Teaching Guide

International Secondary Maths

6

COLIN **WRIGLEY**



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Introduction

How to use this Guide

I. Selection of work and pacing

Class VI in the English National Curriculum is the final year of Key Stage 2, often known as Top Juniors. In school systems that follow this model, all the students will have been promoted from within the same school's Class V and their mathematical background and experience will be known.

However, in many school systems, Class VI is the first year of secondary education, into which the students will have been admitted from many primary schools, with a much greater variety of previous mathematical experience.

International Secondary Maths 6 attempts to address both of these situations. Very little previous knowledge is assumed. Most topics are introduced as though the students have not met them before. Even if they have covered the work before, they may have forgotten it, or need reminders. This has resulted in quite a large book. The teacher must use discretion about pacing. Knowing your students and adjusting the pace accordingly is an important part of professionalism. Good students who have been well taught previously may be able to skip some exercises, or use them as revision assignments without further teacher input. Some guidance about pacing is given in this Guide, chapter by chapter.

II. Integrated mathematics

This textbook series exploits connections between the different branches of mathematics. It may be neat and logical to do arithmetic first, then algebra, then geometry and data handling, but children do not learn best with this sequencing. Some more modern topics may involve two or more of these simultaneously. Wherever possible, links to other branches of mathematics should be pointed out to the students. Some advice on this is given chapter by chapter under the heading of Objectives in Lesson Planning.

III. Lesson planning

Keeping in mind what is written above about knowing your students' previous experience, and adjusting the pace accordingly, it is not possible for a good lesson plan to be written by anyone other than the subject teacher.

However, in this Guide, suggestions have been made under various headings, which may assist teachers in writing their own plans in whatever format is required by their respective management teams.

Objectives

- General objectives
- Specific objectives

These are student-focused, i.e. they answer the question of what it is that we hope the students should be able to do and to know by the end of the lesson.

Method

Also known as strategy, procedure, or techniques, these are teacher focused, i.e. they answer the question of what it is that the teacher will do to enable the students' learning.

Resources

These are materials that are required in addition to the textbook. This Guide contains photocopiable sheets to supplement the textbook, but other items will be needed from time to time.

Assignment

Advice about how to use the exercises: homework, classwork, diagnostic, revision, etc.

Vocabulary

Keywords

IV. Bloom's Taxonomy

It has been standard teacher training for many years now to use Bloom's Taxonomy to explain the hierarchy of cognitive skills. This is helpful in writing objectives for lesson plans, but mathematical skills often involve a number of levels simultaneously. Here is a simplified version that may be of practical use to teachers aiming to expose their students to the higher levels of cognitive activity:

Basics: Remember → Understand → Apply

Higher: Analyse → Create → Evaluate

In the Basics, students learn (memorize) facts until they can *Remember* (recall), *Understand* (explain, give examples, answer routine questions) and *Apply* (use the facts in standard situations).

For Higher skills, students deduce, distinguish, construct, organize, plan, modify, develop, draw relevant diagrams, etc. when faced with a new situation. These Higher skills collectively may be termed *problem-solving*. The textbook exercises contain material at both the Basic and Higher levels. When selecting assignments, keep these levels in mind. All must be fully competent in Basic level skills; as many as possible should be challenged to exercise the Higher level problem-solving skills. Higher level skills can often be developed rapidly through group work. Advice is given on this in the relevant chapters in this Guide.

References: Bloom, B.S. and Krathwohl, D.R. (1956). *Taxonomy of Educational Objectives: The Classification of Educational Goals. Handbook I: Cognitive Domain.* New York: Longmans, Green.

Anderson, L.W. and Kratwohl, D. R. (Eds.) 2001). *A Taxonomy for Learning, Teaching and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives.* New York: Longman.

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V. The Exercises

Each chapter of the book has exercises coded as follow:

A, B, C, etc. following each section of the chapter

M—a miscellaneous exercise on all sections of a chapter (if there are multiple sections)

X—a short, challenging exercise at the end of each chapter, usually involving Higher levels of cognitive skills, for the more talented students only.

Revision Exercises at regular intervals contain material tackled recently and material that ought to have been covered in primary classes. They are not graded: some questions may be answered immediately; others will require deeper thought. This is deliberate: it is more motivating for students. Careful teachers may use these diagnostically to identify weak points in students' knowledge.

VI. Useful Sheets

Photocopiable material is available as follows:

Right-Angled Triangles (3 : 4 : 5)

Right-Angled Triangles (3 : 3 : $3\sqrt{2}$)

Coordinate Grid

Nets for Cube and Pyramid (triangular base)

Net for Cuboid

Nets for Triangular Prism and Trapezoidal Prism

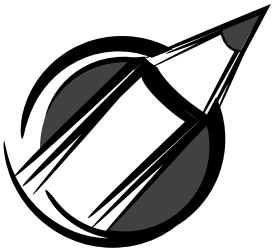
Net for Pyramid (square base)

Spotty paper—Square

Spotty paper—Triangular

Linear Scales

Symmetry (EX 24A)



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Useful Sheets (photocopiable)

Right-Angled Triangles (3 : 4 : 5)	49
Right-Angled Triangles (3 : 3 : $3\sqrt{2}$)	50
Coordinate Grid	63
Nets for Cube and Pyramid (triangular base)	78
Net for Cuboid	79
Nets for Triangular Prism and Trapezoidal Prism	80
Net for Pyramid (square base)	81
Spotty paper—Square	82
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Chapter

1 Chance

If probability has been studied previously, it would probably have been explained in fractional terms, e.g. the chance of a 3 with one roll of a dice is 1 out of 6, i.e. $\frac{1}{6}$.

This chapter introduces the concept of a scale of probability with a precise range of values from 0 to 1.

In oral work in class, brighter students will realise that there are many events said to be impossible that could just possibly happen, having a probability close to zero. Similarly, for almost certain events, probabilities could be just less than 1.

Estimating where on a scale of probability an event should be placed is an excellent whole class activity involving Higher level skills. (See Bloom's Taxonomy in the Introduction.)

LESSON PLANNING

Objectives

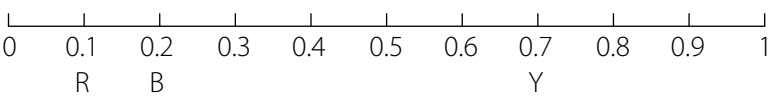
General	1. To understand that probability is measured on a scale from 0 to 1 2. To calculate probabilities of simple events
Specific	1. (Basic) To identify the correct position on the probability scale of simply defined events (Higher) To estimate the position for less clearly defined events 2. To write probabilities as fractions or decimals as appropriate 3. To use the scale of probability to place correctly and in order the likelihood of certain events happening
Pacing	3 lessons and 1 homework assignment
Links	Fractions, decimals
Method	Oral lesson opening: "Tell me something that is impossible." Keywords defined—lots of examples Draw the scale of probability Estimate location of events (e.g. I will die tonight!) Examples of calculating probability (e.g. balls in bag, numbers on dice, etc.) Recap key facts, i.e. scale of probability and keywords, at start of subsequent lessons. Use exercises.
Resources	Real dice and pointers (if available) can be used in experiments, but they could be confusing owing to the variability in experimental probability experiments.

	However, a large dice can be used to demonstrate (by symmetry) that each face is equally likely to show up when rolled. Real balls in bags can be used to show that to calculate probability correctly they have to be equal in size "to make it fair".
Assignments	Exercise 1B has more words and requires higher level skills in general than Exercise 1A. Exercise 1X is only for students who complete all of 1A and 1B correctly. Exercise 1B #1-5 is suggested as a homework assignment.
Vocabulary	scale of probability certain, impossible, almost certain, nearly impossible likely, unlikely, equally likely

ANSWERS

Exercises

EX 1A

1. a) $\frac{2}{5}$ b) $\frac{3}{5}$
2. 0. 1, No
3. a) $\frac{1}{2}$ b) $\frac{1}{6}$ c) $\frac{1}{3}$
4. a) 0 b) 1 c) 1 d) 0
   e) 0
5. individual estimates
6. a) 0.001 b) extremely unlikely to win
7. 

8. a) red b) cannot tell c) $\frac{1}{5}$, 0.2
9. $\frac{1}{3}$
10. a) $\frac{1}{36}$ b) $\frac{1}{2}$ c) $\frac{1}{6}$ d) $\frac{1}{6}$
    e) 7

EX 1B

1. a) white b) red c) green
2. a) 0 b) 0 c) 1
   d) 0.9 approx e) 0:5 approx

3. (c) (a) (b)

4. 0.2

5. 

6. red 0.25, white 0.15, blue 0.25, yellow 0.35

7. 0.75

8. a) $\frac{1}{13}$ b) $\frac{1}{13}$ c) $\frac{3}{52}$ d) $\frac{1}{52}$
   e) $\frac{10}{13}$

9. a) $\frac{1}{6}$ b) $\frac{1}{2}$ c) 1 d) 0
   e) 0 f) 0

10. a) $\frac{2}{5}$ b) $\frac{23}{40}$ c) 0 d) $\frac{3}{5}$

EX 1X

1. 0

2. HHH THH
   HHT THT
   HTH TTH
   HTT TTT
   a) $\frac{1}{4}$ b) $\frac{3}{8}$ c) $\frac{1}{4}$ d) $\frac{1}{2}$ e) 0

3. a) $\frac{1}{6}$ b) $\frac{5}{18}$ c) $\frac{2}{9}$

Chapter

2 Addition

This chapter contains a lot of exercise material but it should not take long to complete. For most students it will be revision. However, the focus should be on the "write/write down" methods rather than the vertical column paper and pencil method. This builds an instinctive feel for numbers, i.e. true numeracy, and has enduring value.

LESSON PLANNING

Objectives

General	To be able to add numbers using appropriate mental and formal techniques
Specific	1. To be able to add quickly and accurately pairs of 2-digit whole numbers, pairs of 2-digit multiples of 10, pairs of 2-digit decimals, writing down the answers 2. To recognise pairs of 1 or 2 decimal places (d.p.) decimals that total exactly 1 3. To use the "round off and adjust" method to add a number close to a whole number 4. To use standard vertical alignment on paper to add more difficult lists of numbers 5. (Higher) To select appropriate techniques to solve word problems
Pacing	As fast as students can handle it. They ought to have covered these techniques previously, but may be a little rusty. 3 lessons maximum.
Links	Units (used in EX 2G)
Method	Use whole class oral session diagnostically for the fast addition techniques. Plan according to feedback. (You may find that only the vertical alignment method on paper is known.) Stress the fast addition techniques. Insist on (no shown working) "write/write down" answers only. Obviously, no calculators are allowed here. Use Exercises. 2A to D thoroughly. EX 2F is routine EX 2G: although choice of methods is allowed, encourage "write/write down" answers.
Resources	None
Assignments	EX 2E may be used for homework. It may also be used competitively, timed. (5s added for each incorrect answer) EX 2G is best done in class, students working in pairs. (This should not be skipped.) EX 2M #1–5 suitable for homework. Students finishing ahead of the rest may be directed to EX 2X.

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Vocabulary	write/write down *(implies no working required)* digits align columns add, more, total

ANSWERS

Exercises

EX 2A

1.	a) 58	b) 94	c) 56	d) 70
2.	a) 100	b) 83	c) 49	d) 88
3.	a) 73	b) 61	c) 101	d) 55
4.	a) 95	b) 53	c) 59	d) 28
5.	a) 29	b) 110	c) 90	d) 77
6.	a) 62	b) 97	c) 118	d) 108
7.	a) 46	b) 45	c) 153	d) 40
8.	a) 66	b) 128	c) 97	d) 103
9.	a) 119	b) 66	c) 158	d) 82
10.	a) 138	b) 123	c) 80	d) 145

EX 2B

1.	a) 560	b) 1350	c) 940	d) 1670
2.	a) 1450	b) 1540	c) 820	d) 700
3.	a) 1110	b) 730	c) 1320	d) 1100
4.	a) 1580	b) 1490	c) 1160	d) 1660
5.	a) 1350	d) 1020	c) 1420	d) 1010
6.	a) 1240	b) 1110	c) 1010	d) 400
7.	a) 1670	b) 1760	c) 560	d) 830
8.	a) 1790	b) 910	c) 1030	d) 1040
9.	a) 1360	b) 1100	c) 1080	d) 520
10.	a) 1080	b) 740	c) 1360	d) 610

EX 2C

1.	a)	13.7	b)	9.7	c)	18.6	d) 15
2.	a)	7.8	b)	16.2	c)	13.4	d) 13.4
3.	a)	1.12	b)	1.09	c)	0.83	d) 0.89
4.	a)	0.75	b)	0.47	c)	1.27	d) 0.99
5.	a)	2.9	d)	0.84			
	c)	9.4	d)	1.30 (or 1.3)			
6.	a)	1	b)	1	c)	1	d) 1
7.	a)	11.9	b)	1	c)	1	d) 0.99
8.	a)	1	b)	7.8	c)	0.69	d) 1
9.	a)	1	b)	1	c)	8.9	d) 0.98
10.	a)	1.19	b)	1	c)	1	d) 4.3

EX 2D

1.	a)	4.6	b)	4.4			
	c)	4.3	d)	12.0 (or 12)			
2.	a)	7.8	b)	10.2	c)	11.1	d) 7.2
3.	a)	16.1	b)	12.8	c)	16.9	d) 15.5
4.	a)	5.2	b)	10.5	c)	5.2	d) 6.3
5.	a)	10.7	d)	8.9	c)	6.8	d) 8.7
6.	a)	15.4	b)	13.2	c)	12.4	d) 16.5
7.	a)	11.9	b)	11.6	c)	10.5	d) 10.7
8.	a)	13.7	b)	5.2	c)	9.8	d) 9.4
9.	a)	7.4	b)	12.3	c)	7.3	d) 10.6
10.	a)	6.4	b)	3.5	c)	9.8	d) 8.2

EX 2E

1.	a)	90	b)	11.4	c)	1.17	d) 900
2.	a)	9.9	b)	1.01	c)	0.95	d) 160
3.	a)	15.4	b)	1.08	c)	1	d) 470
4.	a)	17.2	b)	10.1	c)	129	d) 12.8
5.	a)	6.3	d)	1.03	c)	0.85	d) 1310

6.	a)	1	b)	97	c)	9.3	d)	9.2
7.	a)	17.7	b)	1	c)	1	d)	1050
8.	a)	135	b)	10.7	c)	12.3	d)	1.85
9.	a)	17 (or 17.0)	b)	0.9 (or 0.90)	c)	0.78	d)	700
10.	a)	1	b)	10.9	c)	1	d)	1

EX 2F

1.	a)	1.628	b)	148.8	c)	72.28	d)	1.435
2.	a)	8.544	b)	4.134	c)	770	d)	17.81
3.	a)	3.21	b)	154.4	c)	22.705	d)	8.75
4.	a)	67.52	b)	99.1	c)	2.885	d)	10.7
5.	a)	1.345	b)	101 (or 101.0)	c)	3.753	d)	17.702
6.	a)	193.72	b)	11.27	c)	7.934	d)	2.16
7.	a)	16.34	b)	12.03	c)	1.013	d)	832.244
8.	a)	3.009	b)	11.36	c)	14.593	d)	9.741
9.	a)	5.922	b)	32.1	c)	846.1	d)	652.226
10.	a)	5.83	b)	14.26	c)	62.568	d)	13.879

EX 2G

1. Yasmin is 1.39 m tall now.
2. The ladder is 4 m long.
3. The cloth is 4.11 m long.
4. Zachary's line was 9.4 cm long.
5 There is 0.7 l of mixed juice.
6. Total score of Cyrus was 21.1 points.
7. Today's temperature was 42.5 °C.
8. The weight of the kitten now is 1.08 kg.
9. Bilal's time today was 39.66 s.
10. The total weight of the water and cake ingredients is 0.75 kg.

EX 2M

1. a) 80 b) 67 c) 1590 d) 15.9
2. a) 1 b) 12.8
   c) 12.1 d) 1.20 (or 1.2)
3. a) 16.34 b) 117 c) 780 d) 1740
4. a) 1.31 b) 1 c) 15.4 d) 11.6
5. a) 1.85 d) 13.48 c) 100 d) 1040
6. a) 1290 b) 1230 c) 1.276 d) 944.355
7. a) 19.4 b) 1.77 c) 1.154 d) 11.85
8. a) 84.49 b) 15.59 c) 13.975 d) 982
9. a) The fence is 50.8 m long now.
   b) Mr Khan's baggage weighs 46.3 kg.
   c) The daytime temperature is 28.2 °C
   d) It took 46 s to cook the food properly.
10. a) 0.375 l of drink is made.
    b) 1.25 l of orange paint is made.
    c) The total weight is 18.7 kg.
    d) The chain is 12.59 m long now.

EX 2X

1. a) 11800 b) 185.3 c) 173 d) 27.1
2. a) 803.17 b) 19.665 c) 369.047 d) 11.317
3. a) 2.562 m b) 2.77 l
   c) 7.977 kg d) 27.02 km

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Chapter

3 Areas and Perimeters

The meat of this chapter is EX 3B, compound shapes formed from rectangles. Most students may already know the length × width formula for the area of a rectangle. However, the danger is that this formula may be applied mindlessly to other shapes and confused with the concept of area in general. Ensure that units are correctly expressed. Avoid obsolete notations such as sq. cm. Avoid full stops. In modern notation unit symbols are not regarded as abbreviations, so full stops are incorrect (unless at the end of a sentence). If students are shown correct notation from the start, they will quickly use it.

LESSON PLANNING

Objectives

General	To calculate areas and perimeters of rectangles and shapes formed by combining rectangles
Specific	1. To calculate the area and perimeter of a rectangle with given sides 2. To calculate the length or width of a rectangle given its area and one dimension 3. To recognise that a square is just a special type of a rectangle 4. To select appropriate units of area (from mm^2, cm^2, m^2, km^2) according to the situation 5. To express units of area and perimeter correctly 6. To understand that the areas of other shapes are not calculated by the formula length × width
Pacing	Depending upon previous knowledge, 3 lessons + 2 homeworks
Links	Units Geography of Pakistan and other countries
Method	Demonstrate, using plenty of rectangular arrays of squares counted in rows and columns, to make the length × width rule evident. Show some other shapes to emphasize that length × width only works for areas of rectangles. The perimeter concept (it's a distance) can be emphasized by having a child stride around the boundary of the classroom or a chalked shape on the floor, thus contrasting it with area. (It's a quantity of space.) Explain units. Perimeter is a distance (e.g. cm). Area measures the space within given boundaries (e.g. lengh × width = cm × cm = cm^2).

Resources	Rectangular arrays (e.g. on everyday objects such as window *jalis*)
Assignments	EX 3A as revision, with the briefest of introductions, may be set as homework. EX 3B best for classwork, to ensure that diagrams and working are shown clearly. EX 3C and 3M include some Higher level skills. EX 3X has challenging questions for fast finishers.
Vocabulary	area, length, width perimeter, distance

ANSWERS

Exercises

EX 3A

1. a) 10 cm^2 b) 9 cm^2 c) 24 cm^2 d) 15 cm^2
2. a) 14 cm b) 12 cm c) 20 cm d) 16 cm
3. a) 28 cm^2 b) 4 cm^2 c) 48 cm^2 d) 20 cm^2
4. a) 22 cm b) 8 cm c) 28 cm d) 18 cm
5. a) 24 cm^2 b) 36 cm^2 c) 25 cm^2 d) 30 mm^2
6. a) 63 cm^2 b) 56 mm^2 c) 40 cm^2 d) 90 mm^2
7. a) 32 cm b) 30 mm c) 28 cm d) 38 mm
8. 3 cm
9. 12 mm
10. 20 cm

EX 3B

1. a) (A) 12, (B) 4, total 16 cm^2 b) 18 cm
2. a) (A) 18, (B) 6, total 24 cm^2 b) 22 cm
3. a) (A) 1, (B) 6, (C) 7, total 14 cm^2 b) 22 cm
4. a) (A) 2, (B) 15, total 17 cm^2 b) 20 cm
5. a) 20 cm^2 b) 22 cm
6. a) 14.5 cm^2 b) 25 cm
7. a) 133 cm^2 b) 52 cm
8. 19.5 cm^2
9. 28 cm
10. a) 62 cm^2 b) 6 cm^2 c) 56 cm^2

EX 3C

1. a) cm^2 b) m^2 c) km^2 d) mm^2
2. a) m b) m^2 c) m^2 d) m
3. 2.5
4. b)
5. a) 320 m^2 b) 360 m^2 c) 350 m^2. Best value is (b)
6. a) 80 cm^2 b) 8000 mm^2
7. Northern Ireland, Wales, Scotland, England
8. 1 700 000 km^2
9. a) 271.5 cm b) 4 m^2 c) 6 km^2 d) 5.5 km
10. 144 000 km^2

EX 3M

1. a) 27 cm^2 b) 49 cm^2
   c) 125 cm^2 d) 1800 cm^2
2. a) 32 mm^2 b) 30 cm^2 c) 60 cm^2 d) 80 mm^2
3. a) 25 mm b) 2.5 cm
4. a) (A) 18, (B) 3, total 21 cm^2 b) 20 cm
5. a) 24 cm^2 b) 26 cm
6. 9 cm^2
7. 49 cm^2
8. a) m b) m^2 c) m^2 d) cm
9. a) cm^2 b) km^2 c) m^2 d) mm^2
10. a) Balochistan, Punjab, Sindh, KP b) 29 000 km^2

EX 3X

1. a) 38 cm b) 81.25 cm^2
2. a) 3 702 000 000 m^2 b) 1 409 140 000 000 000 cm^2
   c) 4 000 000 000 000 000 mm^2 d) avoids too many zeros
3. 42 cm^2

Chapter

4 Subtraction

The techniques to be applied in this chapter are similar to those in Chapter 2 for addition. However, most students will find mental methods for fast subtraction more difficult than for addition. Hence, more time will be needed.

LESSON PLANNING

Objectives

General	To be able to subtract numbers using appropriate mental and formal techniques
Specific	1. To be able to subtract quickly and accurately pairs of 2-digit whole numbers, pairs of 2-digit multiples of 10, pairs of 2-digit decimals, writing down the answers 2. To be able to write down subtractions from 1 or 10 3. To use the "round off and adjust" method to subtract numbers close to a whole number 4. To use standard vertical alignment on paper to subtract more difficult numbers 5. (Higher) To select the most suitable strategy for subtraction to solve word problems
Pacing	4 or 5 lessons
Links	Addition in chapter 2
Method	Lots of oral work with the whole class Stress the fast mental techniques. Ensure the bridging strategy is well explained by using a number line. Use the Exercises.
Resources	Number line (with tenths marked): may be drawn on the board but a permanent one above the board is a great visual aid
Assignments	Classwork #1–7, homework #8–10, all exercises
Vocabulary	write/write down digits align, vertical column subtract, left, remaining, fall, less, lower

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ANSWERS

Exercises

EX 4A

1.	a)	24	b)	20	c)	2	d) 21
2.	a)	28	b)	17	c)	3	d) 17
3.	a)	1	b)	41	c)	3	d) 17
4.	a)	7	b)	4	c)	19	d) 19
5.	a)	23	b)	5	c)	3	d) 10
6.	a)	1	b)	5	c)	1	d) 30
7.	a)	1	b)	29	c)	24	d) 52
8.	a)	28	b)	6	c)	28	d) 24
9.	a)	10	b)	42	c)	21	d) 21
10.	a)	24	b)	15	c)	55	d) 21

EX 4B

1.	a)	180	b)	270	c)	10	d) 10
2.	a)	160	b)	190	c)	250	d) 310
3.	a)	60	b)	430	c)	110	d) 50
4.	a)	250	b)	90	c)	120	d) 200
5.	a)	540	b)	10	c)	120	d) 110
6.	a)	220	b)	80	c)	170	d) 20
7.	a)	660	b)	70	c)	280	d) 170
8.	a)	320	b)	240	c)	130	d) 120
9.	a)	20	b)	340	c)	170	d) 200
10.	a)	80	b)	50	c)	530	d) 590

EX 4C

1.	a)	4.1	b)	0.3	c)	0.5	d) 0.2
2.	a)	3.7	b)	2.6	c)	0.4	d) 6.4
3.	a)	0.11	b)	0.05	c)	0.04	d) 0.02
4.	a)	0.08	b)	0.41	c)	0.18	d) 0.25
5.	a)	2.2	b)	0.73	c)	1.3	d) 0.72

6.	a)	0.1	b)	0.58	c)	0.3	d)	0.62
7.	a)	8.6	b)	4.7	c)	9.67	d)	9.29
8.	a)	1.5	b)	0.54	c)	0.37	d)	6.6
9.	a)	0.49	b)	2.4	c)	9.75	d)	0.78
10.	a)	0.41	b)	0.6	c)	0.19	d)	7.9

EX 4D

1.	a)	6.7	b)	4.3	c)	5.7	d)	3.3
2.	a)	1	b)	0.4	c)	0.9	d)	2.4
3.	a)	0.8	b)	3.7	c)	1.4	d)	2.1
4.	a)	1.7	b)	1.2	c)	2.5	d)	0.9
5.	a)	1.1	b)	0.2	c)	0.4	d)	3.1
6.	a)	7.3	b)	5.6	c)	6.5	d)	4
7.	a)	0.3	b)	0.6	c)	1.2	d)	0.6
8.	a)	3.3	b)	4	c)	2.1	d)	0.3
9.	a)	0.4	b)	2	c)	4.2	d)	3.2
10.	a)	6.1	b)	5.8	c)	2.9	d)	2.9

EX 4E

1.	a)	9	b)	9.65	c)	4.9	d)	370
2.	a)	0.14	b)	1.5	c)	0.13	d)	33
3.	a)	0.81	b)	0.9	c)	0.6	d)	70
4.	a)	9.4	b)	9.41	c)	34	d)	0.72
5.	a)	0.1	b)	2.6	c)	2.9	d)	2
6.	a)	3.8	b)	27	c)	0.02	d)	9.3
7.	a)	0.02	b)	9.55	c)	0.5	d)	0.5
8.	a)	360	b)	9.5	c)	0.87	d)	3.1
9.	a)	0.5	b)	0.1	c)	3	d)	280
10.	a)	2.5	b)	9.7	c)	0.8	d)	9.83

EX 4F

1.	a)	0.161	b)	0.808	c)	7	d)	46.5
2.	a)	0.008	b)	2.584	c)	20.16	d)	0.072

3.	a)	7.03	b)	1.518	c)	0.625	d) 1.891
4.	a)	60.87	b)	3.28	c)	0.335	d) 0.02
5.	a)	2.46	b)	46.7	c)	71.732	d) 75.9
6.	a)	0.395	b)	0.016	c)	5.53	d) 55.7
7	a)	0.238	b)	0.187	c)	0.571	d) 36
8.	a)	6.611	b)	1.161	c)	0.082	d) 0.35
9.	a)	0.57	b)	1.25	c)	0.455	d) 1.96
10.	a)	54.94	b)	0.468	c)	0.355	d) 35.935

EX 4G

1. There were 56 cherries left.
2. There were 670 chairs not broken.
3. The plank was 1.78 m long after cutting.
4. There was 1.5 m^2 of cloth left over.
5. 1.25 l of water was left in the bottle.
6. The temperature fell 12.8 degrees.
7. The probability of not winning is 0.82.
8. Bilal improved by 0.41 s.
9. Ayesha's average was lower by 6.8 marks.
10. Daniyal managed to watch 4.8 h of TV.

EX 4M

1.	a)	2.2	b)	0.61	c)	32	d) 1.9
2.	a)	440	b)	9.22	c)	0.6	d) 0.6
3.	a)	2.2	b)	2.8	c)	3.11	d) 38.22
4.	a)	0.18	b)	0.413	c)	8.52	d) 8.22
5.	a)	27	b)	2.085	c)	0.352	d) 0.137
6.	a)	0.686	b)	50	c)	0.31	d) 125.5
7.	a)	3.1	b)	0.487	c)	12.65	d) 0.49
8.	a)	29.97	b)	0.01	c)	160	d) 0.86

9. a) Mr Khan's baggage was overweight by 12.4 kg.
   b) The bag he left behind weighed 15.1 kg.

10. a) The string is 6.35 m long.

b) Kamal made 1.7 l of orange paint.

c) Yasmin scored 60 points fewer today.

d) The probability of not getting double 6 is about 0.97

EX 4X

1.	a)	2600	b)	19000	c)	230.9	d) 6.4
2.	a)	76.53	b)	460.42	c)	4.67	d) 0.0486
3.	a)	999.999 m	b)	4.995 l	c)	997.5 kg	

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Chapter

5 Revision Exercises

Exercises 5A, 5B up to #7 are for consolidation of Chapters 1 to 4. From 5B #8 to 5D, questions are included that a good primary scheme should have covered. These may be used diagnostically. If students are not familiar with all of these topics, it would be useful for the teacher to know. However, there is no need to panic as all of them will be repeated at some stage later in this scheme.

LESSON PLANNING

Objectives	
General	1. To be able to answer miscellaneous questions based on Chapters 1–4 2. To assess whether prior knowledge of topics
Specific	1. To be able to answer "write/write down" questions quickly and accurately 2. To be able to answer harder questions (showing working) correctly 3. To complete all set work 4. To discuss difficulties and explain to a classmate how a problem is solved
Pacing	Depends very much on the students: there could be a lot of variability. 3 lessons?
Method	Give general pep talk on the importance of practice. Set EX 5A. Allow working in pairs. Give out some answers at an early stage to provide confidence (Students mark their own work.) Use EX 5B for homework (#1–7 only). Rest of the exercises may be used as time permits.
Assignments	All should complete up to #7 of EX 5B. As much of the remaining material should be completed as time permits. As usual, EX 5X contains challenging questions.
Vocabulary	Probability, random write/write down add, subtract, difference length, width, rectangle, area, perimeter fraction, mixed number, number line, percentage, sequence arrow diagram, input, output, formula set, even, odd, multiples, primes analogue, digital proportion faces, edges, vertices estimates angle

ANSWERS

Exercises

EX 5A

1. a) $\frac{3}{10}$ b) $\frac{1}{2}$ c) $\frac{4}{5}$ d) 0
2. a) white b) blue c) red
3. a) 70 b) 112 c) 870 d) 610
4. a) 10.8 b) 16.4 c) 0.99 d) 1
5. a) 11.2 b) 13.1 c) 8.5 d) 6.8
6. a) 6.5 b) 5.9 c) 11.7 d) 7.6
7. a) 1.045 b) 90.3 c) 1.975 d) 8.704
8. The width of the carpet is 3.18 m.
9. a) 9 m^2 b) 13 m^2 c) 19 m; Yes
10. a) 2.36 cm^2 or 236 mm^2 b) 6.6 cm or 66 mm

EX 5B

1. a) 22 b) 13 c) 270 d) 80
2. a) 2.1 b) 3.8 c) 0.22 d) 0.34
3. a) 5.7 b) 4.8 c) 1.6 d) 2.9
4. a) 1.4 b) 4.6 c) 2.1 d) 0.2
5. a) 0.053 b) 1.179 c) 2.548 d) 2.16
6. 0.86
7. This was 1.64 m lower.
8. a) mm b) m c) km^2 d) cm
9. a) $-\frac{3}{5}$ b) $\frac{1}{5}$ c) $1\frac{4}{5}$ d) $2\frac{2}{5}$
10. 2.44s

EX 5C

1. 25, 21, 17, 13, 9, 5, 1, –3, –7, –11
2. a) 7.5 b) 4 c) 6 d) $n + 1.2$
3. a) 2, 16, 90, 100, 8 b) 17, 3, 15, 25 c) 15, 90, 100, 25 d) 17, 3, 2
4. a) the red parcel b) 30 g

5. a) 11 b) 5 c) 2 d) 14

6. 4 mm, 5 cm, 80 mm, 80 cm, 6 m, 7 km

7. a) $\frac{1}{5}$ b) $\frac{1}{2}$ c) 5

8. a) 6 b) 12 c) 8

9. a) 210; 213.44 b) 260; 265.81 c) 300; 283.497968
   d) 70 ; 67.97101449

10. a) $16 > -6$ b) $-16 < 6$ c) $10 + 6 = 7 + 9$ d) $-9 < -7$

EX 5D

1. a) 6 b) 5.4 c) 9.2 d) $52\frac{2}{3}$

2 [The line should be accurate to 1 mm.]

3. a) $\frac{3}{100}$; 0.03 b) 75%; $\frac{3}{4}$ c) 40%; 0.4 d) Rs 200

4. a) 42 b) 132 c) 1440 d) 5800

5. a) 315 b) 462 c) 714 d) 1281

6. a) 150° b) 40° c) 130° d) 20°

7. a) 64 805 b) 601 043
   c) twenty-five thousand, two hundred and twelve
   d) two hundred and fifty-six thousand, one hundred and ninety-eight

8. a) 0.5 m b) 1.87s c) 9 km^2 d) 0

9. a) 100 b) 100 c) 1 d) 1

10. $\frac{2}{3}$ $(=\frac{8}{12})$, $\frac{3}{4}$ $(=\frac{9}{12})$, $1\frac{5}{12}$, $1\frac{1}{2}$ $(=1\frac{6}{12})$, $2\frac{1}{6}$, $3\frac{1}{12}$

EX 5X

1 a) 10 b) 1.6 c) 0.54 d) 22

2 940

3. a) Rs 1 b) [Enter $0.05 \times 0.05 \times 0.05 \times 8000$]

Chapter

6 Arrow Diagrams

Students will almost certainly have met arrow diagrams previously. If so, the first exercises, 6A, B, C, will be straightforward, although the numbers may be challenging for some with it's variety of positive and negative integers, fractions, decimals, and mixed numbers. The focus of the chapter is to introduce serious algebraic thinking.

LESSON PLANNING

Objectives

General	To understand and to use simple linear algebraic expressions
Specific	1. To calculate inputs, outputs, or operations from information given on an arrow diagram 2. To use formulas for linear algebraic expressions correctly in arrow diagrams 3. To avoid use of x or ÷ in algebraic expressions, and to use brackets correctly 4. To distinguish correctly the difference in meaning of similar expressions (e.g. $\frac{n+2}{3}$ and $\frac{n}{3}+2$)
Pacing	EX 6A and 6B very quickly Take time over inverse operation ("reversing the flow"), and EX 6C. Key exercises 6D and 6M (4 lessons)
Links	All the fast addition and subtraction methods in chapters 2 and 4. Fractions, decimals, negative numbers
Method	A lot depends upon prior knowledge. The text assumes that students will know the meaning of $n+2$, $n-2$, $2n$, $\frac{n}{2}$, etc., but this may need to be explained. This is emphatically NOT the time for formal definitions of variable, constant, etc. Board work, using single operation diagrams, and then double operation diagrams, such as those in the text, should be continued until students are answering confidently. The aim is for students to see the correct stages when confronted with a linear algebraic expression. For example, when students see $3n+2$, they should think FIRST multiply by 3 THEN add 2 But when they see $3(n+2)$ they should think FIRST add 2 THEN multiply by 3

	This kind of thinking is vital for later work in algebra. Use the words "inverse operation" a lot, when "reversing the flow".
Assignments	EX 6B is good for homework.
Vocabulary	input, output, operation, inverse operation "reversing the flow" formula arrow diagram, double arrow diagram

ANSWERS

Exercises

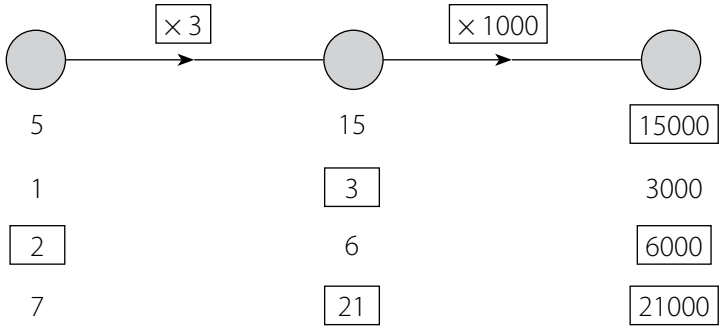
EX 6A

1.	a) 8.1	b) 9.6	c) 11	d) –0.9
2.	a) $\frac{1}{3}$	b) 0	c) $4\frac{2}{3}$	d) $\frac{1}{6}$
3.	a) $7\frac{1}{2}$	b) $4\frac{1}{2}$	c) $-1\frac{1}{2}$	d) 6
4.	a) 6.21	b) 2.31	c) 0.97	d) 1.14
5.	a) 1300	b) 2200	c) 700	d) –200
6.	a) 30	b) 3	c) –12	d) 6
7.	a) $\frac{1}{2}$	b) $-\frac{1}{2}$	c) –4	d) 265
8.	a) 30	b) 5.5	c) 250	d) 2
9.	× 2			
10.	a) 74	b) 2500	c) 107	d) 5.5

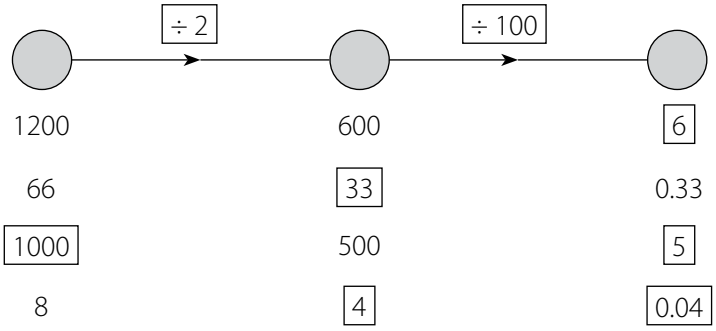
EX 6B

1.	a) 7	b) 17	c) 2	d) 3
2.	a) 3	b) 2.6	c) 0	d) $14\frac{1}{2}$
3.	a) 4	b) 1	c) 3.4	d) 501.5
4.	a) –4	b) 3	c) 9	d) 3.031
5.	a) 120	b) 32	c) 4200	d) 0.3
6.	a) 2400	b) 1000	c) 2	d) 15

7.



8.

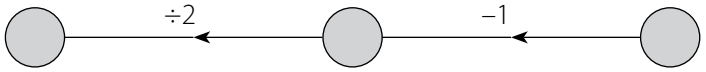


9. a) 80 b) 280 c) 124 d) 180

10 a) 40 b) 0.3 c) 7 d) 0.2

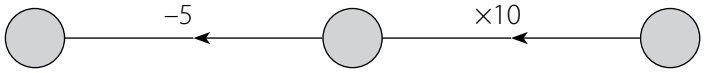
EX 6C

1.



a) 3 b) 6 c) 1 d) 1.5

2.



a) 1 b) 2 c) 5 d) 15

3. a) 9 b) 27 c) $13\frac{1}{2}$ d) 10

5. a) 30 b) 6 c) 30 d) 2.2

6. a) 1 b) 3 c) 5 d) 0.1

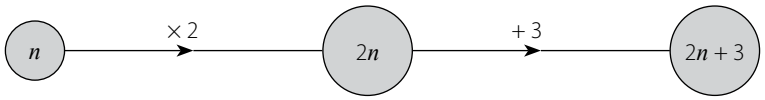
7. a) −3 b) 1.1 c) 0.5 d) 0

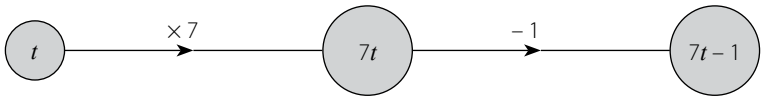
8. a) 1300 b) 14 c) −700 d) 0

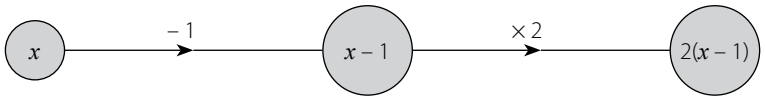
9, a) 0.2 b) 4.2 c) 38.2 d) 11.2

10. a) 2 b) 1 c) 13 d) 50

EX 6D

1. 

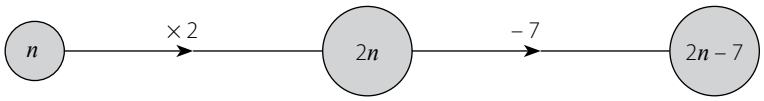
2. 

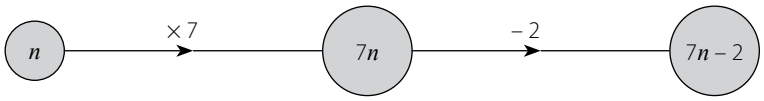
3. 

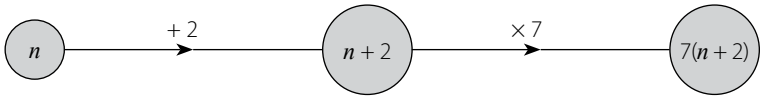
4. a) 3 b) 8 c) 10 d) 35
   e) $3y$ f) $3y + 5$

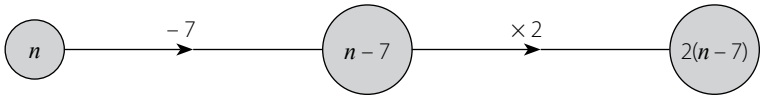
5. a) $\frac{n}{2} + 5$ b) $\frac{n+2}{5}$ c) $2n - 5$ d) $5(n-2)$

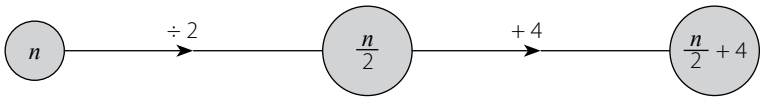
6. a) $2(x+1)$ b) $\frac{x-1}{2}$ c) $2x + 1$ d) $\frac{x}{2} - 1$

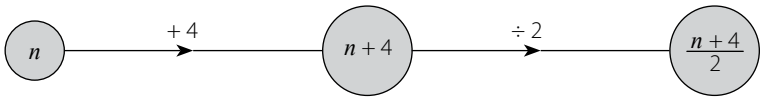
7. a) 

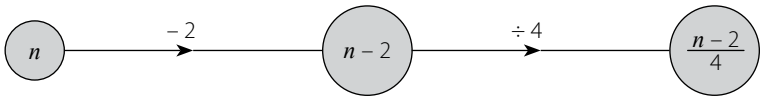
   b) 

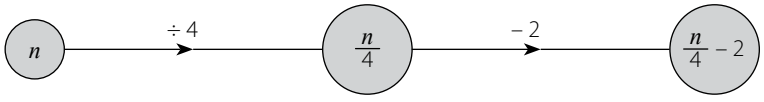
   c) 

   d) 

8. a) 

   b) 

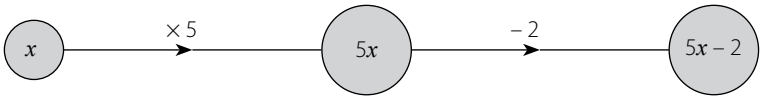
   c) 

   d) 

9. a) 10 b) 22 c) 2.3 d) 2

10. a) 9 b) 7 c) −1 d 5

EX 6M

1. a) 6.18 b) 3.28 c) 0.3 d) 0.91
2. a) 15 b) 6.6 c) 750 d) $2\frac{1}{4}$
3. a) 10 b) 8.4 c) 0 d) 17
4. a) 1800 b) 100 c) 3 d) 8
5. a) 8 b) 0.43 c) 0.07 d) 0.03
6. a) 16 b) 40 c) 18 d) 21
7. a) 200 b) 16 c) –600 d) 0
8. 

9. a) $3(n + 2)$ b) $\frac{n-2}{3}$ c) $2n + 3$ d) $\frac{n}{2} - 3$
10. a) 10.5 b) 4 c) $\frac{1}{2}$ d) 3

EX 6X

1. a) 1.3 b) 6.5 c) 500 d) 0.1034
2. a) $2(n + 1)–6$ b) $2n - 4$
   c) same outputs; $2(n + 1)–6 = 2n - 4$
3. $3(n + 2)–1 = 3n + 5$; other similar diagrams

Chapter

7 Rounding Off

This is another numeracy chapter, with the emphasis on mental methods.

When estimating it is customary to round off to 1 significant figure (s.f.) unless instructed otherwise, or there is a simpler alternative. At this stage it will be sufficient to explain it by looking for the most valuable digit (i.e. the first non-zero digit on the left).

LESSON PLANNING

Objectives

General	To be able to round off numbers (to given levels of accuracy) and use them in calculations and estimates
Specific	1. To be able to round off whole numbers to the nearest 10, 100, or 1000, and decimals to the nearest whole number, tenth, hundredth, or thousandth 2. To be able to round off (to specified accuracy) after completing a calculation 3. To use the "round off and adjust" method for near multiples of 10, 100, or 1000 4. To be able to find products of multiples of 10 mentally 5. To be able to estimate answers by prior rounding off of the given numbers
Pacing	3 or 4 lessons
Method	Rounding needs careful explanation leading to understanding. Do not rush to reach the "following-digit rule". Taking the first text example, 18.6 to the nearest 10 Write down the nearest multiples of 10 on either side 10 18.6 20 Which is nearer? 10 or 20? Similarly, with decimal examples, e.g. 2.763 to 1 d.p. 2.7 2.763 2.8 Which is nearer: 2.7 or 2.8? It will not be long before someone spots the halfway point at 2.75, leading to the "following-digit rule" stated in the text.
Resources	A number line, marked in tenths, is useful.
Assignments	The Exercises 7A and 7B can be completed very quickly. EX 7C and 7M are more challenging.

Vocabulary	round off, adjust estimate decimal place (d.p.) most valuable digit

ANSWERS

Exercises

EX 7A

1.	a)	2800	b)	31 400	c)	900	d)	2000
2.	a)	21 000	b)	137 000	c)	8000	d)	10 000
3.	a)	8	b)	8	c)	6	d)	15
4.	a)	4140	b)	21 770	c)	60	d)	80
5.	a)	7.4	b)	16.5	c)	2.9	d)	3.0
6.	a)	14.6	b)	51.4	c)	64.2	d)	45.6
7.	a)	1.17, 1.2	b)	0.34, 0.3	c)	7.22, 7.2	d)	0.24, 0.2
8.	a)	0.8, 1	b)	4.5, 5				
	c)	3.4, 3	d)	103.02, 103				
9.	a)	11.11, 11.1	b)	2.55, 2.6				
	c)	1.122, 1.1	d)	0.018, 0.0				

EX 7B

	Exact	Nearest Whole	1 d.p.	2 d.p.	3 d.p.
1	7.9761	8	8.0	7.98	7.976
2	4.2353	4	4.2	4.24	4.235
3	8.7747	9	8.8	8.77	8.775
4	39.9167	40	39.9	39.92	39.917
5	8.77153	9	8.8	8.77	8.772
6	7.99109	8	8.0	7.99	7.991
7	1.23257	1	1.2	1.23	1.233
8	19.746	20	19.7	19.75	19.746
9	2.332	2	2.3	2.33	2.332
10	2.29	2	2.2	2.29	2.290

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EX 7C

1. a) 1065 b) 112 c) 3467 d) 1469
2. a) 123 b) 12 757 c) 1133 d) 1213
3. a) 5.931 b) 6.20 c) 67.9
   d) 579.54 e) 663.573 f) 1.2
4. a) 90 b) 129 c) 4 d) 2629
5. a) 2800 b) 3500 c) 1400 d) 3600
   e) 1800 f) 500 g) 3200 h) 2700
6. a) 3600 b) 5600 c) 1800 d) 2400
   e) 800 f) 5000 g) 1600 h) 3200
7. a) 70 b) 1000 c) 11000 d) 1900
8. a) 30 b) 500 c) 1000 d) 300
9. a) 10 b) 1 c) 600 d) 50
10. a) 800 b) 5 c) 24 d) 36 000

EX 7M

1. a) 49 b) 300 c) 3000 d) 4.3
2. a) 1.9 b) 3.3 c) 22.3 d) 0.9
   e) 60.1 f) 1.8 g) 2.7 h) 57.6
3. a) 1.14, 1.1 b) 0.15; 0.2 c) 12.68, 12.7 d) 0.45, 0.5
4. a) 3.5, 4 b) 15.3, 15
   c) 10.2, 10 d) 141.8, 142
5. a) 13.31, 13.3 b) 81.21, 81.2
   c) 1.38, 1.4 d) 0.086, 0.1
6. a) 1661 b) 124 c) 5716 d) 1076
7. a) 741 b) 240 c) 18 d) 537
8. a) 300 b) 7000 c) 400 d) 1400
9. a) 50 b) 500 c) 50 d) 20
10. a) 2000 b) 7 c) 800 d) 20

EX 7X

1. a) 24 b) –2 c) 30 d) 27

2.

	Estimated	Calculated
a)	2600	2658.2
b)	33	34.8205
c)	600	609.201
d)	1000	1043.263889

Estimating gives good results

3. a) Estimate $= (50 - 10 + 30 - 9) \times 8$

$= 61 \times 8$

≈ 4800, much higher than Saira's answer

b) She entered 5.49 instead of 54.9

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Chapter

8 Angles

Measuring and estimating

Although students should have used protractors before, experience would indicate that few do it accurately. The two main errors are:

a) not getting the centre spot over the vertex and the baseline carefully on one of the arms of the angle: students rush the positioning.

b) reading the wrong scale

c) using blunt pencils.

Estimating (Higher level skill) should not be avoided.

Reasoning

Using three basic angle facts to calculate requires selection of appropriate method (Higher level skill). This is the beginning of learning about mathematical proof in a very simple context, so it is important.

LESSON PLANNING

Objectives	
General	1. To be able to draw, measure, and estimate angles to a good standard of accuracy 2. To know some basic angle facts and use them to calculate other angles on a given diagram (not to scale)
Specific	1. To be able to draw and measure acute, right, and obtuse angles to an accuracy of ± 1° 2. To use the facts of 180° forming a straight line and 360° surrounding a point to calculate angles in diagrams 3. To know that the total of the three interior angles of a triangle is 180° and to use this to calculate other angles in diagrams 4. To be able to use letters to stand for missing angles and to find their values using intuitive reasoning
Pacing	4 lessons, 1 homework
Links	Factors (especially of 180) The meaning of $3x$, etc.
Method	Demonstrate drawing/measuring with large board protractor. Emphasize positioning carefully, and looking for zero on the arm so that the correct scale is read.

Before drawing have a mass pencil sharpening session. For geometry, H-rated pencils are better than HB. Pair working can be good: call out an angle, all draw it, then partner measures. Accuracy must be within ± 1°.

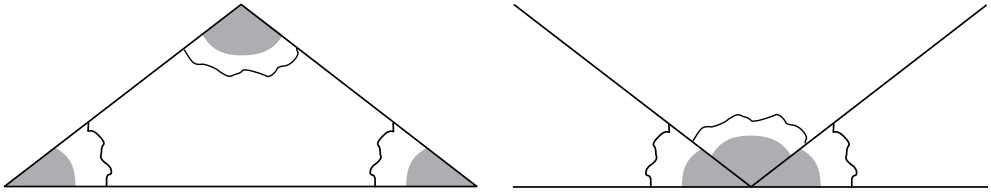
Call out both acute and obtuse angles.

EX 8A may be used for measuring.

EX 8B involves both drawing and estimating. Before setting this, go through the text showing equal division of 180°. (Estimates should be to ± 10°.)

The three angle facts stated in the text should be known already, to be revised only. However, many students forget the angle-sum of a triangle. A practical lesson can reinforce this. Give out prepared triangles, all different. (Sticky paper is ideal.) Students mark the internal angles with an angle arc, tear them off and stick them together on a straight line in their exercise books.

This shows that the angle-sum of a triangle is 180°.



It is recommended that using letters for missing angles, and associated pre-algebra, is not formally introduced. Just set EX 8C and see what happens!

Resources	Sharp pencils (preferably H) Protractors Rulers Sticky paper
Assignments	Any of the exercises, or parts, may be set as homework. EX 8M covers everything in the chapter. EX 8X (as usual) is especially challenging and is not for all.
Vocabulary	draw, measure, estimate, protractor angles around a point angles on a straight line angles inside a triangle acute, obtuse, right-angle

ANSWERS

Exercises

EX 8A

1. 41°
2. 30°
3. 102°

4. 118°

5. 91°

6. 37°

7. 54°

8. 16°

9. 43°

10. 60°

[Allow 1° on either side.]

EX 8B

1. $a = 40, b = 45$

2. $a = 45, b = 30, c = 150$

7. a) 90° b) 135° c) 150° d) 20°

8. a) right b) obtuse c) obtuse d) acute

9. a) acute b) obtuse c) acute d) obtuse

EX 8C

1. $a = 160, b = 140, c = 15, d = 8$ (angles on a straight line)

2. $a = 80, b = 135, c = 40, d = 39$ (angles around a point)

3 $a = 61, b = 90, c = 66, d = 60$ (angles in a triangles)

4. $a = 45, b = 50, c = 20, d = 30$

5. $a = 42, b = 70, c = 60, d = 77$

6. $a = 56, b = 118, c = 45, d = 87$

7 $x = 45$, 44° and 46°

8. $y = 60$, 59° and 121°

9. 30°, 60°, 90°, right-angled triangle

10. isosceles right-angled triangle

EX 8M

3. a) acute b) obtuse c) acute d) obtuse

4 $a = 50°, b = 36°, c = 144°$

6. a) 32°, 8° b) 116°, 94°, 112° c) 1 d) 280°

7. $a = 166$ b) $b = 145$, c) $c = 14$ d) $d = 51$

8. $a = 60$, $b = 69$, $c = 14$, $d = 36$

9. $x = 90°$, 95° and 85°

10. 20° 40°, and 120°

EX 8X

2. e) The angles inside a quadrilateral add up to 360°

3. 35°, 85°, 60° ($n = 40$)

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Chapter

9 Multiplication

This chapter deals with all methods for multiplication of whole numbers and decimals, without calculator, that are appropriate at this stage. Some of it will be revision, but the three strategies described in the text should be explicitly taught as these give students a real feel for how numbers work. For the same reason, encourage mental methods, resorting to the standard algorithms only when there is no alternative.

LESSON PLANNING

Objectives

General	To be able to multiply whole numbers and decimals using suitable strategies (without calculator)
Specific	1. To be able to multiply whole numbers and decimals (up to 4 d.p.) by whole numbers (up to 100) 2. To be able to multiply by using the ***halving and doubling*** strategy where appropriate 3. To be able to multiply by using the ***rounding off and adjusting*** strategy where appropriate 4. To be able to multiply by using the ***changing the order*** strategy where appropriate 5. To be able to multiply two decimals, obtaining the correct number of d.p. in the answer 6. To select an appropriate strategy for multiplication without prompting, and to solve word problems
Pacing	Approximately 4 lessons, 1 homework.
Method	Set EX 9A and 9B and use diagnostically. The "three strategies" should be taught explicitly, with lots of examples. Avoid using the terms commutative, associative, and distributive: at this stage the strategies should be instinctive and not formally presented. EX 9C follows. For the product of two decimals, emphasize (as in the text) that the total number of d.p. has to be preserved. For students who question the rule (all credit due!), use fractions to show why it works, e.g.

$$3.4 \times 2.15$$

$$= \frac{34}{10} \times \frac{215}{100}$$

$$= \frac{34 \times 215}{1000}$$

	So, we multiply 34 x 215 and ensure that the answer has 3 d.p. (thousandths) Exercise 9D follows, and 9M where students have to choose the most appropriate method.
Resources	Tables square, either as a wall poster or on small cards, for students weak on knowledge of multiplication tables
Assignments	Any one of the exercises may be used for homework. Most suitable are EX 9A, 9B, or 9M.
Vocabulary	short multiplication long multiplication strategy halving, doubling, rounding, adjusting, changing the order

ANSWERS

Exercises

EX 9A

1.	a)	410	b)	60 020	c)	1750	d) 90
2.	a)	700	b)	1700	c)	185 600	d) 21000
3.	a)	6	b)	67.8	c)	2160	d) 1.5
4.	a)	34.25	b)	8240	c)	1890	d) 43.5
5.	a)	60	b)	9	c)	40	d) 2
6.	a)	8.2	b)	75.6	c)	31.2	d) 43.5
7.	a)	11.9	b)	18.4	c)	39.2	d) 4.2
8.	a)	3.78	b)	601.04	c)	1554.7	d) 67.23
9.	a)	51.70	b)	1247.6	c)	36.605	d) 2.592
10.	a)	5.586	b)	31.71	c)	208.64	d) 1523.5

EX 9B

1.	a)	6.46	b)	292.76	c)	218.5	d) 3100.8
2.	a)	8.64	b)	83.46	c)	1051.5	d) 161.70
3.	a)	164.25	b)	8.73	c)	2425.5	d) 48.6
4.	a)	502.52	b)	1781.6	c)	207.4	d) 28.56
5.	a)	243.1	b)	32.3	c)	17.85	d) 3.876
6.	a)	73.47	b)	437.1	c)	597.99	d) 6.324
7.	a)	8.4	b)	43.68	c)	3.51	d) 5436.6

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8.	a)	5	b)	490	c)	3023.3	d)	73.602
9.	a)	240.5	b)	90	c)	0.92	d)	54.81
10.	a)	164.7	b)	32.64	c)	269.8	d)	324.6

EX 9C

1.	a)	40	b)	160	c)	51	d)	64
2.	a)	140	b)	4.3	c)	3.6	d)	11.2
3.	a)	336	b)	21.7	c)	49.2	d)	168.3
4.	a)	171	b)	174	c)	81.9	d)	345
5.	a)	13.05	b)	7.238	c)	21.6	d)	14.22
6.	a)	0.34	b)	195.5	c)	19.552	d)	8.43
7.	a)	105	b)	45	c)	12.3	d)	474
8.	a)	11.265	b)	92.92	c)	377.4	d)	62.3
9.	a)	53.2	b)	27	c)	7.2	d)	5.62
10.	a)	39	b)	21.3	c)	5.9	d)	3.6

EX 9D

1.	a)	0.24	b)	0.14	c)	0.012	d)	0.30
2.	a)	6.615	b)	1.39	c)	0.0693	d)	0.0196
3.	a)	0.9372	b)	9.324	c)	84.13	d)	0.2409
4.	a)	0.018	b)	1.04	c)	0.0476	d)	20.12
5.	a)	0.159	b)	3.43	c)	0.0657	d)	3.776
6.	a)	2.134	b)	38.85	c)	19.598	d)	0.15893

7. 0.468 m^2 = 0.5 m^2 (1d.p.)

8. 3.686 m^2 = 3.7 m^2 (1d.p.)

9. 59.1522 m^2 = 59 m^2 (nearest whole number)

10. $8.33 \times 0.4 = 3.332$ l = 3.3 l (1d.p.)

EX 9M

1.	a)	9350	b)	1300	c)	99.5	d)	8340
2.	a)	8	b)	95.1	c)	64.8	d)	271.26
3.	a)	1456.4	b)	23.66	c)	506.88	d)	6945
4.	a)	3082.5	b)	624.24	c)	18.19	d)	915.12

5. a) 11.2 b) 220 c) 244.2 d) 504.6

6. a) 180 b) 13.2 c) 1575 d) 133

7. $5 \times 7.8 \times 1.2 = 7.8 \times 6 = 46.8$ km^2

8. Rs 2989.76 = Rs 2990 (nearest rupee)

9. $30 \times 6.5 \times 0.2 = 6.5 \times 6 = 39$ m^2 (one side of the fence)

10. Rs 325.28 = Rs 325 (nearest rupee)

EX 9X

1. 0.5, 0.1, 0.05, 0.8, 0.3

   a) 0.05 b) 0.24 c) 0.005 d) 0.4

2. a) 2.09 b) 8.1 c) 777 d) 15.3

3. a) 64 b) 21 c) 428.7 d) 3986

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Chapter

10 Revision Exercises

These exercises cover the topics in chapters 1–9 of the text first, and then include general topics from a modern primary scheme, as follows:

- EX 10A #1–8 Revision from Chapter 1–9
- Thereafter, a mixture of old and new topics

LESSON PLANNING

Objectives	
General	1. To be confident in answering questions on work covered in class (Chapters 1–9) 2. To discover if correct answers can be obtained on work not covered recently
Specific	1. To practise answering questions on work covered recently 2. To explore whether questions may be answered on topics that may not have been covered, or covered some time ago
Pacing	2 to 4 lessons, depending on use
Method	There are a number of options depending on how much use the teacher wants to make of the topics not covered in the text. a) Set EX 10A #1–8 and "cherry pick" from the rest. b) Set EX 10A #1–8 and then see how much further the students can manage. c) As for (b) allow students to skip any question they do not understand. [This can be most informative diagnostically.] d) Encourage students who can do a difficult question to explain it to the whole class. e) Allow working in pairs or small groups. f) Competitive group working g) Timed exercise. When 3 (say) students have completed it, stop everyone and give out the answers for immediate feedback. h) Use one of exercises as a mini-test under examination conditions. i) If there is plenty of time, just get everyone to work through all the exercises systematically.
Assignments	All should complete EX 10A #1–8, and as much of the rest as time permits. Any selection may be used for homework.

Vocabulary	modal group sequence, formula true, false, odd, even, prime, multiples symmetry cancel down fractions, simplest equivalents anticlockwise, coordinates scalene, isosceles, equilateral

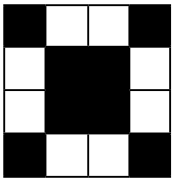
ANSWERS

Exercises

EX 10A

1. a) 8 b) 19 c) 5 d) 0.1
2. a) 10.01; 10.0 b) 50.47; 50.5
   c) 1.403; 1.4 d) 0.526; 0.5
3. $a = 20, b = 43, c = 30, d = 30$
4. a) 17.4 b) 280 c) 266.7 d) 8.84
5. a) 0.3 b) 0.6 c) 0 d) 1
6. a) 138 b) 1224 c) 1 d) 77.31
7. 16 cm^2
8. a) 3.8 b) 0.15 c) 9.03 d) 3.23
9. a) $\frac{1}{10}$; 0.1 b) 80% ; $\frac{4}{5}$ c) 25% ; 0.25 d) Rs 240
10. a) 30 to 40 kg b) 40 to 50 kg c) 40 to 50 kg
    d) girls generally heavier

EX 10B

1. a) n b) $n + 1$ c) $2n + 1$ d) 101
2. a) True b) False c) False d) True
3. 
4. a) 36.2 ℃ b) 36.9 ℃ c) 37.5 ℃ d) 37.1 ℃
5. a) 33 b) 21 c) 10 d) –3.2

6. a) 9 b) 6 c) 2 d) 5

7. a) 38 °C, 27 °C, 10 °C, 4 °C, 0 °C, –7 °C, –21 °C b) 59 degrees

8. a) Rs 450 b) 38 l c) 760 m d) 80 g

9. a) $2n + 3$ b) $2(t + 3)$ c) $2(4q - 1)$

d) $\frac{x+1}{2} - 1$

10. a) 2 b) 2 c) 11 d) 3

EX 10C

1. $a = 19, b = 71, c = 89$

2. a) 100 b) 75.6 c) 1.848 d) 26.4

3. a) ③ b) ① c) ④ d) ②

4. a) 2600 b) 1.25 l c) 3.243 kg d) 76 mm

5. a) m^2 b) km^2 c) m d) mm^2

6. a) 170 b) 460 c) 110 d) 40

7. a) 0.88 m b) 0.5 m^2 c) 0.65 d) 11.79 s

8. a) $\frac{1}{2}$ b) $\frac{7}{8}$ c) $\frac{2}{3}$ d) $\frac{1}{3}$

9. a) 49 b) 0.49 c) 0.64 d) 1.44

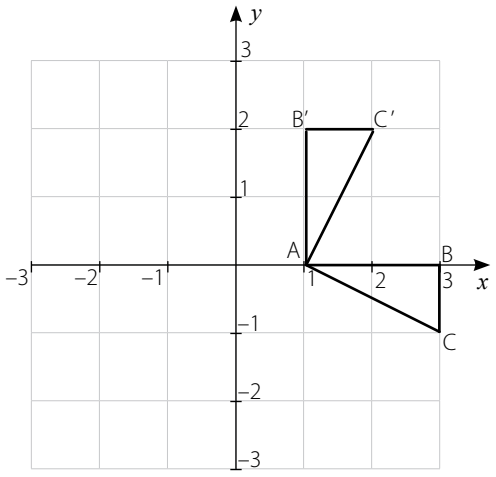
10. a) 25 b) 48 c) 52 d) 100

EX 10D

1. a) 6, 12, 18, 24, 30, 36, 42, 48, 54, 60 b) 2, 3, 5, 7, 11, 13, 17, 19

c) 36, 49, 64, 81 d) 288

2. a) b)



c) $C'(2, 2)$ d) $A \to A, \quad B \to B'(1, 2), \quad C \to C'(2, 2)$

3. a) 15 min late b) 20 min early

c) 2 min early d) 2 min late

4. a) 10 b) –26 c) 8 d) –5

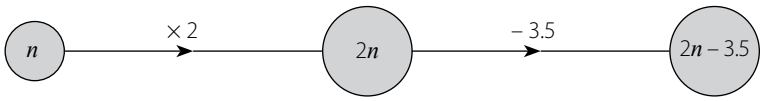
5. a) 102° b) 25°

c) 60° and 60° d) 80° and 20°; 50° and 50°

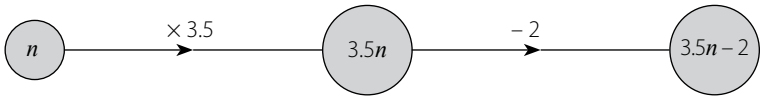
6. a) 56 710 b) two hundred and fifteen thousand and seven

c) 19 028.5 d) eight hundred and forty-two thousand, two hundred and thirty-nine point five seven

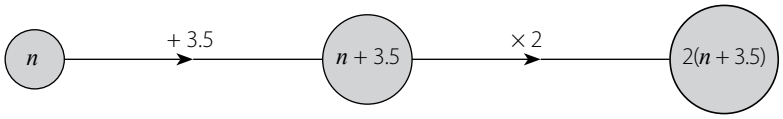
7. a)



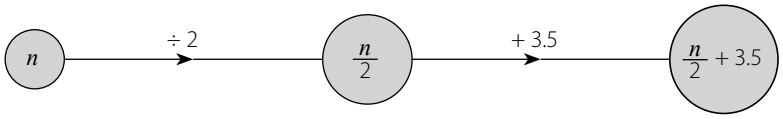
b)



c)



d)



8. a) 1914.4 b) 0.68 c) 119.747

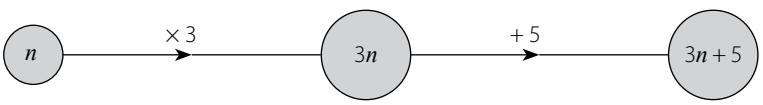
9. $a = 150$ $b = 44$ $c = 82$ $d = 97$

10. a) 4900; 5314.4 b) 24; 23.313 c) 500; 481.92

d) 8; 7.1448

EX 10X

1. Output = $3(n + 2) - 1 = 3n + 5$



2. a) Est = $(50 - 9 + 30 - 1) \times 60$

$= 70 \times 60$

$= 4200$

b) Alisha entered 583 instead of 58.3 c) 3985.971 d) 3986.0

3. 70°, 70°, 40° OR 70°, 55°, 55°

Chapter

11 Percentages

This chapter should be consolidation for the majority of students, although some may have been taught "cook book recipes" to obtain answers without understanding. All the strategies in the text should be presented. The mental techniques are vital for inculcating true numeracy. Calculators should not be allowed unless specifically called for.

LESSON PLANNING

Objectives

General	To be able to change percentages to fractions and decimals and *vice-versa*, and to use percentages in simple contexts.
Specific	1. To be able to find equivalent decimals and fractions for simple percentages, and *vice-versa* 2. To be able to find percentages of areas of shapes, and of numeric quantities, using appropriates strategies 3. To be able to use percentages to place a set of numbers (various forms) in order of size 4. To use a calculator to convert fractions to percentages (1 d.p. after rounding) by division 5. Using suitable techniques to find percentage increases and decreases, and applying them to word problems
Pacing	EX 11A and 11B very quickly. Take more time over 11C and 11M. A well-taught class may be able to skip most of the chapter, just completing EX 11M as a homework assignment.
Method	Since most students will have some familiarity with the topic, emphasize the strategies. Many questions can be solved in more than one way. *Is there another way of doing this?* is a good question to ask.

For example, 35% of Rs 4000

STRATEGY 1: 0.35×4000

$= 35 \times 40$

$= 70 \times 20$ (double/halve)

$=$ Rs 1400

STRATEGY 2: $\frac{35}{\cancel{100}} \times \cancel{4000}^{40}$

$= {}^{1}\ 35 \times 40$

$=$ Rs 1400

STRATEGY 3:	10%	of	Rs 4000	=	Rs 400
	20%				800
	5%				200
	35%				Rs 1400

Assignments	homework EX 11A, 11M
Vocabulary	percentage, hundredth building up in stages dividing it out discount

ANSWERS

Exercises

EX 11A

1.	a)	$\frac{1}{5}$	b)	$\frac{7}{20}$	c)	$\frac{4}{5}$	d) $\frac{6}{25}$
2.	a)	18%	b)	75%	c)	90%	d) 15%
3.	a)	0.39	b)	0.46	c)	0.08	d) 0.125
4.	a)	55%	b)	35%	c)	17.5%	d) 2.5%
5.	a)	20%	b)	40%	c)	40%	d) 100%
6.	a)	Rs 65	b)	Rs 102	c)	1.92 km	
	d)	720 people					
7.	a)	1200 packets	b)	Rs 2100	c)	6 chairs	
	d)	40 books					
8.	a)	Rs 396	b)	224 l	c)	1045 m	d) 210 km^2
9.	a)	Rs 138	b)	105.6 km	c)	136 boys	d) 600 girls
10.	a)	20%	b)	40%	c)	40%	d) 25%

EX 11B

1.	a)	62.5%	b)	40%	c)	75%	d) 80%
2.	a)	33.3%	b)	42.9%	c)	44.4%	d) 83.3%
3.	a)	60%	b)	85%	c)	22.5%	d) 54.5%
4.	a)	41%	b)	0.64	c)	0.35	d) 89%

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5. a) 68%, $\frac{7}{10}$, 86%, $\frac{9}{10}$, 0.91 b) $\frac{1}{8}$, $\frac{3}{8}$, 0.38, 39%, 0.44

c) 16.5%, $\frac{7}{40}$, 0.18, 27%, 0.38 d) 0.18, $\frac{1}{5}$, 25%, $\frac{3}{11}$, $\frac{3}{4}$

6. a) 86%, $\frac{6}{7}$, 0.855 b) 0.8, $\frac{7}{9}$, 77% c) 0.308, $\frac{4}{13}$, 30%

d) 30%, $\frac{5}{17}$, 0.294

7. a) 0.428571 b) 43% c) 42.9% d) 4.3%

8. a) 0.615385 b) 61.5% c) 6.2% d) 7.2%

9. a) $\frac{1}{6}, \frac{3}{8}, \frac{2}{5}, \frac{4}{7}$ b) $\frac{6}{14}, \frac{5}{11}, \frac{8}{13}, \frac{7}{9}$

c) $\frac{10}{16}, \frac{9}{13}, \frac{11}{14}, \frac{12}{15}$ d) $\frac{13}{18}, \frac{15}{20}, \frac{14}{17}, \frac{16}{19}$

10. a) $\frac{11}{20}$ b) $\frac{24}{30}$ c) $\frac{1}{2}$ d) $\frac{56}{70}$

EX 11C

1. Rs 880
2. Rs 5060
3. Rs 9990
4. Rs 4050
5. Rs 600, Rs 300, Rs 150, Rs 750, Rs 5250
6. Rs 128, Rs 672
7. Rs 94
8. Rs 1.78 million
9. Rs 75.6 million
10. Rs 99 200

EX 11M

1. a) 0.32 b) 0.53 c) 0.06 d) 0.115
2. a) Rs 84 b) Rs 126 c) 1.82 km

d) 450 people

3. a) Rs 246 b) 77.04 km c) 78 boys (rounded off)

d) 285 girls (rounded off)

4. a) 40% b) 30% c) 10% d) 80%
5. a) 7.7% b) 13.3% c) 15.8% d) 14.8%

6. a) $\frac{1}{10}$, 13%, $\frac{3}{10}$, 31%, 0.32

b) $\frac{1}{5}$, 0.47, 72%, 0.74, $\frac{4}{5}$

c) 23.1%, 0.26, $\frac{7}{20}$, 45%, 0.54

d) 0.17, $\frac{3}{5}$, 62%, $\frac{9}{13}$, 70%

7. a) 0.894737 b) 89.5% c) 8.9% d) 10.9%

8. Rs 300 extra

9. Rs 204

10. Rs 1225

EX 11X

1. a) $\frac{1}{7} = 0.142857$

$\frac{2}{7} = 0.285714$

$\frac{3}{7} = 0.428571$

$\frac{4}{7} = 0.571428$

$\frac{5}{7} = 0.714285$

$\frac{6}{7} = 0.857142$ The same digits are used in a different order.

b) The digits repeat after the 6th decimal place.

c) $\frac{1}{9} = 0.111...$ $\frac{2}{9} = 0.222...$ The repeated digit is in the fraction numerator.

d) The digits repeat after the 2nd d.p. and the two digits always add up to 9.

2. a) 22.692 km b) 4.032 l c) 3.104 kg

d) 17.503 km^2

3. a) 90% b) 80% c) 80% of 90% = 72%

d) 28%

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Chapter

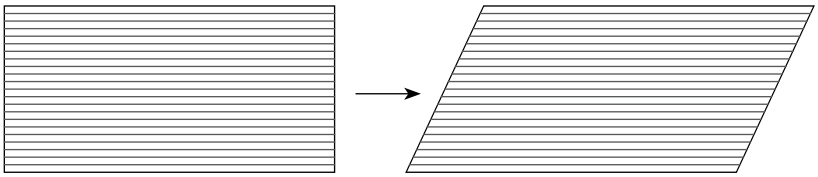
12 Quadrilaterals

This is an activity-based chapter. Learning the properties of quadrilaterals at this stage is best acquired through practical tasks described in the exercises.

LESSON PLANNING

Objectives

General	To be able to recognize six special quadrilaterals by name and properties
Specific	1. To discover properties of special quadrilaterals by drawing and measuring 2. To discover how quadrilaterals can be formed from right-angled triangles
Pacing	2 lessons
Links	Measuring length and angles, symmetry
Method	Practical sessions: These need careful advance planning, with required materials ready for the students to use. At the start go through the text descriptions of the shapes. (The trapezium is dealt with separately before EX 12B.) A good demonstration that makes the dynamic connection in the mind between the rectangle and the parallelogram is to use a simple pile of books and shear it:



Pile of books (front view) rectangle

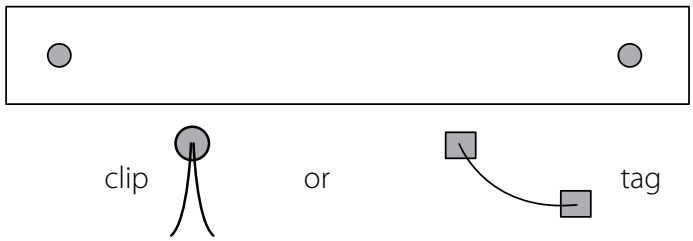
Same pile of books sheared to show parallelogram

This demonstration will help with later work on the area formula for the parallelograms.

Spelling Hint: In "parallelograms" the first two l's are parallel!

Group work is ideal for practical work. Allow discussion of the work (but not chatter), but individuals must record their own answers.

Resources	1. Strips: The strips referred to in the exercises may be simple cardboard strips. The long strips should be 8 cm in length; the short strips 5 cm in length. The width should be about 1 cm. There should be small holes at each end, allowing movement when the strips are connected together with small treasury tags or paper clips.



Another way of doing this is to use plastic straws and fasten them with pipe cleaner pieces.



You will need to prepare 4 long strips and 4 short strips per student. (You can reduce this number if working in groups.)

2. Triangles: The small and large triangles referred to in the exercises are right-angled triangles as shown. You will need 4 of each per student. (Again, you can reduce this by sharing.) Photocopiable sheets are provided for the triangles. If possible, copy straight onto thin card or thick paper. [See pages 49 and 50]

Assignments	This chapter is best done in class, with supervision. If homework is required, use may be made of unused Revision Exercises in Chapter 5 and/or Chapter 10.
Vocabulary	square, rhombus, rectangle, parallelogram kite, concave, convex diagonals, vertex, vertices trapezium, parallel opposite, adjacent bisect, intersect

ANSWERS

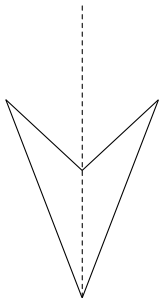
Exercises

EX 12A

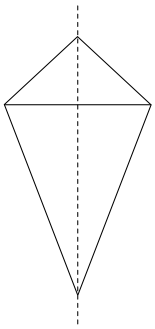
1. b) diagonals equal c) all 90° d) diagonals bisect
2. b) diagonals not equal c) diagonals bisect d) all 90°
3. b) only one diagonal bisected
   c) all 90° d) diagonals intersect at right angles

4. b) One diagonal lies outside the shape boundary.

c)



d)

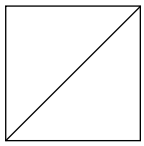


5. b) Yes c) No, opposite pairs equal.

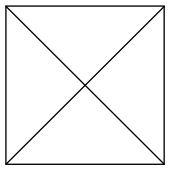
d) at the vertices

6. c) diagonals bisect d) opposite pairs equal

7. a)



b)



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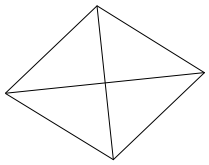

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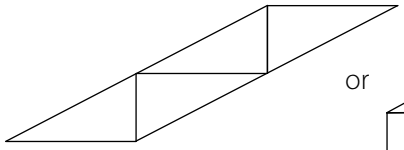

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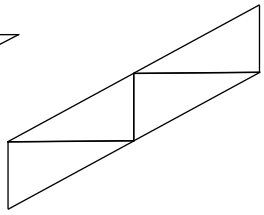

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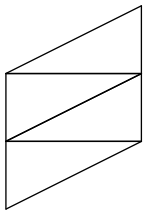
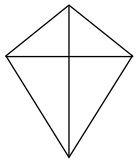
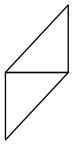


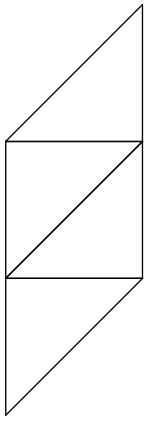
8. a)



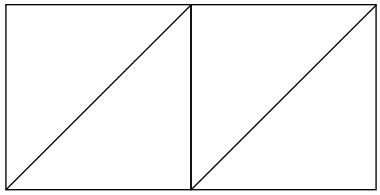
b)



c)



d)



9. a) False. A square has 4 lines of symmetry. b) True
   c) False. A rectangle has 2 lines of symmetry. d) True

10. a) False. A kite has one pair of opposite angles equal.
    b) True c) True
    d) False. In a rhombus each diagonal bisects the other.

EX 12B

1. kite
2. rectangle; rhombus
3. trapezium
4. square
5. square; kite; rhombus
6. square; rectangle; rhombus; parallelogram
7. parallelogram
8. klte; trapezium
9. kite

EX 12X

1. a) square b) rhombus
   c) rhombus d) rectangle

2. a) rectangle b) parallelogram c) rhombus d) kite

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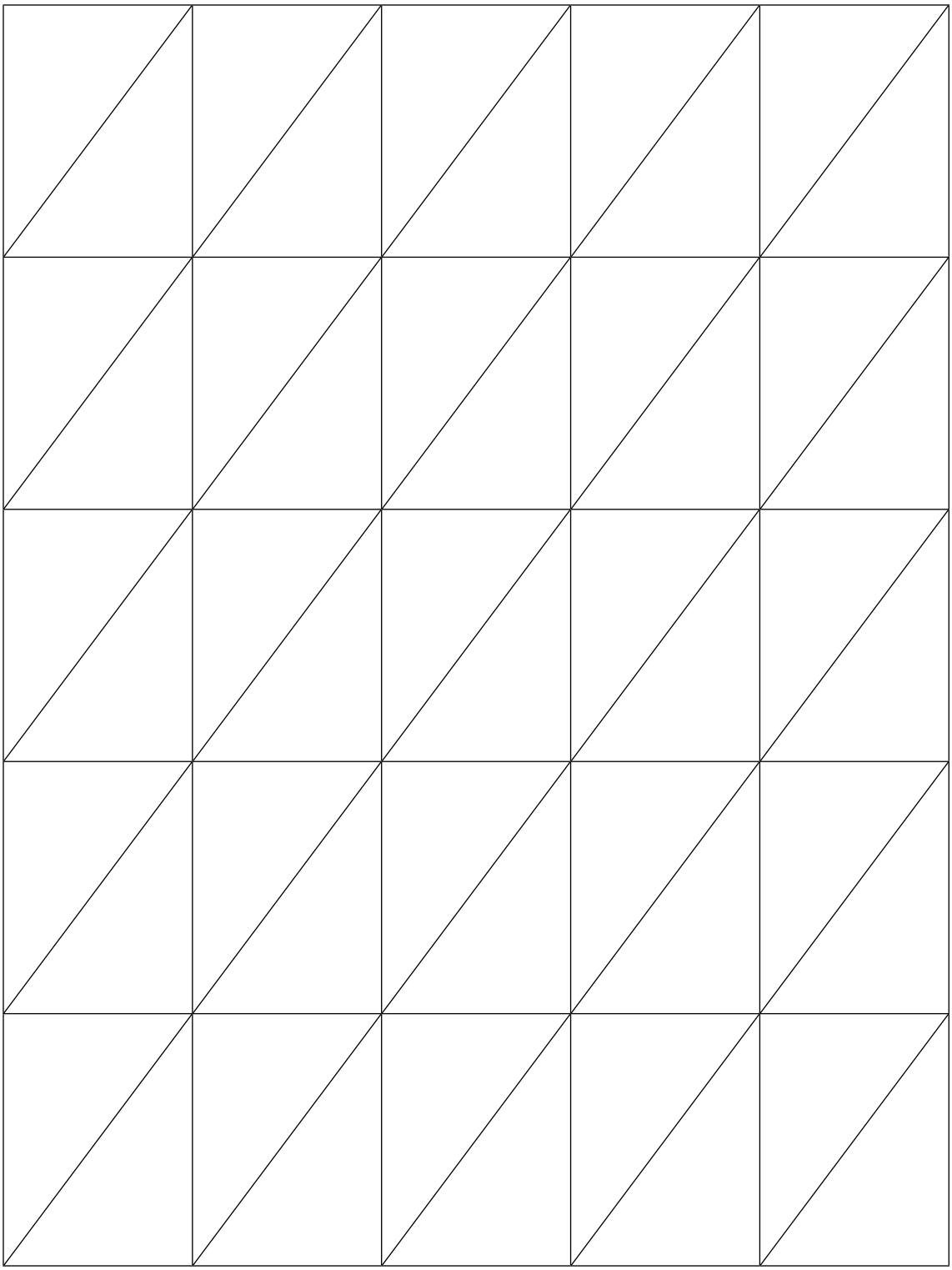
3 : 4 : 5 Triangle (large)



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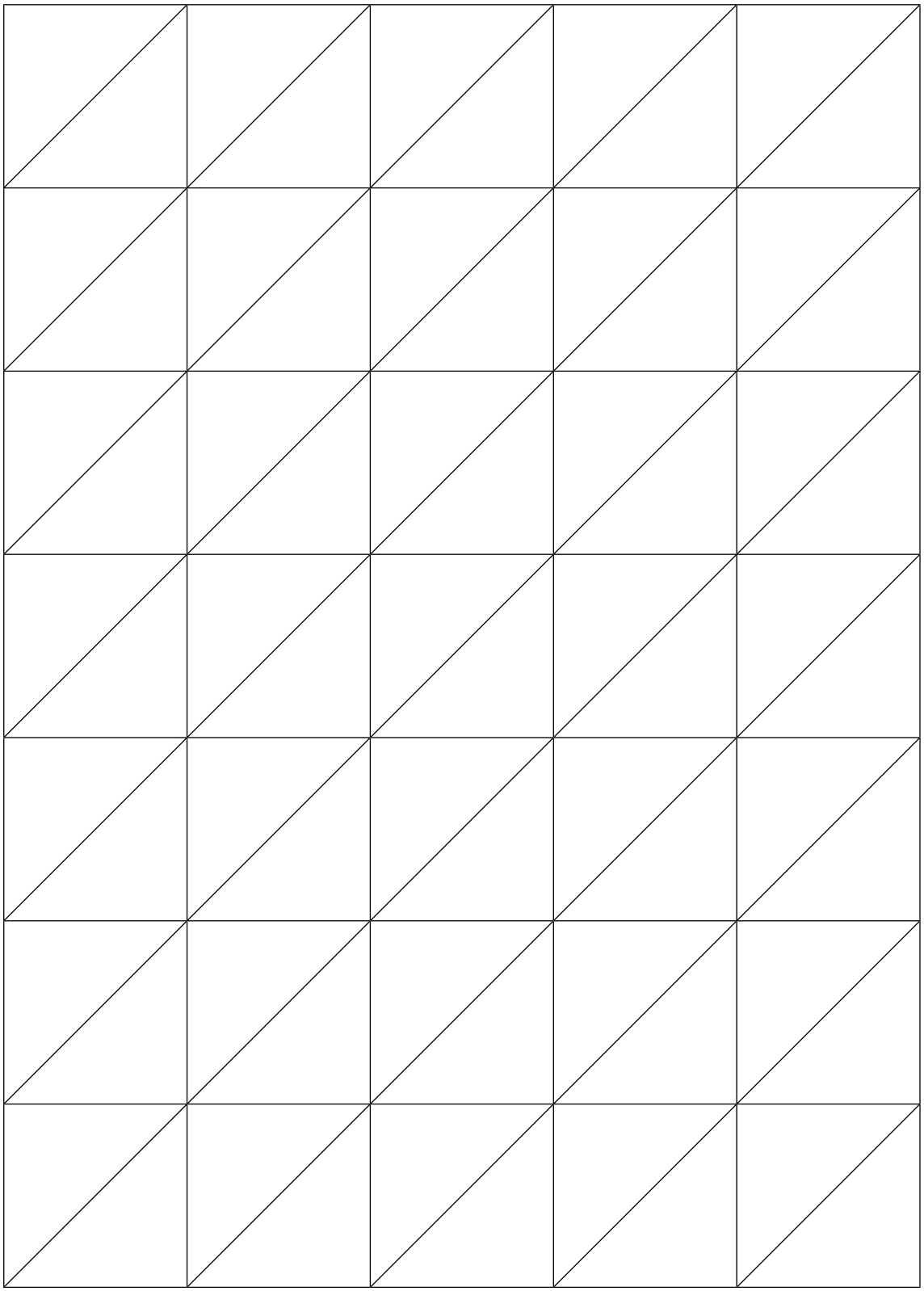
3 : 3 : 3$\sqrt{2}$ Triangle (small)



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Chapter

13 Division

In these days of cheap calculators, and calculator functions on watches and smart phones, the need to know complicated division techniques is obsolete. However, students should be able to do easy divisions mentally and on paper, and use estimation before resorting to a calculator. The different types of answer to a division problem depending on the situation is a particular focus of this chapter, i.e. the meaning of division in practical contexts.

LESSON PLANNING

Objectives

General	To recognize when division is required and to complete the calculation accurately using an appropriate technique
Specific	1. To be able to do simple division by whole numbers and by decimals (up to 2 digits) 2. To know when the answer to a division should be quotient and remainder, mixed number, or decimal, according to context 3. To be able to estimate divisions involving difficult numbers, and to use a calculator to obtain results to specified accuracy 4. To be able to recognize when division is required to solve word problems
Pacing	EX 13A and 13B fairly quickly. Take time over the rest. 3 lessons, 1 homework
Method	Go through Fast Division, Short Division, and dividing by simple decimals quickly (revision for most). Use EX 13A and 13B. Distinguish between answers expressed either as whole number quotient and remainder, mixed number, or decimal. Give practical examples of each. Use EX 13C. For the harder division, you can teach the long division algorithm if you really prefer but the text assumes calculators will be used, after prior estimation. Use EX 13D. Recurring decimals is a fun topic with calculators. Follow the text and keep the class busy with Ex 13E. Some Higher level skills are involved here.
Resources	Calculators (for EX 13D, 13E, and 13M)
Assignments	Most suitable for homework are EX 13A, 13B, and 13M.
Vocabulary	quotient, remainder round off, decimal place, estimate

ANSWERS

Exercises

EX 13A

1.	a)	4	b)	3700	c)	1.2	d)	0.63
2.	a)	7	b)	280	c)	0.86	d)	0.093
3.	a)	97.2	b)	0.48	c)	0.584	d)	0.135
4.	a)	6.6	b)	0.002	c)	0.12	d)	0.44
5.	a)	1.4	b)	3.2	c)	3.2	d)	3.1
6.	a)	0.8	b)	1.4	c)	1.2	d)	4.3
7.	a)	2.96	b)	0.952	c)	72.7	d)	2.46
8.	a)	0.207	b)	9.39	c)	41.9	d)	0.0633
9.	a)	0.097	b)	1.29	c)	0.043	d)	0.751
10.	a)	7.35	b)	0.307	c)	0.527	d)	6.02

EX 13B

1.	a)	47.4	b)	1.72	c)	97.1	d)	4.5
2.	a)	3.4	b)	954	c)	62.1	d)	8840
3.	a)	4.2	b)	241	c)	156	d)	8.07
4.	a)	72.9	b)	776	c)	6.4	d)	0.275
5.	a)	30	b)	50	c)	28	d)	0.2
6.	a)	1.09	b)	13.7	c)	6.2	d)	2.01
7.	a)	67.2	b)	2.1	c)	692	d)	10.3
8.	a)	771	b)	57.4	c)	3220	d)	7.1
9.	a)	48.3	b)	657	c)	0.101	d)	200
10.	a)	4	b)	40	c)	40	d)	0.6

EX 13C

1.	a)	4 r 1	b)	4 r 4	c)	54 r 1	d)	9 r 3
2.	a)	$6\frac{1}{2}$	b)	98 r 1	c)	20 r 1	d)	19 r 1
3.	a)	1.4	b)	0.5	c)	1.6	d)	0.9
4.	a)	3.5	b)	7.25	c)	16.8	d)	125.12

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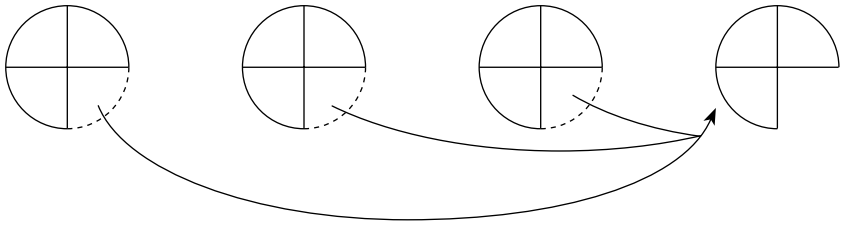
5. a) $8\frac{1}{2}$ b) $9\frac{3}{5}$ c) $2\frac{3}{4}$ d) $4\frac{1}{5}$

6. a) 9 r 1 b) 7

   c) 5 r 3 d) Remainders

7. a) $\frac{3}{4}$ each (Take $\frac{1}{4}$ from each cake for the 4th child.)



   No cake leftover

8. a) 12.5 m

9. $1\frac{1}{2}$ pieces

10. Rs 86.95

EX 13D

1. a) $3 \div 3 = 1$ b) $80 \div 8 = 10$

   c) $0.08 \div 2 = 0.04$ d) $400 \div 1 = 400$

2. a) 20; 19.7 b) 2; 2.4 c) 0.1; 0.1 d) 30; 27.5

3. a) 1; 1.0 b) 12; 11.6 c) 60; 55.4 d) 6; 6.4

4. a) 0.3; 0.3 b) 203.2; 200

   c) 1.1; 1 d) 335.8; 300

5. 1.27 m

6 Rs 429

7. 31.9 km^2

8. (c) is incorrect; 0.1 (1 d.p.)

9. a) 8.64 m^2 b) 0.04 m^2

   c) 216 d) cut tiles-waste

10. a) 190.24 m^2 b) 14 m^2 c) 14 carpets

    d) Without cutting the carpets there is overlapping. 15 carpets can be arranged in 5 rows of 3 to cover the floor.

EX 13E

1. a) 0.3 b) 0.33 c) 0.333 d) $0.\dot{3}$

2. The calculator has rounded off at the screen limit.

3. a) $0.\dot{2}$ b) $0.\dot{4}28\,57\dot{1}$ c) $0.\dot{4}\dot{5}$

   d) $0.\dot{5}38\,46\dot{1}$

4. a) $0.\dot{4}$ b) $0.\dot{8}57\,14\dot{2}$ c) $0.692\,30\dot{7}$ d) $0.\dot{6}\dot{3}$

5. $0.\dot{1},\ 0.\dot{2},\ 0.\dot{3},\ 0.\dot{4},\ 0.\dot{5},\ 0.\dot{6},\ 0.\dot{7},\ 0.\dot{8}$

   The numerator gives the recurring digit.

6. $0.\dot{1}42\,85\dot{7},\ 0.\dot{2}85\,71\dot{4},\ 0.\dot{4}28\,57\dot{1},\ 0.\dot{5}71\,42\dot{8},\ 0.\dot{7}14\,28\dot{5},\ 0.\dot{8}57\,14\dot{2}$

   The digits are the same six, and rotate.

7. a) 0.1 b) $0.\dot{1}$ c) 0.3 d) $0.\dot{3}$

8. a) $5.\dot{4}28\,57\dot{1}$ b) 2.5 c) $2.\dot{5}$ d) $5.\dot{3}$

9. $0.\dot{0}\dot{9},\ 0.\dot{1}\dot{8},\ 0.\dot{2}\dot{7},\ 0.\dot{3}\dot{6},\ 0.\dot{4}\dot{5},\ 0.\dot{5}\dot{4},\ 0.\dot{6}\dot{3},\ 0.\dot{7}\dot{2},\ 0.\dot{8}\dot{1},\ 0.\dot{9}\dot{0}$

   The repeated digits are multiples of 9.

10. $0.\dot{6},\ 0.1\dot{3},\ 0.2,\ 0.2\dot{6},\ 0.\dot{3},\ 0.4,\ 0,\dot{4}\dot{6},\ 0.5\dot{3},\ 0.6,\ 0.6\dot{6},\ 0.7\dot{3},\ 0.8,\ 0.8\dot{6},\ 0.9\dot{3}$

    e.g. patterns in groups of every third number:

    $0.0\dot{6},\ 0.2\dot{6},\ 0.4\dot{6},\ 0.6\dot{6},\ 0.8\dot{6}$

    $0.1\dot{3},\ 0.3$ (i.e. $0.3\dot{3}$), $0.5\dot{3},\ 0.7\dot{3},\ 0.9\dot{3}$

    $0.2,\ 0.4,\ 0.6,\ 0.8$

EX 13M

1. a) 5 b) 8 c) 108.3 d) 7.7

2. a) 1.9 b) 0.9 c) 2.3 d) 6.2

3. a) 3.21 b) 0.415 c) 8.85 d) 7.06

4. a) 49 b) 6.7 c) 3.2 d) 930

5. a) 40 b) 20 c) 87.2 d) 3

6. a) 4 r 3 b) $62\frac{1}{3}$ c) 0.8 d) $1\frac{1}{2}$

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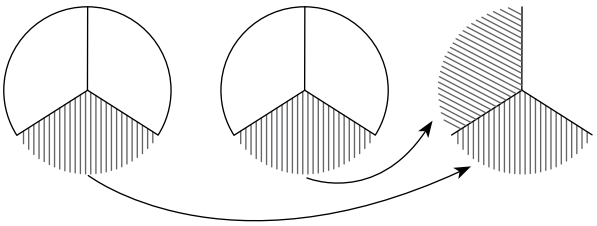
7. $\frac{2}{3}$ each, no cake left over



[$\frac{1}{3}$ cut from each cake for the third child]

8. 2.14 m

9. 16

10. a) 2, 2.0 b) 5, 5.4 c) 600, 588.9 d) 0.2, 0.2

EX 13X

1. a) 72, 72 b) 21, 21 c) 32, 32 d) 150, 150

Dividing by 0.5 means finding how many halves are in it. This is the same as multiplying by 2. Similarly, for dividing by 0.1 and multiplying by 10, etc.

2. a) 114.285 714 b) 10 122.222 c) 1234.5679

d) 8.27273

3. $\frac{1}{2} + \frac{1}{3} + \frac{1}{9} = \frac{17}{18} < 1$, so the farmer's will does not correctly specify the destination of all his cows. [Don't expect students to understand this!]

Chapter

14 Negative Numbers

The concept of negative numbers should have been met before in simple practical contexts, e.g. temperature. This is revised in the text, with time zones included. There is no attempt at this stage to define integers formally, with combination rules, although there is no harm in using the word "integer" to mean a positive or negative whole number or zero. The text in not restricted to integers: some negative decimals and fractions are included.

LESSON PLANNING

Objectives

General	1. To understand that negative numbers extend the number line, and to use them to calculate change 2. To understand and use coordinates (in 2 dimensions) in problems involving reading and plotting points with negative and positive) coordinates
Specific	1. To use < and > signs correctly between pairs of (positive and/or negative) numbers 2. To calculate correctly the change between pairs of (positive and/or negative) numbers 3. To label a coordinate grid (2-D) correctly, and use it to read and plot points, and to draw diagrams/graphs
Pacing	2 lessons, 1 homework.
Links	Geography—time zones Sequences Polygons, symmetry

Method

Use visual aids at this stage, even though the most able students will not need them. A horizontal number line and a world map show clearly the left-right, negative-positive convention in both cases. A vertical number line is best for temperature, water level changes, etc. Revise < and > signs: the pointy end of the sign (small) is next to the smaller number; the wide end (large) is next to the larger numbers. But deal with the (negative) common error: $-5 < -1$ is correct even though 5 is larger than 1. Use EX 14A.

For coordinates, begin with positive axes only, revising how to plot (x, y) points. The most common error is to confuse x and y.

Hints:
- Alphabetical order: x comes before y
- x *looks like a cross*, so the x-axis *goes across*

- When plotting, place a vertical ruler over the x-axis, moving left/right to find the x-coordinate. Then hold the ruler and move up/down to locate the y-coordinate.

Extend the x-axis to the left first, then extend the y-axis down in the negative direction. Lots of examples on the board; invite students to plot points, and to state the coordinates of given points. Use a "spot" for the location of each point. [More able students may see the value of using a + (plus sign) over the point where accuracy is required.]

Use the word origin for the central point (0, 0). Give out coordinate grid sheets when using EX 14B.

Resources	• Number lines, horizontal and vertical, extending in the negative direction. Ideally, every classroom should have these on display permanently. (There is a vertical scale in the text.) • Map of the world. If time zones are not clear, they should be made bold using a black marker pen. • Photocopiable coordinate grids are available. (See page 63) The axes are drawn but students are required to label them x and y correctly, and provide the numbers on the scales. Each sheet may be cut in half. Students glue their work to their exercise books.
Assignments	EX 14A may be completed very quickly. EX 14B will take much longer, and many questions may give rise to discussion ("pair and share" in class). All of EX 14X or a selection from EX 14B would be suitable for homework.
Vocabulary	change negative (Integers, origin) $<$ less than, $>$ greater than

ANSWERS

Exercises

EX 14A

1. a) $-5 < 5$ b) $0 > -15$
   c) $7 > -10$ d) $-15 < -7$
2. a) 30 °C b) 24 °C c) −3 °C d) 1 °C
3. a) rise of 4 degrees b) drop of 7 degrees
   c) drop of 7 degrees d) drop of 12 degrees
4. a) rise of 9 degrees b) rise of 10 degrees
   c) drop of 18 degrees d) rise of 3 degrees
5. a) 0, −5 b) 2, 5 c) −1, −5 d) −1, −8

6. a) 0.5 m rise b) 1.5 m drop
c) 1 m drop d) 2 m drop

7. a) 1 h back b) 2 h forward c) 8 h forward d) 7 h back

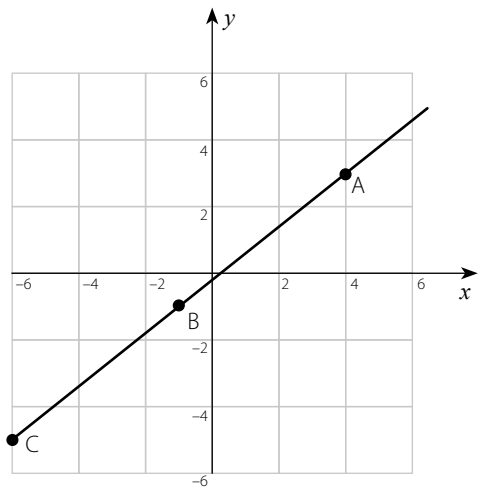
8. a) –3 m b) 1 m c) –1.5 m d) –0.5 m

9. a) No change b) 5 h back c) 8 h forward d) 4 h back

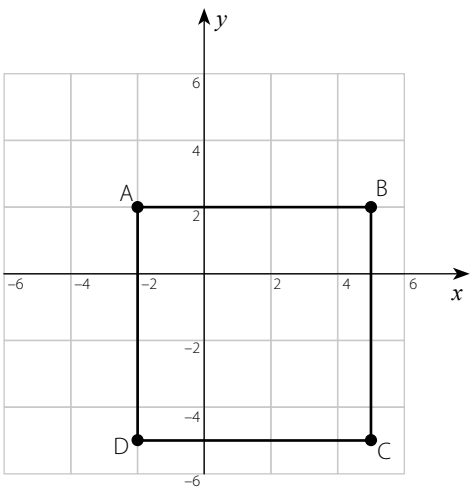
10. a) –6 –4 –2 0 2 4 6 b) –5 –3 –1 1 3
c) –32 –16 –8 –4 –2 –1 d) –8 –6 –4 –2 0 2

EX 14B

1.



2.



d) square

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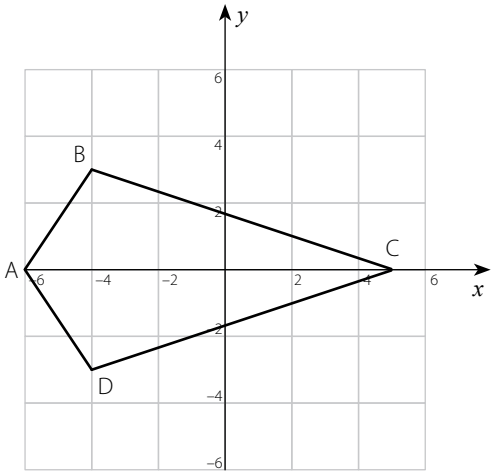
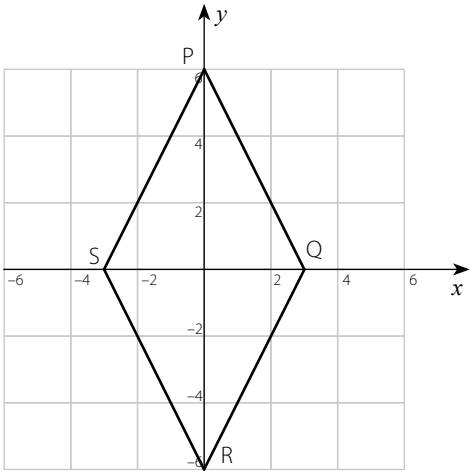
3.



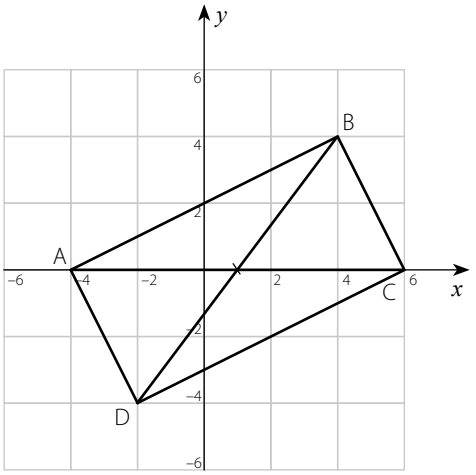
D(–4, –3)

4.



R(0, –6)

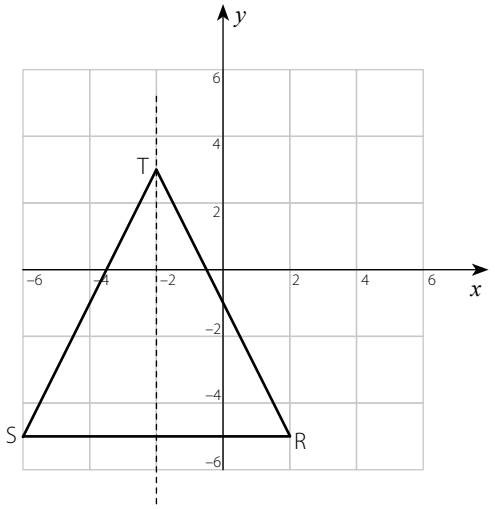
5.



b) R(–2, –4)

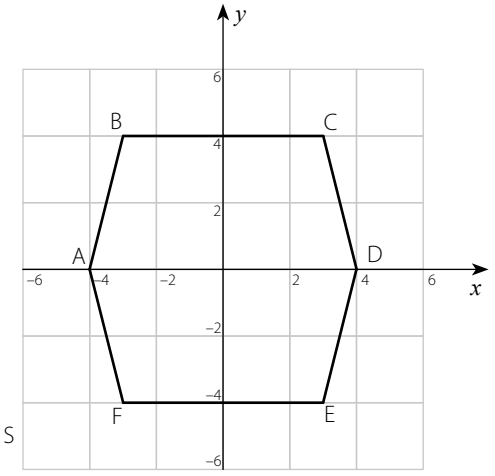
d) Diagonals cross at (1, 0).

6.



c) isosceles

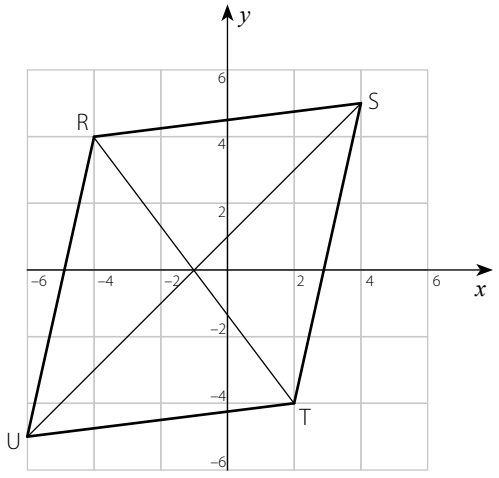
7.



c) hexagon

d) y-axis

8.

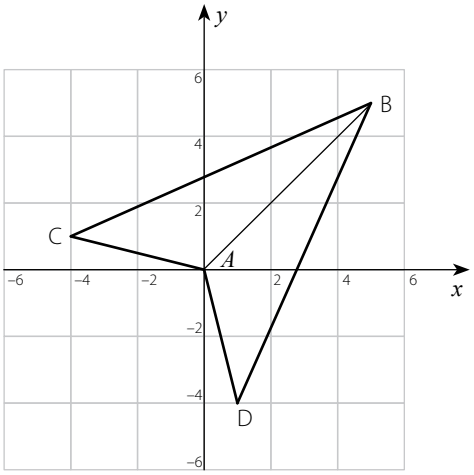


b) parallelogram

c) (–1, 0)

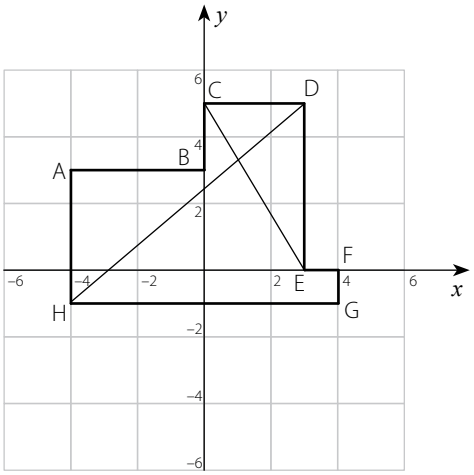
d) no lines of symmetry

9.



d) concave kite

10.



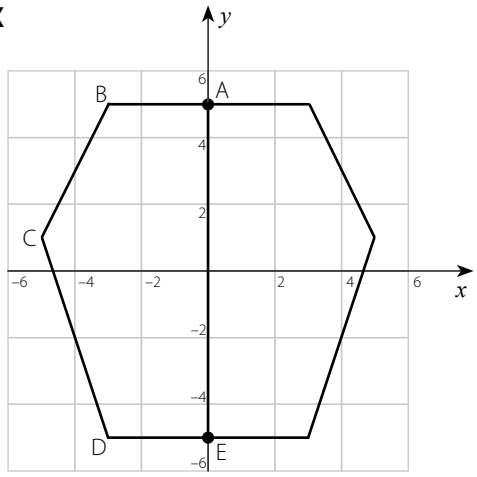
b) octagon

c) 35 cm^2

d) (1, 3)

EX 14X

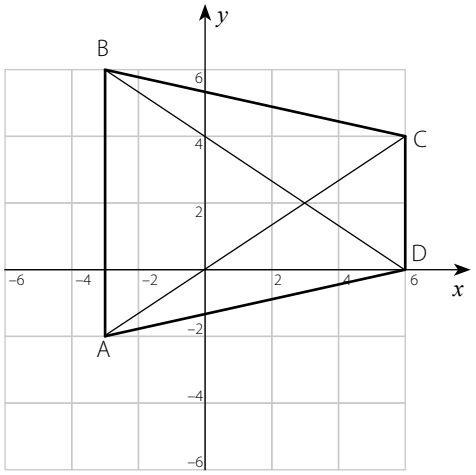
1.



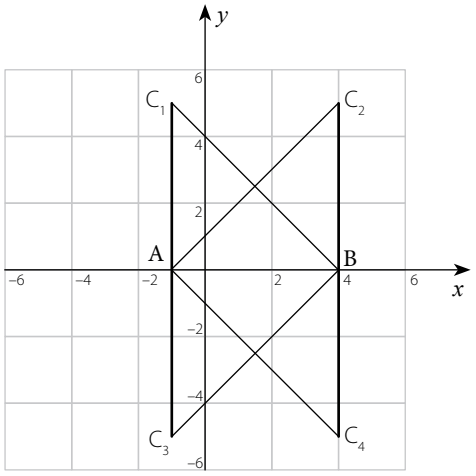
c) hexagon

d) 1

2.



3.



$C_1(-1, 5)$

$C_2(4, 5)$

$C_3(-1, -5)$

$C_4(4, -5)$

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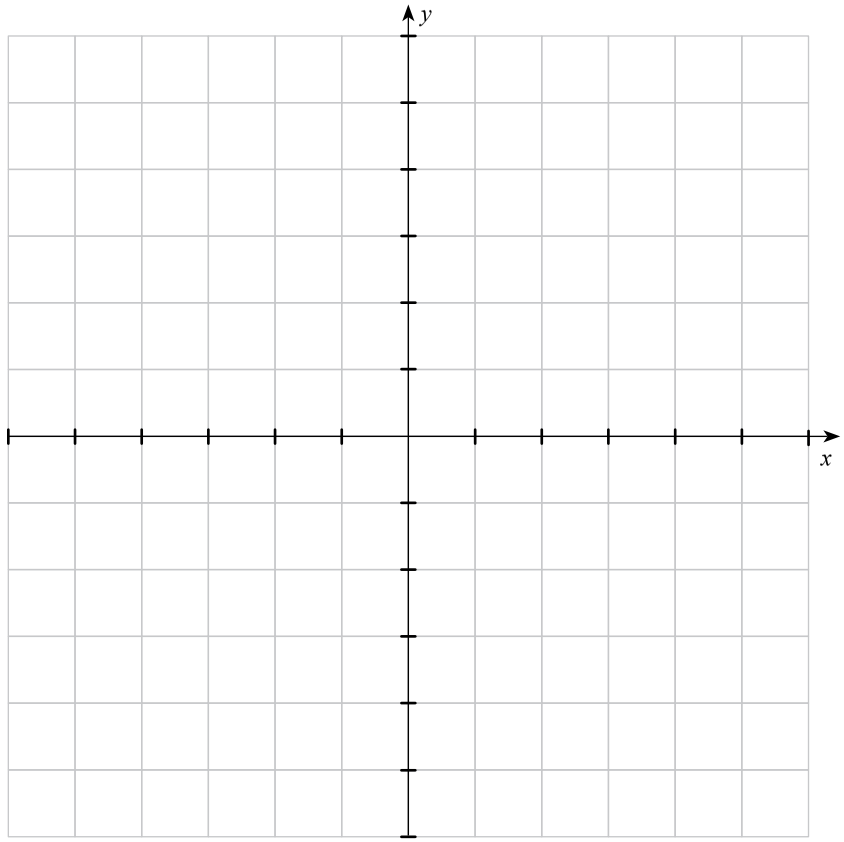
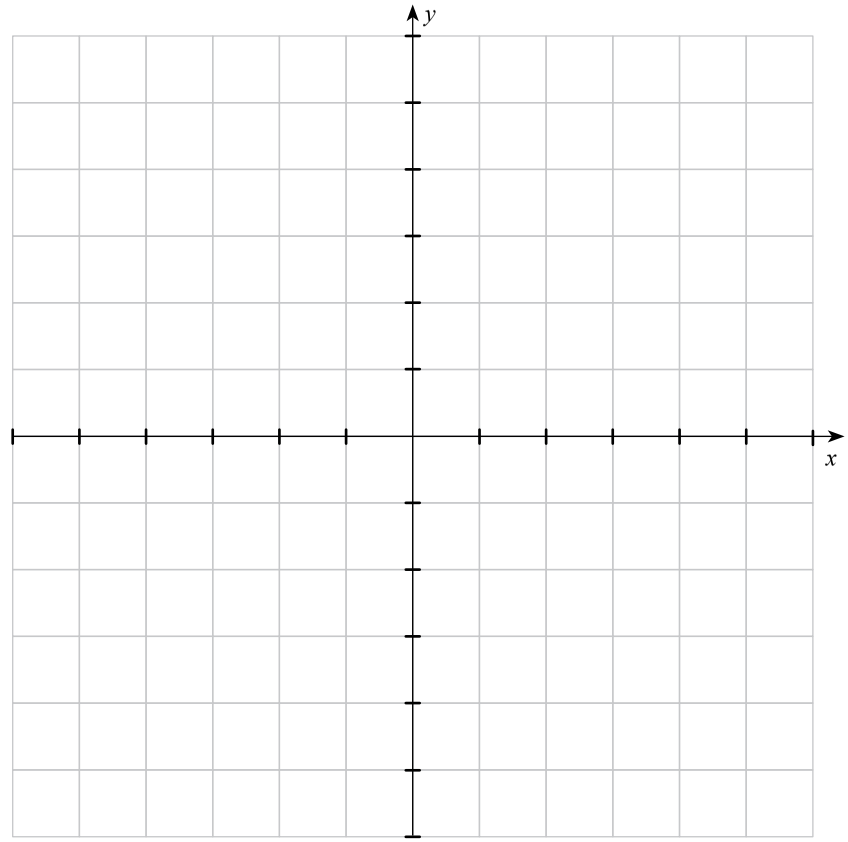
Coordinate Grid

Question No:



Coordinate Grid

Question No:



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Chapter

15 Revision Exercises

All the questions in these exercises relate to topics covered in Chapters 1–14 of the text.

As this is the midpoint of the material for the academic year, it is advised to make maximum use of the revision exercises before moving ahead.

A specimen examination paper is included here (after the answers to the exercises). In view of the fact that some students may have access to this Teaching Guide, it is suggested that modifications should be made.

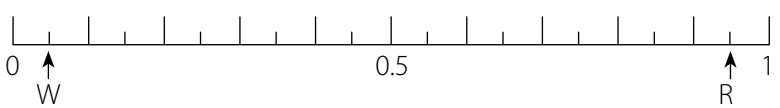
ANSWERS

Exercises

EX 15A

1. a) Rs 70 b) 56 people c) 3.68 km d) Rs 360
2. a) square b) parallelogram or trapezium (if not isosceles)
   c) kite d) irregular
3. a) 2.6 b) 0.7 c) 0.7 d) 0.36
4. a) 21 °C b) 15 °C c) –2 °C d) 1 °C
5. a) 12 b) 4.5 c) 360 d) $\frac{3}{4}$
6. a) 1.6 b) 9.9 c) 62.3 d) 0.7
   e) 50.3 f) 1.8 g) 6.9 h) 43.3
7. a) 40° b) 137° c) 12° d) 131°
8. a) 6 b) 81.9 c) 81.9 d) 170.96
9. a) 0.05 b) highly unlikely

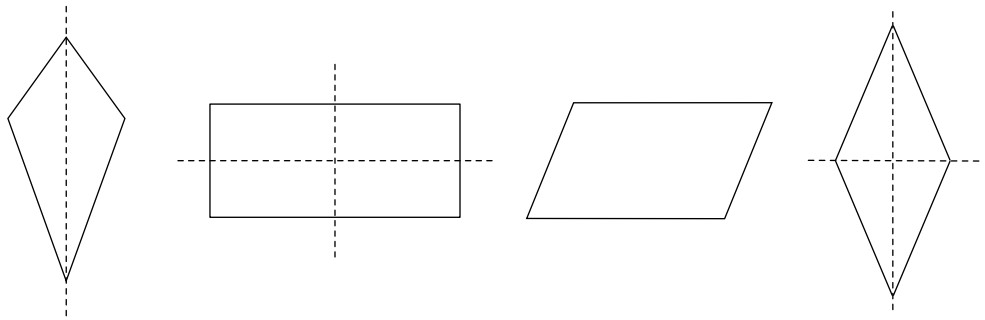
c) and d)

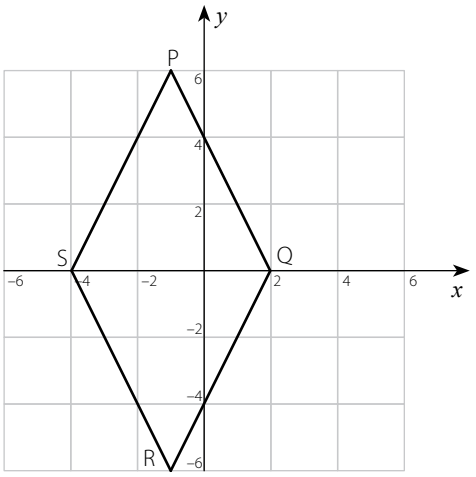


10. a) 100 b) 105 c) 69 d) 110

EX 15B

1. a) 270 mm^2 b) 42 cm^2
   c) 80 cm^2 d) 3.2 cm^2 or 320 mm^2
2. a) 550 b) 9.12 c) 0.6 d) 0.6
3. a) 50% b) 30% c) 20% d) 50%
4. a) 1 b) 2 c) 0 d) 2



5. a) 64 b) 3.4 c) 1.9 d) 1060
6. 

   d) R(–1, –6)
7. a) 2 40 b) 20 c) 20 d) 80
8. a) 3.6; 4 b) 12.3; 12
   c) 12.2; 12 d) 134.7; 135
9. [Allow 5° on either side.] $a = 42$ $b = 28$ $c = 152$
10. a) 2747.5 b) 465.69 c) 14.56 d) 322.62

EX 15C

1. a) 0 b) 1
   c) 1 d) 0 [debatable]

2. a) 14.77 b) 7.632 c) 0.766 d) 12.13

3. a) 24 cm b) 28 cm^2

4. a) 0.28 b) 0.494 c) 8.41 d) 9.43

5. a) 14%, $\frac{4}{10}$, 41%, 0.42 b) $\frac{3}{5}$, 79%, $\frac{4}{5}$, 0.81

   c) 12.3%, $\frac{1}{5}$, 21.3%, 0.321 d) 0.35, 53%, $\frac{7}{13}$, 0.54

6. a) 5*r*1 b) $260\frac{1}{3}$ c) 0.7 d) $1\frac{3}{5}$

7. a) drop of 0.5 m b) drop of 3.0 m c) drop of 1.5 m

   d) drop of 1.5 m

8. a) 25 b) 50 c) 21 d) 15

9. a) 1556 b) 115 c) 5818 d) 1074

10. a) 21°, 7° b) 92°, 106°, 127° c) 0 d) 245°

EX 15D

1. a) 240 b) 11.4 c) 2688 d) 114

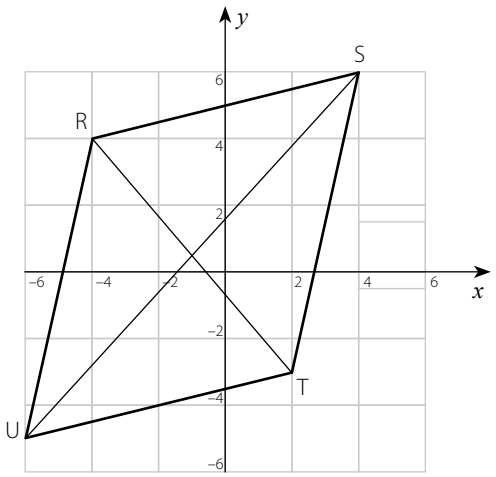
2. a) 1190 b) 990 c) 1.361 d) 880.675

3. 19 cm^2

4. a) 0.867 b) 50 c) 0.72 d) 225.4

5. Rs 2760

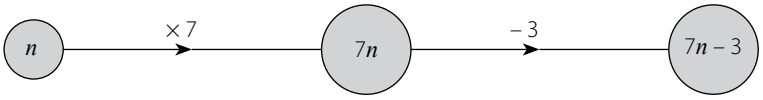
6. 2.78 m

7. 

   b) parallelogram

   c) $(-1, \frac{1}{2})$

   d) no lines of symmetry

8. 

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9. a) $10 \times 60 = 600$ b) $100 \times 80 = 8000$

c) $10 \times 50 = 500$ d) $30 \times 80 = 2400$

10. $a = 45$, $b = 71$, $c = 67$, $d = 18$

EX 15X

1. a) 47.9 b) 87.684 c) 4286 d) 3142

2. $\frac{1}{8}$

3. 74 cm^2

Specimen Examination Paper

[for the first half of the year]

Instructions	The test is 45 minutes long. You must not use a calculator. You will need: pen, pencil, rubber, ruler, protractor. Try to answer all the questions. Check your work carefully. The marks for each question are shown in brackets.	[Full marks = 80]

1. Write down the answers: [4 marks]

   a) 44 + 74 = b) 92 – 61

   c) 8.7 + 3.4 = d) 5.6 – 4.9.

2. The temperature is 18 °C. What is the temperature after [4 marks]

   a) a rise of 2 degrees? b) a fall of 2 degrees?

   c) a fall of 20 degrees? d) a rise of 20 degrees?

3. Write down the answers: [4 marks]

   a) $826 \times 10 =$ b) $7.6 \times 4 =$

   c) $86.1 \div 7 =$ d) $230 \div 100 =$

4. Round off these numbers to the accuracy stated: [4 marks]

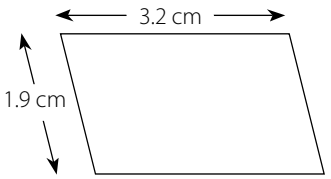
   a) 76.57 (to the nearest whole number)

   b) 42. 36 (to the nearest ten)

   c) 21.46 (to 1 d.p.)

   d) 6.64 (to 1 d.p.)

5. The shape is a parallelogram. Calculate its perimeter. [4 marks]



6. Work out: [6 marks]

   a) 66.7 + 5.93 = b) 6.51 – 5.475 =

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7. Aisha rolls a dice and adds 4 to the number shown. [6 marks]

a) Make a list of possible scores.

b) What is the probability of a score which is a multiple of 5? (fraction answer)

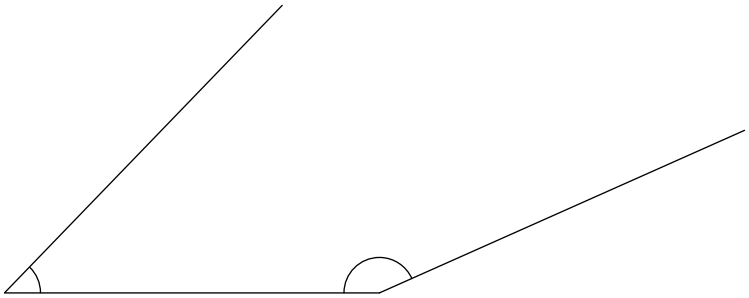
c) What is the probability of a score more than 7? (decimal answer)

d) What is the probability of a score more than 10?

8. Work out: [6 marks]

a) $7.24 \times 5.3 =$ b) $1.908 \div 0.06 =$

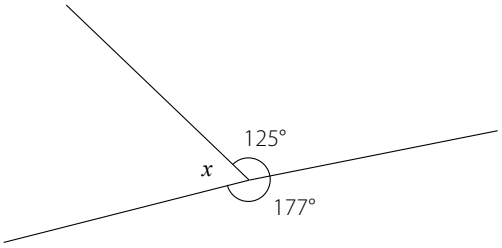
9. [6 marks]



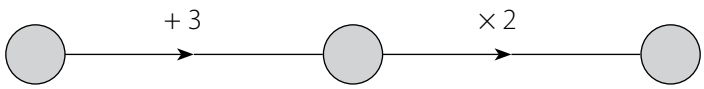
a) With your protractor measure the size of the acute angle accurately.

b) Now measure the obtuse angle.

c) Calculate x in the diagram below (not drawn to scale):



10. Write down the missing numbers or formula in the input and output lists: [6 marks]



1	(a)
1.5	(b)
(c)	2400
(d)	5
n	(e)

11. A pair of shoes is priced at Rs 6600. A discount of $12\frac{1}{2}$% is offered in a sale. Work out the sale price. [6 marks]

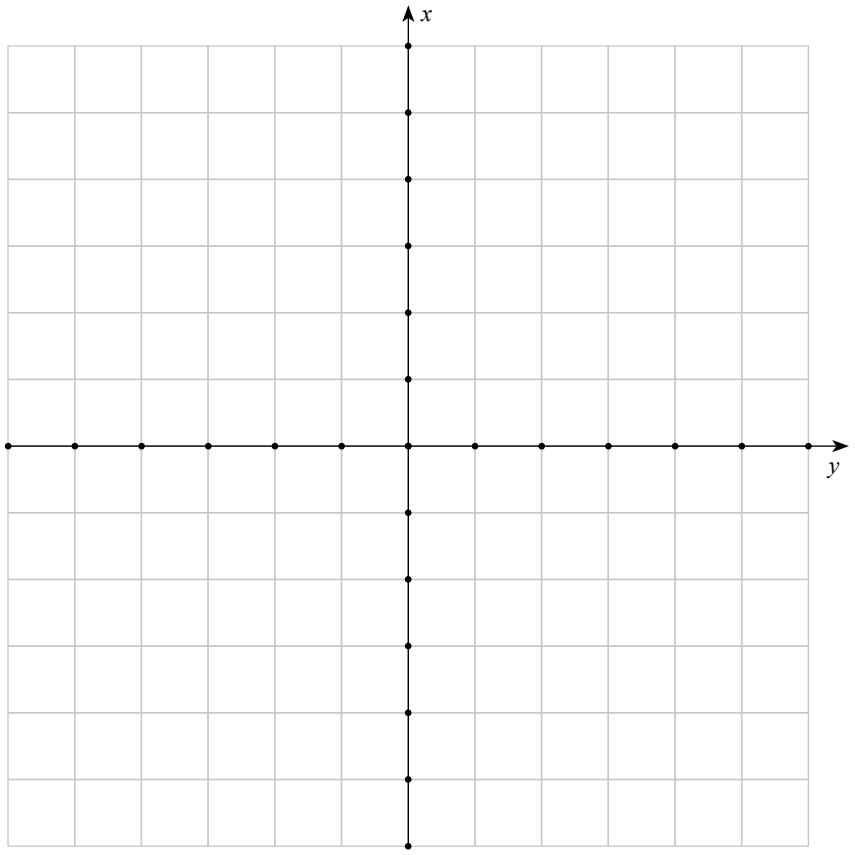
12. A dozen bottles of water, each weighing 1.6 kg are packed into a carton. The empty carton weighs 0.8 kg. What is the total weight of the carton when fully packed? [6 marks]

13. a) On the coordinate grid label the x and y axes (from –6 to 6) [6 marks]

b) Plot and label the points A(3,5), B(3,–3), C(–4,–3), and D(–4,5).

c) Join $ABCD$ to form a quadrilateral. What kind of quadrilateral is it?

d) Write down its area.



14. Draw a diagram showing how 5 cakes (equal size) may be divided equally among 3 children, with no cake left over. How much cake does each child receive? [6 marks]

15. Use estimates to find out if any of these is not correct. Show your working: [6 marks]

a) 9.253 ÷ 4.87 = 1.9 b) 52.17 ÷ 10.23 = 1.5

c) 0.6258 ÷ 2.98 = 0.21 d) 28.8 ÷ 0.48 = 60

Notes on the specimen paper, and guide to setting examinations

1. Start with easy questions and move on to the more difficult later.
2. Leave spaces between the questions for answers on the question paper.
3. Total marks for this paper are 80. If you need a percentage, divide the marks by 0.8.
4. It is unwise to use these precise questions because some students may have access to this Teaching Guide.

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Answers and guide to marking:

1. a) 118 b) 31 c) 12.1 d) 0.7

[1 each]

2. a) 20 °C b) 16 °C c) –2 °C d) 38 °C

[1 each for the numbers; ignore units.]

3. a) 8260 b) 30.4 c) 12.3 d) 2.3

[1 each]

4. a) 77 b) 40 c) 21.5 d) 6.6

[1 each]

5. 3.2 + 1.9 = 5.1 5.1 x 2 = 10.2 (OR 3.2 + 1.9 + 3.2 + 1.9 = 10.2) Ans 10.2 cm

[3 for correct answer, 1 for units. If wrong, allow up to 2 marks for working showing a correct method.]

6. a)
$$\begin{array}{r} 66.7 \\ +\ 5.93 \\ \hline 72.63 \\ \hline \end{array}$$
[2 correct digits + 1 point in correct position]

b)
$$\begin{array}{r} {}^{4}\cancel{6}.{}^{0}\cancel{7}{}^{1}0 \\ -\ 5.475 \\ \hline 1.035 \\ \hline \end{array}$$
[2 correct digits + 1 point in correct position]

7. a) 5, 6, 7, 8, 9, 10 [1]

b) $\frac{1}{3}$ [2, allow 1 for $\frac{2}{6}$]

c) $\frac{3}{6} = \frac{1}{2} = 0.5$ [2, allow 1 for $\frac{3}{6}$ or $\frac{1}{2}$]

d) 0 [1]

8. a)
$$\begin{array}{rl} 7.24 & \text{2 d.p.} \\ \times\ 5.3 & \text{1 d.p.} \\ \hline 2172 & \\ 36200 & \\ \hline 38.372 & \text{3 d.p.} \end{array}$$
[2 digits + 1 point]

b) $\frac{1.908}{0.06} = \frac{190.8}{6}$ $6\overline{)190.8}$ $\begin{array}{r} 31.8 \\ {}^{1}{}^{4} \end{array}$ [1 equivalent division + 1 digits + 1 point]

9. a) 46° [2; allow 1 for 45° or 47°]

b) 156° [2; allow 1 for 155° or 157°]

[allow 2 if correct but (a) and (b) reversed.]

c) $177 + 125 = 302$

$360 - 302 = 58$ $\quad x = 58$ [2; allow 1 if wrong but evidence of correct method.]

10. a) 8 b) 9 c) 1197 d) –0.5

[1 each]

e) $2(n + 3)$ [2]

11. 10% of Rs 6600 is Rs 660

5% 330 [1]

[1]

$2\frac{1}{2}$% 165 [1]

$12\frac{1}{2}$% 825 [1]

Sale Price = 6600 – 825 = Rs 5775 [2]

12. 1.6 kg × 12 = 1.6 x 10 + 1.6 x 2

= 16 + 3.2

= 19.2 (or long multiplication) [4]

Carton weight 0.8

Total 20.0 kg [2]

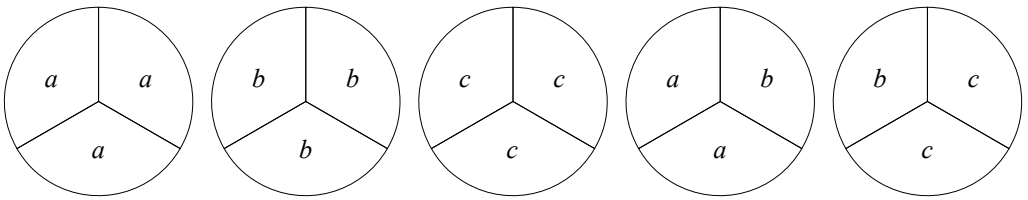
13. a) x, y correct and scales labelled [1]

b) points plotted: all 4 correct [2; allow 1 for 3 correct]

c) rectangle [1 drawn, 1 named]

d) 56 cm^2 [1; ignore units]

14. $\frac{5}{3} = 1\frac{2}{3}$ each [1 answer; 4 diagram]



15. a) $9 \div 5 \approx 2$

b) $50 \div 10 = 5$, Incorrect

c) $0.6 \div 3 = 0.2$

d) $30 \div 0.5 = 60$

[1 each for correct working + 2 for identifying (b)]

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Chapter

16 Using your Calculator

Children love to use calculators, but there can be problems. Very old calculators may not give correct operator priority (e.g. 4 + 3 x 2 = 14 when it should be 10). High specification modern calculators, on the other hand, have multiple modes so students need to know how to obtain the decimal display, (e.g. 8.5 ÷ 6.5 = $\frac{17}{13}$ exactly, when we require 1.30769…) It is useful if there is a school policy recommending a standard machine, otherwise class teaching can become quite stressful. If you are faced with multiple models, try to obtain the help of an assistant for your calculator lessons, maybe an older pupil, to move around and deal with the numerous cries for help!

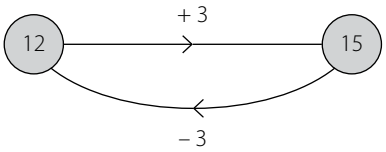
LESSON PLANNING

Objectives

General	To be able to use relevant checking techniques when using a calculator
Specific	1. To use 1 s.f. rounding off method for prior estimation of a calculation 2. To use the inverse operation method of checking a calculation 3. To use entering of numbers in a different order method to check the total of a list 4. To use odd and even properties to spot obvious errors in a calculation 5. To use divisibility tests to spot obvious errors in a calculation 6. To acquire the habit of seeing if the answer to a calculation is reasonable
Pacing	Fairly brisk, most of this would have been met before. Maximum 2 lessons, 1 homework
Links	Arrow diagrams (using the inverse check) Units (reasonable check)
Method	• See preliminary remarks about the range of machines available, and be prepared! Didactic class teaching from the front may work initially, but once the calculators are out, don't even try. • You may need a whole lesson on divisibility tests if students have not met these before. If so, you are advised to do this first. Ask them to write out the tables, do digit sums, look for patterns. Summarize in a plenary, showing how this knowledge can be used to spot errors, e.g. 372 × 0.4 = 148.6 is wrong because the answer is not a multiple of 4 (last two digits, 86, not a multiple). • Using the inverse can be explained in 20 seconds with arrow diagram reinforcement and a few oral examples:

12 + 3 = 15

How do I get back to 12? Subtract 3



- Estimation and lists can be quickly revised.
- Also odds and evens; applying these to decimals can be a bit tricky. The last digits are used, but for addition/subtraction we need the same number of d. p. and zero counts as even for this purpose. For example,

  3.6 + 2.71

  = 3.60 + 2.71 (both 2 d. p.)

  = EVEN + ODD

  = expected answer ODD (2 d. p.)

Resources	Calculators (Have spares for those who forget. Sharing is not viable for this work.)
Assignments	homework—finish the digit sum patterns classwork—Exercise 16A
Vocabulary	Calculator, rounding off, estimation, inverse, odd, even, divisibility
Fun note	DIVISIBILITY is a great word to use when playing Hangman. They usually guess letter I early, giving _ I _ I _ I _ I _ _ and general puzzlement all round!

ANSWERS

Exercises

EX 16A

1. a) 0.165; 0.165 + 0.819 = 0.984

   b) 8.4138; 8.4138 ÷ 1.11 = 7.58

   c) 8.54; 8.54 × 0.74 = 6.3196

   d) 40.38; 40.38 – 5.48 = 34.9

2. a) 28.992 b) 1539.74 c) 699.59 d) 11.36

3. a) Wrong, because EVEN + ODD should be ODD

   c) Wrong, because ODD × ODD should be ODD

   d) Wrong, because EVEN × either should be EVEN

4. a) 10; 11.1 b) 860; 905.5 c) 480; 514.3 d) 62; 64.9

5. a) 1+1 = 2 not a multiple of 3

   b) 31.44 does not end in 0 or 5.

c) 8+5+8 = 21 not a multiple of 9

d) 26 is not a multiple of 4.

6. a) not reasonable b) reasonable

c) reasonable d) not reasonable

7. a) 0.21; 0.2 b) 3; 2.7

c) 11; 10.8 d) 240; 236.8

8. a) 3.33; 3+3+3 = 9, multiple of 9

b) 1.636; even

c) 243.6; 2+4+3+6 = 15, multiple of 3

d) 51.726; 5+1+7+2+6 = 21, multiple of 3 and even

9. a) 7.0 b) 3.4 c) 315.3 d) 34.2

10. a) 2.9 b) 3.8 c) 1570.5 d) 64.5

EX 16X

1. a) 946.6 b) 1.2 c) 97.1 d) 130.9

2. $12\,345\,679 \times 9 = 111\,111\,111$

$18 \quad 222\,222\,222$

$27 \quad 333\,333\,333$

etc

Including the digit 8 puts a zero in each answer.

3. $1001 = 7 \times 11 \times 13$

Chapter

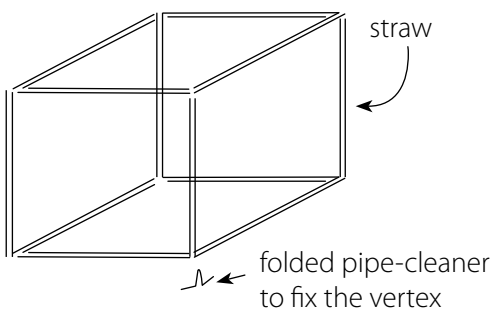
17 Solids

It is amazing how many students can do geometry in 2–dimensions but find it difficult to visualise in 3–D. The 3–D muscles of the mind need to be exercised. Practical experience of making models teaches much about parallels, equal lengths, location of right-angles, etc., just by doing. Using ready-made models for class observation is a second-rate learning experience.

LESSON PLANNING

Objectives

General	1. To recognise the main features of cubes, cuboids, pyramids and prisms 2. To draw diagrams and nets, and calculate some volumes
Specific	1. To refer to vertices, edges and faces correctly (avoiding the term "sides") 2. To count the number of vertices, faces, and edges of cubes, cuboids, pyramids and prisms, and recognize each solid 3. To point out on a model of a solid any planes of symmetry 4. To build models of solids using given nets, or using pipecleaners and straws (skeleton models), and to recognize a cube from any of its nets 5. To be able to draw representations of solids on spotty paper 6. To calculate the volume of a cuboid, a cube, and composites, and to calculate lengths given volume
Pacing	4 lessons, 2 homeworks
Links	Properties of square, rectangle
Method	First, have a model-making session. Nets are available (in this chapter of Guide) for photocopying onto thin card. Divide class into groups and allocate materials accordingly. Each group should make a variety of models, including skeletons. For example, skeleton cube:



	Second, another practical session in groups, with models assigned to each group. Use EX 17A. Squared paper will be needed for question 4. The spotty paper (in this chapter of the Guide) is suitable, or use standard graph paper. Third, do a straight introduction to drawing solids on paper, going through the two Rules in the text. Set EX 17B, and circulate: many will need help. Fourth, introduce the volume formula slowly, using "layers". The formula should arise naturally, rather than being stated as a fact out of the blue. Use EX 17C.
Resources	Nets, pipe-cleaners, scissors, straws for model-making HINT: For fixing models together, provide small self-adhesive labels. This avoids the need for tabs (difficult to cut out) and glue (messy) or Scotch tape (big time-waster in the classroom). Square and triangular spotty paper (photocopiable master copies provided in this chapter of the Teaching Guide on page 82 and 83)
Assignments	The practical work is best done in groups in class. Suggested homework assignments are: • EX 17A #3 and 4 • EX 17C, selection from #1–9. #10 is an extension to prisms, not explicitly taught, for the more able students to puzzle over.
Vocabulary	vertex, face, edge (no sides) for solids cube, cuboid, pyramid, prism plane of symmetry net; skeleton model 2-D, 3-D

ANSWERS

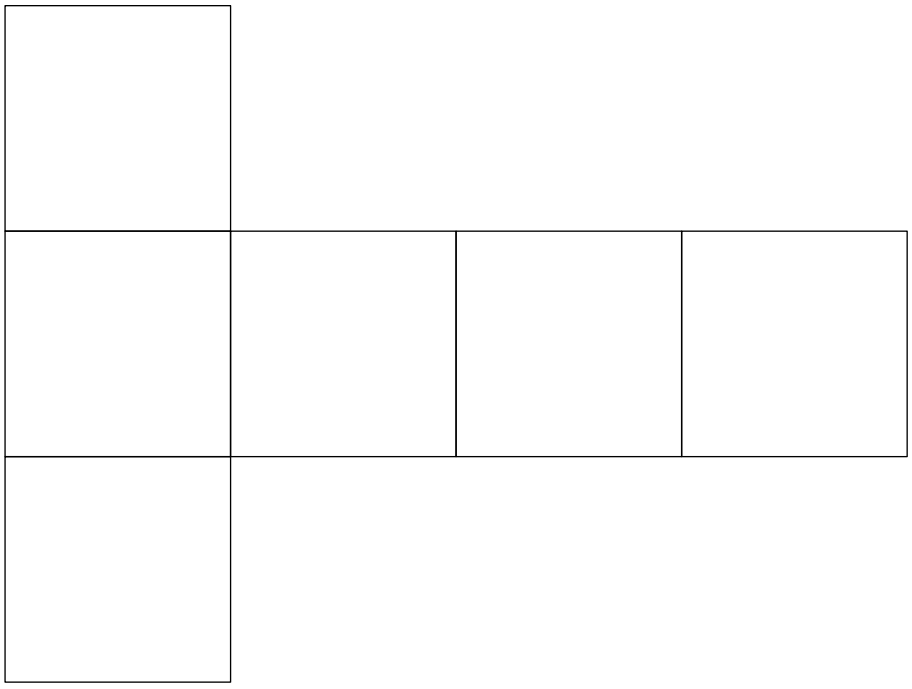
Exercises

EX 17A

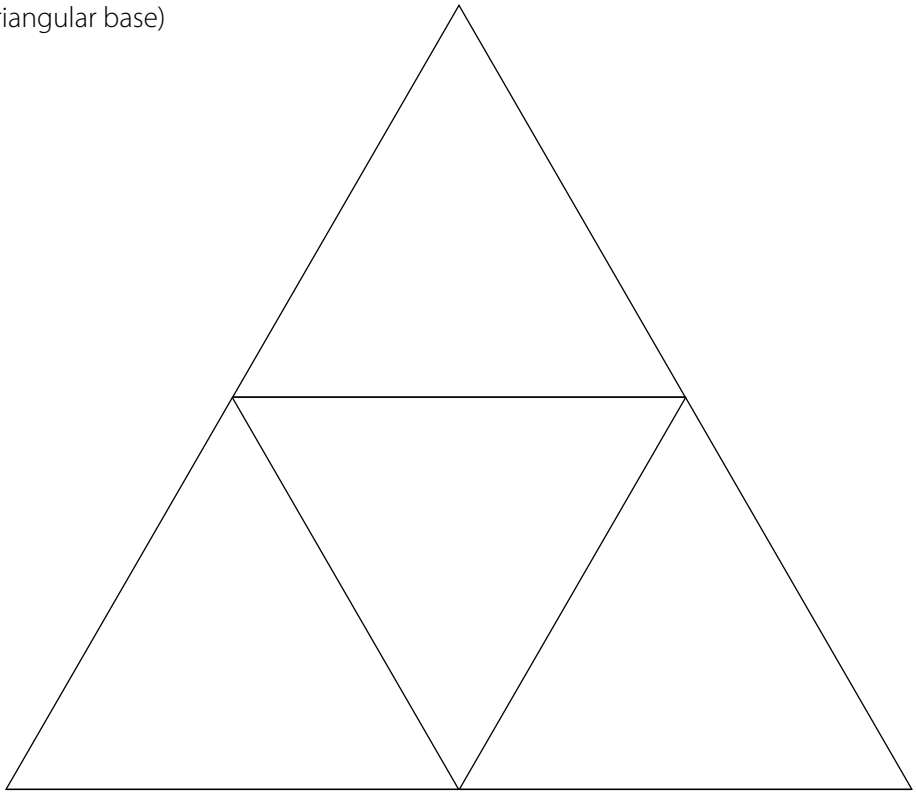
1. The cube has the most planes of symmetry: 12
2. $F + V - E = 2$ in each case
3. a) cube b) pyramid c) cuboid
4. All of them are nets of cubes.

Nets

Cube



Pyramid (triangular base)



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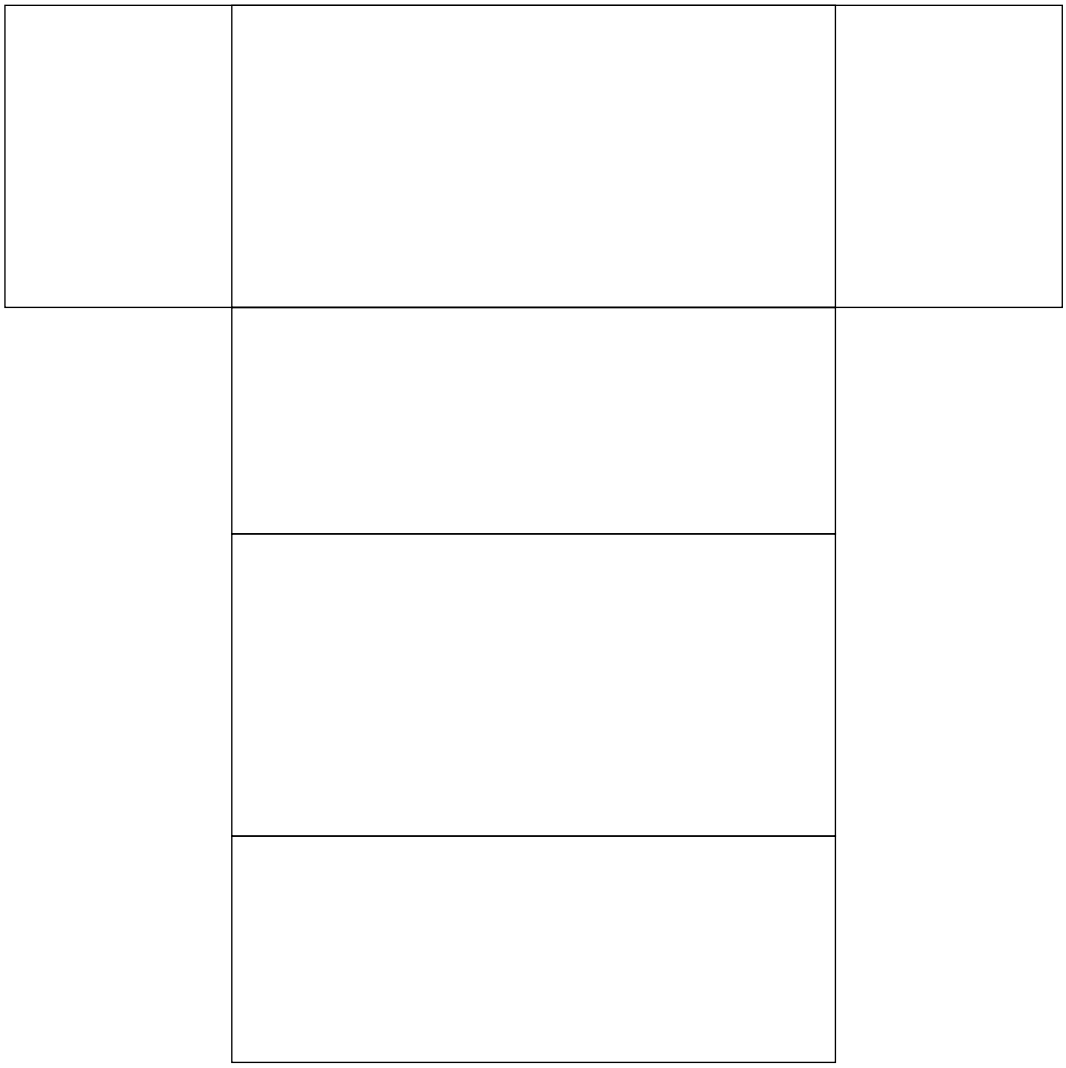
Cuboid



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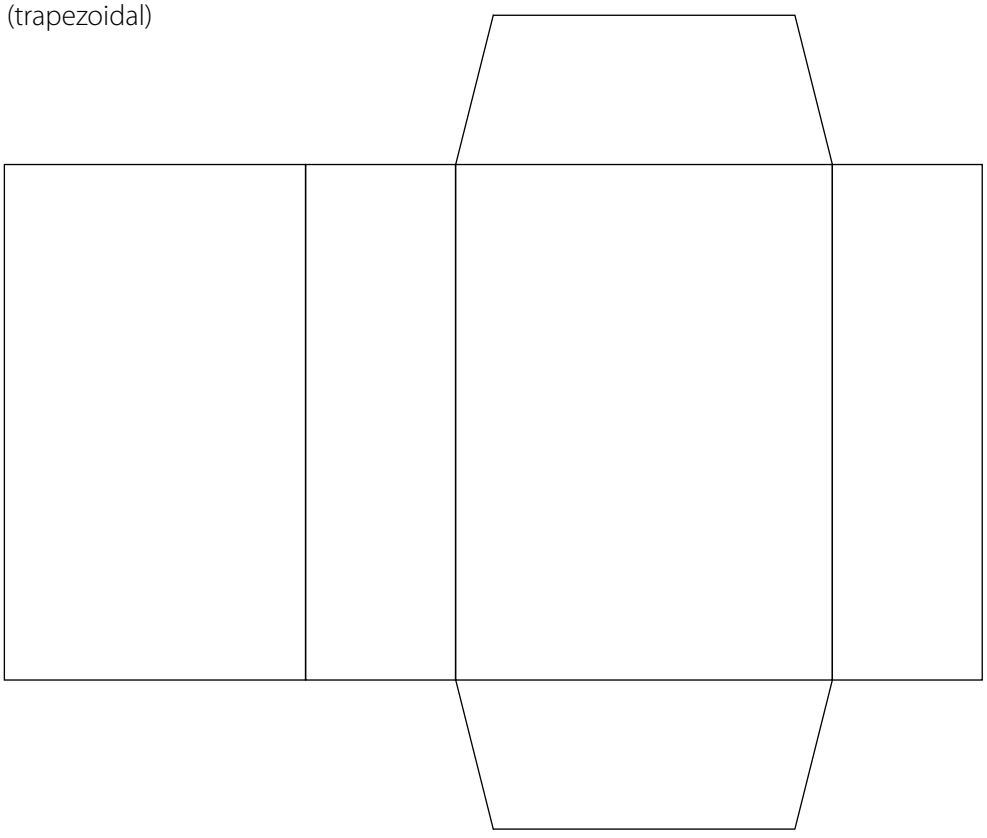
Triangular Prism



Prism (trapezoidal)



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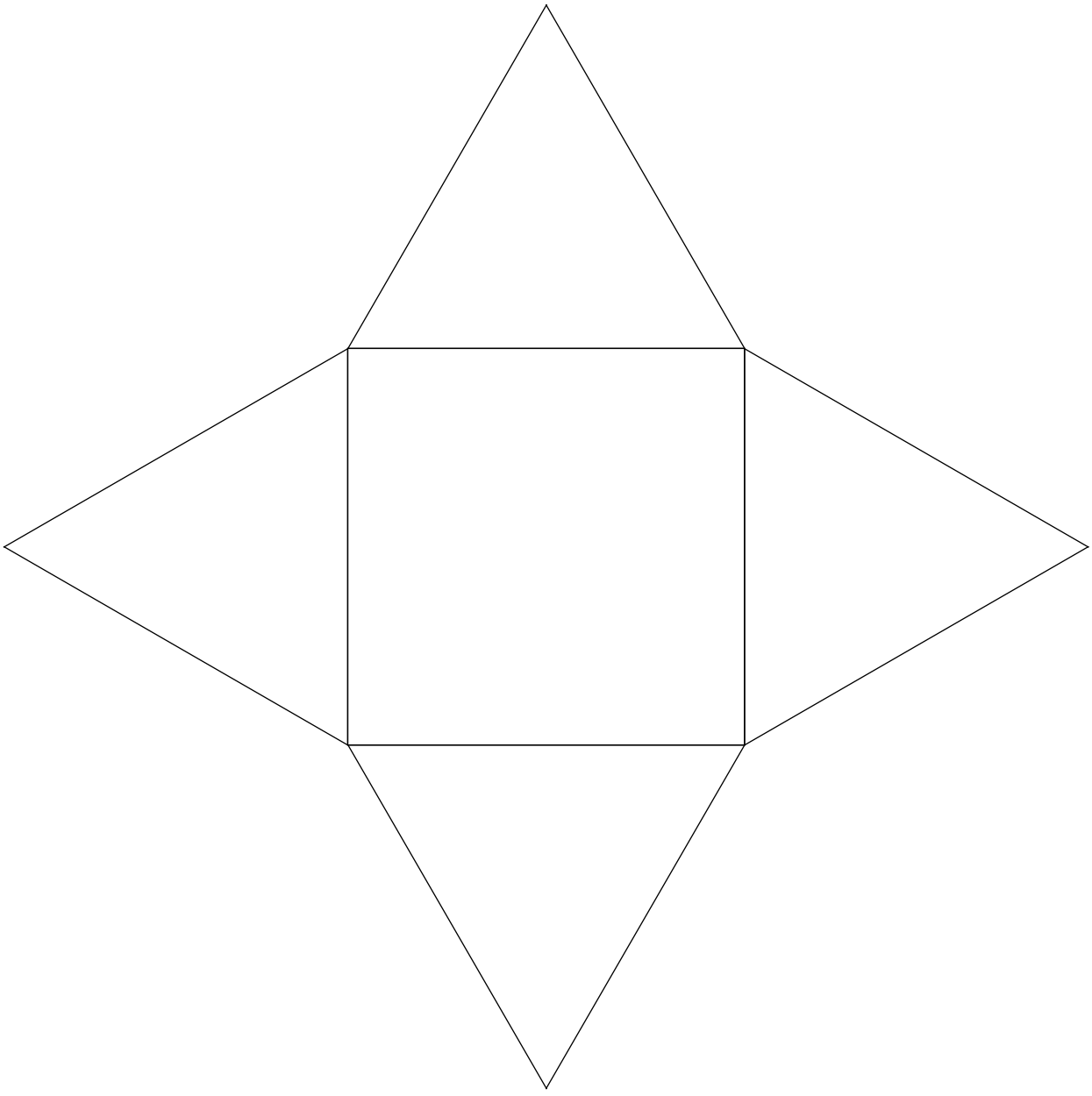
Pyramid (Square base)



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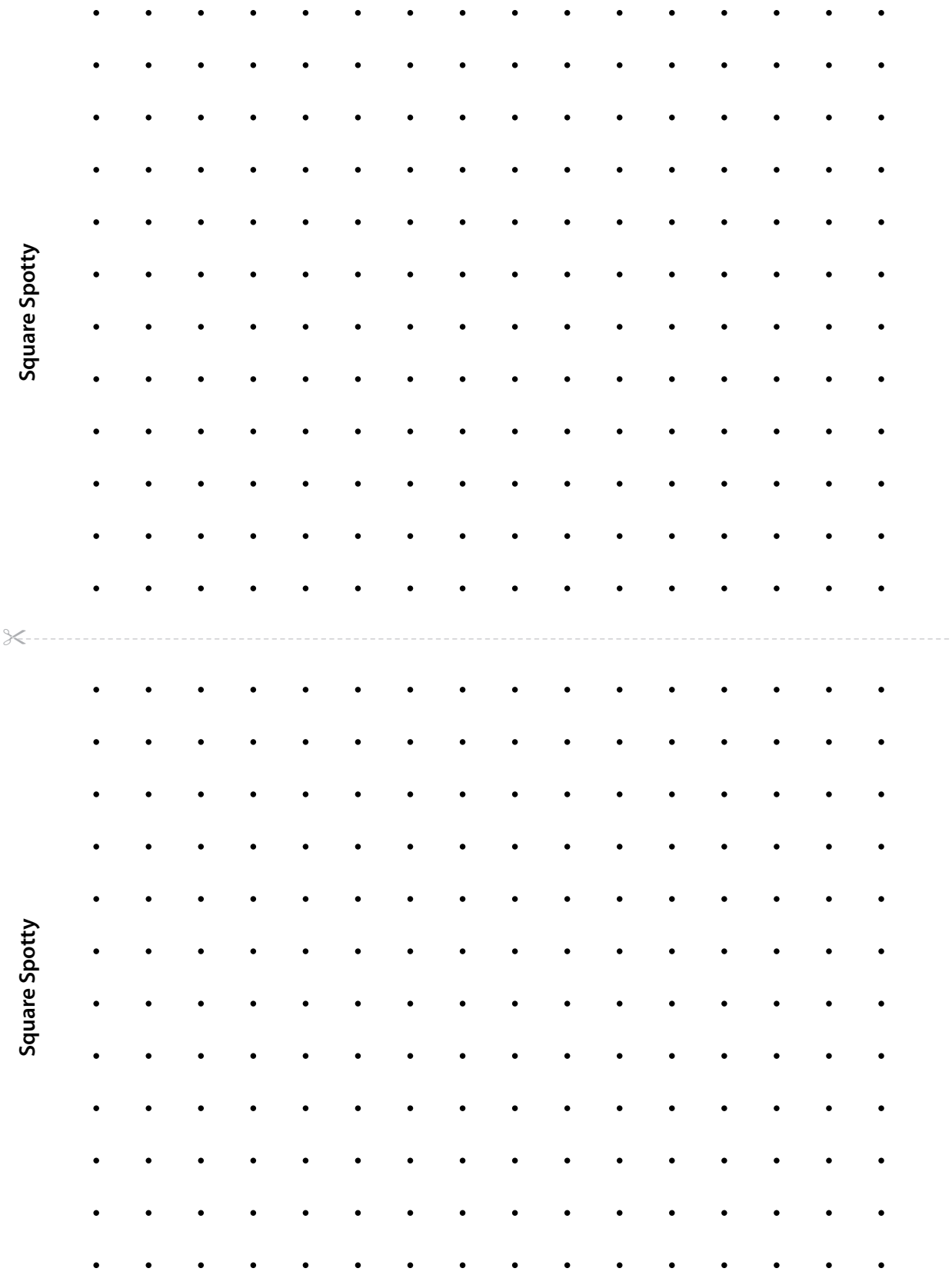

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Triangular Spotty

Triangular Spotty

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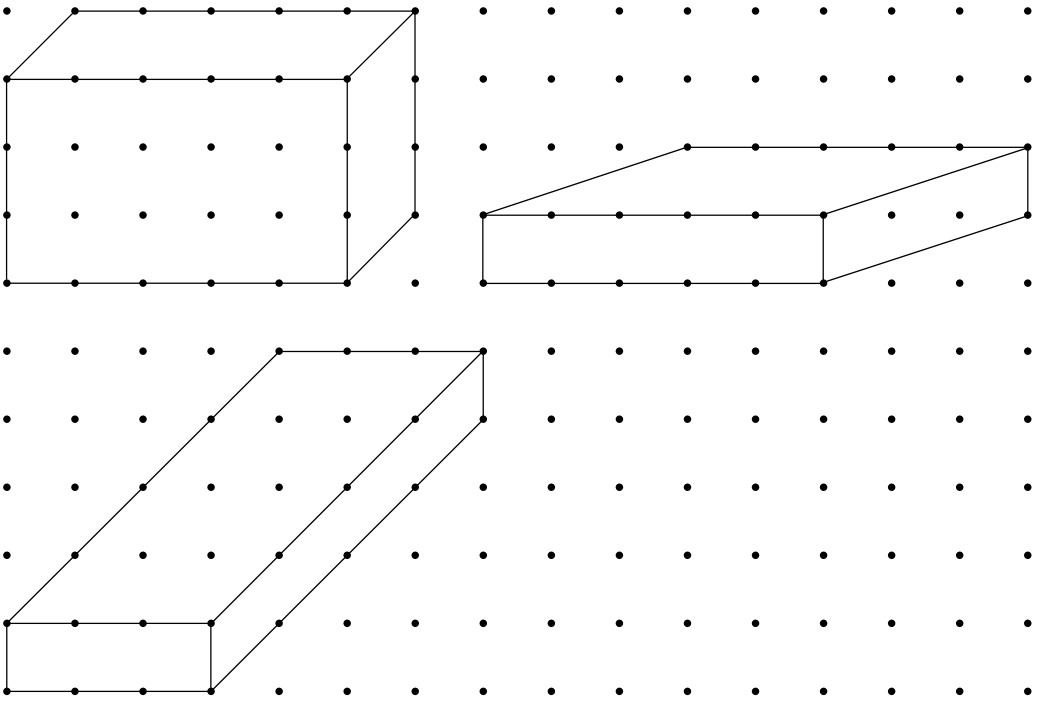
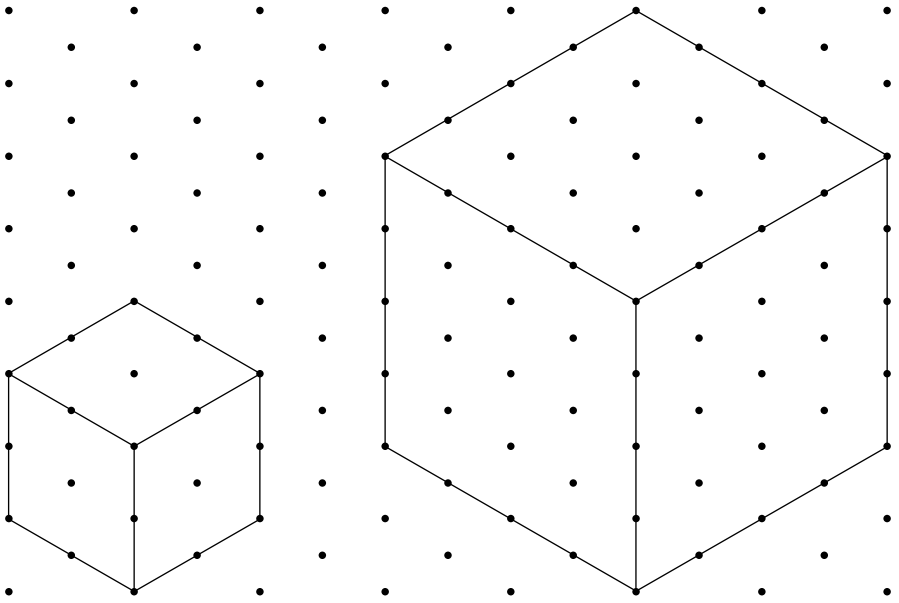
EX 17B

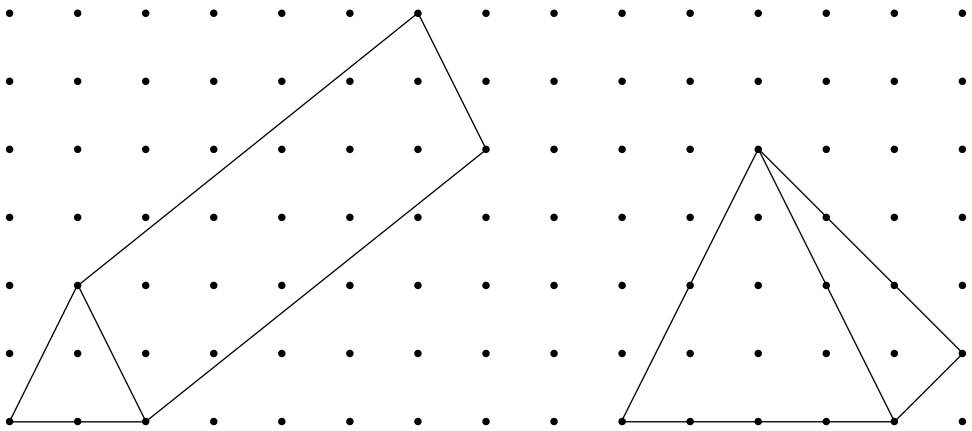
1 (example)



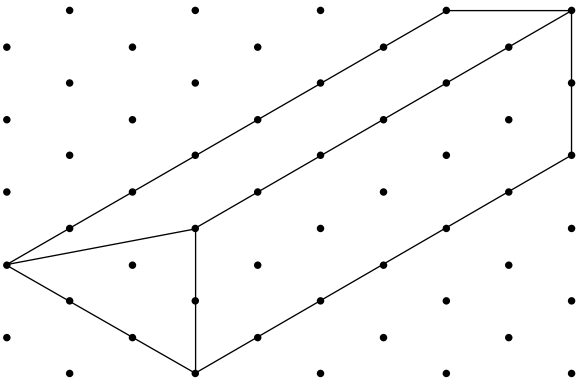
2. example



3. Example



4. Example



EX 17C

1. a) 30 cm^3 b) 34.675 cm^3 c) 80 000 cm^3 d) 476 cm^3
2. a) 64 cm^3 b) 125 cm^3 c) 250.05 cm^3 (2 d.p.)
   d) 2048.4 cm^3 (1 d.p.)
3. 256 cm^3
4. 41 000 cm^3
5. a) 10 cm b) 4 cm c) 30 cm d) 2.5 cm
6. 4 cm
7. 5 cm
8. 6.75 m^3
9. 21 000 cm^3
10. 12.6 cm^3

Chapter

18 Ratio

The concept of ratio is quite hard to explain in words but easy to grasp intuitively. If doubling one quantity causes the other to double, then we have direct proportion.

LESSON PLANNING

Objectives

General	To grasp the concept of proportion and its implications
Specific	1. To be able to express correctly proportions and fractions relating to a direct proportion situation, and do simple calculations 2. To be able to compare two quantities using a ratio (in its simplest form) 3. To be able to divide up a quantity in a given ratio or ratios 4. To recognise indirect proportion situations, and to calculate accordingly
Pacing	3 lessons maximum, 1 homework
Links	Cancelling down fractions, units
Method	EX 18A is revision, so the introduction to this should be brief. In some classes it may be omitted altogether. The next section, bringing in direct proportion, needs a lot of oral work with examples such as those in the text, and others. It is good to make clear that not everything changes in direct proportion. For example, Uzair grows 3 cm in 6 months. How much will he grow in 12 months? [Growth is not at a constant rate] Use EX 18B #1–5. Comparing quantities and dividing up using ratios can be done by other methods, but the text methods are recommended with this age-group of students. Use the rest of EX 18B. For indirect proportion in EX 18C, there are alternative methods that could be used without involving ratio. If you wish to use it, then you will have to insist on the ratio reversal (flip) method. [Many students understand inverse proportion better at a later stage when reciprocal graphs are introduced: teacher may omit the topic here.]
Assignments	Skip EX 18A, or set it as a diagnostic homework EX 18B #1–5 classwork, #6–10 homework EX 18C classwork (or omit)
Vocabulary	ratio, direct proportion, indirect proportion

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ANSWERS

Exercises

EX 18A

1. 1 : 3
2. 2 : 3
3. 5 : 8
4. 140 : 1
5. 40 g
6. 80 blue tiles
7. 28 red, 32 black beads.
8. 1 : 9
9. 1 : 3
10. 1 : 2

EX 18B

1. a) 4 l b) 12 l c) 20 s d) 10.5 s
2. a) 275 g b) 500 g c) 5 d) 187.5 ml
   e) 100 g
3. a) 3 : 2 b) 1 : 2 c) 1 : 3 d) 2 : 7
4. 15:2
5. a) 3 b) $\frac{3}{4}$ c) $\frac{1}{4}$ d) $\frac{1}{3}$
6. a) 3 : 100 b) 3 : 20 c) 1 : 30 d) 1 : 1000
7. a) Maria Rs 2000, Nimra Rs 1600 b) Maria Rs 1600, Nimra Rs 2000
   c) Maria Rs 2400, Nimra Rs 1200 d) Maria Rs 600, Nimra Rs 3000
8. a) Sameer 6, Taha 12, Umair 18 parcels
   b) Sameer 18, Taha 6, Umair 6 parcels
   c) Sameer 12, Taha 15, Umair 9 parcels
   d) Sameer 3, Taha 30, Umair 3 parcels
9. a) 24 km b) 25 miles c) 11.2 km d) 7.5 miles
10. a) $ 95.76 b) $ 3.36 c) Rs 252

EX 18C

1. 6 days
2. 24 snacks
3. 2 h
4. 18 km/h
5. 18 workers
6. 16 days
7. Rs 200
8. 18 h
9. 6 days
10. 80 min

EX 18X

1. a) $1\frac{1}{2}$ days b) 12 men c) They flip.
2. a) 25 days b) 15 days c) 3 days d) They flip.
3. a) direct b) indirect c) indirect d) direct

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Chapter

19 Graphs and Charts

Students will have met frequency tables, pictograms, and bar charts before. The line graph, basically a simplification of the bar chart, may be new. At this stage also, the scales will probably be more difficult to read than hitherto.

LESSON PLANNING

Objectives	
General	To interpret correctly graphs of difference and proportion derived from grouped and ungrouped data
Specific	1. To understand that pictograms, bar charts, and line graphs illustrate differences, and that pie-charts illustrate proportions 2. To interpret correctly from given graphs; to draw line graphs correctly from given data 3. To understand why data is grouped; to use grouped frequency tables and interpret bar charts derived from grouped data; to understand that grouping results in loss of information (e.g. range)
Pacing	2 lessons, 2 homeworks
Links	Reading scales, fractions
Method	Elicit from the students as many kinds of graph as they can think of. (If there is time, they could be asked to bring in examples from newspapers, magazines, food cartons, etc.) Put these into categories. Then follow the text EX 19A is easy but important. (Question 8 needs graph-paper.) This exercise lends itself to (controlled) class discussion. "Pair and share" technique may be used, i.e. students are responsible for their own answers but may discuss (only) with their neighbour. Judicious pairing is recommended. For the section on grouping, start by asking how they would draw the graph if there were hundreds of data items. This leads naturally to grouping as a strategy to summarise it. Then follow the text. Emphasize labelling the horizontal scale correctly. Avoid labelling 1–10, 11–20, etc., which, although not wrong, is rather untidy. The column boundary method is better, with an eye to later work. EX 19B repeatedly asks questions designed to show that grouping results in some loss of information. The range cannot be found precisely; we cannot know for certain any specific score, and the best we can do for a mode is to state the most likely interval of values. (Questions 3 and 9 require graph paper.)

Resources	Graph paper (standard 2 mm recommended) for EX 19A #8 and Ex 19B #3 and 9.
Assignments	Set homework from the exercises. They can be quite time-consuming and all should be completed.
Vocabulary	pictogram, bar chat, line graph, differences pie chart, proportions range frequency table grouped data

ANSWERS

Exercises

EX 19A

1. a) 6 b) 9
   c) $3\frac{1}{2}$ d) November; 11
2. a) Science; 70% b) History; 30%
   c) English, Maths d) 5% better
3. a) Uppex; Rs 500 000 b) Toppo; Vroom
   c) (i) Vroom (ii) Uppex (iii) Toppo
   d) 7 l extra
4. a) $\frac{3}{4}$ b) $\frac{1}{3}$ c) 50 d) 22
5. a) 1 b) 2 c) A d) 16
6. a) Rs 8400 b) $\frac{1}{4}$
   c) Rs 10 000 d) Rs 24200
7. a) size 41; 3 girls b) 90 c) 38; 30 d) 5

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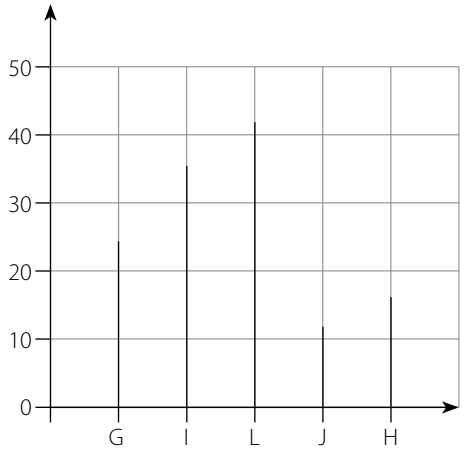
8. a)



b) individual question

9. a) Rs 2 million b) $\frac{1}{6}$ c) 3 times more d) $\frac{1}{12}$

10. a) Sunday, 130 boxes b) Friday & Saturday; 110 boxes

c) After weekend slow business d) 6960 cakes

EX 19B

1. a)

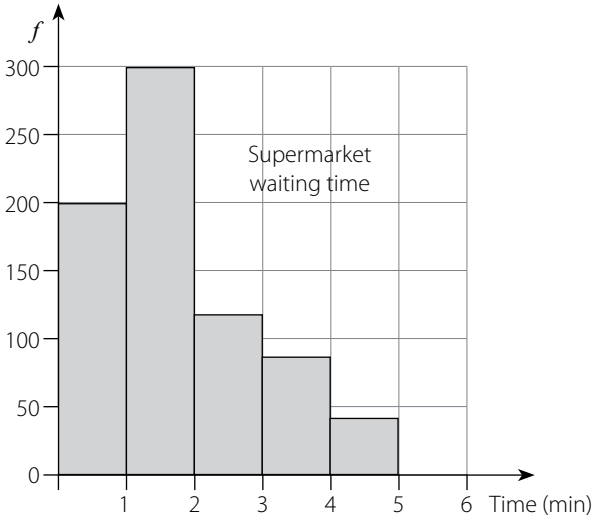
Heights (cm)	f
90 to 100	3
100 to 110	3
110 to 120	4
120 to 130	5
130 to 140	4
140 to 150	1
Total	20

b) 53 cm

2. a) 8 b) 4

c) 21 d) 40 to 45 s

3. a)



b) 1 to 2 min

c) 5 min; we do not know the exact shortest and longest time

4. a)

Heights (kg)	f
2.2 to 2.3	20
2.3 to 2.4	30
2.4 to 2.5	40
2.5 to 2.6	20
2.6 to 2.7	5
Total	115

b) 25; 90

c) 78.3%; yes

d) 0.78 (2 d.p.)

5. a) 0.75 mm b) 2 c) 13 d) 0.15

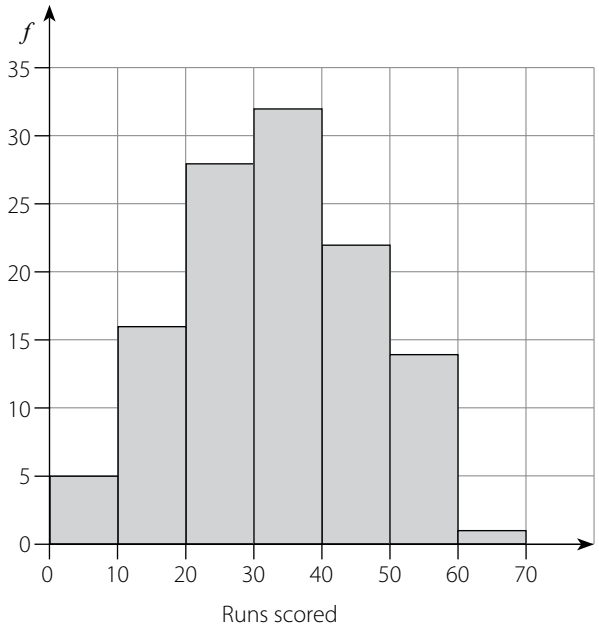
6. a) 40 to 60%; 60 to 80%; Higher

b) 0; 0.05 c) Maths 20% higher d) Maths 40% wider range (approx.)

7. a) 30 b) 40 °C c) 20 to 30 °C; 160 days
d) 80

8. a) 1000 to 1500 m^2 b) 2500 to 3000 m^2 c) 75 d) 475

9. a)



(b) no

(c) may be; no

(d) 30 to 40

10. a) 4 b) 14 c) 9 to 12 d) 3; no

EX 19X

a) graph b) medium

c) 90 cm; actual lengths not known; 90 cm; 70 cm d) $\frac{18}{159} = 0.11$ (2 d.p.)

e) It doesn't matter: measure the snake again.

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Chapter

20 Revision Exercises

All the questions in this revision chapter relate to topics covered in Chapters 1–19 of the text.

ANSWERS

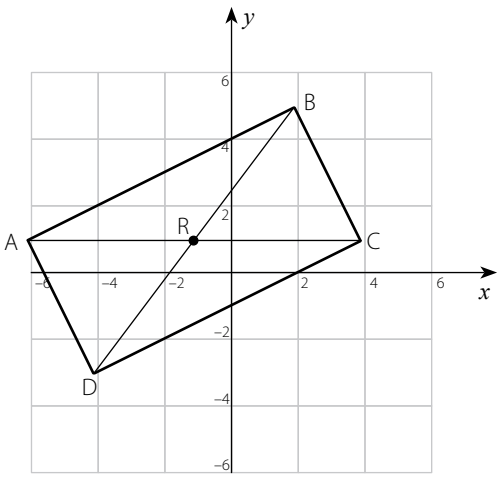
Exercises

EX 20A

1. a) 23.5% b) 31.6% c) 39.1% d) 34.3

2. a) square, rhombus or kite b) rhombus, parallelogram or kite
   c) square d) kite

3. a) 60 b) 24 c) 13.8 d) 3

4. 

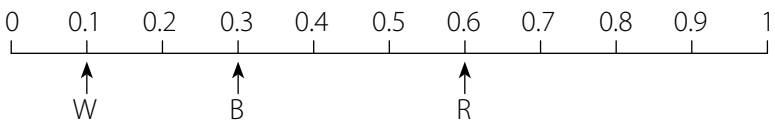
R(–1, 1)

5. a) 5 b) 0.33 c) 0.04 d) 0.02

6. a) 11.4 b) 86.2 c) 2.4 d) 0.5

7. [Accurate angle drawings; expect answers within ± 10°.]

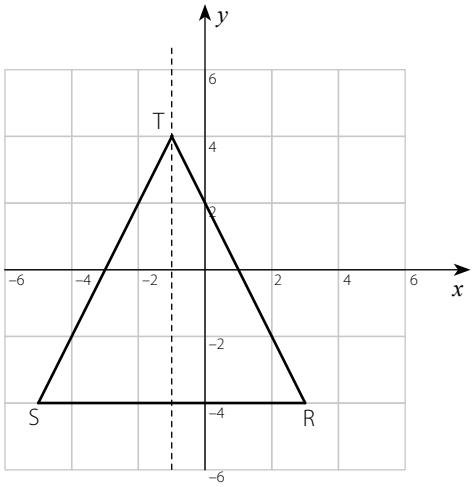
8. a) 12.6 b) 430 c) 194.4 d) 338.4

9. 

10. a) 0.339 b) 10.67 c) 100 d) 788

EX 20B

1. a) 29 cm^2 b) 30 cm
2. a) 28 b) 5.279 c) 0.467 d) 0.169
3. a) 1 + 2 + 4 = 7, not a multiple of 3 b) does not end in 5 or 0
   c) 8 + 8 + 6 = 22, not a multiple of 9 d) 66 not a multiple of 4
4. a) No b) Yes c) Yes
5. a) $\frac{3}{10}$ b) $\frac{7}{10}$ c) $\frac{3}{7}$ d) $2\frac{1}{7}$
6. a) 4 pins b) 0.62 x) 0.18; 0.20 d) 10%
7. a) $\frac{1}{10}$, 16%, $\frac{3}{5}$, 0.61, 62% b) 0.18, $\frac{1}{5}$, $\frac{4}{5}$, 81%, 0.82
   c) 0.26, 26.1%, 0.62, 66%, $\frac{2}{3}$
   d) $\frac{1}{5}$, 0.21, 23%, $\frac{3}{13}$, 0.32
8. a) Yes b) Yes c) Yes d) No
9. a) 6 r 1 b) $84\frac{2}{3}$ c) 0.7 d) $2\frac{7}{10}$
10. a)
    c)



b) isosceles
d) $\angle S = \angle R$

EX 20C

1. a) 100 b) 17 c) –700 d) 0
2. a) 471 b) 244 c) 29 d) 446
3. $a = 162$, $b = 143$, $c = 38$, $d = 51$
4. 16.8 km^2
5. 0.25

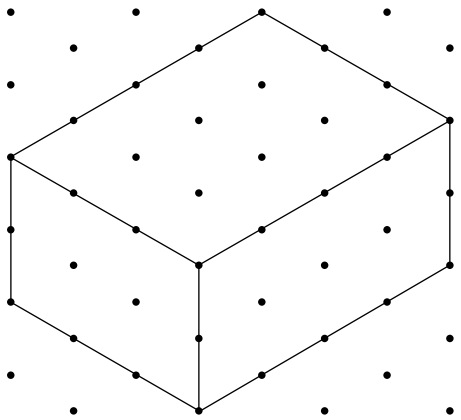
6. a) 45.2 b) 0.866 c) 0.967 d) 16.55

7. 35 cm^2

8. a) 3.1 b) 0.054 c) 3.65 d) 7.07

9. a) 0.24; 0.2 b) 9; 9.3
   c) 7.6; 7.8 d) 440; 436.6

10.



EX 20D

1. a) Sara Rs 1000, Taimoor Rs 2000, Uzair Rs 3000
   b) Sara Rs 2000, Taimoor Rs 1000, Uzair Rs 3000
   c) Sara Rs 1500, Taimoor Rs 2000, Uzair Rs 2500
   d) Sara Rs 1200, Taimoor Rs 1600, Uzair Rs 3200

2. a) 1000 to 1500 m^2 b) 2500 to 3000 m^2 c) 25 d) 125

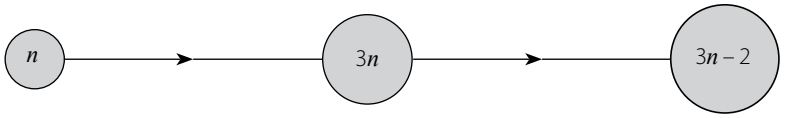
3. Rs 375

4. a) Yes b) No c) Yes d) Yes

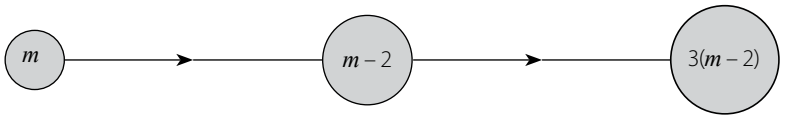
5. 2.63 m

6. a) 25 cm b) –35 cm c) –5 cm d) –65 cm

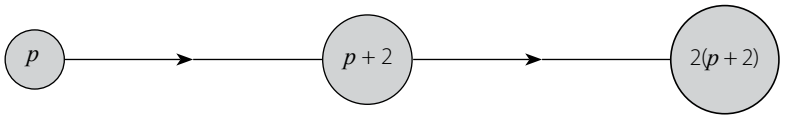
7. a)



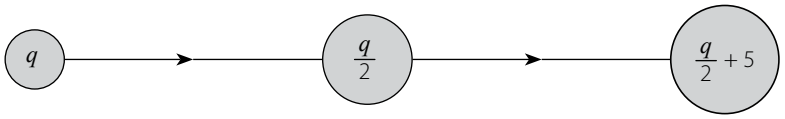
b)



c)



d)



8. a) 400 b) 8000 c) 400 d) 2400

9. a) $n = 180$; 170°, 190°

10. Rs 3783

EX 20X

1. They all recur after 6 d.p.. The 6 recurring digits always add up to 27.

2. a) 2.37 b) 12.3 c) 1414 d) 5.58

3. 25°, 50°, 105°

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Chapter

21 Units

There are three parts to this topic: how units of measurement relate to each other; accurate drawing and measuring using ruler and protractor; and a difficult section on the calendar, time intervals and time zones.

LESSON PLANNING

Objectives

General	To use appropriate units and the relationships between them correctly; to draw and measure accurate lines; to calculate time intervals and time zones
Specific	1. To be aware of the huge range of instruments of measurement and know what some of them measure 2. To memorize the relationships between basic metric units and use the information in calculation 3. To draw lines on diagrams according to instructions and measure them, to an accuracy of ± 1 mm 4. To know the number of days in each month, and calculate the number of days between given dates 5. To use time-zone information to work out the time elsewhere in the world
Pacing	3 lessons, 2 homeworks
Links	Negative numbers, polygons
Method	Make a classroom display on the theme of Measurement. Include pictures of measuring instruments of all kinds, brought in by students. Failing that, call for names of instruments and what they measure, and make a display of those. Mention should be made of: • micrometer, ruler, tape measure, trundle wheel, theodolite, odometer, SAT-NAV, for measuring length, distance, perimeter • electronic balance, shopkeeper's balance, weighbridge, bathroom scales, post office scales, chemical balance for measuring weight (mass) • clock, calendar, stopwatch, hourglass, candle, Sun, Moon for measuring time • medicine spoon, teaspoon, dessert spoon, measuring jug, calibrated tank for volume • thermometer, thermostat, thermocouple, for measuring temperature. Then move from instruments to the units of measurement. Follow the text. These should all be memorized, especially the two relationships between weight and volume. Use Exercise 21A.

	For the drawing, have a mass pencil-sharpening session beforehand. Suggest H pencils rather than HB. Show, using board ruler, how to place the ruler and draw/measure accurately. Use EX 21B. For the calendar section, expect a lot of distress. Students do not find it easy, a position shared also by many adults! Do not expect high scores here. A number of examples should start them off. Follow the text, but more examples will be needed.
Resources	sharp pencils (H recommended) protractor board ruler (for demonstration)
Assignments	Do EX 21B and C in class. EX 21A and M recommended for homework
Vocabulary	leap year tonne balance, stopwatch, thermometer micrometer, weighbridge, medicine spoon, measuring jug consecutive time-zone

ANSWERS

Exercises

EX 21A

1.	a)	cm or mm	b)	g	c)	min and s	d)	°C
2.	a)	mm	b)	t	c)	ml	d)	ml
3.	a)	32	b)	42	c)	348	d)	3480
4.	a)	5	b)	2.5	c)	6200	d)	7250
5.	a)	800	b)	450	c)	9.85	d)	0.65
6.	a)	4000 000	b)	2.65	c)	25000	d)	3.74
7.	a)	7000	b)	4650	c)	1.25	d)	0.75
8.	a)	3000	b)	4216	c)	8.245	d)	4800
9.	a)	10 080	b)	1461	c)	744	d)	86 400
10.	a)	4.5 kg	b)	20 tonne	c)	2.1 l	d)	1.5 l

EX 21B

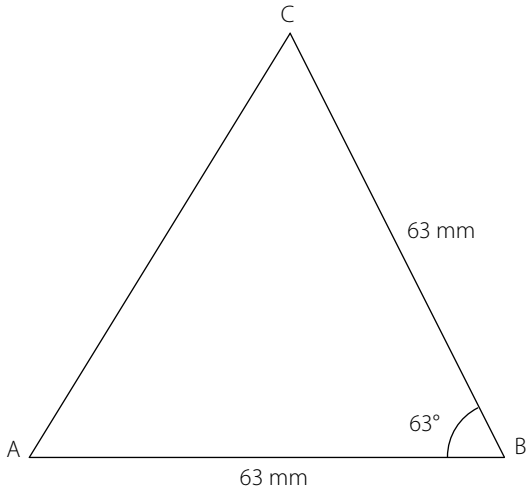
1 to 4 Accurate line drawings [expect ± 1 mm accuracy.]

5. $AB = 61$ mm, $BC = 26$ mm, $AC = 68$ mm

6. AB = 6.8 cm, BC = 4.5 cm, CD = 8.4 cm, DA = 2.9 cm

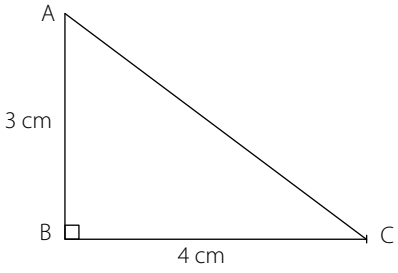
7. $PQ = PS$ = 4.5 cm, $QR = SR$ = 8 cm, kite

8.



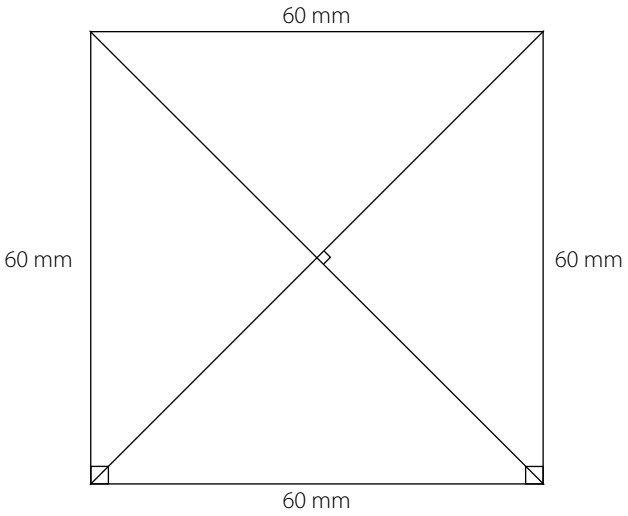
AC = 66 mm

9.



AC = 5 cm

10.



Diagonals equal

85 mm

Intersect at 90°

EX 21C

1. a) 7 b) 26 c) 58 d) 18
2. a) 10 b) 26 c) 38 d) 48
3. a) 23 b) 31 c) 32 d) 59
4. a) 7 b) 7 c) 6 d) 7
5. a) 7y 2 months b) 7y 3 months
   c) 6y 11 months d) 6y 10 months
6. a) 8:53 pm b) 0453
7. a) 4:16 am b) 1146
8. a) 1455 b) 35 min
9. a) 70 b) 10 c) 12
   d) 8 weeks 2 days
10. a) 60 b) 8 weeks 4 days c) Friday
    d) Thursday; No

EX 21M

1. a) °C; thermometer b) km; odometer
   c) g; chemical balance (or electronic balance) d) min and s; stopwatch
2. a) 260 b) 3.15 c) 380 d) 1.55
3. a) 5762 b) 5329 c) 3.75 d) 336
4. a) 7500 b) 7500 c) 300 d) 25 min
5. AB = 59 mm BC = 48 mm, AC = 63 mm
6. No. Long sides are 68 and 69 mm (not equal).
7. Accurate drawing
8. a) 42 b) 71 c) 12 weeks 4 days
   d) Thursday
9. a) 7 b) 7 c) 6 d) 7
10. a) 9 h forward b) 1200 c) 2:20 pm d) 0540

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EX 21X

1. 31 622 400

2. temperature

3. The Julian calendar had too many leap years. Now the centuries are only leap years every 400 years.

4. After every few years an extra second is put in because the length of the day is slightly longer than 24 hours.

5. e.g. 28/07/15 7/28/15 2015/07/28

   28/07/15 07/28/2015

   28/Jul/2015 28th July, 2015 etc.

Chapter

22 Brackets

BODMAS (or BIDMAS or PEMDAS or any other variants) should not be taught as a magic rule: it is a mnemonic to help us remember the prioritries of operations. Perhaps it should be written B(ODM)(AS) to avoid making the following kind of error:

$15 - 7 + 6$

$= 15 - 13$ (taking + first)

$= 2$

The correct answer is of course, 14.

LESSON PLANNING

Objectives

General	To use the correct order of priority of operations in calculations and linear algebraic expressions
Specific	1. To know that brackets must be worked out first, followed by of/multiplication/division (from left to right), followed by addition/subtraction (from left to right) 2. To interpret correctly the priorities in algebraic expressions such as $2n - 3$ and $2(n - 3)$
Pacing	Very fast. The brackets are new, the rest is revision. 1 lesson, 1 homework
Links	Arrow diagrams
Method	Remind class of natural priority of mult/div over add/sub. Most calculators do this automatically, so if there is any confusion show that $5 + 2 \times 4 = 13$ (not 28) Brackets, however, trump everything. Brackets say "DO ME FIRST!" Use BODMAS with care. As in the text, there are three levels. B O D M AS On the same level, work from left to right Algebra emphasizes these priorities because of the "close bond" notation, e.g. $2n$ and $\frac{n}{2}$ would take priority over $n + 2$ or $n - 2$, unless disrupted by brackets.

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Assignments	Either exercise for homework, the other in class. They are both easy enough for answers to be written down without showing working.
Vocabulary	brackets priority

ANSWERS

Exercises

EX 22A

1.	a) 12	b) 18	c) 0	d) 6
2.	a) 7	b) $9\frac{3}{4}$	c) 21	d) 12
3.	a) 7	b) $6\frac{1}{2}$	c) 2	d) 1
4.	a) 1.6	b) 0.6	c) 3.3	d) 3.3
5.	a) 68	b) 0	c) 234	d) 36
6.	a) 7	b) 8	c) 0.5	d) 0.5
7.	a) 17	b) 24	c) 62	d) 150
8.	a) 18.5	b) 30	c) 42.5	d) 17
9.	a) –5	b) 6	c) 1	d) 6
10.	a) 2.2	b) 3.8	c) 5	d) 37.1

EX 22B

1.	a) 11	b) 12	c) 14	d) 12
2.	a) 1	b) 26	c) 14	d) –6
3.	a) 21	b) 40	c) 40	d) 21
4.	a) 3	b) 1	c) 9	d) 9
5.	a) 42	b) 15	c) 54	d) –15
6.	a) 1	b) 4	c) 0	d) –1
7.	a) 3	b) 3.5	c) 35	d) 1.8
8.	a) 3.2	b) 3.6	c) 4	d) 1.8
9.	a) 100	b) 30	c) 30	d) 270
10.	a) 0	b) 0	c) 0	d) 1

EX 22X

1. a) $4a + 2a = 6a$ b) $7b + 5b = 12b$

   c) $c + 2c = 3c$ d) $8d - 3d = 5d$

2. 2 is correct. Division has equal priority to multiplication and we should work left to right, but the brackets have to be completely removed first, i.e.

$12 \div 2(1+2)$	$12 \div 2\ (1+2)$
$= 12 \div 2(3)$	$= 12 \div 2(3)$
$= 12 \div 6$	$= 12 \div 2 \times 3$
$= 2$	$= 6 \times 3$
Correct	$= 18$ Incorrect

   Another way of looking at this is that multiplying factors outside brackets have to be dealt with before the mult/div priority. This "multiplication by juxtaposition priority rule" is not part of BODMAS.

3. 0.4

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Chapter

23 Scales and Dials

Students often make errors reading scales and this chapter is designed to focus on the problem.

LESSON PLANNING

Objectives

General	To read correctly from scales, dials, and digital clocks, with relevant calculations
Specific	1. To know the difference between digital and analogue 2. To read accurately from linear scales and circular dials 3. To label accurately intermediate points of scales and dials 4. To know the equivalent 12 or 24-hour digital and 12-hour analogue times 5. To calculate time intervals using the different methods of stating the time
Pacing	2 lessons, maybe 1 homework
Links	Science equipment, household equipment, drawing accurately
Method	• Context is everything. Try to assemble some items with scales and dials from the science lab, or used in the home. These can be used to elicit the digital/analogue distinction. The text also has a few pictures, but the actual real equipment has greater impact. Follow the text as regards inculcating the habit of asking "What is the value of each division?" when reading an analogue scale/dial. Use board examples. Before setting EX 23A, be prepared by issuing lines and dials pre-drawn to save time. • Changing digital to analogue time and *vice-versa* is not too difficult, but calculating time intervals is much harder. Two examples are given in the text, but more will be required. Suggested sequence is i) 0600 to 0800 ii) 0600 to 0840 iii) 0545 to 0840 iv) 0440 to 0910 v) 0350 to 0910 to get the rhythm of how to break it up. Then do some analogue examples. Use EX 23B. • Although EX 23X is for high-flyers, #1 could be an interesting class project, given time.

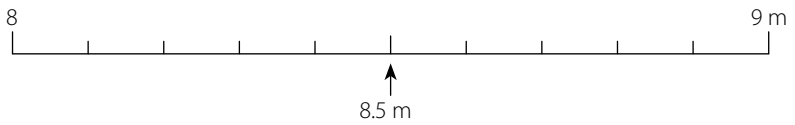
Resources	Various items of measuring equipment, blank lines, and circular dials (photocopiable sheets at the end of this chapter of the Teaching Guide on pages 110 and 111)
Assignments	Best option for homework is to finish EX 23A started in class. EX 23B is more difficult: best tackled in class where support is available.
Vocabulary	digital, analogue, 24-hour, 12-hour division time interval

ANSWERS

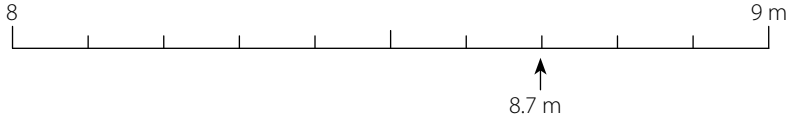
Exercises

EX 23A

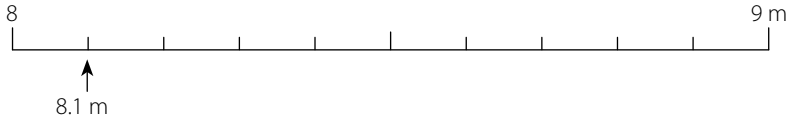
1. a) 18.2 cm b) 10.5 cm c) 5.2 m d) 1.8 m
2. a) 37 °C b) 37.5 °C c) 39 °C d) 36.5 °C
3. a) 2.6 kg b) 2.5 kg c) 12.5 kg d) 350 g
4. a)



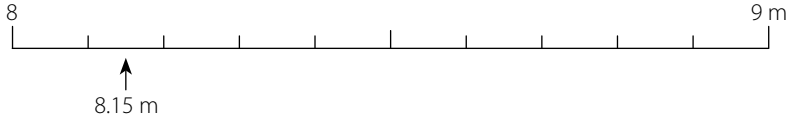
b)



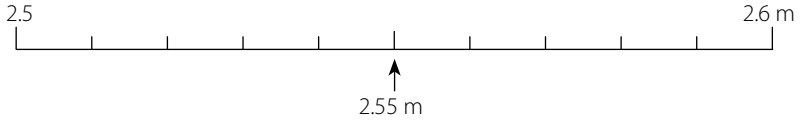
c)



d)



5. a)



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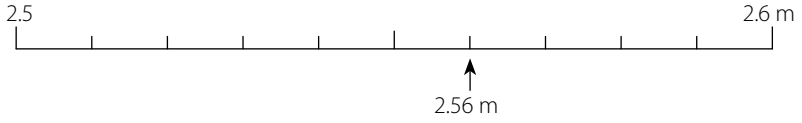

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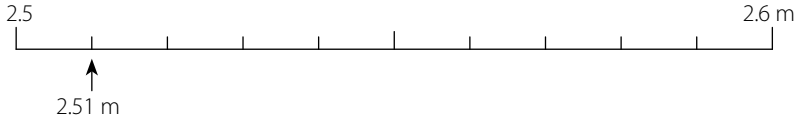

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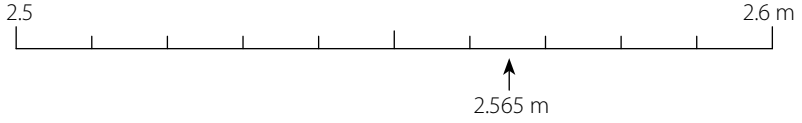

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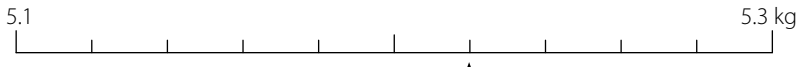
6. a)



b)



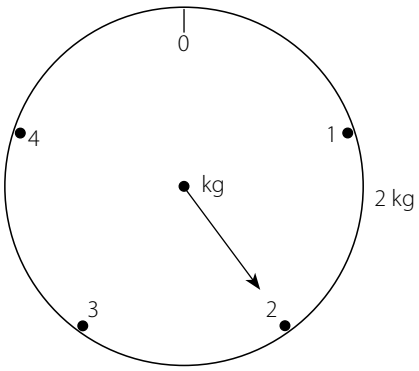
c)



d)



7. a)



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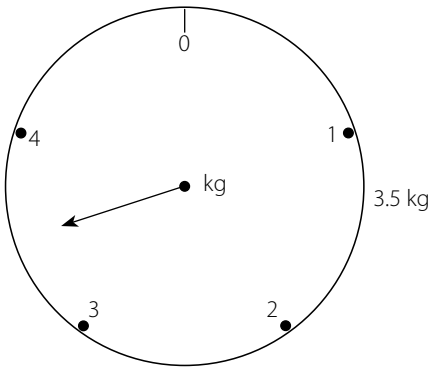
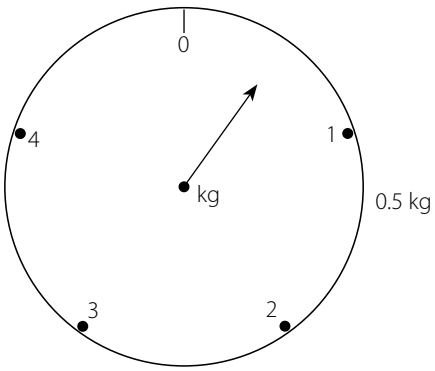
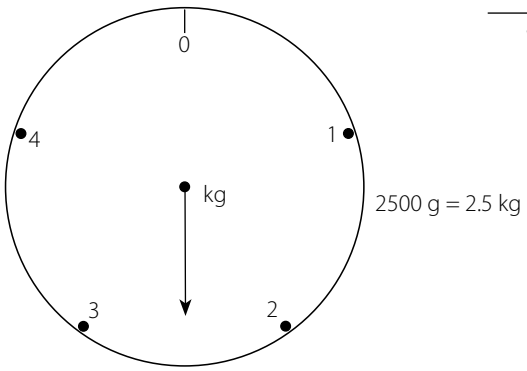


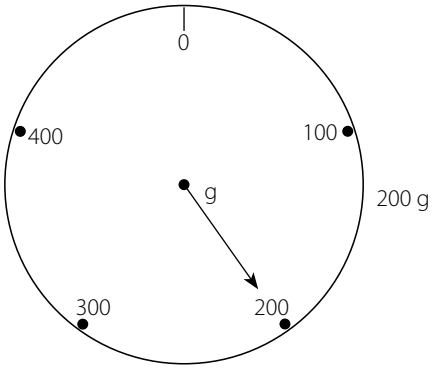
c)



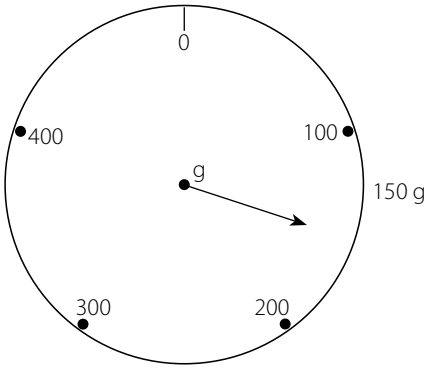
d)



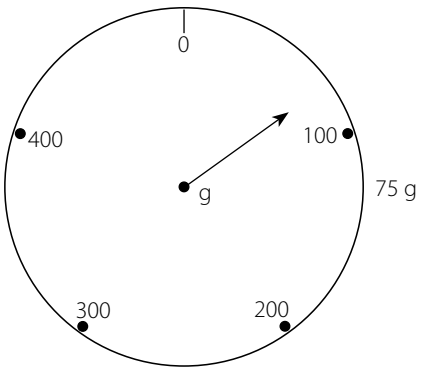
8. a)



b)



c)



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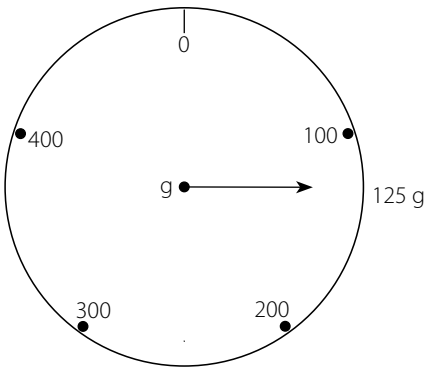
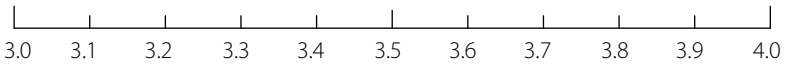
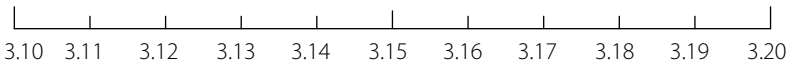


9. a) 2.04 kPa b) 2.2 kPa c) 1.85 kPa d) 1.5 kPa

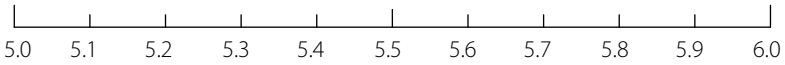
10. a)



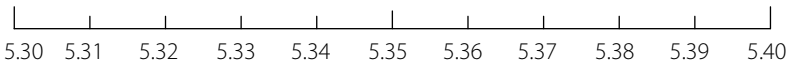
b)



c)



d)



EX 23B

1. a) 3:20 b) 4:40 c) 8:05 d) 9:30
2. a) half past four b) quarter past seven
   c) ten to seven d) five to twelve
3. a) 0110 b) 1425 c) 1035 d) 1245
4. a) 3:20 pm b) 8:35 am
   c) 9:15 am d) 10:50 pm
5. a) 25 min b) 3 h 25 min
   c) 1 h 56 min d) 1 h 23 min
6. a) 1 h 2 min b) 3 h 20 min
   c) 30 min d) 1 h 2 min
7. a) 1 h 35 min b) 1 h 18 min
   c) 1 h 5 min d) 1 h 55 min
8. a) i) b) i) c) i) d) ii)

9. a) 1 h 19 min b) 47 min

c) 1 h 45 min d) 4 h 40 min

10. a) 0715 0819 1508

b) 1218 1612 1718

c) 1221 2002 2112

d) 0909 1009 1010

EX 23X

1. Many ways of expressing 12 h digital with different separators, with or without initial zero and with or without zeros for minutes less than 10, e.g.

4^{05} am = 4.05 am = 04.05 am = 4:05 am = 4▲05 am

etc.

2. a) 11 h 5 min b) 20 h 25 min

c) 11 h 22 min d) 45 h 45 min (or 1 day 21 h 45 min)

3. 2030

Linear Scales

Linear Scales

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Circular Dials

Circular Dials

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Chapter

24 Symmetry

This is an early activity on the three transformations of the plane that produce a congruent image, i.e. reflection, rotation, and translation. Further transformations will follow. There is nothing quite like hands-on experience of moving shapes for developing an intrinsic grasp of geometry.

LESSON PLANNING

Objectives

General	To use reflection, rotation, and translation to solve simple geometry problems
Specific	1. To know the meaning of reflection, rotation and translation 2. To identify line symmetry and rotational symmetry, and indicate them correctly on diagrams 3. To use symmetry to summarize properties of polygons, and answer simple geometry questions
Pacing	A lot will depend upon students' previous experience. They should have met reflection and line symmetry before, but may not have done so. The later questions in both exercises may be difficult and time-consuming. Aim for 2 lessons, but it may need 3, or even 4.
Links	polygons, naming of angles
Method	• Demonstration method. Have pre-prepared large cardboard cut-outs of various shapes. Start with line symmetry and reflection. Ask students to place a ruler on the mirror line. Mix it with asymmetrical shapes. Then bring in some rotational symmetrical shapes, e.g. capital N or swastika. They are "balanced" (the true meaning of symmetrical) but there is no mirror line. This leads naturally to define the centre of rotation. (At this stage, avoid talk of orders of symmetry.) Translation is just another way of moving a shape, not related to symmetry. Use the photocopiable question sheet for EX 24A. Some students may need mirrors or tracing paper to grasp what is happening. Be prepared. • The power of symmetry can be seen when considering properties of polygons. The text shows how the symmetries of a rectangle automatically give lots of other facts about it. You could do a similar demonstration with, say, an equilateral triangle. Use a large cut-out; don't just draw it on the board. A cut-out can actually be rotated; not all children can imagine the movement from a board diagram. (Some adults too!) Use EX 24B.

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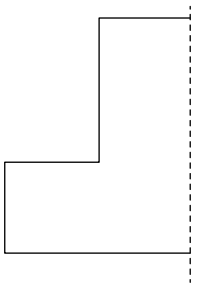
Resources	• A set of large cardboard cut-out shapes (at least A4 size) for class demonstration. • A class set of EX 24A (photocopiable, at the end of this chapter in the Guide) • Some mirrors: This is somewhat problematical in the classroom. A cheap, safe option is to use aluminium foil stuck onto thick card, or wrapped tightly round a short ruler. It has to be really flat, without creases. • Tracing paper: any thin paper will do as long as it can be seen through.
Vocabulary	reflection, line symmetry, mirror line rotation, centre of rotation, clockwise translation, sliding, position

Exercise 24A

Answer on the sheet. Use mirrors or cut-outs to help you if you need them.

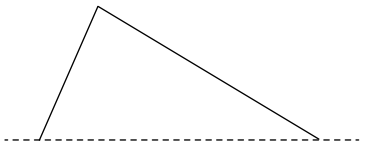
1. These shapes have line symmetry by reflection. The mirror line is shown as a broken line. Complete these diagrams and name the shapes:

a)



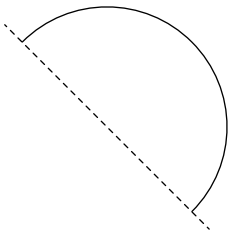
Name of shape: _____

b)



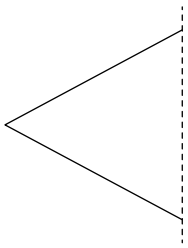
Name of shape: _____

c)



Name of shape: _____

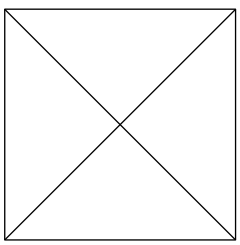
b)



Name of shape: _____

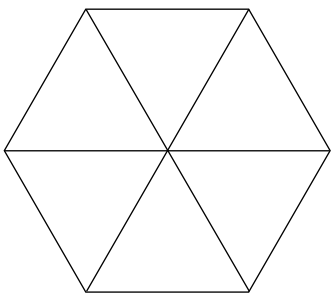
2. These shapes have rotational symmetry by turning. Add a blob to the diagrams to indicate the centre of rotation. State how many ways the shape can be fitted into its own outline by turning around this point.

a)



Fits outline _____ ways

b)



Fits outline _____ ways

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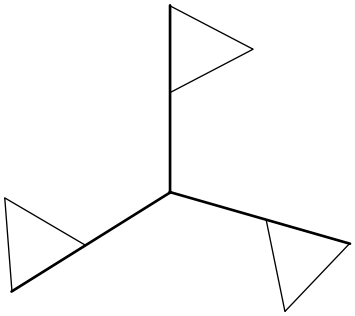
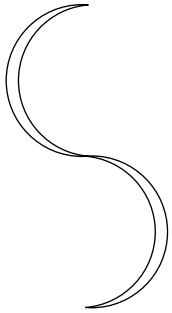
c)



Fits outline _____ ways

d)



Fits outline _____ ways

3. State whether the shapes in question 2 also have line symmetry:

a) _____ b) _____ c) _____ d) _____

4. On the same diagram draw translations of the square

a) 2 cm to the right b) 2 cm below

c) 5 cm to the left d) 1 cm above



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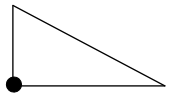
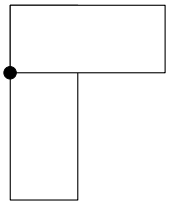
5. These designs are incomplete. They each have rotational symmetry. The blob indicates the centre of rotation. Complete each shape so that it fits into its own outline the number of ways stated.

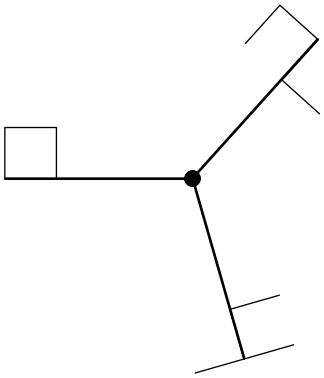
a) Fits outline 2 ways



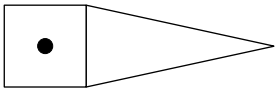
b) Fits outline 4 ways



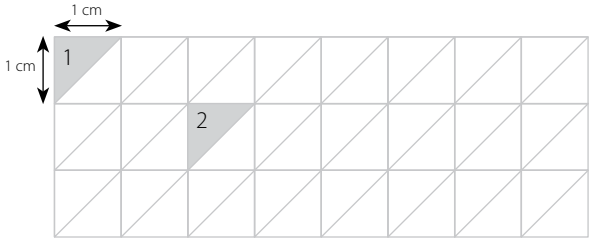
c) Fits outline 3 ways



b) Fits outline 4 ways



6.



In the design, triangle 1 has been repeatedly translated. The translation from 1 to 2 is 2 cm to the right and 1 cm down. On the diagram,

a) label triangle 3 so that the translations from 1 to 3 is 5 cm to the right,

b) label triangle 4 so that the translation from 1 to 4 is 6 cm to the right and 2 cm down,

c) label triangle 5 so that the translation from 4 to 5 is 3 cm left,

d) label triangle 6 so that the translation from 4 to 6 is 5 cm left and 1 cm up.

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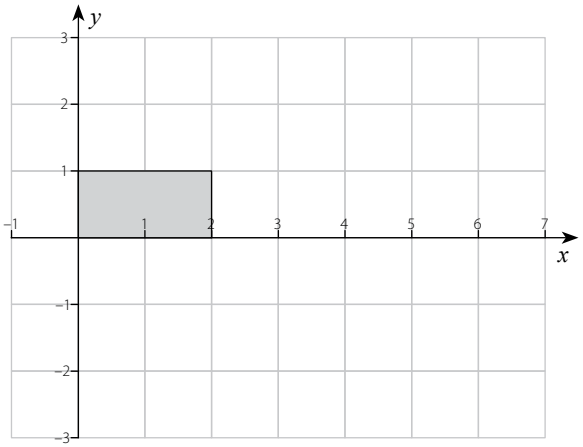
7. There is a rectangle shown on the coordinate grid.

a) The centre of rotation is (2, 1). Mark this point with a blob.

b) Add another rectangle to the grid so that your design has rotational symmetry and fits its own outline 2 ways.

c) Add another rectangle by translating the original 4 cm to the right. (Now you should have 3 rectangles altogether.)

d) Draw 3 more rectangles by reflecting all your rectangles on the x–axis.

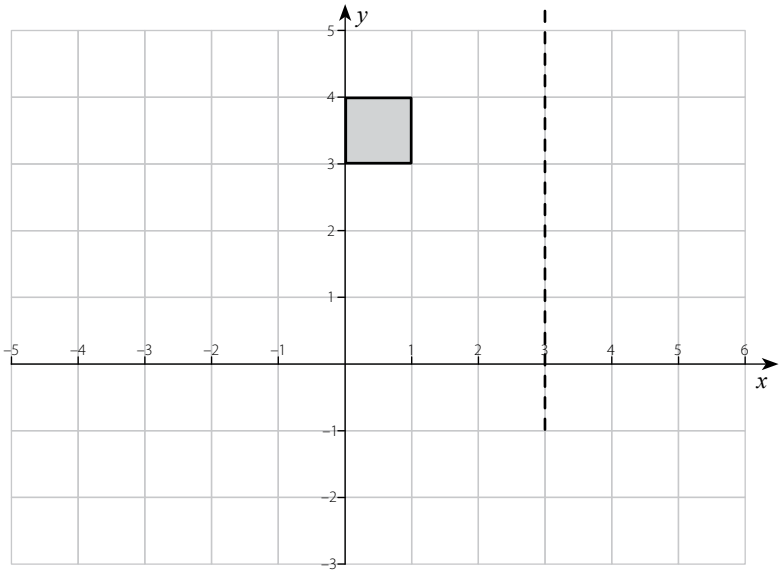


8. a) Rotate the little square so that (1, 3) becomes the centre of rotational symmetry of a design that fits its outline 4 ways.

b) Reflect this design so that the broken line becomes a line of symmetry.

c) Translate both parts of your design 2 cm to the left

d) Use broken lines to show the position of any lines of symmetry in your diagram overall.



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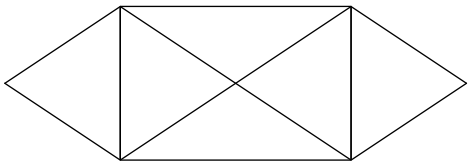
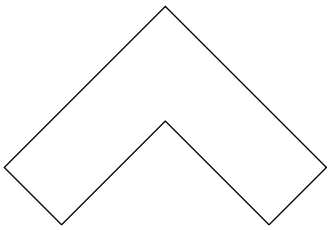
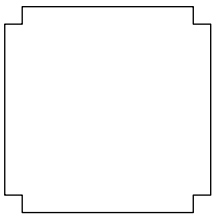
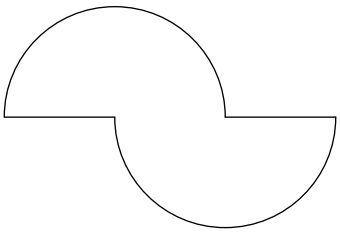
9. Show any symmetry in these designs by using broken lines (line symmetry) and blobs (centres of rotational symmetry). If there is rotational symmetry, state how many ways the design will fit into its own outline when turned.

a) 

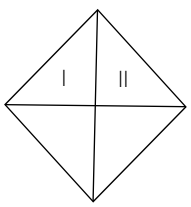
b) 

c) 

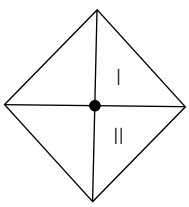
b) 

10. I want to move triangle I to the position of triangle II:

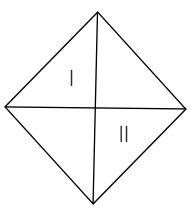
a) by reflection—draw the line of symmetry.



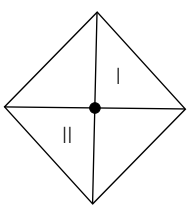
b) by rotation—how many degrees clockwise?



c) by reflection—draw the line of symmetry



d) by rotation—how many degrees clockwise?



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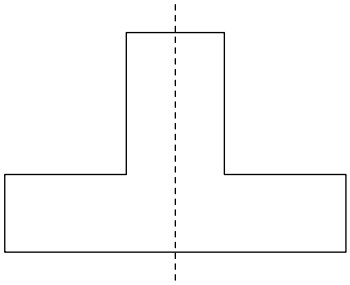
ANSWERS

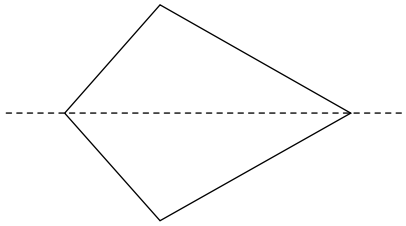
EX 24A

1. a)



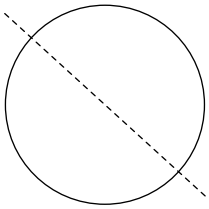
Octagon

b)



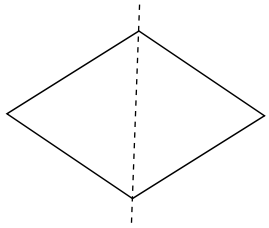
kite

c)



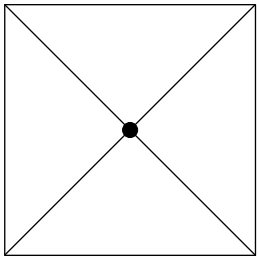
Circle

d)



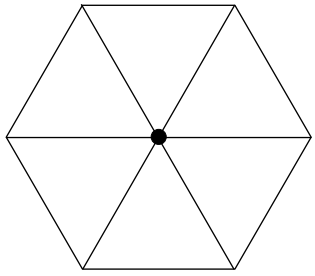
Rhombus

2. a)



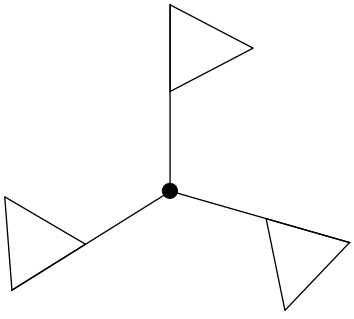
4 ways

b)



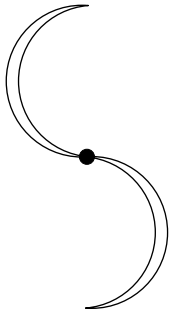
6 ways

c)



3 ways

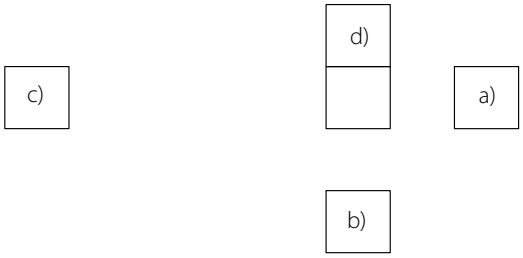
d)



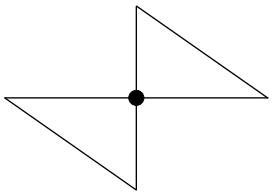
2 ways

3. a) Yes b) Yes c) No d) No

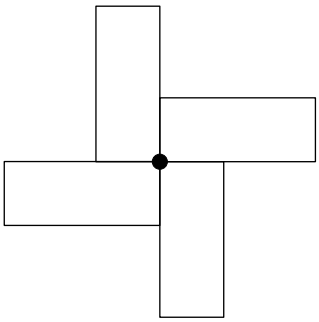
4.



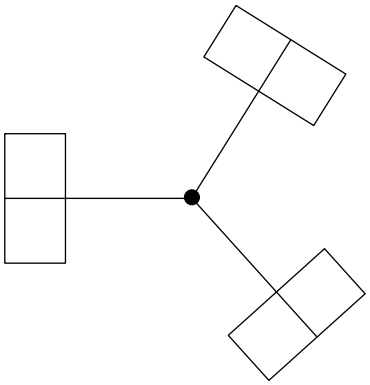
5. a)



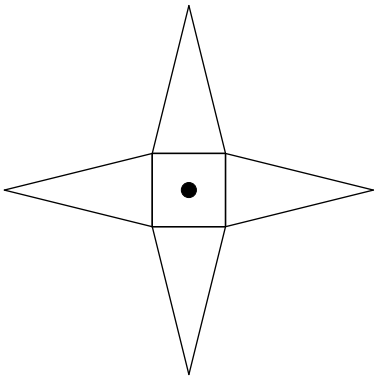
b)



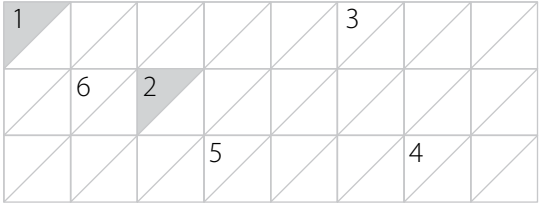
c)



d)



6.



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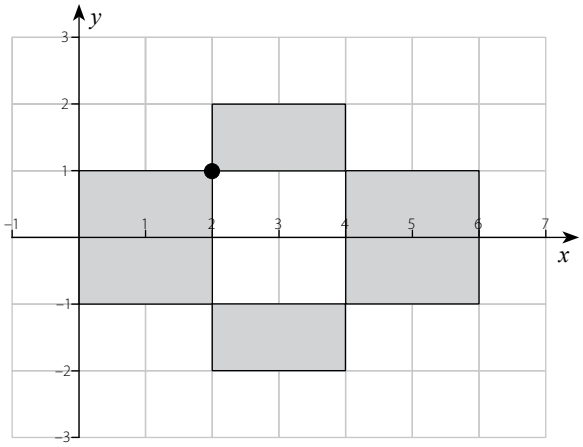
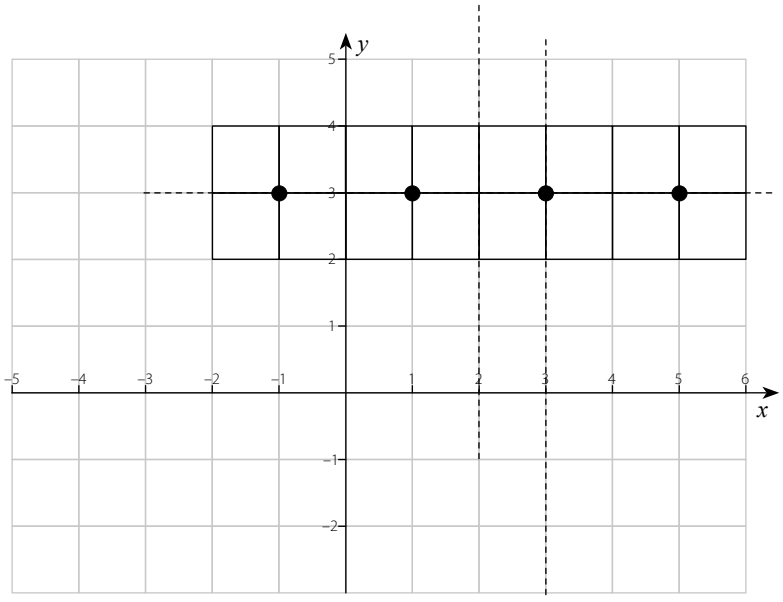
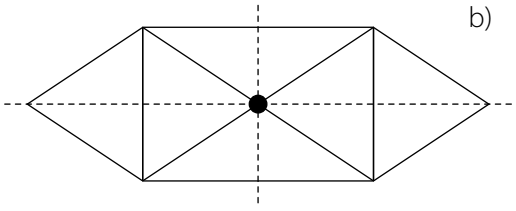
7.



8.

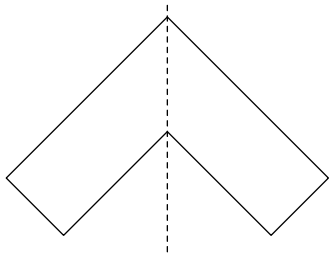


9. a)

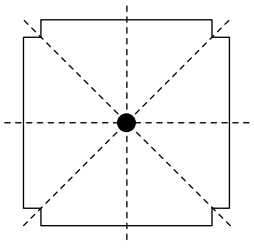


2 ways

b)

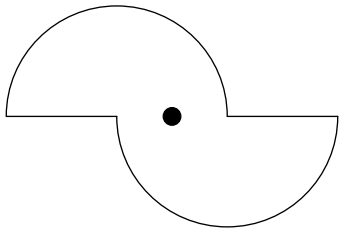


c)



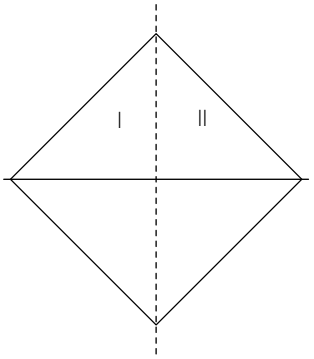
4 ways

b)



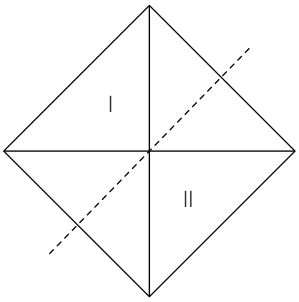
2 ways

10. a)



b) 90°

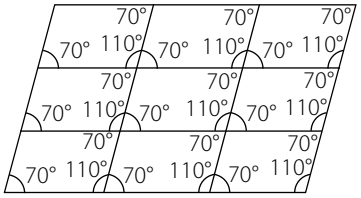
c)



d) 180°

EX 24B

1. a) BC b) ∠ABO c) BD d) ∠AOD
2. a) CD b) ∠CDB c) ∠BCD d) CO
3. a) BC, CD, AD b) ∠ODA, ∠OBC, ∠OBA
   c) AO = CO and BO = DO
   d) ∠BOA, ∠DOA, ∠DOC, 90°, because all four total 360°
4. a) equal b) equal c) equal
   d) opposite pairs equal
5. a) O is the midpoint of each diagonal. b) equal c) equal
6. 40°
7. a) $\angle BCO, \angle CDO, \angle DEO, \angle EFO, \angle FAO$
   b) OA, OB, OC, OD, OF
   c) $\angle DEF, \angle EFA, \angle FAB, \angle ABC, \angle BCD$
   d) AB, BC, CD, DE, EF
8. a) EC b) 120° c) $\angle OCB$ d) $\angle OAB$

9. 

b) angles on a straight line

10. a) reflection b) rotation c) reflection or translation

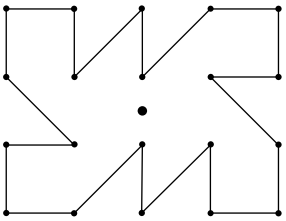
d) reflection or rotation

EX 24X

1. a) False: they can be different sizes b) True c) True

d) False: only one angle is common, the others can be different.

2. One possible solution—there may be others.



This solution has rotational symmetry (centre shown)

3. The lists depend on the way the letters are formed, e.g a capital O could have 2 lines of symmetry, or an infinite number. S may have rotational symmetry but if the upper part is smaller than the lower part, then it would have no symmetry. Such things can be the basis of good discussions amongst a small group of students working on this task.

Chapter

25 Revision Exercises

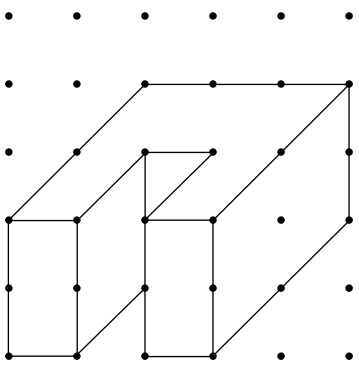
All the questions in this chapter relate to topics covered in Chapters 1–24 of the text.
For some ideas about using Revision Exercises, see the notes in this Guide for Chapter 10 under Methods (c) to (i).

ANSWERS

Exercises

EX 25A

1. a) 0.243; ANS + 0.173 = 0.416
   b) 43.5162; ANS ÷ 5.46 = 7.97
   c) 10.889 393 94; ANS × 0.264 = 2.8748
   d) 96.74; ANS – 7.44 = 89.3

2. 

3. a) 5:4 b) 2:1 c) 2:11 d) 4:7

4. a) $\frac{1}{8}$ b) 100 c) 180 d) 25

5. a) 900 mm^2 b) 360 mm^2 c) 5.89 cm^2 d) 0.75 cm^2

6. a) 13 b) 8.5 c) 0.5 d) 0.5

7. a) 40 min b) 2 h 14 min c) 1 h 10 min
   d) 1 h 55 min

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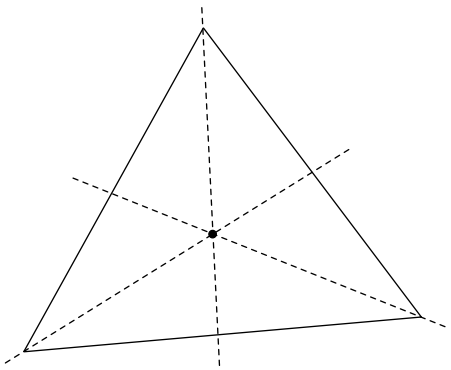
8. a)

b)

c)



d) 3

9. Disappointed. (Discount Rs 45, sale price Rs 255)

10. a) False. Only one pair of opposite angles are equal.

b) False. The diagonals intersect making two pairs of opposite angles equal.

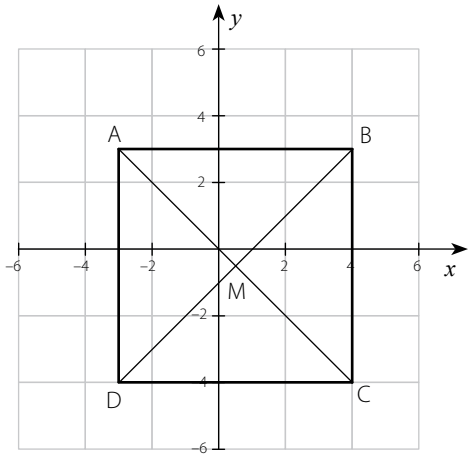
c) True d) True

EX 25B

1. a) 5 b) 2900 c) 2.1 d) 0.75

2. a)

b)



(c) square

d) M(0.5, −0.5)

3. a) 2 b) 10 c) 4.9 d) 134

4. a) 73 b) 467 c) 26 d) 2737

5. a) I acute, II acute, III obtuse

b) estimates c) I 28°, II 86°, III 142° (errors should be ≤ 10°.)

6. a) 568.8 b) 572.0 or 572 c) 414.72 d) 1.188

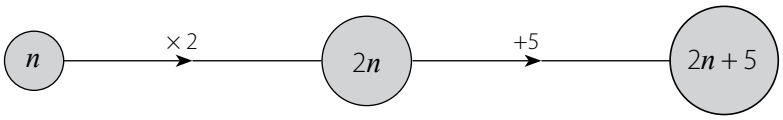
7. a) white b) blue c) red

8. a) 8.4 b) 11.6 c) 7.5 d) 8.7

9. 120 mm

10. a) 0.8 b) 2.3 c) 4.9 d) 2.5

EX 25C

1. 

2. $a = 24$, $b = 28$, $c = 152$, $d = 135$

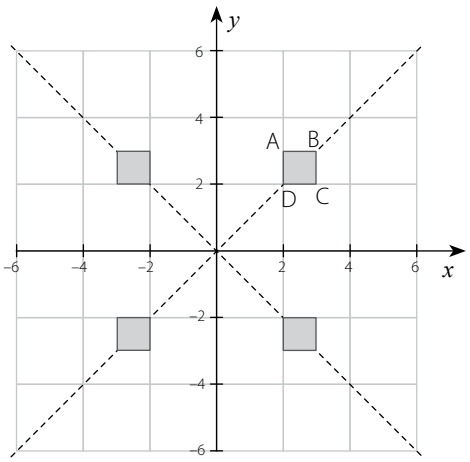
3. a) 2 b) 2 c) 1 d) 2

4. a) up 6 degrees b) down 4 degrees c) up 10 degrees
   d) up 2 degrees

5. a) 2 + 9 + 6 = 17, not a multiple of 3
   b) Last digit is not 0 or 5, not a multiple of 5 c) 4 + 2 = 6, not a multiple of 9
   d) Last pair of digits = 66, not a multiple of 4

6. a) 1 : 80 b) 1 : 20 c) 1 : 100 d) 1 : 125

7. a) 3 b) 3.5 c) 56 d) 1.5

8. 

9. a) $\frac{1}{6}$ b) $\frac{1}{3}$ c) 0 d) 1

10. a) 81.86 b) 1.676 c) 12.06 d) 11.106

EX 25D

1. a) 26 cm b) 38 cm^2

2. a) 370 b) 190 c) 360 d) 410

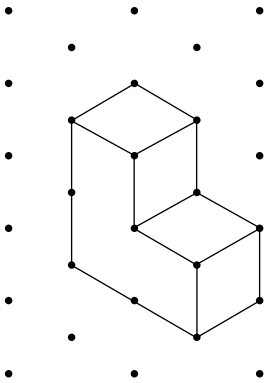
3. a) 1.1 b) 0.4 c) 8.7 d) 0.2

4. a) 650.16 b) 6733.8 c) 712.94 d) 12.04

5. Rs 850; Rs 5950

6. a) 1.59 b) 14.1 c) 9.8 d) 2.02

7. a)



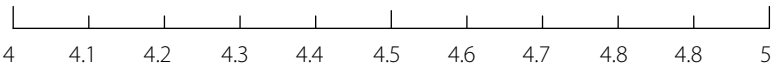
b) 3 cm^3

8. a) 1000 to 1500 m^2 b) 2000 to 3000 m^2 c) 50 d) 425

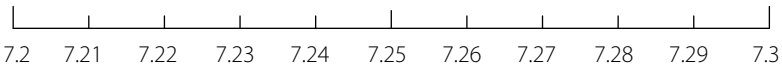
9. a) 70 days b) 10 weeks c) 9 weeks

d) 13 weeks 5 days

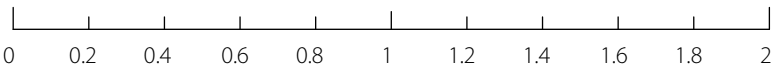
10. a)



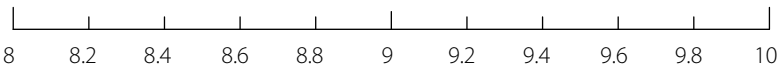
b)



c)



d)



EX 25X

1. A dodecahedron has 12 faces.

2. $1! = 1$ $2! = 2 \times 1 = 2$ $3! = 3 \times 2 \times 1 = 6$ etc.

3. A collection of material would show that pie charts emphasize proportions whereas line/bar graphs emphasize differences.

Chapter

26 Multiples and Factors

This is a basic numeracy chapter. It is all about whole numbers: fractions and decimals do not appear. It checks that students have really learnt their multiplication tables by heart. Calculators should not be allowed.

LESSON PLANNING

Objectives

General	To be thoroughly familiar with whole number facts of multiplication
Specific	1. To know the difference between a multiple and a factor 2. To know how to recognise multiples of 2, 3, 5, 6, 9, 10, 15, 25, 50, and 100 3. To know the prime numbers confidently up to 20, and be fairly certain up to 100 4. To obtain the prime factorisation of a number, and know that it is unique 5. To express prime factorisation in ascending order of factors using index notation 6. To find the LCM and HCF of a pair of numbers 7. To generate number facts about products using the distributive law (not explicitly named) 8. To find square roots and cube roots from the prime factorisation of a number
Pacing	Although this is basic, and ought to be easy, it is extremely important and so time needs to be given. 5 lessons are suggested. It may be done in 4 if one exercise is completed as homework.
Links	Volume of a cube; area of a square; memorizing multiplication tables
Method	• Start with multiples, as in the text. Once these are established, factors can be defined as the "building blocks" of multiples. Primes can never be multiples but they can be factors. Elicit the first 8 primes (up to 20) from the class. These must be memorized, and as many more as possible (up to 100). • Display a Primes to 1000 poster on the noticeboard. • The text suggests factorisation by repeated splitting of factors until they are all prime. This method has certain advantages in terms of understanding. The division algorithm, often taught, gets the right answer but it is not so clear what is going on. For example, to factorise 45 $3 \mid 45$ $3 \mid 15$ 5 $45 = 3 \times 3 \times 5$ $= 3^2 \times 5$

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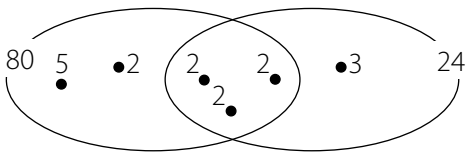
Better (also quicker) is

$$45 = 9 \times 5$$
$$= 3^2 \times 5$$

Use EX 26A.

- The uniqueness of the prime factorisation cannot be proved at this level, but it should be convincing if different strategies produce the same prime factorisation. Only one example is given in the text. More should be done. Prime numbers are rather like atoms: each combination of primes determines each number uniquely just as surely as two atoms of hydrogen and one atom of oxygen combine to make water.
- LCM and HCF are quite straightforward but students sometimes reverse them. If they have met Venn diagrams these can be helpful.
  For example, 80 and 24

  $80 = 2^4 \times 5$ $\quad$ $24 = 3 \times 2^3$



  $LCM = 2^4 \times 3 \times 5$ $\quad$ (all included)

  $HCF = 2^3$ $\quad$ (overlapping)

  Use EX 26B
- Use of the distributive law to generate facts should be taught implicitly and applied by the students intuitively: they need to get a feel for how numbers work. Just do it! Show them a few, and they should just follow the pattern. Use EX 26C. Calculators strictly forbidden here!
- The square root and cube root of perfect squares and perfect cubes can easily be seen from their prime factorisations. For perfect squares the factors will all be in pairs; for perfect cubes the factors will all be in threes. Follow the text. Use Ex 26D.
- As this is a foundation topic a miscellaneous set of questions is provided in EX 26M to reinforce the work.

Resources	Poster of Primes to 1000 (or more), easy to find on the internet.
Assignments	EX 26A to 26D in class Ex 26M as homework
Vocabulary	multiples, factors, primes divisibility, factorisation uniqueness index, indices LCM, HCF square root, cube root

ANSWERS

Exercises

EX 26A

1. a) 116, 130, 150, 200 b) 130, 150, 200, c) 150, 200 d) 200
2. a) 507, 750 b) 750, 800, 805, 850
   c) 750 d) 750, 800, 850
3. a) 250, 275, 305, 450 b) 252, 450
   c) 250, 450 d) 250, 275, 450
4. a) 29, 31 b) 27, 29, 31 c) 27 d) 30
5. a) 500, 600 d) 500, 550, 600
   c) 500, 550, 575, 600 d) 500, 550, 575, 585, 600
6. a) $2 \times 2 \times 5 \times 5$ b) $2 \times 5 \times 5 \times 5$
   c) $5 \times 5 \times 13$ d) $3 \times 3 \times 5 \times 19$
7. a) $5 \times 5 \times 17$ b) $2 \times 5 \times 43$
   c) $5 \times 5 \times 19$ d) $2 \times 2 \times 3 \times 3 \times 5 \times 5$
8. a) $5 \times 5 \times 31$ b) $5 \times 5 \times 29$
   c) $5 \times 5 \times 23$ d) $2 \times 5 \times 5 \times 19$
9. a) $3 \times 5 \times 37$ b) $2 \times 5 \times 41$ c) $3 \times 5 \times 43$ d) 5×67
10. a) $5 \times 7 \times 11$ b) $2 \times 2 \times 2 \times 2 \times 5 \times 5$
    c) $3 \times 5 \times 5 \times 7$ d) $2 \times 2 \times 3 \times 3 \times 17$

EX 26B

1. a) $2^2 \times 3^2 \times 5$ b) $2 \times 3^4 \times 7$
   c) $3^2 \times 7^2 \times 13$ d) $2 \times 3^3 \times 5^2$
2. a) 9 b) 16 c) 25 d) 100
3. a) $2 \times 5 \times 7 \times 11$ b) $2^3 \times 3 \times 5$
   c) $2 \times 3 \times 5^2$ d) $2^3 \times 3^2 \times 5$
4. a) 60 b) 100 c) 1125 d) 2790
5. a) 78 b) 1848 c) 336 d) 1725
6. a) 21 b) 60 c) 6 d) 35
7. a) 9 b) 26 c) 10 d) 37

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8. 24 min

9. 60 s

10. a) 5 b) 8 c) 9 d) 7

EX 26C

1. a) 364 b) 871 c) 585 d) 468

2. a) 696 b) 928 c) 1943 d) 2639

3. a) 2232 b) 1953 c) 1271 d) 2542

4. a) 6174 b) 5586 c) 4410 d) 5488

5.

	× 10	× 7	× 17
1	10	7	17
2	20	14	34
3	30	21	51
4	40	28	68
5	50	35	85
6	60	42	102
7	70	49	119
8	80	56	136
9	90	63	153
10	100	70	170

6.

	× 10	× 3	× 13
1	10	3	13
2	20	6	26
3	30	9	39
4	40	12	52
5	50	15	65
6	60	18	78
7	70	21	91
8	80	24	104
9	90	27	117
10	100	30	130

7.

	× 20	× 2	× 18
1	20	2	18
2	40	4	36
3	60	6	54
4	80	8	72
5	100	10	90
6	120	12	108
7	140	14	126
8	160	16	144
9	180	18	162
10	200	20	180

8.

	× 50	× 5	× 55
1	50	5	55
2	100	10	110
3	150	15	165
4	200	20	220
5	250	25	275
6	300	30	330
7	350	35	385
8	400	40	440
9	450	45	495
10	500	50	550

9. a) 18×50 b) 18×17 c) 18×45 d) $18n$

10. a) 17×43 b) 17×42 c) 17×39 d) $17n$

EX 26D

1. 21
2. 35
3. 62
4. 5
5. 15
6. 16
7. 40
8. 25

9. 91

10. 21

EX 26M

1. a) 30, 45, 50, 225, 300 b) 30, 300 c) 50, 225, 300 d) 45, 225

2. a) $2^3 \times 5^2$ b) $2^2 \times 5^3$ c) $2 \times 3 \times 5^3$ d) $2^3 \times 53$

3. a) $2 \times 3^2 \times 37$ b) $2^3 \times 5 \times 13$
   c) $2^3 \times 3 \times 5 \times 7$ d) $5 \times 7 \times 13$

4. a) 112 b) 264 c) 4662 d) 1104

5. a) 132 b) 1540 c) 672 d) 1900

6. 2 h

7. 77 b) 55 c) 40 d) 4

8. a) 3 b) 41 c) 29 d) 85

9. a) 24 b) 27 c) 7 d) 16

10. a) 99×83 b) 99×35.2 c) $99 \times 40\,200$ d) $99n$

EX 26X

1. a) HCF = 155 LCM = 47 740

2. a) $2^4 \times 3^3 \times 5^2$ b) $7 \times 11 \times 13 \times 17$ c) $2^5 \times 3^2 \times 5^3$

3. a) 749 250 b) 6536.53 c) 10 010
   d) 1424.525

Chapter

27 Algebraic Expressions

This is the beginning of formal algebra, although there has been quite a lot of symbolic representation previously. The focus is narrow, targeted on two basic skills.

LESSON PLANNING

Objectives

General	To simplify algebraic expressions by collecting like terms and forming products of terms
Specific	1. To understand what is meant by like terms and unlike terms, and when and how they may be combined 2. To know that 1 is not used as a coefficient 3. To multiply algebraic terms correctly, using index notation, and following the convention of alphabetical order of letters
Pacing	A quick chapter: 2 lessons
Links	Generating number facts, implicitly using the distributive law
Method	Keep introduction brief and simple, to maximise practice time on the exercises. Do a few starters on the board and let them loose on EX 26A. Similarly, for EX 26B.
Assignments	Suggested homework: to finish EX 26A
Vocabulary	term, like, unlike simplify

ANSWERS

Exercises

EX 27A

1.	a)	$4a$	b)	$2x$	c)	$7p$	d)	$10s$
2.	a)	$3a + b$	b)	$9b$	c)	$14x - 6y$	d)	$8x + 2y$
3.	a)	10	b)	10	c)	50	d)	50
4.	a)	15	b)	15	c)	17	d)	17
5.	a)	$3q$	b)	$5p + 2q$	c)	$r + 4s$	d)	$6r + 7s$
6.	a)	$2p$	b)	$2r$	c)	$6.5t$	d)	$1.2t$

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7. a) $5 + 8a$ b) $5 - 3a$
   c) $-2 + 3p$ d) $2.5x - 1.5$
8. a) $2 - 5a$ b) $2x - 6a$ c) $a + 2c$ d) $6x - 1$
9. $3 + 3a + 5b$ b) $5 - 2a + b$ c) $11 + 3a - 2b$ d) $1 + b$
10. a) $3n + 3$ b) $6n + 5$
    c) $3m - 5n + 1$ d) $m + n - 1$

EX 27B

1. a) $10ab$ b) $27ab$ c) $2ab$ d) $2a^2$
2. a) $6n^2$ b) $5n^2$ c) $12mn^2$ d) $8m^2n$
3. a) $3mn$ b) $5mn^2$ c) pq^2r d) $4p^2q$
4. a) $15x^2$ b) $15x^2y$ c) $15x^2y$ d) $15x^2y$
5. a) $2f^3g$ b) $6f^2g$ c) $3fg^2$ d) $2f^2g^2$
6. a) $6st^2u$ b) $12stu^2$ c) $20stu^2$ d) $6t^3u$
7. a) $5t^2$ b) $8t^2$ c) $12t^2$ d) $20t^2$
8. a) $6t^3$ b) $15t^4$ c) $10t^2$ d) $2t^3$
9. a) $48a^2b^2$ b) $63ab^3$ c) $16ab$ d) $36abc$
10. a) ab^2c^2d b) $4ab^2cd$ c) $12a^2cd$ d) $12b^2c^2d$

EX 27X

1. a) $7a + 3b - 2c$ b) $7 - a + 3b - 3c$ c) $2b + 2c + 3t - 7$
2. a) $56p^4q^4r^4$ b) $3m^4n^4$ c) $36f^4g^3$
3. a) $30t^2$ b) $33t$ c) $40t^2$

Teach students how to read out answers correctly, using indices:

n^2 is "n squared"

n^3 is "n cubed"

n^4 is "n to the power 4"

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Chapter

28 Comparing Groups

This is the beginning of statistical thinking, in a very basic form. It is another skill-focused chapter. The question of whether mean, median, or mode is the best statistic in any given case can be safely left for a later stage. Now the students just need to know how to work them out and what they are for.

LESSON PLANNING

Objectives	
General	To compare groups by calculation of a representative value, and a measure of spread
Specific	1. To know that mean, median, and mode are ways of representing a group in general 2. To calculate correctly mean, median and mode 3. To know that range indicates the spread of the data 4. To use these statistics to answer simple questions about groups
Pacing	2 lessons: some of the questions in the exercises are quite time-consuming.
Links	Bar charts, frequency tables
Method	"Are the children in class VI taller than those in class V?" How do you know? Start a class discussion about choosing a representative of a group (because "we haven't the time to measure everybody"). This leads into the mathematical methods of doing it. Distinguish mean, median, and mode from range. The averages represent the group; the range indicates spread. Use EX 28A. Allow calculators.
Assignments	#9 and 10 could be used as homework
Vocabulary	mean, median, mode range, spread in general

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ANSWERS

Exercises

EX 28A

1. a) 3 b) 5 c) 7 d) 3
2. a) 7 b) 7.5 c) 8.5 d) 8
3. a) 140.4 cm b) 106.1 cm
   c) 114 cm d) 101.1 cm
4. a) 39.1 s b) 32.8 s c) 54.8 s d) 1 min 4 s
5. a) 20 to 40 km/h b) Below 2 min c) 50 to 60% d) 135 cm
6. a) 9 kg b) 50 runs c) 4 °C d) Rs 20
7. Group A: median = 130 kg, range = 25 kg

   Group B: median = 122.5 kg, range = 25 kg

   Group A girls are taller than Group B girls in general and their heights are equally spread out.
8. Group A: mean = 48.8 s, range = 2 s

   Group B: mean = 48.5 s, range = 4 s

   Group A lap times are slightly slower than Group B's times in general, but Group A is more consistent (lower range than B)
9. Team A: median = 1.5 goals/match, range = 3

   Team B: median = 1 goals/match, range = 5

   Team A scores more goals per match than team B in general and are more consistent. (Team B's performance is more variable.)
10. Term: mean = 1.8 h, range = 1.5 h

    Holidays: mean = 2.5 h, range = 2 h

    During the holidays Bilal uses his computer more in general and there is more variation in his use then.

EX 28X

1. 5.7 marks
2. 13 runs
3. 121 cm

Chapter

29 Fractions

Decimals feature more prominently these days because of calculators and the onward march of digital technology. However, fractions need to be understood to facilitate later work with algebraic fractions, although huge computational ability is not required.

LESSON PLANNING

Objectives

General	To find equivalent fractions, decimal equivalents to fractions, fractions of quantities, sum and difference of fractions (including mixed numbers)
Specific	1. To find equivalent fractions by scaling up or down, equivalent fractions and decimals; approximate equivalent decimals by dividing out; fractions of quantities 2. To add and/or subtract fractions and/or mixed numbers
Pacing	2 lessons
Links	Decimals
Method	• Unless the students have been neglected, the first part is all revision. Set EX 29A after the briefest of introductions. • The second part will require careful explanation. Follow the text. Where whole numbers are involved, some teach changing to improper fractions. This method is not recommended as the numbers can become very large. Deal with the whole numbers first, as shown in the worked examples. As usual, more examples should be worked on the board for the whole class.
Resources	A poster showing equivalents can be useful, e.g. $\frac{1}{2} = \frac{2}{4} = \frac{4}{8} = \frac{8}{16}$

$\frac{1}{2}$				$\frac{1}{2}$			
$\frac{1}{4}$		$\frac{1}{4}$		$\frac{1}{4}$		$\frac{1}{4}$	
$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$
$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$

Failing that, these can be seen on a ruler with inches. There are still quite a few of these available despite official attempts to metricate everything.

Assignments	Some of EX 29B in suitable for homework.
Vocabulary	equivalent

ANSWERS

Exercises

EX 29A

1. a) 6 b) 5 c) 3 d) 12
2. c) False: Adding 7 to top and bottom is the error.
3. a) $\frac{4}{5}$ b) $\frac{6}{25}$ c) $\frac{1}{200}$ d) $\frac{3}{4}$
4. a) 0.15 b) 0.2 c) 0.68 d) 0.4
5. a) 0.73 b) 0.82 c) 0.84 d) 0.33
6. a) Rs 3500 b) 2.7 km c) 0.57 s d) Rs 12
7. a) Rs 3516 (nearest rupee) b) 380 m c) 19.32 cm d) 0.735 kg
8. a) Rs 8 b) 90 g c) 4 years d) 15 m
9. a) $\frac{1}{4}$ b) $\frac{3}{5}$ c) $\frac{13}{20}$ d) $\frac{33}{50}$
10. a) 0.3 (1 d.p.), 0.33 (2 d.p.), 0.333 (3 d.p.) b) 0.7 (1 d.p.), 0.67 (2 d.p.), 0.667 (3 d.p.)
    c) 0.3 (1 d.p.), 0.29 (2 d.p.), 0.286 (3 d.p.) d) 0.4 (1 d.p.), 0.36 (2 d.p.), 0.364 (3 d.p.)

EX 29B

1. a) $\frac{5}{6}$ b) $\frac{9}{20}$ c) $1\frac{1}{6}$ d) $\frac{1}{2}$
2. a) $\frac{7}{8}$ b) $1\frac{1}{5}$ c) $\frac{5}{18}$ d) $\frac{3}{8}$
3. a) $\frac{5}{8}$ b) $\frac{1}{10}$ c) $\frac{1}{9}$ d) $\frac{13}{18}$
4. a) $\frac{3}{20}$ b) $\frac{1}{10}$ c) $\frac{1}{2}$ d) $\frac{1}{72}$
5. a) $4\frac{1}{8}$ b) $2\frac{1}{10}$ c) $5\frac{11}{15}$ d) $4\frac{17}{18}$
6. a) $4\frac{2}{5}$ b) $5\frac{5}{8}$ c) $1\frac{17}{18}$ d) $3\frac{4}{5}$
7. a) $2\frac{3}{8}$ b) $1\frac{1}{2}$ c) $4\frac{1}{2}$ d) $\frac{1}{3}$
8. a) $\frac{3}{4}$ b) $1\frac{1}{2}$ c) $1\frac{7}{9}$ d) $\frac{3}{5}$
9. a) $\frac{1}{2}$ b) $\frac{2}{3}$ c) $\frac{1}{8}$ d) $\frac{1}{6}$
10. a) $\frac{1}{3}$ b) $-\frac{2}{5}$ c) $-\frac{1}{4}$ d) $-\frac{1}{10}$

EX 29X

1. a) $\frac{7}{8}$ b) $\frac{15}{16}$ c) $\frac{31}{32}$ d) $\frac{63}{64}$

2. a) $1\frac{11}{20}$ b) $1\frac{4}{7}$ c) $2\frac{17}{24}$ d) $-3\frac{4}{5}$

3. a) $3\frac{2}{5}$ b) $\frac{251}{280}$ c) $\frac{1}{8}$ d) $1\frac{1}{5}$

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Chapter

30 Revision Exercises

All the questions in this chapter relate to topics in the textbook.

As this completes the academic year it is advised to make maximum use of the revision exercises.

A specimen examination paper is included here (after the answers to the exercises). In view of the fact that some students may have access to this Teaching Guide, it is recommended that some changes are made.

ANSWERS

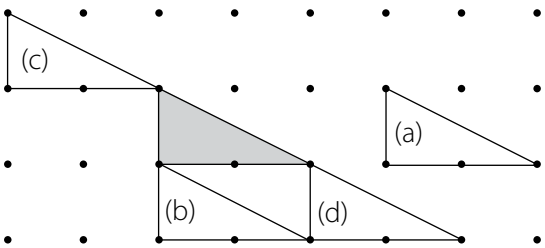
Exercises

EX 30A

1. a) [Allow 6.2 to 6.4 cm]

2. a) 19 b) 11 c) 16 d) 7

3. a) 1.6 kg b) 4.5 kg c) 9.5 kg d) 250 g

4. 

5. a) 825 840 900 b) 800 900

   c) 800 850 900 d) 800 825 850 900

6. a) $5p$ b) $3q$ c) $4.5r$ d) $1.8t$

7. Group A: median = 138.5 cm, range = 6 cm

   Group B: median = 138.5 cm, range = 10 cm

   The heights of the two groups of boys are the same in general, but there is more variation in group B.

8. a) Rs 14 b) 0.7 kg c) 6 years d) 30 m

9. a) 10.5 b) 4.5 c) 287.4 d) 35.2

10. a) Yes b) Yes c) No d) No

EX 30B

1. 6:7

2. a) Urdu 65% b) Geog 10% c) 50 marks d) English

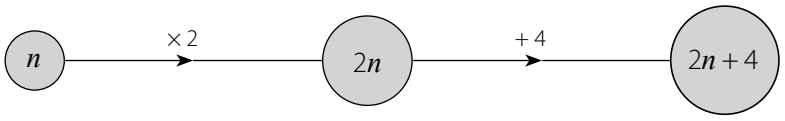
3. a) 0.49 b) 0.56 c) 0.07 d) 0.134

4. a) square b) concave kite c) trapezium
   d) rectangle

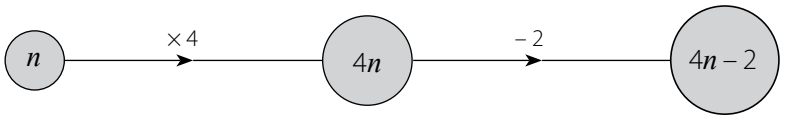
5. a) 2.4 b) 0.7 c) 5.1 d) 4.1

6. a) Rise of 0.5 m b) Drop of 3.5 m
   c) Drop of 4 m d) Drop of 3 m

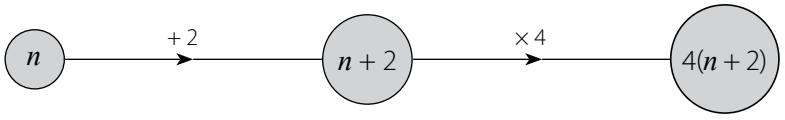
7. a)



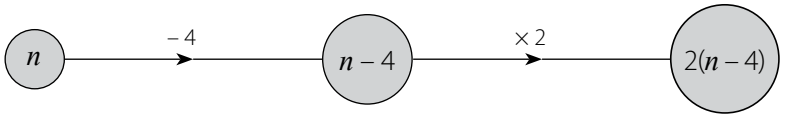
b)



c)



d)



8. a) 1.8; 2 b) 10.5; 11
   c) 3.6; 4 d) 203.01; 203

9. a) acute b) obtuse
   c) acute d) obtuse
   [Accuracy to ± 1° allowed]

10. a) 5.772 b) 69.79 c) 575.6 d) 3145.5

EX 30C

1. a) 0 b) $\frac{4}{7}$

2. a) 7.339 b) 9.153 c) 1004 d) 17.95

3. a) 22 cm b) 22 cm^2

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4. a) 12.13 b) 0.69 c) 0.525 d) 0.018

5. a) 6y 2 months b) 6y 3 months
   c) 5y 11 months d) 5y 10 months

6. a) 22 b) 26 c) 56 d) $8\frac{2}{3}$

7. 40 min

8. a) $2\frac{3}{4}$ b) $1\frac{3}{10}$ c) $2\frac{5}{9}$ d) $1\frac{2}{5}$

9. a) $8(n + 1)$ b) $\frac{n-1}{8}$ c) $8n + 1$ d) $\frac{n}{8} - 1$

10. a) 1773 b) 125 c) 5619 d) 1050

EX 30D

1. 1.36 m

2. a) 0.29 b) 21.9 c) 3.8 d) 8.955

3. a) 70 b) 3.4 c) 1.8 d) 56

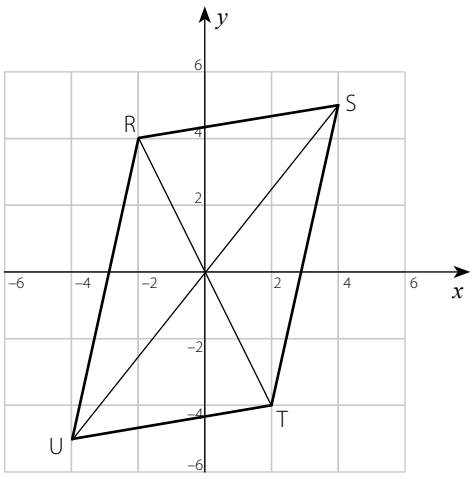
4. a) 6.7 b) 513 c) 35.4 d) 4130

5. a) $3p + 2q$ b) $4p + q$ c) $2p^3q$ d) $2p^2q^2$

6. $a = 80$, $b = 60$, $c = 120$

7. a) 3200 boxes b) Rs 105
   c) 15 tables d) 32 packets

8. a)



   b) parallelogram
   c) (0, 0)
   d) no line symmetry

9. a) Ayaz Rs 8000, Bashir Rs 24 000, Currim Rs 40 000
   b) Ayaz Rs 9000, Bashir Rs 27 000, Currim Rs 36 000
   c) Ayaz Rs 12 000, Bashir Rs 18 000, Currim Rs 42 000
   d) Ayaz Rs 14 400, Bashir Rs 28 800, Currim Rs 28 800

10. a) 2 b) 2 c) 2 d) 3

EX 30X

1. a)

	× 70	× 2	× 72
1	70	2	72
2	140	4	144
3	210	6	216
4	280	8	288
5	350	10	360
6	420	12	432
7	490	14	504
8	560	16	576
9	630	18	648
10	700	20	720

b) $100 \times 72 + 40 \times 72 + 3 \times 72$

$= 7200 + 2880 + 216$

$= 10\,296$

c) 2018×72 $= 2000 \times 72 + 10 \times 72 + 8 \times 72$

$= 144\,000 + 720 + 576$

$= 145\,296$

d) 1015×72 $= 1000 \times 72 + 10 \times 72 + 5 \times 72$

$= 72\,000 + 720 + 360$

$= 73\,080$

2. a) $2^6 \times 3^2 \times 5^2$ b) $2^6 \times 5^6$ c) $2 \times 3 \times 5 \times 7 \times 11 \times 13 \times 17$

d) $2^2 \times 3^2 \times 5 \times 7 \times 11 \times 13$

3. a) 3y 3 months 9 days b) Wednesday

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Specimen Examination Paper

[for final year-end assessment]

Instructions	The test is 1 hour long. You must not use a calculator. You will need: pen, pencil, ruler, rubber. Try to answer all the questions. Check your work carefully. The marks for each question are shown in brackets [Full marks = 100]

1. Write down the answers: [4]

   a) 55 + 83 = b) 76 – 42 =

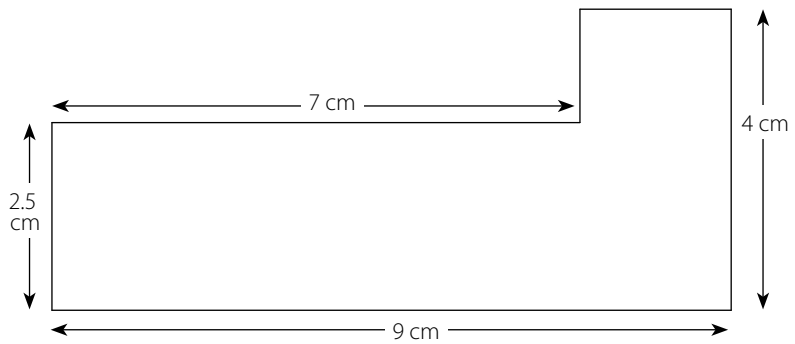
   c) 4.7 + 8.4 = d) 7.5 – 3.9 =

2. Write down the answers: [4]

   a) 247 × 10 = b) 8.3 × 4 =

   c) 98.4 ÷ 8 = d) 470 ÷ 100 =

3. Calculate the total area of the L–shape (in cm^2): [4]



4. Share Rs 1498 between Ahmed and Bilal in the ratio 4 : 3. [4]

5. How many weeks are there from 3rd April to 5th June? [4]

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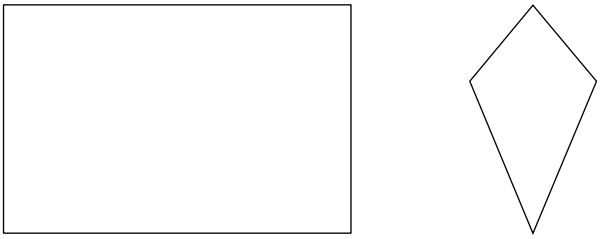
6. Mark any lines or centres of symmetry on these diagrams: [4]

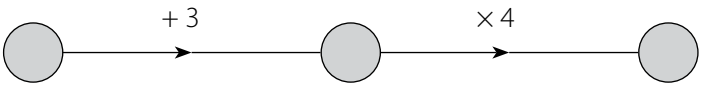
(a) rectangle (b) kite



7. Find the HCF and LCM of 24 and 42. [4]

8. Calculate the sale price of a software download. Normally it costs $35 but 15% discount has been offered. [4]

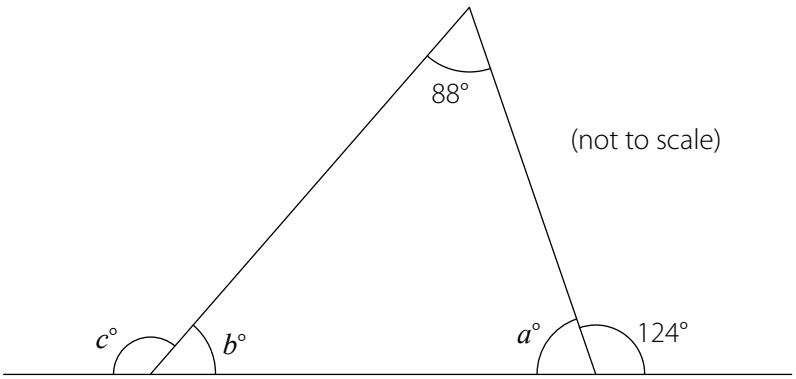
9. What are the output values of this arrow diagram? [4]



1	(a)
2	(b)
3	(c)
n	(d)

10. A bucket of water holds 4.5 l when full. The bucket itself weighs 420 g. What is the total weight of the full bucket? [4]

11. Work out the value of a, b, and c: [6]



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12. After working these out on a calculator, how could I check my answers? State a different method of checking for each. [6]

a) $3.6 + 17.4 + 0.18 + 16.471 + 0.72 + 12.6 + 3 =$

b) $(9.73 - 1.87) \div (0.9 + 2.8) =$

c) $23.72 \times 0.9 =$

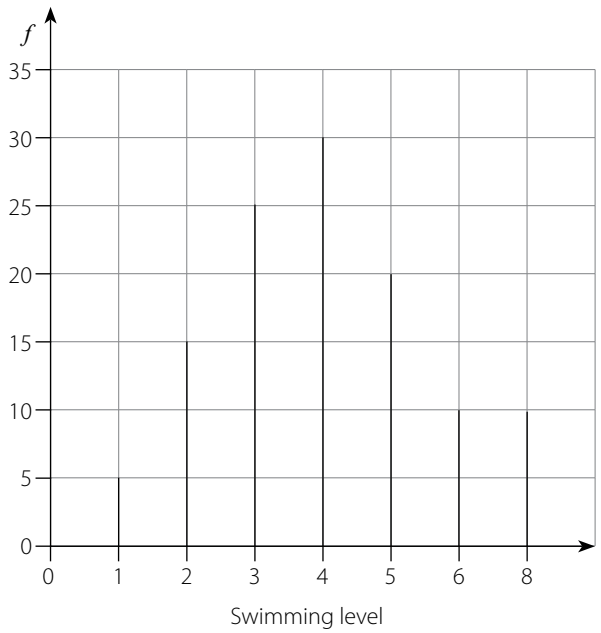
d) $1.032 \times 2.5 =$

13. a) How many faces has a cube? [6]

b) How many edges has a triangular prism?

c) How many vertices has a pyramid on a square base?

14. The graph shows the numbers of students who reached various levels in a swimming club. [6]



a) What is the mode?

b) How many students had not reached level 5?

c) How many students are there in this club altogether?

d) What is the ratio of level 4 to level 5 swimmers?

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15. Find the value of [6]

a) $7 + 14 \div 7$

b) $3 \times 8 + 2 \times 2$

c) $7.5\ (26 - x)$ when $x = 24$

d) $\frac{n}{2} + 5n - 3$ when $n = 0.2$

16. Write a sentence containing the words MEDIAN and RANGE comparing two groups of data from six students: [6]

Test marks in English	6	8	7	5	8	6
Test marks in Maths	7	3	5	9	8	7

17. How long is it [6]

a) from seven o'clock to 08 18?

b) from 9 46 to twelve minutes past ten?

c) from quarter to five, to 6 30?

d) from five to twelve (noon) to 3 30 pm?

18. Calculate: [6]

a) $\frac{2}{3} + \frac{1}{2} =$ c) $2\frac{1}{2} + 1\frac{2}{5} =$

b) $\frac{4}{5} - \frac{1}{3} =$ d) $4\frac{1}{3} - 1\frac{3}{4} =$

19. A bag contains 1 red ball, 7 white balls, 8 blue balls, and 9 green balls. If one is chosen at random, what is the probability it is [6]

a) red? b) white?

c) not blue? d) pink?

(decimal answers)

20. Work out: [6]

a) $0.814 \div 0.2 =$

b) $4.6 \times 7.3 =$

c) $271.6 + 2.4 - 1.08 =$

d) $10.01 \div 0.07 =$

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Answers and mark scheme:

1. a) 138 b) 34 c) 13.1 d) 3.6

[1 mark each = 4]

2. a) 2470 b) 33.2

c) 12.3 d) 4.7 (or 4.70)

[1 mark each = 4]

3. Either or

$7 \times 2.5 + 4 \times 2$ $2 \times 1.5 + 9 \times 2.5$

$= 17.5 + 8$ $= 3 + 22.5$

$= 25.5\ cm^2$ $= 25.5\ cm^2$

[correctly dividing area 1; area of rectangle 1 each; Total 1 = 4]

4. $1498 \div 7 = 214$

Ahmed $4 \times 214 = Rs\ 856$

Bilal $3 \times 214 = Rs\ 642$

$\begin{bmatrix} 2 \\ 1 \\ 1 \end{bmatrix} = 4$

5. April 30 – 3 = 27 days

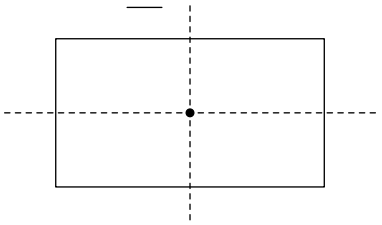
May 31

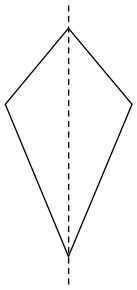
June 1 – 5 5

~~63~~ = 9 weeks

[2 month-wise breakup; 2 answers = 4]

6. a) b)





[2 each = 4]

7. $24 = 2^3 \times 3$

$42 = 2 \times 3 \times 7$

$HCF = 2 \times 3 = 6$

$LCM = 2^3 \times 3 \times 7 = 168$

$\begin{bmatrix} 1 \\ 1 \\ 1 \\ 1 \end{bmatrix} = 4$

8. 10% is $ 3.50
5% is $ 1.75
15% is $ 5.25 discount
Sale price is 35 –5.25 = $ 29.75 [1 1 1 1] = 4

9. a) 16 b) 20 c) 24 d) $4(n + 3)$ [1 each = 4]

10. 4.5 l weighs 4.5 kg water
bucket 0.420
4.920 kg
(or 4.92)
[weight of water 2; answer 2; = 4]

11. $a = 56$ $b = 36$ $c = 144$ [2 each = 6]

12. a) Add the list in reverse order.
b) Estimate by rounding off first. Approx ans. = 2
c) Check digits add up to multiple of 9.
d) Check last 2 digits for multiple of 25.
[1 2 1 2] = 6

13. a) 6 b) 9 c) 5 [2 each = 6]

14. a) level 4 b) 75 students c) 115 students d) 3 : 2 [2 + 1 + 2 + 1 = 6]

15. a) 9 b) 28 c) 15 d) –1.9 [1 + 1 + 1 +3 = 6]

16. The median test mark in Maths is higher than the median for English, and the range for Maths is much greater. [3 median + 3 range = 6]

12. a) 1 h 18 min (or 68 min)
b) 26 min
c) 1 h 45 min (or $1\frac{3}{4}$ hour)
d) 3 h 35 min
[1 2 1 2] = 6

18. a) $1\frac{1}{6}$ b) $\frac{7}{15}$ c) $3\frac{9}{10}$ d) $2\frac{7}{12}$ [1 + 1 + 2 + 2 = 6]

19. a) 0.04 b) 0.28 c) 0.68 d) 0 [1 + 2 + 2 + 1 = 6]

20. a) 4.07 b) 33.58 c) 272.92 d) 143 [1 + 2 + 2 + 1 = 6]

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