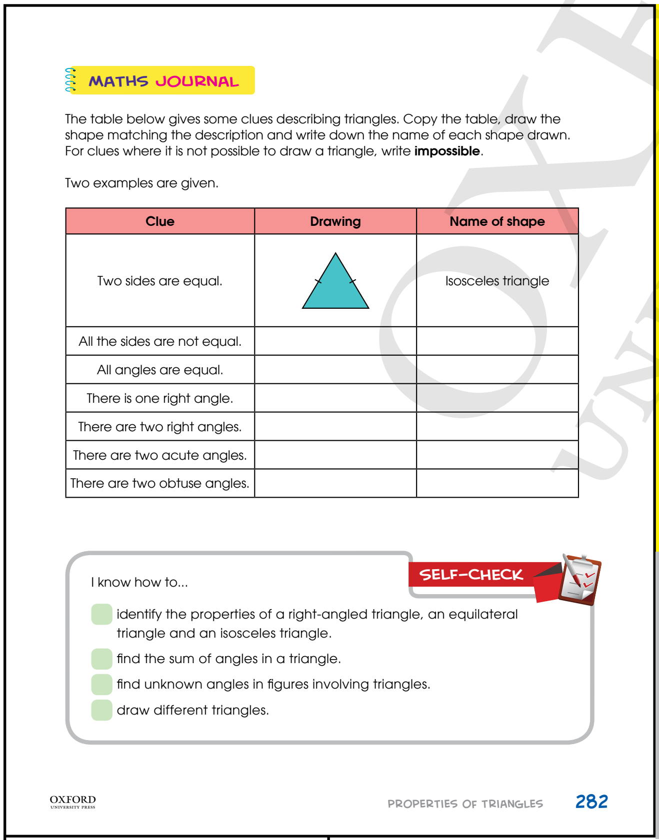
Workbook 5B P114

Mind Workout

Through deduction, pupils can use the properties of equilateral triangle and isosceles triangle to solve for ∠x. Pupils need to recognise ∠ACD = 60° + 90°.



MATHS JOURNAL

The table below gives some clues describing triangles. Copy the table, draw the shape matching the description and write down the name of each shape drawn.
For clues where it is not possible to draw a triangle, write **impossible**.

Two examples are given.

Clue	Drawing	Name of shape
Two sides are equal.		Isosceles triangle
All the sides are not equal.		
All angles are equal.		
There is one right angle.		
There are two right angles.		
There are two acute angles.		
There are two obtuse angles.		

SELF-CHECK

I know how to...

☐ identify the properties of a right-angled triangle, an equilateral triangle and an isosceles triangle.
☐ find the sum of angles in a triangle.
☐ find unknown angles in figures involving triangles.
☐ draw different triangles.

OXFORD UNIVERSITY PRESS PROPERTIES OF TRIANGLES 282

Textbook 5 P282

MATHS JOURNAL

This task consolidates pupils' understanding of the various types of triangles and their properties. It helps them to recognise that some properties are not possible for triangles e.g. a triangle cannot have two right angles or two obtuse angles.

SELF-CHECK

Before the pupils do the self-check, review the properties of various triangles and how they can be applied to find unknown angles.

The self-check can be done after pupils have completed **Review 13** (Workbook 5B P115 – 120).

Answers Review 13 (Workbook 5B P115 – 120)

1. (a) $\angle a = 180^\circ - 90^\circ - 50^\circ$
$= 40^\circ$

(b) $\angle b = 180^\circ - 25^\circ - 25^\circ$
$= 130^\circ$

(c) $\angle c = 180^\circ - 80^\circ - 60^\circ$
$= 40^\circ$

(d) $\angle d = (180^\circ - 100^\circ) \div 2$
$= 40^\circ$

(e) $\angle e = 180^\circ - 89^\circ - 32^\circ$
$= 59^\circ$

(f) $\angle f = 180^\circ - 90^\circ - 15^\circ$
$= 75^\circ$

2. (a) $\angle ACB = 180^\circ - 90^\circ - 55^\circ$
$= 35^\circ$

$\angle m = 180^\circ - 35^\circ$
$= 145^\circ$

(b) $\angle ACB = 180^\circ - 34^\circ - 34^\circ$
$= 112^\circ$

$\angle n = 180^\circ - 112^\circ$
$= 68^\circ$

(c) $\angle p = 180^\circ - 60^\circ - 60^\circ - 44^\circ$
$= 16^\circ$

(d) $\angle r = 180^\circ - 46^\circ - 32^\circ - 90^\circ$
$= 12^\circ$

(e) $\angle BDC = (180^\circ - 62^\circ) \div 2$
$= 59^\circ$

$\angle s = 180^\circ - 59^\circ$
$= 121^\circ$

$\angle t = 180^\circ - 90^\circ - 59^\circ$
$= 31^\circ$

(f) $\angle x = 180^\circ - 90^\circ - 37^\circ$
$= 53^\circ$

$\angle y = 180^\circ - 53^\circ - 53^\circ$
$= 74^\circ$

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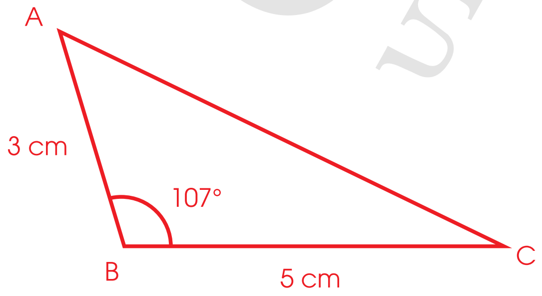

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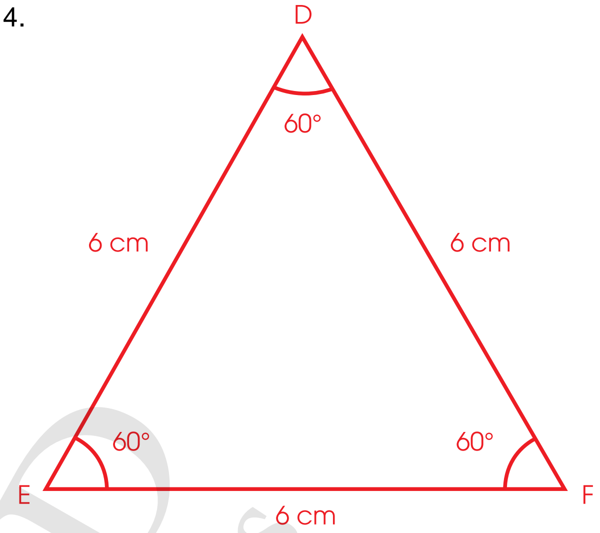
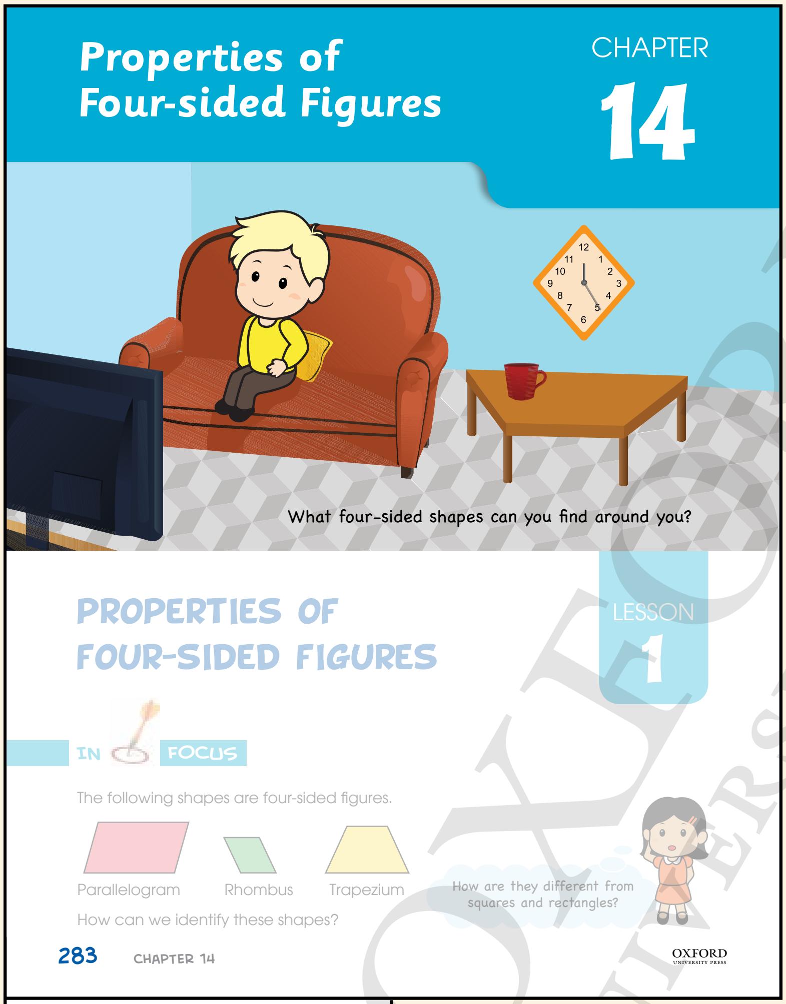


PROPERTIES OF FOUR-SIDED FIGURES

CHAPTER 14



Properties of Four-sided Figures

CHAPTER 14

What four-sided shapes can you find around you?

PROPERTIES OF FOUR-SIDED FIGURES

LESSON 1

IN FOCUS

The following shapes are four-sided figures.

Parallelogram Rhombus Trapezium

How can we identify these shapes?

How are they different from squares and rectangles?

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Textbook 5 P283

Related Resources
NSPM Textbook 5 (P283 – 303)
NSPM Workbook 5B (P121 – 134)

Materials

Set squares, protractor, ruler, square grid paper, scissors, cut-outs of different four-sided figures, mini whiteboard, markers, paper

Lesson
Lesson 1 Properties of Four-sided Figures
Lesson 2 Drawing Four-sided Figures
Problem Solving, Maths Journal and Pupil Review

INTRODUCTION

Pupils have learnt to recognise and identify the 4 basic shapes – square, rectangle, triangle and circle. In Grade Four, they learnt the properties of rectangles and squares, describing them in terms of perpendicular and parallel lines. They learnt to draw squares and rectangles using ruler, set squares and protractor. In this chapter, they will learn the properties of other four-sided figures such as parallelogram, rhombus and trapezium and find unknown angles using the properties. They will learn to sketch and draw these quadrilaterals according to given dimensions using ruler, protractor and set-squares as well as on square grid.

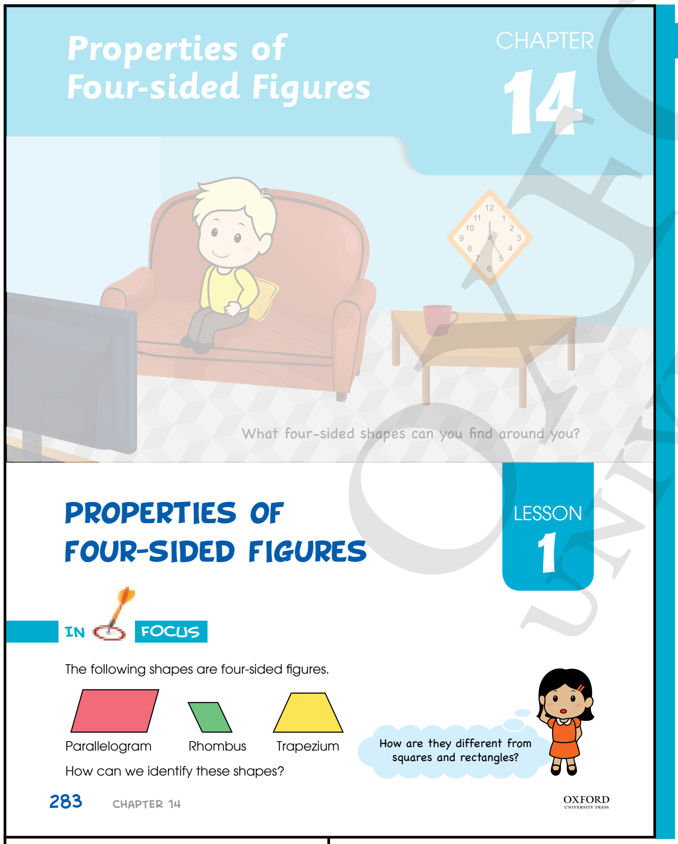
LESSON

1

PROPERTIES OF FOUR-SIDED FIGURES

LEARNING OBJECTIVE

1. Properties of parallelograms, rhombuses and trapeziums.
2. Use the properties to find unknown angles involving parallelograms, rhombuses and trapeziums.



Properties of Four-sided Figures

CHAPTER 14

What four-sided shapes can you find around you?

PROPERTIES OF FOUR-SIDED FIGURES

LESSON 1

IN FOCUS

The following shapes are four-sided figures.

How can we identify these shapes?

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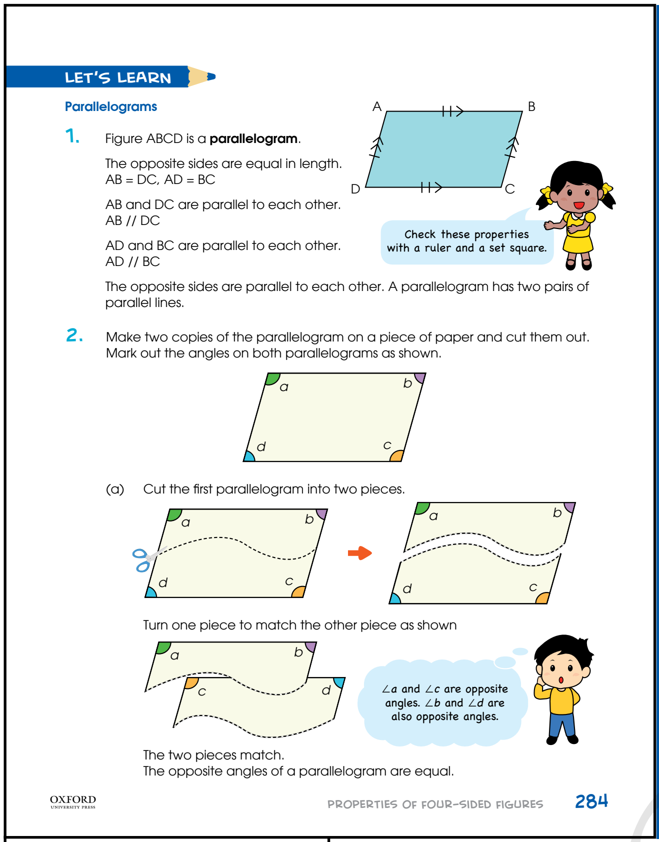
Textbook 5 P283

IN FOCUS

Use the Chapter Opener for pupils to identify any four-sided figures that they see in the picture. Pupils may pick out the clock, the side table, the floor tile pattern, the TV etc. Teacher then displays on the visualiser cut-outs of a square, a rectangle, a parallelogram, a rhombus and a trapezium to represent the figures in the picture. Ask pupils which figures are new to them. Recap the properties of the square and rectangle then introduce the names for the figures: **parallelogram, rhombus and trapezium**. Help pupils with the pronunciations of these names.



LET'S LEARN

Parallelograms

1. Figure ABCD is a **parallelogram**.

The opposite sides are equal in length.
AB = DC, AD = BC

AB and DC are parallel to each other.
AB // DC

AD and BC are parallel to each other.
AD // BC

The opposite sides are parallel to each other. A parallelogram has two pairs of parallel lines.

2. Make two copies of the parallelogram on a piece of paper and cut them out. Mark out the angles on both parallelograms as shown.

(a) Cut the first parallelogram into two pieces.

Turn one piece to match the other piece as shown

The two pieces match.
The opposite angles of a parallelogram are equal.

OXFORD UNIVERSITY PRESS PROPERTIES OF FOUR-SIDED FIGURES 284

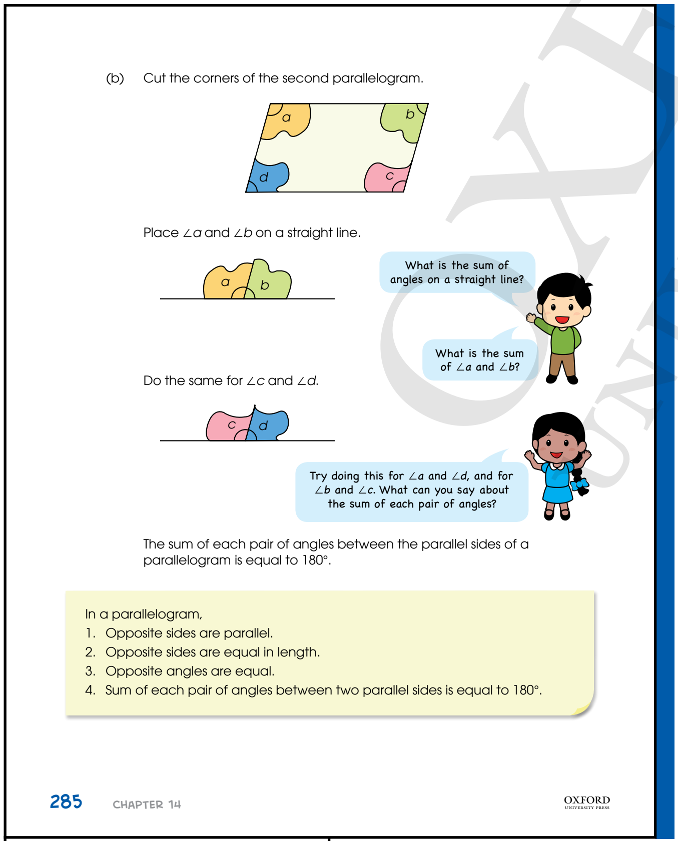
Textbook 5 P284

LET'S LEARN

For Let's Learn 1, introduce the parallelogram ABCD on the visualiser and give every pair of pupils a parallelogram cut-out. Get pupils to measure the sides and use the set square to check for opposite pairs of parallel sides of the given figure. Lead pupils to identify the properties of a parallelogram with respect to its sides: opposite sides of a parallelogram are equal in length and opposite sides of a parallelogram are parallel.

For Let's Learn 2, give each pair of pupils two parallelogram cut-outs.

For Let's Learn 2(a), get pupils to mark out the four angles of one parallelogram in different colours. Teacher then demonstrates and guides pupils in the investigation by cutting the parallelogram into two pieces and matching them to show the property that opposite angles of a parallelogram are equal.



(b) Cut the corners of the second parallelogram.

Place $\angle a$ and $\angle b$ on a straight line.

Do the same for $\angle c$ and $\angle d$.

The sum of each pair of angles between the parallel sides of a parallelogram is equal to 180°.

In a parallelogram,
1. Opposite sides are parallel.
2. Opposite sides are equal in length.
3. Opposite angles are equal.
4. Sum of each pair of angles between two parallel sides is equal to 180°.

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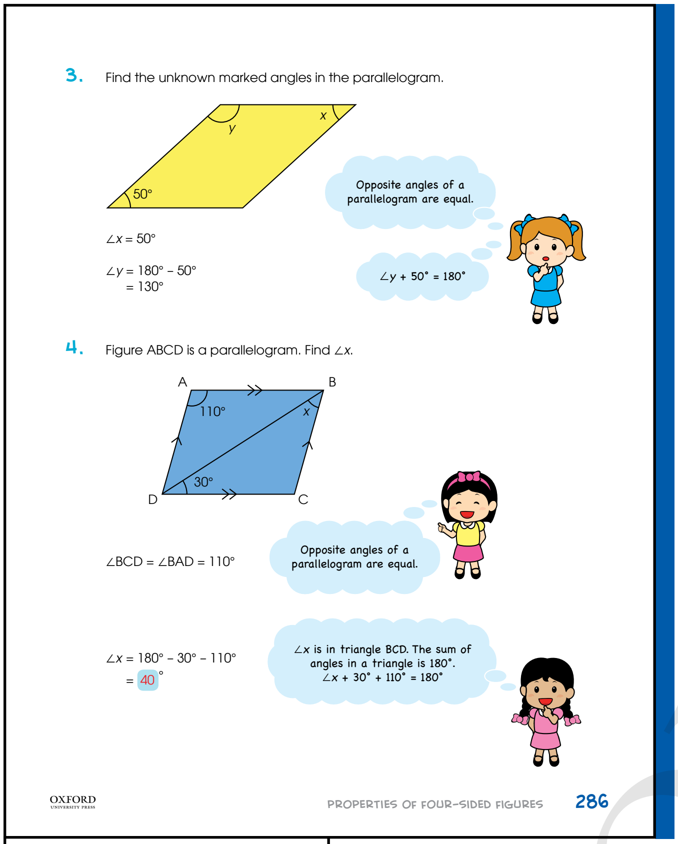
Textbook 5 P285

For Let's Learn 2(b), get pupils to use the other cut-out to investigate the angle properties of the parallelogram. Teacher demonstrates and guides pupils in the investigation.

Get pupils to verbalise the angle properties as they make observations: opposite angles of a parallelogram are equal and the sum of each pair of angles between the parallel sides of a parallelogram is equal to 180°.

Refer pupils to the two investigations that they had done in parts (a) and (b) and get pupils to work in their groups to write out the properties of a parallelogram with respect to the sides and the angles.



3. Find the unknown marked angles in the parallelogram.

$\angle x = 50^\circ$

$\angle y = 180^\circ - 50^\circ$
$= 130^\circ$

Opposite angles of a parallelogram are equal.

$\angle y + 50^\circ = 180^\circ$

4. Figure ABCD is a parallelogram. Find $\angle x$.

$\angle BCD = \angle BAD = 110^\circ$

Opposite angles of a parallelogram are equal.

$\angle x = 180^\circ - 30^\circ - 110^\circ$
$= \boxed{40}^\circ$

$\angle x$ is in triangle BCD. The sum of angles in a triangle is 180°.
$\angle x + 30^\circ + 110^\circ = 180^\circ$

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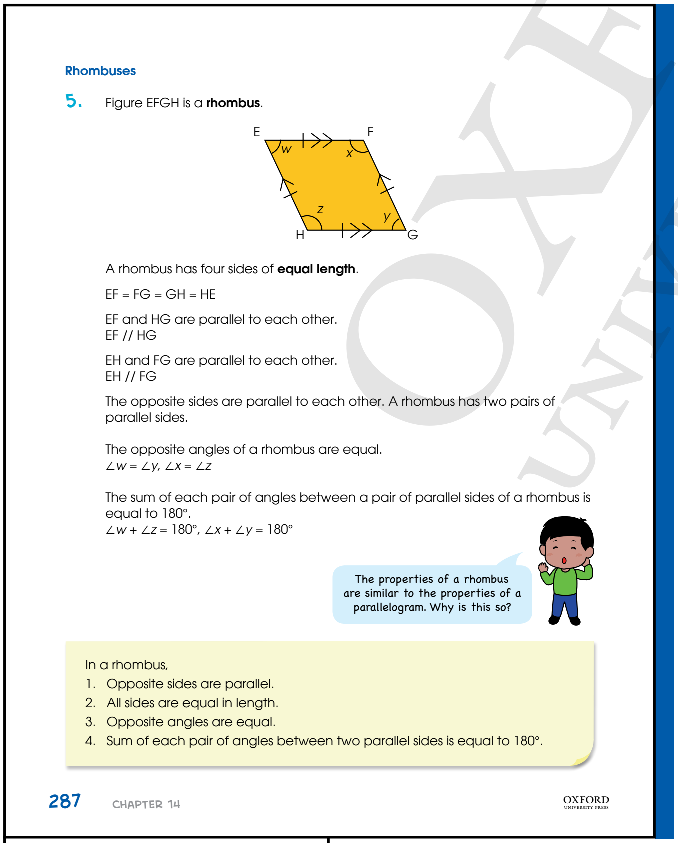
PROPERTIES OF FOUR-SIDED FIGURES 286

Textbook 5 P286

Get pupils to recall the two angle properties of a parallelogram. Guide pupils to apply these properties to find the unknown angles, *x* and *y* in Let's Learn 3.

For Let's Learn 4, use questioning to guide pupils:

- What do we need to find?
- In which triangle is $\angle x$ found?
- Do we know the sizes of the other two angles in BCD?
- How can we find $\angle BCD$ in the parallelogram ABCD? Why?
- Now can we find $\angle x$? Which property will we use?



Rhombuses

5. Figure EFGH is a **rhombus**.

A rhombus has four sides of **equal length**.

EF = FG = GH = HE

EF and HG are parallel to each other.
EF // HG

EH and FG are parallel to each other.
EH // FG

The opposite sides are parallel to each other. A rhombus has two pairs of parallel sides.

The opposite angles of a rhombus are equal.
$\angle w = \angle y$, $\angle x = \angle z$

The sum of each pair of angles between a pair of parallel sides of a rhombus is equal to 180°.
$\angle w + \angle z = 180^\circ$, $\angle x + \angle y = 180^\circ$

The properties of a rhombus are similar to the properties of a parallelogram. Why is this so?

In a rhombus,
1. Opposite sides are parallel.
2. All sides are equal in length.
3. Opposite angles are equal.
4. Sum of each pair of angles between two parallel sides is equal to 180°.

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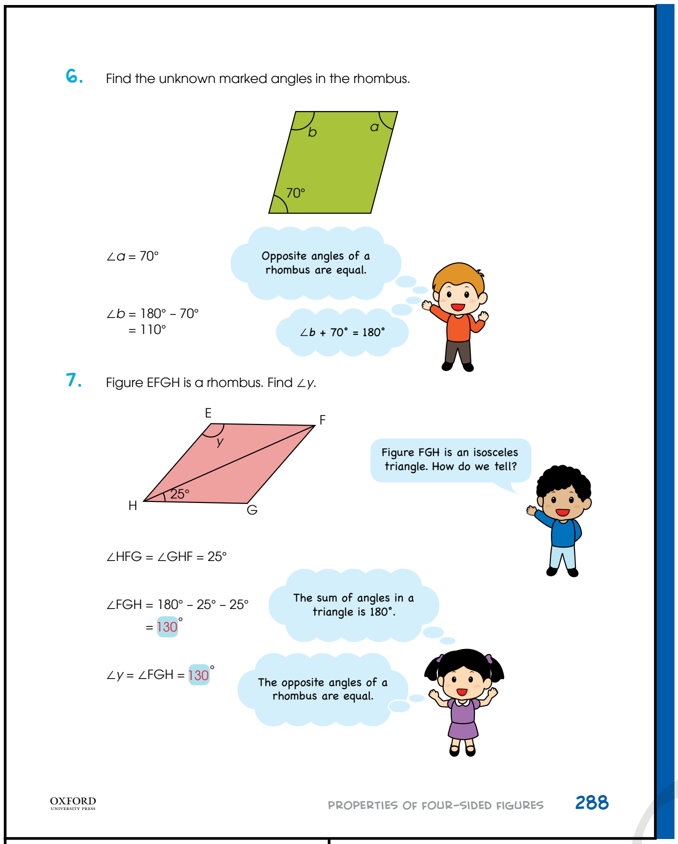
Textbook 5 P287

Teacher introduces the rhombus in Let's Learn 5. Using rhombus cut-outs, teacher can demonstrate to the class by folding and cutting them (as in Let's Learn 2 for parallelogram) to reveal the properties of the rhombus with respect to the sides and then angles.

Get pupils to compare the four properties of the rhombus to the four properties of the parallelogram. Ask:

- How similar/different are the properties of the rhombus and the parallelogram?



6. Find the unknown marked angles in the rhombus.

$\angle a = 70^\circ$

Opposite angles of a rhombus are equal.

$\angle b = 180^\circ - 70^\circ$
$= 110^\circ$

$\angle b + 70^\circ = 180^\circ$

7. Figure EFGH is a rhombus. Find $\angle y$.

Figure FGH is an isosceles triangle. How do we tell?

$\angle HFG = \angle GHF = 25^\circ$

The sum of angles in a triangle is 180°.

$\angle FGH = 180^\circ - 25^\circ - 25^\circ$
$= \boxed{130}^\circ$

$\angle y = \angle FGH = \boxed{130}^\circ$

The opposite angles of a rhombus are equal.

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PROPERTIES OF FOUR-SIDED FIGURES 288

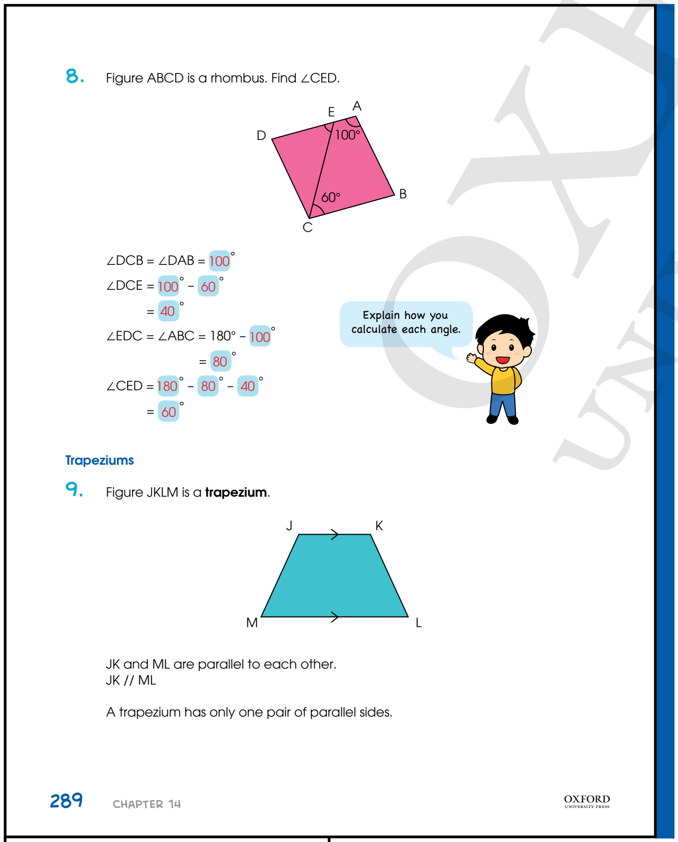
Textbook 5 P288

For Let's Learn 6, get pupils to recall the two angle properties of a rhombus. Guide pupils to apply these properties to find the unknown angles, *a* and *b*.

For Let's Learn 7, use questioning to guide pupils:

- What do we need to find?
- If EFGH is a rhombus, which angle is equal to $\angle y$?
- What type of triangle is FGH? Why?
- Which property will we use to find $\angle FGH$?

Teacher works through the question with pupils, asking them for the property that is being applied in each step.



8. Figure ABCD is a rhombus. Find $\angle CED$.

$\angle DCB = \angle DAB = \boxed{100}^\circ$
$\angle DCE = \boxed{100}^\circ - \boxed{60}^\circ$
$= \boxed{40}^\circ$
$\angle EDC = \angle ABC = 180^\circ - \boxed{100}^\circ$
$= \boxed{80}^\circ$
$\angle CED = \boxed{180}^\circ - \boxed{80}^\circ - \boxed{40}^\circ$
$= \boxed{60}^\circ$

Explain how you calculate each angle.

Trapeziums

9. Figure JKLM is a **trapezium**.

JK and ML are parallel to each other.
JK // ML

A trapezium has only one pair of parallel sides.

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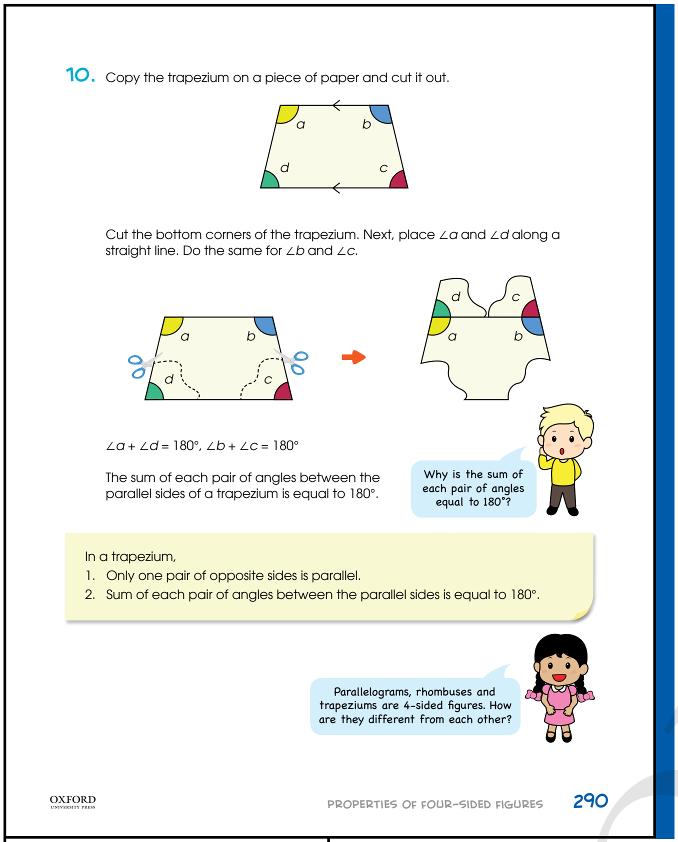
OXFORD

Textbook 5 P289

Using a similar process as in Let's Learn 7, guide pupils through the solution steps in Let's Learn 8. Get pupils to explain the property applied in each step.

Let's Learn 9 introduces the trapezium. Ask pupils to describe it with respect to the sides and angles that they see in the shape. A trapezium is a four-sided figure with only one pair of parallel sides.



10. Copy the trapezium on a piece of paper and cut it out.

Cut the bottom corners of the trapezium. Next, place $\angle a$ and $\angle d$ along a straight line. Do the same for $\angle b$ and $\angle c$.

$\angle a + \angle d = 180^\circ$, $\angle b + \angle c = 180^\circ$

The sum of each pair of angles between the parallel sides of a trapezium is equal to 180°.

Why is the sum of each pair of angles equal to 180°?

In a trapezium,
1. Only one pair of opposite sides is parallel.
2. Sum of each pair of angles between the parallel sides is equal to 180°.

Parallelograms, rhombuses and trapeziums are 4-sided figures. How are they different from each other?

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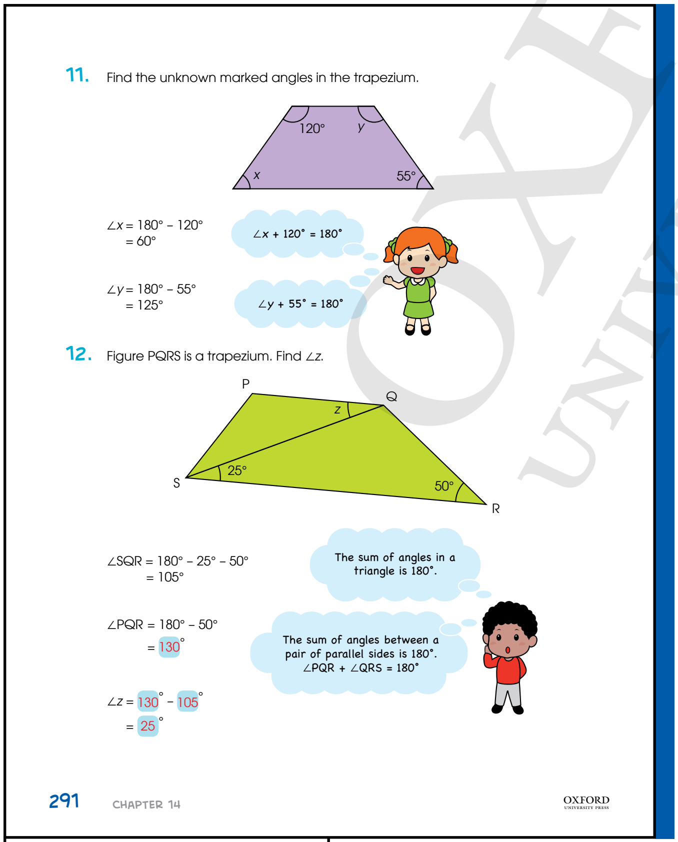
Textbook 5 P290

For Let's Learn 10, get pupils to work in pairs to produce a cut-out of a trapezium to investigate the angle properties of a trapezium.

Teacher demonstrates and guides pupils in the investigation.

Get pupils to verbalise the angle property as they make the observation: the sum of each pair of angles between the parallel sides of a parallelogram is equal to 180°. Teacher summarises the properties of a trapezium.

Get pupils to work in their groups to list out the properties of a parallelogram, a rhombus and a trapezium. Then they can use the list to discuss how these 4-sided figures are different from each other.



11. Find the unknown marked angles in the trapezium.

$\angle x = 180^\circ - 120^\circ$
$= 60^\circ$

$\angle x + 120^\circ = 180^\circ$

$\angle y = 180^\circ - 55^\circ$
$= 125^\circ$

$\angle y + 55^\circ = 180^\circ$

12. Figure PQRS is a trapezium. Find $\angle z$.

$\angle SQR = 180^\circ - 25^\circ - 50^\circ$
$= 105^\circ$

The sum of angles in a triangle is 180°.

$\angle PQR = 180^\circ - 50^\circ$
$= 130^\circ$

The sum of angles between a pair of parallel sides is 180°. $\angle PQR + \angle QRS = 180^\circ$

$\angle z = 130^\circ - 105^\circ$
$= 25^\circ$

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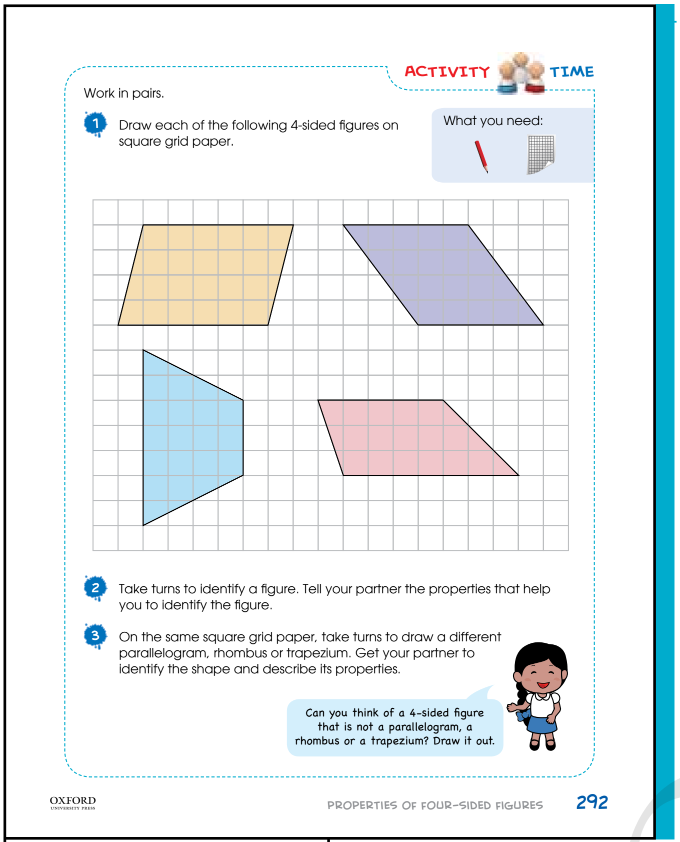
Textbook 5 P291

For Let's Learn 11, get pupils to identify the pair of parallel sides in the trapezium. Recall the angle property of a trapezium. Ask pupils how it can be used to find the unknown marked angles *x* and *y*. Allow sufficient time for pupils to discuss before going through with the class.

For Let's Learn 12, guide pupils with these questions:

- Identify the pair of parallel lines.
- Name the angles that include $\angle z$ and are between the pair of parallel lines.
- How can we find ∠SQR? Why?
- How can we find ∠PQR? Why?
- Now can we find the unknown $\angle z$?



ACTIVITY TIME

Work in pairs.

1. Draw each of the following 4-sided figures on square grid paper.

What you need:

2. Take turns to identify a figure. Tell your partner the properties that help you to identify the figure.

3. On the same square grid paper, take turns to draw a different parallelogram, rhombus or trapezium. Get your partner to identify the shape and describe its properties.

Can you think of a 4-sided figure that is not a parallelogram, a rhombus or a trapezium? Draw it out.

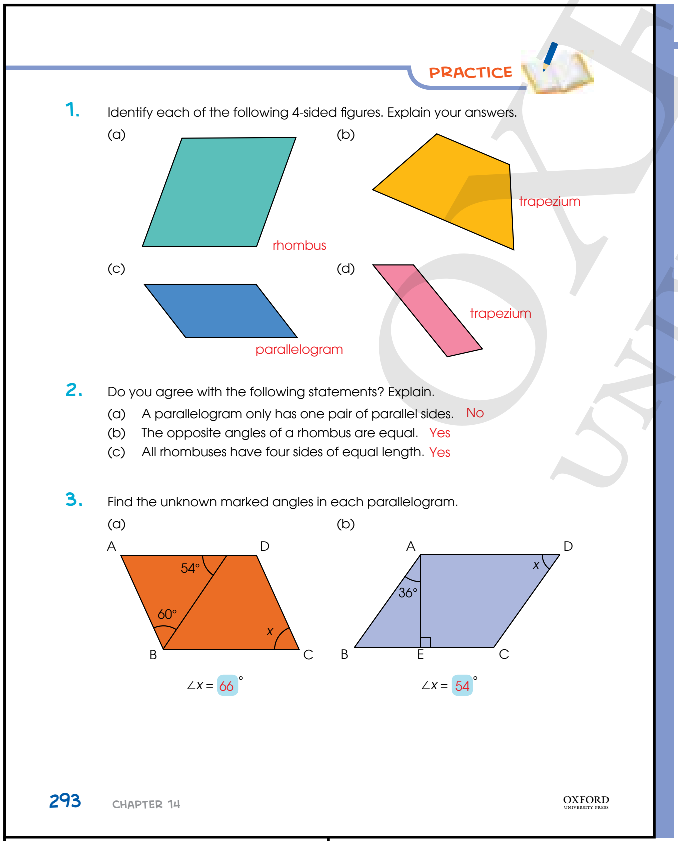
OXFORD UNIVERSITY PRESS PROPERTIES OF FOUR-SIDED FIGURES 292

Textbook 5 P292

ACTIVITY TIME

Pupils work in pairs to explore and draw 4-sided figures using the square grid to guide them in drawing parallel, non-parallel, equal or unequal sides of parallelogram, rhombus, trapezium and any other quadrilateral.

They apply the properties of the different 4-sided figures as they recognise, draw and check their partner's work.



PRACTICE

1. Identify each of the following 4-sided figures. Explain your answers.
   (a) rhombus
   (b) trapezium
   (c) parallelogram
   (d) trapezium

2. Do you agree with the following statements? Explain.
   (a) A parallelogram only has one pair of parallel sides. No
   (b) The opposite angles of a rhombus are equal. Yes
   (c) All rhombuses have four sides of equal length. Yes

3. Find the unknown marked angles in each parallelogram.

(a) ∠x = 66°

(b) ∠x = 54°

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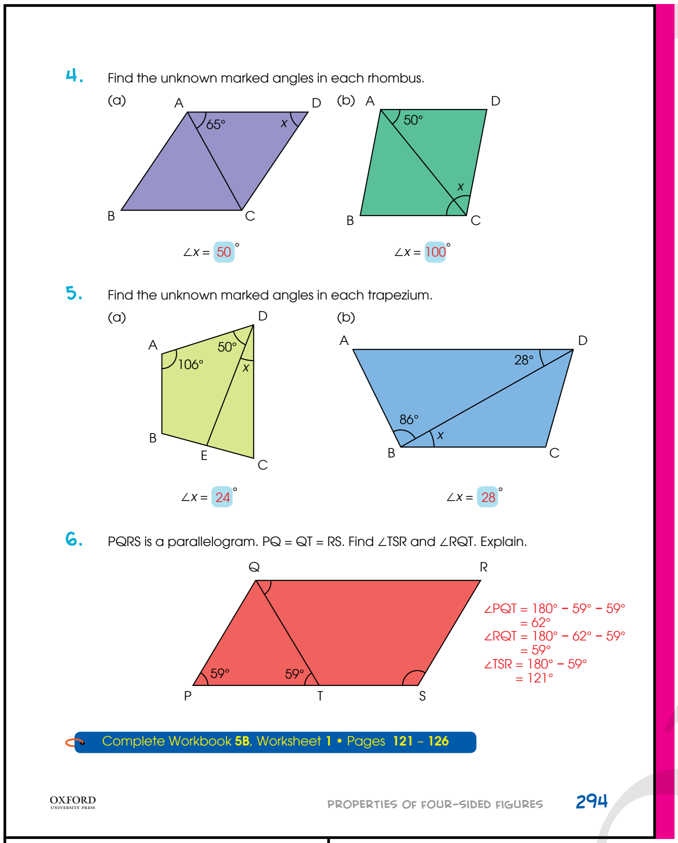
Textbook 5 P293

PRACTICE

Allow pupils to work in pairs before going through with the class. Invite pupils to present and explain their solutions.



4. Find the unknown marked angles in each rhombus.

(a) ∠x = 50°

(b) ∠x = 100°

5. Find the unknown marked angles in each trapezium.

(a) ∠x = 24°

(b) ∠x = 28°

6. PQRS is a parallelogram. PQ = QT = RS. Find ∠TSR and ∠RQT. Explain.

∠PQT = 180° − 59° − 59°
= 62°
∠RQT = 180° − 62° − 59°
= 59°
∠TSR = 180° − 59°
= 121°

Complete Workbook **5B**, Worksheet **1** • Pages **121** – **126**

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PROPERTIES OF FOUR-SIDED FIGURES 294

Textbook 5 P294

Independent seatwork

Assign pupils to complete Worksheet 1 (Workbook 5B P121 − 126).

Answers

Worksheet 1 (Workbook 5B P121 − 126)

1. (a) DC, BC
   (b) AB, AD
   (c) y, z
   (d) $\angle w + \angle x = 180°$
   $\angle w + \angle z = 180°$
   $\angle x + \angle y = 180°$
   $\angle y + \angle z = 180°$

2. (a) 120
   (b) 43

3. (a) 53
   (b) 25
   (c) 50
   (d) 30
   (e) 84
   (f) 40
   (g) 50
   (h) 124

4. (a) AB, DC
   (b) $\angle w + \angle z = 180°$
   $\angle x + \angle y = 180°$

5. (a) 60
   (b) 34
   (c) 71
   (d) 32
   (e) 47
   (f) 30
   (g) 30
   (h) 80

*6. ∠SXQ = 135°
∠PQX = 180° − 135°
= 45°

LESSON PLAN

Chapter 14
Lesson 1

Specific Learning Focus

- Properties of parallelograms, rhombuses and trapeziums.
- Use the properties to find unknown angles involving parallelograms, rhombuses and trapeziums.

Suggested Duration

8 periods

Prior Learning

Pupils should be well-versed with identifying four-sided figures (squares, rectangles, parallelograms, rhombuses and trapeziums). They should be able to find the unknown angles and dimensions of a square and a rectangle by applying their properties. They should also be able to sketch and draw squares and rectangles according to the given dimensions using mathematical tools.

Pre-emptive Pitfalls

Pupils should be well-versed with the properties of angles on a straight line, angles at a point and vertically opposite angles. They should also be able to find the unknown angle in a triangle using the properties of different types of triangles. In this chapter, pupils are required to extend these knowledge and skills and apply them to four-sided figures.

Introduction

Revise with pupils the markings on figures that represent parallel (//), perpendicular (⊥) and equal sides. In Let's Learn 2 (Textbook 5 P284), provide pupils with two parallelogram cut-outs and ask them to identify the pairs of parallel sides. Get pupils to cut the first parallelogram into two pieces and then place one piece on top of the other such that the two pieces match. This helps pupils to conclude that the opposite angles of a parallelogram are equal. Get them to use the other parallelogram to conclude that the sum of each pair of angles between the parallel sides of a parallelogram is equal to 180°. Summarise the following properties of a parallelogram:

- Opposite sides are parallel.
- Opposite sides are equal in length.
- Opposite angles are equal.
- Sum of each pair of angles between two parallel sides is equal to 180°.

In 'Let's Learn' (Textbook 5 P287), guide pupils to use the properties of a rhombus to find the unknown angles. Let pupils explore the properties of a rhombus using the laminated cut-outs and conclude that the properties of a rhombus are similar to the properties of a parallelogram. Explain that this is because similar to a parallelogram, a rhombus also has two pairs of parallel sides. Point out that the difference between a parallelogram and a rhombus is that in a rhombus, all four sides are of equal length whereas in a parallelgoram, opposite sides are equal in length. However, this difference does not have an impact on the calculation of unknown angles in either shape. Summarise the following properties of a rhombus:

- Opposite sides are parallel.
- All sides are equal in length.
- Opposite angles are equal.
- Sum of each pair of angles between two parallel sides is equal to 180°.

Provide pupils with the cut-out of a trapezium and let pupils explore the properties of a trapezium:

- Only one pair of opposite sides is parallel.
- Sum of each pair of angles between the parallel sides is equal to 180°.

Problem Solving

Ask pupils to make a table of similarities and differences between parallelogram, rhombus and trapezium. Verbalise the properties and elicit individual responses while carrying out this exercise.

Activities

Provide pupils with the cut-out of a square grid with four-sided figures on it and encourage verbalisation of the properties before writing them down in their exercise books.

Resources

- paper
- markers
- cut-outs of different four-sided figures (Activity Handbook 5 P59 – 64)
- scissors
- square grid paper (Activity Handbook 5 P25)

Mathematical Communication Support

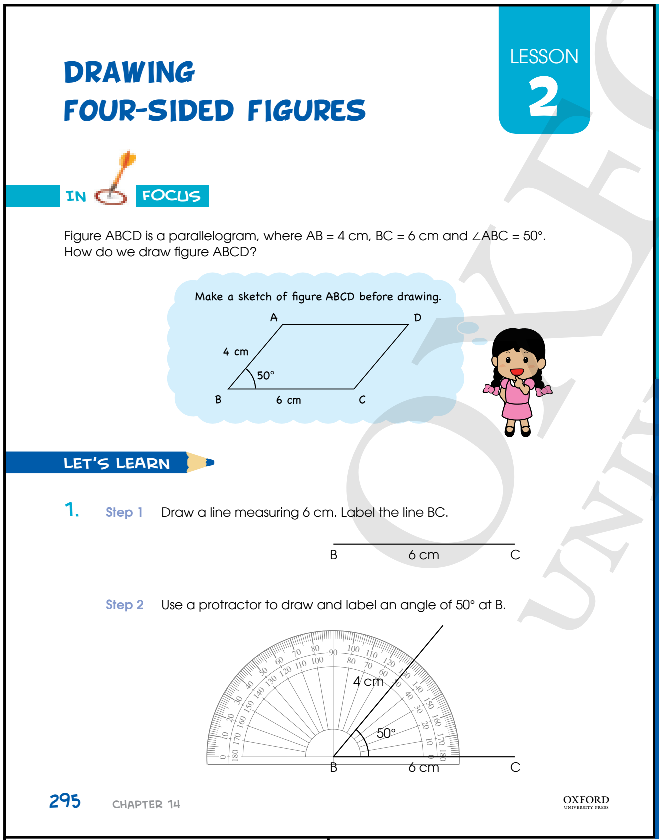
While carrying out 'Activity Time' (Textbook 5 P292), ask pupils important questions to lead them to the correct identification of the shape and description of its properties. For example, ask them "How many pairs of parallel sides can you identify? Are the opposite sides equal in length? Which pairs of angles are equal? Which pair of angles add up to 180°? Why is the sum of the angles of a four-sided figure 360°?".

LESSON
2

DRAWING FOUR-SIDED FIGURES

LEARNING OBJECTIVE

1. Draw different four-sided figures according to given dimensions.



DRAWING FOUR-SIDED FIGURES

LESSON 2

IN FOCUS

Figure ABCD is a parallelogram, where AB = 4 cm, BC = 6 cm and ∠ABC = 50°.
How do we draw figure ABCD?

Make a sketch of figure ABCD before drawing.

LET'S LEARN

1. Step 1 Draw a line measuring 6 cm. Label the line BC.

Step 2 Use a protractor to draw and label an angle of 50° at B.

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Textbook 5 P295

IN FOCUS

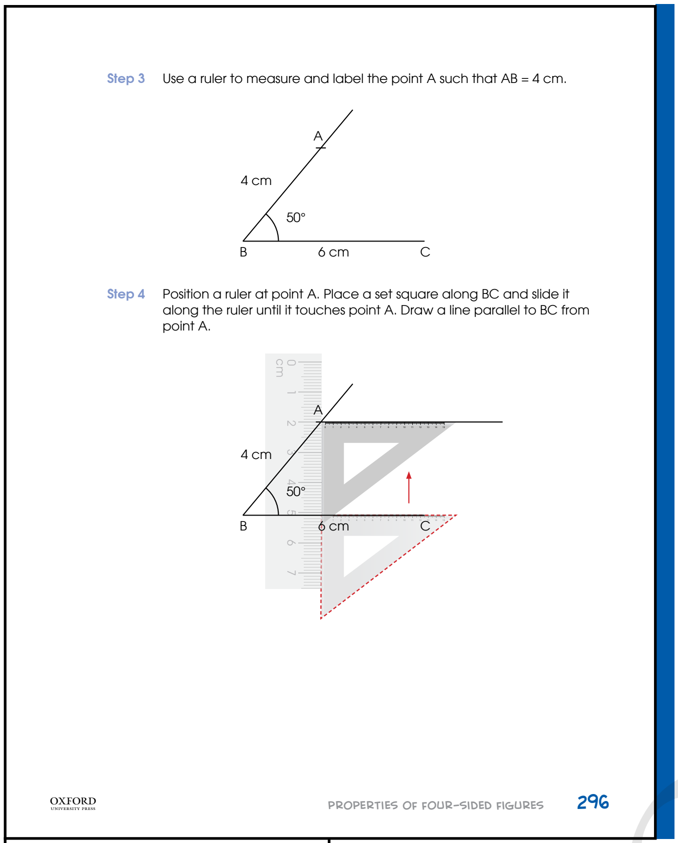
Present the information on parallelogram ABCD and get pupils to make a sketch of it on their mini whiteboard. Teacher then makes a sketch of the figure for pupils to compare against their sketches.
Ask:

- How do we draw this parallelogram according to the exact dimensions given?

LET'S LEARN

For Let's Learn 1, get pupils to take out their drawing tools: a ruler, a protractor and set square.

Teacher demonstrates on a visualiser the steps in drawing the parallelogram ABCD according to the given dimensions of two adjacent sides and the included angle.



Step 3 Use a ruler to measure and label the point A such that AB = 4 cm.

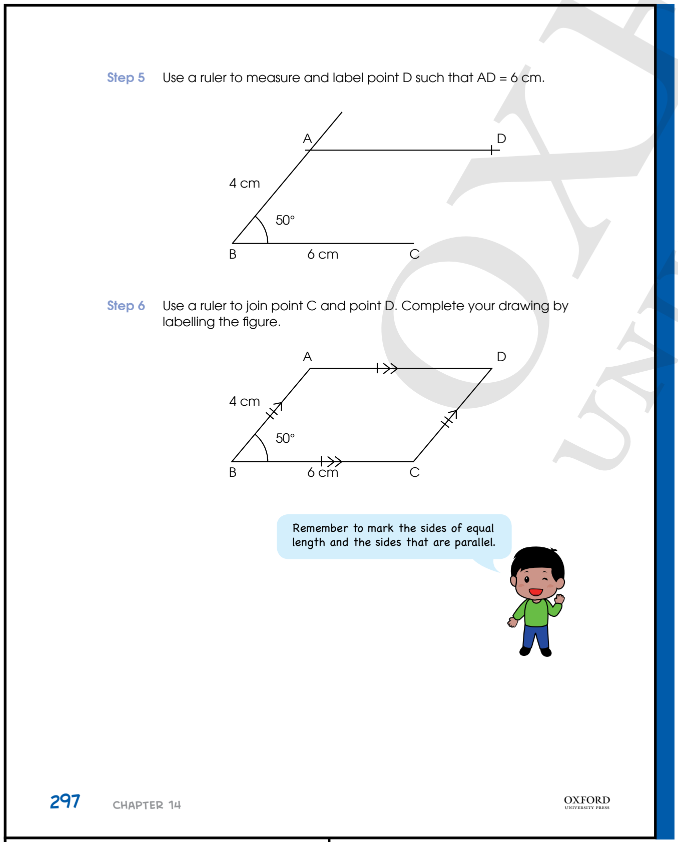
Step 4 Position a ruler at point A. Place a set square along BC and slide it along the ruler until it touches point A. Draw a line parallel to BC from point A.

PROPERTIES OF FOUR-SIDED FIGURES 296

Textbook 5 P296

Lead pupils to see that the set square is necessary to draw the unknown parallel side opposite to the side BC.

Then get pupils to work in pairs. They take turns to follow the steps to draw the parallelogram on their paper while the partner checks the process.



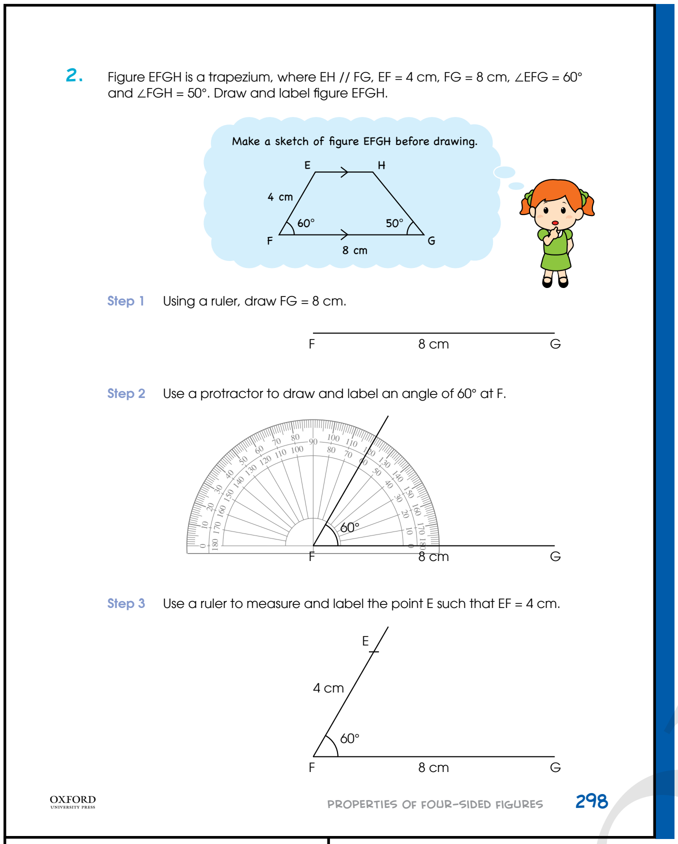
Step 5 Use a ruler to measure and label point D such that AD = 6 cm.

Step 6 Use a ruler to join point C and point D. Complete your drawing by labelling the figure.

297 CHAPTER 14

Textbook 5 P297

Remind pupils to label their completed parallelogram and check against the sketches that they had made earlier.



2. Figure EFGH is a trapezium, where EH // FG, EF = 4 cm, FG = 8 cm, ∠EFG = 60° and ∠FGH = 50°. Draw and label figure EFGH.

Make a sketch of figure EFGH before drawing.

Step 1 Using a ruler, draw FG = 8 cm.

Step 2 Use a protractor to draw and label an angle of 60° at F.

Step 3 Use a ruler to measure and label the point E such that EF = 4 cm.

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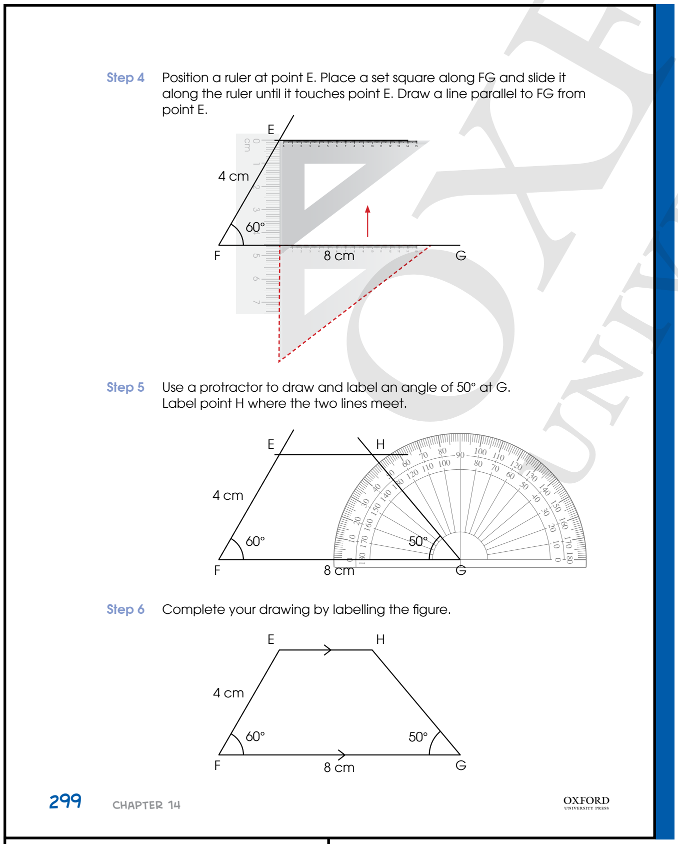
PROPERTIES OF FOUR-SIDED FIGURES 298

Textbook 5 P298

For Let's Learn 2, get pupils to make a sketch of the trapezium EFGH, given the dimensions of two angles and two adjacent sides. Using the same process as in Let's Learn 1, teacher demonstrates and guides pupils along as they take turn to practise drawing the trapezium according to the steps shown.



Step 4 Position a ruler at point E. Place a set square along FG and slide it along the ruler until it touches point E. Draw a line parallel to FG from point E.

Step 5 Use a protractor to draw and label an angle of 50° at G. Label point H where the two lines meet.

Step 6 Complete your drawing by labelling the figure.

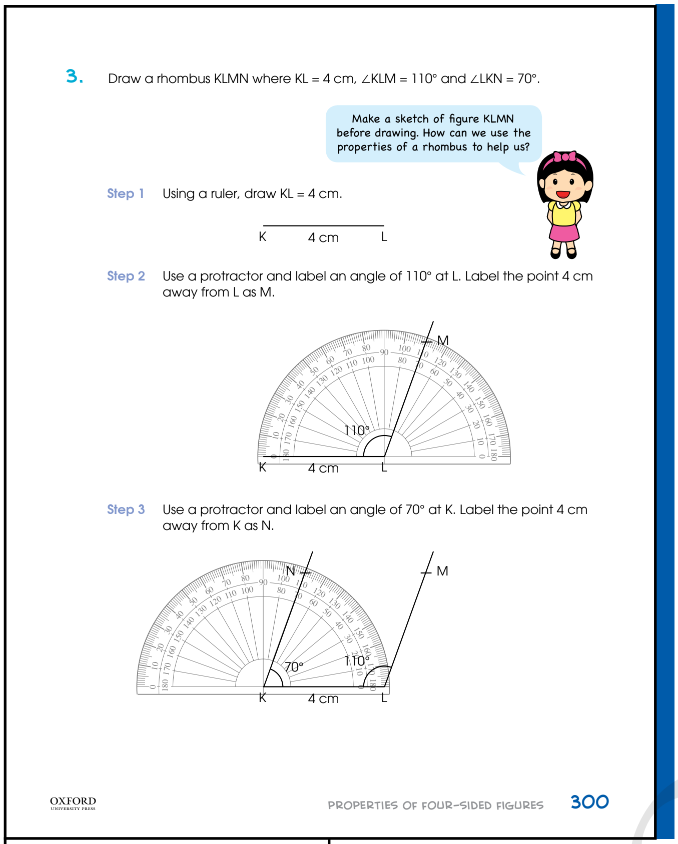
299 CHAPTER 14

OXFORD UNIVERSITY PRESS

Textbook 5 P299

A set square is necessary to draw the unknown opposite side parallel to FG.

Remind pupils to label their completed trapezium.



3. Draw a rhombus KLMN where KL = 4 cm, ∠KLM = 110° and ∠LKN = 70°.

Make a sketch of figure KLMN before drawing. How can we use the properties of a rhombus to help us?

Step 1 Using a ruler, draw KL = 4 cm.

Step 2 Use a protractor and label an angle of 110° at L. Label the point 4 cm away from L as M.

Step 3 Use a protractor and label an angle of 70° at K. Label the point 4 cm away from K as N.

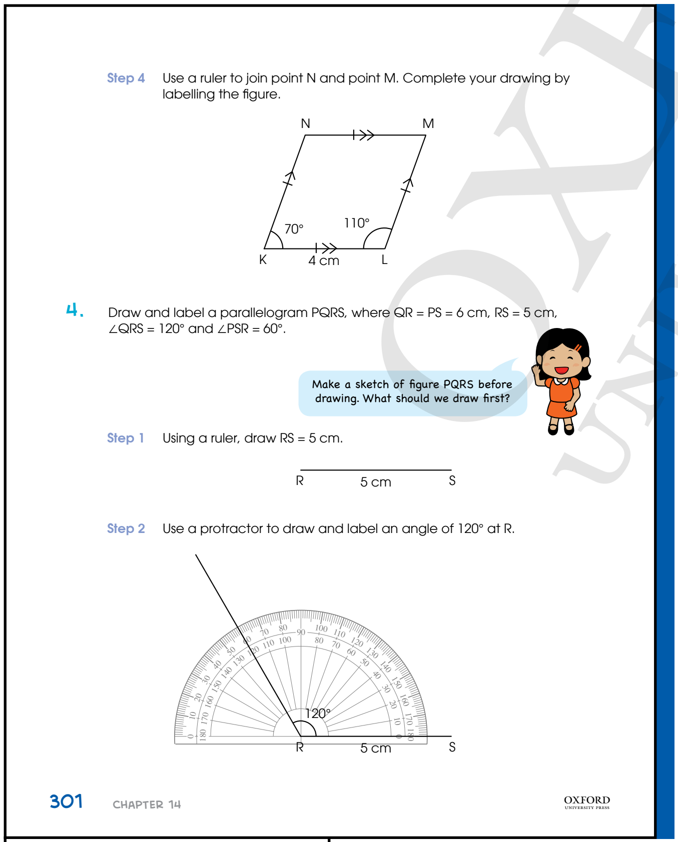
OXFORD UNIVERSITY PRESS PROPERTIES OF FOUR-SIDED FIGURES 300

Textbook 5 P300

For Let's Learn 3, get pupils to make a sketch of the rhombus KLMN given the dimensions of one side and two angles. Recap the properties of a rhombus with pupils.

Teacher demonstrates and guides pupils through the steps in drawing the rhombus using the protractor and ruler.

Lead pupils to see that a set square is not necessary for drawing the opposite parallel side when the two angles between the parallel sides are given.



Step 4 Use a ruler to join point N and point M. Complete your drawing by labelling the figure.

4. Draw and label a parallelogram PQRS, where QR = PS = 6 cm, RS = 5 cm, ∠QRS = 120° and ∠PSR = 60°.

Make a sketch of figure PQRS before drawing. What should we draw first?

Step 1 Using a ruler, draw RS = 5 cm.

Step 2 Use a protractor to draw and label an angle of 120° at R.

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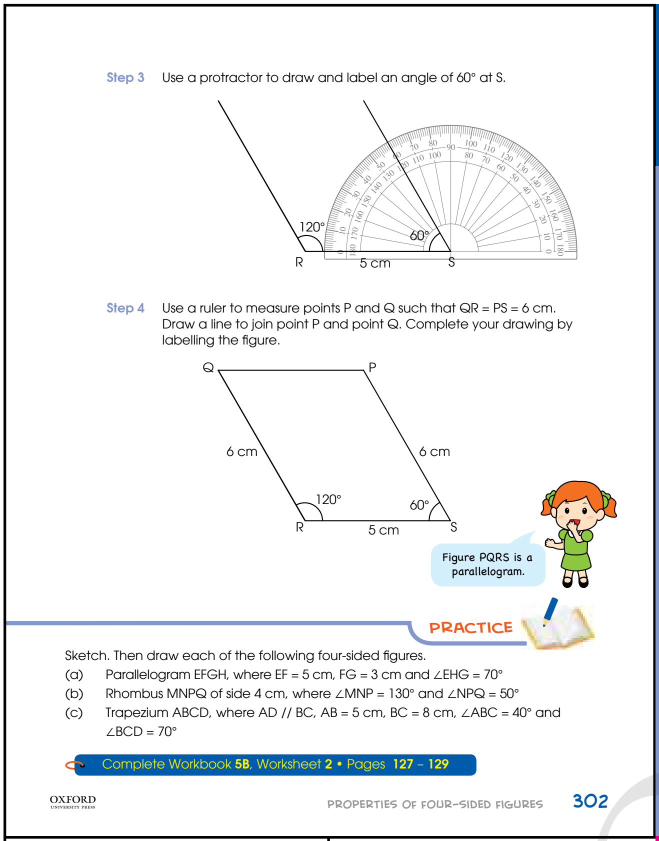
Textbook 5 P301

Remind pupils to label their completed rhombus showing its properties. As an extension, ask pupils to try drawing a rhombus given only one side and one angle.

For Let's Learn 4, allow pupils to work in pairs. Get pupils to make a sketch of the parallelogram given the dimensions of three sides and two angles. Ask pupils to compare with Let's Learn 1 where the dimensions of only two sides and one angle are given. Allow them time to discuss how they can start to draw this parallelogram. Get some pupils to explain their steps.



Step 3 Use a protractor to draw and label an angle of 60° at S.

Step 4 Use a ruler to measure points P and Q such that QR = PS = 6 cm. Draw a line to join point P and point Q. Complete your drawing by labelling the figure.

PRACTICE

Sketch. Then draw each of the following four-sided figures.

(a) Parallelogram EFGH, where EF = 5 cm, FG = 3 cm and ∠EHG = 70°

(b) Rhombus MNPQ of side 4 cm, where ∠MNP = 130° and ∠NPQ = 50°

(c) Trapezium ABCD, where AD // BC, AB = 5 cm, BC = 8 cm, ∠ABC = 40° and ∠BCD = 70°

Complete Workbook **5B**, Worksheet **2** • Pages **127 – 129**

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PROPERTIES OF FOUR-SIDED FIGURES 302

Textbook 5 P302

Teacher then demonstrates and guides pupils through the steps in drawing the parallelogram using the protractor and ruler.

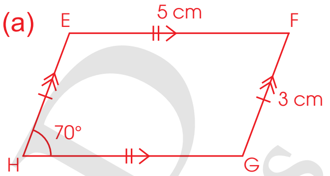
Lead pupils to see that a set square is not necessary for drawing the opposite parallel side when the two angles between the parallel sides are given.

PRACTICE

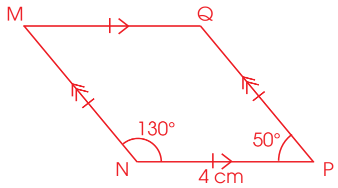
Allow pupils to work in pairs. After sketching each figure together, they can take turns to draw while their partner guides him or her through the steps.

Teacher walks around to monitor and check pupils' progress and difficulties.

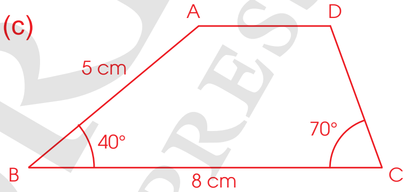
(a)



(b)



(c)

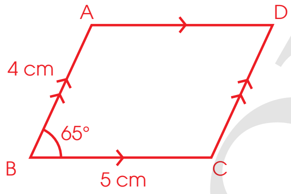


Independent seatwork

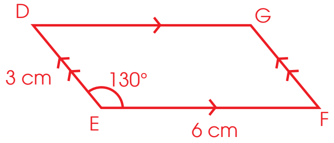
Assign pupils to complete Worksheet 2 (Workbook 5B P127 – 129).

Answers Worksheet 2 (Workbook 5B P127 – 129)

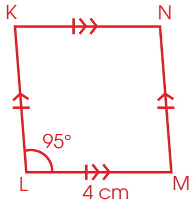
1.



2.



3.



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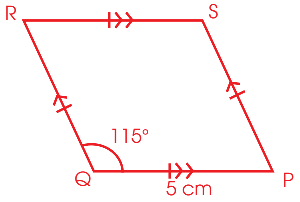
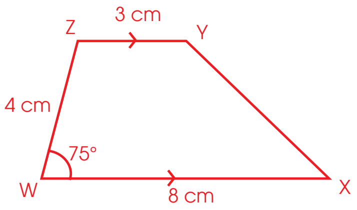
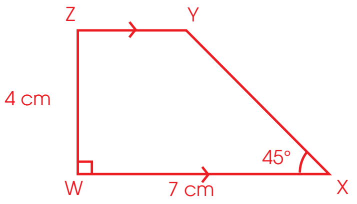


5.



6.



LESSON PLAN

Chapter 14
Lesson 2

Specific Learning Focus

- Draw different four-sided figures according to given dimensions.

Suggested Duration

5 periods

Prior Learning

Pupils should be well-versed in using mathematical tools like the protractor, ruler and set square.

Pre-emptive Pitfalls

When drawing a line at an angle from another line that has been drawn, emphasise that the protractor base line must be aligned to that drawn line. Pupils should be able to identify the correct angle by reading from the protractor.

Introduction

Ask pupils to make a sketch of the figure according to the given dimensions first, before drawing the figure. Give individual attention to pupils and teach them the use of a set square and a ruler to draw parallel lines. Emphasise that they need to correctly align the set square to the ruler and slide it along the ruler to draw parallel lines. Remind pupils to label the angle and the length of the sides of the figure in centimetres. When asked to draw a parallelogram, recall that the opposite sides are equal in length. When asked to draw a rhombus, recall that all four sides are equal in length. When asked to draw a trapezium, recall that all four sides are not equal in length. The teacher may want to point out that only in the case of an isosceles trapezium, then there is a pair of non-parallel opposite sides with equal length.

Problem Solving

Ask the pupils to remember the properties of each shape before sketching the four-sided figure. Recap with pupils that if the shape is a rhombus, all sides have equal length and the sum of each pair of angles between two parallel sides is equal to 180°. Reinforce that the properties of a parallelogram are similar to the properties of a rhombus, except that not all sides of a parallelgoram are equal in length, but rather, the opposite sides are equal in length.

Activities

Since this is an activity-based lesson, encourage pupils to work in pairs to draw the shapes.

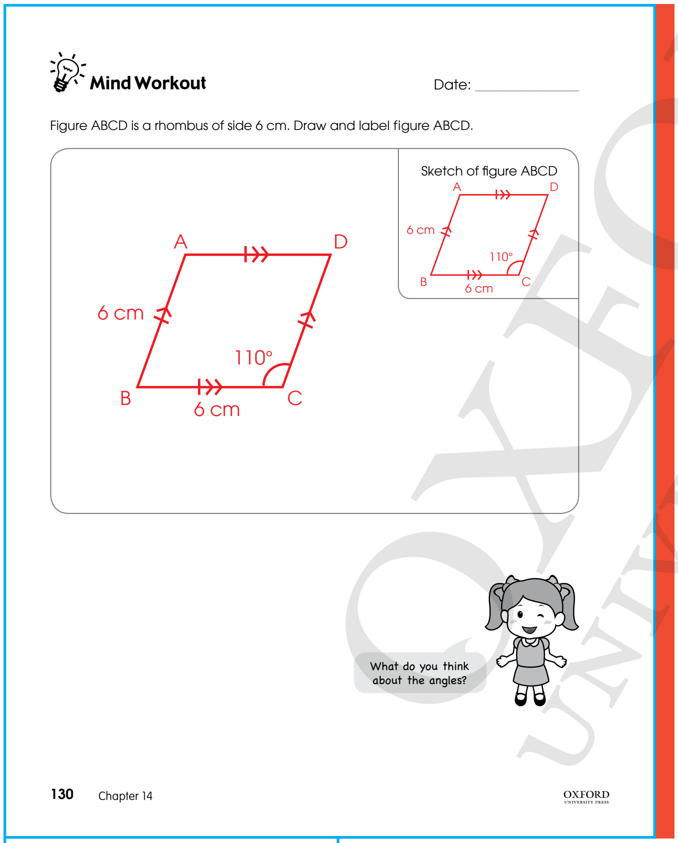
Resources

- mini whiteboard
- markers
- set squares
- protractor
- ruler

Mathematical Communication Support

Write the dimensions of the shape on the board. Ask pupils questions while sketching the shape (e.g. ask which mathematical tool should be used at each stage). Remind pupils to label the dimensions of the shape.

PROBLEM SOLVING, MATHS JOURNAL AND PUPIL REVIEW



Mind Workout Date: ____________

Figure ABCD is a rhombus of side 6 cm. Draw and label figure ABCD.

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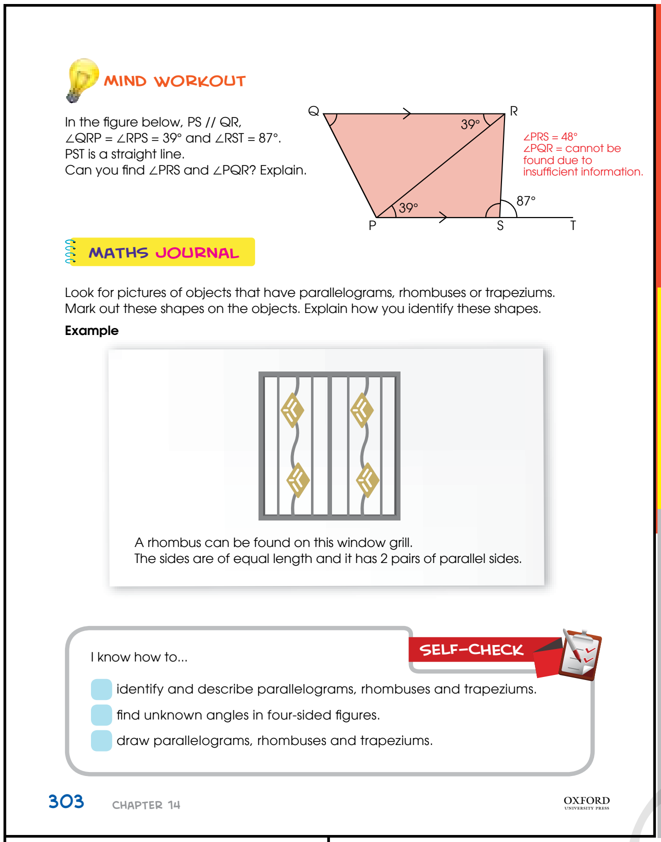
Workbook 5B P130

Mind Workout

Accept all answers that are correct.



MIND WORKOUT

In the figure below, PS // QR,
∠QRP = ∠RPS = 39° and ∠RST = 87°.
PST is a straight line.
Can you find ∠PRS and ∠PQR? Explain.

∠PRS = 48°
∠PQR = cannot be found due to insufficient information.

MATHS JOURNAL

Look for pictures of objects that have parallelograms, rhombuses or trapeziums.
Mark out these shapes on the objects. Explain how you identify these shapes.

Example

A rhombus can be found on this window grill.
The sides are of equal length and it has 2 pairs of parallel sides.

SELF-CHECK

I know how to...

☐ identify and describe parallelograms, rhombuses and trapeziums.
☐ find unknown angles in four-sided figures.
☐ draw parallelograms, rhombuses and trapeziums.

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Textbook 5 P303

MIND WORKOUT

The activity allows pupils to apply the various angle properties they have learnt. It will lead pupils to realise that there is insufficient information to solve for ∠PQR.

MATHS JOURNAL

This task is open-ended for pupils to identify and describe properties of the four-sided figures they see in the real-world objects around them.

SELF-CHECK

Before the pupils do the self-check, review the important concepts once more by asking for examples learnt for each objective.

The self-check can be done after pupils have completed **Review 14** (Workbook 5B P131−134).

Answers

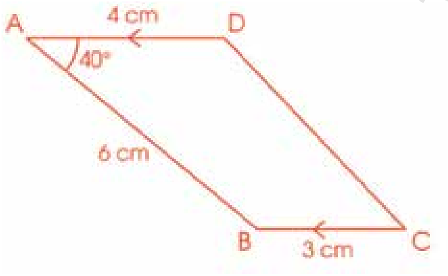
Review 14 (Workbook 5B P131 − 134)

1. (a) 64
   (b) 65
   (c) 42

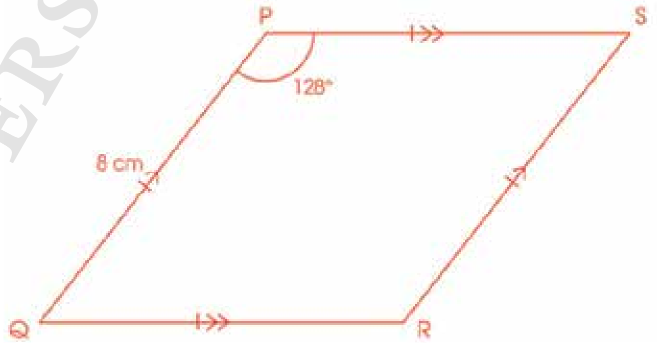
2. (a) 24
   (b) 47

3. ∠ x = 95°
   ∠ y = 71°

4.



5.



PROBABILITY

CHAPTER

15

Probability

CHAPTER

15

How can we find out the probability of Sam picking a marble of each colour?

PROBABILITY

LESSON

1

IN FOCUS

Sam has 20 marbles in a bag.
There are 13 green marbles, 3 yellow marbles, 3 red marbles and 1 blue marble.
What are the chances of Sam picking a marble of each colour?

OXFORD

PROBABILITY 304

Textbook 5 P304

Related Resources
NSPM Textbook 5 (P304 − 307)
NSPM Workbook 5B (P135 – 139)

Materials
Coin, marbles, opaque bag, dice, spinner, alphabet cards

Lesson
Lesson 1 Probability
Problem Solving, Maths Journal and Pupil Review

INTRODUCTION

This chapter introduces the concept of probability. Pupils will learn to find the probability of an event occurring or an event not occurring.

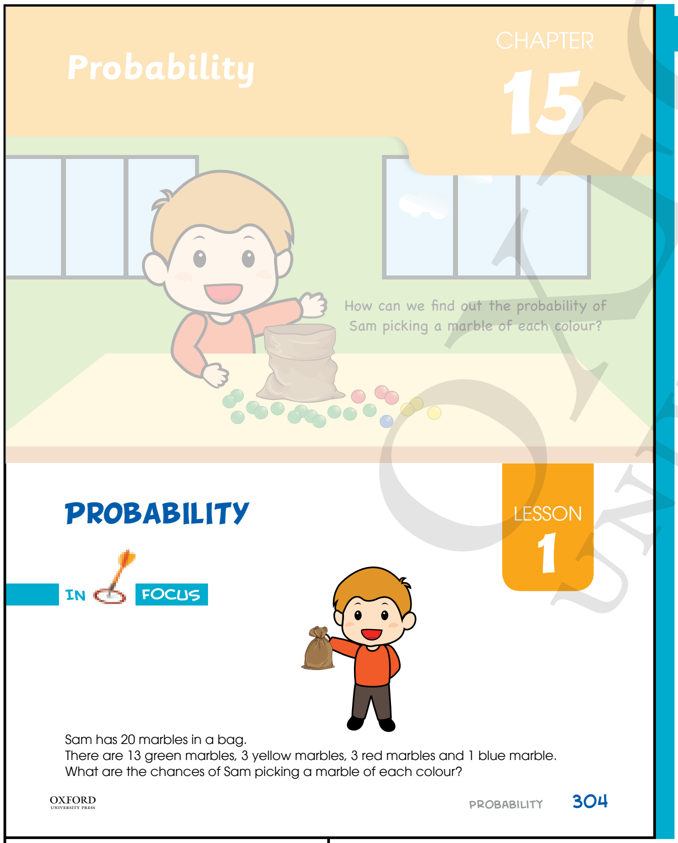
LESSON

1

PROBABILITY

LEARNING OBJECTIVE

1. Understand what probability means.
2. Find the probability of an event occurring or an event not occurring.



Probability

CHAPTER

15

How can we find out the probability of Sam picking a marble of each colour?

PROBABILITY

LESSON

1

IN FOCUS

Sam has 20 marbles in a bag.
There are 13 green marbles, 3 yellow marbles, 3 red marbles and 1 blue marble.
What are the chances of Sam picking a marble of each colour?

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PROBABILITY 304

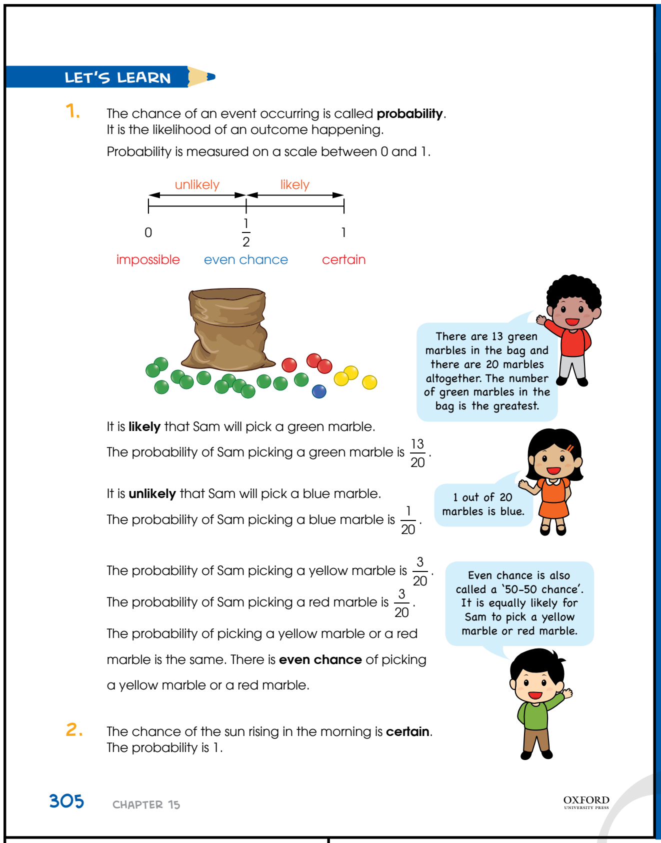
Textbook 5 P304

IN FOCUS

Using the chapter opener, ask pupils to discuss how they can find out the probability of Sam picking a marble of each colour.

Referring to the picture in the chapter opener, ask:

- How many marbles are there in the bag altogether?
- What are the different colours of marbles?
- How many marbles of each colour are there?
- How can we express the chances of Sam picking a marble of each colour?



LET'S LEARN

1. The chance of an event occurring is called **probability**.
It is the likelihood of an outcome happening.

Probability is measured on a scale between 0 and 1.

It is **likely** that Sam will pick a green marble.

The probability of Sam picking a green marble is $\frac{13}{20}$.

It is **unlikely** that Sam will pick a blue marble.

The probability of Sam picking a blue marble is $\frac{1}{20}$.

The probability of Sam picking a yellow marble is $\frac{3}{20}$.

The probability of Sam picking a red marble is $\frac{3}{20}$.

The probability of picking a yellow marble or a red marble is the same. There is **even chance** of picking a yellow marble or a red marble.

2. The chance of the sun rising in the morning is **certain**.
The probability is 1.

305 CHAPTER 15 OXFORD UNIVERSITY PRESS

Textbook 5 P305

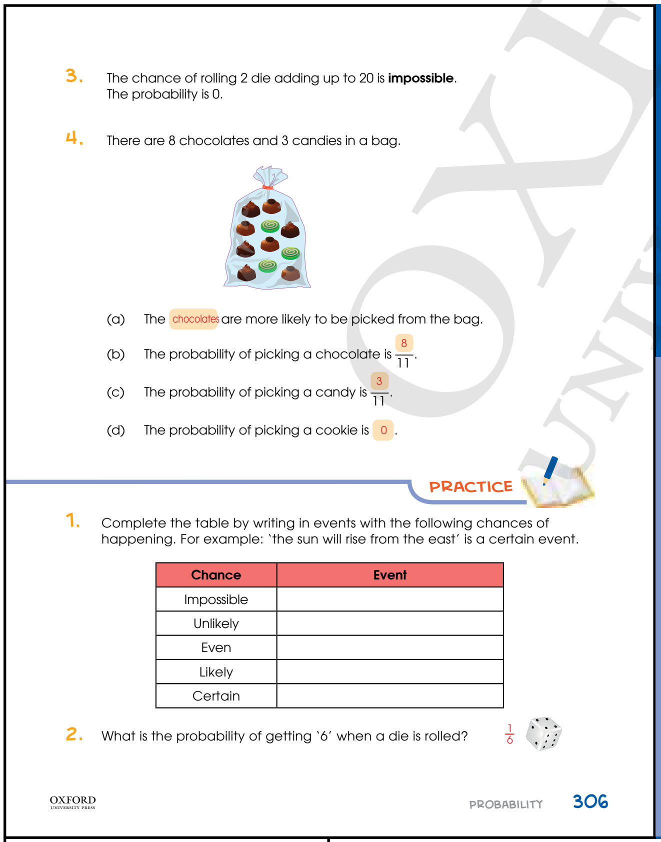
LET'S LEARN

For Let's Learn 1, introduce the term **probability** to pupils by explaining that the probability of an event is the chance of an event occurring. Emphasise that probability is measured on a scale between 0 and 1. Encourage pupils to use key terms to describe the probability of an event − unlikely, likely, impossible, even chance and certain. Referring to the scale, explain the following:

- Probability between 0 and $\frac{1}{2}$ → unlikely to occur
- Probability between $\frac{1}{2}$ and 1 → likely to occur
- Probability = 0 → impossible to occur
- Probability = $\frac{1}{2}$ → even chance (or '50-50 chance') of occurring
- Probability = 1 → certain to occur

Lead pupils to find the probability of Sam picking a marble of each colour by first finding the total number of marbles in the bag. Then, get them to find the number of marbles in each colour. Explain that to find the probability of Sam picking a green marble, it is expressed as a fraction $\frac{\text{number of green marbles}}{\text{total number of marbles}}$. Have them verbalise the fraction in context. For example, say that 13 out of 20 marbles are green. Repeat the same procedure for the other colours of marbles.

For Let's Learn 2, explain to pupils that there are some events that are certain to occur, such as the rising of the sun in the morning. Emphasise that we say that the probability of such events occurring is 1. Ask them if they can think of other events with probability of 1.



3. The chance of rolling 2 die adding up to 20 is **impossible**.
The probability is 0.

4. There are 8 chocolates and 3 candies in a bag.

(a) The chocolates are more likely to be picked from the bag.

(b) The probability of picking a chocolate is $\frac{8}{11}$.

(c) The probability of picking a candy is $\frac{3}{11}$.

(d) The probability of picking a cookie is 0.

PRACTICE

1. Complete the table by writing in events with the following chances of happening. For example: 'the sun will rise from the east' is a certain event.

Chance	Event
Impossible	
Unlikely	
Even	
Likely	
Certain	

2. What is the probability of getting '6' when a die is rolled? $\frac{1}{6}$

OXFORD UNIVERSITY PRESS PROBABILITY 306

Textbook 5 P306

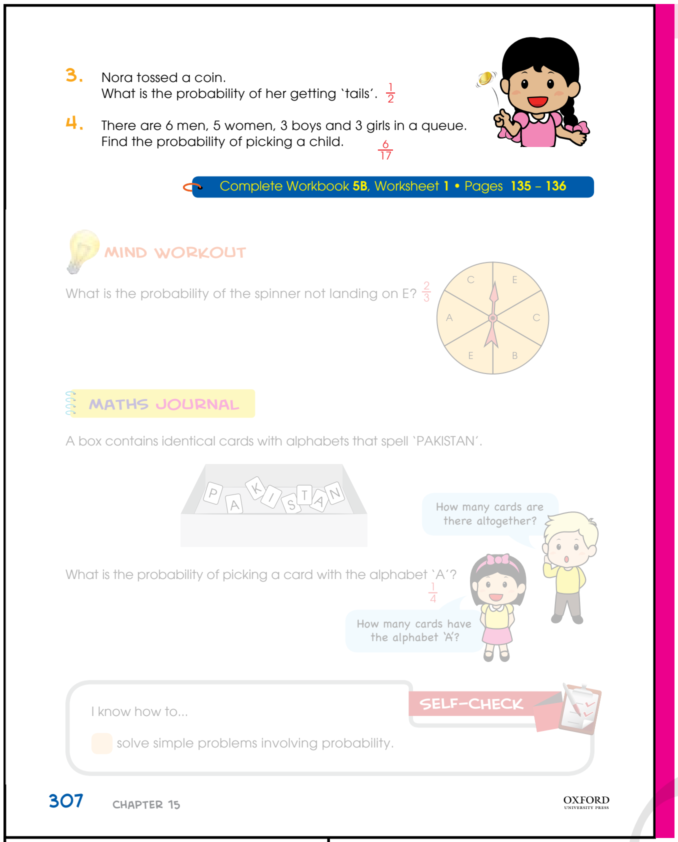
For Let's Learn 3, explain to pupils that for events that are impossible to occur, we say that the probability of such events occurring is 0.

For Let's Learn 4, give pupils some time to work on the question and explain verbally how they obtain their answers. In question (d), ask pupils if there are any cookies in the bag and if there are no cookies, ask them what the probability of picking a cookie is.

PRACTICE

Work with pupils on the practice questions.

For better understanding, select items from Worksheet 1 and work these out with the pupils.



3. Nora tossed a coin.
What is the probability of her getting 'tails'. $\frac{1}{2}$

4. There are 6 men, 5 women, 3 boys and 3 girls in a queue.
Find the probability of picking a child. $\frac{6}{17}$

Complete Workbook **5B**, Worksheet **1** • Pages **135 – 136**

MIND WORKOUT

What is the probability of the spinner not landing on E? $\frac{2}{3}$

MATHS JOURNAL

A box contains identical cards with alphabets that spell 'PAKISTAN'.

How many cards are there altogether?

What is the probability of picking a card with the alphabet 'A'? $\frac{1}{4}$

How many cards have the alphabet 'A'?

SELF-CHECK

I know how to...

☐ solve simple problems involving probability.

307 CHAPTER 15 OXFORD

Textbook 5 P307

Independent seatwork

Assign pupils to complete Worksheet 1 (Workbook 5B P135 – 136).

Answers

Worksheet 1 (Workbook 5B P135 – 136)

1. (a) even chance
   (b) certain
   (c) impossible
   (d) unlikely
   (e) likely

2. (a) likely
   (b) likely
   (c) unlikely
   (d) equal chance

3. (a) $\frac{1}{5}$
   (b) 2
   (c) 3
   (d) none

4. (a) $\frac{3}{8}$
   (b) $\frac{5}{8}$
   (c) $\frac{1}{8}$
   (d) $\frac{3}{8}$
   (e) $\frac{1}{4}$
   (f) 0

LESSON PLAN

Chapter 15
Lesson 1

Specific Learning Focus

- Understand what probability means.
- Find the probability of an event occurring or an event not occurring.

Suggested Duration

3 periods

Prior Learning

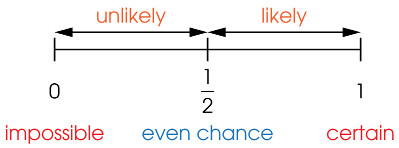
Pupils have no prior knowledge of probability. In this chapter, they will be introduced to the concept of probability.

Pre-emptive Pitfalls

This should be a relatively easy chapter and can be made fun by relating probability to real-life examples

Introduction

Probability is the chance of an event occurring. In Let's Learn 1 (Textbook 5 P305), a scale to measure probability is introduced:



Referring to the scale, explain to pupils that if it is certain that an event will occur (e.g. the sun will set in the West), the probability is 1. On the other hand, if it is impossible for an event to occur (e.g. the sun setting in the East), the probability is 0. Pointing to the middle of the scale, explain that for an event that has an even chance of occurring (e.g. getting an even or odd number from rolling a die), the probability is $\frac{1}{2}$. Referring back to the example in Let's Learn 1, the probability of picking a marble of a certain colour, such as yellow, from a bag of different coloured marbles is given as $\frac{\text{number of yellow marbles}}{\text{total number of marbles}}$.

Problem Solving

Brainstorm real-life events with pupils to create a probability table whereby the probabilities of these events are classified as certain, likely, even chance, unlikely or impossible. The teacher may point out that in the case of picking marbles in a bag, the second time we pick a marble of the same colour, the numerator and denominator of the fraction representing the probability will be one less than the fraction representing the probability the first time the marble of that colour was picked. However, when rolling a die, flipping a coin, or spinning a wheel, the probability will remain the same no matter how many times each event is carried out.

Activities

'Mind Workout' and 'Maths Journal' (Textbook 5 P307) can be conducted as paired activity using the spinner and alphabet cards.

Resources

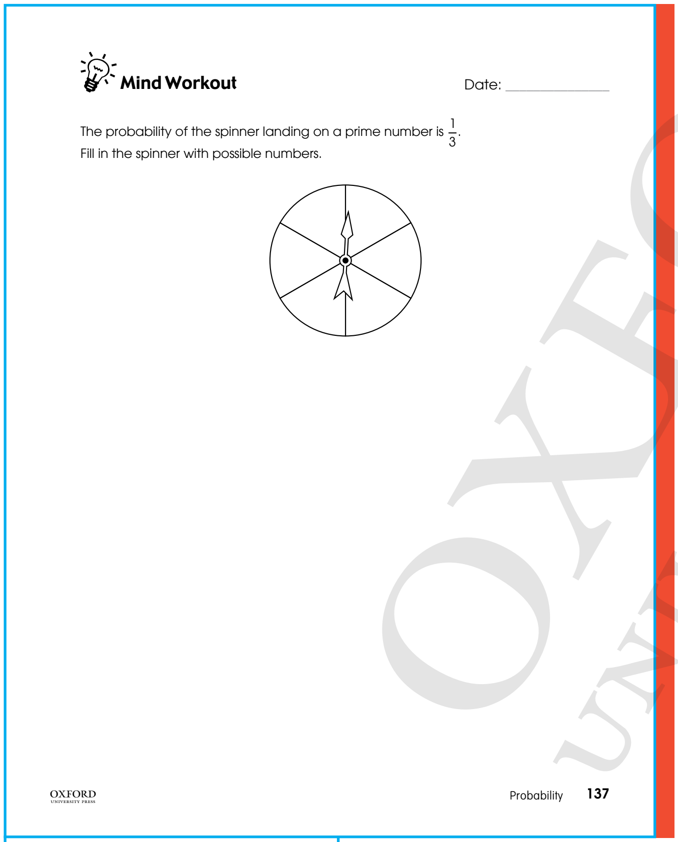
- coin
- dice
- marbles
- spinner (Activity Handbook 5 P65)
- opaque bag
- alphabet cards (Activity Handbook 5 P66)

Mathematical Communication Support

Verbalise real-life examples with pupils and encourage individual responses when classifying the probabilities of these events as certain, likely, even chance, unlikely or impossible. Summarise the following:

probability between 0 and $\frac{1}{2}$	unlikely to occur
probability between $\frac{1}{2}$ and 1	likely to occur
probability = 0	impossible to occur
probability = $\frac{1}{2}$	even chance (or '50-50 chance') of occurring
probability = 1	certain to occur

PROBLEM SOLVING, MATHS JOURNAL AND PUPIL REVIEW



Mind Workout Date: ______________

The probability of the spinner landing on a prime number is $\frac{1}{3}$.
Fill in the spinner with possible numbers.

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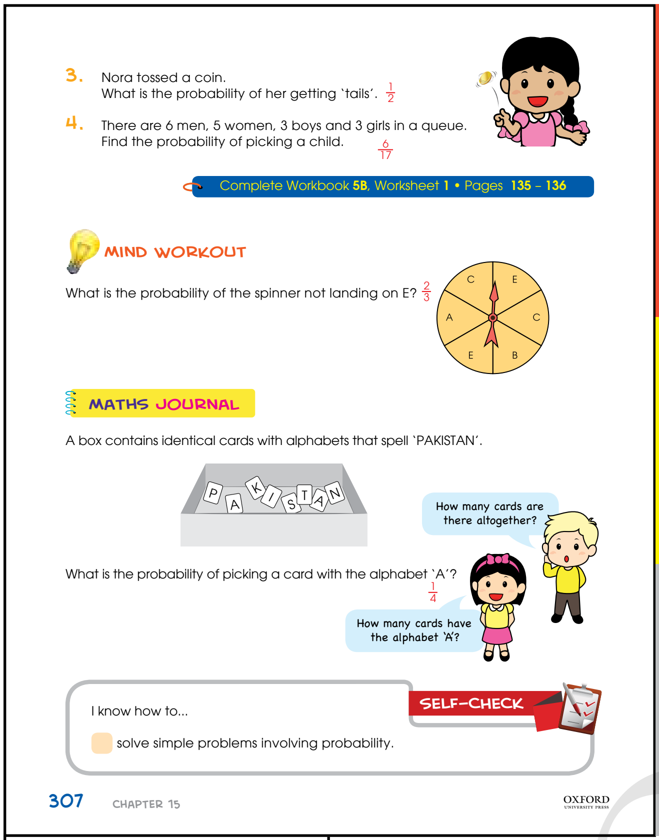
Probability 137

Workbook 5B P137

Mind Workout

Get pupils to count the number of numbers that will be found on the spinner. They should be able to count that there will be 6 numbers. Guide them to find the equivalent fraction of $\frac{1}{3}$ with a denominator of 6 ($\frac{1}{3} = \frac{2}{6}$). Verbalise by saying that since the probability of the spinner landing on a prime number is $\frac{1}{3}$, which is $\frac{2}{6}$, 2 out of 6 numbers are prime numbers. Recap with pupils what prime numbers are. Lead them to see that the spinner should be filled with 2 prime numbers and the remaining 4 numbers must not be prime numbers.



3. Nora tossed a coin.
What is the probability of her getting 'tails'. $\frac{1}{2}$

4. There are 6 men, 5 women, 3 boys and 3 girls in a queue.
Find the probability of picking a child. $\frac{6}{17}$

Complete Workbook **5B**, Worksheet **1** • Pages **135 – 136**

MIND WORKOUT

What is the probability of the spinner not landing on E? $\frac{2}{3}$

MATHS JOURNAL

A box contains identical cards with alphabets that spell 'PAKISTAN'.

What is the probability of picking a card with the alphabet 'A'? $\frac{1}{4}$

SELF-CHECK

I know how to...

☐ solve simple problems involving probability.

307 CHAPTER 15 OXFORD

Textbook 5 P307

MIND WORKOUT

Emphasise the word 'not' in the question. Lead pupils to see that if the spinner does not land on E, it has to land on one of the remaining 4 letters.

MATHS JOURNAL

This activity serves to check if pupils are able to identify all the cards with the alphabet 'A'. Provide pupils with the alphabet cards to help them answer the question.

SELF-CHECK

The self-check can be done after pupils have completed **Review 15** (Workbook 5B P138 − 139).

Answers Review 15 (Workbook 5B P138 − 139)

1. (a) impossible
   (b) likely
   (c) certain
   (d) even chance
   (e) unlikely

2. (a) C
   (b) A, B and E
   (c) $\frac{4}{7}$

3. (a) $\frac{2}{3}$
   (b) $\frac{2}{9}$
   (c) 0

4. (a) $\frac{1}{2}$
   (b) $\frac{9}{20}$
   (c) 0
   (d) $\frac{3}{20}$

5. (a) $\frac{1}{2}$
   (b) 1

Answers Revision 4A (Workbook 5B P140 −143)

1. $3 \times 60 = 180$

2. $1500 \div 200 = 7.5$ min

3. $3.24\ \ell \div 60$ min $= 0.054\ \ell$

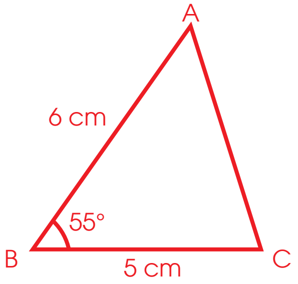
4. 93

5. 38

6. 214

7. 39

8.



9. $5 \div 3\ 1\frac{2}{3}$

$1\frac{2}{3} \times 12 = 20$

10. $25 \times \$19.25 = \$481.25$
$750 \times \$7.20 = \$5400$
$\$481.25 + \$5400 = \$5887.50$

Answers Revision 4B (Workbook 5B P144 − 149)

1. C

2. 15

3. *c*

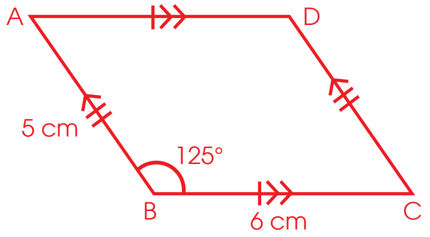
4. $\angle ACE = 180° - 120°$
$= 60°$
$\angle BED = \angle AEC$
$= 180° - 90° - 60°$
$= 30°$

5. $\angle ACB = 180° - 39° - 81°$
$= 60°$
$\angle ACD = 180° - 60° - 75°$
$= 45°$

6. $\angle ADB = (180° - 78°) \div 2$
$= 51°$
$\angle EDA = 180° - 51°$
$= 129°$

7. $\angle ABC = 180° - 64°$
$= 116°$
$\angle ACB = (180° - 116°) \div 2$
$= 32°$
$\angle BCD = 180° - 32°$
$= 148°$

8.



9. (a) heart shape
(b) circle and triangle
(c) $\frac{1}{15}$

10. (a) $\frac{2}{5}$
(b) $\frac{2}{3}$

Answers End-of-Year Revision (Workbook 5B P150 – 172)

1. 1

2. 3

3. 1

4. 3

5. 3

6. 2

7. 3

8. 3

9. 3

10. 2

11. 1

12. 1

13. 2

14. 2

15. 3

16. 56

17. $3465 = 3 \times 3 \times 5 \times 7 \times 11$

18. 20

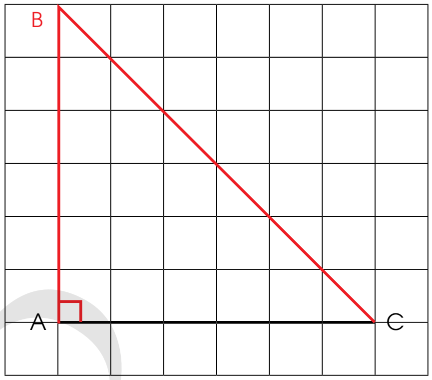
19. $\frac{55}{100} = \frac{11}{20}$

20. $\frac{2}{5} \times 100\% = 40\%$

21. 10 minutes → 450
1 minute → 450 ÷ 10
= 45
60 minutes → 45 × 60
= 2700

22. Probability of spinner landing on number 2 = $\frac{4}{8} = \frac{1}{2}$

23.

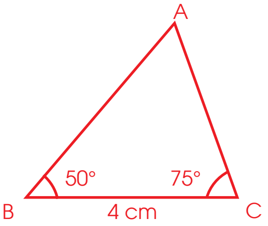


24. $6 \times 4 \times 10 = 240\ \text{cm}^3$
$\frac{4}{5} \times 240\ \text{cm}^3 = 192\ \text{cm}^3$
$= 0.192\ \ell$

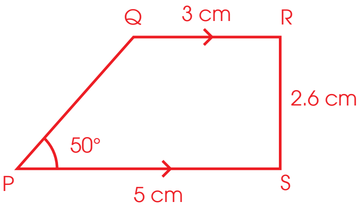
25. $24 \times 4 = 96$
$96 - 30 - 23 - 23 = 20$

26. $\text{1st hour} \rightarrow \$1.50$
$\text{Next } \frac{1}{2} \text{ hr} \rightarrow \$1 \times 3$
$= \$3$
$\$1.50 + \$3 = \$4.50$

27.



28.



29. $\angle x = 180° - 90° - 70°$
$= 20°$
$\angle y = 180° - 70°$
$= 110°$

30. $\angle ADC = \angle ABC$
$= 140°$
$\angle ADE = 180° - 140°$
$= 40°$

31. $\angle XZY = \angle XYZ$
$= 360° - 315°$
$= 45°$
$p = 180° - 45° - 45°$
$= 90°$

32. $\angle DEC = 180° - 90° - 37°$
$= 53°$
$\angle x = 180° - 53°$
$= 127°$

33. $\angle DCE = 180° - 90° - 26°$
$= 64°$
$\angle ABC = \angle ACB$
$= 64°$
$\angle BAC = 180° - 64° - 64°$
$= 52°$

34. $\angle AED = (180° - 20°) \div 2$
$= 80°$
$\angle AEC = 180° - 80°$
$= 100°$

35. $\angle CED = 180° - 68° - 60°$
$= 52°$
$\angle x = 180° - 30° - 52° - 60°$
$= 38°$

36. (a) S\$3 = €2
S\$1 = €$\frac{2}{3}$
S\$600 = €($\frac{2}{3}$ × 600)
= €400

(b) €1 = €1.50
€350 = S\$(1.50 × 350)
= S\$525

37. 2.5 m − 0.32 m − 0.5 m = 1.68 m

38. Rs 45 ÷ Rs 5 = 9
9 ÷ 3 = 3
3 × Rs 2 = Rs 6

39. $1 - \frac{1}{3} - \frac{3}{7} = \frac{5}{21}$
$\frac{1}{3} = \frac{7}{21}$
$\frac{3}{7} = \frac{9}{21}$
$\frac{9}{21} - \frac{5}{21} = \frac{4}{21}$
$\frac{4}{21} \rightarrow$ 20 beads
$\frac{1}{21} \rightarrow$ 20 ÷ 4
= 5 beads

$\frac{7}{21} \rightarrow$ 5 × 7
= 35 beads

40. $\frac{80}{100}$ × \$15 = \$12

41. (a) 50y ml + 60y ml = 110y ml
(b) $\frac{10y}{z}$

42. 1st 1 km → \$3
Next 24 km → ((24 × 1000) ÷ 400) × \$0.22
= \$13.20
\$3 + \$13.20 = \$16.20

43. 50 × 2 = 100
60 × 3 = 180
180 − 100 = 80

44. 30 × 20 × 15 = 9000 cm^3
$\frac{2}{3}$ × 9000 cm^3 = 6000 cm^3
= 6 ℓ
6 ℓ ÷ 2 = 3 minutes

45. (a) $\angle BCD = 180° - 124°$
$= 56°$
$\angle m = 360° - 56°$
$= 304°$
(b) $\angle ADC = \angle ABC$
$= 124°$
$\angle n = 124° - 59°$
$= 65°$

NAVIGATING THROUGH THE ASSESSMENT EXERCISES AND ACTIVITIES

For teachers to assess pupils' achievement of the learning objectives, the Teacher's Resource Book provides direction for teachers on how to use the following assessment and exercises. Summarising the evaluative aspect of this series, the following exercises can be utilised optimally.

TEXTBOOK

CHAPTER OPENER

Chapter Opener consists of familiar events or occurrences that serve as an introduction of the topic to pupils.

IN FOCUS

Questions related to the lesson objectives are asked as an introductory activity for pupils. The activity allows pupils to explore different ways to solve the problem.

LET'S LEARN

Main concepts are introduced in Let's Learn. The consolidation and formalising of concepts are achieved. The exercises can be used by teachers to test their pupils' prior knowledge. Teachers can provide valuable assessment-based feedback to pupils. Having pupils attempt these exercises will help teachers identify the focus of each lesson and the adjustments they need to make to their teaching in order to help pupils meet the intended learning outcomes.

ACTIVITY TIME

Most of the activities in the book are to be carried out in pairs or groups. Pupils explore mathematical concepts in a fun way through games. Observing pupils' approach and dexterity while doing the activity will give a clear indication to teachers on how the lesson should be conducted.

PRACTICE

The questions in Practice enable teachers to gauge if pupils have grasped the concepts. Practice can be done as an independent exercise in class or as homework.

Through the questions, teachers get to understand what their pupils have learned. They will be able to find the answers to the following questions:

(i) Are there any common gaps in my pupils' knowledge of the topic which I need to revisit?
(ii) In which aspects of my pupils' learning of the topic did they achieve mastery?
(iii) What are the strengths and weaknesses in my planning for teaching?

MIND WORKOUT

Pupils' critical and problem-solving skills are enhanced when working on the Mind Workout. Teachers can use the exercises to challenge advanced learners. It is advisable to use the exercise as an independent assignment for pupils.

MATHS JOURNAL

Maths Journal enhances pupils' skills such as mathematical communication, reasoning, organisation and tabulation of data. The exercises can be done in a group or individually in class or at home.

SELF-CHECK

Key concepts required in the syllabus that must be learnt are highlighted in Self-Check. It would be beneficial for pupils when teachers revise the key concepts in class as this allows pupils to assess their own learning at the end of each chapter and facilitates their revision in preparation for the examination.

WORKBOOK

Worksheets
Well-structured questions covering all the concepts taught in each lesson, are found in each worksheet. A suggested approach would be to have pupils do alternate questions from each worksheet or do the questions that will build their foundation of the concepts. The skipped questions can be revisited during revision before the examination. The worksheets in the workbooks can be done as a complimentary practice exercise to augment the concepts learnt.

Maths Journal
Maths Journal tests pupils' understanding of the mathematical concepts learnt in the chapter and further enhances their learning of the concepts.

Mind Workout
Mind Workout consists of higher-order thinking tasks which enable pupils to apply relevant heuristics and extend the concepts and skills learnt.

Revision
Revision exercises at the end of a set of chapters consist of questions that enable pupils to apply all the concepts and skills taught. The exercises can be done before an examination or a test. They serve as good revision exercises for pupils to do in class or as homework with guidance from their parents when necessary. They also enable teachers to evaluate the pupils' understanding of the concepts across strands and topics and can be used as an effective preparatory exercise for examinations.

Review
The Review Exercise consists of questions that requires the application of a consolidation of concepts learnt in the chapter. The exercises can be done as a group assignment for teachers to gauge the pupils' ability to grasp the consolidated concepts learnt in the chapter. Group assignments help pupils to learn together as they gather feedback from one another. Teachers can also get pupils to submit their completed exercises and mark them as a form of informal assessment.

Mid-Year and **End-of-Year Revisions**
These are assessment exercises with multiple choice questions, short-answer questions and word problems. Teachers can use the revision exercises as mock examinations to help pupils prepare for the examinations. Feedback provided to pupils will be extremely beneficial as they will be aware of the areas that they are weak in and work on them. The revision exercises test pupils' ability to recall the concepts taught and apply them. They also allow teachers to analyse the effectiveness of their spiral approach of teaching concepts. Teaching concepts by revisiting, re-linking to other concepts and creating a mind map help pupils do their examinations in a more effective way. A good evaluative assessment should not consist of questions that encourage rote learning, but should consist of questions that encourage learning by the spiral approach.

Examination papers should not be considered by teachers as the only means of evaluation. Informal evaluation involves classroom discussions, participation, exchange of ideas, multiple strategies, activities, group assignments, presentations and above all, mind-mapping, before they embark on independent work. It is essential for the pupils to receive feedback on their work which provides an important opportunity for reflection on what they have learnt. Similarly, teachers should be able to diagnose the progress and achievement of the pupils and decide on the future course of action, which is where the assessment activities and exercises come in.