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# CHAPTER 1
Numbers up to 10 Million

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<th>Textbook Learning</th>
<th>Workbook Practice</th>
<th>Pupil-centred Activities</th>
<th>Concrete Materials</th>
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<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>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.</td>
<td>Textbook 5 P1 − 12 Workbook 5A P1 − 5</td>
<td>Textbook 5 P13 − 16 Workbook 5A P6</td>
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<td>Textbook 5 P6, 10</td>
<td>Computer (ICT), newspapers, place-value chart, place-value cards, number discs</td>
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<tr>
<td>2</td>
<td>2</td>
<td>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.</td>
<td>Textbook 5 P17 − 18 Workbook 5A P7 − 8</td>
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<td>Hundred chart, markers</td>
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<tr>
<td>3</td>
<td>3</td>
<td>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.</td>
<td>Textbook 5 P19 − 20 Workbook 5A P9 − 10</td>
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<td>Mini whiteboard, markers</td>
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<td>4</td>
<td>3</td>
<td>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.</td>
<td>Textbook 5 P12 − 16 Workbook 5A P11</td>
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<td>Mini whiteboard, markers, numeral cards</td>
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#### Four Operations

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<td>Multiply numbers by tens, hundreds, and thousands.</td>
<td>Use number discs to illustrate multiplication of a whole number by tens, hundreds, and thousands.</td>
<td>Number discs, conversion of unit cards</td>
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<td>Worksheet 1A Workbook 5A P17 – 18</td>
<td>Textbook 5 P22 – 26</td>
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<td>2</td>
<td>Divide numbers by tens.</td>
<td>Use number discs to illustrate division of a whole number by tens, hundreds, and thousands.</td>
<td>Number discs, mini whiteboard, markers, conversion of unit cards</td>
<td>-</td>
<td>Worksheet 1B Workbook 5A P19 – 20</td>
<td>Textbook 5 P27 – 30</td>
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<tr>
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<td>Order of Operations</td>
<td>Discover the rules for the order of operations with a scientific calculator and explain why the rules are necessary.</td>
<td>Calculator, mini whiteboard, mathematical expressions cards</td>
<td>-</td>
<td>Worksheet 2A Workbook 5A P21 – 22</td>
<td>Textbook 5 P30 – 33</td>
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**Estimated number of periods:** 10

- **Four Operations**
  - Multiplying by Tens, Hundreds, and Thousands
  - Dividing by Tens, Hundreds, and Thousands
  - Order of Operations

**Textbooks**
- Textbook 5
- Workbook 5A

**Additional Resources**
- Worksheet 1A
- Worksheet 1B
- Worksheet 1C
- Worksheet 2A
- Worksheet 2B
- Worksheet 2C
- Worksheet 3
- Worksheet 4
- Worksheet 5

**Materials**
- Number discs
- Conversion of unit cards
- Calculator
- Mini whiteboard
- Markers
- Markers
- Numeral cards
- Hundred chart
- Number discs
- Hundred chart
- Hundred chart

**Learning Experiences**
- Use number discs to illustrate multiplication of a whole number by tens, hundreds, and thousands.
- Use number discs to illustrate division of a whole number by tens, hundreds, and thousands.
- Discover the rules for the order of operations with a scientific calculator and explain why the rules are necessary.
- Calculate in correct order of operations, including the use of brackets.
- Estimate answer before calculation to check reasonableness of calculated answer by comparison.
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<td>• Solve word problems involving the 4 operations.</td>
<td>Textbook 5 P45 – 51</td>
<td>Worksheet 4 Workbook 5A P33 – 39</td>
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<td>• Solve problems using the part-whole and comparison models.</td>
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<td></td>
<td>• Solve non-routine problems using different heuristics.</td>
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<th>Textbook Learning</th>
<th>Workbook Practice</th>
<th>Pupil-centred Activities</th>
<th>Concrete Materials</th>
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</table>
| 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 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 | _ | _ |

Estimated number of periods: 6
## CHAPTER 4
### Fractions

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<th>Learning Experiences</th>
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<th>Workbook Practice</th>
<th>Pupil-centred Activities</th>
<th>Concrete Materials</th>
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</table>
| 1      | 3                 | **Fractions and Division**  
- Divide a whole number by another whole number and give the answer as a fraction.  
- Convert fractions to decimals.  
- 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 $12 \div 3$ 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  
Workbook 5A  
P53 – 56 | Textbook 5  
P67 | Fraction discs, coloured papers, scissors, drawing block, markers, conversion of fraction cards |
### Scheme of Work

#### Chapter 4: Fractions

**Estimated number of periods:** 30

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<th>Learning Experiences</th>
<th>Textbook</th>
<th>Workbook</th>
<th>Practice</th>
<th>Pupil-centred Activities</th>
<th>Concrete Materials</th>
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<td>• 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 $12 \div 3$ 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.</td>
<td>Textbook 5 P68 – 72</td>
<td>Workbook 5A P57 – 58</td>
<td>Worksheet 1</td>
<td></td>
<td>Textbook 5 P67</td>
<td>Fraction discs, calculator, fraction discs, calculator, mini whiteboard, markers, Fraction discs, coloured papers, scissors, drawing block, markers, conversion of fraction cards</td>
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<td></td>
<td>2</td>
<td>• 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.</td>
<td>Textbook 5 P73 – 77</td>
<td>Workbook 5A P59 – 60</td>
<td>Worksheet 2 Workbook 5A</td>
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<td>Textbook 5 P68 – 72</td>
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<td>3</td>
<td>• 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.</td>
<td>Textbook 5 P78 – 80</td>
<td>Workbook 5A P61 – 64</td>
<td>Worksheet 3 Workbook 5A</td>
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<td>Textbook 5 P74 – 77</td>
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<td>• 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.</td>
<td>Textbook 5 P81 – 84</td>
<td>Workbook 5A P65 – 68</td>
<td>Worksheet 4 Workbook 5A</td>
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<td>• Multiply a fraction and whole number. • Multiply a fraction and an improper fraction. • 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 fractions and mixed numbers.</td>
<td>Textbook 5 P85 – 89</td>
<td>Workbook 5A P73 – 78</td>
<td>Worksheet 5 Workbook 5A</td>
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</tr>
</tbody>
</table>

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**Notes:**

- 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.
- 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.
- Use calculator to do addition and subtraction of fractions. Solve problems using the part-whole and comparison models.
- Use calculator to do multiplication of two improper fractions.
<table>
<thead>
<tr>
<th>Multiplying a Mixed Number and a Whole Number</th>
<th>More Word Problems involving fractions</th>
<th>Problem Solving, Maths Journal and Pupil Review</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Use calculator to check multiplication of a mixed number and a whole number.</td>
<td>- 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.</td>
<td>- 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.</td>
</tr>
<tr>
<td>Textbook 5 P90 – 92</td>
<td>Textbook 5 P93 – 99</td>
<td>Textbook 5 P99 – 100 Workbook 5A P82</td>
</tr>
<tr>
<td>Worksheet 7 Workbook 5A P73 – 74</td>
<td>Worksheet 8 Workbook 5A P75 – 81</td>
<td>Review 4 Workbook 5A P83 – 88</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fraction bars, calculator</th>
<th>Mini whiteboard, markers</th>
<th>Word problem card</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>8</td>
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</table>

**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.

**More Word Problems involving fractions**

- 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.

**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.
<table>
<thead>
<tr>
<th>Lesson</th>
<th>Number of Periods</th>
<th>Learning Objectives</th>
<th>Concrete Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4</td>
<td><strong>Ratio</strong>&lt;br&gt;- Understand notation and representations of ratio&lt;br&gt;- Interpret a:b and a:b:c, where a, b and c are whole numbers.&lt;br&gt;- Find the ratio of two or three given quantities.&lt;br&gt;- Use objects in the classroom to practice simplifying ratios and using ratio language.</td>
<td>Counters, magnetic buttons</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Equivalent Ratios</strong>&lt;br&gt;- Find equivalent ratios of a given ratio.&lt;br&gt;- Express a ratio in its simplest form.&lt;br&gt;- Find the missing term in a pair of equivalent ratios.</td>
<td>Textbook 5 P11</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td><strong>More Word Problems</strong>&lt;br&gt;- Solve word problems involving fractions.&lt;br&gt;- Use calculator to check addition, subtraction and multiplication of fractions.&lt;br&gt;- Solve problems using the part-whole and comparison models.&lt;br&gt;- Work in groups to solve multi-step word problems.</td>
<td>Workbook 5A P73 − 74</td>
</tr>
<tr>
<td>Week</td>
<td>Total</td>
<td>Scheme of Work</td>
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<tr>
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<td>----------------</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>6</td>
<td><strong>Solving Word Problems</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Divide a quantity in a given ratio.</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>• Find one quantity given the other quantity and their ratio.</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>• Solve up to 2-step word problems involving ratio.</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td><strong>Textbook 5</strong></td>
<td></td>
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<tr>
<td></td>
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<td>P113 – 118</td>
<td></td>
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<tr>
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<td></td>
<td><strong>Worksheet 3</strong></td>
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</tr>
<tr>
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<td></td>
<td>Workbook 5A P106 – 110</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td><strong>Problem Solving, Maths Journal and Pupil Review</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Review 5</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Workbook 5A P112 – 116</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Textbook 5</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>P118 – 119 Workbook 5A P111</td>
<td></td>
</tr>
</tbody>
</table>
## CHAPTER 6
### Area of Triangles

<table>
<thead>
<tr>
<th>Lesson</th>
<th>Number of Periods</th>
<th>Learning Objectives</th>
<th>Learning Experiences</th>
<th>Textbook Learning</th>
<th>Workbook Practice</th>
<th>Pupil-centred Activities</th>
<th>Concrete Materials</th>
</tr>
</thead>
</table>
| 1      | 3                | **Base and Height of a Triangle**  
- Identify the base of a triangle and its corresponding height.  
- Draw different triangles on square grid and identify the height of each triangle corresponding to a given base. | • 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. | • 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. | • 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 |
<p>| –      | 3                | <strong>Problem Solving, Maths Journal and Pupil Review</strong> | – | – | – | Textbook 5 P142 Workbook 5A P129 – 130 | Figure cut-outs |</p>
<table>
<thead>
<tr>
<th>Lesson</th>
<th>Number of Periods</th>
<th>Learning Objectives</th>
<th>Learning Experiences</th>
<th>Textbook Learning</th>
<th>Workbook Practice</th>
<th>Pupil-centred Activities</th>
<th>Concrete Materials</th>
</tr>
</thead>
</table>
| 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 cm³ and m³**  
- Measure volumes in cm³ and m³.  
- 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 cm² and 1 cm³, and between 1 m² and 1 cm³, e.g. use newspaper and masking tape to make a square of area 1 m² and a cube of volume 1 m³. | 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 cm³. | • 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 cm³. | 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

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

### 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 |

### Problem Solving, Maths Journal and Pupil Review
- –
- –
- Review 8 Workbook 5B P25 – 30
- Workbook 5B P24
- –
## Chapter 9
### Percentage

<table>
<thead>
<tr>
<th>Lesson</th>
<th>Number of Periods</th>
<th>Learning Objectives</th>
<th>Learning Experiences</th>
<th>Textbook Learning</th>
<th>Workbook Practice</th>
<th>Pupil-centred Activities</th>
<th>Concrete Materials</th>
</tr>
</thead>
</table>
| 1      | 4                | Percent             | • 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 0.2, 51. | Textbook 5 P192 – 202 | Worksheet 1 5B P31 – 34 | Textbook 5 P200 | 10 × 10 square grid papers, colour pencils, decimal cards, fraction cards, percentage cards, percentage bars, mini whiteboard, markers |
## Finding a Percentage Part of a Whole

- Find a percentage part of a whole.
- Find discount, GST and annual interest.
- Collect receipts that show discounts, GST, service charges etc, and use calculator to check how these values are calculated.
- Work in groups to plan a shopping list with a given budget using newspaper advertisements and promotion pamphlets.

### Resources
- Calculator, receipts, computer (ICT), newspapers, mini whiteboard, markers
- Textbook 5 P203 − 205
- Worksheet 2A Workbook 5B P35 − 36
- Textbook 5 P206 − 208
- Worksheet 2B Workbook 5B P37 − 38
- Textbook 5 P209 − 213
- Worksheet 3 Workbook 5B P39 − 41
- Review 9 Workbook 5B P43 − 46

## 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.

### Resources
- Textbook 5 P213 − 214
- Workbook 5B P42
## CHAPTER 10
### Average

<table>
<thead>
<tr>
<th>Lesson</th>
<th>Number of Periods</th>
<th>Learning Objectives</th>
<th>Learning Experiences</th>
<th>Textbook Learning</th>
<th>Workbook Practice</th>
<th>Pupil-centred Activities</th>
<th>Concrete Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>8</td>
<td>Average</td>
<td>• 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.</td>
<td>Textbook 5 P215 – 222</td>
<td>Worksheet 1 Workbook 5B P47 – 51</td>
<td>Textbook 5 P221</td>
<td>Multilink cubes, paper plates, mini whiteboard, markers, formula for average card, computer (ICT)</td>
</tr>
<tr>
<td>−</td>
<td>2</td>
<td>Problem Solving, Maths Journal and Pupil Review</td>
<td>−</td>
<td>−</td>
<td>−</td>
<td>−</td>
<td>Solving a word problem card</td>
</tr>
</tbody>
</table>

Estimated number of periods: 10
## CHAPTER 11

### Rate

<table>
<thead>
<tr>
<th>Lesson</th>
<th>Number of Periods</th>
<th>Learning Objectives</th>
<th>Learning Experiences</th>
<th>Textbook Learning</th>
<th>Workbook Practice</th>
<th>Pupil-centred Activities</th>
<th>Concrete Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6</td>
<td><strong>Understanding Rate</strong>&lt;br&gt;• Express rate as an amount of quantity per unit of another quantity.&lt;br&gt;• Find rate given the total amount and number of units.&lt;br&gt;• Find the total amount given the rate and number of units.&lt;br&gt;• Find the number of units given the rate and the total amount.</td>
<td>• Talk about examples of rate in everyday situations such as postage rates and utility rates (water and electricity consumption rates).&lt;br&gt;• 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.</td>
<td>Textbook 5 P224 – 229</td>
<td>Worksheet 1 Workbook 5B P55 – 58</td>
<td>Textbook 5 P228</td>
<td>Computer (ICT), newspapers, mini whiteboard, markers</td>
</tr>
<tr>
<td>2</td>
<td>6</td>
<td><strong>Solving Word Problems</strong>&lt;br&gt;• Solve word problems involving rate.</td>
<td>• Solve problems using proportional reasoning.</td>
<td>Textbook 5 P230 – 236</td>
<td>Worksheet 2 Workbook 5B P59 – 63</td>
<td>–</td>
<td>–</td>
</tr>
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###CHAPTER 11

####Rate

**Estimated number of periods:** 14

<table>
<thead>
<tr>
<th>Number of Periods</th>
<th>Learning Objectives</th>
<th>Learning Experiences</th>
<th>Textbook</th>
<th>Workbook</th>
<th>Practice</th>
<th>Pupil-centred Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1</strong></td>
<td><strong>Angles on a Straight Line</strong></td>
<td>Use the property of sum of angles on a straight line is 180° to find unknown angles.</td>
<td>Textbook 5 P238 − 242</td>
<td>Worksheet 1 SB P79 − 80</td>
<td>Workbook 5B P81 − 82</td>
<td>Protractor, scissors, angle cut-out</td>
</tr>
<tr>
<td><strong>2</strong></td>
<td><strong>Angles at a Point</strong></td>
<td>Use the property of sum of angles at a point is 360° to find unknown angles.</td>
<td>Textbook 5 P243 − 247</td>
<td>Worksheet 2 SB P81 − 82</td>
<td>Workbook 5B P83 − 84</td>
<td>Protractor, ruler, angle cut-out</td>
</tr>
<tr>
<td><strong>3</strong></td>
<td><strong>Vertically Opposite Angles</strong></td>
<td>Use the property of vertically opposite angles are equal to find unknown angles.</td>
<td>Textbook 5 P248 − 252</td>
<td>Worksheet 3 SB P85 − 87</td>
<td>Workbook 5B P89 − 92</td>
<td>Protractor, scissors, ruler, angle cut-out</td>
</tr>
<tr>
<td><strong>4</strong></td>
<td><strong>Finding Unknown Angles</strong></td>
<td>Find unknown angles involving angles on a straight line, angles at a point and vertically opposite angles.</td>
<td>Textbook 5 P253 − 256</td>
<td>Worksheet 4 SB</td>
<td>Review 12 Workbook 5B P93 − 96</td>
<td>Calculator, Protractor, ruler, scissors, angle cut-out, newspapers, mini whiteboard, markers</td>
</tr>
</tbody>
</table>

###CHAPTER 12

####Angles

**Estimated number of periods:** 10

<table>
<thead>
<tr>
<th>Number of Periods</th>
<th>Learning Objectives</th>
<th>Learning Experiences</th>
<th>Textbook</th>
<th>Workbook</th>
<th>Practice</th>
<th>Pupil-centred Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1</strong></td>
<td><strong>Understanding Rate</strong></td>
<td>• Express rate as an amount of quantity per unit of another quantity.</td>
<td>Textbook 5 P224 − 229</td>
<td>Workbook 5B P55 − 58</td>
<td>Textbook 5 P228</td>
<td></td>
</tr>
<tr>
<td><strong>2</strong></td>
<td><strong>Solving Word Problems</strong></td>
<td>• Solve word problems involving rate.</td>
<td>Textbook 5 P230 − 236</td>
<td>Workbook 5B P59 − 63</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>3</strong></td>
<td><strong>Problem Solving, Maths Journal and Review</strong></td>
<td>Look for real-life examples of different types of angles in the environment that relate to the various angle properties.</td>
<td>Textbook 5 P236 − 237</td>
<td>Workbook 5B P64</td>
<td></td>
<td></td>
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</table>
## CHAPTER 13
Properties of Triangles

<table>
<thead>
<tr>
<th>Lesson</th>
<th>Number of Periods</th>
<th>Learning Objectives</th>
<th>Learning Experiences</th>
<th>Textbook Learning</th>
<th>Workbook Practice</th>
<th>Pupil-centred Activities</th>
<th>Concrete Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4</td>
<td>Types of Triangles</td>
<td>• 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.</td>
<td>Textbook 5 P258 – 262</td>
<td>Worksheet 1 Workbook 5B P93 – 94</td>
<td>Textbook 5 P262</td>
<td>Cut-outs of different triangles, square grid paper, mini whiteboard, markers, ruler, protractor, table cut-out</td>
</tr>
<tr>
<td>2</td>
<td>6</td>
<td>Sum of Angles in a Triangle</td>
<td>• Investigate the property of sum of angles in a triangle is 180° using cut-outs and folding. • Identify and justify the angle properties of various triangles using cut-outs and folding.</td>
<td>Textbook 5 P263 – 270</td>
<td>Worksheet 2A Workbook 5B P95 – 102</td>
<td>–</td>
<td>Cut-outs of different triangles, protractor, scissors</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>Drawing Triangles</td>
<td>• Sketch and draw different triangles according to given dimensions using a ruler, a protractor and a set square.</td>
<td>Textbook 5 P276 – 281</td>
<td>Worksheet 3 Workbook 5B P111 – 113</td>
<td>–</td>
<td>Ruler, protractor, set squares</td>
</tr>
<tr>
<td>–</td>
<td>2</td>
<td>Problem Solving, Maths Journal and Pupil Review</td>
<td>–</td>
<td>–</td>
<td>Review 13 Workbook 5B P115 – 120</td>
<td>Textbook 5 P281 – 282 Workbook 5B P114</td>
<td>Table cut-out</td>
</tr>
<tr>
<td>Lesson</td>
<td>Number of Periods</td>
<td>Learning Objectives</td>
<td>Learning Experiences</td>
<td>Concrete Materials</td>
<td>Pupil-centred Activities</td>
<td>Workbook Practice</td>
<td>Textbook Learning</td>
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<td>------------------</td>
</tr>
<tr>
<td>1</td>
<td>4</td>
<td>Properties 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.</td>
<td>-</td>
<td>Textbook 5 P292</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>6</td>
<td>Properties of Four-sided Figures • 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. • Identify and justify the angle properties of various triangles using cut-outs and folding.</td>
<td>-</td>
<td>Textbook 5 P263 − 270</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>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.</td>
<td>-</td>
<td>Textbook 5 P276 − 281</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td>Properties of Four-sided Figures • Investigate the properties of parallelogram, rhombuses and trapezium using cut-outs and discuss their differences. • Use the properties to find unknown angles involving parallelograms, rhombuses and trapeziums. • Work in pairs to explore drawing special quadrilaterals on square grid papers.</td>
<td>-</td>
<td>Textbook 5 P283 − 294</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>Drawing Four-sided Figures • Draw different four-sided figures according to given dimensions.</td>
<td>-</td>
<td>Textbook 5 P295 − 302</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>6</td>
<td>2</td>
<td>Problem Solving, Maths Journal and Pupil Review</td>
<td>-</td>
<td>Review 14 Workbook 5B P131 − 134</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Lesson</td>
<td>Number of Periods</td>
<td>Learning Objectives</td>
<td>Concrete Materials</td>
<td>Pupil-centred Activities</td>
<td>Textbook Practice</td>
<td>Workbook Practice</td>
<td></td>
</tr>
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<td></td>
</tr>
<tr>
<td>1</td>
<td>3</td>
<td>Probability</td>
<td>Coin, marbles, opaque bag, dice</td>
<td>-</td>
<td>Textbook 5 P304 – 307</td>
<td>Worksheet 1 Workbook 5B P135 – 136</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>Problem Solving, Maths Journal and Pupil Review</td>
<td>Alphabet Cards, spinner</td>
<td>Textbook 5 P307 Workbook 5B P137</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Review 15 Workbook 5B P138 – 139</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Estimated number of periods: 5
<table>
<thead>
<tr>
<th>Lesson Number</th>
<th>Number of Periods</th>
<th>Learning Objectives</th>
<th>Learning Experiences</th>
<th>Textbook</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3</td>
<td>• 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.</td>
<td>Textbook 5 P304 – 307 Workbook 5B P135 – 136</td>
<td>Workbook 5B P137 Textbook 5 P307 Workbook 5B P138 – 139</td>
</tr>
</tbody>
</table>

- Coin, marbles, opaque bag, dice
- Problem Solving, Maths Journal and Pupil Review
- Review 15 Workbook 5B P138 – 139

CHAPTER 15 Probability
# SYLLABUS MATCHING GRID
## CAMBRIDGE PRIMARY MATHEMATICS STAGE 5

### 1. Number

<table>
<thead>
<tr>
<th>Learning Objective</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Numbers and the number system</strong></td>
<td></td>
</tr>
<tr>
<td>Count on and back in steps of constant size, extending beyond zero.</td>
<td>Chapter 1</td>
</tr>
<tr>
<td>Know what each digit represents in five- and six-digit numbers.</td>
<td>Chapter 1</td>
</tr>
<tr>
<td>Partition any number up to one million into thousands, hundreds, tens and units.</td>
<td>Chapter 1</td>
</tr>
<tr>
<td>Use decimal notation for tenths and hundredths and understand what each digit represents.</td>
<td>Chapter 8</td>
</tr>
<tr>
<td>Multiply and divide any number from 1 to 10 000 by 10 or 100 and understand the effect.</td>
<td>Chapter 2</td>
</tr>
<tr>
<td>Round four-digit numbers to the nearest 10, 100 or 1000.</td>
<td>Book 4 Chapter 1</td>
</tr>
<tr>
<td>Round a number with one or two decimal places to the nearest whole number.</td>
<td>Book 4 Chapter 8</td>
</tr>
<tr>
<td>Order and compare numbers up to a million using the &gt; and &lt; signs.</td>
<td>Book 4 Chapter 1</td>
</tr>
<tr>
<td>Order numbers with one or two decimal places and compare using the &gt; and &lt; signs.</td>
<td>Book 4 Chapter 8</td>
</tr>
<tr>
<td>Recognise and extend number sequences.</td>
<td>Book 4 Chapter 1</td>
</tr>
<tr>
<td>Recognise odd and even numbers and multiples of 5, 10, 25, 50 and 100 up to 1000.</td>
<td>Chapter 1</td>
</tr>
<tr>
<td>Make general statements about sums, differences and multiples of odd and even numbers.</td>
<td>Chapter 1</td>
</tr>
<tr>
<td>Recognise equivalence between: $\frac{1}{2}$, $\frac{1}{4}$ and $\frac{1}{8}$; $\frac{1}{3}$ and $\frac{1}{6}$; $\frac{1}{5}$ and $\frac{1}{10}$.</td>
<td>Chapter 4</td>
</tr>
<tr>
<td>Change an improper fraction to a mixed number, e.g. $\frac{7}{4}$ to $1\frac{3}{4}$; order mixed numbers and place between whole numbers on a number line.</td>
<td>Book 4 Chapter 3</td>
</tr>
<tr>
<td>Relate finding fractions to division and use to find simple fractions of quantities.</td>
<td>Chapter 4</td>
</tr>
<tr>
<td>Understand percentage as the number of parts in every 100 and find simple percentages of quantities.</td>
<td>Chapter 9</td>
</tr>
<tr>
<td>Express halves, tenths and hundredths as percentages.</td>
<td>Chapter 9</td>
</tr>
<tr>
<td>Use fractions to describe and estimate a simple proportion, e.g. $\frac{1}{5}$ of the beads are yellow.</td>
<td>Chapter 4</td>
</tr>
<tr>
<td>Use ratio to solve problems, e.g. to adapt a recipe for 6 people to one for 3 or 12 people.</td>
<td>Chapter 5</td>
</tr>
</tbody>
</table>

### 2. Calculation

#### Mental strategies

<table>
<thead>
<tr>
<th>Learning Objective</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Know multiplication and division facts for the $2 \times$ to $10 \times$ tables.</td>
<td>Chapter 2</td>
</tr>
<tr>
<td>Know and apply tests of divisibility by 2, 5, 10 and 100.</td>
<td>Chapter 2</td>
</tr>
<tr>
<td>Recognise multiples of 6, 7, 8 and 9 up to the 10th multiple.</td>
<td>Book 3 Chapter 3</td>
</tr>
<tr>
<td>Find factors of two-digit numbers.</td>
<td>Chapter 1</td>
</tr>
<tr>
<td>Count on or back in thousands, hundreds, tens and ones to add or subtract.</td>
<td>Chapter 1</td>
</tr>
<tr>
<td>Add or subtract near multiples of 10 or 100, e.g. 4387 – 299.</td>
<td>Chapters 1 and 2</td>
</tr>
<tr>
<td>Use appropriate strategies to add or subtract pairs of two- and three-digit numbers and numbers with one decimal place, using jottings where necessary.</td>
<td>Chapter 8</td>
</tr>
<tr>
<td>Calculate differences between near multiples of 1000, e.g. 5026 – 4998, or near multiples of 1, e.g. 3.2 – 2.6.</td>
<td>Chapter 2</td>
</tr>
<tr>
<td>Multiply multiples of 10 to 90, and multiples of 100 to 900, by a single-digit number.</td>
<td>Chapter 2</td>
</tr>
<tr>
<td>Multiply by 19 or 21 by multiplying by 20 and adjusting.</td>
<td>Book 4 Chapter 2</td>
</tr>
<tr>
<td>Use factors to multiply, e.g. multiply by 3, then double to multiply by 6.</td>
<td>Chapter 2</td>
</tr>
</tbody>
</table>

#### Addition and Subtraction

<table>
<thead>
<tr>
<th>Learning Objective</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Find the total of more than three two- or three-digit numbers using a written method.</td>
<td>Chapter 2</td>
</tr>
<tr>
<td>Add or subtract any pair of three- and/or four-digit numbers, with the same number of decimal places, including amounts of money.</td>
<td>Chapter 8</td>
</tr>
</tbody>
</table>
### Multiplication and division

<table>
<thead>
<tr>
<th>Activity</th>
<th>Chapter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multiply or divide three-digit numbers by single-digit numbers.</td>
<td>Chapter 2</td>
</tr>
<tr>
<td>Multiply two-digit numbers by two-digit numbers.</td>
<td>Chapter 2</td>
</tr>
<tr>
<td>Multiply two-digit numbers with one decimal place by single-digit numbers, e.g. $3.6 \times 7$.</td>
<td>Chapter 8</td>
</tr>
<tr>
<td>Divide three-digit numbers by single-digit numbers, including those with a remainder (answers no greater than 30).</td>
<td>Chapter 2</td>
</tr>
<tr>
<td>Start expressing remainders as a fraction of the divisor when dividing two-digit numbers by single-digit numbers.</td>
<td>Book 3 Chapter 3 and Book 4 Chapter 2</td>
</tr>
<tr>
<td>Decide whether to group (using multiplication facts and multiples of the divisor) or to share (halving and quartering) to solve divisions.</td>
<td>Chapter 2</td>
</tr>
<tr>
<td>Decide whether to round an answer up or down after division, depending on the context.</td>
<td>Chapter 2</td>
</tr>
<tr>
<td>Begin to use brackets to order operations and understand the relationship between the four operations and how the laws of arithmetic apply to multiplication.</td>
<td>Chapter 2</td>
</tr>
</tbody>
</table>

### Geometry

#### Shapes and geometric reasoning

<table>
<thead>
<tr>
<th>Activity</th>
<th>Chapter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identify and describe properties of triangles and classify as isosceles, equilateral or scalene.</td>
<td>Chapter 13</td>
</tr>
<tr>
<td>Recognise reflective and rotational symmetry in regular polygons.</td>
<td>Book 4 Chapter 4</td>
</tr>
<tr>
<td>Create patterns with two lines of symmetry, e.g. on a pegboard or squared paper.</td>
<td>Book 4 Chapter 4</td>
</tr>
<tr>
<td>Visualise 3D shapes from 2D drawings and nets, e.g. different nets of an open or closed cube.</td>
<td>Book 6 Chapter 10</td>
</tr>
<tr>
<td>Recognise perpendicular and parallel lines in 2D shapes, drawings and the environment.</td>
<td>Book 3 Chapter 12</td>
</tr>
<tr>
<td>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.</td>
<td>Book 4 Chapter 5</td>
</tr>
<tr>
<td>Calculate angles in a straight line.</td>
<td>Chapter 12</td>
</tr>
</tbody>
</table>

#### Position and movement

<table>
<thead>
<tr>
<th>Activity</th>
<th>Chapter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Read and plot co-ordinates in the first quadrant.</td>
<td>Book 4 Chapter 6</td>
</tr>
<tr>
<td>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.</td>
<td>Book 4 Chapter 4</td>
</tr>
<tr>
<td>Understand translation as movement along a straight line, identify where polygons will be after a translation and give instructions for translating shapes.</td>
<td>Book 4 Chapter 6</td>
</tr>
</tbody>
</table>

### Measure

#### Length, mass and capacity

<table>
<thead>
<tr>
<th>Activity</th>
<th>Chapter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Read, choose, use and record standard units to estimate and measure length, mass and capacity to a suitable degree of accuracy.</td>
<td>Chapter 7</td>
</tr>
<tr>
<td>Convert larger to smaller metric units (decimals to one place), e.g. change $2.6$ kg to $2600$ g.</td>
<td>Chapter 8</td>
</tr>
<tr>
<td>Round measurements to the nearest whole unit.</td>
<td>Chapter 8</td>
</tr>
<tr>
<td>Interpret a reading that lies between two unnumbered divisions on a scale.</td>
<td>Chapter 8</td>
</tr>
<tr>
<td>Compare readings on different scales.</td>
<td>Book 3 Chapters 4 – 6</td>
</tr>
<tr>
<td>Draw and measure lines to the nearest centimetre and millimetre.</td>
<td>Chapters 13 and 14</td>
</tr>
</tbody>
</table>

#### Time

<table>
<thead>
<tr>
<th>Activity</th>
<th>Chapter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recognise and use the units for time (seconds, minutes, hours, days, months and years).</td>
<td>Book 4 Chapter 12</td>
</tr>
<tr>
<td>Tell and compare the time using digital and analogue clocks using the 24-hour clock.</td>
<td>Book 4 Chapter 12</td>
</tr>
<tr>
<td>Read timetables using the 24-hour clock.</td>
<td>Book 4 Chapter 12</td>
</tr>
<tr>
<td>Calculate time intervals in seconds, minutes and hours using digital or analogue formats.</td>
<td>Book 4 Chapter 12</td>
</tr>
<tr>
<td>Calculate time intervals in months or years.</td>
<td>Chapter 10</td>
</tr>
</tbody>
</table>

#### Area and perimeter

<table>
<thead>
<tr>
<th>Activity</th>
<th>Chapter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measure and calculate the perimeter of regular and irregular polygons.</td>
<td>Book 4 Chapter 10</td>
</tr>
<tr>
<td>Understand area measured in square centimetres ($cm^2$).</td>
<td>Chapter 6</td>
</tr>
<tr>
<td>Use the formula for the area of a rectangle to calculate the rectangle’s area.</td>
<td>Chapter 6</td>
</tr>
</tbody>
</table>
5. Handling data

<table>
<thead>
<tr>
<th>Organising, categorising and representing data</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
</tr>
<tr>
<td>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.</td>
</tr>
<tr>
<td>Construct simple line graphs, e.g. to show changes in temperature over time.</td>
</tr>
<tr>
<td>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.</td>
</tr>
</tbody>
</table>

6. Problem solving

<table>
<thead>
<tr>
<th>Using techniques and skills in solving mathematical problems</th>
</tr>
</thead>
<tbody>
<tr>
<td>Understand everyday systems of measurement in length, weight, capacity, temperature and time and use these to perform simple calculations.</td>
</tr>
<tr>
<td>Solve single and multi-step word problems (all four operations); represent them, e.g. with diagrams or a number line.</td>
</tr>
<tr>
<td>Check with a different order when adding several numbers or by using the inverse when adding or subtracting a pair of numbers.</td>
</tr>
<tr>
<td>Use multiplication to check the result of a division, e.g. multiply $3.7 \times 8$ to check $29.6 \div 8$.</td>
</tr>
<tr>
<td>Recognise the relationships between different 2D and 3D shapes, e.g. a face of a cube is a square.</td>
</tr>
<tr>
<td>Estimate and approximate when calculating, e.g. using rounding, and check working.</td>
</tr>
<tr>
<td>Consider whether an answer is reasonable in the context of a problem.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Using understanding and strategies in solving problems</th>
</tr>
</thead>
<tbody>
<tr>
<td>Understand everyday systems of measurement in length, weight, capacity, temperature and time and use these to perform simple calculations.</td>
</tr>
<tr>
<td>Choose an appropriate strategy for a calculation and explain how they worked out the answer.</td>
</tr>
<tr>
<td>Explore and solve number problems and puzzles, e.g. logic problems.</td>
</tr>
<tr>
<td>Deduce new information from existing information to solve problems.</td>
</tr>
<tr>
<td>Use ordered lists and tables to help to solve problems systematically.</td>
</tr>
<tr>
<td>Describe and continue number sequences, e.g. $-30, -27, \square, \square, -18...$; identify the relationships between numbers.</td>
</tr>
<tr>
<td>Identify simple relationships between shapes, e.g. these triangles are all isosceles because ...</td>
</tr>
<tr>
<td>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.</td>
</tr>
<tr>
<td>Explain methods and justify reasoning orally and in writing; make hypotheses and test them out.</td>
</tr>
<tr>
<td>Solve a larger problem by breaking it down into sub-problems or represent it using diagrams.</td>
</tr>
</tbody>
</table>
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:

ALGEBRA
NUMBER
MEASURES
DATA AND CHANCE
SHAPE AND SPACE

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

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.

**What was the population of Islamabad in 2017?**

**How many babies were born in Islamabad in 2017?**
1. Read and write numbers in numerals and in words.

**LEARNING OBJECTIVE**

**COUNTING TO 10 MILLION**

**LESSON 1**

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.

**RECAP**

*Textbook 5 P1 Chapter 1*

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

\[
13,605 = 1 \text{ ten thousand} + 3 \text{ thousands} + 6 \text{ hundreds} + 5 \text{ ones}
\]

We write 13,605 as *thirteen thousand, six hundred and five*.

*Ten Thousands Thousands Hundreds Tens Ones*

\[
\begin{array}{cccc}
10,000 & 3,000 & 600 & 5 \\
\end{array}
\]

1. What was the population of Islamabad in 2017?

2. How many babies were born in Islamabad in 2017?

**COUNTING TO 10 MILLION**

**RECAP**

Numbers up to 10 Million

**LESSON 1**

*Textbook 5 P3*

**LET’S LEARN**

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

\[
\begin{align*}
300,000 & = 3 \text{ hundred thousand} \\
500,000 & = 5 \text{ hundred thousand} \\
400,000 & = 4 \text{ hundred thousand} \\
1,000,000 & = 10 \text{ hundred thousand} \\
\end{align*}
\]

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

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.

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

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.

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

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

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.

In 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 $5 \times 100 000$, 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.
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.

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?

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

\[
\begin{array}{cccccccc}
\text{Millions} & \text{Hundred thousands} & \text{Ten thousands} & \text{Thousands} & \text{Hundreds} & \text{Tens} & \text{Ones} \\
1 & 0 & 9 & 0 & 0 & 0 & 0
\end{array}
\]

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.

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.

---

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

\[
\begin{array}{cccccccc}
\text{Millions} & \text{Hundred thousands} & \text{Ten thousands} & \text{Thousands} & \text{Hundreds} & \text{Tens} & \text{Ones} \\
9 & 6 & 0 & 3 & 4 & 5 & 2
\end{array}
\]

\[
9,603,452 = 9 \text{ millions } 6 \text{ hundred thousands } 0 \text{ ten thousand } 3 \text{ thousands } 4 \text{ hundreds } 5 \text{ tens } 2 \text{ ones}
\]

\[
= (9 \times 1,000,000) + (6 \times 100,000) + (0 \times 10,000) + (3 \times 1,000) + (4 \times 100) + (5 \times 10) + (2 \times 1)
\]

\[
= 9,000,000 + 600,000 + 300 + 452
\]

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

(a) 5,068,300

Five million, sixty-eight thousand and three hundred

(b) 40,032,400

Four million, three thousand, two hundred and forty

10. What are the missing numbers?

(a) 2,019,005 = 2,000,000 + 19,005

(b) 4,803,684 + 400,000 + 803,000 + 684

(c) 8,007,300 + 6,000,000 + 7000 + 300

(d) 9,283,090 = 9,000,000 + 283,090

(e) 6,000,000 + 50,000 + 42 = 6,057,042

(f) 920,000 + 300,000 + 8 = 9,300,008
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.

Work with pupils on the practice questions.
Independent seatwork

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

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 2,00,32
   (f) Twenty-five lakhs, seven hundred and eighteen 2,50,07,18

5. Write in words following the International and Pakistani number system.
   (a) 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) 5 000 000 + 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 + 211 = 5 002 211

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 thirty 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

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:

\[
10 \times 100\,000 = 1\,000\,000 \\
1000 \times 1000 = 1\,000\,000
\]

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:

\[
5 \times 100\,000 = 500\,000 \\
1 \times 10\,000 = 10\,000 \\
3 \times 1000 = 3\,000 \\
9 \times 100 = 900 \\
2 \times 10 = 20 \\
4 \times 1 = 4
\]

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.).
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.

**LEARNING OBJECTIVE**

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.
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.

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.
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.

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 |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>11</td>
</tr>
<tr>
<td>13</td>
<td>71</td>
</tr>
<tr>
<td>51</td>
<td>63</td>
</tr>
</tbody>
</table>

2. (a) $2 \times 2 \times 3$
   (b) $2 \times 2 \times 2 \times 2 \times 3$
   (c) $2 \times 2 \times 3 \times 3 \times 3$
   (d) $2 \times 2 \times 3 \times 3 \times 3 \times 5$
   (e) $2 \times 3 \times 5 \times 11$
   (f) $5 \times 5 \times 173$
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.

**Textbook 5**  
**P16**  
**numbers up to 10 million**

3. Write 108 as a product of its prime factors.
   
   $$108 = 2 \times 2 \times \times \times$$

4. Write 448 as a product of its prime factors.
   
   $$448 = \times \times \times \times \times \times \times$$

1. Circle all the prime numbers.

2. Express each of the following numbers as a product of its prime factors.
   (a) 48  (b) 52  (c) 36
   (d) 84  (e) 66  (f) 32

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

Work with pupils on the practice questions. For better understanding, select items from Worksheet 2 and work these out with the pupils.

**Practice**  
**Independent seatwork**  
Assign pupils to complete Worksheet 2 (Workbook 5A P6).

1. **Prime Numbers Composite Numbers**
   
   3 11 29 31 13 71 43 101
   
   12 18 15 25 42 27 58 39 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

**Answers**  
**Worksheet 2 (Workbook 5A P6)**

**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.

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

<table>
<thead>
<tr>
<th>Method 1</th>
<th>Method 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 60 192</td>
<td>2 60 192</td>
</tr>
<tr>
<td>2 30 96</td>
<td>2 30 96</td>
</tr>
<tr>
<td>3 15 48</td>
<td>3 15 48</td>
</tr>
<tr>
<td>5 6 16</td>
<td>5 6 16</td>
</tr>
<tr>
<td>HCF of 60 and 192 = 2 x 3 = 6</td>
<td>HCF of 60 and 192 = 2 x 3 = 6</td>
</tr>
</tbody>
</table>

What is the highest common factor of 60 and 192?

Let's Learn
1. Method 1

2 x 3 is common in both the numbers.

60 = 2 x 2 x 3 x 5
192 = 2 x 2 x 2 x 2 x 2 x 2 x 3

HCF of 60 and 192 = 2 x 2 x 3

= 12

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

Stop dividing when there are no more common prime factors.

In Lesson 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.

\[
\begin{array}{c|c|c}
& 32 & 88 \\
2 & 16 & 44 \\
2 & 8 & 22 \\
2 & 4 & 11 \\
1 & 2 & 11 \\
1 & 1 & 1 \\
\end{array}
\]

HCF of 32 and 88 = \(2 \times 2 \times 2\) = 8

3. Find the HCF of 108 and 288.

\[
\begin{array}{c|c|c}
& 108 & 288 \\
2 & 54 & 144 \\
3 & 27 & 72 \\
3 & 9 & 24 \\
3 & 3 & 8 \\
1 & 1 & 1 \\
\end{array}
\]

HCF of 108 and 288 = \(2 \times 3 \times 3\) = 18

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

\[
\begin{array}{c|c|c|c}
& 425 & 200 & 100 \\
5 & 85 & 40 & 20 \\
5 & 17 & 8 & 4 \\
1 & 1 & 2 & 1 \\
\end{array}
\]

HCF of 425, 200, and 100 = \(5 \times 5\) = 25

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

(a) 3 × 5, 15
(b) 2 × 11 × 13
(c) 2 × 2 × 3 × 13
(d) 2 × 2 × 3 × 5 × 7
(e) 2 × 2 × 3 × 7
(f) 2 × 3 × 7
(g) 2 × 2 × 3 × 7
(h) 2 × 3 × 7

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

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.

Work with pupils on the practice questions.

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

**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
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?
LEAST COMMON MULTIPLE (LCM)

**LEARNING OBJECTIVE**

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

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?

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.

\[
\begin{align*}
45 &= 3 \times 3 \times 5 \\
75 &= 3 \times 5 \times 5
\end{align*}
\]

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

\[\text{LCM of 45 and 75} = 3 \times 3 \times 5 \times 5 = 225\]

3. Find the LCM of 56 and 196.

\[
\begin{align*}
56 &= 2 \times 2 \times 7 \\
196 &= 2 \times 2 \times 7 \times 7
\end{align*}
\]

\[\text{LCM of 56 and 196} = 2 \times 2 \times 7 \times 7 = 196\]

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

\[
\begin{align*}
9 &= 3 \times 3 \\
12 &= 2 \times 2 \times 3 \\
18 &= 2 \times 3 \times 3
\end{align*}
\]

\[\text{LCM of 9, 12 and 18} = 2 \times 2 \times 3 \times 3 \times 3 = 108\]

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.

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) \(3 \times 7 \times 2 \times 5 \times 5 = 1050\)
   (b) \(2 \times 2 \times 3 \times 3 \times 3 \times 11 = 1188\)

3. (a) \(2 \times 2 \times 7 \times 3 \times 3 \times 3 = 756\)
   (b) \(2 \times 3 \times 5 \times 7 \times 7 = 1470\)
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.
Six cards were picked from the numeral cards below to form a 6-digit number.

1 1 2 2 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.

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

MATHS JOURNAL

Match the most suitable number to each of the following.

(a) The height of Golden Gate Bridge in USA is about 2 000 000 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.

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.

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.
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**

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.

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

```
1 1 2 2 5 5
```

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

**Maths journal**

Match the most suitable number to each of the following.

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

Explain your answers.

2 000 000
200 000
20 000

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.

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.

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).
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 eighty-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) \[ \frac{630}{2} \times \frac{315}{3} = \frac{3}{5} \times 7 \]
\[ 630 = 2 \times 3 \times \frac{3}{5} \times 7 \]

(b) \[ \frac{3675}{3} \times \frac{1225}{5} = \frac{49}{7} \]
\[ 3675 = 3 \times 5 \times \frac{5}{7} \times 7 \]

5. (a) \[ \frac{2}{3} \times \frac{1350}{675} = \frac{3}{3} \times \frac{225}{75} \]
\[ \frac{5}{5} \]
\[ 3675 = 2 \times 3 \times \frac{3}{5} \times 5 \]

(b) \[ \frac{2}{3} \times \frac{882}{441} = \frac{3}{3} \times \frac{147}{49} \]
\[ \frac{7}{7} \]

6. 140

7. 7700
FINDING THE MASS OF THE TWO WATERMELOONS

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?

**Answer:**

Two watermelons weigh 10 times as much as a pineapple. Since a pineapple weighs 1000 g, two watermelons weigh 10 times 1000 g, which equals 10,000 g. So, the mass of the two watermelons is 10,000 grams.
The mass of two watermelons is equal to the mass of 10 similar pineapples. How can we find the mass of the two watermelons?

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?

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.
Chapter 2

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

LEARNING OBJECTIVES

LESSON 1

IN FOCUS

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

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?

MULTIPLYING BY TENS, HUNDREDS AND 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

LESSON 1

IN FOCUS

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

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?

MULTIPLYING BY TENS, HUNDREDS AND 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.

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.

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

\[320 \times 20 = 320 \times 2 \times 10\]
\[= 640 \times 10\]
\[= 6400\]

There are 6400 pages in 20 such notebooks.

Method 2

\[320 \times 20 = 320 \times 2 \times 10\]
\[= 640 \times 10\]
\[= 6400\]

There are 6400 pages in 20 such notebooks.

Which method do you prefer? Why?

Show how you use number discs to find the answer.

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 \(320 \times 20\). Ask pupils to compare the two methods.

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.

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

Practice

Independent seatwork

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

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

Method 1

\[ 320 \times 20 = 320 \times 2 \times 10 = 640 \times 10 = 6400 \]

There are 6400 pages in 20 such notebooks.

Method 2

\[ 320 \times 20 = 320 \times 10 \times 2 = 3200 \times 2 = 6400 \]

Which method do you prefer? Why?

Show how you use number discs to find the answer.

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 \times 20. Ask pupils to compare the two methods.

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.

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

Practice

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) \[ 85 \times 20 = 85 \times 2 \times 10 = 170 \times 10 = 1700 \]
   (c) \[ 632 \times 30 = 632 \times 3 \times 10 = 1896 \times 10 = 18960 \]
   (d) \[ 1011 \times 40 = 1011 \times 4 \times 10 = 4044 \times 10 = 40400 \]

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
**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

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
\[231 \times 200 = 231 \times 100 \times 2\]

\[= 231 \times 100 = 23 100\]

Method 2
\[231 \times 200 = 231 \times 2 \times 100\]

\[= 231 \times 2 \times 100 = 462 \times 100 = 46 200\]

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

5. Multiply 300 by 308.

(a) \[300 \times 308 = 3 \times 100 \times 308\]

\[= 3 \times 10 000 = 30 000\]

(b) \[300 \times 308 = 100 \times 308\]

\[= 100 \times 308 = 30 800\]


(a) \[3 \times 800 = 2 400\]

(c) \[210 \times 600 = 126 000\]

(e) \[7 \times 1400 = 9800\]

(g) \[267 \times 700 = 186 900\]

(h) \[800 \times 1712 = 1 369 600\]

Let’s Learn 2 extends pupils’ learning by going further to the products of other whole numbers with 100.

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.

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 \times 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.

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).

Let’s Learn 1. Ask pupils if they notice 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 the volume of liquid in 200 such bottles is 46 200 ml.

With the use of number discs, help pupils visualise and understand the products of 100 with 1/10/100/1000 in necessary.

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
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.

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
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.

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

Practice
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) \[2801 \times 2000 = 2801 \times 2 \times 1000 = 5602 \times 1000 = 5 602 000\]
   (c) \[390 \times 7000 = 390 \times 7 \times 1000 = 2730 \times 1000 = 2 730 000\]
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

\[
\begin{array}{c}
\text{5} \quad \text{7} \quad \text{6} \\
\text{H T O}
\end{array}
\quad \times \quad 100
\quad \Rightarrow
\quad \begin{array}{c}
\text{5} \quad \text{7} \quad \text{6} \quad \text{0} \quad \text{0} \\
\text{H T H T O}
\end{array}
\]

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

\[
\begin{array}{c}
\text{2} \quad \text{5} \quad \text{6} \\
\text{H T O}
\end{array}
\quad \times \quad 1000
\quad \Rightarrow
\quad \begin{array}{c}
\text{2} \quad \text{5} \quad \text{6} \quad \text{0} \quad \text{0} \quad \text{0} \\
\text{H H T H T O}
\end{array}
\]

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

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 with 10/100/1000. 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?

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.
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.

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

\[ \frac{6000}{30} = \frac{6000}{10} \div 3 \]

Show how you use number discs to find the answer.

Method 2

\[ 6000 \div 30 = 6000 \div 3 \div 10 \]

The factory used 200 kg of sugar each day.

   (a) \[ 1220 \div 20 = 1220 \div 10 \div 2 \]
   (b) \[ 1220 \div 20 = 1220 \div 2 \div 10 \]

Show how you use number discs to find the answer.
Which method do you prefer? Why?

5. Divide.
   (a) \[ 80 \div 40 = 2 \]
   (b) \[ 720 \div 60 = 12 \]
   (c) \[ 3600 \div 30 = 121 \]
   (d) \[ 43400 \div 70 = 620 \]

PRACTICE

Divide.
   (a) \[ 78 \div 10 = 7 \]
   (b) \[ 490 \div 10 = 49 \]
   (c) \[ 2300 \div 10 = 230 \]
   (d) \[ 10900 \div 10 = 1090 \]
   (e) \[ 92 \div 30 = 3 \]
   (f) \[ 360 \div 40 = 9 \]
   (g) \[ 1840 \div 40 = 46 \]
   (h) \[ 16000 \div 50 = 320 \]

Complete Workbook 5A, Worksheet 2A (Workbook 5A P23 – 24).

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).
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 \(6000 \div 30\). 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 (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) \(15480 \div 60 = 15480 \div 10 \div 6 = 258\)

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

### Answers

- \(a\) 3 
- \(b\) 31

- \(a\) 17 
- \(b\) \(8700 \div 30 = 8700 \div 10 \div 3 = 870 \div 3 = 290\) 
- \(c\) \(15480 \div 60 = 15480 \div 10 \div 6 = 258\)

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

- \(a\) 10 
- \(b\) 10 
- \(c\) 4600 
- \(d\) 5280
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.

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.
Divide.
(a) 400 ÷ 100 = 4
(c) 9200 ÷ 100 = 92
(e) 400 ÷ 100 = 4
(g) 36000 ÷ 600 = 60
(b) 5400 ÷ 100 = 54
(d) 10900 ÷ 100 = 109
(f) 4000 ÷ 100 = 40
(h) 16000 ÷ 50 = 320

\[ \text{Practice} \]

Divide. Use number discs to help you.
(a) 700 ÷ 100 = 7
(b) 3000 ÷ 100 = 30
(c) 5400 ÷ 100 = 54
(d) 9200 ÷ 100 = 92

Let's Learn 3 allows pupils to 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 practice dividing 205000 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.

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

\[ \text{Answers} \]

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) 62400 ÷ 800 = 62400 ÷ 100 ÷ 8
      = 624 ÷ 8
      = 78

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

\[ \text{Independent seatwork} \]

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

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**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?

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

   - 1000 + 1000 = 1
   - 1000 + 1000 = 1
   - 1000 + 1000 = 1
   - 1000 + 1000 = 1
   - 1000 + 1000 = 1
   - 1000 + 1000 = 1

   The eagle weighs 4 kg.

---

**Practice**

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

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**LET'S LEARN**

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 + 2000 = 6000 + 1000 = 2
   - 6000 + 2000 = 6000 + 1000 = 2
   - 6000 + 2000 = 6000 + 1000 = 2
   - 6000 + 2000 = 6000 + 1000 = 2
   - 6000 + 2000 = 6000 + 1000 = 2

   Method 2
   
   - 6000 + 2000 = 6000 + 1000 = 2
   - 6000 + 2000 = 6000 + 1000 = 2
   - 6000 + 2000 = 6000 + 1000 = 2

   Each person received 3 bottles of water.

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**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.
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.

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

**Answers**

**Worksheet 2C (Workbook 5A P27 – 28)**

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

2. (a) 93  
   (b) \( \frac{84 000}{7000} = \frac{84 000}{1000} \cdot \frac{1}{7} \)  
   \[ = \frac{84}{7} \]  
   \[ = 12 \]  
   (c) \( \frac{150 000}{2000} = \frac{150 000}{1000} \cdot \frac{1}{2} \)  
   \[ = \frac{150}{2} \]  
   \[ = 75 \]  
   (d) \( \frac{2 416 000}{8000} = \frac{2 416 000}{1000} \cdot \frac{1}{8} \)  
   \[ = \frac{7536}{6} \]  
   \[ = 1256 \]  
   (e) \( \frac{7 536 000}{6000} = \frac{7 536 000}{1000} \cdot \frac{1}{6} \)  
   \[ = \frac{7536}{6} \]  
   \[ = 1256 \]  

3. (a)  
   \( \frac{30 000}{1000} = \frac{30 000}{1000} \cdot \frac{1}{3} \)  
   \[ = \frac{30}{3} \]  
   \[ = 10 \]  
   \[ \frac{10}{3} = \frac{30}{9} \]  
   \[ = 10 \]  
   (b)  
   \( \frac{708 000}{6000} = \frac{708 000}{1000} \cdot \frac{1}{6} \)  
   \[ = \frac{708}{6} \]  
   \[ = 118 \]
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.
LEARNING OBJECTIVE
1. Calculate in correct order of operations, including the use of brackets.

ORDER OF OPERATIONS

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.

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 $48 ÷ 4 \times 2$.
   When only multiplication and division are involved, we work from left to right.
   
   $$48 ÷ 4 \times 2 = 12 \times 2 = 24$$

   We need to follow the order of operations to find the value.

3. Find the value of the following:
   (a) $15 - 9 + 7$  
   (b) $46 - 28 + 10 - 20$  
   (c) $42 + 7 \times 2$  
   (d) $64 + 8 \times 4 + 2$

   $$42 - 6 \times 3 = 32 - 18$$  
   $$= 14$$

4. Find the value of $32 - 6 \times 3$.
   We work on multiplication and division before addition and subtraction.

   $$32 - 6 \times 3 = 32 - 18$$  
   $$= 14$$

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 $8 + 2 \times 6 - (4 \times 5)$.
   Work out the expression inside the brackets first.

   $$8 + 2 \times 6 - (4 \times 5)$$  
   $$= 8 + 2 \times 6 - 20$$  
   $$= 20 - 20$$  
   $$= 0$$

   Next do multiplication and division from left to right.

   Finally do addition and subtraction from left to right.

   Let’s Learn 2 involves all four operations.

   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.

   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.

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?

   $$(1869 + 1651) ÷ 22 \times 13 = ?$$

   Key in the following on the calculator.

   $(1869 + 1651) ÷ 22 ÷ 13 = 2080$

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

8. Find the value of each of the following:
   (a) $28 + 4 \times 3$  
   (b) $56 + 4 \times 9$  
   (c) $20 - 6 \times 3 + 2 \times 6$  
   (d) $8 \times (10 - 6) + (18 \times 0)$  
   (e) $(32 - 25) ÷ 4$  
   (f) $72 ÷ (3 \times 6) + 16 \times 2$

   Use your calculator to check your answers.
Four Operations

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.

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) $23 + 4 - 5$
   = 27 - 5
   = 22

(b) $52 + 67 - 40$
   = 119 - 40
   = 79

(c) $91 - 7 + 17$
   = 84 + 17
   = 101

(d) $49 - 23 + 69$
   = 26 + 69
   = 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
### Chapter 2

2. (a) \[9 \times 2 + 3 = 18 + 3 = 6\]
(b) \[14 \times 5 + 10 = 70 + 10 = 7\]
(c) \[100 \div 5 \times 3 = 20 \times 3 = 60\]
(d) \[324 \div 9 \times 8 = 36 \times 8 = 288\]
(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) \[12 \times 6 + 3 \times 9 = 72 + 3 \times 9 = 24 \times 9 = 216\]
(k) \[95 \div 5 \times 4 + 2 = 19 \times 4 + 2 = 76 + 2 = 38\]
(l) \[4 \times 12 \times 5 \div 10 = 48 \times 5 \div 10 = 240 \div 10 = 24\]

3. (a) \[5 \times 6 - 7 = 30 - 7 = 23\]
(b) \[36 \div 9 - 2 = 4 - 2 = 2\]
(c) \[34 - 10 \times 3 = 34 - 30 = 4\]
(d) \[64 - 8 + 2 = 64 - 4 = 60\]
(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) \[100 + 10 \times 5 \div 2 = 10 \times 5 \div 2 = 10 - 10 = 0\]
(j) \[25 \times 3 + 40 \div 8 = 75 + 40 \div 8 = 75 + 5 = 80\]
(k) \[200 - 10 \times 20 \div 20 = 200 - 200 \div 2 \div 20 = 200 - 100 = 100\]
(l) \[80 + 30 \times 10 \times 4 - 12 = 80 + 3 \times 4 - 12 = 80 + 12 - 12 = 80\]
2. (a) $9 \times 2 \div 3 = \frac{18}{3} = 6$
(b) $14 \times 5 \div 10 = \frac{70}{10} = 7$
(c) $100 \div 5 \times 3 = \frac{20}{3} = 60$
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(k) $95 \div 5 \times 4 \div 2 = \frac{19}{2} = 38$
(l) $4 \times 12 \times 5 \div 10 = \frac{48}{10} = 24$

3. (a) $5 \times 6 - 7 = 30 - 7 = 23$
(b) $36 \div 9 - 2 = 4 - 2 = 2$
(c) $34 - 10 \times 3 = 34 - 30 = 4$
(d) $64 - 8 \div 2 = 64 - 4 = 60$
(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) $100 \div 10 - 5 \times 2 = 10 - 10 = 0$
(j) $25 \times 3 + 40 \div 8 = 75 + 5 = 80$
(k) $200 - 10 \times 20 \div 2 = 200 - 100 = 100$
(l) $80 + 30 \div 10 \times 4 - 12 = 80 + 12 - 12 = 80$

4. (a) $8 + (12 - 10)$
   $= 8 + 2$
   $= 10$
(b) $12 \times (4 \div 2)$
   $= 12 \times 2$
   $= 24$
(c) $13 \times (2 + 3)$
   $= 13 \times 5$
   $= 65$
(d) $18 \div (19 - 10)$
   $= 18 \div 9$
   $= 2$
(e) $12 \times 2 - 4 + (6 - 3)$
   $= 12 \times 2 - 4 + 3$
   $= 24 - 4 + 3$
   $= 20 + 3$
   $= 23$
(f) $9 \div 3 \times (2 + 2) - 10$
   $= 9 \div 3 \times 4 - 10$
   $= 3 \times 4 - 10$
   $= 12 - 10$
   $= 2$
(g) $(40 - 10) \times 2 + (30 - 20)$
   $= 30 \times 2 + (30 - 20)$
   $= 30 \times 2 + 10$
   $= 60 + 10$
   $= 70$
(h) $25 - 3 + 10 \times (5 - 2)$
   $= 25 - 3 + 10 \times 3$
   $= 25 - 3 + 30$
   $= 52$
(i) $300 + (3 + 7) - 6 \times 2$
   $= 300 + 10 - 6 \times 2$
   $= 300 + 10 - 12$
   $= 30 - 12$
   $= 18$
(j) $30 - (4 \times 2 + 2) \div 5$
   $= 30 - (8 + 2) \div 5$
   $= 30 - 10 \div 5$
   $= 30 - 2$
   $= 28$
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’. 
Chapter 2

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.

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LESSON PLAN

8 – 5 =
7 – 3 =
9 – 2 =

LEARNING OBJECTIVE

1. Solve word problems involving the 4 operations.

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

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

IN FOCUS

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.

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.

In

FOCUS

Why is the number of girls represented by 3 units?

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.

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.

There were 546 people at the funfair.
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?

<table>
<thead>
<tr>
<th>Before</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>Girls</td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td></td>
</tr>
</tbody>
</table>

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?

$4785 \div 3 = 1595$
The grocer sold 1595 bags of 3 oranges.

$1595 \times 5 = 7975$
The grocer received $7975 from the sale of oranges.

$7090 \times 6 = 42 540$
The grocer received $42 540 from the sale of tomatoes.

$7975 + 42 540 = 50 515$
The grocer received $50 515 altogether.

For Let’s Learn 2, 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 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?

Since each shirt costs twice as much as each tie, we use 2 units to represent the cost of each shirt and 1 unit to represent the cost of each tie.

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?

Since each laptop costs twice as much as each printer, we use 2 units to represent the cost of each laptop and 1 unit to represent the cost of each printer.

The cost of 1 laptop is $225.

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 3647 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?

\[\text{Siti} + \text{Priya} = 3647\]
\[\text{Siti} = 3 \times \text{Kate}\]

What should we find first? Why?

2 units = 3647 - 3049 = 698
1 unit = 358 + 2 = 360
4 units = 1440

Kate and Priya have 1196 beads altogether.
3049 - 229 = 2750
Siti has 2750 beads.

2750 + 1196 = 3946
The three girls have 3946 beads altogether.

What are some methods you can use to check your answer? Discuss with your classmates.

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.

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.

For Let’s Learn 7, get pupils to explain how the comparison to illustrate the portion of the price of a laptop is more than a printer. The bars are then duplicated as many points as Junhao. How many points did each of them have at first?

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 = 210 + 2 = 212

Farhan
Junhao

470
50

Draw a model to help you solve the problem.

1 unit refers to Junhao’s new score.

Each of them had 432 points at first.

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

Method 1

\[
\begin{array}{|c|c|c|c|}
\hline
\text{Cows} & \text{Chickens} & \text{Total number of legs} \\
\hline
20 & 20 \times 4 = 80 & 20 + 2 = 40 = 120 \\
15 & 15 \times 4 = 60 & 25 + 2 = 50 = 110 \\
10 & 14 \times 4 = 58 & 26 + 2 = 52 = 108 \\
\hline
\end{array}
\]

There are 14 cows on the farm.
Allow pupils to work in pairs. Give pupils sufficient time to work on the practice before going through.

1. There are 24 bags of cement and 2308 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 $4820 in September. How many hours of overtime did he work in September? 40 hours

3. The total cost of all tickets to Europe for 2 adults and 4 children was $4940. Each child ticket cost $530 less than an adult ticket. What was the cost of an adult ticket? $1170

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. $1180

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 $10595. 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? 2040

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

123,456,789 × 9 = 111111111
123,456,789 × 18 = 222222222
123,456,789 × 27 = 333333333
123,456,789 × 36 = 444444444

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

123,456,789 × 45 = 555555555
123,456,789 × 63 = 777777777
123,456,789 × 81 = 999999999

Share your answers with your classmates.
Practice

Textbook 5

P50

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 × 2 = $432
   $7215 − $432 = $6783
   $6783 ÷ 7 = $969
   $969 + $216 = $1185
   $1185 × 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

Mind Workout

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

123 456 789 × 9 =
123 456 789 × 18 =
123 456 789 × 27 =
123 456 789 × 36 =

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

123 456 789 × 45 =
123 456 789 × 63 =
123 456 789 × 81 =

Do you see any pattern?

Share your answers with your classmates.

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

4. The total cost of 5 computers and 3 printers is $7100. The total cost of 4 such computers and 3 such printers is $6020. 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 $1699 and the cost of a Brand B computer is $2889. A company bought 5 computers for $10 995. 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. 250

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

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

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

Do you see any pattern?

Share your answers with your classmates.
1. Fill in each blank with +, −, × or ÷.
   (a) 3 × 4 = 12
   (b) 18 + 20 = 38
   (c) 100 − 50 = 50
   (d) 75 ÷ 15 = 5

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

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.
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.

**Mind Workout**

Date: _______________

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

   (a) \(3 \times 4 \div 10 = 2\)
   
   (b) \(18 \div 20 \times 4 = 23\)
   
   (c) \(100 \div 50 \times 35 \div 5 = 57\)
   
   (d) \(75 \div 15 \times 2 = 30\)

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?

   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.

**Textbook 5**

**P52**

52 four operations

**Maths journal**

The method Ahmad uses to find the value of \(24 \times 25\) is shown below.

\[32 \times 25 = 8 \times 4 \times 25 = 8 \times 100 = 800\]

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

(a) \(25 \times 48\)
(b) \(12 \times 250\)

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.

**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.

**Answers**

Review 2 (Workbook 5A P41 – 44)

1. (a) \(340 \times 10 = 3400\)
   
   (b) \(55 \times 100 = 5500\)
   
   (c) \(182 \times 1000 = 182000\)
   
   (d) \(250 \times 500 = 125000\)
   
   (e) \(67 \times 300 = 20100\)
   
   (f) \(48 \times 6000 = 288000\)
   
   (g) \(220 \div 10 = 22\)
   
   (h) \(70800 \div 100 = 708\)
   
   (i) \(419000 \div 1000 = 419\)
   
   (j) \(30000 \div 300 = 100\)
   
   (k) \(960 \div 20 = 48\)
   
   (l) \(52000 \div 4000 = 13\)

2. (a) \(= 40 + 80 - 50\)
   
   \[= 120 - 50\]
   
   \[= 70\]
   
   (b) \(= 30 + 240 + 4\)
   
   \[= 30 + 60\]
   
   \[= 90\]
   
   (c) \(= 50 + (12 - 9) \div 3\)
   
   \[= 50 + 3 \div 3\]
   
   \[= 50 + 1\]
   
   \[= 51\]
   
   (d) \(= 7 \times 21 + 36 \div 9\)
   
   \[= 147 + 4\]
   
   \[= 151\]

3. \(\$540 + \$235 = \$775\)
   
   \(\$1000 - \$775 = \$225\)

4. \(2040 \text{ cm} \div 30 = 68 \text{ cm}\)
   
   \(68 \text{ cm} \times 10 = 680 \text{ cm}\)
   
   \(2040 \text{ cm} - 680 \text{ cm} = 1360 \text{ cm}\)

5. 2 units = \(55 - 15\)
   
   \[= 40\]
   
   1 unit = \(40 \div 2\)
   
   \[= 20\]
   
   3 units = \(20 \times 3\)
   
   \[= 60\]

6. 5 units = 70
   
   1 unit = \(70 \div 5\)
   
   \[= 14\]
   
   9 units = \(14 \times 9\)
   
   \[= 126\]

*7. 3 units = \(738 - 42\)
   
   \[= 696\]
   
   1 unit = \(696 \div 3\)
   
   \[= 232\]
   
   \(232 + 42 = 274\)
Introduction to Algebra

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.

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

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

<table>
<thead>
<tr>
<th></th>
<th>Siti's sister</th>
<th>Siti</th>
</tr>
</thead>
<tbody>
<tr>
<td>Now</td>
<td>10 years old</td>
<td>12 years old</td>
</tr>
<tr>
<td>Last year</td>
<td>9 years old</td>
<td>11 years old</td>
</tr>
<tr>
<td>2 years ago</td>
<td>8 years old</td>
<td>10 years old</td>
</tr>
</tbody>
</table>

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

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

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

(x + 2) and (y – 2) are examples of algebraic expressions.

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

His mother is (12 + y) years old. Should we add or subtract to find Weiming's mother's age? Explain.

3. Write an algebraic expression for each of the following. Explain your answers.
   (a) Add 5 to a.
   (b) Add b to 1.
   (c) 4 more than c.
   (d) a more than 8.
   (e) Subtract 3 from a.
   (f) Subtract 7 from 7.
   (g) 6 less than g.
   (h) h less than 2.

4. 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.

<table>
<thead>
<tr>
<th>Number of balls</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>At first</td>
<td>x</td>
</tr>
<tr>
<td>Add 1 ball</td>
<td>x + 1</td>
</tr>
<tr>
<td>Remove 1 ball</td>
<td>x – 1</td>
</tr>
<tr>
<td>Add 2 balls</td>
<td>x + 2</td>
</tr>
<tr>
<td>Add 5 balls</td>
<td>x + 5</td>
</tr>
<tr>
<td>Remove 3 balls</td>
<td>x – 3</td>
</tr>
<tr>
<td>Remove 8 balls</td>
<td>x – 8</td>
</tr>
</tbody>
</table>

Explain your answers.

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

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

2 × p = 2p
These are 2p ml of juice in 2 glasses.

3 × p = 3p
These are 3p ml of juice in 3 glasses.

4 × p = 4p
These are 4p ml of juice in 4 glasses.

2p, 3p and 4p are also examples of algebraic expressions.
In a basket, there are \( q \) apples and twice as many oranges as apples. How many oranges are there?

\[
q + 2q = 3q
\]

There are \( 2q \) oranges. Note that we always write the number before the letter.

7. Write an algebraic expression for each of the following.
   (a) Multiply \( a \) by 7.
   (b) Multiply 3 by \( b \).
   (c) 9 groups of \( c \).
   (d) 5 times of \( d \).
   (e) There are \( x \) peanuts in a packet. How many peanuts are there in 10 packets?

\[
5 + 5 \times 10 = 50
\]

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.

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

For 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.

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

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 $p$ from 10. $10 - p$
(c) Multiply $c$ by 7. $7c$
(d) Divide $d$ by 10. $\frac{d}{10}$
(e) Subtract 12 from twice of $a$. $2a - 12$
(f) Add 2 to 4 times of $f$. $2f + 2$
(g) Divide the sum of 11 and $q$ by 9. $\frac{11 + q}{9}$
(h) $1723$

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

<table>
<thead>
<tr>
<th>Number of vehicles</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>There are $q$ motorcycles.</td>
<td>$q$</td>
</tr>
<tr>
<td>There are 10 times as many cars as motorcycles. How many cars are there?</td>
<td>$10q$</td>
</tr>
<tr>
<td>There are 3 times as many motorcycles as scooters. How many scooters are there?</td>
<td>$\frac{q}{3}$</td>
</tr>
<tr>
<td>There are 51 more motorcycles than vans. How many vans are there?</td>
<td>$q - 51$</td>
</tr>
</tbody>
</table>

---

**Answers**

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) $\frac{15 + j}{2}$
(j) $8 + \frac{i}{3}$

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
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.
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.

Textbook 5 P60
Chapter 3

Workbook 5A P48

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.

\[
\begin{align*}
\text{cost of 2 apples} & = 2w \\
\text{cost of 3 papayas} & = 3 \times 2 = 6 \\
\text{total cost} & = 2w + 6
\end{align*}
\]

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 \( \frac{30 + x}{4} \).

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.

I know how to...

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

SELF-CHECK
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

---

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) $\frac{4z}{6}$
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.
LEARNING OBJECTIVES
1. Divide a whole number by another whole number and give the answer as a fraction.
2. Convert fractions to decimals.

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?
LEARNING OBJECTIVES

LESSON 1

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

IN FOCUS

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

FRACTIONS AND DIVISION

1. **LET’S LEARN**

   - **1.** 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?

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

   - **3.** Divide. Express each answer as a fraction in its simplest form. Explain.
     - (a) \(1 ÷ 7\)
     - (b) \(3 ÷ 5\)
     - (c) \(5 ÷ 9\)
     - (d) \(2 ÷ 3\)

   - **4.** 3 identical cakes were divided equally between Sam and Bina. How many cakes did each child receive?

   - **5.** 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 \(1 + 2 = \frac{1}{2}\)"

   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 “\(1 + 2 = \frac{1}{2}\)” and “\(3 + 4 = \frac{3}{4}\)” on the board and ask pupils if they notice anything about the numbers. Lead pupils to conclude that \(a ÷ b = \frac{a}{b}\).

   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.
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.

We can show this in a model.

Each child received \( \frac{3}{2} \) or \( \frac{1}{2} \) cakes.

\[
\begin{align*}
\frac{3}{2} + \frac{1}{2} &= \frac{4}{2} = 2
\end{align*}
\]

3 + 2 is the same as \( \frac{3}{2} \) of 3.

5. Divide. Express each answer as a mixed number in its simplest form. Explain.
   - \( \frac{5}{2} \)
   - \( \frac{7}{5} \)
   - \( \frac{10}{4} \)
   - \( \frac{9}{6} \)

   - \( \frac{5}{2} = 2 \frac{1}{2} \)
   - \( \frac{7}{5} = 1 \frac{2}{5} \)
   - \( \frac{10}{4} = 2 \)
   - \( \frac{9}{6} = 1 \frac{1}{2} \)

6. What is the value of \( \frac{2}{5} \)? Express your answer as a decimal.

\[
2 \div 5 = \frac{2}{5} = \frac{4}{10} = 0.4
\]

Recall how we convert fractions to decimals.

\[
\frac{2}{5} = \frac{4}{10} \times \frac{2}{2} \times \frac{2}{2}
\]

7. Find the value of \( \frac{3}{4} \). Express your answer as a decimal.

\[
3 \div 4 = \frac{3}{4} = \frac{75}{100} = 0.75
\]

8. Express \( \frac{1}{8} \) as a decimal.

\[
1 \div 8 = \frac{1}{8} = \frac{125}{1000} = 0.125
\]

Why do we convert the denominator to 1000?

9. Express \( \frac{11}{8} \) as a decimal.

\[
11 \div 8 = 1 \frac{3}{8} = 1 + \frac{3}{8} = 1 \frac{3}{8}
\]

10. Express each of the following as a decimal.

   - \( \frac{4}{5} \)
   - \( \frac{7}{8} \)
   - \( \frac{16}{2} \)
   - \( \frac{9}{4} \)

   - \( \frac{4}{5} = 0.8 \)
   - \( \frac{7}{8} = 0.875 \)
   - \( \frac{16}{2} = 8 \)
   - \( \frac{9}{4} = 2.25 \)

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.
Part A
Distribute the materials needed. Ensure that pupils understand the instructions of the task. High progress pupils can try other examples (e.g. \(2 \div 8\) etc).

Part B
Go around the class to ensure that pupils are explaining correctly.

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) \(\frac{2}{5}\)  (b) \(\frac{3}{4}\)  (c) \(\frac{5}{2} \div 2 = \frac{5}{4}\)  (d) \(10 \div 8 = \frac{10}{8}\)  = \(\frac{1}{4}\)

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) \(\frac{3}{4}\)  (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) \(4 \div 5 = \frac{4}{5}\)  (d) \(5 \div 8 = \frac{5}{8}\)  = \(\frac{8}{10}\)  = \(\frac{625}{1000}\)  = 0.8  = 0.625

5. (a) 1.4  (b) 2.75  (c) \(5 \div 2 = \frac{5}{2}\)  (d) \(12 \div 8 = \frac{12}{8}\)  = \(\frac{3}{2}\)  = \(\frac{15}{10}\)  = \(\frac{5}{10}\)  = 2.5  = 1.5
Lesson Plan

Chapter 4
Lesson 1

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 \( 1 \div 4 \) 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,

\[
\begin{align*}
\frac{1}{5} \times 2 & = \frac{2}{10} \\
\frac{4}{25} \times 25 & = \frac{100}{100} \\
\frac{8}{125} \times 125 & = \frac{1000}{1000}.
\end{align*}
\]

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?
ADDIING MIXED NUMBERS

LEARNING OBJECTIVE
1. Add mixed numbers.

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.

Textbook 5 P68
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.

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.
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 $\frac{6}{10}$.

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.

Work with pupils on the practice questions.

### Practice

**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. $1\frac{1}{4} \text{ hr} + 1\frac{1}{3} \text{ hr} = 1\frac{3}{12} \text{ hr} + 1\frac{4}{12} \text{ hr}$
   $= 2\frac{7}{12} \text{ hr}$

3. $2\frac{4}{5} \ell + 2\frac{1}{2} \ell = 5\frac{3}{10} \ell$
LEARNING OBJECTIVE
1. Subtract mixed numbers.

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?

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 $\frac{4}{8}$. 

Textbook 5 P73
Fractions

Weiming had \( \frac{11}{8} \) pies left.

Find the difference between \( 2 \frac{5}{6} \) and \( 1 \frac{1}{4} \). Use \( \frac{1}{2} \) to help you.

Subtract the wholes first:

\[
2 - 1 = 1
\]

Then change the fractions to fractions with the same denominator and subtract:

\[
\frac{5}{6} - \frac{1}{4} = \frac{2}{3} - \frac{1}{2} = \frac{4}{6} - \frac{3}{6} = \frac{1}{2}
\]

Finally add \( \frac{1}{2} \) to the remaining 1 whole.

Are there other ways to subtract?

\[
2 \frac{5}{6} - 1 \frac{1}{4} = \frac{15}{6} - \frac{5}{4} = \frac{10}{6} - \frac{3}{4} = \frac{5}{2} - \frac{3}{4} = \frac{10}{4} - \frac{6}{4} = \frac{1}{2}
\]

Weiming had \( \frac{1}{2} \) pies left.

2. Find the difference between \( 2 \frac{5}{6} \) and \( 1 \frac{1}{4} \). Use \( \frac{1}{2} \) to help you.

\[
2 \frac{5}{6} - 1 \frac{1}{4} = 3 \frac{1}{12}
\]

3. Subtract. Show how you subtract using \( \frac{1}{2} \).

   \( \begin{align*}
   (a) & \quad 3 \frac{2}{5} - 2 \frac{4}{7} \\
   (b) & \quad 4 \frac{7}{10} - 3 \frac{2}{5} \\
   (c) & \quad 2 \frac{1}{2} - 1 \frac{1}{4} \\
   (d) & \quad 3 \frac{6}{7} - 1 \frac{3}{5}
   \end{align*} \]

   Use your \( \frac{1}{2} \) to check your answers.

4. Subtract \( 2 \frac{4}{5} \) from \( 3 \frac{3}{8} \).

   Method 1
   Convert both mixed numbers into improper fractions.

   \[
   \frac{3}{8} - \frac{4}{5} = \frac{15}{40} - \frac{16}{40} = \frac{1}{40}
   \]

   Method 2
   Convert 1 whole to \( \frac{40}{40} \).

   \[
   \frac{3}{8} - \frac{4}{5} = \frac{15}{40} - \frac{32}{40} = \frac{17}{40}
   \]

   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 \( \frac{3}{4} - \frac{1}{2} \)? Express your answer as a mixed number in its simplest form.

Method 1
Convert both mixed numbers into improper fractions:

\[
\frac{3}{4} - \frac{1}{2} = \frac{3}{4} - \frac{2}{4} = \frac{1}{4}
\]

Method 2
Convert 1 whole to \( \frac{4}{4} \):

\[
\frac{3}{4} - \frac{1}{2} = \frac{3}{4} - \frac{2}{4} = \frac{1}{4}
\]

Which method is better? Why?

6. Find the difference between \( 2\frac{1}{2} \) and \( 1\frac{1}{4} \). Use \( \text{ } \) to help you.

\[
2\frac{1}{2} - 1\frac{1}{4} = \frac{5}{2} - \frac{5}{4} = \frac{5}{4}
\]

7. Subtract.

(a) \( 3\frac{1}{4} - 2\frac{1}{4} \)
(b) \( 4 - \frac{1}{2} \)
(c) \( 3\frac{2}{5} - 2\frac{1}{5} \)
(d) \( 2\frac{1}{2} - 1\frac{1}{2} \)
(e) \( 4\frac{3}{4} - 1\frac{1}{4} \)

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.

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 \( \frac{31}{9} - \frac{4}{9} \) 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 7, allow pupils to use their calculators to check their answers. Remind pupils to express their answers in the simplest form.

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) $1 \frac{1}{6}$
   (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. $4 \frac{2}{5} m - 2 \frac{3}{4} m = \frac{13}{20} m$
**LESSON PLAN**

**Chapter 4 Lessons 2 & 3**

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**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 \(9\) 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**
LEARNING OBJECTIVE
1. Solve word problems involving division of numbers to give fractions, adding mixed numbers and subtracting mixed numbers.

SOLVING WORD PROBLEMS

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
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.

Priya

Cat

28 kg

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?
1. Solve word problems involving division of numbers to give fractions, adding mixed numbers and subtracting mixed numbers.

**LEARNING OBJECTIVE**

SOLVING WORD PROBLEMS

**LESSON 4**

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?

**IN FOCUS**

**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?

**Textbook 5**

P78

Fractions

1

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**

Priya

Cat

28 kg

?

1.

28 ÷ 8 = \[\frac{28}{8} = \frac{3}{1} + \frac{1}{2}\]

Priya's cat weighs \[\frac{3}{1} + \frac{1}{2}\] kg.

28

8

= \[\frac{3}{1} \frac{1}{2}\]

7

2

?

28 kg

\[\frac{3}{1} + \frac{1}{2}\]

kg

3 1

2

+ 28 = \[\frac{31}{1} \frac{1}{2}\]

Priya and her cat weigh 31.5 kg in total.

**Fractions | 85**

**Textbook 5**

P79

Fractions

1

LESSON 4

SOLVING WORD PROBLEMS

**IN FOCUS**

There were \[\frac{4}{1} \frac{1}{8}\] apple pies.

\[\frac{4}{1} \frac{1}{8}\]

\[\frac{1}{1} \frac{2}{10}\]

\[\frac{1}{8}\]

\[\frac{1}{4}\]

\[\frac{1}{2}\]

\[\frac{1}{2}\]

\[\frac{1}{8}\]

\[\frac{1}{4}\]

\[\frac{1}{2}\]

\[\frac{1}{2}\]

\[\frac{1}{8}\]

There were \[\frac{4}{1} \frac{1}{8}\] apple pies.

\[\frac{4}{1} \frac{1}{8} + \frac{1}{1} \frac{2}{10} = \frac{14}{10}\]

\[\frac{1}{4}\]

\[\frac{1}{2}\]

There were \[\frac{14}{10}\] pies in total.

**Practice**

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 \[\frac{1}{1} \frac{1}{4}\] cakes in the box. How many cakes did Mrs Lee have left?

2. Xinyi mixed some syrup and water to make a drink. She used \[\frac{2}{4}\] of water. The volume of water used was \[\frac{1}{1} \frac{1}{2}\] more than the volume of syrup used. What was the total volume of drink Xinyi made?

3. Kate had 6 chocolate bars. She ate \[\frac{1}{1} \frac{1}{4}\] chocolate bars and gave \[\frac{1}{2}\] chocolate bars to Meiling. How many chocolate bars did Kate have left?

**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 \[\frac{1}{1} \frac{1}{4}\] cakes in the box. How many cakes did Mrs Lee have left?

2. Xinyi mixed some syrup and water to make a drink. She used \[\frac{2}{4}\] of water. The volume of water used was \[\frac{1}{1} \frac{1}{2}\] more than the volume of syrup used. What was the total volume of drink Xinyi made?

3. Kate had 6 chocolate bars. She ate \[\frac{1}{1} \frac{1}{4}\] chocolate bars and gave \[\frac{1}{2}\] chocolate bars to Meiling. How many chocolate bars did Kate have left?

**Practice**

Complete Workbook 5A, Worksheet 4, Pages 61 – 64

**Fractions**

80

**Textbook 5**

P80

Fractions

1

LESSON 4

SOLVING WORD PROBLEMS

**Practice**

1. Sam cycled \[\frac{1}{1} \frac{1}{5}\] 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 \[\frac{2}{1} \frac{1}{2}\] km longer than Route A. Find the total distance Sam cycled.

2. 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 \[\frac{1}{1} \frac{1}{4}\] cakes in the box. How many cakes did Mrs Lee have left?

3. Xinyi mixed some syrup and water to make a drink. She used \[\frac{2}{4}\] of water. The volume of water used was \[\frac{1}{1} \frac{1}{2}\] more than the volume of syrup used. What was the total volume of drink Xinyi made?

4. Kate had 6 chocolate bars. She ate \[\frac{1}{1} \frac{1}{4}\] chocolate bars and gave \[\frac{1}{2}\] chocolate bars to Meiling. How many chocolate bars did Kate have left?

**Practice**

Complete Workbook 5A, Worksheet 4, Pages 61 – 64

**Fractions**

80

**Textbook 5**

P80

Fractions

1

LESSON 4

SOLVING WORD PROBLEMS

**Practice**

1. Sam cycled \[\frac{1}{1} \frac{1}{5}\] 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 \[\frac{2}{1} \frac{1}{2}\] km longer than Route A. Find the total distance Sam cycled.

Sam’s home

Library

Weiming’s home

Route A

\[\frac{1}{1} \frac{1}{5}\] km

Route B

\[\frac{2}{1} \frac{1}{2}\] km

Sam cycled \[\frac{4}{1} \frac{1}{8}\] km.

**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?

**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.

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).
1. \(8 - 1 \frac{1}{12} = 6 \frac{11}{12}\)
   \[\frac{6\frac{11}{12} - 1\frac{1}{6}}{12} = 4\frac{1}{12}\]

2. \(22\frac{1}{2} \text{ km} - 19\frac{7}{10} \text{ km} = 2\frac{4}{5} \text{ km}\)

3. \(1\frac{1}{2} \text{ kg} + 1\frac{2}{5} \text{ kg} = 2\frac{9}{10} \text{ kg}\)
   \[\frac{2\frac{9}{10} \text{ kg} + \frac{4}{5} \text{ kg}}{10} = 3\frac{7}{10} \text{ kg}\]

4. \(1\frac{3}{4} \text{ km} + 2\frac{1}{2} \text{ km} = 5\frac{1}{4} \text{ km}\)
   \[\frac{6\frac{5}{8} \text{ km} - 5\frac{1}{4} \text{ km}}{8} = 1\frac{3}{8} \text{ km}\]

5. \(75 \text{ kg} + 10 = 7\frac{1}{2} \text{ kg}\)
   \[75 \text{ kg} + 7\frac{1}{2} \text{ kg} = 82\frac{1}{2} \text{ kg}\]

6. \(22 \ell + 4 \ell = 5\frac{1}{2} \ell\)
   \[\frac{5\frac{1}{2} \ell + 1\frac{1}{8} \ell}{8} = 6\frac{5}{8} \ell\]

7. \(3\frac{4}{5} \text{ m} - 2\frac{7}{10} \text{ m} = 1\frac{1}{10} \text{ m}\)
   \[3\frac{4}{5} \text{ m} + 1\frac{1}{10} \text{ m} = 4\frac{9}{10} \text{ m}\]

8. \(1\frac{2}{3} \text{ hr} + 1\frac{2}{3} \text{ hr} = 3\frac{1}{3} \text{ hr}\)
   \[3\frac{1}{3} \text{ hr} + 1\frac{2}{3} \text{ hr} = 5 \text{ hr}\]
MULTIPLYING A FRACTION AND A WHOLE NUMBER

LEARNING OBJECTIVE
1. Multiply a fraction and a whole number.

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?

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 $\frac{2}{5}$ of 20?

\[
\begin{array}{c}
\text{Method 1} \\
\frac{2}{5} \times 20 = \frac{40}{5} = 8
\end{array}
\]

\[
\begin{array}{c}
\text{Method 2} \\
\frac{4}{5} \times 20 = \frac{80}{5} = 16
\end{array}
\]

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.

\[
\begin{align*}
45 m \\
\times \frac{3}{10} &= 27 \\
\end{align*}
\]

She gave away $11\frac{1}{2}$ m of ribbon.

4. Mrs Salim spent $\frac{5}{6}$ hr at the supermarket. How do we express $\frac{5}{6}$ hr in min?

\[
\begin{align*}
\frac{5}{6} \times 60 &= \frac{300}{6} = 50 \\
\end{align*}
\]

So, $\frac{5}{6}$ hr = 50 min.

5. Express $\frac{7}{12}$ hr in min.

\[
\begin{align*}
\frac{7}{12} \times 60 &= \frac{420}{12} = 35 \\
\end{align*}
\]

So, $\frac{7}{12}$ hr = 35 min.

6. Find the value of $\frac{5}{4} \times 24$.

\[
\begin{align*}
\text{Method 1} \\
\frac{5}{4} \times 24 &= \frac{120}{4} = 30 \\
\end{align*}
\]

\[
\begin{align*}
\text{Method 2} \\
\frac{1}{5} \times 24 &= \frac{24}{5} = 4.8 \\
\end{align*}
\]

For Let’s Learn 4, highlight to the 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 $3 \times 4$.

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?

For Let’s Learn 4, 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 $3 \times 4$.

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.
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).

Textbook 5 P84

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 \text{ min}
   (b) \frac{3}{4} \times 60 = 45 \text{ min}
   (c) \frac{2}{5} \times 60 = 24 \text{ min}
   (d) \frac{11}{12} \times 60 = 55 \text{ 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. \(\frac{5}{6} \times 12 \text{ km} = 10 \text{ km}\)

7. \(\frac{3}{8} \times \$56 = \$21\)

8. \(1 - \frac{3}{5} = \frac{2}{5}\)
   \(\frac{2}{5} \times 80 \text{ kg} = 32 \text{ kg}\)
LEARNING OBJECTIVES
1. Multiply two proper fractions.
2. Multiply a proper fraction and an improper fraction.
3. Multiply two improper fractions.

MULTIPLYING TWO FRACTIONS

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.

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.

\[
\frac{1}{4}
\]

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.

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 \( \frac{2}{3} \) of \( \frac{1}{4} \)? Express your answer in its simplest form.

Method 1
\[
\frac{2}{3} \times \frac{1}{4} = \frac{2 \times 1}{3 \times 4} = \frac{2}{12}
\]

We can also find the common factors of the numerator and the denominator.

\[
\frac{2}{12} = \frac{1}{6}
\]

Method 2
\[
\frac{2}{3} \times \frac{1}{4} = \frac{2}{12}
\]

Which method do you prefer? Why?

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.
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.
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. \( \frac{1}{4} m \times \frac{1}{4} m = \frac{1}{16} m^2 \)

5. \( \frac{1}{5} \ell \times \frac{4}{5} \ell = \frac{4}{25} \ell \)

6. \( \frac{3}{5} \times \frac{8}{9} = \frac{8}{15} \)
LEARNING OBJECTIVE

1. Multiply a mixed number and a whole number.

LESSON 7

MULTIPLYING A MIXED NUMBER AND A WHOLE NUMBER

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 $1\frac{1}{2} \times 4 = 6$.

Textbook 5 P90
1. Multiply a mixed number and a whole number.

**LEARNING OBJECTIVE**

**MULTIPLYING A MIXED NUMBER AND A WHOLE NUMBER**

**LESSON 7**

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.

**IN FOCUS**

**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 \( 1 \frac{1}{2} \times 4 = 6 \).

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.

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.

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.

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.

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.

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.

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.

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.
Answers

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. $4\frac{1}{2} \text{ m} \times 3 \text{ m} = 13\frac{1}{2} \text{ m}^2$
LESSON PLAN

Chapter 4
Lessons 5, 6 & 7

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?
1. Solve word problems involving fractions.

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

1. Method 1

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?

<table>
<thead>
<tr>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Friday</td>
</tr>
<tr>
<td>9 units = 180</td>
</tr>
<tr>
<td>1 unit = 180 $\div$ 9</td>
</tr>
<tr>
<td>= 20</td>
</tr>
<tr>
<td>5 units = 20 $\times$ 5</td>
</tr>
<tr>
<td>= 100</td>
</tr>
</tbody>
</table>

Weiming read 100 pages on both days.

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.
1. Solve word problems involving fractions.

**LEARNING OBJECTIVE**

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?

**IN FOCUS**

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.

Textbook 5

P93

93 Chapter 4

Lesson 8

More word problems

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?

\[
\text{9 units} = 180 \\
1 \text{ unit} = \frac{180}{9} \\
= 20 \\
5 \text{ units} = 20 \times 5 \\
= 100
\]

Weiming read 100 pages on both days.

Let’s Learn

1. Method 1

<table>
<thead>
<tr>
<th></th>
<th>Friday</th>
<th>Saturday</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>( \frac{2}{9} )</td>
<td>( \frac{1}{3} )</td>
</tr>
</tbody>
</table>

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 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.

Method 3

\[
\frac{2}{9} + \frac{1}{3} = \frac{2}{9} + \frac{3}{9} = \frac{5}{9}
\]

Weiming read 100 pages on both days.

2. Ahmad spent \( \frac{5}{8} \) of his allowance on a bowl of noodles and \( \frac{1}{5} \) 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 = \( 1 - \frac{5}{8} \)

\[
\text{Fraction spent on the drink} = \frac{1}{5} \times \frac{3}{8} = \frac{1}{8}
\]

Ahmad spent \( \frac{1}{8} \) of his allowance on the drink.

Method 2

\[
\text{Solve the problem by drawing a model.}
\]

Food | Remainder
---|---
\( \frac{5}{8} \) | \( \frac{3}{8} \)

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.

\[
\text{1} \quad \text{of the audience are children.}
\]

\[
\frac{1}{5} \quad \text{of the children are girls.}
\]

\[
\text{How many parts do you need to further divide the unit representing the children?}
\]

\[
\text{What other information do you have?}
\]

\[
\text{What is another way to solve the problem in another way?}
\]

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 \( \frac{1}{3} \times \text{remainder} \).

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?
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

\[
2 \text{ units} = 90 \\
1 \text{ unit} = \frac{90}{2} = 45 \\
8 \text{ units} = 45 \times 8 = 360
\]

There are 360 Primary 5 pupils in the school.

**Method 2**

\[
\frac{5}{8} - \frac{3}{8} = \frac{2}{8}
\]

\[
The \text{ difference between the fraction of girls and boys is } \frac{1}{4}.
\]

\[
90 \div 2 = 45 \\
45 \times 8 = 360
\]

There are 360 Primary 5 pupils in the school.

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.

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. Melinda used \( \frac{2}{3} \) of the flour she had to make muffins and \( \frac{1}{6} \) 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.

\[
\frac{1}{3} - \frac{2}{3} = \frac{3}{6} - \frac{4}{6} = \frac{1}{6}
\]

She used \( \frac{1}{6} \) of the total amount of flour to make pancakes.

\[
\frac{1}{6} + \frac{1}{6} = \frac{2}{6}
\]

She had \( \frac{2}{3} \) g of flour at first.

\[
\frac{2}{3} + \frac{2}{3} = \frac{4}{3}
\]

She used \( \frac{4}{3} \) g of flour to make muffins.

Did she use more flour for muffins or for pancakes? How much more?

---

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?
- What other information do you have?
- Can you solve the problem in another way?

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?

---

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).
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. $1 - \frac{2}{5} = \frac{3}{5}$
   $3 \frac{3}{5} - \frac{3}{10} = \frac{3}{10}$
   $\frac{3}{10} \times 3000 = 900$

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. $1 - \frac{2}{3} = \frac{1}{3}$
   $\frac{5}{6} \times \frac{1}{3} = \frac{5}{18}$
   $\frac{2}{3} \times \frac{5}{18} = \frac{12}{18} - \frac{5}{18}$
   $\frac{7}{18}$
   $\$35 \div 7 = 5$
   $\$5 \times 18 = 90$

9. $1 \text{ unit} = 8$
   $10 \text{ units} = 8 \times 10$
   $= 80$

10. $\frac{4}{5} \text{ kg} + 2 \frac{1}{2} \text{ kg} = 4 \frac{3}{10} \text{ kg}$
    $3 \times 1 \frac{4}{5} \text{ kg} = 5 \frac{2}{5} \text{ kg}$
    $5 \times 4 \frac{3}{10} \text{ kg} = 21 \frac{1}{2} \text{ kg}$
    $5 \frac{2}{5} \text{ kg} + 21 \frac{1}{2} \text{ kg} = 26 \frac{9}{10} \text{ kg}$

11. $1 - \frac{9}{10} = \frac{1}{10}$
    $\frac{9}{10} - \frac{1}{10} = \frac{8}{10}$
    $\frac{72}{8} = 9$
    $9 \times 10 = 90$

12. $1 - \frac{1}{4} = \frac{3}{4}$
    $\frac{3}{4} - \frac{2}{5} = \frac{7}{20}$
    $\frac{7}{20} - \frac{1}{40} = \frac{1}{10}$
    $18 \times 10 = 180$

13. $1 - \frac{7}{9} = \frac{2}{9}$
    $\frac{2}{9} \times 1890 = 420$
    $420 \div 4 = 105$
    $105 \times 3 = 315$

14. Red
   Blue
   $2 \times 4 \text{ units} = 8 \text{ units}$
   $8 \text{ units} - 5 \text{ units} = 3 \text{ units}$
   $3 \text{ units} = 135$
   $8 \text{ units} + 5 \text{ units} = 13 \text{ units}$
   $1 \text{ unit} = 135 \div 3$
   $= 45$
   $13 \text{ units} = 45 \times 13$
   $= 585$
### 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 $45 \times 8$. 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

Solve.
1. Nora had $42. She spent $12 of it on food. She then spent $7 of the remaining amount on a pen. How much money did Nora have left? $13
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? $\frac{1}{30}$
3. At a supermarket, rice is sold at $3 for 1 kg and chicken is sold at $8 for 1 kg. Mrs Lee buys $\frac{3}{2}$ kg of rice and $\frac{1}{4}$ kg of chicken. How much does Mrs Lee pay altogether? $\$9.50$
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? 510

Practice
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? $\$46$

You may use a... to help you.

Pupils may work in groups to solve the problem. Allow pupils to check their answers using their calculators.
1. Nora had $42. She spent $1 \frac{3}{7}$ of it on food. She then spent $\frac{1}{7}$ of the remaining amount on a pen. How much money did Nora have left?

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?

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?

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?

**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.
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) \( 1\frac{28}{5} \)  
   (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. \( 2 \text{ m} + 5 = \frac{2}{5} \text{ m} \)

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. \( 1 - \frac{2}{3} = \frac{3}{5} \)  
    \( \frac{3}{5} \times \frac{3}{5} = \frac{9}{25} \)  
    \( \frac{2}{5} - \frac{9}{25} = \frac{1}{25} \)  
    \( 24 \times 25 = 600 \)
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
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) $\frac{2}{3}$  
   (b) $\frac{3}{7}$  
   (c) $\frac{2}{9}$  
   (d) $\frac{3}{5}$  
   (e) $\frac{4}{5}$  
   (f) $\frac{1}{7}$
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) $\frac{5}{7}$  
   (b) $\frac{1}{9}$  
   (c) 87  
   (d) 272
7. 4326 − 144 = 4182  
   4182 ÷ 2 = 2091  
   2091 + 144 = 2235  
   2235 ÷ 5 = 447
8. $\frac{7q - 2}{2}$
9. $1 - \frac{1}{3} = \frac{2}{3}$  
   $\frac{3}{5} \times \frac{2}{3} = \frac{2}{5}$  
   $\frac{2}{5} \times 240 = 96$  
   $96 + 4 = 24$
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 ÷ 15  
      = $75  
    $\frac{56}{56} = $75 $\times $56  
      = $4200
How many cups of water does Siti need when she uses 1 cup of fresh lemon juice?

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?

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.
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 three given quantities.

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.
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.

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.

<table>
<thead>
<tr>
<th>Name</th>
<th>Priya</th>
<th>Kate</th>
<th>Meiling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amount of savings</td>
<td>$2</td>
<td>$1</td>
<td>$4</td>
</tr>
</tbody>
</table>

The ratio of Meiling’s savings to Kate’s savings to Priya’s savings is 4 : 1 : 2.

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 : 3

10. The masses of three fruits are shown.

(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.

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.

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 these plays.

<table>
<thead>
<tr>
<th>Play</th>
<th>Start</th>
<th>End</th>
</tr>
</thead>
<tbody>
<tr>
<td>New World</td>
<td>10:00</td>
<td>10:50</td>
</tr>
<tr>
<td>Silverlocks</td>
<td>11:00</td>
<td>12:20</td>
</tr>
<tr>
<td>Fantastic Five</td>
<td>10:00</td>
<td>13:30</td>
</tr>
</tbody>
</table>

The ratio of the duration of Silverlocks to the duration of Fantastic Five to the duration of New World is $8:6:5$.

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.

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 $3:7$.

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 $18:22$.

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 $3:5:6$.

4. (a) The ratio of the number of red cubes to the number of blue cubes is $4:8$.
(b) The ratio of the number of red cubes to the number of yellow cubes to the number of blue cubes is $4:3:8$.
(c) The ratio of the number of yellow cubes to the number of red and blue cubes to the total number of cubes is $2:9:15$.

For 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
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:

<table>
<thead>
<tr>
<th>Unit</th>
<th>Conversion Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>hr</td>
<td>× 60</td>
</tr>
<tr>
<td>l</td>
<td>× 1000</td>
</tr>
<tr>
<td>ml</td>
<td>× 1000</td>
</tr>
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<td>km</td>
<td>× 100</td>
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<td>m</td>
<td>× 1000</td>
</tr>
<tr>
<td>cm</td>
<td>× 1000</td>
</tr>
<tr>
<td>kg</td>
<td>× 1000</td>
</tr>
</tbody>
</table>

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.
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.

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**

\[
\begin{align*}
1 & : 2 \\
3 & : 6
\end{align*}
\]

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**

\[
\begin{align*}
1 & : 2 \\
3 & : 6
\end{align*}
\]
Find equivalent ratios of a given ratio.

Express a ratio in its simplest form.

Find the missing term in a pair of equivalent ratios.

**LEARNING OBJECTIVES**

**EQUIVALENT RATIOS**

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?

**IN FOCUS**

Textbook 5
P108

108 Ratio

LESSON 2
equivalent ratios

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?

Bina had 3 stalks of tulips and 6 stalks of roses. Try this using . Use to represent tulips and to represent roses. What ratio do you get?

**LET'S LEARN**

The ratio of the number of bouquets of tulips to the number of bouquets of roses is 1 : 2.

1. The ratio of the number of stalks of tulips to the number of stalks of roses is 3 : 6. Count the number of flowers in the bouquets. Did the number of stalks of tulips and stalks of roses change?

**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

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?

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).
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?

Give out counters and guide pupils to do the activity as explained.
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?

1. The ratio of the number of stars to the number of crescents is _____.
   The ratio in its simplest form is _____.

2. The capacities of some containers are given.
   Container Capacity
   Bottle 2000 ml
   Tank 8
   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 : _____.
   (b) The ratio of the capacity of the bottle to the capacity of the tank is 1 : _____.
   (c) The ratio of the capacity of the bottle and tank to the total capacity of the three containers is _____: __________.

3. What are the missing numbers?
   (a) 2 : 5 = ____ : 10  (b) 9 : 12 = 3 : ____
   (c) 10 : 8 : 12 = ____ : ____
   (d) 3 : 12 : 18 = 1 : ____

4. Express each of the following ratios in its simplest form.
   (a) 9 : 3 = ____:
   (b) 4 : 16 = ____:
   (c) 6 : 18 : 8 = ____: ____:
   (d) 10 : 25 : 15 = ____: ____:

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 = _____.
   Are the heights in the same units? How do we find the ratio in its simplest form?

6. Give out counters and guide pupils to do the activity as explained.

7. ACTIVITY TIME
   Which ratio is in its simplest form? How do you know?

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
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?
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.

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.

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.

Pupils should add 8 cups of lemon juice.
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.

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?

Mrs Lee
Son

8 units = 32
1 unit = \( \frac{32}{8} \) = 4
3 units = 3 × 4 = 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.

(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 32 : 10 : 27.
(b) Tom has 69 stamps altogether.
So, the ratio of the number of Thailand stamps to the total number of stamps that Tom has is 27 : 69.

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.

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.

Let pupils work in pairs or individually on the practice questions.
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. \(1 \text{ unit} = 200 \text{ ml}\)
   \(4 \text{ units} = 200 \text{ ml} \times 4 = 800 \text{ ml}\)

4. \(4 \text{ units} = 96\)
   \(1 \text{ unit} = 96 \div 4 = 24\)
   \(3 \text{ units} = 24 \times 3 = 72\)

5. \(15 \text{ units} = 105 \text{ cards}\)
   \(1 \text{ unit} = 105 \div 15 = 7 \text{ cards}\)
   \(8 \text{ units} = 7 \times 8 = 56 \text{ cards}\)

6. \(10 \text{ units} = 40 \text{ pupils}\)
   \(1 \text{ unit} = 40 \div 10 = 4 \text{ pupils}\)
   \(7 \text{ units} = 4 \times 7 = 28 \text{ pupils}\)

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. \(10 : 15 : 12\)
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?

You may use a to help you.

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.
If pupils are having difficulties 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**

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.

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.
If pupils are having difficulties 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.

Mind Workout

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.

How many different ways did you write the ratio?

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.

SELF–CHECK

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.

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.

| 1. (a) 3 : 5  
    (b) 5 : 3  
    (c) 3 : 8  
    (d) 5 : 8 |
| 2. (a) 5 : 1 : 2  
    (b) 5 : 4 : 2  
    (c) 2 : 1  |
| 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 |
| 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. |
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.

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.

   A
   Height
   Base
   B
   P
   C

   When AC is the base, BQ is the height.

   The height of a triangle is perpendicular to its base.

   A
   Height
   Base
   B
   Q
   C

   When AB is the base, CR is the height.

   A
   Height
   Base
   B
   R
   C

   The height of a triangle is perpendicular to its base.

   A
   Height
   Base
   B
   Q
   C

   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.

   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, \( \overline{EJ} \) is the height.
   (b) When ST is the base, \( \overline{TU} \) is the height.
   (c) When AB is the base, \( \overline{CD} \) is the height.

4. For each of the following triangles, name the base for the given height.
   (a) When BC is the height, \( \overline{AB} \) is the base.
   (b) When EG is the height, \( \overline{DF} \) is the base.
   (c) When JK is the height, \( \overline{LM} \) is the base.

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 \( \triangle LMN \)
   (b) Which triangle has OR as its height? Triangle \( \triangle OMN \)
   (c) Which triangle has PS as its height? Triangle \( \triangle PMN \)

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 \( \text{ACDF} \) 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.
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.

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.
Chapter 6

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.

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.

Textbook 5

125 Chapter 6

When the height is RD, the base is .
When the height is QE, the base is .
When the height is PF, the base is .

(b) What do you observe about the positions of the heights in triangles ABC and DEF?

Textbook 5

126

When the height is CX, the base is .
When the height is AY, the base is .
When the height is BZ, the base is .

Textbook 5

127

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.

Textbook 5

128

Work with pupils on the practice questions. Invite pupils to explain how they arrive at their answers.
Independent seatwork

Assign pupils to complete Worksheet 1 (Workbook 5A P117 – 120).

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.

![Diagram of triangles PQR, SUR, TRV and BCEG]

Answers

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
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 \( \angle EGF \)). 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) • set squares
• shape cut-outs (Activity Handbook 5 P23, 25) • 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?
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

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?

Area of triangle ABC = \( \frac{1}{2} \times \text{area of rectangle ABCD} \)

= \( \frac{1}{2} \times 6 \times 5 \)

= 15 cm²

LET'S LEARN

1. In triangle ABC, AB is the height and BC is the base of the triangle. Find its area.

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.
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.

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.
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.

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 = \( \frac{1}{2} \times b \times h \)).

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. Explain how you find your answers.
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 = \( \frac{1}{2} \times b \times h \)).

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.

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.

**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 cm²
   (b) \( \frac{1}{2} \times 10 \times 12 \)
   = 60 cm²
   (c) \( \frac{1}{2} \times 6 \times 10 \)
   = 30 cm²
   (d) \( \frac{1}{2} \times 24 \times 20 \)
   = 240 cm²
   (e) \( \frac{1}{2} \times 9 \times 8 \)
   = 36 cm²
   (f) \( \frac{1}{2} \times 6 \times 15 \)
   = 45 cm²

(g) \( \frac{1}{2} \times 15 \times 8 \)
   = 60 cm²

(h) \( \frac{1}{2} \times 14 \times 8 \)
   = 56 cm²

\( \frac{1}{2} \times 10 \times 8 \)
   = 40 cm²

56 cm² – 40 cm²
   = 16 cm²
Chapter 6
Lesson 2
LESSON PLAN

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 = \( \frac{1}{2} \times \text{base} \times \text{height} \), 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.
LEARNING OBJECTIVE

1. Find the area of composite figures made up of squares, rectangles and triangles.

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.

**LET'S LEARN 1.**

The figure is made up of rectangle R and triangle T. How can we find the area of this figure?

- **Area of rectangle R:** 20 × 18 = 360 m²
- **Base of triangle T:** 18 + 8 = 26 m
- **Area of triangle T:** \( \frac{1}{2} \times 26 \times 16 = 208 \text{ m}^2 \)
- **Area of figure:** 360 + 208 = 568 m²
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.

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.
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.

2. Figure ABCD is a rectangle. What is the area of the shaded part?

Area of shaded part = area of rectangle ABCD – area of triangle AFG – area of triangle EGC

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.

3. 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.

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.

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.
What you need:

1. Work in groups of 3 to 4.
2. Take any three shapes from .
3. Make three figures using these shapes. What do you notice about the figures made?
4. Copy the outline of each figure on paper.
5. Exchange the outlines you have drawn in 3 with another group. Identify the shapes used to make the figures.

ACTIVITY TIME

1. Find the area of each figure.
   (a) Area of rectangle = 15 \times 9 = 135 \text{ m}^2
   Area of triangle = \frac{1}{2} \times 15 \times 8 = 60 \text{ m}^2
   Area of figure = 135 + 60 = 195 \text{ m}^2
   (b) Area of rectangle ABCD = 26 \times 20 = 520 \text{ cm}^2
      Area of triangle BEC = \frac{1}{2} \times 26 \times 10 = 130 \text{ cm}^2
      Area of shaded part = 520 - 130 = 390 \text{ cm}^2
   (c) Area of triangle AEB = \frac{1}{2} \times 16 \times 8 = 64 \text{ m}^2
      Area of triangle CED = \frac{1}{2} \times 16 \times 12 = 96 \text{ m}^2
      Area of shaded part = 64 \times 96 = 160 \text{ m}^2
   (d) Area of rectangle ABCD = 40 \times 24 = 960 \text{ m}^2
      EF = 40 - 16 - 11 = 13 \text{ m}
      Area of triangle GEF = \frac{1}{2} \times 13 \times 24 = 156 \text{ m}^2
      Area shaded part = 960 - 156 = 804 \text{ m}^2

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.

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 \times 9 = 135 \text{ m}^2
   17 \text{ m} - 9 \text{ m} = 8 \text{ m}
   Area of triangle = \frac{1}{2} \times 15 \times 8 = 60 \text{ m}^2
   Area of figure = 135 + 60 = 195 \text{ m}^2
   (b) Area of A = \frac{1}{2} \times 10 \times 6 = 30 \text{ cm}^2
   Area of B = 15 \times 16 = 90 \text{ cm}^2
   Area of C = \frac{1}{2} \times 7 \times 6 = 21 \text{ cm}^2
   Area of figure = Area of A + Area of B + Area of C = 30 + 90 + 21 = 141 \text{ cm}^2
   (c) Area of triangle AEB = \frac{1}{2} \times 16 \times 8 = 64 \text{ m}^2
   Area of triangle CED = \frac{1}{2} \times 16 \times 12 = 96 \text{ m}^2
   Area of shaded part = 64 \times 96 = 160 \text{ m}^2
   (d) Area of rectangle ABCD = 40 \times 24 = 960 \text{ m}^2
      EF = 40 - 16 - 11 = 13 \text{ m}
      Area of triangle GEF = \frac{1}{2} \times 13 \times 24 = 156 \text{ m}^2
      Area shaded part = 960 - 156 = 804 \text{ m}^2
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 formula. 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.
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.
Chapter 6

PROBLEM SOLVING, MATHS JOURNAL AND PUPIL REVIEW

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

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.

Area of Triangles

Workbook 5A P129

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.

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.

SELF–CHECK

Area of Triangles

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.

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.

Maths journal

This journal task allows pupils to show their understanding and application of the skills and concepts taught using their own explanations.

Textbook 5 P142

Area of Triangles
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.
Answers Review 6 (Workbook 5A P131 – 136)

1. (a) CE
   (b) BC

2. (a) 12 cm²
   (b) 9 cm²
   (c) 10 cm²

3. (a) $\frac{1}{2} \times 12 \times 6$
   = 36 cm²
   (b) $\frac{1}{2} \times 10 \times 12$
   = 60 cm²
   (c) $\frac{1}{2} \times 24 \times 5$
   = 60 cm²
   (d) $\frac{1}{2} \times 32 \times 9$
   = 144 cm²

4. (a) Area of A = 7 × 5
   = 35 cm²
   Area of B = $\frac{1}{2} \times 7 \times 7$
   = 24.5 cm²
   Area of C = 9 × 7
   = 63 cm²
   Area of figure = Area of A + Area of B + Area of C
   = 35 cm² + 24.5 cm² + 63 cm²
   = 122.5 cm²

5. (a) 40 cm × 20 cm = 800 cm²
   20 cm – 8 cm = 12 cm
   $\frac{1}{2} \times 40 \text{ cm} \times 12 \text{ cm} = 240 \text{ cm}²$
   800 cm² – 240 cm² = 560 cm²
   Area of A = $\frac{1}{2} \times 3 \times 8$
   = 12 m²
   Area of B = 8 × 5
   = 40 m²
   Area of C = $\frac{1}{2} \times 8 \times 6$
   = 24 m²
   Area of shaded part = Area of A + Area of B + Area of C
   = 12 m² + 40 m² + 24 m²
   = 76 m²
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 cm³. They also learn to draw cubes and cuboids of different sizes and orientations on isometric grid papers.
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 cm³. They also learn to draw cubes and cuboids of different sizes and orientations on isometric grid papers.

**LEARNING OBJECTIVES**

1. Build solids with unit cubes.
2. Express volume of a solid in cubic units.

**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.

   The volume of a solid is the amount of space it occupies.
   The volume of 1 unit cube is 1 cubic unit.

   Can you recall the properties of a cube?
   All the sides of a unit cube are of equal length.
   Volume of 1 unit cube = 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 unit cubes and has a volume of cubic units.
   Solid has a larger volume than Solid B.

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.

   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.

   What other cubes and cuboids can you build using unit cubes?

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.

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 = 9 unit cubes
   - Solid B = 8 unit cubes
   - Solid C = 7 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 C, Solid A, Solid B, Solid D

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.

For Let’s Learn 6, allow pupils to work in pairs.

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.

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.
1. The solids shown are made up of unit cubes. What is the volume of each solid?
   (a) 5 cubic units  
   (b) 26 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)  
   (c)  

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. (a)  
   (b)  
   (c)  

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.
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 $1 \times 1 \times 1$ cube. Then, expand this concept with $2 \times 2 \times 2$, $3 \times 3 \times 3$ 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.
LEARNING OBJECTIVE

1. Draw cubes and cuboids on an isometric grid.

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.
Chapter 7

**LEARNING OBJECTIVE**

**DRAWING CUBES AND CUBOIDS**

Lesson 1

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.

**IN FOCUS**

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.

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**Textbook 5 P149**

1. The unit cube below is drawn on an isometric grid. What do you notice?

Take a and look at it from different directions. What do you notice?

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**Textbook 5 P150**

2. We can draw cubes of different lengths on isometric grids. One example is shown below.

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**Textbook 5 P151**

3. We can also draw cuboids of different sizes in different orientations on isometric grids. How are the following cuboids drawn?

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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.

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B and C are cubes. A and D are cuboids.

**ACTIVITY**

**TIME**

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.

The activity allows pupils to create their own cubes and cuboids and then translate them into isometric drawings in different orientations.

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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).
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. Draw the following figures on isometric grids.
   (a)  
   (b)  
   (c)  
   (d)  

2. Copy the following and complete the drawings of each cube or cuboid.
   (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)  
   (b)  
   (c)  

2. (a)  
   (b)  
   (c)  
   (d)  
   (e)  
   (f)  
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.
LEARNING OBJECTIVES

1. Measure volumes in cm³ and m³.
2. Use formula to find the volume of a cube/cuboid.

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.

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 cm³.

Ask pupils to count the number of 1-cm cubes to find the volume of the solid in cm³.

Make known to pupils that cm³ is a standard unit of measure for volume.
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.

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 \times 3 = 15 cubes in the top layer. Since there are 2 layers, there are 15 \times 2 = 30 cubes altogether.

Volume of cuboid = 30 cm³

We can also find the volume by multiplying the length, breadth and height.

5 \times 3 \times 2 = 30

The volume of the cuboid is 30 cm³.

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:

\text{Volume of a cuboid} = \text{Length} \times \text{breadth} \times \text{height}

Repeat the process used in Let's Learn 5 for Let's Learn 6 to find the volume of the 3 \times 3 \times 3 cube.

Let's Learn 7 gives pupils the opportunity to use the formula for finding volumes of cubes and cuboids in cm³ and m³ based on the given dimensions. Work through the example together with pupils.
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?

The volume of the cuboid is 30 cm$^3$.

$5 \times 3 \times 2 = 30$

We can also find the volume by multiplying the length, breadth and height.

Volume of cuboid = 30 cm$^3$

15 × 2 = 30 cubes altogether.

There are $5 \times 3 = 15$ cubes in the top layer. Since there are 2 layers, there are $15 \times 2 = 30$ cubes altogether.

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.

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.

1. What is the volume of each solid?

(a) Number of 1-cm cubes = 8
Volume = 8 cm$^3$

(b) Number of 1-cm cubes = 10
Volume = 10 cm$^3$

(c) Number of 1-m cubes = 6
Volume = 6 m$^3$

2. 1-m cubes were used to build the following solids. Find the volume of each solid.

(a) Volume = $2 \times 2 \times 2 = 8$ m$^3$

(b) Volume = $5 \times 5 \times 2 = 50$ m$^3$

3. Find the volume of each of the following solids.

(a) Volume = $10 \times 5 \times 6 = 300$ cm$^3$

(b) Volume = $35 \times 25 \times 3 = 2625$ m$^3$

(c) Volume = $7 \times 6 \times 3 = 126$ cm$^3$

(d) Volume = $8 \times 8 \times 5 = 320$ m$^3$
1. (a) 9
   (b) 12

2. (a) 10
   (b) 20

3. (a) Length = 5 cm
   Breadth = 1 cm
   Height = 2 cm
   Volume = \(5 \times 1 \times 2\)
   = 10 cm\(^3\)

   (b) Length = 3 cm
   Breadth = 3 cm
   Height = 3 cm
   Volume = \(3 \times 3 \times 3\)
   = 27 cm\(^3\)

   (c) Length = 4 cm
   Breadth = 4 cm
   Height = 2 cm
   Volume = \(4 \times 4 \times 2\)
   = 32 cm\(^3\)

4. (a) Length = 4 m
   Breadth = 4 m
   Height = 4 m
   Volume = \(4 \times 4 \times 4\)
   = 64 m\(^3\)

   (b) Length = 5 m
   Breadth = 2 m
   Height = 3 m
   Volume = \(5 \times 2 \times 3\)
   = 30 m\(^3\)

   (c) Length = 4 m
   Breadth = 2 m
   Height = 4 m
   Volume = \(4 \times 2 \times 4\)
   = 32 m\(^3\)

5. (a) 7 cm \(\times 5\) cm \(\times 3\) cm = 105 cm\(^3\)
   Volume = 105 cm\(^3\)

   (b) 9 cm \(\times 3\) cm \(\times 11\) cm = 297 cm\(^3\)
   Volume = 297 cm\(^3\)

   (c) 8 cm \(\times 8\) cm \(\times 8\) cm = 512 cm\(^3\)
   Volume = 512 cm\(^3\)

   (d) 6 m \(\times 7\) m \(\times 3\) m = 126 m\(^3\)
   Volume = 126 m\(^3\)

   (e) 20 cm \(\times 6\) cm \(\times 6\) cm = 720 cm\(^3\)
   Volume = 720 cm\(^3\)

   (f) 11 cm \(\times 11\) cm \(\times 11\) cm = 1331 cm\(^3\)
   Volume = 1331 cm\(^3\)
LEARNING OBJECTIVES
1. Find the volume of liquid in a rectangular tank.
2. Convert between ℓ, ml and cm³.

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?

For Let’s Learn 1, ask:
- How can we find the volume of the tank in cm³?

Lead pupils to observe that 1000 cm³ of water is equivalent to 1 litre. Recall 1 ℓ = 1000ml. 1000 ml = 1000 cm³; 1 ml = 1 cm³.
2. Express the following in cubic centimetres.
(a) 250 ml  \(250 \text{ cm}^3\)
(b) 1350 ml  \(1350 \text{ cm}^3\)
(c) 2 \(\times\) 150 ml  \(300 \text{ cm}^3\)
(d) 12 \(\times\) 5 ml  \(60 \text{ cm}^3\)

3. Express the following in litres and millilitres.
(a) 156 \(\text{cm}^3\)  \(156 \text{ ml}\)
(b) 5000 \(\text{cm}^3\)  \(5 \text{ l}\)
(c) 2650 \(\text{cm}^3\)  \(2.65 \text{ l}\)
(d) 12 060 \(\text{cm}^3\)  \(12.06 \text{ l}\)

4. Find the volume of water in the rectangular tank. Leave your answer in millilitres.
\[
\text{Volume of water} = 15 \times 7 \times 5 = 525 \text{ cm}^3 = 525 \text{ ml} = 0.525 \text{ l}
\]

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 \(\times\) 4 \(\times\) 16
= 1280 \(\text{cm}^3\)
= 1280 ml
= 1.28 l

Is there another way to solve this problem?

6. A rectangular tank measuring 50 cm by 28 cm by 20 cm contained some water. After 10 \(\text{ml}\) 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 \(\times\) 28 \(\times\) 20
= 28 000 \(\text{cm}^3\)
= 28 l

Amount of water added = 10 \(\text{ml}\)

Volume of water in the tank at first = 28 l – 10 \(\text{ml}\)
= 27.9 l

For Let’s Learn 2, guide pupils to do the conversion using the equivalence: 1 l = 1000 ml; 1 ml = 1 cm³

For Let’s Learn 3, guide pupils to do the conversion using the equivalence: 1 cm³ = 1 ml; 1000 cm³ = 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.

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.

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 26 cm. The oil fills the container to a height of 15 cm. What is the capacity of the bottle? 1000 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.

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.

For Let's Learn 3, guide pupils to do the conversion using the equivalence: 1 mƖ = 1 cm³. For Let's Learn 2, guide pupils to do the conversion using the equivalence: 1 cm³ = 1 ml; 1000 cm³ = 1 mƖ.

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? What do we already know? What do we need to find? What steps do we take to find the solution? What is the relationship between these two heights to help us find the volume of water needed? What is the capacity of the bottle? What is the height of the water? Is there another way to solve this problem?

Practice

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 26 cm. The oil fills the container to a height of 15 cm. What is the capacity of the bottle? 1000 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.

Independent seatwork

Assign pupils to complete 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 cm³
   = 576 ml
   (b) 10 cm × 10 cm × 15 cm
   = 1500 cm³
   = 1 ℓ 500 ml
   (c) 30 cm × 22 cm × 11 cm
   = 7260 cm³
   = 7 ℓ 260 ml
   (d) 20 cm × 15 cm × 18 cm
   = 5400 cm³
   = 5 ℓ 400 ml

4. 25 cm × 25 cm × 20 cm
   = 12 500 cm³
   = 12 500 ml
   = 12.5 ℓ

5. 30 cm − 13 cm = 17 cm
   20 cm × 4 cm × 17 cm
   = 1360 cm³
   = 1360 ml
   = 1 ℓ 360 ml

6. 3 ℓ = 3000 ml
   = 3000 cm³
   12 cm × 12 cm × 12 cm = 1728 cm³
   3000 cm³ − 1728 cm³ = 1272 cm³
   = 1 ℓ 272 ml

7. (a) 15 cm × 7 cm × 6 cm = 630 cm³
   20 cm × 10 cm × 3 cm = 600 cm³
   630 cm³ + 600 cm³ = 1230 cm³
   = 1230 ml
   = 1 ℓ 230 ml
   (b) 15 cm × 10 cm × 30 cm = 4500 cm³
   4500 cm³ − 1230 cm³ = 3270 cm³
   = 3270 ml
   = 3 ℓ 270 ml

8. 28 cm × 15 cm × 12 cm = 5040 cm³
   4 ℓ = 4000 ml
   = 4000 cm³
   5040 cm³ − 4000 cm³ = 1040 cm³
   = 1040 ml
   = 1 ℓ 40 ml

9. 40 cm × 20 cm × 30 cm = 24 000 cm³
   = 24 000 ml
   = 24 ℓ

   \( \frac{3}{4} \times 24 ℓ = 18 ℓ \)
Lesson Plan

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 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 $\times$ 10 cm $\times$ 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’.
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.
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

#### Textbook 5

P163

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?

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.

### 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.

I know how to...

- build solids using unit cubes.
- measure volume in cubic units.
- draw cubes and cuboids on isometric grid.
- 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.

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.
1. (a) 
(b) 

2. 10

3. (a) 4704 cm³
   (b) 0.072 m³

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 cm³
   7500 cm³ ÷ 8 = 937.5 cm³

7. (a) 20 cm × 15 cm × 2 cm = 600 cm³
    = 600 ml
   (b) 20 cm × 15 cm × 15 cm = 4500 cm³
    = 4500 ml
    4500 ml − 600 ml = 3900 ml
    = 3 ℓ 900 ml

8. 25 cm × 15 cm × 20 cm = 7500 cm³
   = 7500 ml
   \( \frac{1}{4} \times 7500 \text{ ml} = 1875 \text{ ml} \)
   = 1 ℓ 875 ml
   4.5 ℓ + 1 ℓ 875 ml = 6 ℓ 375 ml
Answers

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 = \( \frac{50 \text{ cm}}{10} \)
   = 5 cm
   3 units = \( 5 \text{ cm} \times 3 \)
   = 15 cm

8. 5 units = 2 ℓ
   1 unit = \( \frac{2 \ell}{5} \)
   = 400 ml
   4 units = \( 400 \text{ ml} \times 4 \)
   = 1600 ml
   = 1 ℓ 600 ml

9. 3 units = 6
   1 unit = \( \frac{6}{3} \)
   = 2
   5 units = \( 2 \times 5 \)
   = 10

10. 7 units = 28
    1 units = \( \frac{28}{7} \)
      = 4
    3 units = \( 4 \times 3 \)
      = 12

Revision 2A | 173
1. (a) 6  
   (b) 40  
   (c) 13  
   (d) 180, 2

2. 20

3. 13

4. (a) 125  
   (b) 351

5. $16 \text{ cm} - 6 \text{ cm} = 10 \text{ cm}$  
   $30 \text{ cm} \times 7 \text{ cm} \times 10 \text{ cm} = 2100 \text{ cm}^3$

6. $35 - $5 = $30 
   $35 + $30 = $65  
   $65 \times 4 = $260

7. $1050 \div $70 = 15 
   $400 \div $80 = 5  
   $5 : 15 = 1 : 3$

8. 15 units = Rs 105  
   1 unit = Rs $105 \div 15$  
   = Rs 7  
   8 units = Rs $7 \times 8$  
   = 56

9. Area of square = $64 \text{ cm}^2$  
   = $8 \text{ cm} \times 8 \text{ cm}$  
   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 $= 64 \text{ cm}^2 + 72 \text{ cm}^2 + 28 \text{ cm}^2$  
   = 164 cm$^2$

10. $16 \text{ cm} \times 10 \text{ cm} \times 22 \text{ cm} = 3520 \text{ cm}^3$  
    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. $35 - $5 = $30
   $35 + $30 = $65
   $65 × 4 = $260
   $1050 ÷ $70 = 15
   $400 ÷ $80 = 5
   5 : 15 = 1 : 3
   15 units = Rs 105
   1 unit = Rs 105 ÷ 15
   = Rs 7
   8 units = Rs 7 × 8
   = 56
23. 12
24. 3 : 2 : 4
25. $165 000 - $20 000 - $145 000
   $145 000 ÷ $5 000 = 29 months
26. $35 × 4 = 124 \frac{4}{5} \text{ kg}
27. \( \frac{5}{8} \times \frac{4}{5} = \frac{1}{2} \)
28. \( 1\frac{1}{4} \times 2 = 2\frac{1}{2} \ell \)
29. \( 2\frac{1}{2} \ell - 1\frac{2}{5} \ell = 1\frac{1}{10} \ell \)
30. 11 units = 132
    1 unit = 132 ÷ 11
    = 12
    8 units = 12 × 8
    = 96
31. Cost of 4 pens = $4q
    Cost of 3 notebooks = $2 × 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 × 9 + 11
    = 245
    Nora had 245 g of butter at first.
33. Area of big triangle
    \( = \frac{1}{2} \times 9 \text{ cm} \times 6 \text{ cm} \)
    \( = 27 \text{ cm}^2 \)
    Area of unshaded triangle
    \( = \frac{1}{2} \times 7 \text{ cm} \times 3 \text{ cm} \)
    \( = 10.5 \text{ cm}^2 \)
    Total shaded area = 27 cm$^2$ - 10.5 cm$^2$
    \( = 16.5 \text{ cm}^2 \)
34. $40 + 2 = 20$ cm
   Area of 1 triangle $= \frac{1}{2} \times 20 \times 10 = 100$ cm$^2$
   Area of figure = Area of 5 triangles
   $= 100 \times 5 = 500$ cm$^2$

35. Area of rectangle $ABCD = 20 \times 16 = 320$ cm$^2$
   Area of triangle $CDE = \frac{1}{2} \times 9 \times 16 = 72$ cm$^2$
   $AF = FB = 8$ cm
   Area of triangle $FGC = \frac{1}{2} \times 12 \times 8 = 48$ cm$^2$
   Total area of shaded part $= 320 - 72 - 48 = 200$ cm$^2$

36. $3$ units $= 19500$
   $1$ unit $= 19500 \div 3 = 6500$
   $2$ units $= 13000$

37. $1$ unit $= 120 - 50 = 70$
   $120 + 70 = 190$

38. $39 - 3 = 36$
   $36 \times 1 = 36$
   $3$ bags $= 36$ sweets
   $1$ bag $= 36 \div 3 = 12$ sweets
   $39$ bags $= 12 \times 39 = 468$ sweets

39. $18 \times 2$ points $= 36$ points
   $2 \times 1$ point $= 2$ points
   $36$ points $- 2$ points $= 34$ points
   Therefore, he answered $18$ questions correctly.

40. $\$52 - \$4 = \$48$
    $\$48 \div 2 = \$24$

41. AE $= ED = 2$ cm
   $AF = FB = 2 \times AE = 4$ cm
   Area of rectangle $ABCD = 8 \times 4 = 32$ cm$^2$
   Area of triangle $AFE = \frac{1}{2} \times 2 \times 4 = 4$ cm$^2$
   Area of triangle $CDE = \frac{1}{2} \times 2 \times 8 = 8$ cm$^2$
   Area of triangle $CBF = \frac{1}{2} \times 4 \times 4 = 8$ cm$^2$
   Area of triangle $EFC = 32 - 4 - 8 = 12$ cm$^2$
   Fraction shaded $= \frac{12}{32} = \frac{3}{8}$

42. $\frac{2}{7} \times \frac{5}{8} = \frac{5}{28}$
   $1 - \frac{5}{28} = \frac{23}{28}$
   $23 \div 28 = 92$ cupcakes
   $\frac{1}{28} = 92 \div 23 = 4$ cupcakes
   $\frac{28}{28} = 4 \times 28 = 112$ cupcakes

43. First mug
   lemon syrup
   water
   $5$ units $= 350$ ml
   $1$ unit $= 350 \div 5 = 70$ ml
   $4$ units $= 70 \times 4 = 280$ ml
   $280 - 250 = 30$ ml
34. \( \frac{40 \text{ cm}}{2} = 20 \text{ cm} \)

35. Area of 1 triangle  = \( 2 \times 20 \text{ cm} \times 10 \text{ cm} \) 
   = 100 cm\(^2\)

Area of figure  = Area of 5 triangles 
   = 100 cm\(^2\) \times 5 
   = 500 cm\(^2\)

36. Area of rectangle ABCD  = 20 cm \times 16 cm 
   = 320 cm\(^2\)

Area of triangle CDE  = \( \frac{1}{2} \times 9 \text{ cm} \times 16 \text{ cm} \) 
   = 72 cm\(^2\)

AF = FB = 8 cm

Area of triangle FGC  = \( \frac{1}{2} \times 12 \text{ cm} \times 8 \text{ cm} \) 
   = 48 cm\(^2\)

Total area of shaded part  = 320 cm\(^2\) 
   \[ \begin{align*} 
   &- 72 \text{ cm}^2 \\
   &- 48 \text{ cm}^2 \\
   \end{align*} \] 
   = 200 cm\(^2\)

37. 1 unit = 120 − 50 
   = 70

120 + 70 = 190

38. 39 − 3 = 36

36 \times 1 = 36

3 bags = 36 sweets 

1 bag  = \( \frac{36}{3} \) 
   = 12 sweets

39 bags  = 12 \times 39 
   = 468 sweets

39. 18 \times 2 \text{ points} = 36 \text{ points} 

2 \times 1 \text{ point} = 2 \text{ points} 

36 \text{ points} − 2 \text{ points} = 34 \text{ points} 

Therefore, he answered 18 questions correctly.

40. \$52 − \$4 = \$48

Bala

Ann

\$4

\$52 

\$48 \div 2 = \$24

41. AE = ED = 2 cm 

AF  = FB

= 2 \times AE

= 4 cm

Area of rectangle ABCD  = 8 cm \times 4 cm 
   = 32 cm\(^2\)

Area of triangle AFE  = \( \frac{1}{2} \times 2 \text{ cm} \times 4 \text{ cm} \) 
   = 4 cm\(^2\)

Area of triangle CDE  = \( \frac{1}{2} \times 2 \text{ cm} \times 8 \text{ cm} \) 
   = 8 cm\(^2\)

Area of triangle CBF  = \( \frac{1}{2} \times 4 \text{ cm} \times 4 \text{ cm} \) 
   = 8 cm\(^2\)

Area of triangle EFC  = 32 cm\(^2\) 
   \[ \begin{align*} 
   &- 4 \text{ cm}^2 \\
   &- 8 \text{ cm}^2 \\
   &- 8 \text{ cm}^2 \\
   \end{align*} \] 
   = 12 cm\(^2\)

Fraction shaded  = \( \frac{12}{32} \) 
   = \( \frac{3}{8} \)

42. \( \frac{27 \times 5}{8} = \frac{5}{28} \) 

\( 1 - \frac{5}{28} = \frac{23}{28} \) 

\( \frac{23}{28} \times 28 = 92 \text{ cupcakes} \) 

\( \frac{1}{28} \times 28 = 4 \text{ cupcakes} \) 

\( \frac{112 \text{ cupcakes}}{28} = 4 \times 28 \) 

43. First mug 

350 ml 

water

lemon

syrup

For the second mug, 

7 units = 350 ml 

1 unit = \( \frac{350 \text{ ml}}{7} \) 
   = 50 ml 

5 units = 50 ml \times 5 
   = 250 ml 

280 ml − 250 ml = 30 ml

44. \( \frac{100}{20} = 5 \text{ cm} \)

Area of triangle ADF  = \( \frac{1}{2} \times 5 \text{ cm} \times 6 \text{ cm} \) 
   = 15 cm\(^2\)

45. \( \frac{360}{20} = 18 \text{ cm} \)

Area of shaded part  = Area of triangle CDF 
   = \( \frac{1}{2} \times 18 \text{ cm} \times 20 \text{ cm} \) 
   = 180 cm\(^2\)
How can we multiply to find the answers?

\[ 0.1 \times 10 \]
\[ 0.01 \times 10 \]
\[ 0.001 \times 10 \]

A round trip following a path is about 7 km to 10 km. How do we express this distance in metres?

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.
MULTIPLYING BY TENS, HUNDREDS AND THOUSANDS

LEARNING OBJECTIVES
1. Multiply decimals by tens.
2. Multiply decimals by hundreds.
3. Multiply decimals by thousands.

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 it similar or different to multiplying 10/100/1000 by 10.
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

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
   (c) 0.8 × 70
   (e) 0.36 × 3.6
   (b) 0.108 1.08
   (d) 0.49 × 20
   (f) 1.6 16
   (a) 4.056 40.56
   (f) 227.227

4. A drink was sold in small packets of 0.33 ml each. Mrs Wong bought 20 such packets. What was the total volume of drink she bought?
   0.33 × 20 = 0.33 × 10 × 2
   = 3.3 ml
   = 6.6 ml

   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 = 1.45 × 10 × 5
   = 72.5 kg

   (a) 0.8 × 70 = 56
   (c) 0.305 × 50 = 15.25
   (e) 0.41 × 20 = 8.2
   (b) 0.12 × 10 = 1.2
   (d) 0.2 × 10 = 2.0
   (f) 0.8 × 70

7. What are the missing numbers?
   (a) 0.013 × 10 = 0.13
   (c) 0.305 × 50
   (e) 0.203 × 10
   (b) 0.12 and 10
   (d) 0.013 × 10
   (f) 0.12 and 10

   Multiply. Explain.
   (a) 0.013 × 10 = 0.13
   (c) 0.305 × 50
   (e) 0.203 × 10

   Complete Workbook 5B, Worksheet 1A + Pages 1–2

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### 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

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**Independent seatwork**

Assign pupils to complete Worksheet 1A (Workbook 5B P1 – 2).
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

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 × 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.
Let’s Learn 7 reinforces the concept of multiplying decimals by 100. Get pupils to explain their answers.

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) $2.1 \times 300 = 2.1 \times 3 \times 100$  
   $= 6.3 \times 100$  
   $= 630$  
   (b) $0.48 \times 200 = 0.48 \times 100 \times 2$  
   $= 48 \times 2$  
   $= 96$  
   (c) $1.092 \times 500 = 1.092 \times 100 \times 5$  
   $= 109.2 \times 5$  
   $= 546$

3. (a) 100  
   (b) 0.054  
   (c) 0.099  
   (d) 100

4. $2.05 \times 300 = 615 \text{ g}$

5. $3.75 \text{ km} \times 100 = 375 \text{ km}$
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.

Textbook 5 P171
4. There were 3000 participants in a race. Each participant ran 5.1 km. What was the total distance covered by the participants?

\[5.1 \times 3000 = 5.1 \times 3 \times 1000 = 15.3 \times 1000 = 15300 \text{ km}\]

The total distance covered was 15300 km.


\[1.725 \times 2000 = 1725 \times 2 = 3450\]


(a) \(0.01 \times 300\)  
(b) \(0.06 \times 400\)  
(c) \(1.12 \times 2000\)  
(d) \(2.84 \times 1000\)

7. Find the missing numbers.

(a) \(0.147 \times \)  
(b) \(1000 \times \)  
(c) \(0.972 \times \)

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**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.

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**Practice**

Multiply.

(a) \(0.215 \times 1000\)  
(b) \(0.017 \times 200\)  
(c) \(0.002 \times 400\)  
(d) \(0.02 \times 2000\)

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**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) \(0.012 \times 3000 = 0.012 \times 1000 \times 3\)  
   \(= 12 \times 3\)  
   \(= 36\)  

   (b) \(0.892 \times 6000 = 0.892 \times 1000 \times 6\)  
   \(= 892 \times 6\)  
   \(= 5352\)  

   (c) \(0.73 \times 4000 = 0.73 \times 1000 \times 4\)  
   \(= 730 \times 4\)  
   \(= 2920\)

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) \(6.3 \times 4000 = 6.3 \times 4 \times 1000\)  
   \(= 25.2 \times 1000\)  
   \(= 25200\)  

   (f) \(0.07 \times 5000 = 0.07 \times 1000 \times 5\)  
   \(= 70 \times 5\)  
   \(= 350\)  

   (g) \(2000 \times 0.696 = 2 \times 1000 \times 0.696\)  
   \(= 2 \times 696\)  
   \(= 1392\)  

   (h) \(5.25 \times 3000 = 5.25 \times 1000 \times 3\)  
   \(= 5250 \times 3\)  
   \(= 15750\)
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 $2.62 \times 3000$:  
$2.62 \times 1000 \times 3 \quad \text{or} \quad 2.62 \times 3 \times 1000$
$= 2620 \times 3 \quad \text{or} \quad = 7.86 \times 1000$
$= 7860 \quad \text{or} \quad = 7860$

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. $200 = 2 \times 100$), or (ii) using multiplication algorithm.
DIVIDING BY TENS, HUNDREDS AND THOUSANDS

LEARNING OBJECTIVES
1. Divide decimals by tens.
2. Divide decimals by hundreds.
3. Divide decimals by thousands.

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.

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 $1 \div 10 = 0.1$, and that $10 \times 0.1 = 1$. 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.
Let’s Learn 6 reinforces the concept of dividing 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.

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.
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) $29.4 \div 60 = 29.4 \div 10 \div 6$
   $= 2.94 \div 6$
   $= 0.49$
   (c) $375 \div 50 = 375 \div 10 \div 5$
   $= 37.5 \div 5$
   $= 7.5$

3. (a) 10  
   (b) 10  
   (c) 15.07  
   (d) 32.7  
   (e) 10  
   (f) 2

4. $26 \text{ m} \div 10 = 2.6 \text{ m}$

5. $272 \div 40 = $6.80
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

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

### Practice

**Independent seatwork**

Assign pupils to complete Worksheet 2B (Workbook 5B P9 – 10).

### Answers

**Worksheet 2B (Workbook 5B P9 – 10)**

1. Divide by 10

<table>
<thead>
<tr>
<th>Number</th>
<th>Divide by 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.7</td>
<td>0.007</td>
</tr>
<tr>
<td>1.9</td>
<td>0.019</td>
</tr>
<tr>
<td>21</td>
<td>0.21</td>
</tr>
<tr>
<td>46</td>
<td>0.46</td>
</tr>
<tr>
<td>135.7</td>
<td>1.357</td>
</tr>
<tr>
<td>509.9</td>
<td>5.099</td>
</tr>
</tbody>
</table>

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
Dividing by thousands

1. 
   - 100 + 1000 = 0.1
   - 10 + 1000 = 0.01
   - 1 + 1000 = 0.001

When a number is divided by 1000, the decimal point moves 3 places to the left.

2. Find the value of $5 \div 1000$.
   - $5 \div 1000 = 0.005$

3. Divide. Use number discs to help you.
   a) 3 + 1000 = 0.003
   b) 567 + 1000 = 0.567
   c) 1980 + 1000 = 1.98
   d) 24 + 1000 = 0.024

4. What is the value of $15 \div 3000$?
   - $15 \div 3 = 5$
   - $5 \div 1000 = 0.005$
   - $15 \div 3 \div 1000 = 0.005$

   a) $6 \div 2000 = 0.003$
   b) $690 \div 5000 = 0.19$
   c) $30 \div 6000 = 0.005$
   d) $3120 \div 2000 = 1.56$

6. Find the missing numbers.
   a) $711 + 1000 = 0.711$
   b) $247 \div 1000 = 0.247$
   c) $6 \div 1000 = 0.006$

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

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.
Chapter 8

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) \(1200 \div 2000 = 120 \div 2 \div 1000\)  
   \(= 600 \div 1000\)  
   \(= 0.6\)  
   (b) \(5400 \div 9000 = 540 \div 9 \div 1000\)  
   \(= 600 \div 1000\)  
   \(= 0.6\)  
   (c) \(74 000 \div 8000 = 74 \div 8\)  
   \(= 9.25\)  
   (d) \(23 600 \div 5000 = 23.6 \div 5\)  
   \(= 4.72\)

3. (a) 1000  
   (b) 1710  
   (c) 7941  
   (d) 1000

4. (a) 0.032  
   (b) 0.067  
   (c) 0.6  
   (d) 0.299  
   (e) \(14 \div 7000 = 14 \div 7 \div 1000\)  
   \(= 2 \div 1000\)  
   \(= 0.002\)  
   (f) \(9630 \div 3000 = 963 \div 3 \div 1000\)  
   \(= 3210 \div 1000\)  
   \(= 3.21\)  
   (g) \(66 \div 6000 = 66 \div 6 \div 1000\)  
   \(= 11 \div 1000\)  
   \(= 0.011\)  
   (h) \(8850 \div 5000 = 8850 \div 5 \div 1000\)  
   \(= 1770 \div 1000\)  
   \(= 1.77\)
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. \(1 \div 10 = 0.1\) and \(10 \times 0.1 = 1\)). 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 \(\times\) 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

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.

IN FOCUS

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.

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

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?
   0.8 m
   0 0.1 m 0.2 m 0.3 m 0.4 m 0.5 m 0.6 m 0.7 m 0.8 m 0.9 m 1 m
   0 10 cm 20 cm 30 cm 40 cm 50 cm 60 cm 70 cm 80 cm 90 cm 100 cm
3. Express 1.42 m in centimetres.
   \[ 1.42 \text{ m} = 1.42 \times 100 \]
   \[ = 142 \text{ cm} \]

   \(2.25 \text{ m} = 2 \text{ m} + 0.25 \text{ m} = 2 \text{ m} 25 \text{ cm}\)

   \(2.1 \text{ m} = 2 \text{ m} + 0.1 \text{ m} = 2 \text{ m} 10 \text{ cm}\)

6. A table is 172 cm wide. What is its width in metres?
   \[172 \text{ cm} = 172 \div 100 \text{ m} = 1.72 \text{ m}\]

7. The width of a school basketball court is 15 m 24 cm. What is the width of the basketball court in metres?
   \[15 \text{ m} 24 \text{ cm} = 15 \text{ m} + 0.24 \text{ m} = 15.24 \text{ m}\]

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.

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.

(a) 0.29 km = \(\frac{290}{1000}\) m
(b) 3.6 km = \(3600\) m
(c) 6.41 km = \(6410\) m
(d) 7.05 km = \(7050\) 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?

\[1600 \text{ m} = 1600 \div 1000 = 1.6 \text{ km}\]
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?

\[1 \text{ km} 250 \text{ m} = 1 \text{ km} + 0.25 \text{ km} = 1.25 \text{ km}\]
Mr Lim swam a total of 1.25 km.


(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

3. Write 3.25 kg in grams.

\[3.25 \text{ kg} = 3.25 \times 1000 = 3250 \text{ g}\]

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.

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

Assign pupils to complete Worksheet 3A (Workbook 5B P13 – 14).
(a) 0.29 km =
(b) 3.608 km =
(c) 6.41 km = km m
(d) 7.055 km = km 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
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
Mr Lim swam a total of 1.25 km.

(a) 1385 m = km
(b) 8520 m = km
(c) 462 m = km
(d) 28 m = km
(e) 1 km 983 m = km
(f) 6 km 205 m = km
(g) 10 km 37 m = km
(h) 13 km 4 m = km

250 m = 250 ÷ 1000
= 0.25 km

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 = cm
(b) 2.4 m = cm
(c) 5.95 m = m cm
(d) 7.01 m = m cm
(e) 6.6 km = m
(f) 3.508 km = m
(g) 9.12 km = km m
(h) 4.033 km = km m

2. Convert.
(a) 559 cm = m
(b) 38 cm = m
(c) 2 m 45 cm = m
(d) 9 m 7 cm = m
(e) 8 m = km
(f) 3016 m = km
(g) 4 km 203 m = km
(h) 5 km 3 m = km

3. Write 3.25 kg in grams.
3.25 kg = 3.25 × 1000
= 3250 g

Answers
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)

<table>
<thead>
<tr>
<th>Metres</th>
<th>Metres and Centimetres</th>
<th>Centimetres</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.24</td>
<td>2 m 24 cm</td>
<td>224 cm</td>
</tr>
<tr>
<td>1.8 m</td>
<td>1 m 80 cm</td>
<td>180 cm</td>
</tr>
<tr>
<td>4.56 m</td>
<td>4 m 56 cm</td>
<td>456 cm</td>
</tr>
</tbody>
</table>

(b)

<table>
<thead>
<tr>
<th>Kilometres</th>
<th>Kilometres and metres</th>
<th>Metres</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.4 km</td>
<td>6 km 400 m</td>
<td>6400 m</td>
</tr>
<tr>
<td>2.059 km</td>
<td>2 m 59 cm</td>
<td>2059 m</td>
</tr>
<tr>
<td>7.008 km</td>
<td>7 km 8 m</td>
<td>7008 m</td>
</tr>
</tbody>
</table>

6. 90 cm

7. 0.28
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.

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 when a decimal is multiplied by 1000, the decimal point shifts 3 places to the right.

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.
Textbook 5 P184

Answers

Worksheet 3B (Workbook 5B P15 – 16)

1. | Kilograms | Grams |
<table>
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<td>0.231</td>
<td>231</td>
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<tr>
<td>0.47</td>
<td>470</td>
</tr>
<tr>
<td>4.3</td>
<td>4300</td>
</tr>
<tr>
<td>8.09</td>
<td>8090</td>
</tr>
<tr>
<td>20.423</td>
<td>20423</td>
</tr>
<tr>
<td>397</td>
<td>397000</td>
</tr>
</tbody>
</table>

2. | Grams  | Kilograms |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
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<td>0.033</td>
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<td>51</td>
<td>0.051</td>
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<td>219</td>
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</tr>
<tr>
<td>500</td>
<td>0.5</td>
</tr>
<tr>
<td>397</td>
<td>0.397</td>
</tr>
</tbody>
</table>

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
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.

Refering 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 0.85 ℓ. 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.

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.

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.

Assign pupils to complete Worksheet 3C (Workbook 5B P17 – 18).

Allow pupils to discuss and work in pairs. Give pupils sufficient time to work on the practice before going through.
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 |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0.016 ℓ</td>
<td>16 ml</td>
<td></td>
</tr>
<tr>
<td>9.2 ℓ</td>
<td>9 ℓ 200 ml</td>
<td>9200 ml</td>
</tr>
<tr>
<td>6.05 ℓ</td>
<td>6 ℓ 50 ml</td>
<td>6050 ml</td>
</tr>
<tr>
<td>3.058 ℓ</td>
<td>3 ℓ 58 ml</td>
<td>3058 ml</td>
</tr>
<tr>
<td>7.101 ℓ</td>
<td>7 ℓ 101 ml</td>
<td>7101 ml</td>
</tr>
</tbody>
</table>

5. 0.33 ℓ

6. 150 150 ml
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 \( 0.725 \times 1000 = 725 \) 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 (+).
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.

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.

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.

Tom bought 5 files and 12 notebooks. He gave the cashier $50. How much change did he receive?

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. 33.45 ÷ 17
50 - 17 ÷ 33
Is your answer reasonable?
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?

\[
\begin{align*}
\text{Papaya} & : 2.35 \text{ kg} \\
\text{Watermelon} & : 4 \text{ kg 50 g}
\end{align*}
\]

\[4 \text{ kg 50 g} = 4050 \text{ g}
\]

\[4.05 - 2.35 = 1.7 \text{ kg}
\]

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?

\[
\begin{align*}
\text{Cup} & : 0.15 \text{ l} \\
\text{Glass} & : 0.15 + 0.15 = 0.30 \text{ l} \\
\text{Bottle} & : 6 	imes 0.30 = 1.80 \text{ l}
\end{align*}
\]

There is 1.80 l of water in the bottle.

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?

\[
\begin{align*}
\text{Key chain} & : 3 \times \text{ Badge} \\
10 \text{ units} & = 29 \text{ dollars} \\
1 \text{ unit} & = \frac{29}{10} \text{ dollars} = 2.90 \text{ dollars} \\
3 \text{ units} & = 3 \times 2.90 = 8.70 \text{ dollars} \\
\text{Each badge cost} & = 2.90 \text{ dollars} \\
\text{Each key chain cost} & = 3 \times 2.90 = 8.70 \text{ dollars} \\
\text{Tom spent} & = 2.90 + 8.70 = 11.60 \text{ dollars}
\end{align*}
\]

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.
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 18 packets. What is the mass of each packet in kg? 0.23 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 1.5 kg of celery cost altogether? $9.35

4. A pencil case costs four times as much as a pen. 2 pencil cases and 3 pens cost $24.78 altogether. Find the cost of each pencil case. 99

Answers

Worksheet 4 (Workbook 5B P19 – 23)

1. $0.35 \times 12 = \$7 \quad 1.75 \times 10 = \$17.50 \quad \$7 + 17.50 = \$24.50

2. \$4.25 − \$3.50 = \$0.75 \quad 0.75 + 2.30 = \$3.05

3. 3.7 \ell + 1.4 \ell = 5.1 \ell \quad 5.1 \ell ÷ 300 \text{ ml} = 5100 \text{ ml} ÷ 300 \text{ ml} = 17

4. 1 \text{ kg} \rightarrow \$35 \quad 950 \text{ g} = 0.95 \text{ kg} \quad 0.95 \text{ kg} \rightarrow \$35 \times 0.95 = \$33.25

5. \$6.70 − \$5 = \$0.70 \quad 2 \times \$0.70 = \$1.40

6. 6150 \text{ g} − 5150 \text{ g} = 1000\text{g} \quad 1000 \text{ g} ÷ 50 = 20 \text{ g} \quad 300 \times 20 \text{ g} = 6000 \text{ g} \quad 6150 \text{ g} − 6000 \text{ g} = 150 \text{ g}

7. (a) 2 \times 500 \text{ g} = 1000 \text{ g} \quad 2250 \text{ g} − 1000 \text{ g} = 1250 \text{ g} \quad 1250 \text{ g} ÷ 5 = 250 \text{ g}

(b) 250 \text{ g} + 500 \text{ g} = 750 \text{ g}

8. 1.4 \text{ m} = 140 \text{ cm} \quad 2 \text{ units} = 140 \text{ cm} − 60 \text{ cm} = 80 \text{ cm} \quad 1 \text{ unit} = 80 ÷ 2 = 40 \text{ cm} \quad 60 \text{ cm} − 40 \text{ cm} = 20 \text{ cm}

9. 1 \text{ apple and 1 pear} \rightarrow 40\text{¢} + 60\text{¢} = \$1 \quad 7 \text{ apples and 7 pears} \rightarrow 7 \times \$1 = \$7 \quad 7.40 − \$7 = 40\text{¢}

10. 80 \text{ 20-cent coins} \rightarrow 80 \times \$0.20 = \$16 \quad \$29.80 − \$16 = \$13.80 \quad \$13.80 ÷ \$0.30 = 46
Chapter 8

PROBLEM SOLVING, MATHS JOURNAL AND PUPIL REVIEW

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.

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? $7.05
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. $6.25

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
Chapter 8

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**

Textbook 4B P41

**Practice**

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?

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?

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?

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.

**Mind Workout**

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 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?

Mr Tan wanted to drive 726 km to get from Penang to Singapore. He set off from Penang with some petrol in his car.

**DECIMALS**

The task allows pupils to practice conversion of units with authentic measurements found in newspapers and magazines.

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).
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. $1 \ell = 10,500 \text{ ml}$
   $1 \ell 50 \text{ ml} = 1050 \text{ ml}$
   $10 \,500 \text{ ml} + 1050 \text{ ml} = 10$

5. 5.22 m = 522 cm
   $522 \div 58 = 9 \text{ minutes}$

6. $3 \times \$1.70 = \$5.10$
   $5 \times \$5.90 = \$11.80$
   $10 \times \$3.20 = \$32$
   $\$50 - \$5.10 - \$11.80 - \$32$
   $= \$1.10$

7. (a) $\$4.20 - \$2.45 = \$1.75$
   (b) $\$1.95 \times 2 = \$3.90$
   $\$3.90 = \$2.90 = \$1$
   (c) $\$4.20 - \$1.50 = \$2.70$
       The two drinks are fruit juice and soft drink,
       with a difference of $\$2.70$.

8. (a) $0.32 \ell + 0.3 \ell + 0.18 \ell + 0.1 \ell + 0.08 \ell + 0.07 \ell$
    $= 1.05 \ell$
   (b) $1 \ell 800 \text{ ml} = 1.8 \ell$
    $1.8 \ell - 1.05 \ell = 0.75 \ell$
    $0.75 \ell + 3 = 0.25 \ell$

9. (a) $5 \text{ m} = 500 \text{ cm}$
   $500 \text{ cm} + 12 = 41\frac{2}{3}$
   Greatest number she could wrap = 41
   (b) $41 \times 12 \text{ cm} = 492 \text{ cm}$
   $500 \text{ cm} - 492 \text{ cm} = 8 \text{ cm}$

10. $500 \text{ g} = 0.5 \text{ kg}$
    $3.53 \text{ kg} - 0.5 \text{ kg} = 3.03 \text{ kg}$
    $\frac{1}{2} \times 3.03 \text{ kg} = 1.515 \text{ kg}$

11. $3.45 \text{ kg} - 0.2 \text{ kg} = 3.25 \text{ kg}$
    $3.25 \text{ kg} + 0.25 \text{ kg} = 13$
    Sam has 15 paper bags.
    $15 \times 0.5 \text{ kg} = 7.5 \text{ kg}$
    $7.5 \text{ kg} + 0.3 \text{ kg} = 7.8 \text{ kg}$
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.
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.

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.
1. 60 out of 100 books are red.
   \[
   \frac{60}{100} = \frac{60\%}{100} = 60\%
   \]
   60% of the books are red.

2. What percentage of the books are blue?
   \[
   \frac{40}{100} = \frac{40\%}{100} = 40\%
   \]
   40% of the books are blue.

3. What percentage of the square grid is shaded?
   \[
   \frac{39}{100} = \frac{39\%}{100} = 39\%
   \]
   39% of the square grid is shaded.

4. In the diagram below, 1 out of 10 parts of the diagram is shaded.
   \[
   \frac{1}{10} = \frac{10\%}{100} = 10\%
   \]
   Since \(\frac{1}{10}\) is 10% and 1 whole can be represented by 100%, we can draw a diagram as shown below.

5. What percentage of the diagram is shaded?
   \[
   \frac{60}{100} = \frac{60\%}{100} = 60\%
   \]
   60% of the diagram is shaded.

6. 0.1, or one tenth, can be expressed as \(\frac{1}{10}\).
   \[
   0.1 = \frac{1}{10} = 10\%
   \]
   We can also express a decimal as a percentage.

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”.

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.

\[ 0.9 = \frac{9}{10} = 90\% \]

8. Express 0.25 as a percentage.

\[ 0.25 = \frac{25}{100} = 25\% \]

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%

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

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 \( \frac{x}{100} \)) 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.

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 $\frac{5}{20}$ as a percentage.

Method 1

\[
\frac{5}{20} = \frac{10}{40} = 40\% 
\]

Method 2

\[
\frac{5}{20} = 0.25 = 0.25 \times 100\% = 25\% 
\]

Method 3

\[
\frac{5}{20} = \frac{5}{20} \times 100\% = 25\% 
\]

15. Express each of the following fractions as a percentage.

(a) $\frac{2}{5} = 40\%$
(b) $\frac{15}{20} = 75\%$
(c) $\frac{3}{4} = 75\%$
(d) $\frac{10}{5} = 200\%$

Explain how you arrive at each answer.

16. What percentage of the grid is shaded?

60 out of 200 squares are shaded.

\[
\frac{60}{200} = 30\% 
\]

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) $\frac{45}{200} = 22.5\%$
(b) $\frac{0}{200} = 0\%$
(c) $\frac{140}{200} = 70\%$
(d) $\frac{349}{200} = 83\%$
(e) $\frac{5}{200} = 2.5\%$
(f) $\frac{100}{250} = 40\%$

Explain how you arrive at each answer.

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.

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?

\[ \frac{1}{3} \text{ of the packets contain milk.} \]

\[ \frac{1}{3} \times 100\% = \frac{100}{3}\% = 33\frac{1}{3}\% \]

33\frac{1}{3}\% of the packets contain milk.

19. What percentage of each figure is shaded?

20. Express each of the following fractions as a percentage.
   (a) \( \frac{1}{3} \) 16\%
   (b) \( \frac{7}{9} \) 77\frac{1}{9}\%

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\% \( \frac{6}{10} = \frac{3}{5} \)
   (c) 75\% \( \frac{3}{4} \)
   (d) 94\% \( \frac{47}{50} \)

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.

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.

Get 2 pupil volunteers and demonstrate how the game is played. Distribute the materials and get pupils to play within a stipulated time.
Work with pupils on the practice questions. Use pupils’ errors for class discussion to rectify them.
1. (a) \( \frac{40}{100} = 40\% \) of the squares are shaded.
   (b) \( \frac{3}{10} = \frac{30}{100} = 30\% \) 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. \( \frac{24}{40} \times 100\% = 60\% \)
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 $\frac{20}{25} \times 100\% = 4 \times 20 = 80\%$. 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 ($50\% = \frac{50}{100} = \frac{5}{10} = \frac{1}{2}$).

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 x 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.).
FINDING A PERCENTAGE PART OF A WHOLE

LEARNING OBJECTIVES
1. Find a percentage part of a whole.
2. Find discount, GST and annual interest.

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?”

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
- 30% Vanilla
- 20% Chocolate
- 20% Strawberry

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% of 80 = \frac{30}{100} \times 80
= 24

30% of 80 is the same as \frac{30}{100} of 80.

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} \times 80. We have learnt in fractions that \frac{30}{100} of 80 is \frac{30}{100} \times 80. You can now calculate the number of pupils who like chocolate ice cream.”
1. What is 30% of 80?

For Let's Learn 1(a), guide pupils using the same teacher language as Let's Learn 1(a). Ask:

- What percentage of the pupils like chocolate 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.

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.

Assign pupils to work on the practice questions individually. Go through the solutions with the class and discuss the methods used in each instance.

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Complete Workbook 5B, 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) \(\frac{25}{100} \times 120 = 30\)
      \(72 - 30 = 42\)
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.

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 \(\frac{20}{100}\). 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.

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

\[ \text{Interest} = \frac{1}{100} \times 5500 = 55 \]

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.

**Practice**

Solve.

1. A dress costs $54. Kate buys the dress at a discount of 28%. How much does Kate pay for the dress?

\[ \text{Discount} = 28\% \times 54 = 0.28 \times 54 = 15.12 \]

\[ \text{Price after discount} = 54 - 15.12 = 38.88 \]

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?

\[ \text{Discount} = 20\% \times 750 = 0.2 \times 750 = 150 \]

\[ \text{Price after discount} = 750 - 150 = 600 \]

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?

\[ \text{Interest} = \frac{1}{100} \times 45000 = 450 \]

\[ \text{Total amount} = 45000 + 450 = 45450 \]

4. $1.20 \times 6 = $7.20

\[ 100\% \rightarrow $7.20 \\
1\% \rightarrow \frac{7.20}{100} = 0.072 \\
90\% = 0.072 \times 90 = 6.48 \]

**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% $50 000
   1% $50 000 + 100 = $50 000
   Rs 500 000 + Rs 50 000 = Rs 550 000

6. 100% $5000
   1% $5000 + 100 = $50
   Rs 5000 + Rs 50 = Rs 5050

**Independent seatwork**

Assign pupils to complete Worksheet 2B (Workbook 5B P37 – 38).
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

\[ \frac{1}{100} \times Rs \ 5500 = Rs \]

Mr Ali will have Rs \[ \text{[calculated amount]} \] 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.

**Practice**

Solve.

1. A dress costs $54. Kate buys the dress at a discount of 28%. How much does Kate pay for the dress?

\[
\text{Discount} = \frac{28}{100} \times 54 = \$9.12
\]

Kate pays $54 - $9.12 = $44.88 for the dress.

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?

\[
\text{Discount} = \frac{20}{100} \times 750 = Rs \ 150
\]

Ann paid Rs 750 - Rs 150 = Rs 600 for the shoes.

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?

\[ \frac{1}{100} \times Rs \ 45000 = Rs \]

Mrs Lee will have Rs \[ \text{[calculated amount]} \] in her account at the end of the year.

Are there any items that are at a discount?

Complete Workbook 5B, Worksheet 2B • Pages 37 – 38

- Percentage | 225
- 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

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

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%.

   60% of 280 = \( \frac{60}{100} \times 280 = 168 \) cupcakes

   The bakery sold 168 cupcakes on Tuesday.

   **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 = \( \frac{60}{100} \times 280 \).
1. Solve up to 2-step word problems involving percentage.

**LEARNING OBJECTIVE**

**SOLVING WORD PROBLEMS**

**LESSON 3**

Textbook 5 P209

2. 120 pupils went on an excursion to Nathia Gali. 56% of the pupils were girls and the rest of the pupils were boys. How many boys went on the excursion?

Number of girls = 56%

Number of boys = 100% - 56% = 44%

**LET’S LEARN**

60% of 280 = 60

100 × 280 = 168

The bakery sold 168 cupcakes on Tuesday.

**IN FOCUS**

Discuss with pupils how the problem can be solved. Ask pupils to draw a model representing the information.

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 = \(\frac{60}{100} \times 280\).

**LET’S LEARN**

*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.

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.

20% of $15 = \(\frac{20}{100} \times 15\)

Ann saved $3.

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 = 8500 m

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%

\(\frac{85}{100} \times 60 = 51\)

The price of the dress after the discount is $51.

**LET’S LEARN**

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.

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 × 25 = 500
70% of 500 = 0.70 × 500 = 350

Method 2
70% of 20 = 0.70 × 20
= 14

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
1470
1500 × 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 × 80 = 160
160
80 × 100% = 20%

The shopkeeper threw away 20% of the oranges.

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 = \( \frac{\text{number of pupils present}}{\text{total number of pupils}} \) × 100%.

For Let's Learn 8, pupils need to find the total number of oranges. The percentage of oranges thrown away will be \( \frac{\text{number of oranges thrown away}}{\text{total number of oranges}} \) × 100%.
Chapter 9: Work with pupils on the practice questions.

Practice Textbook 5
P212

Percentage

1. A school has 1500 pupils. On Wednesday, 30 of the pupils were absent. Find the percentage of pupils who were present on that day.

\[ 1500 - 30 = 1470 \]
\[ \frac{1470}{1500} \times 100\% = \%
\]

\% of pupils were present on that day.

2. 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?

\[ 2 \times \frac{8}{80} \times 100\% = \%
\]

The shopkeeper threw away \% of the oranges.

3. 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**

\[ 20 \times 25 = 500 \]
\[ \frac{70}{100} \times 500 = \]

**Method 2**

\[ \frac{70}{100} \times 20 = \]

Sam packed sweets into the party bags.

Check your answers.

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? How do you tell?

<table>
<thead>
<tr>
<th>Shop</th>
<th>Discount Rule</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fair Shop</td>
<td>30% discount on all items</td>
</tr>
<tr>
<td>Cool Shop</td>
<td>Buy 2 Get 1 free!</td>
</tr>
</tbody>
</table>

\[ \frac{70}{100} \times 15 \text{ every month} = 72 \text{ cm} \]
\[ \frac{72}{4} = 18 \text{ cm} \]

\[ \frac{70}{100} \times 40 \text{ cm} = 28 \text{ cm} \]
\[ \frac{28}{2} = 14 \text{ cm} \]

Answers

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. \( \frac{85}{100} \times 80 = 68 \)
\[ \frac{1.50 \times 68}{2} = $102 \]

4. \( 100\% \rightarrow $1.50 \)
\[ 1\% \rightarrow \frac{$1.50}{100} = $0.015 \]
\[ 90\% = \frac{$0.015 \times 90}{100} = $1.35 \]

5. \( \frac{60}{100} \times 120 = 72 \text{ cm} \)
\[ \frac{72}{4} = 18 \text{ cm} \]

6. \( \frac{70}{100} \times 40 \text{ cm} = 28 \text{ cm} \)
\[ \frac{28}{2} = 14 \text{ cm} \]
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

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: 20%
Answers

Review 9 (Workbook 5B P43 – 46)

1. (a)

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% \( \rightarrow \) $1750
   1% \( \rightarrow \) $1750 + 100
   = $17.50
   85% = $17.50 \times 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%
    \( \frac{25}{100} \times 1400 = 350 \)
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.
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.

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.
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.

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.

2. The table shows the scores obtained by 4 pupils for a mathematics quiz. What is the average score of the 4 pupils?

<table>
<thead>
<tr>
<th>Name</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farhan</td>
<td>24</td>
</tr>
<tr>
<td>Siti</td>
<td>26</td>
</tr>
<tr>
<td>Ann</td>
<td>21</td>
</tr>
<tr>
<td>Sam</td>
<td>25</td>
</tr>
</tbody>
</table>

Total score = 24 + 26 + 21 + 25 = 96
Average score = 96 ÷ 4 = 24
The average score of the 4 pupils is 24.

3. The table shows the number of flights handled by an airport over 3 days in 2016.

<table>
<thead>
<tr>
<th>Day</th>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of flights</td>
<td>856</td>
<td>924</td>
<td>968</td>
</tr>
</tbody>
</table>

What was the average number of flights handled each day?

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.

<table>
<thead>
<tr>
<th>Level</th>
<th>Number of pupils</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary 1</td>
<td>300</td>
</tr>
<tr>
<td>Primary 2</td>
<td>238</td>
</tr>
<tr>
<td>Primary 3</td>
<td>195</td>
</tr>
<tr>
<td>Primary 4</td>
<td>202</td>
</tr>
<tr>
<td>Primary 5</td>
<td>246</td>
</tr>
<tr>
<td>Primary 6</td>
<td>181</td>
</tr>
</tbody>
</table>

Total number of pupils = 300 + 238 + 195 + 202 + 246 + 181 = 1302
Average number of pupils in each level = 1302 ÷ 6 = 217
The average number of pupils in each level is 217.

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. Three children have an average of 43 stickers each. How many stickers do the 3 children have altogether?

43 \times 3 = 129

The children have 129 stickers altogether.

6. A lift can carry 12 people with an average mass of 70 kg. What is the greatest load the lift can carry?

70 \times 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 \times 12 = $252

She will save $252 in 1 year.

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 \div 8 = 25

There are 25 levels in the game.

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 \div 700 = 4

He baked 4 trays of cookies.

10. Four 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?

Total score = 55 + 32 + 48 + 46
= 181
Average score = 181 \div 4 = 45.25

The average score of the 4 children is 45.25.

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 \times \text{number of data}

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.

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 x 3 = 468 cm
Total height of 3 boys and 1 girl = 153 x 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.

<table>
<thead>
<tr>
<th>Day</th>
<th>Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sunday</td>
<td>28.7°C</td>
</tr>
<tr>
<td>Monday</td>
<td>28.9°C</td>
</tr>
<tr>
<td>Tuesday</td>
<td>28.4°C</td>
</tr>
<tr>
<td>Wednesday</td>
<td>29.4°C</td>
</tr>
<tr>
<td>Thursday</td>
<td>29.2°C</td>
</tr>
</tbody>
</table>

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 = 28.7 + 28.9 + 28.4 + 29.4 + 29.2 = 141.8°C
Sum of temperatures from Monday to Friday = 5 x 29.0
Temperature on Friday = 

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.

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.

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.
1. The table shows the amount of money Bala saved from January to March.

<table>
<thead>
<tr>
<th>Month</th>
<th>January</th>
<th>February</th>
<th>March</th>
</tr>
</thead>
<tbody>
<tr>
<td>Savings</td>
<td>$8</td>
<td>$10</td>
<td>$15</td>
</tr>
</tbody>
</table>

What was Bala’s average monthly savings? $11

2. The following chart shows the highest daily temperatures from Monday to Sunday.

<table>
<thead>
<tr>
<th>Mon</th>
<th>Tue</th>
<th>Wed</th>
<th>Thu</th>
<th>Fri</th>
</tr>
</thead>
<tbody>
<tr>
<td>30°C</td>
<td>30°C</td>
<td>29°C</td>
<td>31°C</td>
<td>33°C</td>
</tr>
</tbody>
</table>

What is the average daily temperature for the 5 days? 30.2°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 litre of water a day. How much water does she drink in 30 days? 54 litre

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

**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
Average is part of the statistics strand of Mathematics, in continuation from bar graphs, line graphs and picture graphs learnt in previous grades.

Average should be a relatively simple concept to grasp.

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: 

$$\text{Average} = \frac{\text{total value}}{\text{number of data}}$$

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).

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.
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.

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: 37 years old

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

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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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.

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.
Answers  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 = $7.90$
Mr Goh needs to use the car park. What does he need to know?

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

How much does Mr Goh need to pay?

**IN FOCUS**

Mr Goh needs to pay to use the car park. What does he need to know?

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$1 per hour
65¢ per day

How much does Mr Goh need to pay?
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?

How much does Mr Goh need to pay?

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.

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?
Chapter 11

UNDERSTANDING RATE

LESSON 1

Mr Goh needs to pay to use the car park. What does he need to know?

Coupon Parking

7.00 am - 10.30 pm

$1 per hour

65¢ per day

'per' means for each.

Textbook 5

How much does Mr Goh need to pay?

The car park charges on weekdays are shown below.

Mr Goh wants to park his car for 4 hours on a weekday from 6.00 p.m.

UnderstandInG rate

Rate

LESSON

11

CHAPTER

IN FOCUS

1. How much does he need to pay every hour?

To find out Mr Goh's parking charges, we need to know how much he needs to pay for each hour.

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 × 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.

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.

Let's Learn 5

Mrs Tan can type 60 words per minute. How many words can she type in 15 minutes?

Mrs Tan types at a rate of 60 words per minute. How many words can she 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.

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.

What is the rate? How do we find the number of words that she can type in 15 minutes?

A factory makes 3234 toys in 7 hours. At this rate, how many toys can the factory make per hour?

A machine prints 75 sheets of paper per minute. How much time is needed to print 450 sheets of paper?

A machine prints 75 sheets of paper per minute.

Time taken to print 450 sheets = 450 ÷ 75 = 6 min

6 min is needed to print 450 sheets of paper.

Look at your electricity bill. How much electricity does your family use per day?

Mr Tan's family uses 30.9 kWh of electricity per day.

How much electricity does Mr Tan's family use per day?

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.

Mr Tan’s family uses 30.9 kWh of electricity per day.

The factory makes 462 toys per hour.

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.

Rate | 245

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.
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.

For Let's Learn 9, explain that $1.20 is charged for the first hour and $0.60 is charged for the additional $1 \frac{1}{2} \text{ hr or part thereof}$ since it does not exceed $1 \frac{1}{2} \text{ 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.}

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.
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.

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For Let's Learn 9, explain that $1.20 is charged for the 1st hour and $0.60 is charged for the additional \( \frac{1}{2} \) 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.

**Textbook 5 P228**

Rate

9.

The parking rate at a shopping mall is shown below.

<table>
<thead>
<tr>
<th>Parking Rate</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>$1.20 for the 1st hour</td>
<td></td>
</tr>
<tr>
<td>$0.60 for every additional ( \frac{1}{2} ) hr or part thereof</td>
<td></td>
</tr>
</tbody>
</table>

How much must Mr Lim pay to park his car at the mall for \( \frac{3}{4} \) hours?

1st hour \( \rightarrow \) $1.20

Next \( \frac{3}{4} \) hr \( \rightarrow \) $0.60 \times 2 = $2

Total amount to pay = $1.20 + $2 = $3.20

Mr Lim must pay $3.20.

'part thereof' means part of it.

**ACTIVITY 1 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

2. Discuss the examples you have found with your group members.
   - What other rates can you think of?

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.

**ACTIVITY 1 TIME**

Weiming wants to post a letter locally.

Local postage rates

<table>
<thead>
<tr>
<th>Mass step up to</th>
<th>Charge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard regular mail</td>
<td></td>
</tr>
<tr>
<td>20 g</td>
<td>$0.30</td>
</tr>
<tr>
<td>40 g</td>
<td>$0.37</td>
</tr>
</tbody>
</table>

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.

**Textbook 5 P229**

Rate

1. 17 \times $3 = $51

2. 45 \times 60 = 2700

3. 500 \times $0.20 = $100

4. 3240 \div 40 = 81 minutes

5. 600 \div 50 = 12 minutes

6. $30 \div 100 = $0.30

7. 36 + 30 = 1.2

8. 42 + 1.50 = 28

9. $2.25

10. 1st hour \( \rightarrow \) $1.50
      
      Next \( \frac{3}{4} \) hr \( \rightarrow \) $1 \times 2 = $2
      
      $1.50 + $2 = $3.50

Work with pupils on the practice questions.

**Independent seatwork**

Assign pupils to complete Worksheet 1 (Workbook 5B P55 – 58).
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, \( \frac{3234 \text{ toys}}{7 \text{ hrs}} \rightarrow 1 \text{ hr}, \frac{3234}{7} = 462 \text{ toys per hr}. \) 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.

SOLVING WORD PROBLEMS

IN FOCUS

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?

<table>
<thead>
<tr>
<th>Salary rates</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday to Friday</td>
<td>$6 per hour</td>
<td></td>
</tr>
<tr>
<td>Saturday and Sunday</td>
<td>$10 per hour</td>
<td></td>
</tr>
</tbody>
</table>

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.

Textbook 5 P230
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
Amount of water in the pail after 3 hours = 15 × 3 × 60
= 2700 ml

**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.

<table>
<thead>
<tr>
<th>Parking Rate</th>
<th>Exchange Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st hour</td>
<td>$1.80</td>
</tr>
<tr>
<td>Every additional 1/2 hr or part thereof</td>
<td>$0.80</td>
</tr>
</tbody>
</table>

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 1/2 hr = $4 ÷ $0.80 = 5
5 × 1/2 + 1 = 3 1/2
The greatest amount of time Mr Chen parked his car was 3 1/2 hr.

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.
(c) $250 = 3 × 250
= 750 Malaysian ringgit.
Mrs Ali will receive 750 Malaysian ringgit.

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 1/2 hr there are after the first hour. Remind pupils to add the initial first hour to get the final answer.

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.
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.

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.
Solve.

1. The table shows how much a waiter was paid at a restaurant.

<table>
<thead>
<tr>
<th>Time</th>
<th>Rate per hour</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:00 a.m. to 6:00 p.m.</td>
<td>$10 per hour</td>
</tr>
<tr>
<td>After 6:00 p.m.</td>
<td>$15 per hour</td>
</tr>
</tbody>
</table>

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? $75

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.

![Exchange Rate Graph]

(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

---

**Mind Workout**

The table shows the cost of printing photographs at a shop.

<table>
<thead>
<tr>
<th>Size</th>
<th>Cost per photo</th>
</tr>
</thead>
<tbody>
<tr>
<td>4R</td>
<td>$0.25</td>
</tr>
<tr>
<td>5R</td>
<td>$0.50</td>
</tr>
<tr>
<td>6R</td>
<td>$0.80</td>
</tr>
</tbody>
</table>

A school ordered 300 photos of size 4R and some photos of size 6R. The total amount spent on the photos was $180. How many photos did the school order altogether? 443

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Assign pupils to complete Worksheet 2 (Workbook 5B P59 – 63).
Answers

Worksheet 2 (Workbook 5B P59 – 63)

1. \[8 \times \$20 = \$160\]
\[4 \times \$30 = \$120\]
\[\$160 + \$120 = \$280\]

2. 1st hour \(\rightarrow \$3\)
Next 3 hours \(\rightarrow \$2 \times 6 = \$12\)
\[\$3 + \$12 = \$15\]

3. \[30 \div 2 = 15\]
\[15 \times 1.5 \ell = 22.5 \ell\]

4. \[\$4200 + \$960 = 4 \frac{3}{8} \text{ months}\]
The least number of months is 5 months.

5. (a) \[250 \div 1.3 = 192.31\]
She received US$192.31.
(b) \[10.40 \times 1.3 = 13.52\]
The book costs S$13.52.

6. (a) For Machine A.
30 minutes \(\rightarrow 2700\)
1 minute \(\rightarrow 2700 \div 30 = 90\)
For Machine B,
40 minutes \(\rightarrow 3720\)
1 minute \(\rightarrow 3720 \div 40 = 93\)
Machine B is faster.
(b) \[93 - 90 = 3\]
3 boxes per minute faster

7. 1st hour \(\rightarrow \$5\)
Next hour \(2 \frac{1}{2} \text{ hour} \rightarrow \$4 \times 3 = \$12\)
\[\$5 + \$12 = \$17\]

8. Water drains at 2 litres per minute.
16 \div 2 = 8 \text{ min}\]
4.55 p.m. + 8 min = 5.03 p.m.
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.

4. The table shows the rates for bicycle rental at a shop.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1st hour</td>
<td>$6</td>
</tr>
<tr>
<td>Every additional hour or part thereof</td>
<td>$4</td>
</tr>
</tbody>
</table>

Ann and Siti each rented a bicycle for 3 hours. How much did they pay in all?

Explain your answer. Use a diagram to help you.

443

---

The table shows the cost of printing photographs at a shop.

<table>
<thead>
<tr>
<th>Size</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
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<td>4R</td>
<td>$0.25 per photo</td>
</tr>
<tr>
<td>5R</td>
<td>$0.50 per photo</td>
</tr>
<tr>
<td>6R</td>
<td>$0.80 per photo</td>
</tr>
</tbody>
</table>

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?

Explain your answer. Use a diagram to help you.
Chapter 11

PROBLEM SOLVING, MATHS JOURNAL AND PUPIL REVIEW

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

The table shows the cost of printing photographs at a shop.

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Explain your answer. Use a to help you.

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?

Guide pupils by referring them to Let’s Learn 6 on P234 of the textbook. The steps are similar.

Mind Workout

Date: _______________

A taxi company calculates taxi fare as shown in the table.

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flag down (inclusive of 1st km or less)</td>
<td>$3</td>
</tr>
<tr>
<td>Every 400 m thereafter or less (up to 10 km)</td>
<td>$0.22</td>
</tr>
<tr>
<td>Every 350 m thereafter or less (after 10 km)</td>
<td>$0.22</td>
</tr>
</tbody>
</table>

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 × 400 m) = 7 km
Answer: 7 km

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.

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.

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.

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).
1. \(13 \times 6 = 78\)

2. \(300 \div 5 = 60\)

3. \(280 \div 40 = 7\) minutes

4. \(8 \times $1.20 = $9.60\)

5. \(42 \div 3.5 = $12\)

6. 
   - 1st hour $8
   - Next 2 hours $6 \times 2 = $12
   - $8 + $12 = $20

7. \(40 \ell - 25 \ell = 15 \ell\)
   - \(15 \ell \rightarrow 135\) km
   - \(1 \ell \rightarrow 135 + 15\)
     - = 9 km
   - \(25 \ell \rightarrow 9 \times 25\)
     - = 225 km

8. 
   - 10 presents $\rightarrow$ 20 minutes
   - 1 present $\rightarrow$ 20 + 10
     - = 2 minutes
   - 15 presents $\rightarrow$ 15 \times 2
     - = 30 minutes

9. 
   - 1st 500 copies $\rightarrow$ $0.35 \times 500$
     - = $175
   - Next 250 copies $\rightarrow$ $0.15 \times 250$
     - = $37.50
   - $175 + $37.50 = $212.50

10. Monday to Friday $(12 \times 4) \times 5$
    - = $240
    - Saturday $\rightarrow$ $18 \times 4$
      - = $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% → $\frac{17}{100} = 0.17$
   75% → $0.17 \times 75 = 12.75$

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

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. \(\frac{20}{100} \times 1100 = 220\)
   
   \(220 \times 12 = 2640\)

5. \(\frac{90}{100} \times 120 = 108\)

6. $75 \times 2 = 150$
   $81 \times 3 = 243$
   $243 - 150 = 93$

7. 5 p.m. to 6 p.m. → $1.20
   6 p.m. to 7.30 p.m. → $1.00 \times 2 = 2.00
   $1.20 + $2.00 = 3.20$

8. $427 - 25 = 402$
   $402 \div 33.50 = 12$ days

9. 5 × $80 = 400$
   $440 - 400 = 40$
   $40 \div 20 = 2$
   She worked 3 weekdays and 2 weekends.

10. $33 - 21 = 12$
    $12 \div 3 = 4$
    2 hours + (4 × \(\frac{1}{2}\) hr) = 4 hours
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.
LEARNING OBJECTIVE

1. Use the property of ‘sum of angles on a straight line is 180°’ to find unknown angles.

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?
Chapter 12

Angles

Look for examples of angles around you. What are some properties of these angles?

An angle is formed when two straight lines meet at a point.

We use a protractor to measure the size of the angle.

RECAP

What are some properties of these angles?

1. What do we use to measure an angle?
2. How many ways can you name and label an angle?
3. Ask:
   - What is the sum of angles on a straight line?
   - What is the sum of these two angles?
   - What type of angles are \( \angle PQS \) and \( \angle PQR \)?
   - What is the sum when we add these two angles on a straight line RS?

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.

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°.
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 $180^\circ$’.

For Let’s Learn 6 and 7, allow pupils to work out the answers before going through with the class.

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 $180^\circ$.

**Practice**

In each of the following, XYZ is a straight line. Find the unknown marked angles. Explain your answers.

(a) $\angle x = 180^\circ - 110^\circ = 70^\circ$

(b) $\angle z = 180^\circ - 90^\circ - 42^\circ = 48^\circ$

(c) $\angle y = 35^\circ - 25^\circ = 10^\circ$

8. Look at the diagram. Is XYZ a straight line?

No

How can we tell whether XYZ is a straight line?

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).
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.

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°.

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Assign pupils to complete Worksheet 1 (Workbook 5B P79 – 80).

Allow pupils to work in pairs and check each other's answers. Select some pupils to show and explain their work.

**Practice**
**Textbook 5**

**242.**

Look at the diagram. Is XYZ a straight line?

In each of the following, XYZ is a straight line. Find the unknown marked angles.

Explain your answers.

8. (a) \( \angle a = \) \( \)°
   (b) \( \angle b = \) \( \)°

(c) \( \angle c = \) \( \)°
   (d) \( \angle d = \) \( \)°

X Y

\[ \begin{align*}
Z & \qquad 35° \quad 40° \\
X & \quad \quad Y \\
Z & \quad \quad \quad 68° \\
X & \quad \quad Y \\
Z & \quad \quad \quad \quad 140° \\
X & \quad \quad Y \\
Z & \quad \quad \quad \quad \quad 85° \\
X & \quad \quad Y \\
Z & \quad \quad \quad \quad \quad \quad 105° \\
X & \quad \quad Y \\
Z & \quad \quad \quad \quad \quad \quad \quad 22° \\
X & \quad \quad Y \\
Z & \quad \quad \quad \quad \quad \quad \quad \quad 95° \\
X & \quad \quad Y \\
Z & \quad \quad \quad \quad \quad \quad \quad \quad \quad 35° \\
X & \quad \quad Y \\
Z & \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad 43° \\
X & \quad \quad Y \\
Z & \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad 139° \\
X & \quad \quad Y
\end{align*} \]

9. How can we tell whether XYZ is a straight line?

X Y

\[ \begin{align*}
43° \quad 139° \\
Z & \quad \quad X \\
Y & \quad \quad Z
\end{align*} \]

Complete Workbook 5B, Worksheet 1 • Pages 79 – 80

Answer Key for Worksheet 1

**Answers**

1. (a) 90
   (b) 82
   (c) 145
   (d) 43

2. (a) 45
   (b) 52
   (c) 104
   (d) 68
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.).
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.

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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.

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• 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.).

**LEARNING OBJECTIVE**
1. Use the property of sum of angles at a point is 360° to find unknown angles.

**ANGLES AT A POINT**

**LET’S LEARN**
1. The marked angles meet at a point. Use a protractor to measure each marked angle.

   \[ \angle a = 135°, \angle b = 45° \text{ and } \angle c = 180° \]

   \[ \angle a + \angle b + \angle c = 135° + 45° + 180° = 360° \]

   What is the sum of \( \angle a \) and \( \angle b \)?

   \[ \angle a = 135°, \angle b = 45° \text{ and } \angle c = 180° \]

   \[ \angle a + \angle b = 180° \]

   What is the sum of \( \angle a \) and \( \angle b \)?

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 \( \angle c \)?

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.

\(\angle a + \angle b + \angle c + \angle d = 360°\)

3. \(\angle a, \angle b, \angle c\) and \(\angle d\) meet at a point. Use a protractor to measure each of the angles.

\(\angle a = 100°, \angle b = 110°, \angle c = 120°, \angle d = 130°\)

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°’.

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°.
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°’.

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.

Allow pupils to work in pairs and check each other’s answers. Select some pupils to show and explain their work.

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
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. \( \angle \) 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 (\( \angle \), °). 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°’.
LEARNING OBJECTIVE

1. Use the property of ‘vertically opposite angles are equal’ to find unknown angles.

VERTICALLY OPPOSITE ANGLES

What do you notice about the marked angles?

1. WX and YZ are straight lines that cross at a point to form two pairs of vertically opposite angles.

\[ \angle a = 120° \] Find \( \angle b, \angle c \) and \( \angle d \).

\[ \angle a = \angle b = 120° \]

\( \angle a \) and \( \angle b \) are vertically opposite angles.

\[ \angle c \] and \( \angle d \) are also vertically opposite angles.

\[ \angle c = 180° - 120° = 60° \]

\[ \angle c = \angle d = 60° \]

Which pairs of angles are on a straight line? What do you notice about the angles?

Vertically opposite angles are equal.

LET’S LEARN

Teacher draws intersecting lines XW and YZ and marks out the four angles, \( \angle a, \angle b, \angle c \) and \( \angle d \). 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 \( \angle a \) 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.

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.
LESSON 3
Vertically opposite angles

What do you notice about the marked angles? Opposite angles.

Vertically opposite angles are equal.

\[ \angle YX = 180° - 120° \]
\[ c = 120° \]

Find \( \angle b \), \( \angle d \) and \( \angle a \).

\[ \angle b = \angle d = 60° \]
\[ \angle a = 120° \]

The pairs of angles are on a straight line. What do you notice about the angles?

Vertically opposite angles are equal.

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.

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, \( \angle COE \) and \( \angle DOF \). 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.
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.

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).
Chapter 12

6. POQ is a straight line. Are the statements true? Explain.

\[ \angle POT \quad \text{and} \quad \angle SOQ \ \text{are vertically opposite angles.} \]
\[ \angle POS \quad \text{and} \quad \angle TOQ \ \text{are vertically opposite angles.} \]

6. AB and CD are straight lines. Find \( \angle x \).

\[ \angle x = 90° + 30° = 120° \]

7. EF and GH are straight lines. Find \( \angle y \).

\[ \angle y = 30° + 110° = 140° \]

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.

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.

Practice

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
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
• ruler
• angle cut-out (Activity Handbook 5 P49)
• 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?
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.

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LETS LEARN

1. \( \angle COE = \angle FOD = 75^\circ \)

\[ \angle AOC = 180^\circ - \angle COE - \angle EOB \]
\[ = 180^\circ - 75^\circ - 62^\circ \]
\[ = 43^\circ \]

\( \angle COE \) and \( \angle FOD \) are vertically opposite angles.

\( \angle AOC \), \( \angle COE \) and \( \angle EOB \) are on the straight line \( AB \).

\( \angle AOC = \angle COE + \angle EOB + 180^\circ \)

Is there another way to find \( \angle AOC \)?

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IN FOCUS

Introduce the question to the pupils. Allow time for pupils to discuss in pairs. Invite pupils to share their responses.

Referring to the given figure, teacher helps pupils to see an overview of the problem from the In Focus by asking:
- Can we find \( \angle COE \)? Why?
- Now can we find \( \angle AOC \)? Why?

Teacher guides pupils through the worked example. Ask pupils to think of another way to find \( \angle AOC \). Using pupils’ responses, teacher works with pupils to solve the problem in other ways.
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 \( \angle AOB \) part of the sum of angles on a straight line?
- Since we know \( \angle DOE \), can we find \( \angle COD \)? Why?
- Now can we find \( \angle AOB \)? How and why?

Work together with the pupils to find the unknown angle. Ask pupils to think of another way to find \( \angle AOB \). 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.

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.
1. AB and CD are straight lines. Find $\angle A$ and $\angle C$.

\[ \angle A = 140° \]
\[ \angle C = 40° \]

2. AB and CD are straight lines. Find $\angle x$, $\angle y$, and $\angle z$.

\[ \angle x = 35° \]
\[ \angle y = 55° \]
\[ \angle z = 30° \]

3. PQ is a straight line. Find $\angle TOS$.

\[ \angle TOS = 87° \]

4. (a) 148, 122

(b) 62, 98

(c) 125, 20

5. 110, 160
Four straight lines, AB, CD, EF and GH cross at point O.

What is the sum of \(\angle p\), \(\angle q\), \(\angle r\) and \(\angle s\)? Explain.

Without calculation, pupils are to deduce that \(\angle HOA\) is equal to \(\angle r\) and that the 4 angles lie on the straight line DC.
Chapter 12

PROBLEM SOLVING, MATHS JOURNAL AND PUPIL REVIEW

Workbook 5B

Chapter 12

88

Mind Workout

Date: _______________

Four straight lines, AB, CD, EF and GH cross at point O.

\[ \angle p, \angle q, \angle r, \text{ and } \angle s \]

What is the sum of \( \angle p, \angle q, \angle r, \text{ and } \angle s \)? Explain.

Without calculation, pupils are to deduce that \( \angle HOA = \angle r \) and that the 4 angles lie on the straight line DC.

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 \( \angle z \) and 130°.

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.

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).

**MIND WORKOUT**

**MATHS JOURNAL**

**SELF-CHECK**

<table>
<thead>
<tr>
<th>Object</th>
<th>Picture</th>
<th>Type of angle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scissors</td>
<td><img src="image" alt="Scissors Image" /></td>
<td>Vertically opposite angles</td>
</tr>
<tr>
<td>Table</td>
<td><img src="image" alt="Table Image" /></td>
<td>Angles on a straight line</td>
</tr>
</tbody>
</table>

**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. \( \angle EOD = 50°, \angle COF = 50°, \angle DOF = 130° \)
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.
**LEARNING OBJECTIVE**

1. Properties of right-angled triangle, isosceles triangle and equilateral triangle.

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**Types of Triangles**

Look at these triangles. Can you sort them into three different groups?

We can sort them by their angles or by the lengths of their sides.

A B C D E G K L M H F J

**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.
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.

2. We can also group the triangles according to the lengths of their sides. Measure the sides of the triangle 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 a right angle.
   - (b) It has equal sides.
   - (c) It is an acute-angled triangle.
   - (d) It is also an isosceles triangle.

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.

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.
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.

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.

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).
1. Match each shape to its name. Each shape can only be matched to one name.

- Equilateral triangle
- Right-angled triangle
- Obtuse-angled triangle
- Isosceles triangle
- Acute-angled triangle

2. (a) A
   (b) C and E
   (c) C, D and F
   (d) 2
   (e) equal
Properties of Triangles

1. Match each shape to its name. Each shape can only be matched to one name.

- Equilateral triangle
- Right-angled triangle
- Obtuse-angled triangle
- Isosceles triangle
- Acute-angled triangle

Answers

2. (a) A
(b) C and E
(c) C, D and F
(d) 2
(e) equal

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.
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.

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.

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°.
Chapter 13

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.

**LEARNING OBJECTIVES**

**LESSON 2**

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.

**IN FOCUS**

Textbook 5

P263

**LESSON 2**

**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.

The three angles are on a straight line.

What is the sum of angles on a straight line?

2. ABC is a triangle. Find \( \angle x \).

\[ \angle x = 180° - 40° - 35° \]

\[ = 105° \]

We subtract the given angles from 180° to find the unknown angle.

Two angles are given.

\[ \angle x + 40° + 35° = 180° \]

3. Find the unknown marked angles in each triangle.

(a) \( \angle a = 180° - 32° - 138° \)

\[ = 10° \]

(b) \( \angle b = 180° - 97° - 35° \)

\[ = 48° \]

(c) \( \angle c = 180° - 44° - 125° \)

\[ = 35° \]

4. Use a protractor to measure the angles in this triangle. Find the sum of the angles.

(a) \( \angle a = 20° \)

(b) \( \angle b = 12° \)

(c) \( \angle c = 35° \)

(d) \( \angle a + \angle b + \angle c = 20° + 12° + 35° \)

\[ = 67° \]

Check your measurement if the sum is not equal to 180°.

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.

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.
5. Draw a right-angled triangle on a piece of paper and cut it out. Fold the triangle as shown.

\[ \angle a = 90° \]
\[ \angle b + \angle c = 180° - 90° = 90° \]

6. Find the unknown marked angle in each triangle.

(a) \[ \angle ACB = 90° - 54° = 36° \]
(b) \[ \angle BCA = 45° - 36° = 9° \]

When one angle of a triangle is a right angle, the sum of the other two angles is 90°.

7. Is triangle XYZ a right-angled triangle? Explain your answer.

No

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.

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.
Chapter 13

Properties of Triangles

5. Draw a right-angled triangle on a piece of paper and cut it out. How do you know that it is a right-angled triangle? The sum of the other two angles is 90°.

90° + ∠b + ∠c = 180°

36° 90° 45° 45°

Isosceles triangles

The two sides of the triangle match exactly.

8.

5.

Right-angled triangles

triangle as shown.

∠c = 180° – 90° = 90°

45°

An isosceles triangle has two equal angles.

∠∠b = ∠n and ∠∠m are opposite the two equal sides.

When one angle of a triangle = the other two angles is 90°.

For Let’s Learn 5, teacher shows a right-angled triangle with the marked angles. Ask pupils what the sum of the

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.

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°.
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).

Textbook 5 P270

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) $\angle c = (180^\circ - 130^\circ) ÷ 2$
   
   $= 25^\circ$

   (d) $\angle d = 180^\circ - 60^\circ - 60^\circ$
   
   $= 60^\circ$

4. (a) DEF
   
   (b) PQR

5. (a) $\angle w = 90^\circ ÷ 2$
   
   $= 45^\circ$

   (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
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 \( \angle p \)?
• 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 \( \angle p \)?
• In triangle ABD, do we know the size of \( \angle ABD \) and \( \angle ADB \)? 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 \( \angle q \)?
• How can we find \( \angle ACB \)? Why?
• Now can we find \( \angle q \)? Why?

For Let’s Learn 3,
• What do we need to find?
• What are the angles on the straight line BCD?
• Can we find \( \angle ACB \) first? How and why?
• Now can we find \( \angle x \)? 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 \( \angle z \).

\begin{align*}
\angle CAB &= \angle CBA = 30^\circ \\
\angle ACB &= 180^\circ - \angle CAB - \angle CBA \\
&= 120^\circ \\
\angle z &= \angle ACB = 120^\circ
\end{align*}

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 \( \angle z \)?
- What type of triangle is CAB?
- How can we find the size of \( \angle ACB \) 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 \( \angle DCB \) a part of?
- What is the other angle to that part?
- Do we know the size of \( \angle ACB \)? How can we find it?
- What type of triangle is ACD?
- How can we find the size of \( \angle DCA \)?
Work through the solution with pupils. Ask pupils for the property that they had applied in each step.

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.
Chapter 13

Sum of angles in a triangle = 180°

Triangle CAB is an isosceles triangle.

\[ \angle CAB = \angle CBA = 30° \]

\[ \angle ACB = \angle DCB. \]

\[ \angle DCB = 120° \]

\[ 120° - 30° = 90° \]

\[ \angle DCB = 90° \]

\[ \angle ACB = 180° - 90° = 90° \]

\[ \angle ACB = 90° \]

Properties of Triangles

What you need:

Work in pairs.

1. Look at each triangle and identify each type of triangle.

For Let’s Learn 5, guide pupils with the following questions:

- How can we find the size of \( \angle ACB \)? How can we find it?
- What is the other angle to that part?
- Vertically opposite angles
- Which angle is the unknown angle vertically opposite to the unknown angle?
- Since ACD and ECB are straight lines, which angle is \( \angle ACB \) first?
- \( \angle ACB \) a part of? \( \angle DCA \)?
- What type of triangle is CAB?
- What type of triangle is ACD?
- Do we know the size of \( \angle DCA \)?
- Which angle is the unknown angle in \( \triangle ACD \)?
- How can we find the size of \( \angle DCA \)?
- How can we find it?
- What property that they had applied in each step.
- The activity allows pupils to solve problems in pairs.
- Teacher walks around to check on the mathematical errors or difficulty pupils might encounter.
- 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).
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) ÷ 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) ÷ 2 \\
= 31^\circ \\
(f) \angle CDE = 180^\circ - 90^\circ - 50^\circ \\
= 40^\circ \\
\angle v = (180^\circ - 40^\circ) ÷ 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) ÷ 2 \\
= 55^\circ \\
\angle y = 180^\circ - 55^\circ \\
= 125^\circ \\
\angle y = 180^\circ - 90^\circ - 55^\circ \\
= 35^\circ
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.

---

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?

---

**IN FOCUS**

Figure ABC is a triangle, where BC = 6 cm, ∠ABC = 50° and ∠ACB = 60°. How do we draw Figure ABC?

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.

---

**LET’S LEARN**

1. Draw a line measuring 6 cm. Label the line BC.

   \[ \text{Step 1: } \text{Draw a line measuring 6 cm. Label the line BC.} \]

2. Use a protractor to draw and label an angle of 50° at B.

   \[ \text{Step 2: } \text{Use a protractor to draw and label an angle of 50° at B.} \]

---

**Figure ABC**

Make a sketch of figure ABC before drawing.

---

**Textbook 5** P276

**Properties of Triangles**
1. How do we draw Figure ABC?

2. Draw a triangle DEF, in which DE = 4 cm, EF = 5 cm and ∠DEF = 55°.

   - **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.
   - **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°.

   - **Step 1** Draw a line measuring 6 cm. Label the line MN.
   - **Step 2** Make a sketch of triangle LMN before drawing.
   - **Step 3** Use a ruler to draw and label an angle of 60° at C.

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.

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.
Remind pupils to label their completed triangles and check against the sketches that they had made earlier.

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.

Check your drawing. Is the length of PQ equal to the length of PR?

Sketch. Then draw each of the following triangles.

(a) Triangle ABC, where BC = 6 cm, AB = 7 cm and \( \angle ABC = 110° \).
(b) Triangle EFG, where FG = 5 cm, \( \angle EFG = 40° \) and \( \angle EGF = 70° \).
(c) Triangle JKL, where KL = 8 cm, JK = 6 cm and \( \angle JKL = 90° \).
(d) Triangle PQR, where QR = 6 cm, \( \angle QRP = 60° \) and \( \angle PQR = 30° \).

Complete Workbook 5B, Worksheet 3 • Pages 111 – 113

MIND WORKOUT

Figure ABC is an isosceles triangle, where AB = AC and \( \angle BAD = 30° \). Figure ADE is an equilateral triangle. Find \( x \).

 answers

1. \( A \)
\( B \)
\( C \)

2. \( D \)
\( E \)
\( F \)

3. \( G \)
\( H \)

4. \( I \)
\( J \)

5. \( T \)
\( S \)
\( U \)

6. \( X \)
\( Y \)
\( Z \)

Properties of Triangles

Assign pupils to complete Worksheet 3 (Workbook 5B P111 – 113).
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

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.

**PROBLEM SOLVING, MATHS JOURNAL AND PUPIL REVIEW**

**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.

**PROBLEM SOLVING, MATHS JOURNAL AND PUPIL REVIEW**

**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.

**PROBLEM SOLVING, MATHS JOURNAL AND PUPIL REVIEW**

**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

Through deduction, pupils can use the properties of an equilateral triangle and an isosceles triangle to solve for $\angle x$. Pupils need to recognise $\angle ACD = 60^\circ + 90^\circ$.

ABC is an equilateral triangle and BCD is a right-angled triangle where BC = CD.

Find $\angle x$.

Answer: 45°

Chapter 13

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.

<table>
<thead>
<tr>
<th>Clue</th>
<th>Drawing</th>
<th>Name of shape</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two sides are equal.</td>
<td></td>
<td>Isosceles triangle</td>
</tr>
<tr>
<td>All the sides are not equal.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All angles are equal.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>There is one right angle.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>There are two right angles.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>There are two acute angles.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>There are two obtuse angles.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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).
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) \( \angle d = (180^\circ - 100^\circ) ÷ 2 \)
   \( = 40^\circ \)
(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) \( \angle BDC = (180^\circ - 62^\circ) ÷ 2 \)
   \( = 59^\circ \)
\( \angle s = 180^\circ - 59^\circ \)
   \( = 121^\circ \)
\( \angle t = 180^\circ - 90^\circ - 59^\circ \)
   \( = 31^\circ \)
(f) \( \angle x = 180^\circ - 90^\circ - 37^\circ \)
   \( = 53^\circ \)
\( \angle y = 180^\circ - 53^\circ - 53^\circ \)
   \( = 74^\circ \)

3. \( 3 \text{ cm} \)
\( 5 \text{ cm} \)
\( 107^\circ \)
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.
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.

**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**

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.
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.

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.

\[ \angle x = 50° \]
\[ \angle y = 180° - 50° = 130° \]

4. Figure ABCD is a parallelogram. Find \( \angle x \).

\[ \angle BCD = \angle BAD = 110° \]
\[ \angle x = 180° - 30° - 110° = 40° \]

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 \( \text{BCD} \)?
- How can we find \( \angle BCD \) in the parallelogram \( ABCD \)? Why?
- Now can we find \( \angle x \)? Which property will we use?

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?
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.

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 \( \angle c \).

\[
\angle a + \angle b = 180^\circ, \quad \angle b + \angle c = 180^\circ
\]

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°.

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.

\[
\angle x = 180^\circ - 120^\circ = 60^\circ
\]

\[
\angle y = 180^\circ - 55^\circ = 125^\circ
\]

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 \( \angle SQR \)? Why?
- How can we find \( \angle PQR \)? Why?
- Now can we find the unknown \( \angle z \)?
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.

Allow pupils to work in pairs before going through with the class. Invite pupils to present and explain their solutions.
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.

What you need:

Work in pairs.

1. Draw each of the following 4-sided figures on square grid paper.
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.

Independent seatwork

Assign pupils to complete Worksheet 1 (Workbook 5B P121 − 126).

Properties of Four-sided Figures | 311

Answers

Worksheet 1 (Workbook 5B P121 − 126)

1. (a) DC, BC
   (b) AB, AD
   (c) y, z
   (d) \( \angle w + \angle x = 180^\circ \)
   \( \angle w + \angle z = 180^\circ \)
   \( \angle x + \angle y = 180^\circ \)
   \( \angle y + \angle z = 180^\circ \)

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) \( \angle w + \angle z = 180^\circ \)
   \( \angle x + \angle y = 180^\circ \)

5. (a) 60
   (b) 34
   (c) 71
   (d) 32
   (e) 47
   (f) 30
   (g) 30
   (h) 80

*6. \( \angle SXQ = 135^\circ \)
   \( \angle PQX = 180^\circ - 135^\circ = 45^\circ \)
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 parallelogram, 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
- scissors
- square grid paper (Activity Handbook 5 P25)
- cut-outs of different four-sided figures (Activity Handbook 5 P59 – 64)

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°?”.
LEARNING OBJECTIVE

1. Draw different four-sided figures according to given dimensions.

In Focus

Figure ABCD is a parallelogram, where \( AB = 4 \text{ cm} \), \( BC = 6 \text{ cm} \) and \( \angle ABC = 50^\circ \). How do we draw figure ABCD?

Make a sketch of figure ABCD before drawing.

1. Step 1 Draw a line measuring 6 cm. Label the line BC.

2. Step 2 Use a protractor to draw and label an angle of 50° at B.

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.
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.

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, \( \angle EFG = 60^\circ \) and \( \angle FGH = 50^\circ \). Draw and label figure EFGH.

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.

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.

A set square is necessary to draw the unknown opposite side parallel to FG.

Remind pupils to label their completed trapezium.
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 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.

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.
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.

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.

Independent seatwork

Assign pupils to complete Worksheet 2 (Workbook 5B P127 – 129).

Answers Worksheet 2 (Workbook 5B P127 – 129)

1. \(\text{A} \rightarrow \text{D} \rightarrow \text{C} \rightarrow \text{B} \rightarrow \text{A}\)

2. \(\text{D} \rightarrow \text{G} \rightarrow \text{F} \rightarrow \text{E} \rightarrow \text{D}\)

3. \(\text{K} \rightarrow \text{N} \rightarrow \text{M} \rightarrow \text{L} \rightarrow \text{K}\)

4. \(\text{R} \rightarrow \text{S} \rightarrow \text{P} \rightarrow \text{Q} \rightarrow \text{R}\)

5. \(\text{Z} \rightarrow \text{Y} \rightarrow \text{X} \rightarrow \text{W} \rightarrow \text{Z}\)

6. \(\text{Z} \rightarrow \text{Y} \rightarrow \text{X} \rightarrow \text{W} \rightarrow \text{Z}\)
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 parallelogram 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

Chapter 14

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 parallel goram 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.

Mind Workout
Date: _______________

Figure ABCD is a rhombus of side 6 cm. Draw and label figure ABCD.

What do you think about the angles?

Accept all answers that are correct.
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 $\angle PQR$.

Mind Workout

In the figure below, $PS // QR$, $\angle QRP = \angle RPS = 39^\circ$ and $\angle RST = 87^\circ$. PST is a straight line.

Can you find $\angle PRS$ and $\angle PQR$? Explain.

I know how to...

- identify and describe parallelograms, rhombuses and trapeziums.
- find unknown angles in four-sided figures.
- draw parallelograms, rhombuses and trapeziums.

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.

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.

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. $\angle x = 95^\circ$  
   $\angle y = 71^\circ$

4. 

5. 

Answers

Review 14 (Workbook 5B P131 – 134)
Chapter 14

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 \( \angle PQR \).

Mind Workout

In the figure below, PS // QR, \( \angle QRP = \angle RPS = 39° \) and \( \angle RST = 87° \). PST is a straight line.

Can you find \( \angle PRS \) and \( \angle PQR \)? Explain.

I know how to...

- identify and describe parallelograms, rhombuses and trapeziums.
- find unknown angles in four-sided figures.
- draw parallelograms, rhombuses and trapeziums.

Self-Check

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.

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).

1. (a) 64° (b) 65° (c) 42°

2. (a) 24° (b) 47°

3. \( \angle x = 95° \) \( \angle y = 71° \)

4. [Questions and answers]

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

Probability

INTRODUCTION

This chapter introduces the concept of probability. Pupils will learn to find the probability of an event occurring or an event not occurring.
LEARNING OBJECTIVE
1. Understand what probability means.
2. Find the probability of an event occurring or an event not occurring.

How can we find out the probability of Sam picking a marble of each colour?

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?

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?
LETS LEARN

1. The chance of an event occurring is called probability. Probability is measured on a scale between 0 and 1.

<table>
<thead>
<tr>
<th>Probability</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Im probable</td>
<td>Certain even chance unlikely even chance impossible to occur</td>
</tr>
</tbody>
</table>

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’)
- 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 of each colour. Explain that to find the probability of Sam picking a green marble, it is expressed as a fraction of green marbles in the bag is the greatest.

2. The chance of the sun rising in the morning is certain. The probability is 1.

3. The chance of rolling 2 dice 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 $\frac{3}{11}$.

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.

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.

WORK WITH PUPILS ON THE PRACTICE QUESTIONS:

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.

<table>
<thead>
<tr>
<th>Chance</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impossible</td>
<td></td>
</tr>
<tr>
<td>Unlikely</td>
<td></td>
</tr>
<tr>
<td>Even</td>
<td></td>
</tr>
<tr>
<td>Likely</td>
<td></td>
</tr>
<tr>
<td>Certain</td>
<td></td>
</tr>
</tbody>
</table>

2. What is the probability of getting '6' when a die is rolled?

WORK WITH PUPILS ON THE PRACTICE QUESTIONS:
Complete Workbook 5B, Worksheet 1 • Pages 135 – 136

3. Nora tossed a coin. What is the probability of her getting ‘tails’?

4. There are 6 men, 5 women, 3 boys and 3 girls in a queue. Find the probability of picking a child.

MATHS JOURNAL
A box contains identical cards with alphabets that spell ‘PAKISTAN’.

What is the probability of picking a card with the alphabet ‘A’?

SELF-CHECK
How many cards are there altogether?
How many cards have the alphabet ‘A’?

Mind Workout
What is the probability of the spinner not landing on E?

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
   (f) 0
   (d) \(\frac{3}{8}\)
   (e) \(\frac{1}{4}\)

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) \(\frac{1}{8}\)
Lesson Plan

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:

\[
\begin{array}{cccc}
\text{impossible} & \text{even chance} & \text{certain} \\
0 & \frac{1}{2} & 1 \\
\end{array}
\]

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
- spinner (Activity Handbook 5 P65)
- marbles
- 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:

<table>
<thead>
<tr>
<th>Probability</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>between 0 and (\frac{1}{2})</td>
<td>unlikely to occur</td>
</tr>
<tr>
<td>between (\frac{1}{2}) and 1</td>
<td>likely to occur</td>
</tr>
<tr>
<td>0</td>
<td>impossible to occur</td>
</tr>
<tr>
<td>(\frac{1}{2})</td>
<td>even chance (or ‘50-50 chance’) of occurring</td>
</tr>
<tr>
<td>1</td>
<td>certain to occur</td>
</tr>
</tbody>
</table>
The probability of the spinner landing on a prime number is \(\frac{1}{3}\).

Fill in the spinner with possible numbers.

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’? \( \frac{3}{2} \)
4. There are 6 men, 5 women, 3 boys and 3 girls in a queue. Find the probability of picking a child. \( \frac{5}{17} \)

MIND WORKOUT

What is the probability of the spinner not landing on E? \( \frac{1}{2} \)

MATHS JOURNAL

A box contains identical cards with alphabets that spell ‘PAKISTAN’.

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

Textbook 5 P307

Answers Review 15 (Workbook 5B P138 – 139)

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.

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.

The self-check can be done after pupils have completed Review 15 (Workbook 5B P138 – 139).
1. $3 \times 60 = 180$

2. $1500 \div 200 = 7.5$ min

3. $3.24 \ell + 60$ min $= 0.054 \ell$

4. 93

5. 38

6. 214

7. 39

8. 

![Diagram of a triangle with sides labeled 5 cm, 6 cm, and 6 cm, and angles labeled 55°, 60°, and 65°.]

9. $5 \div 3 \frac{2}{3}
   \quad \left(\frac{2}{3} \times 12 = 20\right)$

10. $25 \times \$19.25 = \$481.25
    
    $750 \times \$7.20 = \$5400
    
    $\$481.25 + \$5400 = \$5887.50$

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**Answers**

Revision 4A (Workbook 5B P140 – 143)

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. $\angle ADB = (180° - 78°) + 2$
   
   $= 51°$

   $\angle EDA = 180° - 51°$
   
   $= 129°$

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Revision 4B (Workbook 5B P144 – 149)

7. $\angle ABC = 180° - 64°$
   
   $= 116°$

   $\angle ACB = (180° - 116°) + 2$
   
   $= 32°$

   $\angle BCD = 180° - 32°$
   
   $= 148°$

8. 

![Diagram of a quadrilateral with sides labeled 5 cm, 6 cm, and 125° angle.]

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 \text{ minutes} \rightarrow 450
   1 \text{ minute} \rightarrow 450 \div 10
   = 45
   60 \text{ minutes} \rightarrow 45 \times 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. 1st hour \rightarrow $1.50
   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. \( \angle AED = (180° - 20°) + 2 \)
   \[ = 80° \]
   \[ \angle AEC = 180° - 80° \]
   \[ = 100° \]

35. \( \angle CED = 180° - 68° - 60° \)
   \[ = 52° \]
   \[ \angle x = 180° - 30° - 52° - 60° \]
   \[ = 38° \]

36. (a) \$3 = €2
   \[ S\$1 = \frac{2}{3} \]
   \[ S\$600 = \frac{2}{3} \times 600 \]
   \[ = 400 \]

   (b) €1 = £1.50
   \[ £350 = S\$(1.50 \times 350) \]
   \[ = S\$525 \]

37. 2.5 m - 0.32 m - 0.5 m = 1.68 m

38. Rs 45 + Rs 5 = 9
   \[ 9 + 3 = 3 \]
   \[ 3 \times Rs 2 = Rs 6 \]

39. \[ 1 - \frac{1}{3} - \frac{3}{7} = \frac{5}{21} \]
   \[ \frac{1}{3} = \frac{7}{21} \]
   \[ \frac{3}{7} = \frac{9}{21} \]
   \[ \frac{9}{21} - \frac{5}{21} = \frac{4}{21} \]
   \[ \frac{4}{21} \rightarrow 20 \text{ beads} \]
   \[ \frac{1}{21} \rightarrow 20 + 4 \]
   \[ = 5 \text{ beads} \]
   \[ \frac{7}{21} \rightarrow 5 \times 7 \]
   \[ = 35 \text{ beads} \]

40. \[ \frac{80}{100} \times $15 = $12 \]

41. (a) 50y ml + 60y ml = 110y ml
   (b) \( \frac{10y}{Z} \)

42. 1st 1 km \( \rightarrow $3 \)
   Next 24 km \( \rightarrow ((24 \times 1000) + 400) \times 0.22 \)
   \[ = $13.20 \]
   \[ $3 + $13.20 = $16.20 \]

43. 50 \times 2 = 100
   60 \times 3 = 180
   180 - 100 = 80

44. 30 \times 20 \times 15 = 9000 cm³
   \[ \frac{2}{3} \times 9000 \text{ cm}³ = 6 \ell \]
   \[ 6 \ell + 2 = 3 \text{ minutes} \]

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.

**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**
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.

**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.

**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?

**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.
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.