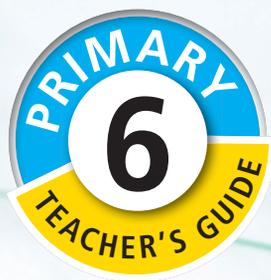


**NEW**

# Smart

## Mathematics



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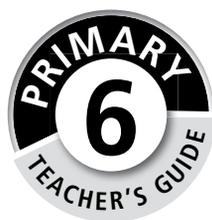


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**NEW**

# Smart

## Mathematics



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# Introduction

## The purpose of the curriculum

The main objectives of the curriculum are to prepare the pupils to:

- acquire the mathematical literacy necessary to function in an information age
- cultivate the understanding and application of mathematical concepts and skills necessary to thrive in the ever-changing technological world
- develop the essential elements of problem solving, communication, reasoning and connection in the study of Mathematics
- take advantage of the numerous career opportunities provided by Mathematics
- become prepared for further studies in Mathematics and related fields.

## The role of the teacher

One of the principal duties of a Mathematics teacher is to prepare and present good lessons to his or her pupils. The teacher needs to:

- be as well-informed as possible on the Mathematics curriculum and objectives
- know the aims and objective of each topic
- select appropriate content material
- decide on the best methods of presentation such as group work, worksheets, question and answer sessions and debates
- remain informed about social and environmental issues and other current news in Nigeria and the rest of the world
- through innovative teaching approaches encourage learning that will promote creativity and critical thinking in pupils.

To be effective in presentation, the teacher must prepare a written or typed plan for each lesson. This plan must include aims, objectives, resources, time frames, content for the lesson, activities, homework, assessment, and ideas or additional worksheets to cater for pupils who require extension or learning support (remedial).

The teacher must prepare each topic in advance. Many teachers go into the classroom without adequate preparation. It is the Mathematics teacher's responsibility to involve all pupils actively in the learning process. It is a proven fact that pupils learn far more by *doing* than by *listening*.

Mathematics involves being curious and asking questions. When possible, teachers must ask questions to engage the pupils, encourage independent thought processes and help pupils develop problem-solving skills. Teachers need to start their lessons by asking the pupils to write down answers to a few questions that are related to the lesson. This will help pupils focus on the lesson.

Teachers can use different types of questions in lessons:

- **diagnostic** questions enable teachers to determine pupils' prior knowledge on a topic
- **consolidation** questions help pupils master challenging concepts
- questions can **stimulate** pupils' interest in the subject
- questions can be used to help **conclude** a lesson. This will help teachers find out whether pupils have understood concepts and terminology that were used in a lesson. Such questions will also highlight areas that pupils need to revise at home or that teachers will need to revisit in the next lesson. Refer pupils to the glossary at the back of the Pupil's Book as necessary.

Teachers must ensure that they do not appear to have favourites in a class. They must devise a system to ensure that they ask questions fairly and are careful not to embarrass pupils who struggle to answer questions.

## How to use the Curriculum guide and objectives

A curriculum gives the content that teachers are required to teach in their subjects. The primary function of a curriculum guide is to provide an outline of the subject matter and its content, and to indicate how much work to cover in a particular class. It allows teachers to clarify their thinking about a subject, and to plan and develop particular curriculum experiences that they believe may require more time and attention when preparing lessons. The criteria all teachers should bear in mind when planning the work for a class are continuity in learning and progression of experience. Teachers can add their own notes to the curriculum guide and objectives on pages viii–xv.

The curriculum guide is sequential. The sequence of work in the textbook is aligned with the curriculum. Teachers should not be tempted to select material at random. It is better to spend time planning the work for a term to ensure that they adhere to the curriculum.

## Planning for the year

The year is divided into three terms. Each term is divided into 13 weeks. For Mathematics, there are 13 topics for Term 1, 8 topics for Term 2 and 6 topics for Term 3. At the end of each term, it is important to ensure that there is time for revision and an examination. This time frame may differ depending on the planning of a particular school. The exercises in the Workbook give pupils the opportunity to apply what they have learnt. References in the Pupil's Book indicate the best time to use the exercises in the Workbook. At the end of the Pupil's Book are 100 example multiple choice examination questions teachers can use to help pupils revise the year's work and three example examination papers to help prepare for the examination.

Each teacher's management of each class will have an enormous influence on the teacher's ability to adhere to the time frames. Focus on effective strategies for discipline. Teachers will have fewer problems regarding discipline if they are punctual, well-prepared, follow a plan (write this on the board at the start of the lesson), keep their word (and do not, for example, make empty threats) and consistently adhere to rules.

A teacher of Mathematics is a professional instructor who facilitates, promotes and influences pupils to achieve the objectives of the curriculum. It is the wish of the authors that the pupils will, at the end of each course in the series, attain a level of Mathematics proficiency that will equip them for future studies in this field.

# Cambridge Curriculum guide and objectives

The first column gives the units and last two columns give the page numbers in the *Smart Mathematics* Primary 6 Pupil's Book (PB) and Workbook (WB) where curriculum material is covered.

Unit	Curriculum objectives Pupils should be able to:	PB	WB
<b>Theme 1: Numbers and numeration</b>			
<b>Subtheme 1: Whole numbers</b>			
<b>Topic 1: Whole numbers</b>			
<b>Unit 1: Millions and billions</b>	1. Count in millions and billions.	1–4	2
	2. Write and read up to one million.	5–8	3
	3. Solve <b>quantitative reasoning</b> problems relating to millions and billions.	5, 8–10	4
<b>Unit 2: Place value</b>	1. Give the place value and the value of a digit in a whole number.	11–13	5
	2. Identify the value and place value of digits in given numbers.	11–13	6
	3. Solve <b>quantitative reasoning</b> problems relating to place value.	13–14	8
	4. Give the value and the place value of a digit in a decimal number.	14–18	7
	5. Rounding off whole numbers and decimal numbers.	30–32	
<b>Unit 3: LCM and HCF</b>	1. Find the LCM of two-digit whole numbers.	19–22	9, 10
	2. Find the HCF of two-digit whole numbers.	23–25	11, 12
	3. Solve <b>quantitative reasoning</b> problems relating to LCM and HCF.	22–23, 25	
<b>Topic 2: Demography</b>			
<b>Unit 4: Demography (population)</b>	1. Read, write and compare populations of small and big cities.	26–29, 32–36	13–14

Unit	Curriculum objectives Pupils should be able to:	PB	WB
<b>Unit 4: Demography (population) (continued)</b>	2. Read and compare populations of HIV-prevalence in different countries.	36–38	15
	3. Count in thousands and millions in population studies.	28–29, 33–36	
<b>Subtheme 2: Fractions</b>			
<b>Topic 1: Fractions</b>			
<b>Unit 5: Fractions and decimal numbers</b>	1. Order fractions.	39–45	16–17
	2. Solve <b>quantitative reasoning</b> problems relating to fractions.	46–48	18
	3. Express decimal numbers as fractions and fractions as decimal numbers.	49–52	19, 20, 21–23
<b>Topic 2: Ratios and proportions</b>			
<b>Unit 6: Working with ratio and proportion</b>	1. Solve problems involving ratio.	53–57	24–25, 26
	2. Apply ratio to everyday life.	55	26
	3. Solve <b>quantitative reasoning</b> problems involving ratio.	57–60, 64–68	27–28
	4. Solve problems relating to direct proportion.	60–62	29
	5. Solve <b>quantitative reasoning</b> problems involving direct proportion.	62	27
	6. Solve problems relating to inverse proportion.	63–64	28
	7. Identify daily activities that are inversely related.	63–64	28
	8. Solve <b>quantitative reasoning</b> problems involving inverse proportions.	63–64	28
<b>Ratio of family size and resources</b>	1. Find the ratio of family size and resources.	59, 60	27
	2. Use ratio correctly in relating the proportion of resources to family size.	64–68	
<b>Ratio of two populations</b>	1. Express two populations in given ratio.	57–60	

Unit	Curriculum objectives Pupils should be able to:	PB	WB
Ratio of prevalence of HIV/AIDS between two sexes and two states.	1. Express the ratio of the prevalence of HIV/AIDS between the two sexes in a town or a country.	59, 64, 68	
	2. Correctly express the ratios in monitoring the trend of infection of HIV/AIDS in the two sexes between different states.	59, 64, 68	
	3. Solve <b>quantitative reasoning</b> problems that involve the ratio, percentage, profit and loss and HIV/AIDS prevalence.	59, 64, 68, 77, 80, 132	57
<b>Topic 3: Percentages</b>			
Unit 7: Working with percentages	1. Express one number as a percentage of another number.	69–72	31
	2. Find a number expressed as a percentage of another number.	69–72	
	3. Express one population as a percentage of another population.	69–72	
	4. Solve problems that involve percentage increase.	72–76	32, 33
	5. Calculate percentage increase as it relates to population growth.	85	
	6. Solve problems that relate to percentage decrease.	76–78	32, 33
	7. Solve problems that relate to percentages of profit and loss.	80–81	32, 33
	8. Solve <b>quantitative reasoning</b> problems that relate to percentage increase and percentage decrease.	78–81	32, 33

<b>Theme 2: Basic operations</b>			
<b>Subtheme 1: Basic operations</b>			
<b>Topic 1: Addition and subtraction</b>			
Unit 8: Add and subtract	1. Add any set of numbers.	82–94	34, 35–36
	2. Solve problems related to subtracting whole numbers.	82–85	34

Unit	Curriculum objectives Pupils should be able to:	PB	WB
<b>Unit 8: Add and subtract (continued)</b>	3. Solve word problems that involve the addition and subtraction of whole numbers.	84–85, 94	34, 37, 38, 39
<b>Topic 2: Multiplication</b>			
<b>Unit 9: Multiply</b>	1. Multiply a three-digit number by a three-digit number.	95–98	40, 41, 46
	2. Apply multiplication to everyday problems.	96–98	
	3. Solve quantitative reasoning problems that relate to multiplication.	107–109	41, 60
	4. Multiply decimal numbers by decimal numbers (to one decimal place).	98–100	41
	5. Multiply fractions by fractions.	101–102	42, 43
	6. Calculate the squares of numbers up to 500.	103–104, 108–109	44, 45
	7. Calculate the square roots of perfect squares.	105–106, 108–109	
<b>Topic 3: Division</b>			
<b>Unit 10: Divide</b>	1. Divide whole numbers by two- and three-digit decimal numbers.	110–120	47, 48–49
<b>Topic 4: Order of operations</b>			
<b>Unit 11: Order of operations (BODMAS)</b>	1. Use basic operations in the right order.	121–124	50–51
	2. Solve quantitative reasoning problems that involve using the correct order of operations (BODMAS).	124	50–51
<b>Subtheme 2: Derived operations</b>			
<b>Topic 1: Indices (powers)</b>			
<b>Unit 12: Indices (powers)</b>	1. Write numbers in index form.	125–129	52
	2. Solve problems that involve powers (indices).	126–129	53
	3. Solve quantitative reasoning problems that involve indices.	129	

Unit	Curriculum objectives Pupils should be able to:	PB	WB
<b>Topic 2: Ratio and percentage</b>			
<b>Unit 13: Working with ratio and percentage</b>	1. Solve problems that involve ratios.	53–57, 130–131	24–25, 26
	2. Express a number as a percentage of another number.	69–72, 130–131	31
	3. Solve problems on percentage profit and loss.	69–72, 130–131	
	4. Apply a profit and loss percentage to business.	130–131	
	5. Solve quantitative reasoning problems that involve ratio, percentage, profit and loss.	57–60, 64–68, 78–81, 130–131	27–28, 32, 33

### Theme 3: Algebraic processes

#### Subtheme 1: Open sentences

##### Topic 1: Open sentences

<b>Unit 14: Solving open sentences</b>	1. Solve problems that are written as open sentences.	135–136	89, 90
	2. Interpret words in open sentences and solve them.	136–140	
	3. Solve <b>quantitative reasoning</b> problems related to open sentences.	141–142	91

### Theme 4: Measurement

#### Subtheme 1: Primary measures

##### Topic 1: Money

<b>Unit 15: Money and currency</b>	1. Solve problems related to taxes and rates.	143–148	55, 56
	2. Solve problems that involve buying and selling shares and dividends.	148–149	57
	3. Solve <b>quantitative reasoning</b> problems that are based on taxes and are also related to selling shares and dividends.	149	56, 57, 59

Unit	Curriculum objectives Pupils should be able to:	PB	WB
<b>Unit 15: Money and currency (continued)</b>	4. Use a calculator to convert from one currency to another currency.	151, 153	58
	5. Solve <b>quantitative reasoning</b> problems that are based on converting from one currency to another currency.	150, 152–154	58
<b>Topic 2: Length</b>			
<b>Unit 16: Working with length</b>	1. Use Pythagoras' rule to find the length of an unknown side in a right-angled triangle.	155–165	64, 65–66
	2. Solve <b>quantitative reasoning</b> problems that involve Pythagoras' rule.	165–166	61, 62
<b>Topic 3: Weight</b>			
<b>Unit 17: Weight (mass)</b>	1. Express the same weight in different units (grams, kilograms and tonnes).	167–168	78
	2. Solve word problems that involve weight.	168–172	79–80
<b>Topic 4: Time</b>			
<b>Unit 18: Working with time</b>	1. Tell time in seconds and minutes.	173–179	81, 83
	2. Solve <b>quantitative reasoning</b> problems that relate to time.	179–181	
	3. Read the timetable of journeys, particularly by trains and aeroplanes.	181–182	82
	4. Use time to plan daily activities.	179–183	
<b>Subtheme 2: Secondary measures</b>			
<b>Topics 1 and 2: Perimeter and area</b>			
<b>Unit 19: Perimeter and area</b>	1. Discover that different rectangles with the same area have different perimeters.	184–190	67, 71
	2. Calculate the areas of a figure that can be divided into rectangles and/or triangles.	190–194	68, 69, 70, 71
	3. Calculate land areas in hectares.	195	
	4. Solve <b>quantitative reasoning</b> problems that involve perimeter and/or area.	186–187, 188–190, 193–194	71, 72

Unit	Curriculum objectives Pupils should be able to:	PB	WB
<b>Topics 3 and 4: Volume and capacity</b>			
<b>Unit 20: Volume and capacity</b>	1. Calculate volumes of prisms, cylinders and spheres.	196–206	74, 75, 76
	2. Solve <b>quantitative reasoning</b> problems that involve the volumes of prisms, cylinders and spheres.	207–209	77
	3. Use standard units for capacity.	196–197, 206	73
	4. Solve word problems that involve litres.	60, 61, 91, 102, 107, 172, 197, 206–208	73
<b>Topics 5 and 6: Speed and athletics times</b>			
<b>Unit 21: Speed</b>	1. Calculate average speed.	210–212	84
	2. Solve <b>quantitative reasoning</b> problems that involve time, speed and distance.	213–214, 216–219	85, 86, 87
	3. Estimate times to complete races.	215–219	

<b>Theme 5: Mensuration and geometry</b>			
<b>Subtheme 1: Shapes</b>			
<b>Topic 1: Plane figures</b>			
<b>Unit 22: Properties of plane figures</b>	1. Identify the basic properties of plane figures such as rectangles and squares.	225–232	92, 93, 94, 95, 96, 97
<b>Topic 2: Angles</b>			
<b>Unit 23: Measuring angles</b>	1. Measure angles in degrees.	233–243	98, 99, 100, 101
	2. Measure angles in a plane figure.	244–247	102, 103, 104

Unit	Curriculum objectives Pupils should be able to:	PB	WB
<b>Topic 3: Heights and distances</b>			
<b>Unit 24: Measuring heights and distances</b>	1. Measure the heights of human beings, buildings, trees and also measure distances.	248–251	105
<b>Topic 4: Polygons</b>			
<b>Unit 25: Polygons and polyhedra</b>	1. Solve problems that involve two- and three-dimensional shapes.	252–266	106, 107, 108, 109, 110
<b>Topic 5: Scale drawings</b>			
<b>Unit 26: Working with scale drawings</b>	1. Draw plans according to a given scale.	267–272	111, 112
	2. Apply and use scale drawings to convert lengths and distances in the environment to any scale.	267–272	113, 114, 115

<b>Theme 6: Everyday statistics</b>			
<b>Subtheme 1: Data collection and presentation</b>			
<b>Topics 1 and 2: Population and measures of central tendency</b>			
<b>Unit 27: Population and measures of central tendency</b>	1. Interpret pictograms and bar graphs.	273–285	116–117
	2. Use pictograms and bar graphs to represent populations of people or data.	277–285	118–119, 120–121
	3. Find the mode of data.	286–288	122
	4. Calculate the mean of given data.	286–288	123

**Unit 1: Millions and billions****Teaching guidelines and solutions**

The unit starts with a revision of counting up to millions. Pupils can work in groups and make charts to show counting in 2s, 3s, 4s, 5s, 7s, 8s, 9s, 10s and so on. Ask groups to display their charts in class and refer to these charts as necessary when they answer the questions in exercises. The exercises give pupils opportunities to revise counting. If teachers find that pupils need more exercises, they can set more similar questions to those in the exercises for pupils to answer.

**Exercise 1**

(PB page 2)

1, 2.

Tens (10s)	Hundreds (100s)	Thousands (1 000s)	Ten thousands (10 000s)
10	100	1 000	62 000
20	200	2 000	72 000
30	300	3 000	82 000
40	400	4 000	92 000
50	500	5 000	102 000
60	600	6 000	112 000
70	700	7 000	122 000
80	800	8 000	132 000
90	900	9 000	142 000
100	1 000	10 000	152 000
110	1 100	11 000	162 000
120	1 200	12 000	172 000
Rule: add 10	Rule: add 100	Rule: add 1 000	Rule: add 10 000

3. a) 180, 190, 200                      b) 660, 670, 680  
 c) 1 020, 1 030, 1 040                d) 152 040, 152 050, 152 060
4. a) 13 700, 13 800, 13 900    b) 1 200, 1 300, 1 400  
 c) 754 300, 754 400, 754 500  
 d) 973 100, 973 200, 973 300
5. a) 34 000, 35 000, 36 000  
 b) 61 000, 62 000, 63 000  
 c) 888 000, 889 000, 890 000  
 d) 997 000, 998 000, 999 000
6. a) 200 000, 250 000, 300 000  
 b) 220 000, 270 000, 320 000  
 c) 400 000, 450 000, 500 000  
 d) 850 000, 900 000, 950 000
7. a) 700 000, 900 000, 1 100 000  
 b) 800 000, 1 000 000, 1 200 000
8. a) Add 10                      b) Add 100                      c) Add 1 000  
 d) Add 50 000                e) Add 200 000
9. a) 57, 47, 37                      b) 205, 105, 5  
 c) 73 000, 72 500, 72 000    d) 973 821, 973 721, 973 621  
 e) 934 321, 924 321, 914 321
10. a) ... 670, ... 370  
 b) ... 754, ... 784  
 c) 94 729, ... 91 729, 90 729  
 d) ... 110 000, ... 140 000, 150 000  
 e) ... 689 749, ... 689 719  
 f) ... 792 989, ... 492 989

## Counting in millions and billions

The exercises give pupils the opportunity to practise counting in different multiples and learn to spot patterns.

### Exercise 2

(PB page 4)

1. 4 000 000, 5 000 000            2. 8 000 000, 9 000 000  
 3. 5 500 000, 6 500 000            4. 3 000 004, 4 000 004  
 5. 3 099 999, 4 099 999            6. 17 000 450, 16 000 450  
 7. 271 269 271, 271 268 271  
 8. 888 888 888, ... 858 888 888

### Exercise 3

(PB page 4)

1. 800 000 000, 900 000 000
2. 1 000 004 000, 1 000 005 000
3. 1 534 567 890, 1 634 567 890
4. 1 000 000, 100 000
5. 1 000 000 000, 1 010 000 000
6. 1 452 456 456, 1 453 456 456

### Workbook: Exercise 1

(WB page 2)

1.

10s	100s	1 000s	10 000s	100 000s
90	700	53 100	112 000	821 999
100	800	54 100	122 000	721 999
110	900	55 100	132 000	621 999
120	1 000	56 100	142 000	521 999
130	1 100	57 100	152 000	421 999

2.
  - a) ... 101, ... 141, 151, ... 171
  - b) ... 490, ... 500, ... 515, 520
  - c) ... 5 127, 4 127, 3 127
  - d) ... 85 100, ... 88 100
  - e) ... 691 250, 591 250
  - f) ... 3 650 000, ... 3 850 000, ... 4 050 000
  - g) ... 64 million, ... 84 million
  - h) ... 11 342 781 972

### Exercise 4

(PB page 5)

1.
  - a) 4 727, 31 201
  - b) 17 005 017, 21 012 617
2.
  - a)  $9\,611\,000 - 8\,999\,000 = 612\,000$
  - b)  $52\,812\,128 - 25\,128\,812 = 27\,683\,316$

## Reading and writing numbers up to one billion

It is useful to learn how to read numbers up to one billion. Use the information in the diagram on page 5 in the Pupil's Book to make a chart. Display the chart and discuss the diagram with the class. Pupils should refer to it regularly until they are used to the different groupings of numbers.

## Exercise 5

(PB page 7)

1.
  - a) 7 349: seven thousand, three hundred and forty-nine
  - b) 8 129 820: eight million, one hundred and twenty-nine thousand, eight hundred and twenty
  - c) 10 054 734: ten million, fifty-four thousand, seven hundred and thirty-four
  - d) 729 000 000 091: seven hundred and twenty-nine billion, and ninety-one
  - e) 919 803 744 310: nine hundred and nineteen billion, eight hundred and three million, seven hundred and forty-four thousand, three hundred and ten
2.
  - a) 800 080: eight hundred thousand, and eighty
  - b) 1 650 820: one million, six hundred and fifty thousand, eight hundred and twenty
  - c) 28 904 211: twenty-eight million, nine hundred and four thousand, two hundred and eleven
  - d) 163 451 705: one hundred and sixty-three million, four hundred and fifty-one thousand, seven hundred and five
  - e) 891 001 010 100: eight hundred and ninety-one billion, one million, ten thousand, one hundred
3. 

a) 335 000	b) 890 225
c) 456 500	d) 2 545 620
e) 6 860 315	f) 10 278 050
g) 23 850 024	
4.
  - a) 1 346 625: one million, three hundred and forty-six thousand, six hundred and twenty-five
  - b) 16 736 107: sixteen million, seven hundred and thirty-six thousand, one hundred and seven
  - c) 9 276 032: nine million, two hundred and seventy-six thousand, and thirty-two

## Workbook: Exercise 2

(WB page 3)

1.

	Digits	Words
a)	750	seven hundred and fifty
b)	2 891	two thousand, eight hundred and ninety-one
c)	72 111	seventy-two thousand, one hundred and eleven
d)	89 000 000	eighty-nine million



- d)  $123 \text{ million} + 80 \text{ million} = 203 \text{ million}$   
 e)  $3\frac{1}{2} \text{ billion} + 6\frac{1}{2} \text{ billion} = 10 \text{ billion}$
2.  $800 \times 12 = \text{R}9\ 600$
3.  $35\ 000 \div 350 = 100 \text{ bags}$
4. a) 4 112, 4 212, 4 512, 4 612, 4 712, 4 912  
 b) 2 493, 3 450, 3 921, 5 780, 6 919
5. 19 721 539, 19 721 537, 19 721 535, 19 721 531

### Exercise 7

(PB page 5)

1. C 55 793, 56 793      2. A Add 3.  
 3. B 34 546, 33 544      4. C 58  
 5. C million, ninety, forty      6. A  $1\ 000 = 882 + 128 - 10$

## Unit 2: Place value

### Teaching guidelines and solutions

The work from Unit 1 is expanded in this section to include the place value of digits in whole numbers and decimal numbers.

### Place value in whole numbers

Prepare a place value chart like the one on page 11 in the Pupil's Book to use when explaining place value. Display the place value chart for pupils to refer to as they solve problems in this unit.

#### Exercise 1

(PB page 12)

1. a) 30 000 000      b) 5      c) 400 000 000  
 d) 1 000 000 000      e) 70 000      f) 8 000
2. The digit 1 has a value of 1 billion and the 5 has a value of 5.
3. a) 9 000 000 000      b) 200 000 000  
 c) 800 000      d) 600  
 e) 10      f) 7 000  
 g) 30 000      h) 5

#### Exercise 2

(PB page 12)

1. a) 8 000      b) 80 000      c) 800  
 d) 800 000      e) 800 000 000      f) 80 000 000 000

- g) 80                      h) 8 000 000              i) 8 000  
 j) 800 000                k) 8                        l) 800
2. a) 600                    b) 30 000 000            c) 700 000  
 d) 8                        e) 6 000                 f) 400 000 000 000  
 g) 1 000 000 000      h) 80 000                i) 300 000 000  
 j) 70 000 000 000    k) 90                      l) 900

3.

	Billions			Millions			Thousands			Units		
	H	T	U	H	T	U	H	T	U	H	T	U
a)								4	5	9	5	0
b)						1	5	8	5	6	3	5
c)							3	8	9	4	2	5
d)					2	1	5	7	0	2	0	0
e)				1	7	5	2	5	0	8	5	5
f)			3	2	1	3	6	5	0	7	7	5
g)						8	9	5	0	6	3	5
h)						5	9	4	5	6	7	0
i)					2	5	7	6	0	8	0	0
j)		3	2	4	1	5	3	6	7	5	2	5

4.

Number in words	Billions			Millions			Thousands			Units		
	H	T	U	H	T	U	H	T	U	H	T	U
Seventy million five hundred and twenty-one					7	0	0	0	0	5	2	1
Eighty billion, twelve million		8	0	0	1	2	0	0	0	0	0	0
Eighty-one million, three thousand and twelve					8	1	0	0	3	0	1	2
Forty-five billion, nine million, nine hundred and ninety-nine		4	5	0	0	9	0	0	0	9	9	9
One hundred and four billion, two hundred and seventy-one million, seven thousand, eight hundred and six	1	0	4	2	7	1	0	0	7	8	0	6

## Workbook: Exercise 4

(WB page 5)

1.

	Billions			Millions			Thousands			Units		
	H	T	U	H	T	U	H	T	U	H	T	U
a)										7	9	2
b)								1	4	7	9	2
c)							3	8	1	7	9	2
d)					1	4	6	7	3	9	2	5
e)				2	9	1	0	8	3	5	6	5
f)		1	4	8	9	2	5	0	0	0	0	3

2. a) fourteen thousand                      b) fourteen million  
c) fourteen billion

3. 900

## Exercise 3

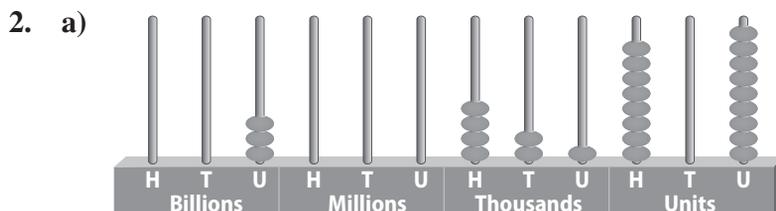
(PB page 13)

1. a) Place value of 4 in 413 235 685: 400 000 000  
Place value of 4 in 459 072: 400 000  
b) Answers may differ. An example answer is that it is not surprising that people move from smaller towns to cities as they look for better opportunities to make a living.
2. a) 9 875 321                                      b) 1 235 789
3.  $50\ 000 - 500 = 49\ 500$ . The place value of the first 5 is 50 000. The place value of the second 5 is 500.
4. 1 021 042 506  
One billion, twenty-one million, forty-two thousand, five hundred and six

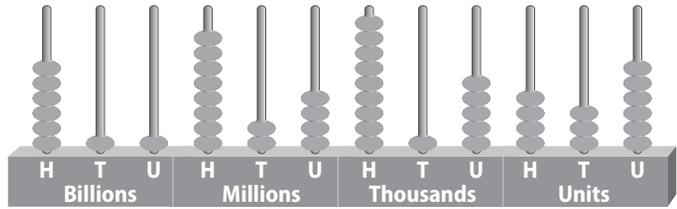
## Workbook: Exercise 5

(WB page 6)

1. Digits: 27 415 903 160  
Words: twenty-seven billion, four hundred and fifteen million, nine hundred and three thousand, one hundred and sixty



b)



## Place value in decimal numbers

Use the diagrams on page 15 in the Pupil's Book to help explain decimal values. The examples show equivalent decimal numbers and fractions and also the place value of decimal numbers.

Make a copy of the diagram on page 16 in the Pupil's Book to show the difference between whole number digits and decimal digits.

### Exercise 4

(PB page 16)

1. Place value of 0: 0; place value of 2: 0.2; place value of 3: 0.03; place value of 4: 0.004

2.  $\frac{43}{100} = 0.43$

3. a) 9.0  
c) 0.04  
e) 0.007  
g) 0.02  
i) 0.07

- b) 0.9  
d) 30.0  
f) 100.0  
h) 20.0  
j) 8.0

4. a) 30.0  
c) 0.03  
e) 0.3

- b) 0.003  
d) 0.003  
f) 0.3

5. a)  $\frac{6}{10} = 0.6$ ; 0.6

b)  $\frac{4}{1000} = 0.004$ ; 0.004

c)  $\frac{3}{100} = 0.03$ ; 0.03

d)  $\frac{7}{10} = 0.7$ ; 0.7

e)  $\frac{9}{100} = 0.09$ ; 0.09

f)  $\frac{1265}{1000} = 1.265$ ; 0.005

g)  $\frac{427}{10} = 42.7$ ; 0.7

h)  $\frac{614}{100} = 6.14$ ; 0.04

i)  $\frac{492}{100} = 4.92$ ; 0.02

j)  $\frac{659}{1000} = 0.659$ ; 0.009

6. a)  $7\frac{1}{10} = 7.1$

b)  $\frac{71}{1000} = 0.071$

c)  $\frac{71}{100} = 0.71$

7. a)  $0.381 = \frac{381}{1000}$

b)  $38.1 = 38\frac{1}{10}$

c)  $3.81 = 3\frac{81}{100}$

## Exercise 5

(PB page 17)

1.

Decimal numbers in words	Millions			Thousands			Units			.	t	h	th
	H	T	U	H	T	U	H	T	U				
Seven million, six hundred and twenty-five thousand point four five six			7	6	2	5	0	0	0	.	4	5	6
Five hundred and forty thousand, nine hundred and eighty-nine point four nine six				5	4	0	9	8	9	.	4	9	6
Seventeen thousand, four hundred and ninety-one point eight seven					1	7	4	9	1	.	8	7	
Forty-seven million, nine thousand, seven hundred and twenty-two point seven six one		4	7	0	0	9	7	2	2	.	7	6	1
One hundred and fifty million, six hundred and seventy-nine thousand and fifty-five point five three three	1	5	0	6	7	9	0	5	5	.	5	3	3

2. a) 67 921.4396: sixty-seven thousand, nine hundred and twenty-one point four three nine six  
 b) 12.121: twelve point one two one  
 c) 792 380.0859: seven hundred and ninety-two thousand, three hundred and eighty point zero eight five nine  
 d) 54 340 071.88: fifty-four million three hundred and forty thousand and seventy-one point eight eight
3. a)  $\frac{2}{100}$       b)  $\frac{8}{10\,000}$       c)  $\frac{2}{10}$       d)  $\frac{6}{1\,000}$   
 e)  $\frac{8}{1\,000}$       f)  $\frac{3}{1\,000}$       g)  $\frac{6}{1\,000}$       h)  $\frac{8}{10}$
4. a) 9                      b) 2                      c) 4  
 d) last 7                e) 5                      f) last 9
5. a) 0.6                    b) 6.0                    c) 0.0006  
 d) 0.06                e) 0.006                f) 0.0006

## Workbook: Exercise 6

(WB page 7)

1.

Millions			Thousands			Units			.	Decimal fraction		
H	T	U	H	T	U	H	T	U	.	t	h	th
							8	1	.	9		
					6	7	5	1	.	2	3	
	1	0	4	5	2	0	3	8	.	0	0	7
		9	0	0	1	0	0	7	.	8	9	5

a)

b)

c)

d)

2. a)  $\frac{56}{100} = 0.56$       b)  $\frac{481}{1000} = 0.481$       c)  $\frac{925}{10} = 92.5$

d)  $\frac{8\,250}{100} = 82.50$       e)  $\frac{14}{100} = 0.14$       f)  $\frac{9\,070}{1000} = 9.07$

3. 0.14, 0.481, 0.56, 9.07, 82.50, 92.5

4. It is **easier** to arrange decimal fractions in ascending order than to arrange fractions in ascending order.

### Exercise 6

(PB page 18)

1. a)  $103.482 = 100 + 3 + \frac{4}{10} + \frac{8}{100} + \frac{2}{1000}$

b)  $99.102 = 90 + 9 + \frac{1}{10} + \frac{2}{1000}$

c)  $692.005 = 600 + 90 + 2 + \frac{5}{1000}$

d)  $700.001 = 700 + \frac{1}{1000}$

2. a) ~~₺~~39.91      b) ~~₺~~24.99      c) ~~₺~~95.95      d) ~~₺~~38.79

3. a) 0.357      b) 0.753

4. 87.912 is larger than 87.192.

5. Cows, goats and footballs only exist as whole entities.

6. a) ~~₺~~973.82

b)  $999.95 - 973.82 = \text{~~₺~~26.13}$

### Workbook: Exercise 7

(WB page 8)

1. a) 165.427      b) 5 413.26

c) 70 461.32      d) 9 286.045

2. 70 461.32, 9 286.045, 5 413.26, 165.427

3. a)  $104.775 = 100 + 4 + \frac{7}{10} + \frac{7}{100} + \frac{5}{1000}$   
 b)  $1\ 020.02 = 1\ 000 + 20 + \frac{2}{100}$   
 c)  $78\ 009.104 = 70\ 000 + 8\ 000 + 9 + \frac{1}{10} + \frac{4}{1000}$   
 d)  $43\ 619.782$   
 $= 40\ 000 + 3\ 000 + 600 + 10 + 9 + \frac{7}{10} + \frac{8}{100} + \frac{2}{1000}$
4. a) 111 101.912 is larger.    b) 493 217.021 is larger.
5. a)  $\frac{46}{10} = 4.6$  and  $\frac{46}{100} = 0.46$ ; 4.6 is larger.  
 b)  $\frac{725}{100} = 7.25$  and  $\frac{35}{5} = 7$ ; 7.25 is larger.

## Unit 3: LCM and HCF

### Teaching guidelines and solutions

In this unit, the focus is on finding the LCM of two-digit whole numbers, using multiples and factorisation to find the HCF of whole numbers, finding the factors and the HCF of whole numbers and solving problems.

### Lowest common multiple (LCM)

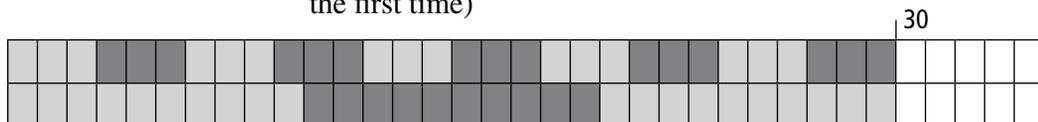
Stress that an LCM is the smallest multiple the numbers have in common. An LCM is larger than or equal to the largest number. It can equal the largest number (for example, the LCM of 2, 3 and 6 is 6). Pupils can list multiples (as shown in the examples), but this can involve writing long lists of multiples (as in Exercise 1), or find the prime factors of the numbers. They can also use a table to find the LCM of a few numbers (see the last example and the steps on page 21 in the Pupil's Book).

Work through the summary on page 21 of the Pupil's Book with the class. Workbook Exercise 8 gives pupils hands-on opportunities to find the LCM of numbers.

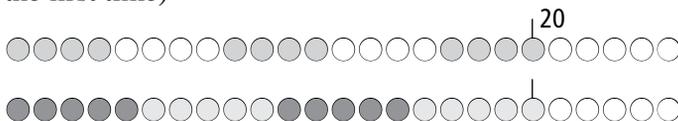
### Workbook: Exercise 8

(WB page 9)

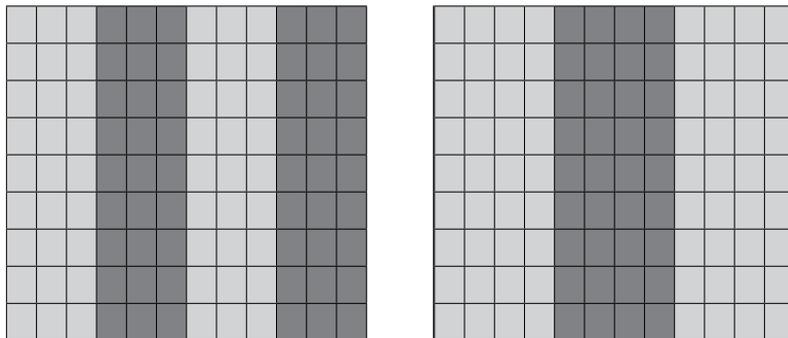
1. LCM = 30 (where a group of 3 and a group of 10 align for the first time)



2. LCM = 20 (where a group of 4 and a group of 5 align for the first time)



3. The shading shows that four groups of 27 fill the 108 blocks and three groups of 36 fill 108 blocks. So, the LCM of 27 and 36 is 108.



### Exercise 1

(PB page 22)

- Multiples of 2: 2, 4, 6, 8, 10, 12, **14**, 16, ...

Multiples of 7: 7, **14**, 21, 28, ...

LCM of 2 and 7: 14
- Multiples of 3: 3, 6, 9, 12, 15, 18, 21, 24, 27, 30, 33, 36, 39, 42, 45, 48, 51, 54, 57, **60**, 63, ...

Multiples of 4: 4, 8, 12, 16, 20, 24, 28, 32, 36, 40, 44, 48, 52, 56, **60**, 64, ...

Multiples of 5: 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, **60**, 65, ...

LCM of 3, 4 and 5: 60
- Multiples of 4: 4, 8, 12, 16, 20, 24, 28, 32, **36**, 40, ...

Multiples of 9: 9, 18, 27, **36**, 45, ...

LCM of 4 and 9: 36
- Multiples of 3: 3, 6, 9, 12, 15, 18, 21, 24, 27, 30, 33, 36, 39, 42, 45, 48, 51, 54, 57, **60**, 63, 66, 69, 72, 75, 78, 81, 84, 87, 90, 93, 96, 99, 102, 105, 108, 111, 114, 117, **120**, ...

Multiples of 5: 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, **60**, 65, 70, 75, 80, 85, 90, 95, 100, 105, 110, 115, **120**, ...

Multiples of 8: 8, 16, 24, 32, 40, 48, 56, 64, 72, 80, 88, 96,  
104, 112, **120**, ...  
LCM of 3, 5 and 8: 120

### Workbook: Exercise 9

(WB page 10)

1. Factors of 15: 3, 5, 15  
Prime factors: 3 and 5  
Factors of 20: 2, 4, 5, 10, 20  
Prime factors: 2 and 5  
LCM of 15 and 20:  $2 \times 3 \times 5 = 30$
2. Multiples of 18: 18, 36, 54, **72**, 90, 108, ...  
Multiples of 24: 24, 48, **72**, 96, 120, ...  
Multiples of 36: 36, **72**, 108, ...  
LCM of 18, 24 and 36: 72

<b>3.</b>	<b>a)</b>	2	75	80	90	<b>b)</b>	2	48	72	108
		2	75	40	45		2	24	36	54
		2	75	20	45		2	12	18	27
		2	75	10	45		2	6	9	27
		3	75	5	45		3	3	9	27
		3	25	5	15		3	1	9	9
		5	25	5	5		3		3	3
		5	5	1	1				1	1
			1							

LCM of 75, 80 and 90:  
 $2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 5$   
 $\times 5 = 3\ 600$

LCM of 48, 72 and 108:  
 $2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 3$   
 $= 432$

### Exercise 2

(PB page 22)

1. **a)** Multiples of 9: **18**, 27, ...  
Multiples of 2: 2, 4, 6, 8, 10, 12, 14, 16, **18**, ...  
LCM of 9 and 2: 18
- b)** Multiples of 3: 3, 6, 9, 12, 15, 18, **21**, ...  
Multiples of 7: 7, 14, **21**, ...  
LCM of 3 and 7: 21
- c)** Multiples of 6: **6**, 12, ...  
Multiples of 3: 3, **6**, 9, ...  
LCM of 6 and 3: 6
- d)** Multiples of 12: 12, 24, 36, **48**, 60, ...  
Multiples of 16: 16, 32, **48**, ...  
LCM of 12 and 16: 48

- e) Multiples of 10: 10, 20, **30**, ...  
 Multiples of 15: 15, **30**, ...  
 LCM of 10 and 15: 30
- f) Multiples of 14: 14, 28, **42**, ...  
 Multiples of 21: 21, **42**, ...  
 LCM of 14 and 21: 42

2. a) Prime factors of 4:  $2^2$   
 Prime factors of 6:  $2 \times 3$   
 LCM of 4 and 6:  $2^2 \times 3 = 12$
- b) Prime factors of 9:  $3^2$   
 Prime factors of 12:  $2^2 \times 3$   
 LCM of 9 and 12:  $2^2 \times 3^2 = 36$
- c) Prime factors of 5: 5  
 Prime factors of 8:  $2^3$   
 LCM of 5 and 8:  $2^3 \times 5 = 40$
- d) Prime factors of 18:  $2 \times 3^2$   
 Prime factors of 16:  $2^4$   
 LCM of 18 and 16:  $2^4 \times 3^2 = 144$
- e) Prime factors of 21:  $3 \times 7$   
 Prime factors of 20:  $2^2 \times 5$   
 LCM of 21 and 20:  $2^2 \times 3 \times 5 \times 7 = 420$
- f) Prime factors of 27:  $3^3$   
 Prime factors of 15:  $3 \times 5$   
 LCM of 27 and 15:  $3^3 \times 5 = 135$

3. a) 

2	14	20	21	30
2	7	10	21	15
3	7	5	21	15
5	7	5	7	5
7	7	1	7	1
	1		1	

 LCM of 14, 20, 21 and 30:  
 $2^2 \times 3 \times 5 \times 7 = 420$

b) 

2	18	25	32
2	9	25	16
2	9	25	8
2	9	25	4
2	9	25	2
3	9	25	1
3	3	25	
5	1	25	
5		5	
		1	

 LCM of 18, 25 and 32:  
 $2^5 \times 3^2 \times 5^2 = 7\ 200$

### Exercise 3

(PB page 22)

Pupils use the method they prefer to find the LCMs.

1. LCM of 5, 4 and 2: 20
2. LCM of 3, 6 and 9: 18
3. LCM of 4, 5 and 6: 60
4. LCM of 6, 12 and 18: 36
5. LCM of 15, 8 and 12: 120
6. LCM of 20, 15 and 10: 60

### Exercise 4

(PB page 22)

1. Prime factors of 14:  $2 \times 7$   
Prime factors of 4:  $2^2$   
LCM of 4 and 14: 28  
To have 28 pens and 28 pencils, you would have to buy two packets of pens and seven packets of pencils.
2. Prime factors of 8:  $2^3$   
Prime factors of 12:  $2^2 \times 3$   
LCM of 8 and 12:  $2^3 \times 3 = 24$   
To get 24 of each type of plant, he needs to buy three trays of parsley seedlings and two trays of lettuce seedlings.
3. Prime factors of 9:  $3^2$   
Prime factors of 8:  $2^3$   
Prime factors of 6:  $2 \times 3$   
LCM of 6, 8 and 9:  $2^3 \times 3^2 = 72$   
To sell the client 72 of each type of bread, they must sell the client 8 packets of brown rolls, 9 packets of white rolls and 12 packets of flat breads.

### Exercise 5 (challenge)

(PB page 23)

1. Yes, the LCM must include all prime factors.
2. The first multiple of the larger number is double itself. However, the LCM of 3 and 6 is the larger number (6) and not double that number ( $6 \times 2 = 12$ ).

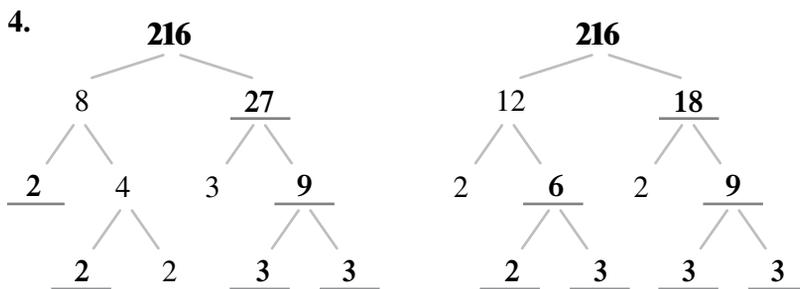
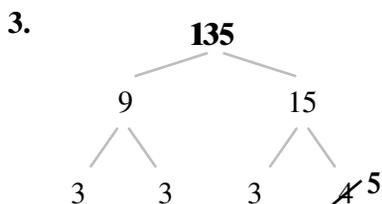
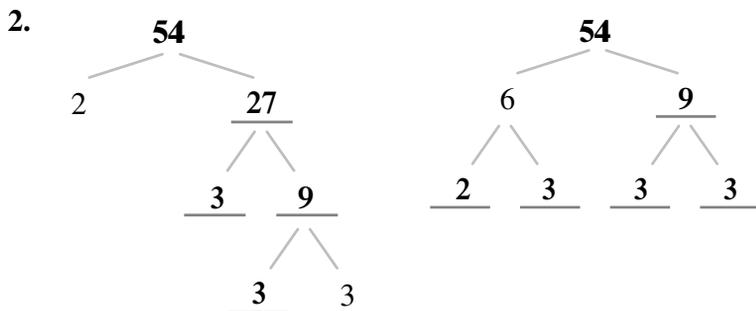
## Highest common factor (HCF)

We generally use factor trees to find HCFs. Work through the examples in the Pupil's Book with the class.

## Workbook: Exercise 10

(WB page 11)

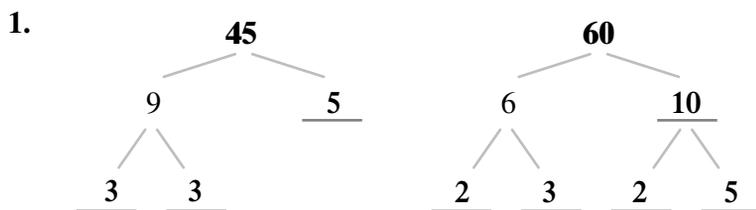
1. Both factor trees are correct. The order in which numbers are divided into 42 differs, but the factors are the same using both methods.



Factors of 216:  $2 \times 2 \times 2 \times 3 \times 3 \times 3$

## Workbook: Exercise 11

(WB page 12)



Common factors of 45 and 60: 3 and 5

HCF:  $3 \times 5 = 15$

2	64
2	32
2	16
2	8
2	4
2	2
	1

2	408
2	204
2	102
3	51
17	17
	1

2	748
2	374
11	187
17	17
	1

Common factors of 64, 408 and 748:  $2 \times 2$

HCF:  $2 \times 2 = 4$

3. HCF of 378 and 486:  $2 \times 3 \times 3 = 18$

### Exercise 6

(PB page 24)

1. a) HCF of 10 and 32: 2      b) HCF of 16 and 28: 4
- c) HCF of 21 and 35: 7      d) HCF of 30 and 50: 10
- e) HCF of 14 and 42: 14     f) HCF of 48 and 72: 24
- g) HCF of 60 and 90: 30    h) HCF of 25 and 40: 5
  
2. a) HCF of 12 and 40: 4      b) HCF of 22 and 66: 22
- c) HCF of 54 and 81: 27    d) HCF of 48 and 72: 24
- e) HCF of 48 and 64: 16    f) HCF of 15 and 60: 15

### Exercise 7

(PB page 25)

1. HCF of 12, 18 and 42: 6    2. HCF of 20, 35 and 50: 5
3. HCF of 9, 54 and 21: 3    4. HCF of 12, 93 and 117: 3
5. HCF of 5, 7 and 11: 1    6. HCF of 12, 36 and 72: 12
7. HCF of 25, 75 and 125: 25
8. HCF of 24, 48 and 96: 24
9. HCF of 40, 64 and 136: 8

### Exercise 8

(PB page 25)

1. a) HCF of 126, 162 and 180: 18
- b) HCF of 184, 230 and 276: 46
  
2. The HCF of 45 and 60 is 15. So, he will cut off 15 m lengths.

### Exercise 9 (challenge)

(PB page 25)

1. a) LCM of 6 and 8 is 24. After 24 minutes, they will complete a lap at the same time.
- b) It does not matter in which direction they run. The starting place and ending place remain the same no matter in which direction they run around the track.

2. a) The HCF of 60, 72 and 144 is 12. She can make 12 parcels.
- b) Each parcel will have 6 white marbles, 12 green marbles and 5 red marbles.

## Unit 4: Demography (population)

### Teaching guidelines and solutions

In this section, the focus is on reading, writing and comparing the populations of small and big cities, reading and comparing the population of HIV prevalence in different countries and counting in thousands and millions when working with population studies.

The work in this unit forms the foundation for Theme 6, Everyday statistics, in the third term.

### Different populations

Explain the term population and work through the examples on pages 26 and 27 in the Pupil's Book with the class.

#### Exercise 1

(PB page 27)

1. Answers will differ.
  2. a) School A total population: 1 833  
School B total population: 768
  - b) Total teacher population: 71
  - c) Total number of boys: 1 340
  - d) Total number of girls: 1 190
  - e) School A is probably in a city; it has more pupils and more teachers than school B.
3. a) The states are in alphabetical order.

b)

States	Population			
	1991	2006	2011	2016
Bayelsa State	–	1 704 515	1 966 426	2 278 000
Taraba State	1 512 184	2 294 800	2 647 413	3 066 800
Abia State	2 329 487	2 845 380	3 250 816	3 727 300
Bauchi State	4 351 007	4 653 066	5 499 737	6 537 300
Lagos State	5 725 116	9 113 605	10 668 139	12 550 600
Kano State	5 810 470	9 401 288	11 058 314	13 076 900

- c) Answers may differ.
  - d) One million, five hundred and twelve thousand, one hundred and eighty-four
  - e) Eleven million, fifty-eight thousand, three hundred and fourteen
  - f) True; both Lagos and Kano had populations of more than 10 million in 2011 and in 2016.
  - g) Answers may differ.  
Perhaps records were not kept or the records were not reliable.
  - h) Answers may differ.  
However, it is likely that the population was less than one and a half million as other states' populations grew by more than 200 000 from 1991 to 2006 and Bayelsa's population was over one million, seven hundred thousand in 2006.
  - i) The numbers have been rounded off to the nearest thousand.
  - j) The statement is true for Kano State and for Lagos State. It is not true for the other four states in the table.
  - k) The population of Bayelsa State was expected to increase by 311 574.
4. a) Oyo: six million, five hundred and ninety-six thousand, three hundred and ninety-two  
Cross River: three million, three hundred and thirty-seven thousand, five hundred and seventeen
- b) Kaduna State
  - c) Cross River State
  - d)  $7\ 087\ 266 - 3\ 337\ 517 = 3\ 749\ 749$
  - e) Jigawa: 5 031 103, Oyo: 6 596 392, Kaduna: 7 087 226
  - f) Cross River: 3 337 517, Plateau: 3 663 428,  
Adamawa: 3 667 419, Kogi: 3 841 884
  - g) Ondo: 4 012 106 and Sokoto: 4 292 416

## Workbook: Exercise 12

(WB page 13)

1. a) Five cities
- b) Ogbomoso (1 500 000)
  - c) Okene (445 000)
  - d) Benin City and Oyo:  $1\ 400\ 000 - 620\ 400 = 779\ 600$   
Ogbomoso and Maiduguri:  
 $1\ 500\ 000 - 1\ 200\ 000 = 300\ 000$

Jos and Sokoto:  $900\ 000 - 500\ 500 = 399\ 500$

Aba and Zaria:  $1\ 277\ 300 - 1\ 000\ 000 = 277\ 300$

Zaria and Warri:  $1\ 000\ 000 - 500\ 900 = 499\ 100$

- e) Warri (500 900), Sokoto (500 500) and Okene (445 000)
- f) Ogbomoso (1 500 000), Benin City (1 400 000) and Aba (1277 300)

2. a)

City	Population (millions)	Population
Abuja	3.0	3 000 000
Ibadan	3.6	3 600 000
Kaduna	1.7	1 700 000
Kano	3.6	3 600 000
Lagos	21.6	21 600 000
Port Harcourt	1.9	1 900 000

- b) Alphabetical order
- c) Ibadan and Kano
- d) Kaduna and Port Harcourt
- e) Ibadan and Kano
- f) Kaduna: 1 700 000, Port Harcourt: 1 900 000, Abuja: 3 000 000, Ibadan: 3 600 000, Kano: 3 600 000, Lagos: 21 600 000

## Rounding off

Statistics are often rounded off. Work through the explanations and examples on page 31 in the Pupil's Book with the class.

Discuss with the class why, for example, in Exercise 2 question 3, we round off 17 927 to 18 000 both when rounding off to 100 and to 1 000. (When rounding off to 100, the 9 in the hundreds place value becomes a 10 and we carry 1 to the thousands.)

### Exercise 2

(PB page 31)

1. 1 836: 1 840, 1 800, 2 000
2. 4 223: 4 220, 4 200, 4 000
3. 17 927: 17 930, 18 000, 18 000
4. 25 255: 25 260, 25 300, 25 000
5. 92 412: 92 410, 92 400, 92 000

6. 11 111: 11 110, 11 100, 11 000
7. 39 499: 39 500, 39 500, 39 000
8. 192 010: 192 010, 192 000, 192 000
9. 38 364: 38 360, 38 400, 38 000
10. 17 888: 17 890, 17 900, 18 000

### Exercise 3

(PB page 32)

1.
  - a) Imo: 225.3 km  $\approx$  225 km, 230 km
  - b) Mada: 201.1 km  $\approx$  201 km, 200 km
  - c) Ngodela: 289.6 km  $\approx$  290 km, 290 km
  - d) Niger: 1 174.6 km  $\approx$  1 175 km, 1 170 km
2.
  - a) ~~₦~~237.425  $\approx$  ~~₦~~237.43
  - b) ~~₦~~609.052  $\approx$  ~~₦~~609.05
  - c) ~~₦~~6 234.725  $\approx$  ~~₦~~6 234.73
  - d) ~~₦~~2 812.6675  $\approx$  ~~₦~~2 812.67
3.
  - a) Abia: 3 250 816  $\approx$  3 251 000
  - b) Kano: 11 058 314  $\approx$  11 058 000
  - c) Lagos: 10 668 139  $\approx$  10 668 000
  - d) Taraba: 2 647 413  $\approx$  2 647 000

### Exercise 4

(PB page 33)

1.
  - a) The list is alphabetical.
  - b) The last three digits in each population are 000.
  - c) Burkina Faso and Niger
  - d) Cameroon, Chad and Niger
  - e) Nigeria: 184 264 000: one hundred and eighty-four million, two hundred and sixty-four thousand  
Ethiopia: 90 076 000; ninety million, and seventy-six thousand  
Egypt: 88 523 000; eighty-eight million, five hundred and twenty-three thousand
  - f) Burkina Faso: 18 450 000; eighteen million, four hundred and fifty thousand  
Chad: 13 675 000; thirteen million, six hundred and seventy-five thousand  
Gabon: 1 873 000: one million, eight hundred and seventy-three thousand
  - g)  $184\,264\,000 - 1\,873\,000 = 182\,391\,000$
2.
  - a) Africa and Asia
  - b) True, four billion is more than half of seven billion.



- e) False, Gabon had 300 fewer AIDS deaths.
  - f) True
3. a) South Africa: 5 600 000; five million, six hundred thousand  
Nigeria: 3 400 000; three million, four hundred thousand  
Kenya: 1 600 000; one million, six hundred thousand  
Uganda: 1 400 000; one million, four hundred thousand  
Zimbabwe: 1 200 000; one million, two hundred thousand
- b) South Africa; Nigeria; Kenya; Zimbabwe; Uganda  
No, Zimbabwe is at the bottom of the list of people living with AIDS, but it has more children living with HIV/AIDS than Uganda.
  - c) Kenya and Uganda
  - d) Uganda had 540 000 and Kenya had 580 000 men living with HIV/AIDS in 2011.
  - e) South Africa had the most AIDS deaths in 2011.
  - f) This is not surprising as South Africa also had the most people living with HIV/AIDS in that year.
4. a) Nigeria
- b) Answers may differ. An example answer is that it is surprising as South Africa had more people living with HIV/AIDS than Nigeria.
5. No, the table shows that no data was available for children in Niger who were living with HIV/AIDS in 2011.

### Exercise 6 (challenge)

(PB page 38)

Learners work in pairs to research HIV/AIDS-information on the internet.

Ask learners to summarise their information on posters and display their posters in the classroom.

## Unit 5: Fractions and decimal numbers

### Teaching guidelines and solutions

In this unit, pupils will work with fractions and decimal numbers and order fractions, convert fractions to decimal numbers and decimal numbers to fractions and solve problems that involve fractions.

## Order fractions

Pupils must be able to compare fractions and rank them in either ascending or descending order. There are many examples in the Pupil's Book.

### Exercise 1

(PB page 42)

1. a)  $\frac{1}{2} = \frac{2}{4} = \frac{3}{6} = \frac{4}{8}, \frac{1}{3} = \frac{2}{6}, \frac{2}{3} = \frac{4}{6}$

b)  $\frac{5}{20} = \frac{2}{8} = \frac{3}{12} = \frac{6}{24} = \frac{10}{40}$

c)  $\frac{4}{12} = \frac{11}{33} = \frac{9}{27} = \frac{25}{75}$

d)  $\frac{8}{12} = \frac{2}{3} = \frac{12}{18} = \frac{24}{36}, \frac{20}{60} = \frac{10}{30}$

e)  $\frac{10}{50} = \frac{12}{60} = \frac{3}{15}, \frac{3}{12} = \frac{25}{100} = \frac{6}{24}$

f)  $\frac{1}{6} = \frac{100}{600} = \frac{6}{36} = \frac{4}{24}$

2. a)  $\frac{10}{12} = \frac{5}{6}$                       b)  $\frac{4}{18} = \frac{2}{9}$                       c)  $\frac{34}{36} = \frac{17}{18}$

d)  $\frac{21}{27} = \frac{7}{9}$                       e)  $\frac{3}{4} = \frac{21}{28}$                       f)  $\frac{5}{6} = \frac{15}{18}$

3. a)  $\frac{1}{2}$                       b)  $\frac{1}{3}$                       c)  $\frac{6}{20}$

d)  $\frac{5}{8}$                       e)  $\frac{4}{7}$                       f)  $\frac{3}{10}$

### Workbook: Exercise 14

(WB page 16)

1.

$\frac{1}{2}$						$\frac{1}{2}$					
$\frac{1}{3}$				$\frac{1}{3}$				$\frac{1}{3}$			
$\frac{1}{4}$			$\frac{1}{4}$			$\frac{1}{4}$			$\frac{1}{4}$		
$\frac{1}{6}$		$\frac{1}{6}$		$\frac{1}{6}$		$\frac{1}{6}$		$\frac{1}{6}$		$\frac{1}{6}$	
$\frac{1}{12}$											

2. a)  $\frac{1}{2} = \frac{2}{4} = \frac{3}{6} = \frac{6}{12}$                       b)  $\frac{1}{4} = \frac{3}{12}$                       c)  $\frac{1}{3} = \frac{2}{6} = \frac{4}{12}$

d)  $\frac{2}{3} = \frac{4}{6} = \frac{8}{12}$                       e)  $\frac{3}{4} = \frac{9}{12}$                       f)  $\frac{5}{6} = \frac{10}{12}$

3. a)  $\frac{1}{4}, \frac{2}{6}, \frac{5}{12}$                       b)  $\frac{1}{2}, \frac{7}{12}, \frac{2}{3}$                       c)  $\frac{2}{3}, \frac{3}{4}, \frac{5}{6}$

d)  $\frac{4}{6}, \frac{3}{4}, \frac{10}{12}$                       e)  $\frac{2}{3}, \frac{9}{12}, \frac{5}{6}$                       f)  $\frac{1}{12}, \frac{1}{6}, \frac{1}{2}$

4. Answers may differ. One example is given for each question.

a)  $\frac{1}{5} = \frac{2}{10}$     b)  $\frac{3}{5} = \frac{6}{10}$     c)  $\frac{2}{7} = \frac{4}{14}$     d)  $\frac{5}{8} = \frac{10}{16}$

5. a)  $\frac{1}{1} = \frac{2}{2} = \frac{3}{3} = \frac{4}{4} = \frac{22}{22} = \frac{100}{100} = \frac{538}{538} = \frac{5450}{5450}$

b)  $\frac{1}{5} = \frac{2}{10} = \frac{3}{15} = \frac{4}{20} = \frac{5}{25} = \frac{20}{100} = \frac{600}{3000} = \frac{70}{350}$

c)  $\frac{3}{4} = \frac{6}{8} = \frac{27}{36} = \frac{45}{60} = \frac{81}{108} = \frac{75}{100} = \frac{33}{44} = \frac{600}{800}$

d)  $\frac{2}{3} = \frac{10}{15} = \frac{40}{60} = \frac{8}{12} = \frac{44}{66} = \frac{66}{99} = \frac{120}{180} = \frac{22}{33}$

e)  $\frac{5}{8} = \frac{15}{24} = \frac{15}{24} = \frac{40}{64} = \frac{35}{56} = \frac{65}{104} = \frac{500}{800} = \frac{110}{176}$

f)  $\frac{9}{10} = \frac{36}{40} = \frac{450}{500} = \frac{99}{110} = \frac{72}{80} = \frac{90}{100} = \frac{135}{150} = \frac{720}{800}$

6. a)  $\frac{1}{3}$     b)  $\frac{5}{8}$     c)  $\frac{8}{12} = \frac{2}{3}$

d)  $\frac{6}{10} = \frac{3}{5}$     e)  $\frac{4}{16} = \frac{1}{4}$     f)  $\frac{10}{25} = \frac{2}{5}$

### Exercise 2

(PB page 43)

1. Answers will differ. Two examples are given for each fraction.

a)  $\frac{1}{7} = \frac{2}{14} = \frac{3}{21}$     b)  $\frac{3}{8} = \frac{6}{16} = \frac{300}{800}$     c)  $\frac{2}{5} = \frac{4}{10} = \frac{20}{50}$

d)  $\frac{1}{9} = \frac{2}{18} = \frac{10}{90}$     e)  $\frac{3}{5} = \frac{6}{10} = \frac{9}{15}$     f)  $\frac{5}{6} = \frac{10}{12} = \frac{500}{600}$

2. a)  $\frac{1}{11}, \frac{4}{11}, \frac{5}{11}, \frac{7}{11}, \frac{8}{11}$     b)  $\frac{4}{9}, \frac{13}{25}, \frac{55}{100}, \frac{6}{10}$

c)  $\frac{1}{6}, \frac{4}{9}, \frac{7}{12}, \frac{2}{3}$     d)  $\frac{1}{8}, \frac{1}{6}, \frac{1}{4}, \frac{3}{8}, \frac{5}{12}$

e)  $\frac{2}{9}, \frac{2}{6}, \frac{4}{9}, \frac{2}{3}, \frac{5}{6}$     f)  $\frac{1}{9}, \frac{1}{8}, \frac{1}{7}, \frac{1}{6}, \frac{1}{5}, \frac{1}{3}, \frac{1}{2}$

### Compare fractions with the same numerator

The diagram on page 43 in the Pupil's Book shows that when two or more fractions have 1 as a numerator, the fraction with the larger denominator is smaller. Pupils can draw similar diagrams to display in class.

### Exercise 3

(PB page 44)

1. a)  $\frac{1}{7}, \frac{1}{32}, \frac{1}{39}, \frac{1}{43}, \frac{1}{52}, \frac{1}{92}$     b)  $\frac{1}{521}, \frac{1}{713}, \frac{1}{899}, \frac{1}{912}, \frac{1}{934}$

c)  $\frac{12}{9}, \frac{8}{9}, \frac{7}{9}, \frac{5}{9}, \frac{3}{9}, \frac{1}{9}$     d)  $\frac{5}{6}, \frac{5}{9}, \frac{5}{12}, \frac{7}{18}$

e)  $\frac{5}{6}, \frac{3}{4}, \frac{7}{10}, \frac{3}{5}$     f)  $\frac{7}{12}, \frac{24}{48}, \frac{11}{24}, \frac{3}{8}$

2. a)  $\frac{3}{8} > \frac{5}{16}$       b)  $\frac{1}{8} > \frac{2}{32}$       c)  $\frac{9}{99} < \frac{3}{22}$   
 d)  $\frac{3}{7} < \frac{4}{8}$       e)  $\frac{4}{9} = \frac{12}{27}$       f)  $\frac{3}{5} > \frac{3}{6}$

## Compare mixed numbers

Pupils need to use their knowledge of LCMs when converting fractions.

When adding or subtracting, it is often easier to solve a problem without changing mixed numbers into fractions, but when multiplying and dividing, it is necessary to change mixed numbers into fractions.

### Exercise 4

(PB page 45)

1. a)  $3\frac{5}{9}$       b)  $3\frac{19}{36}$   
 c)  $5\frac{5}{44}$       d)  $21\frac{6}{10}$
2. a)  $3\frac{5}{9}, 4\frac{5}{9}, 6\frac{5}{9}$       b)  $3\frac{19}{36}, 3\frac{7}{12}, 3\frac{2}{3}$   
 c)  $5\frac{5}{44}, 5\frac{2}{22}, 5\frac{2}{11}$       d)  $21\frac{6}{10}, 21\frac{3}{4}, 21\frac{5}{6}$
3. a)  $1\frac{4}{9}, 1\frac{3}{8}, 1\frac{3}{10}, 1\frac{2}{7}$       b)  $5\frac{3}{4}, 4\frac{10}{11}, 3\frac{7}{9}, 2\frac{11}{12}$   
 c)  $\frac{8}{9}, \frac{6}{7}, \frac{7}{10}, \frac{2}{3}$       d)  $1\frac{3}{4}, 1\frac{3}{5}, 1\frac{3}{8}, 1\frac{1}{3}$

### Exercise 5

(PB page 46)

- They ate 5 oranges and took 40 oranges home.
- $\frac{4}{7}$
- 12 eggs
- Recipe B
- Farmer A sold  $\frac{3}{4} \times 100 = 75$  bags  
 He did not sell 25 bags of cashew nuts.  
 Farmer B sold  $\frac{3}{4} \times 80 = 60$  bags  
 He did not sell 20 bags of cashew nuts.  
 Farmer C sold  $\frac{3}{4} \times 120 = 90$  bags  
 He did not sell 30 bags of cashew nuts.  
 In total, 75 bags of cashew nuts were not sold.
- $\frac{4}{5}$  of 100 = 80 and  $\frac{9}{10}$  of 150 = 135  
 They sold more sandwiches.



## Convert fractions to decimal numbers

The diagrams in Workbook Exercise 16 show 100 squares. Using such diagrams will help pupils understand how to convert fractions to decimal numbers. Work through the examples in the Pupil's Book with the class and then ask them to complete Workbook Exercise 16.

### Workbook: Exercise 16

(WB page 19)

- a) Fraction:  $\frac{21}{100}$ ; decimal number: 0.21

b) Fraction:  $\frac{83}{100}$ ; decimal number: 0.83
- a) 0.4                      b) 0.6                      c) 0.9

d) 1.5                      e) 1.6                      f) 1.8

g) 2.3                      h) 2.6                      i) 2.9
- 1.019, 1.1, 1.764, 1.821, 2.001, 2.12, 2.257, 2.925

### Exercise 7

(PB page 51)

- a)  $\frac{3}{4} = 0.75$                       b)  $\frac{4}{5} = 0.8$                       c)  $\frac{3}{5} = 0.6$

d)  $\frac{12}{15} = 0.8$                       e)  $\frac{32}{40} = 0.8$                       f)  $\frac{3}{6} = 0.5$

g)  $\frac{9}{36} = 0.25$                       h)  $\frac{1}{25} = 0.04$                       i)  $\frac{20}{25} = 0.8$

j)  $\frac{150}{600} = 0.25$
- a)  $0.2 = \frac{2}{10}$                       b)  $0.5 = \frac{5}{10}$                       c)  $0.3 = \frac{3}{10}$

d)  $0.6 = \frac{6}{10}$                       e)  $0.24 = \frac{24}{100}$                       f)  $0.12 = \frac{12}{100}$

g)  $0.084 = \frac{84}{1\,000}$                       h)  $0.032 = \frac{32}{1\,000}$                       i)  $0.068 = \frac{68}{1\,000}$

j)  $0.093 = \frac{93}{1\,000}$
- a)  $\frac{1}{20} = 0.05$                       b)  $\frac{3}{200} = 0.015$                       c)  $\frac{873}{1\,000} = 0.873$

d)  $\frac{15}{20} = 0.75$                       e)  $\frac{9}{150} = 0.06$                       f)  $\frac{90}{150} = 0.6$
- a)  $0.25 = \frac{25}{100}$                       b)  $0.975 = \frac{975}{1\,000}$                       c)  $0.008 = \frac{8}{1\,000}$

d)  $0.005 = \frac{5}{1\,000}$                       e)  $0.002 = \frac{2}{1\,000}$                       f)  $0.375 = \frac{375}{1\,000}$
- a)  $0.8 < \frac{5}{6}$                       b)  $\frac{1}{5} = 0.2$                       c)  $\frac{12}{40} < 0.6$

d)  $3.25 > \frac{31}{5}$                       e)  $1.9 > \frac{13}{4}$                       f)  $\frac{15}{8} < 1.9$

6. a) ..., 12.4, 13.5  
 b) ..., 22.5, 27.5  
 c) ..., 6.8, 5.4

### Exercise 8

(PB page 52)

1. Group A:  $\frac{8}{17}, \frac{93}{190}, \frac{199}{399}$       Group B:  $\frac{3}{5}, \frac{4}{7}, \frac{5}{9}, \frac{63}{125}, \frac{82}{161}$
2. Answers will differ.  
 Examples:  $0.25 = \frac{1}{4} = \frac{2}{8} = \frac{5}{20} = \frac{9}{36} = \frac{30}{120} = \frac{100}{400}$
3.  $\frac{3}{5} \times 40 = 24$ ; so,  $40 - 24 = 16$  boys  
 Alternatively,  $\frac{5}{5} - \frac{3}{5} = \frac{2}{5}$  are boys. So,  $\frac{2}{5} \times 40 = 16$  are boys
4. a) ~~R~~ $4\frac{3}{4} = \text{R}4.75$       b) ~~R~~ $7\frac{1}{10} = \text{R}7.10$   
 c) ~~R~~ $23\frac{1}{4} = \text{R}23.25$       d) ~~R~~ $82\frac{7}{10} = \text{R}82.70$   
 e) ~~R~~ $\frac{3}{5} = \text{R}0.60$       f) ~~R~~ $218\frac{95}{100} = \text{R}218.95$
5. Answers may differ. However, it is easier to compare digital numbers to see which is larger or smaller, than to compare fractions with differing denominators!

### Workbook: Exercise 17

(WB page 20)

1.  $498 > 489$       2.  $3\ 152 < 3\ 153$
3.  $45\ 732 > 44\ 732$       4.  $191\ 191 > 191\ 181$
5.  $824\ 423 > 823\ 444$       6.  $917\ 764 > 917\ 763$
7.  $1\ 234\ 567 < 1\ 234\ 756$       8.  $5\ 829\ 001 < 5\ 839\ 002$
9.  $\frac{1}{8} < \frac{1}{4}$       10.  $\frac{1}{2} = \frac{50}{100}$
11.  $\frac{1}{12} < \frac{2}{6}$       12.  $\frac{2}{12} = \frac{1}{6}$
13.  $\frac{1}{23} > \frac{1}{24}$       14.  $\frac{3}{14} < \frac{3}{11}$
15.  $2\frac{1}{3} = \frac{7}{3}$       16.  $4\frac{2}{5} < \frac{23}{5}$
17.  $2.5 = 2\frac{9}{18}$       18.  $74.75 = 74\frac{75}{100}$
19.  $5.04 < 5\frac{4}{10}$       20.  $7\frac{6}{100} = 7\frac{3}{50}$
21.  $8.01 < 8.1$       22.  $0.035 < 0.35$
23.  $53.917 < 54.917$       24.  $7\ 914.99 < 7\ 915$
25.  $47\frac{1}{20} < 47.2$       26.  $\frac{50}{60} > 0.75$

27.  $12\frac{3}{25} > 11\frac{3}{25}$

28.  $59.88 = 59\frac{88}{100}$

29.  $1\,431.02 > 1\,431.002$

30.  $73\frac{4}{100} < 73.4$

**Exercise 9 (challenge)**

(PB page 52)

1.  $\frac{1}{4}$  is larger than  $\frac{12}{52}$ .

$\frac{1}{4}$  of ~~N~~416 = ~~N~~104

$\frac{12}{52}$  of ~~N~~416 = ~~N~~96

2.  $\frac{5}{24}$ , 0.2,  $\frac{1}{8}$  ( $\frac{5}{24} = 0.208$  (rounded off to three decimal places) and  $\frac{1}{8} = 0.125$ )

3.  $7\frac{13}{20}$ , 7.7,  $7\frac{3}{4}$  ( $7\frac{13}{20} = 7.65$  and  $7\frac{3}{4} = 7.75$ )

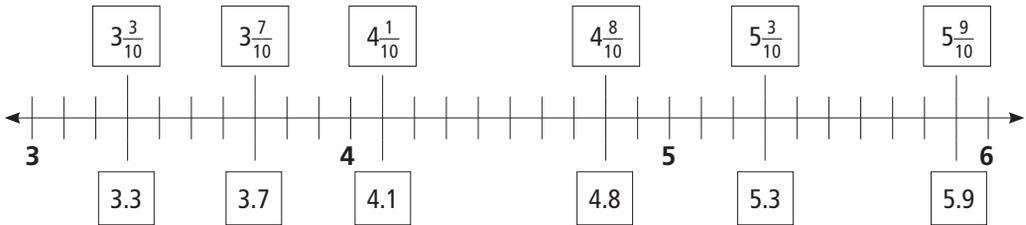
4. 4.89, 4.88, 4.81, 4.80, 4.08, 4.008

**Workbook: Exercise 18**

(WB page 21)

1. a) 11.6   b) 12   c) 12.3   d) 12.5   e) 12.8  
 f) 13.1   g) 13.8   h) 14.5   i) 14.8

2. Fractions are given above the number line and decimal numbers below the number line.



3. a)  $0.75 = \frac{75}{100} = \frac{3}{4}$    b)  $0.6 = \frac{6}{10} = \frac{3}{5}$    c)  $2.5 = 2\frac{5}{10} = 2\frac{1}{2}$   
 d)  $1.1 = 1\frac{1}{10} = \frac{11}{10}$    e)  $1.01 = \frac{101}{100}$    f)  $4.11 = 4\frac{11}{100} = 4\frac{22}{200}$

4. 0.6, 0.75, 1.01, 1.1, 2.5, 4.11

5. Fractions from top to bottom:

$\frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1}{5}, \frac{1}{6}, \frac{1}{7}, \frac{1}{8}, \frac{1}{9}, \frac{1}{10}, \frac{1}{11}, \frac{1}{12}, \frac{1}{13}, \frac{1}{14}, \frac{1}{15}, \frac{1}{16}$

Decimal numbers from top to bottom:

0.5, 0.33, 0.25, 0.2, 0.167, 0.14, 0.125, 0.11, 0.1, 0.091, 0.083, 0.077, 0.071, 0.067, 0.0625

6. a) 9 000   b) 3  
 c) 100 000   d) 0.02

- |               |          |
|---------------|----------|
| e) 0.2        | f) 9     |
| g) 80         | h) 0.002 |
| i) 4 000 000  | j) 0.1   |
| k) 60 000 000 | l) 4     |
7. a)  $9\,000 - 20 = 8\,980$       b)  $5.0 - 0.3 = 4.7$   
 c)  $0.02 - 0.003 = 0.017$     d)  $20.0 - 0.02 = 19.98$   
 e)  $800\,000 - 30 = 799\,970$     f)  $90.0 - 0.007 = 8.993$   
 g)  $50\,000 - 0.6 = 49\,999.4$     h)  $8 - 0.008 = 7.992$

## Unit 6: Working with ratio and proportion

### Teaching guidelines and solutions

In this unit, the focus is on ratios and proportion. Pupils will solve real-life problems that involve ratio, and work with direct and indirect proportion. They will look at family sizes and resources, compare populations and look at HIV/AIDS prevalence between males and females and between countries.

### Ratio

Make sure pupils understand that the following example ratios all mean the same thing: 1 to 4 (in sentences) 1 : 4,  $\frac{1}{4}$ , 0.25 and 25%. We simplify ratios where possible.

#### Exercise 1

(PB page 55)

- Crosses : ticks =  $16 : 4 = 4 : 1$
  - Red arrows : blue arrows =  $1 : 2$
  - Stars : circles =  $3 : 1$
  - Triangles : squares =  $15 : 5 = 3 : 1$

- She needs 8 pineapples.

#### Workbook: Exercise 19

(WB page 24)

- Two options are given for each answer. Other answers could also be correct.

- Dark grey represents red, light grey represents blue.



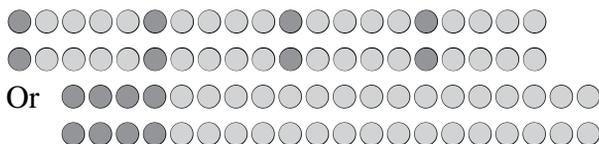
Or,

- Dark grey represents green, light grey represents yellow.

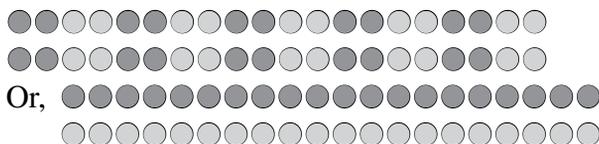


Or,

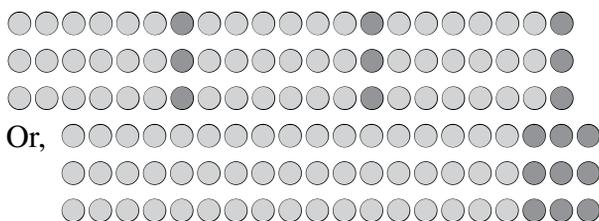
- c) Dark grey represents green, light grey represents pink.



- d) Dark grey represents blue, light grey represents yellow.



- e) Dark grey represents blue, light grey represents green.



2. a)  $\clubsuit : \heartsuit = 30 : 50 = 3 : 5$  and  $\heartsuit : \clubsuit = 50 : 30 = 5 : 3$   
 b)  $\blacksquare : \bullet = 54 : 18 = 3 : 1$  and  $\bullet : \blacksquare = 18 : 54 = 1 : 3$   
 c)  $\times$  to  $\checkmark = 12 : 40 = 3 : 10$  and  $\checkmark$  to  $\times = 40 : 12 = 10 : 3$
3. a) Chairs : tables = 2 : 1      b) Chairs : tables = 11 : 1  
 c) Chairs : tables = 8 : 2 = 4 : 1

## Sharing in a ratio

You can share an amount or a number in a certain ratio. Ensure that the quantities in a ratio are in the same unit. So, for example, you can compare metres with metres, but not metres with centimetres.

### Workbook: Exercise 20

(WB page 26)

1. a) Number of parts:  $1 + 1 = 2$ ;  $\frac{1}{2}$  of 600 = ₹300  
 Check:  $300 + 300 = 600$   
 b) Number of parts:  $1 + 2 = 3$ ;  $\frac{1}{3}$  of 600 = ₹200;  
 $\frac{2}{3}$  of 600 = ₹400  
 Check:  $200 + 400 = 600$   
 c) Number of parts:  $1 + 3 = 4$ ;  $\frac{1}{4}$  of 600 = ₹150;  
 $\frac{3}{4}$  of 600 = ₹450  
 Check:  $150 + 450 = 600$

- d) Number of parts:  $1 + 5 = 6$ ;  $\frac{1}{6}$  of 600 = ~~₦~~100;  
 $\frac{5}{6}$  of 600 = ~~₦~~500  
 Check:  $100 + 500 = 600$
- e) Number of parts:  $4 + 6 = 10$ ;  $\frac{4}{10}$  of 600 = ~~₦~~240;  
 $\frac{6}{10}$  of 600 = ~~₦~~360  
 Check:  $240 + 360 = 600$
- f) Number of parts:  $5 + 10 = 15$ ;  $\frac{5}{15}$  of 600 = ~~₦~~200;  
 $\frac{10}{15}$  of 600 = ~~₦~~400  
 Check:  $200 + 400 = 600$
2. a)  $3 : 27 = 1 : 9$     b)  $6 : 54 = 1 : 9$     c)  $25 : 200 = 1 : 8$   
 d)  $64 : 88 = 8 : 11$  e)  $35 : 63 = 5 : 9$  f)  $60 : 72 = 5 : 6$
3. a)  $8 : 12$ ; divide by 4; simplified ratio:  $2 : 3$   
 b)  $9 : 81$ ; divide by 9; simplified ratio:  $1 : 9$   
 c)  $50 : 450$ ; divide by 50; simplified ratio:  $1 : 9$   
 d)  $375 : 500$ ; divide by 125; simplified ratio:  $3 : 4$

## Exercise 2

(PB page 56)

1. a)  $3 : 5 = 12 : 20$                       b)  $7 : 9 = 21 : 27$   
 c)  $25 : 9 = 50 : 18$                       d)  $6 : 30 = 1 : 5$   
 e)  $1 : 6 = 4 : 24$                           f)  $16 : 28 = 4 : 7$   
 g)  $1 : 4 = 6 : 24$                           h)  $6 : 15 = 18 : 45$   
 i)  $0.7 : 2 = 6.3 : 18$                       j)  $2 : 6 = 12 : 36$
2. a)  $10 : 6 = 5 : 3$   
 b)  $1\frac{1}{2} : 2\frac{1}{2} = \frac{3}{2} : \frac{5}{2} = 3 : 5$   
 c)  $6 \text{ cm} : 6 \text{ mm} = 60 : 6 = 10 : 1$   
 d) ~~₦~~9 600 : ~~₦~~6 000 =  $96 : 60 = 8 : 5$   
 e)  $6 \text{ cm} : 1 \text{ m} = 6 : 100 = 3 : 50$   
 f)  $8 : 12 = 2 : 3$                           g)  $400 : 500 = 4 : 5$   
 h)  $15 : 10 = 3 : 2$                           i)  $8 : 6 = 4 : 3$   
 j)  $3\ 000 : 600 = 5 : 1$
3. Weekend days : school days =  $2 : 5$   
 $\frac{5}{7}$  of 70 = 50; There are 50 school days in 10 weeks.
4.  $4 : 5 = 32 : 40$ ; The width is 32 cm.
5. a)  $60 \text{ cm to } 3\ 000 \text{ mm} = 600 : 3\ 000 = 1 : 5$   
 b)  $12 \text{ kg to } 960 \text{ g} = 12\ 000 : 960 = 25 : 2$   
 c)  $15 \text{ m to } 360 \text{ cm} = 1\ 500 : 360 = 25 : 6$   
 d)  $17 \text{ to } 85 = 1 : 5$

6.  $1 : 8 = 25 : 200$   
25 taxis can transport 200 people.
7.  $40 : 300 = 1 : 7.5$   
One dose is 7.5 ml.

### Exercise 3

(PB page 57)

1. a) Akwa Ibom:  $4\ 500\ 000 : 6\ 500 = 9\ 000 : 13$   
 b) Delta:  $4\ 500\ 000 : 17\ 000 = 4\ 500 : 17$   
 c) Ekiti:  $2\ 500\ 000 : 6\ 000 = 2\ 500 : 6$   
 d) Kebbi:  $3\ 500\ 000 : 37\ 500 = 35\ 000 : 375 = 1\ 400 : 15$   
 $= 280 : 3$   
 e) Lagos:  $14\ 500\ 000 : 3\ 500 = 145\ 000 : 35 = 29\ 000 : 7$   
 f) Osun:  $4\ 000\ 000 : 8\ 500 = 40\ 000 : 85$   
 $= 8\ 000 : 17$   
 g) Rivers:  $5\ 500\ 000 : 47\ 000 = 5\ 500 : 47$   
 h) Yobe:  $2\ 500\ 000 : 937\ 000 = 2\ 500 : 937$
2. a) Anambara: males : females  
 $= 2\ 100\ 000 : 1\ 900\ 000 = 21 : 19$   
 b) Edo: males : females  
 $= 1\ 600\ 000 : 1\ 600\ 000 = 16 : 16 = 1 : 1$   
 c) Kwara: males : females  
 $= 1\ 250\ 000 : 1\ 150\ 000 = 125 : 115 = 25 : 23$   
 d) Lagos: males : females  
 $= 4\ 600\ 000 : 4\ 400\ 000 = 46 : 44 = 23 : 22$   
 e) Osun: males : females  
 $= 1\ 800\ 000 : 1\ 700\ 000 = 18 : 17$   
 f) Sokoto: males : females  
 $= 1\ 850\ 000 : 1\ 850\ 000 = 185 : 185 = 1 : 1$
3.  $4 + 5 = 9$ ; number of girls:  $\frac{5}{9}$  of  $45 = 25$
4. People infected with HIV to total population =  $1\ 000 : 100\ 000$   
 $= 1 : 100$
5. a) Apples to mangoes =  $4 : 6 = 2 : 3$   
 b) Oranges to mangoes =  $8 : 6 = 4 : 3$   
 c) Mangoes to apples =  $6 : 4 = 3 : 2$   
 d) Bananas to oranges =  $14 : 8 = 7 : 4$
6. Number of parts in ratio:  $4 + 3 = 7$   
 First daughter receives:  $\frac{4}{7} \times 7\ 000 = \text{N}4\ 000$

Second daughter receives:  $\frac{3}{7} \times 7\ 000 = \text{R}3\ 000$

Check:  $\text{R}4\ 000 + \text{R}3\ 000 = \text{R}7\ 000$

7. Height of building to height of house =  $9 : 2$   
=  $\square : 12 = 54 : 12$

Height of building: 54 m

8. a)  $15 : 45 = 1 : 3$

b)  $\frac{3}{4} : 1\frac{1}{2} = \frac{3}{4} : \frac{3}{2} = \frac{3}{4} : \frac{6}{4} = 1 : 2$

c)  $125 : 175 = 5 : 7$

9. Number of parts in ratio:  $3 + 2 = 5$

First young man receives:  $\frac{3}{5}$  of  $4\ 800 = \text{R}2\ 880$

Second young man receives:  $\frac{2}{5}$  of  $4\ 800 = \text{R}1\ 920$

Check:  $\text{R}2\ 880 + \text{R}1\ 920 = \text{R}4\ 800$

10. People to budget =  $9\ 000\ 000 : \text{R}45\ 000\ 000 = 1 : 5$

## Proportion

Amounts are in direct proportion when one amount increases (or decreases) as the other amount increases (or decreases). Give pupils a few simple examples to help them remember direct proportion such as the more apples you buy, the more you have to pay.

Indirect proportion refers to when one quantity increases, the other quantity decreases. Discuss a few examples such as the more people who share a bunch of bananas, the fewer bananas there are for each person.

Work through the examples with the class.

### Exercise 4

(PB page 62)

1. a)  $2 \times 160 = 320\text{ g}$

b)  $5 \times 160 = 800\text{ g}$

c)  $6 \times 160 = 960\text{ g}$

d)  $10 \times 160 = 1\ 600\text{ g}$

2. a) Walk 9 km in 3 h

He walks 3 km in 1 h. (He walks 1 km in  $\frac{60}{3} = 20$  min.)

b) Walk 4 km:  $4 \times 20\text{ min.} = 80\text{ min.} = 1\text{ h } 20\text{ min.}$

He walks 4 km in 1 h 20 min.

c) Walk 10 km:  $10 \times 20\text{ min.} = 200\text{ min.} = \frac{200}{60} = 3\text{ h } 20\text{ min.}$

He walks 10 km in 3 h 20 min.

3.

Number of books	1	10	15	20	40	50	75	100
Price (₦)	3 500	35 000	52 500	70 000	140 000	175 000	262 500	350 000

4. The worker earns  $\frac{12\,000}{16} = \text{₦}750$  per hour
  - a) Pay for 8 h:  $8 \times 750 = \text{₦}6\,000$
  - b) Pay for 12 h:  $12 \times 750 = \text{₦}9\,000$
  - c) Pay for 28 h:  $28 \times 750 = \text{₦}21\,000$
  - d) Pay for 40 h:  $40 \times 750 = \text{₦}30\,000$
5. Cost for four boxes:  $4 \times \text{₦}375 = \text{₦}1\,500$
6.  $15 \times \text{₦}0.22 = \text{₦}3.30$
7. Price for 6 kg =  $3 \times \text{₦}816.60 = \text{₦}2\,449.80$
8. Distance =  $15 \times 5 = 75$  km

### Exercise 5

(PB page 63)

1. a) 8 men take 20 days to build a house.  
 1 man will take  $8 \times 20 = 160$  days to build the house.  
 5 men will take  $\frac{160}{5} = 32$  days to build the house  
 or, 5 men take  $\frac{8}{5} \times 20 = 32$  days to build the house.
  - b) The quantities are inversely proportional.
2. 6 women take 48 h 20 min. (or, 2 900 min.) to prepare food.  
 2 women take 48 h 20 min.  $\times 3 = 145$  h to prepare the food  
 (or, 2 women take  $2\,900 \times 3 = 8\,700$  min.) to prepare the food.  
 $\frac{8\,700}{60} = 145$  h  
 So, 8 women take  $\frac{145\text{ h}}{4} = 36$  h 15 min. to prepare the food  
 or, 8 women take  $\frac{145 \times 60}{4} = 2\,175$  min. = 36.25 h  
 = 36 h 15 min. to prepare the food  
 or, 8 women take  $\frac{6}{8} \times 2\,900$  min. = 2 175 min.  
 = 36 h 15 min. to prepare the food.
3. 12 gardeners take 8 days to plant 75 trees.  
 1 gardener takes  $12 \times 8 = 96$  days to plant 75 trees.  
 25 gardeners take  $\frac{96}{25} = 3.84$  days to plant 75 trees.  
 Round off 3.84 days to 4 days.  
 Or, 25 gardeners take  $\frac{12}{25} \times 8 = 3.84$  days to plant 75 trees.

4. 1 water pump fills a water tank in 4 h  
2 water pumps fill a water tank in  $\frac{1}{2} \times 4 = 2$  h
5. 20 workers take 6 days to make the beams.  
10 workers take  $6 \times 2 = 12$  days to make beams.  
30 workers take  $\frac{12}{3} = 4$  days to make the beams  
or, 30 workers take  $\frac{20}{30} \times 6 = 4$  days to make the beams.
6. One secretary takes 2 h to type 3 papers.  
Two secretaries take  $\frac{1}{2} \times 2$  h = 1 h to type 3 papers.
7. 8 people take 14 days to eat 5 kg of apples.  
5 people take  $\frac{8}{5} \times 14 = 22.4$  days to eat 5 kg of apples.

### Workbook: Exercise 21

(WB page 27)

1.

Pupils	1	2	3	10	20	45	50	75	100
Shoes	2	4	6	20	40	90	100	150	200

2. Number of pupils  $\times 2 =$  number of shoes

3.

Centimetres	1	4	10	65	80	95	100
Millimetres	10	40	100	650	800	950	1 000

4. Number of centimetres  $\times 10 =$  number of millimetres
5.  $32 \times 20 = 640$  matches
6.  $16 \times 5 = 80$  stairs
7. Direct proportion means that when one amount increases, the other amount increases.

8.

Months	1	2	3	4	5	12	24
Amount (₹)	250	500	750	1 000	1 250	3 000	6 000

9. a) 6  
b) 2
10. 1 painter will take  $12 \times 4$  hours = 48 hours.  
8 painter will take  $48$  hours  $\div 8 = 6$  hours.

11. 3 people build a wall in 8 days.  $3 \times 8 = 24$   
 24 people build a wall in 1 day.  $24 \times 1 = 24$   
 4 people build a wall in 6 days.  $4 \times 6 = 24$   
 6 people build a wall in 4 days.  $6 \times 4 = 24$   
 8 people build a wall in 3 days.  $8 \times 3 = 24$   
 12 people build a wall in 2 days.  $12 \times 2 = 24$
12. The products in question 11 are the products of 24.
13. Indirect proportion means that when one amount increases, the other amount decreases.

## Ratios in different contexts

We can use ratio to understand better how resources are spent. In this section, pupils solve problems that involve the ratios of family size and resources, populations and the prevalence of HIV/AIDS between women and men, and between different states.

### Exercise 6

(PB page 65)

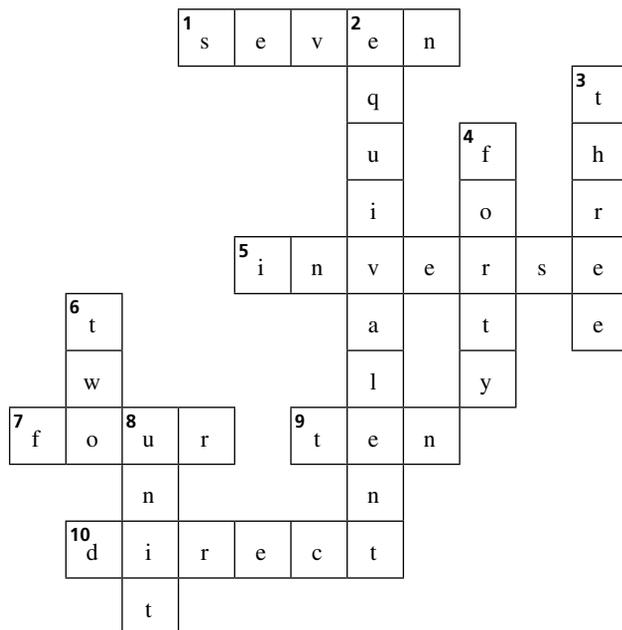
1. Family members to hours to clean house =  $6 : 2 = 3 : 1$   
 Answers may differ about whether it is fair for all members of a house to help clean the house.
2.  $\text{N}140\ 000 - \text{N}50\ 000 = \text{N}90\ 000$   
 a) Income to family members =  $90\ 000 : 5 = 18\ 000 : 1$   
 b) Income to family members =  $90\ 000 : 8 = 11\ 250 : 1$
3. Savings:  $\text{N}10\ 000 \times 6 \times 12 = \text{N}720\ 000$   
 Children to savings =  $2 : 720\ 000 = 1 : 360\ 000$
4. a) Population age group A to age group B  
 $= 360 : 144 = 5 : 2$   
 b) Group A males to females =  $183 : 177 = 61 : 59$   
 c) Group D males to females =  $12 : 20 = 3 : 5$   
 d) Population group A to age group D  
 $= 360 : 32 = 45 : 4$   
 e) Total ratio of males to females  
 $= 394 : 406 = 197 : 203$   
 f) Population age group C to age group D  
 $= 264 : 32 = 33 : 4$
5. a) The population more than quadrupled  
 $(45\ 000\ 000 \times 4 = 180\ 000\ 000)$ .  
 b) C  $1 : 4$

6. a) Fruit to vegetables = 11 : 7  
 b)  $4 : 14 = 2 : 7$                       c)  $5 : 13$
7. Cost =  $6 \times \text{N}82.50 = \text{N}495.00$
8. Dibia family to Monye family =  $4 : 12 = 1 : 3$
9. Niger river to Ogun river =  $1\ 200\ \text{km} : 300\ \text{km} = 4 : 1$

### Exercise 7 (challenge)

(PB page 67)

1. a) Lagos to Enugu =  $5\ 200\ 000 : 400\ 000 = 13 : 1$   
 b) Bauchi to Aba =  $200\ 000 : 500\ 000 = 1 : 2.5$   
 c) Gboko to Kano =  $100\ 000 : 2\ 200\ 000 = 1 : 22$
2. a) Ghana to Cameroon =  $26\ 450\ 000 = 21\ 300\ 000 = 1.24 : 1$   
 b) Gabon to Nigeria =  $2\ 200\ 000 = 178\ 000\ 000 = 1 : 80.9$   
 c) Ethiopia to Kenya =  $86\ 500\ 000 : 43\ 250\ 000 = 2 : 1$
3. Pupils to budget =  $60\ 000 : \text{N}5\ 000\ 000 = 1 : 83.33$
4. 30 workers build a wall in 15 days.  
 10 workers build the wall in  $\frac{30}{10} \times 15 = 45$  days.
5. 6 men hoe the field in 12 h  
 9 men hoe the field in  $\frac{6}{9} \times 12 = 8$  h
6. Ratio of women to men =  $740 : 600 = 37 : 30$
7.  $8 : 40 = 1 : 5$
8. a) Rivers to Nasarwa  
 =  $15.2 : 8.1 = 152 : 81 = 1.8 : 1 \approx 2 : 1$   
 b) Taraba to Kaduna  
 =  $10.5 : 9.2 = 105 : 92 = 1.14 : 1 \approx 1 : 1$   
 c) Rivers to Taraba  
 =  $15.2 : 10.5 = 152 : 105 = 1.4 : 1 \approx 1 : 1$
9. a) The last four digits in all three numbers are 0.  
 b) Women to men  
 =  $1\ 600\ 000 : 1\ 400\ 000 = 16 : 14 = 8 : 7 = 1 : 14$   
 c) Children to adults  
 =  $270\ 000 : (1\ 600\ 000 + 1\ 400\ 000)$   
 =  $270\ 000 : 3\ 000\ 000 = 27 : 300 = 9 : 100$   
 d) Women to children and men  
 =  $1\ 600\ 000 : (1\ 400\ 000 + 270\ 000)$   
 =  $1\ 600\ 000 : 1\ 670\ 000 = 160 : 167$



## Unit 7: Working with percentages

### Teaching guidelines and solutions

In this unit, the focus is on writing one number as a percentage of another number, calculating percentage increase and percentage decrease and solving problems that involve percentages.

The unit starts with a revision of percentages. The diagrams on page 69 show percentages as parts of 100. Pupils can make a few similar diagrams to display in class. Check with the class if they agree on the percentage of blocks that are shaded on each diagram.

### Write a number as a percentage of another number

Pupils should work through the examples to practise writing one number as a percentage of another.

#### Exercise 1

(PB page 70)

1. a)  $\frac{1}{10} \times \frac{100}{1} = 10\%$

b)  $\frac{75}{225} \times \frac{100}{1} = 33.3\%$

- c)  $\frac{28}{112} \times \frac{100}{1} = 25\%$   
d)  $\frac{85}{510} \times \frac{100}{1} = 16.66\%$
2. a)  $\frac{9}{36} \times \frac{100}{1} = 25\%$       b)  $\frac{(36-9)}{36} \times \frac{100}{1} = 75\%$
3.  $\frac{5}{25} \times \frac{100}{1} = 20\%$
4. a)  $\frac{15}{100}$  of 180 = 27      b)  $\frac{25}{100}$  of 88 = 22  
c)  $\frac{32}{100}$  of 500 = 160      d)  $\frac{55}{100}$  of 720 = 396  
e)  $\frac{36}{100}$  of 225 = 81      f)  $\frac{48}{100}$  of 725 = 348  
g)  $\frac{62}{100}$  of 1 000 = 620      h)  $\frac{73}{100}$  of 1 700 = 1 241  
i)  $\frac{85}{100}$  of 1 900 = 1 615      j)  $\frac{90}{100}$  of 14 630 = 13 167
5. a)  $\frac{12}{100}$  of 350 = 42 pupils  
b)  $\frac{27}{100}$  of 1 200 = 324 days  
c)  $\frac{39}{100}$  of 2 000 = 780 cows  
d)  $\frac{44}{100}$  of 7 200 = 3 168 telephones  
e)  $\frac{58}{100}$  of 1 300 = 754 beds  
f)  $\frac{62}{100}$  of 7 250 = 4 495 books  
g)  $\frac{74}{100}$  of 1 000 mm = 740 mm  
h)  $\frac{69}{100}$  of ₦1 500 = ₦1 035  
i)  $\frac{82}{100}$  of 1 200 lamps = 984 lamps  
j)  $\frac{93}{100}$  of 146 300 people = 136 059 people

## Exercise 2

(PB page 71)

1.  $\frac{8}{32} \times \frac{100}{1} = 25\%$
2.  $\frac{37}{50} \times \frac{100}{1} = 74\%$
3.  $\frac{25}{100} \times 48 = 12$  apple trees died, 36 apple trees did not die.
4. a)  $29 + 43 + 9 = 81$ ; so, 19% of the pupils prefer green.  
b)  $\frac{43}{100} \times 400 = 172$  pupils prefer blue.  
c)  $\frac{29}{100} \times 400 = 116$  pupils prefer red.

- d)  $\frac{9}{100} \times 400 = 36$  pupils prefer yellow.
- e)  $\frac{19}{100} \times 400 = 76$  pupils prefer green.
5.  $\frac{90}{100} \times 150 = 135$  pupils walk to school.
6.  $70\% = 63$ ; so,  $100\% = \frac{63}{70} \times 100 = 90$  pupils
7.  $100\% - 55\% = 45\%$  of families have fewer than five children.
- 8.

Total	100	420	850
8%	8	33.6	68
25%	25	105	212.5
56%	56	235.2	476
72%	72	302.4	612
80%	80	336	680

### Workbook: Exercise 23

(WB page 30)

1.

	Fraction	Decimal number	Percentage
a)	$\frac{1}{2}$	0.5	50%
b)	$\frac{1}{4}$	0.25	25%
c)	$\frac{1}{5}$	0.2	20%
d)	$\frac{1}{1}$	1.0	100%
e)	$\frac{3}{10}$	0.3	30%
f)	$\frac{1}{8}$	0.125	12.5%
g)	$\frac{2}{5}$	0.4	40%
h)	$\frac{6}{10}$	0.6	60%
i)	$\frac{7}{10}$	0.7	70%
j)	$\frac{3}{8}$	0.375	37.5%
k)	$\frac{55}{100}$ or $\frac{11}{20}$	0.55	55%
l)	$\frac{3}{4}$	0.75	75%
m)	$\frac{9}{10}$	0.9	90%
n)	$\frac{8}{10}$ or $\frac{4}{5}$	0.8	80%
o)	$\frac{19}{20}$ or $\frac{95}{100}$	0.95	95%

2. a) 5% of 100 2  
 b) 20% of 10 4  
 c) 10% of 40 5  
 d) 15% of 40 6  
 e) 50% of 40 8  
 f) 10% of 100 10  
 g) 15% of 120 12  
 h) 75% of 20 14  
 i) 20% of 110 15  
 j) 50% of 42 18  
 k) 75% of 120 20  
 l) 20% of 60 21  
 m) 40% of 80 22  
 n) 80% of 10 30  
 o) 100% of 14 32
- 90

3.  $\frac{4}{10} = \frac{2}{5} = 40\% = 0.4 = \frac{8}{20} = \frac{120}{300}$

## Percentage increase and decrease

Being able to calculate percentage increases and decreases is a useful skill that people need in real life to calculate prices.

Ensure pupils understand the following terms:

- cost price – the price that is paid for an item
- selling price – the price for which an item is sold
- profit = selling price – cost price
- loss = cost price – selling price.

Write the following formulae on the board or on posters:

- Percentage profit =  $\frac{\text{profit}}{\text{cost price}} \times \frac{100}{1}$
- Percentage increase =  $\frac{\text{profit}}{\text{cost price}} \times \frac{100}{1} = \frac{\text{selling price} - \text{cost price}}{\text{cost price}} \times \frac{100}{1}$

$$\begin{aligned} \text{Percentage increase} &= \frac{\text{change in amounts}}{\text{initial amount}} \times \frac{100}{1} \\ &= \frac{\text{new amount} - \text{initial amount}}{\text{initial amount}} \times \frac{100}{1} \end{aligned}$$

- Percentage decrease =  $\frac{\text{loss}}{\text{cost price}} \times \frac{100}{1} = \frac{\text{cost price} - \text{selling price}}{\text{cost price}} \times \frac{100}{1}$
- Percentage decrease =  $\frac{\text{change in amount}}{\text{initial amount}} \times \frac{100}{1}$   
 $= \frac{\text{most recent amount} - \text{initial amount}}{\text{initial amount}} \times \frac{100}{1}$
- Change in amount =  $\frac{\text{percentage decrease} \times \text{initial amount}}{100}$

### Exercise 3

(PB page 75)

- $\frac{112}{100} \times 2\,000 = \text{R}2\,240$
- $\frac{30\,000 - 25\,000}{25\,000} \times \frac{100}{1} = \frac{5\,000}{25\,000} \times \frac{100}{1} = 20\%$
- $\frac{15\,000 - 12\,000}{12\,000} \times \frac{100}{1} = \frac{3\,000}{12\,000} \times \frac{100}{1} = 25\%$
- $\frac{25\,000}{450\,000} \times \frac{100}{1} = 5.56\%$
- $\frac{300}{500} \times \frac{100}{1} = 60\%$
- $\frac{50}{250} \times \frac{100}{1} = 20\%$
- $\text{R}5\,000\,000 - \text{R}500\,000 = \text{R}4\,500\,000$
  - $\frac{500\,000}{4\,500\,000} \times \frac{100}{1} = 11.1\%$

### Workbook: Exercise 24

(WB page 32)

- 10% discount:  
 Decrease in price =  $10\% \times \text{R}15\,000 = \frac{10}{100} \times \frac{15\,000}{1} = \text{R}1\,500$   
 Selling price =  $15\,000 - 1\,500 = \text{R}13\,500$   
 20% increase =  $120\% \times \text{R}15\,000 = \frac{120}{100} \times \frac{15\,000}{1} = \text{R}18\,000$   
 10% increase:  
 Increase in price =  $10\% \times \text{R}15\,000 = \frac{10}{100} \times \frac{15\,000}{1} = \text{R}1\,500$   
 Selling price =  $15\,000 + 1\,500 = \text{R}16\,500$   
 25% discount =  $75\% \times \text{R}15\,000 = \frac{75}{100} \times \frac{15\,000}{1} = \text{R}11\,250$
- Calculate the percentage increase or decrease.
  - Percentage increase =  $\frac{2\,000}{10\,000} \times \frac{100}{1} = 20\%$
  - Percentage decrease =  $\frac{10\,000}{25\,000} \times \frac{100}{1} = 40\%$
- Percentage increase =  $\frac{500}{4\,000} \times \frac{100}{1} = 12.5\%$
  - Percentage decrease =  $\frac{1\,000}{10\,000} \times \frac{100}{1} = 10\%$
  - Percentage increase =  $\frac{2\,000}{16\,000} \times \frac{100}{1} = 12.5\%$

- d) Percentage increase =  $\frac{3\,000}{25\,000} \times \frac{100}{1} = 12\%$
- e) Percentage decrease =  $\frac{2\,500}{30\,000} \times \frac{100}{1} = 8.33\%$
4. a) Selling price =  $\frac{110}{100} \times 17\,500 = \text{N}19\,250$
- b) Selling price =  $\frac{115}{100} \times 600\,000 = \text{N}690\,000$
- c) Selling price =  $\frac{105}{100} \times 1\,000\,000 = \text{N}1\,050\,000$
- d) Selling price =  $\frac{125}{100} \times 75\,000 = \text{N}93\,750$

### Exercise 4 (challenge)

(PB page 75)

1. Selling price =  $\frac{125}{100} \times 4\,000\,000 = \text{N}5\,000\,000$
2. Selling price =  $\frac{120}{100} \times 5\,000 = \text{N}6\,000$
3. Selling price =  $\frac{130}{100} \times 2\,500 = \text{N}3\,250$
4. Selling price =  $\frac{105}{100} \times \text{N}5\,000\,000 = \text{N}5\,250\,000$
5. a) Profit =  $\frac{10}{100} \times 100\,000\,000 = \text{N}10\,000\,000$
- b) Selling price =  $100\,000\,000 + 10\,000\,000 = \text{N}110\,000\,000$

### Exercise 5

(PB page 78)

1. Percentage loss =  $\frac{500\,000}{5\,500\,000} \times \frac{100}{1} = 9.09\%$
2. Percentage loss =  $\frac{5\,000}{20\,000} \times \frac{100}{1} = 25\%$
3. Percentage loss =  $\frac{50\,000}{300\,000} \times \frac{100}{1} = 16.67\%$
4. Percentage loss =  $\frac{2\,000}{10\,000} \times \frac{100}{1} = 20\%$
5. a) Loss =  $\text{N}80\,000 - \text{N}50\,000 = \text{N}30\,000$
- b) Percentage loss =  $\frac{30\,000}{80\,000} \times \frac{100}{1} = 37.5\%$

### Exercise 6

(PB page 79)

1. a) Percentage decrease =  $\frac{8\,000}{40\,000} \times \frac{100}{1} = 20\%$
- b) Percentage increase =  $\frac{2\,500}{10\,000} \times \frac{100}{1} = 25\%$
- c) Percentage increase =  $\frac{2\,000}{4\,000} \times \frac{100}{1} = 50\%$
2. Percentage decrease =  $\frac{150}{900} \times \frac{100}{1} = 16.67\%$
3. Percentage increase =  $\frac{6}{24} \times \frac{100}{1} = 25\%$

4. Selling price =  $\frac{110}{100} \times 250 = \text{N}275$
5. Increased number of schools =  $\frac{115}{100} \times 60 = 69$
6. Percentage increase =  $\frac{500}{3\,000} \times \frac{100}{1} = 16.67\%$
7. Percentage decrease =  $\frac{5}{54} \times \frac{100}{1} = 9.26\%$
8. Percentage decrease =  $\frac{1\,000\,000}{2\,600\,000} \times \frac{100}{1} = 38.46\%$
9. Percentage increase =  $\frac{138\,500\,000}{45\,000\,000} \times \frac{100}{1} = 307.78\%$
10. a) Profit =  $\text{N}21\,000 - \text{N}16\,000 = \text{N}5\,000$   
 b) Percentage profit =  $\frac{5\,000}{16\,000} \times \frac{100}{1} = 31.25\%$

### Exercise 7

(PB page 80)

1. a) Profit =  $\text{N}750 - \text{N}650 = \text{N}100$   
 b) Percentage profit =  $\frac{100}{650} \times \frac{100}{1} = 15.38\%$
2. a) Profit =  $\text{N}26\,000 - \text{N}25\,000 = \text{N}1\,000$   
 b) Percentage profit =  $\frac{1\,000}{25\,000} \times \frac{100}{1} = 4\%$
3. a) Profit =  $\text{N}32\,000 - \text{N}26\,500 = \text{N}5\,500$   
 b) Percentage profit =  $\frac{5\,500}{26\,500} \times \frac{100}{1} = 20.75\%$
4. Cost price =  $\text{N}485\,000 - \text{N}93\,000 = \text{N}392\,000$
5. Cost price =  $\text{N}198\,000 - \text{N}23\,000 = \text{N}175\,000$
6. Selling price =  $\text{N}470\,000 + \text{N}130\,000 = \text{N}600\,000$
7. a) Cost price =  $\text{N}7\,000\,000 - \text{N}500\,000 = \text{N}6\,500\,000$   
 b) Percentage profit =  $\frac{500\,000}{6\,500\,000} \times \frac{100}{1} = 7.69\%$
8. Cost price =  $\text{N}4\,000\,000\,000 - \text{N}800\,000\,000$   
 =  $\text{N}3\,200\,000\,000$
9. Cost price =  $\text{N}24\,200 - \text{N}2\,500$   
 =  $\text{N}21\,700$
10. Loss:  $\text{N}13\text{ million} - \text{N}8\text{ million} = \text{N}5\text{ million}$

### Exercise 8 (challenge)

(PB page 81)

Answers will depend on the examples pupils find.

**Unit 8: Add and subtract****Teaching guidelines and solutions**

In this unit, the focus is on solving problems that involve adding and subtracting whole numbers, solving word problems that involve adding and subtracting whole numbers, and adding and subtracting fractions and decimal numbers.

**Add and subtract whole numbers**

Work through the column method to add and subtract numbers. Check how well pupils remember how to use place value columns.

**Exercise 1**

(PB page 83)

1.
  - a)  $406 + 572 = 978$
  - b)  $8\ 560 + 65\ 629 = 74\ 189$
  - c)  $623\ 109 + 328\ 972 = 952\ 081$
  - d)  $9\ 493\ 653 + 650\ 238 = 10\ 143\ 891$
  - e)  $782\ 916 + 374\ 947 = 1\ 157\ 863$
  - f)  $7\ 491\ 056 + 1\ 167\ 843 = 8\ 658\ 899$
  - g)  $13\ 920\ 617 + 2\ 521\ 384 = 16\ 442\ 001$
  - h)  $814\ 252 + 5\ 175\ 382 = 5\ 989\ 634$
  - i)  $882\ 175 + 95\ 000 = 977\ 175$
  - j)  $101\ 603\ 000 + 312\ 000\ 200 = 413\ 603\ 200$
2.
  - a)  $823 - 632 = 191$
  - b)  $8\ 567 - 6\ 439 = 2\ 128$
  - c)  $28\ 153 - 6\ 368 = 21\ 785$
  - d)  $12\ 672 - 5\ 483 = 7\ 189$
  - e)  $9\ 251\ 675 - 524\ 382 = 8\ 727\ 293$
  - f)  $790\ 000 - 335\ 343 = 454\ 657$
  - g)  $1\ 285\ 325 - 566\ 925 = 718\ 400$
  - h)  $92\ 908\ 450 - 27\ 007\ 942 = 65\ 900\ 508$
  - i)  $120\ 300\ 500 - 115\ 200\ 100 = 5\ 100\ 400$
  - j)  $703\ 000\ 000 - 693\ 000\ 000 = 10\ 000\ 000$

## Exercise 2

(PB page 84)

- $\text{N}789\,500 + 2 \times \text{N}789\,500 = \text{N}2\,368\,500$
- $\text{N}5\,678\,000 - \text{N}850\,000 = \text{N}4\,828\,000$
- $808\,442\,605 - 516\,325\,834 = 292\,116\,771$  adults
- $\text{N}6\,247\,000 + \text{N}9\,362\,520 = \text{N}15\,609\,520$
- $\text{N}15\,934\,650 + \text{N}9\,054\,900 = \text{N}24\,989\,550$
  - $\text{N}15\,934\,650 - \text{N}9\,054\,900 = \text{N}6\,879\,750$
- $93 + 185 + 92 + 380 = 750$  km
- From 1960 to 1980 (20 years): 28 486 485
  - From 1980 to 2000 (20 years): 49 178 628
  - From 2000 to 2020 (20 years): 87 282 151
  - From 2020 to 2050 (30 years): 230 196 184
  - From 1960 to 2000 (40 years): 77 665 113
  - From 1960 to 2020 (60 years): 164 947 264
  - From 1960 to 2050 (90 years): 395 143 448

## Workbook: Exercise 25

(WB page 34)

- |       |         |                   |    |             |                  |
|-------|---------|-------------------|----|-------------|------------------|
| 1. a) | Oyo     | 5 591 589         | b) | Osun        | 3 423 535        |
|       | Borno   | <u>4 151 193</u>  |    | Cross River | <u>2 888 966</u> |
|       |         | <u>9 742 782</u>  |    |             | <u>6 312 501</u> |
| c)    | Taraba  | 2 300 736         | d) | Kogi        | 3 278 487        |
|       | Yobe    | <u>2 321 591</u>  |    | Imo         | <u>3 934 899</u> |
|       |         | <u>4 622 327</u>  |    |             | <u>7 213 386</u> |
| e)    | Lagos   | 9 013 534         | f) | Niger       | 3 950 249        |
|       | Katsina | <u>5 792 578</u>  |    | Jigawa      | <u>4 384 649</u> |
|       |         | <u>14 806 112</u> |    |             | <u>8 334 898</u> |
- 
- |       |                  |    |                  |
|-------|------------------|----|------------------|
| 2. a) | 9 383 682        | b) | 9 383 682        |
|       | <u>4 182 032</u> |    | <u>4 676 465</u> |
|       | <u>5 201 650</u> |    | <u>4 707 217</u> |
| c)    | 9 383 682        | d) | 9 383 682        |
|       | <u>1 703 358</u> |    | <u>1 405 201</u> |
|       | <u>7 680 324</u> |    | <u>7 978 481</u> |

## Add and subtract fractions

Remind pupils that the denominators of fractions must be the same before they can order or add or subtract the fractions.

Workbook Exercise 26 uses diagrams to show pupils what it means when denominators are the same. These diagrams should help pupils realise why denominators must be the same. If necessary, create similar diagrams to use when explaining how to add and subtract fractions.

Work through the steps on pages 85 and 86 in the Pupil's Book and the examples with the class. Check how well pupils understand how to convert fractions to mixed numbers and how to convert mixed numbers to fractions.

### Workbook: Exercise 26

(WB page 35)

1. a)  $\frac{2}{8} + \frac{5}{8} = \frac{7}{8}$

b)  $\frac{5}{16} + \frac{7}{16} = \frac{12}{16} = \frac{3}{4}$

c)  $\frac{9}{28} + \frac{5}{14} = \frac{9}{28} + \frac{10}{28} = \frac{19}{28}$

d)  $\frac{9}{16} + \frac{3}{9} = \frac{81}{144} + \frac{48}{144} = \frac{129}{144}$

2. Subtract  $\frac{1}{4}$  from each whole.

a)  $\frac{5}{16} - \frac{1}{4} = \frac{5}{16} - \frac{4}{16} = \frac{1}{16}$

b)  $\frac{5}{12} - \frac{1}{4} = \frac{5}{12} - \frac{3}{12} = \frac{2}{12} = \frac{1}{6}$

c)  $\frac{7}{8} - \frac{1}{4} = \frac{7}{8} - \frac{2}{8} = \frac{5}{8}$

d)  $\frac{2}{4} - \frac{1}{4} = \frac{1}{4}$

3. a)

10	11	6
5	9	13
12	7	8

b)

$5\frac{1}{4}$	$5\frac{1}{4}$	$2\frac{1}{4}$
$1\frac{1}{4}$	$4\frac{1}{4}$	$7\frac{1}{4}$
$6\frac{1}{4}$	$3\frac{1}{4}$	$3\frac{1}{4}$

c)  $3\frac{1}{2} + 1 + 4\frac{1}{2} = 9$

$3\frac{1}{2}$	4	$1\frac{1}{2}$
1	3	5
$4\frac{1}{2}$	2	$2\frac{1}{2}$

d)

$\frac{2}{10}$	$\frac{7}{10}$	$\frac{6}{10}$
$\frac{9}{10}$	$\frac{5}{10}$	$\frac{1}{10}$
$\frac{4}{10}$	$\frac{3}{10}$	$\frac{8}{10}$

4. a)

$\frac{8}{15}$	$\frac{1}{15}$	$\frac{2}{5} = \frac{6}{15}$
$\frac{1}{5} = \frac{3}{15}$	$\frac{1}{3} = \frac{5}{15}$	$\frac{7}{15}$
$\frac{4}{15}$	$\frac{9}{15}$	$\frac{2}{15}$

b)

$\frac{9}{2}$	1	$\frac{7}{2}$
2	3	4
$\frac{5}{2}$	5	$\frac{3}{2}$

### Exercise 3

(PB page 88)

1. a)  $\frac{4}{7} + \frac{2}{7} = \frac{6}{7}$       b)  $\frac{2}{9} + \frac{7}{9} = \frac{9}{9} = 1$   
 c)  $\frac{3}{16} + \frac{7}{16} = \frac{10}{16} = \frac{5}{8}$       d)  $\frac{7}{8} + \frac{5}{8} = \frac{12}{8} = 1\frac{4}{8} = 1\frac{1}{2}$   
 e)  $\frac{5}{9} + \frac{7}{9} = \frac{12}{9} = 1\frac{3}{9} = 1\frac{1}{3}$       f)  $\frac{9}{21} + \frac{7}{21} = \frac{16}{21}$
2. a)  $\frac{2}{3} + \frac{1}{6} = \frac{4}{6} + \frac{1}{6} = \frac{5}{6}$   
 b)  $\frac{5}{6} + \frac{3}{8} = \frac{20}{24} + \frac{9}{24} = \frac{29}{24} = 1\frac{5}{24}$   
 c)  $\frac{2}{3} + \frac{4}{11} = \frac{22}{33} + \frac{12}{33} = \frac{34}{33} = 1\frac{1}{33}$   
 d)  $\frac{4}{7} + \frac{2}{3} = \frac{12}{21} + \frac{14}{21} = \frac{26}{21} = 1\frac{5}{21}$   
 e)  $\frac{4}{9} + \frac{4}{5} = \frac{20}{45} + \frac{36}{45} = \frac{55}{45} = 1\frac{10}{45} = 1\frac{2}{9}$   
 f)  $\frac{3}{6} + \frac{3}{8} = \frac{12}{24} + \frac{9}{24} = \frac{21}{24} = \frac{7}{8}$
3. a)  $1\frac{5}{7} + 3\frac{1}{2} = 4\frac{10}{14} + \frac{7}{14} = 4\frac{17}{14} = 5\frac{3}{14}$   
 b)  $\frac{7}{10} + 2\frac{3}{8} = \frac{28}{40} + 2\frac{15}{40} = 2\frac{43}{40} = 3\frac{3}{40}$   
 c)  $3\frac{1}{4} + 2\frac{2}{3} = 5\frac{3}{12} + \frac{8}{12} = 5\frac{11}{12}$   
 d)  $4 + 5\frac{1}{3} = 9\frac{1}{3}$   
 e)  $\frac{4}{9} + 2\frac{5}{6} = \frac{16}{36} + 2\frac{30}{36} = 2\frac{36}{36} = 3$   
 f)  $10\frac{1}{10} + 1\frac{3}{20} = 11\frac{2}{20} + \frac{3}{20} = 11\frac{5}{20} = 11\frac{1}{4}$
4. a)  $3\frac{2}{3} + 2\frac{3}{4} + 9\frac{1}{6} = 14\frac{8}{12} + \frac{9}{12} + \frac{2}{12} = 14\frac{19}{12} = 15\frac{7}{12}$   
 b)  $2\frac{1}{4} + 4\frac{2}{5} + 4\frac{1}{6} = 10\frac{15+24+10}{60} = 19\frac{49}{60}$   
 c)  $\frac{1}{8} + 7 + 1\frac{2}{3} = 8\frac{3+16}{24} = 8\frac{19}{24}$   
 d)  $\frac{7}{10} + 1\frac{1}{5} + 3\frac{1}{4} = 4\frac{14+4+5}{20} = 4\frac{23}{20} = 5\frac{3}{20}$   
 e)  $2\frac{4}{5} + 7\frac{3}{10} + 4\frac{2}{3} = 13\frac{24+9+20}{30} = 13\frac{53}{30} = 14\frac{23}{30}$   
 f)  $4\frac{1}{2} + 2\frac{3}{5} + 1\frac{1}{6} + 2\frac{3}{4} = 9\frac{30+36+10+45}{60} = 9\frac{121}{60} = 11\frac{1}{60}$

### Exercise 4

(PB page 89)

- $5\frac{1}{4} + 6\frac{1}{3} = 11\frac{3+4}{12} = 11\frac{7}{12}$  bundles of firewood
- $\frac{3}{4} + 1\frac{1}{16} + \frac{7}{8} = 1\frac{12+1+14}{16} = 1\frac{27}{16} = 2\frac{11}{16}$  kg
- $2\frac{1}{4} + 3\frac{3}{4} + 1 = 6\frac{1+3}{4} = 6\frac{4}{4} = 7$  bags of carrots
- $1\frac{1}{2} + 2\frac{1}{4} + 2\frac{1}{4} = 5\frac{2+1+1}{4} = 5\frac{4}{4} = 6$  yams

### Exercise 5

(PB page 90)

- $\frac{8}{9} - \frac{2}{9} = \frac{6}{9} = \frac{2}{3}$
  - $\frac{13}{15} - \frac{8}{15} = \frac{5}{15} = \frac{1}{3}$
  - $\frac{7}{10} - \frac{7}{20} = \frac{14-7}{20} = \frac{7}{20}$
  - $\frac{9}{10} - \frac{7}{10} = \frac{2}{10} = \frac{1}{5}$
  - $\frac{3}{4} - \frac{2}{3} = \frac{9-8}{12} = \frac{1}{12}$
  - $\frac{5}{6} - \frac{3}{10} = \frac{25-9}{30} = \frac{14}{30} = \frac{7}{15}$
- $3\frac{4}{5} - 2\frac{3}{5} = 1\frac{1}{5}$
  - $6\frac{7}{10} - 2\frac{3}{10} = 4\frac{4}{10} = 4\frac{2}{5}$
  - $7\frac{2}{5} - 2\frac{3}{5} = 6\frac{7}{5} - 2\frac{3}{5} = 4\frac{4}{5}$
  - $9\frac{2}{3} - 5\frac{1}{2} = 4\frac{4-3}{6} = 4\frac{1}{6}$
  - $8\frac{3}{4} - 1\frac{2}{5} = 7\frac{15-8}{20} = 7\frac{7}{20}$
  - $11\frac{1}{2} - \frac{3}{4} = 10\frac{6-3}{4} = 10\frac{3}{4}$

### Exercise 6 (challenge)

(PB page 91)

- $3\frac{2}{3} - 1\frac{1}{3} = 2\frac{1}{3}$  cups of milk
- $4 - 1\frac{3}{4} = 2\frac{4-3}{4} = 2\frac{1}{4}$  sticks of butter
- $15\frac{1}{4} - 5\frac{1}{2} = 9\frac{5-2}{4} = 9\frac{3}{4}$  wood panels
- $100 - 82\frac{3}{4} = 17\frac{4-3}{4} = 17\frac{1}{4}$  bundles of insulation
- $\frac{5}{6} - \frac{3}{5} = \frac{25-18}{30} = \frac{7}{30}$   
 $\frac{7}{30}$  of container = 14 ℓ  
So,  $\frac{1}{30}$  of container = 2 ℓ  
So, full container =  $2 \times 30 = 60$  ℓ
- $\frac{3}{4} - \frac{1}{8} = \frac{5}{8}$
  - $1 - \frac{3}{4} - \frac{1}{8} = \frac{1}{8}$
  - $\frac{1}{8} + \frac{1}{4} + \frac{1}{2} + \frac{3}{4} + 1 = 2\frac{5}{8}$

## Add and subtract decimal numbers

Show pupils what we mean when we say that decimal points must align when we write one number below another number so that we can add or subtract. If we make a mistake here, the answer will be incorrect.

It is useful to use place value tables to help explain this concept. Refer to the two tables in the examples on page 92 in the Pupil's Book.

### Exercise 7

(PB page 92)

- |            |             |              |
|------------|-------------|--------------|
| a) 45.882  | b) 18.347   | c) 249.304   |
| d) 183.948 | e) 2 224.51 | f) 4 450.224 |
- |            |              |              |
|------------|--------------|--------------|
| a) 9.276   | b) 0.737     | c) 127.388   |
| d) 200.921 | e) 1 143.045 | f) 9 866.774 |

### Exercise 8

(PB page 93)

- |           |            |            |
|-----------|------------|------------|
| a) 1.67   | b) 4.49    | c) 22.5366 |
| d) 8.8777 | e) 26.9766 | f) 33.7997 |
- |              |               |                |
|--------------|---------------|----------------|
| a) ₦3 904.90 | b) ₦0.75      | c) ₦7.31       |
| d) ₦893.73   | e) ₦45 286.24 | f) ₦100 000.00 |
- |            |            |            |
|------------|------------|------------|
| a) ₦87.25  | b) ₦142.05 | c) ₦284.11 |
| d) ₦134.85 | e) ₦103.05 | f) ₦281.12 |

### Exercise 9

(PB page 93)

- |   |
|---|
| a) $27 + 25 - 42 = 10$  |
| b) $12\ 892 + 7\ 108 = 20\ 000$                                   |
| c) $92 + 73 + 48 + 35 + 52 = 300$                                 |
| d) $\frac{4}{5} + \frac{2}{3} + \frac{1}{10} + \frac{13}{30} = 2$ |
| e) $8\frac{1}{2} - 7\frac{3}{8} + \frac{7}{8} = 2$                |
| f) $8\frac{3}{7} + 2\frac{1}{14} - 5\frac{1}{2} - 5 = 0$          |
| g) $72.198 + 0.222 - 9.42 = 63$                                   |
| h) $9\ 351.91 - 9\ 000.01 = 351.9$                                |
- $\frac{10\ 000}{2\ 500} = 4$  months
- $\frac{1}{3} \times 90 = 30$  orange trees
- $\frac{1}{10} \times 30 = 3$  pupils cleaned the bathrooms.  
 $\frac{1}{5}$  of 30 = 6 pupils cleaned the water source.



The calculations show an interesting pattern. Follow the steps. As pupils do not work with negative numbers yet, the first digit in the first number must always be larger than the last digit in this number.

<p><b>Step 1:</b> Write a three-digit number with the first digit larger than the last digit.</p> $\begin{array}{r} \text{—————} 411 \\ - 114 \\ \hline \end{array}$ <p><b>Step 3:</b> Subtract.</p> $\text{—————} \underline{297}$	<p><b>Step 2:</b> Write the first number with the digits reversed. Write 114 because the first number is 411.</p>
<p><b>Step 4:</b> Write the answer to the above subtraction problem.</p> $\begin{array}{r} \text{—————} 297 \\ + 792 \\ \hline \end{array}$ <p><b>Step 6:</b> Add.</p> $\text{—————} \underline{1\ 089}$	<p><b>Step 5:</b> Write the above number with the digits reversed. Write 792 as the answer is 297.</p>

**Note:** The answer to any such calculation is 1 089!

### Exercise 10 (challenge)

(PB page 94)

Make sure pupils understand that income refers to money someone receives (such as a salary) and that expenses refer to things we spend money on (such as rent and food).

When a budget (financial plan) balances the income and expenses have the same total.

### Workbook: Exercise 29

(WB page 39)

Pupils write the items in the budget. Work with pupils to fill in realistic amounts for your city or town for this year.

Income	Amounts
Salary	
Bonus	
<b>Total</b>	
Expenses	Amounts
Food	
Transport	
Cellphone	
Clothing	

Expenses (continued)	Amounts
Electricity	
Internet	
Haircut	
Insurance	
<b>Total</b>	

## Unit 9: Multiply

### Teaching guidelines and solutions

In this unit, the focus is on multiplying whole numbers, fractions and decimal numbers. Pupils will also work with the squares of numbers (up to 500) and perfect squares.

### Revise quick multiplication methods

Display multiplication tables on the board and revise these tables with the class.

The unit starts with revision of quick multiplication by 2, 5, 9, 11, 25 and 50. Work through the examples with the class.

#### Exercise 1

(PB page 96)

- Pupils discuss multiplication shortcuts.
- Pupils should use the shortcuts to work out the answers.
  - $350 \times 2 = 700$
  - $460 \times 5 = \frac{4\ 600}{2} = 2\ 300$
  - $54 \times 9 = 540 - 54 = 486$
  - $130 \times 11 = 1\ 300 + 130 = 1\ 430$
  - $64 \times 25 = \frac{6\ 400}{4} = 1\ 600$
  - $64 \times 50 = \frac{6\ 400}{2} = 3\ 200$

#### Exercise 2

(PB page 96)

- $1\ 250 \times 2 = 2\ 500$
- $5\ 400 \times 2 = 10\ 800$

3.  $850 \times 5 = \frac{8\,500}{2} = 4\,250$
4.  $1\,525 \times 5 = \frac{15\,250}{2} = 7\,625$
5.  $25 \times 9 = 250 - 25 = 225$
6.  $64 \times 9 = 640 - 64 = 576$
7.  $123 \times 9 = 1\,230 - 123 = 1\,107$
8.  $715 \times 9 = 7\,150 - 715 = 6\,435$
9.  $1\,429 \times 9 = 14\,290 - 1\,429 = 12\,861$
10.  $2\,564 \times 9 = 25\,640 - 2\,564 = 23\,076$
11.  $238 \times 10 = 2\,380$
12.  $371 \times 10 = 3\,710$
13.  $875 \times 10 = 8\,750$
14.  $2\,567 \times 10 = 25\,670$
15.  $164 \times 11 = 1\,640 + 164 = 1\,804$
16.  $536 \times 11 = 5\,360 + 536 = 5\,896$
17.  $961 \times 11 = 9\,610 + 961 = 10\,571$
18.  $1\,523 \times 11 = 15\,230 + 1\,523 = 16\,753$
19.  $300 \times 25 = \frac{30\,000}{4} = 7\,500$
20.  $1\,000 \times 25 = 25\,000$
21.  $80 \times 25 = \frac{8\,000}{4} = 2\,000$
22.  $3\,200 \times 25 = \frac{320\,000}{4} = 80\,000$
23.  $400 \times 50 = \frac{40\,000}{2} = 20\,000$
24.  $60 \times 50 = \frac{6\,000}{2} = 3\,000$

### Exercise 3

(PB page 96)

1.  $9 \times 1\,800 = 18\,000 - 1\,800 = \cancel{16\,200}$
2.  $11 \times 65\,000 = 650\,000 + 65\,000 = 715\,000$
3.  $48 \times 560 = \cancel{26\,880}$
4.  $9 \times 235 = 2\,350 - 235 = 2\,115$

## Multiply whole numbers

Workbook Exercise 30 gives pupils the opportunity to revise multiplication of whole numbers from 5 to 15. Encourage pupils to use shortcuts.

Work through the examples on page 97 in the Pupil's Book before pupils tackle Exercise 4.

### Workbook: Exercise 30

(WB page 40)

	5	6	7	8	9	10	11	12	13	14	15
5	25	30	35	40	45	50	55	60	65	70	75
6	30	36	42	48	54	60	66	72	78	84	90
7	35	42	49	56	63	70	77	84	91	98	105
8	40	48	56	64	72	80	88	96	104	112	120
9	45	54	63	72	81	90	99	108	117	126	135
10	50	60	70	80	90	100	110	120	130	140	150
11	55	66	77	88	99	110	121	132	143	154	165
12	60	72	84	96	108	120	132	144	156	168	180
13	65	78	91	104	117	120	143	156	169	182	195
14	70	84	98	112	126	140	154	168	192	196	210
15	75	90	105	120	135	150	165	180	195	210	225
20	100	120	140	160	180	200	220	240	260	280	300
30	150	180	210	240	270	300	330	360	390	420	450

### Exercise 4

(PB page 97)

- $364 \times 35 = 12\,740$
- $548 \times 57 = 31\,236$
- $149 \times 73 = 10\,877$
- $748 \times 81 = 60\,588$
- $829 \times 38 = 31\,502$
- $413 \times 92 = 37\,996$
- $352 \times 291 = 32\,032$
- $592 \times 824 = 487\,808$
- $919 \times 191 = 175\,529$
- $429 \times 735 = 315\,315$
- $617 \times 283 = 174\,611$
- $593 \times 444 = 263\,292$

### Exercise 5

(PB page 98)

- $52 \times 835 = 43\,420$
- $35 \times 798 = 27\,930$
- $48 \times 435 = 20\,880$
- $168 \times 346 = 58\,128$

## Multiply decimal numbers

Explain to pupils that the easiest way to multiply with decimal numbers is to first count the decimal places in all the numbers you want to multiply. Then ignore the decimal points and multiply the numbers. Pupils must place the decimal point back into the answer, allowing for the number of places (counting from the right) counted at the beginning. Remind pupils to include (and count) the zeroes in their answers even when they are at the end of a number, so that their answers will be correct.

### Exercise 6

(PB page 99)

- $85.4 \times 10 = 854$
  - $2.317 \times 10 = 23.17$
  - $542.67 \times 10 = 5\,426.7$
  - $38.56 \times 100 = 3\,856$
  - $385.756 \times 100 = 38\,575.6$
  - $4.563 \times 1\,000 = 4\,563$
- $35 \times 1.2 = 42.0$
  - $47 \times 2.3 = 108.1$
  - $95 \times 5.3 = 503.5$
  - $79 \times 2.6 = 205.4$
  - $85 \times 8.4 = 714.0$
  - $73 \times 6.6 = 481.8$
- $4.21 \times 3.1 = 13.051$
  - $0.8 \times 0.7 = 0.56$
  - $143.4 \times 0.05 = 7.17$
  - $6.13 \times 1.4 = 8.582$

### Workbook: Exercise 31

(WB page 41)

- $2.15 \times 0.3$  — 6.45
  - $21.5 \times 0.3$  — 645
  - $21.5 \times 3$  — 0.645
  - $215 \times 3$  — 64.5
  - $2.15 \times 3$  — 6\,450
  - $2.15 \times 3\,000$  — 0.0645
- $14.25 \times 2.1$  — 29\,925
  - $142.5 \times 2.1$  — 29.925
  - $1.425 \times 2.1$  — 299.25
  - $1\,425 \times 2.1$  — 2\,992.5
  - $1\,425 \times 21$  — 2.9925
  - $14.25 \times 0.21$  — 0.29925

- |       |                  |        |
|-------|------------------|--------|
| 3. a) | $2.5 \times 0.5$ | 12.5   |
| b)    | $25 \times 0.5$  | 1 250  |
| c)    | $25 \times 5$    | 0.125  |
| d)    | $25 \times 0.05$ | 0.0125 |
| e)    | $2.5 \times 5$   | 125    |
| f)    | $0.25 \times 5$  | 1.25   |

### Exercise 7

(PB page 99)

- |    |                                |    |                               |
|----|--------------------------------|----|-------------------------------|
| 1. | $42.4 \times 1.21 = 51.304$    | 2. | $1.257 \times 2.14 = 2.68998$ |
| 3. | $6.242 \times 2.17 = 13.54514$ | 4. | $6.38 \times 4.23 = 26.9874$  |
| 5. | $7.19 \times 0.02 = 0.1438$    | 6. | $7.65 \times 2.04 = 15.606$   |
| 7. | $57.43 \times 0.009 = 0.51687$ |    |                               |
| 8. | $8.29 \times 4.31 = 35.7299$   |    |                               |
| 9. | $12.3 \times 4.56 = 56.088$    |    |                               |

### Exercise 8

(PB page 100)

- $85.25 \times \cancel{\text{N}2\,500} = \cancel{\text{N}213\,125.00}$
- $0.6 \times 1.35 \text{ g} = 0.81 \text{ g}$
- $6 \times 1.75 \text{ m} = 10.5 \text{ m}$
- $2.5 \times 72.6 \text{ km} = 181.5 \text{ km}$
- $11.5 \text{ cm} \times 6.25 \text{ cm} = 71.875 \text{ cm}^2$
- $5 \times 13.5 = 67.5$  marks
- Emeka cleared  $17.8 \text{ m} \times 22.6 \text{ m} = 402.28 \text{ m}^2$   
Nsirimo cleared  $31.2 \text{ m} \times 13.7 \text{ m} = 427.44 \text{ m}^2$   
Nsirimo cleared more land.
  - Nsirimo cleared  $427.44 - 402.28 = 25.16 \text{ m}^2$  more than Emeka.
- $15 \times 2.25 \text{ m} = 33.75 \text{ m}$

## Multiply fractions

Create diagrams like those on page 101 in the Pupil's Book to help you explain what it means to multiply fractions. Work through the examples on page 101 with the class. Show pupils how to divide factors into numerators and denominators and draw light lines through numbers.

**Workbook: Exercise 32**

(WB page 42)

1. a)  $\frac{4}{6} \times 3 = \frac{12}{6} = 2$       b)  $\frac{5}{9} \times 4 = \frac{20}{9} = 2\frac{2}{9}$   
 c)  $\frac{7}{12} \times 3 = \frac{21}{12} = 1\frac{9}{12} = 1\frac{3}{4}$       d)  $\frac{12}{20} \times 2 = \frac{24}{20} = 1\frac{4}{20} = 1\frac{1}{5}$
2. a)  $4 \times \frac{7}{10} = \frac{28}{10} = 2\frac{8}{10} = 2\frac{4}{5}$       b)  $4 \times \frac{3}{8} = \frac{12}{8} = 1\frac{4}{8} = 1\frac{1}{2}$
3. a)  $1\frac{1}{2} \times \frac{10}{21} = \frac{3}{2} \times \frac{10}{21} = \frac{30}{42} = \frac{5}{7}$   
 b)  $1\frac{1}{2} \times \frac{4}{30} = \frac{3}{2} \times \frac{4}{30} = \frac{12}{60} = \frac{1}{5}$   
 c)  $1\frac{1}{2} \times \frac{5}{8} = \frac{3}{2} \times \frac{5}{8} = \frac{15}{16}$   
 d)  $1\frac{1}{2} \times \frac{4}{6} = \frac{3}{2} \times \frac{4}{6} = \frac{12}{12} = 1$

**Workbook: Exercise 33**

(PB page 43)

1. a)  $\frac{7}{6} \times \frac{3}{9} = \frac{7}{18}$       b)  $\frac{2}{3} \times \frac{2}{3} = \frac{4}{9}$   
 c)  $\frac{3}{8} \times \frac{1}{4} = \frac{3}{32}$       d)  $\frac{3}{7} \times \frac{2}{5} = \frac{6}{35}$   
 e)  $\frac{2}{3} \times \frac{3}{5} = \frac{2}{5}$       f)  $\frac{2}{7} \times \frac{4}{3} = \frac{8}{21}$   
 g)  $\frac{45}{9} \times \frac{18}{15} = \frac{6}{1} = 6$       h)  $\frac{4}{11} \times \frac{33}{8} = \frac{3}{2}$   
 i)  $\frac{3}{8} \times \frac{25}{45} = \frac{5}{24}$       j)  $\frac{24}{32} \times \frac{4}{7} = \frac{6}{14} = \frac{3}{7}$   
 k)  $\frac{1}{12} \times \frac{12}{48} = \frac{1}{48}$       l)  $\frac{2}{3} \times \frac{3}{12} = \frac{1}{6}$
2. a)  $2\frac{1}{2} \times 6\frac{2}{5} = \frac{5}{2} \times \frac{32}{5} = 16$   
 b)  $2\frac{1}{3} \times 2\frac{1}{7} = \frac{7}{3} \times \frac{15}{7} = 5$   
 c)  $2\frac{2}{13} \times 3\frac{5}{7} = \frac{28}{13} \times \frac{26}{7} = 8$   
 d)  $4\frac{2}{3} \times 2\frac{1}{4} = \frac{14}{3} \times \frac{9}{4} = \frac{21}{2} = 10\frac{1}{2}$   
 e)  $3\frac{1}{3} \times 1\frac{3}{9} = \frac{10}{3} \times \frac{12}{9} = \frac{40}{9} = 4\frac{4}{9}$   
 f)  $1\frac{3}{8} \times 2\frac{2}{11} = \frac{11}{8} \times \frac{24}{11} = \frac{24}{8} = \frac{3}{1} = 3$   
 g)  $4\frac{4}{10} \times 1\frac{1}{4} = \frac{44}{10} \times \frac{5}{4} = \frac{11}{2} = 5\frac{1}{2}$   
 h)  $5\frac{1}{3} \times 2\frac{5}{8} = \frac{16}{3} \times \frac{21}{8} = \frac{14}{1} = 14$

**Exercise 9**

(PB page 102)

1. a)  $\frac{2}{3}$  of 21 = 14  
 b)  $\frac{3}{5}$  of 35 = 21

- c)  $\frac{4}{7}$  of 49 = 28
- d)  $\frac{1}{5} \times 6 = \frac{6}{5}$
- e)  $\frac{5}{9} \times 15 = \frac{25}{3}$
- f)  $\frac{7}{9} \times 18 = 14$
- g)  $\frac{1}{12} \times 36 = 3$
- h)  $\frac{5}{6} \times 30 = 25$
2. a)  $\frac{4}{7} \times \frac{3}{8} = \frac{3}{14}$
- b)  $\frac{3}{8} \times \frac{4}{9} = \frac{1}{6}$
- c)  $\frac{6}{11} \times \frac{5}{9} = \frac{30}{99} = \frac{10}{33}$
- d)  $\frac{2}{3} \times \frac{9}{20} = \frac{3}{10}$
3. a)  $2\frac{2}{5} \times 1\frac{1}{2} = \frac{12}{5} \times \frac{3}{2} = \frac{18}{5}$
- b)  $3\frac{1}{4} \times 2\frac{1}{2} = \frac{13}{4} \times \frac{5}{2} = \frac{65}{8}$
- c)  $1\frac{2}{5} \times \frac{5}{22} \times 2\frac{1}{3} = \frac{7}{5} \times \frac{5}{22} \times \frac{7}{3} = \frac{49}{66}$
- d)  $4\frac{4}{9} \times 1\frac{5}{6} = \frac{40}{9} \times \frac{11}{6} = \frac{220}{27}$

### Exercise 10

(PB page 102)

1.  $4\frac{1}{2} \times 1\frac{1}{7} \times \frac{7}{9} = \frac{9}{2} \times \frac{8}{7} \times \frac{7}{9} = 4$  The correct answer is 4.
2.  $\frac{1}{4} \times 36 = 9$
3. a)  $1\frac{3}{5} \text{ h} \times 4 = \frac{8}{5} \times \frac{4}{1} = \frac{32}{5} = 6\frac{2}{5}$  of an hour
- b)  $\frac{32}{5} \times \frac{5}{1} = 32$  hours
4.  $\frac{3}{4} \times 2\frac{3}{5} \ell = \frac{3}{4} \times \frac{13}{5} = \frac{39}{20} = 1\frac{19}{20} \ell$
5.  $5 \times \frac{3}{15} = \frac{15}{15} = 1$  You will read the whole book in five days.

## The squares of numbers

The square of a number is the product of the number multiplied by itself. The diagram on page 103 shows 3 multiplied by 3. Pupils can work in groups and make a few similar diagrams to show 4 multiplied by 4, 5 multiplied by 5, 6 multiplied by 6, and so on. Display the diagrams in the classroom. Ask a few pupils to make charts to show square numbers up to 500.

## Exercise 11

(PB page 103)

1. The multiples in the shaded blocks are square numbers.

1	2	3	4	5	6	7	8	9	10
2	4	6	8	10	12	14	16	18	20
3	6	9	12	15	18	21	24	27	30
4	8	12	16	20	24	28	32	36	40
5	10	15	20	25	30	35	40	45	50
6	12	18	24	30	36	42	48	54	60
7	14	21	28	35	42	49	56	63	70
8	16	24	32	40	48	56	64	72	80
9	18	27	36	45	54	63	72	81	90
10	20	30	40	50	60	70	80	90	100

- 2.

$1^2$	$2^2$	$3^2$	$4^2$	$5^2$	$6^2$	$7^2$	$8^2$	$9^2$	$10^2$
1	4	9	16	25	36	49	64	81	100

- 3.

Number	11	12	13	14	15	16	17	18	19	20
Square	$11^2$ = 121	$12^2$ = 144	$13^2$ = 169	$14^2$ = 196	$15^2$ = 225	$16^2$ = 256	$17^2$ = 289	$18^2$ = 324	$19^2$ = 361	$20^2$ = 400

Number	21	22	23	24	25	26	27	28	29	30
Square	$21^2$ = 441	$22^2$ = 484	$23^2$ = 529	$24^2$ = 576	$25^2$ = 625	$26^2$ = 676	$27^2$ = 729	$28^2$ = 784	$29^2$ = 841	$30^2$ = 900

4. a)  $3^2 + 4^2 = 5^2$   
 b)  $5^2 + 12^2 = 13^2$   
 c)  $8^2 + 15^2 = 17^2$   
 d)  $7^2 + 24^2 = 25^2$   
 e)  $20^2 + 21^2 = 29^2$   
 f)  $9^2 + 40^2 = 41^2$

5.

Squared number	Simplified
$3^2$	9
$6^2$	36
$7^2$	49
$9^2$	81
$12^2$	144
$14^2$	196
$21^2$	441
$35^2$	1 225
$37^2$	1 369
$30^2$	900

## Square roots

The square root of a number multiplied by itself gives the number.

A perfect square is formed by multiplying a number by itself.

Work through the examples of how to use factorisation and the middle factor to find square roots with the class.

### Exercise 12

(PB page 106)

1. a)

2	36
2	18
3	9
3	3
	1

$$36 = 2^2 \times 3^2$$

$$\sqrt{36} = 2 \times 3$$

$$= 6$$

b)

2	256
2	128
2	64
2	32
2	16
2	8
2	4
2	2
	1

$$256 = 2^4 \times 2^4$$

$$\sqrt{256} = 2^4$$

$$= 16$$

2. a)  $16 = 2^2 \times 2^2; \sqrt{16} = 2^2 = 4$   
 b)  $81 = 3^2 \times 3^2; \sqrt{81} = 3^2 = 9$   
 c)  $25 = 5^2; \sqrt{25} = 5$   
 d)  $100 = 2^2 \times 5^2; \sqrt{100} = 2 \times 5 = 10$   
 e)  $49 = 7^2; \sqrt{49} = 7$   
 f)  $169 = 13^2; \sqrt{169} = 13$
3. a)  $196 = 2^2 \times 7^2; \sqrt{196} = 2 \times 7 = 14$   
 b)  $361 = 19^2; \sqrt{361} = 19$   
 c)  $484 = 2^2 \times 11^2; \sqrt{484} = 22$   
 d)  $625 = 5^2 \times 5^2; \sqrt{625} = 25$   
 e)  $1\ 024 = 2^5 \times 2^5; \sqrt{1\ 024} = 2^5 = 32$   
 f)  $289 = 17^2; \sqrt{289} = 17$   
 g)  $400 = 2^2 \times 2^2 \times 5^2; \sqrt{400} = 2^2 \times 5 = 20$   
 h)  $529 = 23^2; \sqrt{529} = 23$   
 i)  $676 = 2^2 \times 13^2; \sqrt{676} = 26$   
 j)  $225 = 3^2 \times 5^2; \sqrt{225} = 3 \times 5 = 15$   
 k)  $324 = 2^2 \times 3^2 \times 3^2; \sqrt{324} = 2 \times 3^2 = 18$   
 l)  $576 = 2^3 \times 2^3 \times 3^2; \sqrt{576} = 2^3 \times 3 = 24$
4. a)  $81 = 3 \times 3 \times 3 \times 3; \sqrt{81} = 3 \times 3 = 9$   
 b)  $225 = 3 \times 3 \times 5 \times 5; \sqrt{225} = 3 \times 5 = 15$   
 c)  $144 = 2 \times 2 \times 2 \times 2 \times 3 \times 3; \sqrt{144} = 2 \times 2 \times 3 = 12$   
 d)  $324 = 2 \times 2 \times 3 \times 3 \times 3 \times 3; \sqrt{324} = 2 \times 3 \times 3 = 18$   
 e)  $196 = 2 \times 2 \times 7 \times 7; \sqrt{196} = 2 \times 7 = 14$   
 f)  $441 = 3 \times 3 \times 7 \times 7; \sqrt{441} = 3 \times 7 = 21$   
 g)  $2\ 500 = 2 \times 2 \times 5 \times 5 \times 5 \times 5; \sqrt{2\ 500} = 2 \times 5 \times 5 = 50$   
 h)  $5\ 625 = 3 \times 3 \times 5 \times 5 \times 5 \times 5; \sqrt{5\ 625} = 3 \times 5 \times 5 = 75$   
 i)  $6\ 561 = 3 \times 3$   
 $\sqrt{6\ 561} = 3 \times 3 \times 3 \times 3 = 81$   
 j)  $3\ 025 = 5 \times 5 \times 11 \times 11; \sqrt{3\ 025} = 5 \times 11 = 55$

### Exercise 13

(PB page 107)

1. a)  $93 \times 7.4 = 688.2$   
 b)  $67 \times 3.9 = 261.3$   
 c)  $84 \times 5.3 = 445.2$   
 d)  $78 \times 2.9 = 226.2$

2. a)  $14.91 \times 2.1 = 31.311$   
 b)  $6.34 \times 3.51 = 22.2534$   
 c)  $3.77 \times 3.22 = 12.1394$   
 d)  $45.67 \times 0.17 = 7.7639$   
 e)  $4.44 \times 5.23 = 23.2212$   
 f)  $8.135 \times 0.006 = 0.04881$
3. a)  $\frac{3}{9} \times 9 = 3$   
 b)  $\frac{6}{13} \times 39 = 18$   
 c)  $\frac{1}{4} \times \frac{1}{3} = \frac{1}{12}$   
 d)  $\frac{7}{8} \times \frac{2}{21} = \frac{1}{12}$   
 e)  $7\frac{5}{12} \times 4\frac{2}{9} = \frac{89}{12} \times \frac{38}{9} = \frac{89}{6} \times \frac{19}{9} = \frac{1691}{54} = 31\frac{17}{54}$   
 f)  $4\frac{1}{10} \times 2\frac{1}{6} = \frac{41}{10} \times \frac{13}{6} = \frac{533}{60} = 8\frac{53}{60}$
4.  $7 \times 2.25 \ell = 15.75 \ell$
5. a)  $15.5 \times 2.5 = 38.75$   
 b)  $15.5 \times 1.5 = 23.25$   
 c)  $38.75 - 23.25 = 15.5$
6.  $5 \times \frac{2}{11} = \frac{10}{11}$
7.  $6 \times 6 \times 800 = 28\ 800$  eggs
8.  $75 \times 84 = 6\ 300$  passengers
9.  $25 \times \cancel{N}8\ 000 = \cancel{N}200\ 000$
10.  $224 \times 270 = 60\ 480$  words
11. a) 100 and 10 000  
 b) 81  
 c) 36  
 d) 121, 361 and 441
12.  $\sqrt{121} = 11$  cm
13.  $\sqrt{625} = 25$  m
14.  $\sqrt{400} = 20$  m
15.  $\sqrt{841} = 29$  m
16.  $65^2 = 4\ 225$  m<sup>2</sup>;  $6^2 = 36$  m<sup>2</sup>;  $4\ 225 - 36 = 4\ 189$  m<sup>2</sup>

## Exercise 14 (challenge)

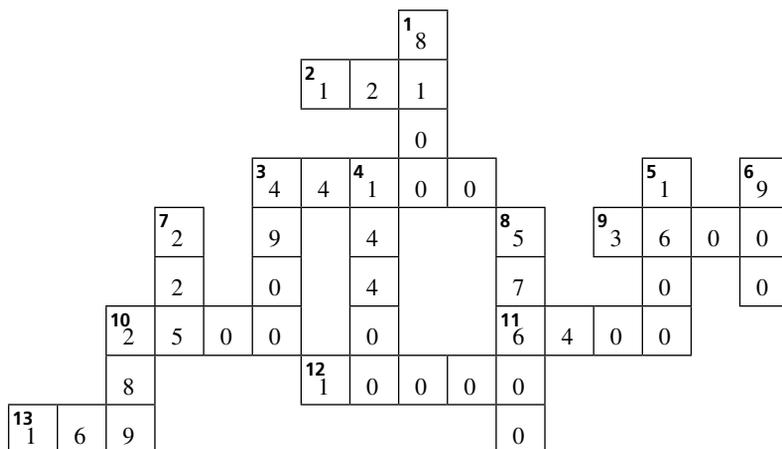
(PB page 108)

1.
  - a) The date multiplied by the month gives the year;  
 $4 \times 4 = 16$  and  $5 \times 5 = 25$ .
  - b) 1 January 2001 ( $1 \times 1 = 1$ ); 2 February 2004 ( $2 \times 2 = 4$ );  
3 March 2009 ( $3 \times 3 = 9$ )
2.  $1^2 = 1, 2^2 = 4, 3^2 = 9, 4^2 = 16, 5^2 = 25, 6^2 = 36, 7^2 = 49,$   
 $8^2 = 64, 9^2 = 81, 10^2 = 100$ 
  - a) 0, 1, 4, 5, 6, 9
  - b) Answers may differ. All numbers end with one of the digits 1 to 0 and so there cannot be a square number with a last digit that is not listed in 2a).
  - c) Answers may differ. A few examples are given below.  
Last digit 0:  $20 \times 20 = 400$  and  $30 \times 30 = 900$   
Last digit 1:  $11 \times 11 = 121$  and  $19 \times 19 = 361$   
Last digit 4:  $12 \times 12 = 144$  and  $18 \times 18 = 324$   
Last digit 5:  $15 \times 15 = 225$  and  $25 \times 25 = 625$   
Last digit 6:  $14 \times 14 = 196$  and  $24 \times 24 = 576$   
Last digit 9:  $13 \times 13 = 169$  and  $23 \times 23 = 529$
3.
  - a)  $11^2 = 121$
  - b)  $111^2 = 12\ 321$
  - c)  $1\ 111^2 = 1\ 234\ 321$
  - d)  $11\ 111^2 = 123\ 454\ 321$
4.
  - a) 64 squares
  - b)  $8^2 = 64$
  - c) 32
  - d) 32
5. Pupils design a game board according to certain rules.
6. We can only design a game board using bases that are even numbers such as  $2^2, 4^2, 6^2, 8^2$  and  $10^2$  if the numbers of white and black squares in each horizontal line are to be equal. A game board using bases that are odd numbers will not have the same numbers of white and black squares in each row. So, we cannot use  $3^2, 5^2$  and  $7^2$ .
7.
  - a)  $42 = 6^2 + 2^2 + 1^2 + 1^2$   
Check:  $36 + 4 + 1 + 1 = 42$
  - b)  $88 = 8^2 + 4^2 + 2^2 + 2^2$   
Check:  $64 + 16 + 4 + 4 = 88$

## Workbook: Exercise 34

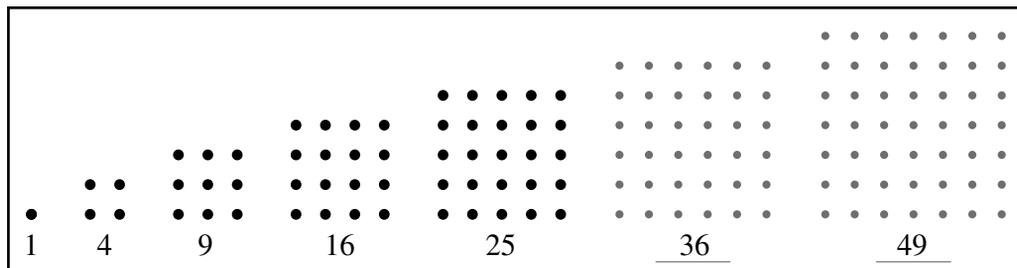
(WB page 44)

1. Pupils fill in the square numbers on the puzzle.



2. a) 1, 100, 10 000  
 b) 4, 0.04, 0.0004  
 c) 0.09, 9, 900

3.



## Workbook: Exercise 35

(WB page 45)

1. a)  $18 = 3^2 + 2^2 + 2^2 + 1^2$ ; check:  $9 + 4 + 4 + 1 = 18$   
 b)  $39 = 5^2 + 3^2 + 2^2 + 1^2$ ; check:  $25 + 9 + 4 + 1 = 39$   
 c)  $78 = 8^2 + 3^2 + 2^2 + 1^2$ ; check:  $64 + 9 + 4 + 1 = 78$   
 d)  $97 = 8^2 + 5^2 + 2^2 + 2^2$ ; check:  $64 + 25 + 4 + 4 = 97$   
 e)  $121 = 10^2 + 4^2 + 2^2 + 1^2$ ; check:  $100 + 16 + 4 + 1 = 121$   
 f)  $162 = 12^2 + 4^2 + 1^2 + 1^2$ ; check:  $144 + 16 + 1 + 1 = 162$
2. Numbers that cannot be squares: 82, 953 and 198

## Workbook: Exercise 36

(WB page 46)

1. a)  $111 \times 11 = 1\ 221$   
 b)  $1\ 111 \times 11 = 12\ 221$

- c)  $111 \times 111 = 12\ 321$
  - d)  $111\ 111 \times 111 = 12\ 333\ 321$
  - e)  $1\ 111 \times 111 = 123\ 321$
  - f)  $11\ 111 \times 111 = 1\ 233\ 321$
2. Descriptions may differ. We give a few examples.  
 The first and last digit in all answers is 1.  
 If you multiply 111 and 1 111 by 11, the answers include only 1's and 2's.  
 If you multiply 111, 1 111, 11 111 and 111 111 by 111, the answers will include only 1s, 2s and 3s.

## Unit 10: Divide

### Teaching guidelines and solutions

In this section, pupils will divide whole numbers and decimal numbers by two- and three-digit numbers.

### Divisibility rules

The unit starts with a revision of divisibility rules. Encourage pupils to use these rules, even when they use calculators, to check whether an answer looks correct.

#### Exercise 1

(PB page 111)

1.
  - a) 462: divisible by 2, 3 and 6
  - b) 1 002: divisible by 2, 3 and 6
  - c) 14 238: divisible by 2, 3, 6 and 9
  - d) 83 026: divisible by 2
  - e) 97 128: divisible by 2, 3, 4, 6, 8 and 9
  - f) 964 194: divisible by 2, 3 and 6
2. Divisible by 6:  
528, 651 942, 3 614 346, 95 748, 346 812, 12 354 300
3. Divisible by 9:  
882, 693, 246 753, 89 667, 423 243, 3 547 215, 572 607
4.
  - a) 10: divisible by 2, 5 and 10
  - b) 12: divisible by 2, 3, 4 and 6
  - c) 21: divisible by 3 and 7
  - d) 39: divisible by 3

- e) 54: divisible by 2, 3, 6 and 9
- f) 96: divisible by 2, 3, 4, 6, and 8
- g) 123: divisible by 3
- h) 555: divisible by 3 and 5
- i) 690: divisible by 2, 3, 5, 6 and 10
- j) 3 456: divisible by 2, 3, 4, 6, 8 and 9
- k) 7 350: divisible by 2, 3, 5, 6, 7 and 10
- l) 9 864: divisible by 2, 3, 4, 6, 8 and 9

5. 264 is divisible by 3 and by 6.

6. 24 is divisible by: 2, 3, 4, 6 and 8; these numbers are factors of 24.

### Workbook: Exercise 37

(WB page 47)

Numbers	Divide by							
	2	3	4	5	6	8	9	10
20	10		5	4				2
36	18	12	9		6		4	
42	21	14			7			
60	30	20	15	12	10			6
72	36	24	18		12	9	8	
85				17				
96	48	32	24		16	12		
120	60	40	30	24	20	15		12
144	72	48	36		24	18	16	
150	75	50		30	25			15
168	84	56	42		28	21		
222	111	74			37			
255		85		51				
288	144	96	72		48	36	32	
310	155			62				31
576		192			96		64	
672	336	224	168		112	84		
1 152	576	384	288		192	144	128	

## Exercise 2

(PB page 112)

- |                             |                             |
|-----------------------------|-----------------------------|
| a) $8\,464 \div 2 = 4\,232$ | b) $6\,504 \div 3 = 3\,252$ |
| c) $8\,412 \div 4 = 2\,103$ | d) $6\,975 \div 5 = 1\,395$ |
| e) $7\,338 \div 6 = 1\,223$ | f) $9\,457 \div 7 = 1\,351$ |
| g) $9\,648 \div 8 = 1\,206$ | h) $9\,171 \div 9 = 1\,019$ |
| i) $8\,184 \div 4 = 2\,046$ | j) $6\,475 \div 5 = 1\,295$ |
- |                               |                               |
|-------------------------------|-------------------------------|
| a) $75\,824 \div 2 = 37\,912$ | b) $71\,615 \div 5 = 14\,323$ |
| c) $70\,143 \div 3 = 23\,381$ | d) $59\,652 \div 6 = 9\,942$  |
| e) $88\,572 \div 4 = 22\,143$ | f) $70\,104 \div 8 = 8\,763$  |
| g) $65\,313 \div 9 = 7\,257$  | h) $99\,355 \div 5 = 19\,871$ |
| i) $52\,575 \div 5 = 10\,515$ | j) $75\,816 \div 9 = 8\,424$  |

## Divide whole or decimal numbers by two- and three-digit whole numbers

The examples on pages 113 and 114 and also on pages 116 and 117 in the Pupil's Book show how to use long division to divide numbers by two- and three-digit numbers. Ask pupils to start by writing down the first nine multiples of a divisor as shown in these examples. Show pupils how this simplifies calculations.

## Exercise 3

(PB page 115)

- |                           |                           |
|---------------------------|---------------------------|
| a) $3\,705 \div 15 = 247$ | b) $7\,821 \div 33 = 237$ |
| c) $4\,378 \div 22 = 199$ | d) $7\,536 \div 16 = 471$ |
| e) $7\,521 \div 23 = 327$ | f) $5\,313 \div 11 = 483$ |
| g) $5\,984 \div 32 = 187$ | h) $7\,533 \div 31 = 243$ |
| i) $3\,696 \div 4 = 924$  |                           |
- |                               |                                |
|-------------------------------|--------------------------------|
| a) $29\,656 \div 44 = 674$    | b) $86\,972 \div 34 = 2\,558$  |
| c) $60\,060 \div 26 = 2\,310$ | d) $111\,384 \div 56 = 1\,989$ |
| e) $36\,495 \div 45 = 811$    | f) $54\,944 \div 32 = 1\,717$  |
| g) $14\,688 \div 34 = 432$    | h) $97\,839 \div 63 = 1\,553$  |
| i) $55\,530 \div 45 = 1\,234$ |                                |
- |                                 |                                |
|---------------------------------|--------------------------------|
| a) $45\,783 \div 10 = 4\,578.3$ | b) $553.6 \div 32 = 17.3$      |
| c) $907.2 \div 24 = 37.8$       | d) $458.8 \div 31 = 14.8$      |
| e) $5\,548.4 \div 52 = 106.7$   | f) $3\,647.7 \div 63 = 57.9$   |
| g) $4\,321.4 \div 82 = 52.7$    | h) $39\,887.8 \div 71 = 561.8$ |
| i) $24\,140.8 \div 46 = 524.8$  |                                |

## Exercise 4

(PB page 118)

- |                           |                            |
|---------------------------|----------------------------|
| a) $33.5 \div 10 = 3.35$  | b) $43.6 \div 10 = 4.36$   |
| c) $2.67 \div 10 = 0.267$ | d) $162.5 \div 10 = 16.25$ |

- e)  $367.14 \div 100 = 3.6714$   
 f)  $561.24 \div 100 = 5.6124$   
 g)  $510.4 \div 100 = 5.104$   
 h)  $252.5 \div 100 = 2.525$   
 i)  $4.563 \div 1\ 000 = 0.004563$   
 j)  $2\ 735.4 \div 1\ 000 = 2.7354$   
 k)  $48\ 373.84 \div 1\ 000 = 48.37384$   
 l)  $27\ 253.31 \div 1\ 000 = 27.25331$   
 m)  $7\ 213.2 \div 10 = 721.32$   
 n)  $735.4 \div 100 = 7.354$   
 o)  $49\ 386.24 \div 1\ 000 = 49.38624$   
 p)  $13\ 463.8 \div 10\ 000 = 1.34638$
2. a)  $24 \div 1.2 = 20.0$                       b)  $15 \div 2.5 = 6.0$   
 c)  $81 \div 5.4 = 15.0$                         d)  $14 \div 2.8 = 5.0$   
 e)  $204 \div 6.8 = 30.0$                         f)  $288 \div 3.6 = 80.0$   
 g)  $78 \div 5.2 = 15.0$                         h)  $64 \div 3.2 = 20.0$   
 i)  $86 \div 4.3 = 20.0$
3. a)  $0.582 \div 3 = 0.194$                       b)  $25.8 \div 8 = 3.225$   
 c)  $0.39 \div 6 = 0.065$                         d)  $0.025 \div 0.0004 = 62.5$   
 e)  $3.74 \div 1.1 = 3.4$                          f)  $0.72 \div 0.8 = 0.9$   
 g)  $4.25 \div 0.5 = 8.5$                          h)  $62.1 \div 0.9 = 69.0$   
 i)  $9.612 \div 0.09 = 106.8$
4. a)  $1.68 \div 0.6 = 2.8$                         b)  $2.96 \div 0.8 = 3.7$   
 c)  $4.77 \div 0.9 = 5.3$                         d)  $28.35 \div 4.5 = 6.3$   
 e)  $44.02 \div 6.2 = 7.1$                         f)  $33.62 \div 4.1 = 8.2$   
 g)  $23.32 \div 5.3 = 4.4$                         h)  $7.882 \div 1.4 = 5.63$   
 i)  $21.6 \div 1.08 = 20.0$                         j)  $33.764 \div 4.6 = 7.34$   
 k)  $68.64 \div 2.2 = 31.2$                         l)  $27.84 \div 3.2 = 8.7$   
 m)  $1.0116 \div 0.18 = 5.62$                     n)  $38.475 \div 1.5 = 25.65$   
 o)  $90.36 \div 0.2 = 451.8$

### Workbook: Exercise 38

(WB page 48)

Pupils complete the exercise in their workbooks.

1. a)  $368 \div 8 = 46$                               b)  $784 \div 14 = 56$

$$\begin{array}{r} 46 \\ 8 \overline{) 368} \\ \underline{32} \phantom{0} \\ 48 \\ \underline{48} \\ 0 \end{array}$$

$$\begin{array}{r} 56 \\ 14 \overline{) 784} \\ \underline{70} \phantom{0} \\ 84 \\ \underline{84} \\ 0 \end{array}$$

2.

1	2	3	4	5	6	7	8	9
56	112	168	224	280	336	392	448	504

$$\begin{array}{r} 82 \\ 56 \overline{) 4592} \\ \underline{448} \\ 112 \\ \underline{112} \\ 0 \end{array}$$

$$4592 \div 56 = 82$$

$$\begin{array}{r} 71 \\ 56 \overline{) 3976} \\ \underline{392} \\ 56 \\ \underline{56} \\ 0 \end{array}$$

$$3976 \div 56 = 71$$

3. a)  $110.4 \div 6 = 18.4$

$$\begin{array}{r} 184 \\ 6 \overline{) 1104} \\ \underline{6} \\ 50 \\ \underline{48} \\ 24 \\ \underline{24} \\ 0 \end{array}$$

b)  $374.8 \div 4 = 93.7$

$$\begin{array}{r} 937 \\ 4 \overline{) 3748} \\ \underline{36} \\ 14 \\ \underline{12} \\ 28 \\ \underline{28} \\ 0 \end{array}$$

4.

1	2	3	4	5	6	7	8	9
23	46	69	92	115	138	161	184	207

$$\begin{array}{r} 912 \\ 23 \overline{) 20976} \\ \underline{207} \\ 27 \\ \underline{23} \\ 46 \\ \underline{46} \\ 0 \end{array}$$

$$2097.6 \div 23 = 91.2$$

$$\begin{array}{r} 758 \\ 23 \overline{) 17434} \\ \underline{161} \\ 133 \\ \underline{115} \\ 184 \\ \underline{184} \\ 0 \end{array}$$

$$1743.4 \div 23 = 75.8$$

5.

1	2	3	4	5	6	7	8	9
47	94	141	188	235	282	329	376	423

$$\begin{array}{r}
 2816 \\
 47 \overline{) 132352} \\
 \underline{94} \\
 383 \\
 \underline{376} \\
 75 \\
 \underline{47} \\
 282 \\
 \underline{282} \\
 0
 \end{array}$$

$$1323.52 \div 47 = 28.16$$

$$\begin{array}{r}
 6125 \\
 47 \overline{) 287875} \\
 \underline{282} \\
 58 \\
 \underline{47} \\
 117 \\
 \underline{94} \\
 235 \\
 \underline{235} \\
 0
 \end{array}$$

$$2878.75 \div 47 = 61.25$$

### Exercise 5

(PB page 119)

- a) 3 447    b) 21 285    c) 7 218    d) 329 211
- There is no remainder ( $12\,564 \div 6 = 2\,094$ ).
- Each waiter receives:  $\text{R}9\,420 \div 12 = \text{R}785$
- Each customer receives:  $13.55 \text{ kg} \div 5 = 2.71 \text{ kg}$
- Each person receives:  $100 \ell \div 8 = 12.5 \ell$
- Price for 1 kg meat:  $\text{R}1\,800 \div 1.5 = \text{R}1\,200$
- Area of land:  $112.6 \times 74.8 = 8\,422.48 \text{ m}^2$   
Land each child receives:  $8\,422.48 \text{ m}^2 \div 4 = 2\,105.62 \text{ m}^2$
- Apple trees in half a hectare:  $54 \div 3 = 18$  apple trees
- Average number of people who had malaria:  $8\,520 \div 12 = 710$

### Exercise 6 (challenge)

(PB page 120)

$$\begin{aligned}
 &\text{Average length of one car + following distance behind one car} \\
 &= 4.5 + 2 \times 4.5 \\
 &= 4.5 + 9 \\
 &= 13.5 \text{ m}
 \end{aligned}$$

$$\begin{aligned}
 &\text{Number of cars in one lane on bridge} \\
 &= 118\,000 \div 13.5 \\
 &= 8\,740.7
 \end{aligned}$$

$$\approx 8\,741 \text{ cars (rounded off to a whole number)}$$

$$\begin{aligned}
 &\text{Number of cars in four lanes} \\
 &= 8\,741 \times 4 \\
 &= 34\,964 \text{ cars}
 \end{aligned}$$

### Additional estimation questions

1. Estimate the mass of all the cars on the bridge. Pupils can use 1 500 kg for the average mass of one car.

$$\begin{aligned} &\text{Average mass of all the cars on the bridge} \\ &= 34\,964 \times 1\,500 \\ &= 52\,446\,000 \text{ kg} \end{aligned}$$

2. Estimate the mass of all the cars plus the mass of on average four people in each vehicle. Pupils can use 55 kg as an average for the mass of each person.

$$\begin{aligned} &\text{Mass of cars with four people in each car} \\ &= 52\,446\,000 + [34\,964 \times (4 \times 55)] \\ &= 52\,446\,000 + (34\,964 \times 220) \\ &= 52\,446\,000 + 7\,692\,080 \\ &= 60\,138\,080 \text{ kg} \end{aligned}$$

## Unit 11: Order of operations (BODMAS)

### Teaching guidelines and solutions

In this unit, the focus is on solving problems by multiplying, dividing, adding and subtracting. Make a large BODMAS chart for the classroom so that pupils can refer to it easily as they solve problems.

Explain to pupils that when a problem contains only addition and subtraction, they can just work from left to right – they do not have to do addition in one step and subtraction in the next step. And, when a problem contains only division and multiplication, they can also work from left to right – they do not have to do division first and then multiplication.

### Workbook: Exercise 39

(WB page 50)

1. a)  $\frac{1}{2}$  of  $6 + 4$  \_\_\_\_\_ 7  
b)  $\frac{1}{4}$  of  $16 + 2$  \_\_\_\_\_ 12  
c)  $\frac{1}{12}$  of  $36 - 2$  \_\_\_\_\_ 19  
d)  $27 \div 3 + 3$  \_\_\_\_\_ 6  
e)  $1 + 9 \times 2$  \_\_\_\_\_ 3  
f)  $5 + 4 - 3 \times 2$  \_\_\_\_\_ 1

2. Use the correct order of operations to solve the problems.

a)  $2 + (3 + 5) \times 2 \div 4 - 1$       b)  $(2 + 3 + 5) \times 2 \div (4 - 1)$   
 $= 2 + 8 \times 2 \div 4 - 1$                        $= 10 \times 2 \div 3$   
 $= 2 + 4 - 1$                                        $= \frac{20}{3}$   
 $= 5$      $= 6\frac{2}{3}$

c)  $(2 + 3) + (5 \times 2) \div 4 - 1$       d)  $(2 + 3 + 5) \times (2 \div 4) - 1$   
 $= 5 + 10 \div 4 - 1$                                $= 10 \times \frac{1}{2} - 1$   
 $= 5 + \frac{10}{4} - 1$                                        $= 5 - 1$   
 $= 4 + 2\frac{2}{4}$      $= 4$   
 $= 6\frac{1}{2}$

3. a)  $24 \div 2 + 4$   
 $= 12 + 4 = 16$

b)  $24 \div (2 + 4)$   
 $= 24 \div 6 = 4$

c)  $3^2 + 3^2 \div 9 + 1$   
 $= 9 + 1 + 1$   
 $= 11$

d)  $12 \div 3 \times 2 - 6$   
 $= 8 - 6$   
 $= 2$

e)  $(18 \div 2 + 1) \div 5$   
 $= 10 \div 5$   
 $= 2$

f)  $\frac{1}{10}$  of  $(2 \times 50) + 10$   
 $= 10 + 10$   
 $= 20$

g)  $72 \div (3 \times 12) - 2$   
 $= 2 - 2$   
 $= 0$

h)  $(41 + 7) \div 3 + 4$   
 $= 16 + 4$   
 $= 20$

i)  $(2 + 4) \times 20 \div 10 - 9$   
 $= 12 - 9$   
 $= 3$

j)  $3 \times 3 + (3 \div 3) + 3^2$   
 $= 9 + 1 + 9$   
 $= 19$

k)  $17 - 3 \times 2 + 8 \div 2$   
 $= 11 + 4$   
 $= 15$

l)  $\frac{1}{3}$  of  $27 - 3^2 + 1$   
 $= 9 - 9 + 1$   
 $= 1$

m)  $(53 + 7) \div 3 - 8 \times 2$   
 $= 20 - 16$   
 $= 4$

n)  $\frac{2}{3}$  of  $9 \times 2 \div 4$   
 $= 3$

### Exercise 1

(PB page 123)

1. a)  $182 - (24 \times 4) = 86$

b)  $23 \times (56 \div 7) = 184$

c)  $(124 - 36) \div 4 = 22$

- d)  $23 + (636 \div 6) \times 8 = 871$   
 e)  $48 \div 8 \times (35 - 19) = 96$   
 f)  $654 - (267 + 7) = 380$
2. a)  $750 \div 15 + 50 \div 2 = 75$   
 b)  $275 \times 2 \div 11 = 50$   
 c)  $\frac{7}{8}$  of  $32 \times 3 - 20 = 64$   
 d)  $\frac{2}{3}$  of  $12 - 6 = 2$   
 e)  $1\,234 \times 10 - (428 \div 2) + 78.5 = 12\,204.5$
3. The first and last problems give the same answer; the brackets in (c) do not change the order of operations. The brackets in (b) change the order of operations and the answer differs from the other answers.  
 a) 78 of  $234 \div 3 + 17 = 6\,101$   
 b) 78 of  $234 \div (3 + 17) = 912.60$   
 c) 78 of  $(234 \div 3) + 17 = 6\,101$

## Exercise 2

(PB page 123)

1. a)  $273 \times (\frac{2}{3} \text{ of } 12) = 2\,184$   
 b)  $(\frac{5}{8} \times 168) + 368 = 473$   
 c)  $(124 \times 3) \times 4 = 1\,488$   
 d)  $54 + (1\frac{1}{3} \times 6) \times 7 = 110$   
 e)  $48 \times 1\frac{1}{4} \times (35 - 19) = 960$   
 f)  $\frac{7}{8}$  of  $640 - (289 + 199) = 72$   
 g)  $3\,003 - (8\frac{4}{7} \times 63) + 638 = 3\,101$   
 h)  $621 - (\frac{2}{5} \times 10) = 617$   
 i)  $(1\,734 \times 3) \times (5\frac{1}{2} \times 6) = 171\,666$   
 j)  $\frac{1}{4}$  of  $24 \times (12 \div 6) + 5 = 17$
2. a)  $3\frac{1}{5} + \frac{5}{8} \times 2\frac{2}{15}$   
 $= 3\frac{1}{5} + \frac{5}{8} \times \frac{32}{15}$   
 $= 3\frac{1}{5} + \frac{4}{3}$   
 $= 4\frac{(3+5)}{15}$   
 $= 4\frac{8}{15}$
- b)  $12\frac{2}{5} \times \frac{5}{31} \times \frac{3}{4}$   
 $= 12 \times \frac{1}{31} \times \frac{3}{2}$   
 $= 12 \frac{3}{62}$

$$\begin{aligned}
 \text{c) } & 8\frac{7}{10} - 5\frac{3}{4} \times \frac{2}{5} \\
 & = 8\frac{7}{10} - \frac{23}{4} \times \frac{2}{5} \\
 & = 8\frac{7}{10} - \frac{23}{10} \\
 & = 6\frac{(7-3)}{10} \\
 & = 6\frac{4}{10} \\
 & = 6\frac{2}{5}
 \end{aligned}$$

$$\begin{aligned}
 \text{d) } & 7\frac{2}{3} + \frac{2}{5} - \frac{3}{10} \times 2\frac{1}{2} \\
 & = 7\frac{2}{3} + \frac{2}{5} - \frac{3}{10} \times \frac{5}{2} \\
 & = 7\frac{2}{3} + \frac{2}{5} - \frac{3}{4} \\
 & = 7\frac{(40+24-45)}{60} \\
 & = 7\frac{19}{60}
 \end{aligned}$$

$$\begin{aligned}
 \text{e) } & 7\frac{3}{4} + (2\frac{2}{3} \times \frac{6}{7}) - \frac{3}{8} \\
 & = 7\frac{3}{4} + \frac{8}{3} \times \frac{6}{7} - \frac{3}{8} \\
 & = 7\frac{3}{4} + \frac{16}{7} - \frac{3}{8} \\
 & = 7\frac{(42+128-21)}{56} \\
 & = 7\frac{149}{56} \\
 & = 9\frac{37}{56}
 \end{aligned}$$

$$\begin{aligned}
 \text{f) } & (\frac{4}{5} \times \frac{3}{4}) \times \frac{2}{5} + 1\frac{1}{3} \\
 & = \frac{3}{5} \times \frac{2}{5} + 1\frac{1}{3} \\
 & = \frac{6}{25} + 1\frac{1}{3} \\
 & = 1\frac{(18+25)}{75} \\
 & = 1\frac{43}{75} \\
 & = 1\frac{14}{15}
 \end{aligned}$$

$$\begin{aligned}
 \text{g) } & \frac{3}{10} \times 3\frac{3}{4} + (\frac{4}{3} \times 7\frac{1}{2}) \\
 & = \frac{3}{10} \times \frac{15}{4} + \frac{4}{3} \times \frac{15}{2} \\
 & = \frac{9}{8} + 10 \\
 & = 11\frac{1}{8}
 \end{aligned}$$

$$\begin{aligned}
 \text{h) } & 4\frac{1}{2} \times 3\frac{3}{5} \times \frac{4}{27} + 5\frac{2}{3} \\
 & = \frac{9}{2} \times \frac{18}{5} \times \frac{4}{27} + 5\frac{2}{3} \\
 & = \frac{12}{5} + 5\frac{2}{3} \\
 & = 2\frac{2}{5} + 5\frac{2}{3} \\
 & = 7\frac{(6+10)}{15} \\
 & = 7\frac{16}{15} \\
 & = 8\frac{1}{15}
 \end{aligned}$$

$$\begin{aligned}
 \text{i) } & 2\frac{1}{4} \times 1\frac{1}{2} + (5\frac{1}{4} \times \frac{3}{7}) \\
 & = \frac{9}{4} \times \frac{3}{2} + \frac{21}{4} \times \frac{3}{7} \\
 & = \frac{27}{8} + \frac{9}{4} \\
 & = \frac{27+18}{8} \\
 & = \frac{45}{8} \\
 & = 5\frac{5}{8}
 \end{aligned}$$

$$\begin{aligned}
 \text{j) } & 5\frac{1}{4} \times \frac{3}{7} + \frac{5}{8} - \frac{2}{5} \\
 & = \frac{9}{4} + \frac{5}{8} - \frac{2}{5} \\
 & = \frac{(90+25+16)}{40} \\
 & = \frac{131}{40} \\
 & = 3\frac{11}{40}
 \end{aligned}$$

### Exercise 3

(PB page 124)

1. a)  $5 \times 3 + 9 = 24$                       b)  $15 \div 3 + 2 = 7$   
c)  $20 - 4 \times 3 = 8$                       d)  $18 - 15 \div 3 = 13$
  
2. a)  $7 \times 3 + 4 - 5 = 20$   
b)  $16 \div 4 \times 4 + 2 = 18$   
c)  $7 \times 9 - 36 \div 4 = 54$   
d)  $64 \div 8 + 4 \times 6 = 32$   
e)  $24 \div 6 + 3 \times 12 = 40$   
f)  $\frac{1}{4}$  of  $108 - 3 \times 9 = 27 - 27 = 0$
  
3. a)  $7 + (6 \times 52) + \frac{4}{5}$  of  $125 = 7 + 312 + 100 = 419$   
b)  $\frac{1}{3}$  of  $24 + (27 \div 3) \times 14 = 134$   
c)  $67 \times 16 - (19 \times 21) + \frac{2}{5}$  of  $210 = 1\,072 - 399 + 84 = 757$   
d)  $123 + 10^2 - (2 \times 8) \times 7 = 123 + 100 - 112 = 111$
  
4. a)  $4 \times (8 - 5) = 12$   
b)  $25 \div 5 \times 30 + 60 - 80 = 150 + 60 - 80 = 130$   
c)  $\frac{1}{2}$  of  $(\frac{1}{4}$  of  $544) + \frac{1}{2}$  of  $64 = \frac{1}{2}$  of  $136 + 32 = 68 + 32 = 100$   
d)  $96 \div (40 \div 5) + 2 + 10 = 96 \div 8 + 12 = 12 + 12 = 24$   
e)  $\frac{1}{111} \div 12\,321 - (3 \times 3 + 2) = 111 - 11 = 100$

## Unit 12: Indices

### Teaching guidelines and solutions

In this unit, the focus is on writing numbers in index form, multiplying numbers in index form and solving problems that include indices. Revise squared numbers with your class. Explain that this is a special case of using the index 2.

### Use powers to write numbers

Write a few numbers in index form in expanded form (as shown on page 125 in the Pupil's Book with  $2^1$  to  $2^5$ ) to help explain indices.

Earlier this term, pupils worked with prime factors and they used indices when listing prime factors and finding the HCFs of numbers.

Prepare a chart with the following to display in the classroom:

Index facts:

- A number with an index of 0 = 1  
Examples:  $2^0 = 1$ ,  $3^0 = 1$  and  $18^0 = 1$
- A number with an index of 1 = the number  
Examples:  $2^1 = 2$  and  $75^1 = 75$
- A number with an index of 2 is a squared number  
Examples:  $2^2$ ,  $3^2$  and  $19^2$
- A number with an index of 3 is a cubed number  
Examples:  $2^3$ ,  $3^3$  and  $19^3$

### Exercise 1

(PB page 126)

- $3^2 = 3 \times 3 = 9$
  - $4^2 = 4 \times 4 = 16$
  - $2^4 = 2 \times 2 \times 2 \times 2 = 16$
  - $5^3 = 5 \times 5 \times 5 = 125$
- $6 \times 6 \times 6 = 6^3$
  - $8 \times 8 = 8^2$
  - $4 \times 4 \times 4 \times 4 = 4^4$
  - $10 \times 10 \times 10 \times 10 = 10^4$
- $2^3$ : base: 2, exponent: 3
  - $3^5$ : base: 3, exponent: 5
  - $5^2$ : base: 5, exponent: 2
  - $7^4$ : base: 7, exponent: 4
  - $4^3$ : base: 4, exponent: 3
  - $9^4$ : base: 9, exponent: 4
- $4^2$ : square with side lengths of 4 blocks  
(16 squares in total)
  - $5^2$ : square with side lengths of 5 blocks  
(25 squares in total)
  - $6^2$ : square with side lengths of 6 blocks  
(36 squares in total)

## Write a number as a product of prime numbers

Work through the examples. Ensure that pupils understand how to write the number as a product of the prime factors.

### Exercise 2

(PB page 128)

- $2 \times 2 \times 2 \times 2 \times 2 = 2^5$
  - $5 \times 5 \times 5 \times 5 \times 5 = 5^6$
  - $2 \times 2 \times 2 \times 2 \times 7 \times 7 \times 7 \times 7 = 2^4 \times 7^4$
  - $2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 3 \times 3 \times 3 = 2^4 \times 3^5$

- e)  $2 \times 3 \times 3 \times 3 \times 5 \times 5 \times 7 \times 7 \times 7 = 2 \times 3^3 \times 5^2 \times 7^3$   
 f)  $2 \times 2 \times 3 \times 4 \times 5 \times 5 = 2^2 \times 3 \times 4 \times 5^2$
2. a)  $72 = 2^3 \times 3^2$   
 b)  $220 = 2^2 \times 5 \times 11$   
 c)  $162 = 2 \times 3^4$   
 d)  $2\,500 = 2^2 \times 5^4$   
 e)  $275 = 5^2 \times 11$   
 f)  $1\,248 = 2^5 \times 3 \times 13$

### Workbook: Exercise 40

(WB page 52)

1. a) base: 4  
 b) index: 2
2. a)  $2^2 + 3^2 + 4^2 = 2 \times 2 + 3 \times 3 + 4 \times 4 = 4 + 9 + 16 = 29$   
 b)  $3^3 + 2^3 = 3 \times 3 \times 3 + 2 \times 2 \times 2 = 27 + 8 = 35$   
 c)  $4^2 + 2^2 = 4 \times 4 + 2 \times 2 = 16 + 4 = 20$   
 d)  $1^2 + 1^3 + 1^4 = 1 \times 1 + 1 \times 1 \times 1 + 1 \times 1 \times 1 \times 1$   
 $= 1 + 1 + 1 = 3$   
 e)  $2^0 + 5^0 + 4^1 = 1 + 1 + 4 = 6$   
 f)  $5^2 - (3^2 + 4^2) = 5 \times 5 - (3 \times 3 + 4 \times 4) = 25 - 25 = 0$
3. a)  $2 \times 3 \times 2 \times 3 \times 2 \times 2 \times 2 = 2^5 \times 3^2$   
 b)  $4 \times 4 \times 4 \times 6 \times 4 \times 6 = 4^4 \times 6^2$   
 c)  $100 \times 100 \times 100 \times 10 = 10 \times 100^3$   
 d)  $43 \times 43 \times 44 \times 44 \times 45 = 43^2 \times 44^2 \times 45$
4. a)  $3^3 \times 3^2 \times 3 = 3^6$   
 b)  $4^2 \times 4 \times 5^3 \times 4 \times 5^2 = 4^4 \times 5^7$   
 c)  $5^2 \times 10^0 \times 5 \times 10^2 = 5^3 \times 10^2$   
 d)  $1^5 \times 2^2 \times 2 \times 1 = 1 \times 4 \times 2 = 8$

## Operations with numbers in index form

In this unit, pupils multiply numbers in index form. Work through the examples.

### Exercise 3

(PB page 129)

1. a)  $2^2 \times 2^3 = 2^5$   
 b)  $5 \times 5^3 = 5^4$   
 c)  $4^4 \times 4 = 4^5$   
 d)  $7 \times 7^3 = 7^4$   
 e)  $2^4 \times 2 = 2^5$   
 f)  $4 \times 4 \times 4^3 = 4^5$

2. a)  $8^4 \times 2^3 \times 3^2 = (2^3)^4 \times 2^3 \times 3^2 = 2^{12} \times 2^3 \times 3^2 = 2^{15} \times 3^2$   
 b)  $5^4 \times 5 \times 7^2 = 5^5 \times 7^2$   
 c)  $6^2 \times 6^3 \times 7 = (2 \times 3)^5 \times 7 = 2^5 \times 3^5 \times 7$   
 d)  $3^3 \times 3^2 \times 9^2 \times 9 = 3^5 \times (3^2)^2 \times 3^2 = 3^{11}$   
 e)  $5^3 \times 5^2 \times 10 = 5^7 \times 2 \times 5 = 2 \times 5^8$   
 f)  $8^2 \times 8^2 \times 6^5 = (2^3)^2 \times (2^3)^2 \times (2 \times 3)^5 = 2^6 \times 2^6 \times 2^5 \times 3^5$   
 $= 2^{17} \times 3^5$
3. a)  $6 \times 8 = 2 \times 3 \times 2^3 = 2^4 \times 3 = 48$   
 b)  $16 \times 18 = 2^4 \times 2 \times 3^2 = 2^5 \times 3^2 = 32 \times 9 = 288$   
 c)  $100 \times 250 = 2^2 \times 5^2 \times 5^3 \times 2 = 2^3 \times 5^5 = 8 \times 3\ 125$   
 $= 25\ 000$   
 d)  $144 \times 72 = 2^4 \times 3^2 \times 2^3 \times 3^2 = 2^7 \times 3^4 = 128 \times 81$   
 $= 10\ 368$   
 e)  $49 \times 210 = 7^2 \times 2 \times 3 \times 5 \times 7 = 2 \times 3 \times 5 \times 7^3$   
 $= 10\ 290$   
 f)  $54 \times 16 = 2 \times 3^3 \times 2^4 = 2^5 \times 3^3 = 32 \times 27 = 864$

#### Exercise 4 (challenge)

(PB page 129)

1. a)  $2^{10} = 1\ 024$  is greater ( $10^2 = 100$ )  
 b)  $3^4 = 81$  is greater ( $2^5 = 32$ )  
 c)  $9^1 = 9$  is greater ( $8^1 = 8$ )  
 d) Neither is greater;  $271^0 = 1^0$
2. a)  $6^3 \times 6 \times 6 = 6^5 = 7\ 776$   
 b)  $3^2 \times 3 \times 3^2 = 3^5 = 243$   
 c)  $5 \times 5^3 \times 5 = 5^5 = 3\ 125$   
 d)  $8 \times 8^2 \times 8^2 = 8^5 = 32\ 768$   
 e)  $2^2 \times 2 \times 2^2 = 2^5 = 32$   
 f)  $7 \times 7^2 \times 7^2 = 7^5 = 16\ 807$
3. Chinomso is not correct.  
 $10^2 \times 10^4 = 10^6 = 1\ 000\ 000$  (1 million)
4. a)  $13 = 2^2 + 3^2$   
 b)  $29 = 2^2 + 5^2$   
 c)  $40 = 2^2 + 6^2$   
 d)  $58 = 3^2 + 7^2$
5. a)  $7 = 4^2 - 3^2$   
 b)  $11 = 6^2 - 5^2$   
 c)  $12 = 4^2 - 2^2$   
 d)  $21 = 5^2 - 2^2$

Power	Base	Index	Expanded form	Standard form
$2^2$	2	2	$2 \times 2$	4
$4^3$	4	3	$4 \times 4 \times 4$	64
$5^1$	1	1	5	5
$6^5$	6	5	$6 \times 6 \times 6 \times 6 \times 6$	7 776
$7^4$	7	4	$7 \times 7 \times 7 \times 7$	2 401
$3^6$	3	6	$3 \times 3 \times 3 \times 3 \times 3 \times 3$	729
$11^2$	11	2	$11 \times 11$	121
$1^7$	1	7	$1 \times 1 \times 1 \times 1 \times 1 \times 1 \times 1$	1
$7^1$	7	1	7	7
$9^0$	9	0		1
$10^3$	10	3	$10 \times 10 \times 10$	1 000
$20^3$	20	3	$20 \times 20 \times 20$	8 000
$12^2$	12	2	$12 \times 12$	144
$15^2$	15	2	$15 \times 15$	225
$9^4$	9	4	$9 \times 9 \times 9 \times 9$	6 561

## Unit 13 Working with ratio and percentage

Revise the work pupils did in Unit 6 and Unit 7 with the class. Use this unit to find out how well pupils have understood the work. Remind pupils that they need to ensure that the units for the numbers in a ratio are the same.

### Exercise 1

(PB page 130)

1. a)  $44 \text{ mm to } 4 \text{ mm} = 44 : 4 = 11 : 1$
- b)  $10 \text{ cm to } 10 \text{ mm} = 10 \text{ cm to } 1 \text{ cm} = 10 : 1$   
     Or,  $100 \text{ mm to } 10 \text{ mm} = 100 : 10 = 10 : 1$
- c)  $1\ 200 : 800 = 12 : 8 = 3 : 2$

2. a)  $\frac{8}{160} \times \frac{100}{1} = \frac{10}{2} = 5\%$   
 b)  $\frac{25}{500} \times \frac{100}{1} = \frac{25}{5} = 5\%$   
 c)  $\frac{4\,000}{80\,000} \times \frac{100}{1} = \frac{40}{8} = 5\%$
3.  $\frac{\text{Loss}}{\text{cost price}} \times \frac{100}{1}$   
 $= \frac{400 - 250}{400} \times \frac{100}{1} = \frac{150}{400} \times \frac{100}{1} = \frac{150}{5} = 37.5\%$
4. a) Profit = 3 000 – 2 800 = ~~₦~~200  
 Percentage profit =  $\frac{200}{2\,800} \times \frac{100}{1} = 7.1\%$   
 (rounded off to one decimal place)
- b) Loss = 40 000 – 25 000 = ~~₦~~15 000  
 Percentage loss =  $\frac{15\,000}{40\,000} \times \frac{100}{1} = \frac{15}{40} \times \frac{100}{1} = \frac{150}{4} = 37.5\%$
- c) Profit = 8 000 – 5 500 = ~~₦~~2 500  
 Percentage profit =  $\frac{2\,500}{5\,500} \times \frac{100}{1} = \frac{500}{11} = 45.5\%$   
 (rounded off to one decimal place)
- d) Loss = 6 000 – 4 500 = ~~₦~~1 500  
 Percentage loss =  $\frac{1\,500}{6\,000} \times \frac{100}{1} = \frac{100}{4} = 25\%$

## Exercise 2

(PB page 131)

1. a)  $\frac{100 + 15}{100} \times 3\,800 = \text{₦}4\,370$   
 b)  $\frac{100 - 21}{100} \times 42\,000 = \text{₦}33\,180$   
 c)  $\frac{100 - 6}{100} \times 1\,500 = \text{₦}1\,410$   
 d)  $\frac{100 + 10}{100} \times 83\,500 = \text{₦}91\,850$   
 e)  $\frac{100 - 12}{100} \times 4\,760 = \text{₦}4\,188.80$   
 f)  $\frac{100 - 45}{100} \times 95\,000 = \text{₦}52\,250$
2. a) 52 : 416 = 1 : 8  
 b) 75 to 3 600 = 1 : 48  
 c) 420 mm to 21 m  
 = 420 mm to 21 000 mm = 420 : 21 000  
 = 42 : 2 100 = 1 : 50
3. a) 5 : 8 = 45 : 72; he made 72 ties.  
 b) Nine days

c)  $\frac{100+25}{100} \times 12\,000 = \text{N}15\,000$

d) Selling price for one jacket =  $\frac{275\,000}{25} = \text{N}11\,000$

The tailor will make a loss and not a profit. It costs  $\text{N}12\,000$  to make one jacket.

$$\text{Loss} = 25 \times 12\,000 - 275\,000$$

$$= 300\,000 - 275\,000 = \text{N}25\,000$$

e) Cost to produce 45 jackets =  $45 \times 12\,000 = \text{N}540\,000$

$$\text{Loss} = 540\,000 - 405\,000 = \text{N}135\,000$$

4. A's cost =  $280 \times 50 = \text{N}14\,000$

$$\text{A's selling price} = \frac{100+12}{100} \times 14\,000 = \text{N}15\,680$$

$$\text{A's profit} = 15\,680 - 14\,000 = \text{N}1\,680$$

$$\text{B's cost} = 25 \times 300 = \text{N}7\,500$$

$$\text{B's selling price} = \frac{100+13}{100} \times 7\,500 = \text{N}8\,475$$

$$\text{B's profit} = 8\,475 - 7\,500 = \text{N}975$$

A makes a bigger profit selling products that are cheaper than B's products at a lower profit percentage because she sells more products!

# Revision

Teachers may select revision questions for the final term assessment. The questions and problems involve work covered throughout the term. Problems include routine questions and those involving quantitative reasoning.

## Revision

(PB page 132)

1. a) 15 623 912  
b) 27 000 304
2. a)  $100\ 100 + 999\ 899\ 900 = 1\ 000\ 000\ 000$   
b)  $90\ 010 + 999\ 909\ 990 = 1\ 000\ 000\ 000$
3. a) 3  
b) 0.03  
c) 30  
d) 0.003
4. a)  $539 - 297.7 = 241.3$  km; Cross River is 241.3 km longer.  
b)  $627.5 - 539 = 88.5$  km; Sokoto River is 88.5 km longer.
5. a) one hundred thousand  $\times$  ten = one million  
b)  $100\ 000 \times 10 = 1\ 000\ 000$   
b) one hundred million  $\times$  10 = one billion  
d)  $100\ 000\ 000 \times 10 = 1\ 000\ 000\ 000$
6. a) Multiples of 12: 12, 24, 36, **48**, 60, ...  
Multiples of 16: 16, 32, **48**, 64, ...  
Multiples of 24: 24, **48**, 72, ...  
LCM of 12, 16 and 24: 48  
Saheed needs to buy 48 mangoes.  
b) He can fill 4 boxes.
7. Multiples of 6: 6, 12, 18, 24, 30, 36, 42, 48, 54, 60, 66, 72, 78, 84, 90, 96, 102, **108**, ...  
Multiples of 18: 18, 36, 54, 72, 90, **108**, ...  
Multiples of 27: 27, 54, 81, **108**, 135, ...  
Multiples of 36: 36, 72, **108**, 144, ...  
LCM of 6, 18, 27 and 36: 108  
It will take 108 seconds before all four drummers beat together again.

8. a) Nigeria  
 b)  $18.9\%$  of 173 615 345 = 32 813 300  
 c) Russian Federation  
 d)  $59.3\%$  of 142 833 689 = 84 700 377  
 e) Age 25–64
9. Dada:  $\frac{1}{6}$  of 120 km = 20 km  
 Enofe:  $\frac{3}{7}$  of 210 km = 90 km  
 Enofe cycled further.
10.  $0.375 = \frac{375}{1\,000} = \frac{3}{8}$
11. Length of A's house to length of B's house = 9 : 2 = **63** : 14  
 Length of A's house: 63 m
12. 16 children can eat for 10 days  
 12 children can eat for  $\frac{16}{12}$  or  $\frac{4}{3}$  of 10 = 13.33 days
13. Male students to female students = 9 : 10  
 Number of parts: 9 + 10 = 19  
 Female students =  $\frac{10}{19} \times 1\,520 = 800$
14. People living with HIV/AIDS to total population  
 = 3 400 000 : 166 600 000  
 = 1 : 49
15. Percentage profit =  $\frac{\text{profit}}{\text{cost price}} \times \frac{100}{1} = \frac{80\,000}{500\,000} \times \frac{100}{1} = 16\%$
16. Selling price =  $\frac{110}{100} \times 150\,000 = 11 \times 15\,000 = \text{N}165\,000$
17. Percentage increase =  $\frac{\text{change in amounts}}{\text{initial amount}} \times \frac{100}{1}$   
 $= \frac{150\,000}{100\,000} \times \frac{100}{1}$   
 $= 150\%$
18. a) Total cost: ~~N~~220 000 + ~~N~~20 000 = ~~N~~240 000  
 b) Loss: ~~N~~240 000 – ~~N~~120 000 = ~~N~~120 000  
 c) Percentage loss =  $\frac{\text{loss}}{\text{cost price}} = \frac{120\,000}{240\,000} \times \frac{100}{1} = 50\%$
19. a)  $(23 + 363 \div 6) \times 8 = (23 + 60.5) \times 8 = 83.5 \times 8 = 668$   
 b)  $(48 \div 8 \times 35) - 19 = 210 - 19 = 191$   
 c)  $654 - (267 + 7) = 654 - 274 = 380$   
 d)  $(1\,735 \div 5) \times (912 - 899) = 347 \times 13 = 4\,511$
20. a)  $2^3 \times 7^2 \times 2^2 \times 7^3 = 2^5 \times 7^5 = 32 \times 16\,807 = 537\,824$   
 b)  $7^5 \times 8^2 \times 8^3 = 7^5 \times 8^5 = 16\,807 \times 32\,768 = 550\,731\,776$



**Unit 14: Solving open sentences****Teaching guidelines and solutions**

In this unit, the focus is on solving open sentences, interpreting words in open sentences and using quantitative reasoning and problem-solving strategies to solve problems that involve three or more arithmetic operations.

The open sentence is an introduction to algebra. We start with a small square to represent an unknown value and then use variables such as  $a$ ,  $b$ ,  $c$  and  $x$  to represent unknown values. It is important that pupils understand what the small squares and variables mean in this context.

Draw a simple scale balance (such as the one used in the Pupil's Book on page 138) to show pupils what we mean when we say that every operation you apply to one side of the equals sign must also be applied to the other side so that the equation remains true.

**Open and closed sentences**

Make a simple poster with examples of open and closed sentences to display in the classroom. Remember, all equations contain the equal (=) sign.

Work through a few examples where you use quick investigations (or simple logic) to solve simple open sentences.

**Exercise 1**

(PB page 136)

- |                  |                   |                  |
|------------------|-------------------|------------------|
| 1. $\square = 5$ | 2. $\square = 62$ | 3. $\square = 3$ |
| 4. $\square = 4$ | 5. $\square = 10$ | 6. $\square = 3$ |

**Interpret and solve word problems**

This section introduces pupils to translating word problems into algebraic symbols and then solving the problems. Work through a few examples with the class. Pupils solve the problems in Workbook: Exercise 73.

## Workbook: Exercise 73

(WB page 89)

- $\square = 12$
- $\square = 8$
- $\square = 43$
- $\square = 14$
- $\square = 10$
- $\square = 8$
- $\square = 5$
- $\square = 8$
- $\square = 5$
- $\square = 5$
- $\square = 10$
- $\square = 9$
- $\square = 3$
- $\square = 3$
- $\square = 5$
- $\square = 4$
- $\square = 111$
- $\square = 345$

## Exercise 2

(PB page 137)

- $(12 \times 5) - \square = 12$   
 $\square = 48$
- $12 + 14 + 20 + \square = 50 - 3$   
 $\square = 1$
- $60 \div 12 = \square$   
 $\square = 5$  apples
- $\square = 5 \times 5 + 3$   
 $\square = 28$

## Exercise 3

(PB page 139)

- $5 + \square = 10$   
 $5 - 5 + \square = 10 - 5$   
 $\square = 5$
- $\square - 4 = 6$   
 $\square - 4 + 4 = 6 + 4$   
 $\square = 10$
- $8 \div \square = 1$   
 $8 \div \square \times \square = 1 \times \square$   
 $8 = \square$
- $18 \div \square = 8 - 2$   
 $18 \div \square \times \square = (8 - 2) \times \square$   
 $18 = 6 \times \square$   
 $\frac{18}{6} = \frac{6}{6} \times \square$   
 $3 = \square$
- $10 + 6 + \square = 5 \times 4$   
 $16 - 16 + \square = 20 - 16$   
 $\square = 4$
- $22 \div \square = 6 - 4$   
 $22 \div \square \times \square = 2 \times \square$   
 $22 = 2 \times \square$   
 $\frac{22}{2} = \square$   
 $11 = \square$
- $11 \times 3 + \square = 30 + 6$   
 $33 + \square = 36$   
 $\square = 36 - 33$   
 $\square = 3$
- $96 \div \square = 3 \times 12 \div 6$   
 $96 \div \square = 6$   
 $\square = 16$

## Using algebraic symbols

Work through the rules for working with algebraic symbols and the examples on page 139 in the Pupil's Book with the class. Take note of any misconceptions pupils have and use further examples to address these misconceptions. Refer to the rules as pupils solve problems. Pupils solve the problems in Exercise 74 in the Workbook.

**Workbook: Exercise 74**

(WB page 90)

$$\begin{aligned}
 1. \quad a + 7 &= 10 \\
 a &= 7 - 7 \\
 &= 10 - 7 \\
 a &= 3
 \end{aligned}$$

$$\begin{aligned}
 3. \quad a - 25 &= 1 \\
 a - 25 + 25 &= 1 + 25 \\
 a &= 26
 \end{aligned}$$

$$\begin{aligned}
 5. \quad 3a &= 12 \\
 \frac{3a}{3} &= \frac{12}{3} \\
 a &= 4
 \end{aligned}$$

$$\begin{aligned}
 7. \quad a + 4a - 4 &= 11 \\
 5a - 4 + 4 &= 11 + 4 \\
 \frac{5a}{5} &= \frac{15}{5} \\
 a &= 3
 \end{aligned}$$

$$\begin{aligned}
 9. \quad \frac{2a}{3} &= 2 \\
 \frac{2a}{3} \times \frac{3}{1} &= 2 \times 3 \\
 2a &= 6 \\
 \frac{2a}{2} &= \frac{6}{2} \\
 a &= 3
 \end{aligned}$$

$$\begin{aligned}
 11. \quad a^2 &= 25 \\
 a &= \sqrt{25} \\
 a &= 5
 \end{aligned}$$

$$\begin{aligned}
 2. \quad 5 + a &= 12 \\
 5 - 5 + a &= 12 - 5 \\
 a &= 7
 \end{aligned}$$

$$\begin{aligned}
 4. \quad a - 12 &= 15 \\
 a - 12 + 12 &= 15 + 12 \\
 a &= 27
 \end{aligned}$$

$$\begin{aligned}
 6. \quad 2a &= 10 \\
 \frac{2a}{2} &= \frac{10}{2} \\
 a &= 5
 \end{aligned}$$

$$\begin{aligned}
 8. \quad 12a + 4a + 21 &= 37 \\
 16a + 21 - 21 &= 37 - 21 \\
 \frac{16a}{16} &= \frac{16}{16} \\
 a &= 1
 \end{aligned}$$

$$\begin{aligned}
 10. \quad 3 + 7a &= 17 \\
 3 - 3 + 7a &= 17 - 3 \\
 7a &= 14 \\
 \frac{7a}{7} &= \frac{14}{7} \\
 a &= 2
 \end{aligned}$$

$$\begin{aligned}
 12. \quad 3a^2 &= 12 \\
 \frac{3a^2}{3} &= \frac{12}{3} \\
 a^2 &= 4 \\
 a &= 2
 \end{aligned}$$

**Exercise 4**

(PB page 140)

$$\begin{aligned}
 1. \quad 3a &= 12 \\
 \frac{3a}{3} &= \frac{12}{3} \\
 a &= 4
 \end{aligned}$$

$$\begin{aligned}
 3. \quad 6x \div 6 &= 12 \\
 x &= 12
 \end{aligned}$$

$$\begin{aligned}
 5. \quad 12a - 12 &= 0 \\
 12a - 12 + 12 &= 0 + 12 \\
 12a &= 12 \\
 \frac{12a}{12} &= \frac{12}{12} \\
 a &= 1
 \end{aligned}$$

$$\begin{aligned}
 2. \quad a + 3a &= 16 \\
 4a &= 16 \\
 \frac{4a}{4} &= \frac{16}{4} \\
 a &= 4
 \end{aligned}$$

$$\begin{aligned}
 4. \quad 4x + 7 &= 15 \\
 4x + 7 - 7 &= 15 - 7 \\
 4x &= 8 \\
 \frac{4x}{4} &= \frac{8}{4} \\
 x &= 2
 \end{aligned}$$

$$\begin{aligned}
 6. \quad 4y + 12 &= 24 \\
 4y + 12 - 12 &= 24 - 12 \\
 4y &= 12 \\
 \frac{4y}{4} &= \frac{12}{4} \\
 y &= 3
 \end{aligned}$$

$$7. \quad 54a \div 27 = 10$$

$$\frac{54a}{27} = 10$$

$$2a = 10$$

$$a = 5$$

$$8. \quad 4b + b + 6b = 39 - 6$$

$$11b = 33$$

$$b = 11$$

$$9. \quad 24 - 4 \times 2 + 4b = 20 - 16$$

$$24 - 8 + 4b = 4$$

$$16 + 4b = 4$$

$$4b = 4 - 16$$

$$4b = -12$$

$$b = -3$$

$$10. \quad 5 + 10a \div 2 = 30$$

$$5 + \frac{10a}{2} = 30$$

$$5 + 5a = 30$$

$$5a = 25$$

$$a = 5$$

$$11. \quad 2 \times b + 4b - 3b = 9$$

$$2b + b = 9$$

$$3b = 9$$

$$b = 3$$

$$12. \quad 2x + 3x + 10 = 50$$

$$5x = 50 - 10$$

$$5x = 40$$

$$x = 8$$

### Exercise 5

(PB page 141)

1.  $2a + 6a + 12a = 100$ ; A ( $a = 5$ )
2.  $72a \div 6 = 24$ ; A ( $a = 2$ )
3.  $11 + 81 + 31 + 12 = 56$ ; C ( $a = 3$ )
4.  $4 \times 3a - 4$ ; B ( $a = 2$ )
5.  $14a + 99 = 100 + 3 \times 4 + 1$ ; A ( $a = 1$ )
6.  $5 \times 6a - 10 = 80 \div 2$ ; A ( $a = 1$ )
7.  $26 + 3 \times a - (20 - 5) = 11 + 3 \times 7$ ; C ( $a = 7$ )
8.  $(45a + a) \div 23 = 8$ ; B ( $a = 4$ )
9.  $42 \div 14 \times 2a = 2 + 2 \times 8$ ; C ( $a = 3$ )
10.  $5a + 12a - 7a = 100$ ; C ( $a = 10$ )

### Exercise 6 (challenge)

(PB page 142)

1.  $3a + 7 = 4^2$   
 $3a + 7 - 7 = 16 - 7$   
 $3a = 9$   
 $\frac{3a}{3} = \frac{9}{3}$   
 $a = 3$
2.  $(a + 4) \div 8 = 8$   
 $(a + 4) \div 8 \times 8 = 8 \times 8$   
 $a + 4 = 64$   
 $a + 4 - 4 = 64 - 4$   
 $a = 60$

$$\begin{aligned}
 3. \quad & 6a - 11 = 2a + 13 \\
 & 6a - 11 + 11 = 2a + 13 + 11 \\
 & \quad \quad \quad 6a = 2a + 24 \\
 & 6a - 2a = 2a - 2a + 24 \\
 & \quad \quad \quad 4a = 24 \\
 & \quad \quad \quad \frac{4a}{4} = \frac{24}{4} \\
 & \quad \quad \quad a = 6 \\
 \\
 4. \quad & 7a + 2 = 9a - 16 \\
 & 7a + 2 - 2 = 9a - 16 - 2 \\
 & \quad \quad \quad 7a = 9a - 18 \\
 & 7a - 7a + 18 = 9a - 7a - 18 + 18 \\
 & \quad \quad \quad 18 = 2a \\
 & \quad \quad \quad \frac{2a}{2} = \frac{18}{2} \\
 & \quad \quad \quad a = 9
 \end{aligned}$$

$$\begin{aligned}
 5. \quad \text{a)} \quad & \text{Each girl's mass} = x + 5 \text{ kg} \\
 \text{b)} \quad & 5x + 6(x + 5) = 470 \text{ kg} \\
 & 5x + 6x + 30 = 470 \\
 & 11x + 30 - 30 = 470 - 30 \\
 & \quad \quad \quad 11x = 440 \\
 & \quad \quad \quad \frac{11x}{11} = \frac{440}{11} \\
 & \quad \quad \quad x = 40 \text{ kg}
 \end{aligned}$$

Each boy's weight: 40 kg

Each girl's weight:  $40 + 5 = 45$  kg

$$\begin{aligned}
 \text{Check: } & 5 \times 40 + 6 \times 45 \\
 & = 200 + 270 \\
 & = 470 \text{ kg}
 \end{aligned}$$

### Workbook: Exercise 75

(WB page 91)

$$\begin{array}{ll}
 1. \quad 4p - 5 = 10 - p & 2. \quad 12 + 7 \times p = 2 \times 3 \times p + 13 \\
 4p + p = 10 + 5 & \quad \quad \quad 12 + 7p = 6p + 13 \\
 5p = 15 & \quad \quad \quad 7p - 6p = 13 - 12 \\
 p = 5 & \quad \quad \quad p = 1 \\
 \\
 3. \quad 3 \times (p + 4p) = 55 - 2 \times 5 & 4. \quad 3 \times p + 4p - 4 = 55 - 2 \times 5 \\
 3 \times 5p = 55 - 10 & \quad \quad \quad 3p + 4p - 4 = 55 - 10 \\
 15p = 45 & \quad \quad \quad 7p = 49 \\
 p = 3 & \quad \quad \quad p = 7
 \end{array}$$

5.  $3 \times 5p = 3 + 4p + 3 \times 10$   
 $15p = 3 + 4p + 30$   
 $11p = 33$   
 $p = 3$
6.  $\frac{8p}{2} + 5 = \frac{32p}{16} + 27$   
 $4p + 5 = 2p + 27$   
 $2p = 22$   
 $p = 11$
7.  $\frac{3}{4} \times \frac{2p}{3} = 2$   
 $\frac{6p}{12} = 2$   
 $6p = 24$   
 $p = 4$
8.  $63p - 63 = 0$   
 $63p = 63$   
 $p = 1$
9.  $4p^2 = 100$   
 $p^2 = 25$   
 $p = 5$
10.  $24 + 22p^2 = 112$   
 $22p^2 = 88$   
 $p^2 = 4$   
 $p = 2$

**Unit 15: Money and currency****Teaching guidelines and solutions**

In this unit, the focus is on working with taxes, VAT, shares and dividends, calculating tax rates and share dividends, and converting between currencies.

**Government income and personal tax**

Much of the money a government needs to run a country comes from personal tax. Tax rates can change from year to year. Check the current tax rates to see if they have changed since the Pupil's Book went to print. If so, it would be good to adapt problems so that pupils are working with the most recent tax tables.

If the rate for value-added tax (VAT) has changed from 5%, it would also be good to point this out to pupils and use the current VAT rate when pupils solve problems.

Make a chart of personal tax rates like the one on page 144 in the Pupil's Book. Work through a few examples with the class. Pupils should realise that the percentage of tax payable increases for each income category. Pupils need to find which category applies to a particular taxpayer. At the lowest level, any taxable income up to ₺300 000 is taxed at 7%. The tax rate increases for different categories. At the top end, taxpayers earning a taxable income of more than ₺3 200 000 will pay tax at all the stepped intervals and any taxable income over ₺3 200 000 will be taxed at 24%.

**Exercise 1**

(PB page 146)

1. a)  $75 \times 1\,200 - 11\,000$   
 $= 90\,000 - 11\,000$   
 $= \text{₺}79\,000$
- b)  $160 \times 1\,200 - 11\,000$   
 $= 192\,000 - 11\,000$   
 $= \text{₺}181\,000$
- c)  $320 \times 1\,200 - 11\,000$   
 $= 384\,000 - 11\,000$   
 $= \text{₺}373\,000$

2. Deductions

$$\begin{aligned}
 &= 10\,000 + \left(\frac{20}{100} \times 4\,500\,000 + 5\,000\right) + (3 \times 2\,500) \\
 &\quad + (2 \times 2\,000) + \left(\frac{7.5}{100} \times 4\,500\,000\right) \\
 &= 10\,000 + (900\,000 + 5\,000) + 7\,500 + 4\,000 + 337\,500 \\
 &= \text{N}1\,264\,000
 \end{aligned}$$

$$\text{Taxable income} = 4\,500\,000 - 1\,264\,000 = \text{N}3\,236\,000$$

3.

Taxable income	Taxable amount (N)	Rate of tax (%)	Calculation	Tax payable (N)
First N300 000	300 000	7	$\frac{7}{100} \times 300\,000$	21 000
Next N300 000	300 000	11	$\frac{11}{100} \times 300\,000$	33 000
Next N500 000	500 000	15	$\frac{15}{100} \times 500\,000$	75 000
Next N500 000	500 000	19	$\frac{19}{100} \times 500\,000$	95 000
Next N1 600 000	1 600 000	21	$\frac{21}{100} \times 1\,600\,000$	336 000
Above N3 200 000	36 000	24	$\frac{24}{100} \times 36\,000$	8 640
<b>Totals</b>	<b>3 236 000</b>			<b>568 640</b>

4.

Taxable income	Taxable amount (N)	Rate of tax (%)	Calculation	Tax payable (N)
First N300 000	300 000	7	$\frac{7}{100} \times 300\,000$	21 000
Next N300 000	300 000	11	$\frac{11}{100} \times 300\,000$	33 000
Next N500 000	500 000	15	$\frac{15}{100} \times 500\,000$	75 000
Next N500 000	500 000	19	$\frac{19}{100} \times 500\,000$	95 000
Next N1 600 000	1 250 000	21	$\frac{21}{100} \times 1\,250\,000$	262 500
<b>Totals</b>	<b>2 850 000</b>			<b>486 500</b>

5. a) Tax on N808 500

$$\begin{aligned}
 &(\text{Tax groups: } 300\,000 + 300\,000 + 208\,500) \\
 &21\,000 + 33\,000 + \frac{15}{100} \times 208\,500 = 54\,000 + 31\,275 \\
 &= \text{N}85\,275
 \end{aligned}$$

b) Tax on N1 204 000

$$\begin{aligned}
 &(\text{Tax groups: } 300\,000 + 300\,000 + 500\,500 + 104\,000) \\
 &21\,000 + 33\,000 + 75\,000 + \frac{19}{100} \times 104\,000 \\
 &= 129\,000 + 19\,760 \\
 &= \text{N}148\,760
 \end{aligned}$$

- c) Tax on ~~₤~~755 000  
 (Tax groups: 300 000 + 300 000 + 155 000)  
 $21\ 000 + 33\ 000 + \frac{15}{100} \times 155\ 000$   
 $= 54\ 000 + 23\ 250$   
 $= \text{~~₤~~77\ 250}$
- d) Tax on ~~₤~~2 140 000  
 (Tax groups: 300 000 + 300 000 + 500 000 + 500 000 + 540 000)  
 $21\ 000 + 33\ 000 + 75\ 000 + 95\ 000 + \frac{21}{100} \times 540\ 000$   
 $= 224\ 000 + 113\ 400$   
 $= \text{~~₤~~337\ 400}$
- e) Tax on ~~₤~~3 095 000  
 (Income groups: 300 000 + 300 000 + 500 000 + 500 000 + 1 495 000)  
 $21\ 000 + 33\ 000 + 75\ 000 + 95\ 000 + \frac{21}{100} \times 1\ 495\ 000$   
 $= 224\ 000 + 313\ 950$   
 $= \text{~~₤~~537\ 950}$
- f) Tax on ~~₤~~3 655 000  
 (Tax groups: 300 000 + 300 000 + 500 000 + 500 000 + 1 600 000 + 455 000)  
 $21\ 000 + 33\ 000 + 75\ 000 + 95\ 000 + 336\ 000$   
 $+ \frac{24}{100} \times 455\ 000$   
 $= 560\ 000 + 109\ 200$   
 $= \text{~~₤~~669\ 200}$

## Value-added tax

Discuss value-added tax (VAT) with the class and items that are VAT-exempt. Take a few till slips to class and show pupils how VAT is shown on different till slips. You can ask pupils to bring till slips to class, highlight the VAT on each one and display them in class for a few days.

### Exercise 2

(PB page 148)

- Price including VAT =  $\frac{105}{100} \times 6\ 200 = \text{~~₤~~6\ 510$
- Price including VAT =  $\frac{105}{100} \times 2\ 800 = \text{~~₤~~2\ 940$
- Price including VAT =  $\frac{105}{100} \times 8\ 000 = \text{~~₤~~8\ 400$
- Price including VAT =  $\frac{105}{100} \times 1\ 600 = \text{~~₤~~1\ 680$

5. Price including VAT =  $\frac{105}{100} \times 11\,000 = \text{N}11\,550$

6. Price including VAT =  $\frac{105}{100} \times 550\,000 = \text{N}577\,500$

### Workbook: Exercise 42

(WB page 55)

1.

Taxable income (N)	Taxable amount (N)	Rate of tax (%)	Calculation	Tax payable (N)
First 300 000	300 000	7	$\frac{7}{100} \times 300\,000$	21 000
Next 300 000	300 000	11	$\frac{11}{100} \times 300\,000$	33 000
Next 500 000	500 000	15	$\frac{15}{100} \times 500\,000$	75 000
Next 500 000	500 000	19	$\frac{19}{100} \times 500\,000$	95 000
Next 1 600 000	1 600 000	21	$\frac{21}{100} \times 1\,600\,000$	336 000
Above 3 200 000	300 000	24	$\frac{24}{100} \times 300\,000$	72 000
<b>Totals</b>	<b>3 500 000</b>			<b>632 000</b>

2. a)  $\frac{5}{100} \times 750 = \text{N}37.50$

b)  $\frac{5}{100} \times 12\,000 = \text{N}600$

c)  $\frac{5}{100} \times 6\,439 = \text{N}321.95$

d)  $\frac{5}{100} \times 83\,440 = \text{N}4\,172$

e)  $\frac{5}{100} \times 22\,685 = \text{N}1\,134.25$

### Workbook: Exercise 43

(WB page 56)

Price	VAT	Price including VAT
<b>Rice cakes</b> N830.00	$\frac{5}{100} \times 830.00$ = N41.50	$\frac{105}{100} \times 380.00 = \text{N}871.50$ Or, $830.00 + 41.50 = \text{N}871.50$
<b>Dress</b> N9 250.00	$\frac{5}{100} \times 9\,250.00$ = N462.50	$\frac{105}{100} \times 9\,250.00 = \text{N}9\,712.50$ Or, $9\,250.00 + 462.50 = \text{N}9\,712.50$
<b>Running shoes</b> N13 440.00	$\frac{5}{100} \times 13\,440.00$ = N672.00	$\frac{105}{100} \times 13\,440.00 = \text{N}14\,112.00$ Or, $13\,440.00 + 672.00 = \text{N}14\,112.00$
<b>Take-away meal</b> N785.95	$\frac{5}{100} \times 785.95$ = 39.2975 $\approx$ N39.30 (to two decimal places)	$\frac{105}{100} \times 785.95 = \text{N}825.2474$ $\approx 825.25$ (to two decimal places) Or, $785.95 + 39.30 = \text{N}825.25$

Price	VAT	Price including VAT
<b>TV set</b> ₹169 950	$\frac{5}{100} \times 169\,950$ = ₹8 497.50	$\frac{105}{100} \times 169\,950 = \text{₹}178\,447.50$ Or, $169\,950 + 8\,497.50$ = ₹178 447.50
<b>Football</b> ₹3 450	$\frac{5}{100} \times 3\,450.00$ = ₹172.50	$\frac{105}{100} \times 3\,450 = \text{₹}3\,622.50$ Or, $3\,450.00 + 172.50$ = ₹3 622.50
<b>Car</b> ₹3 385 500	$\frac{5}{100} \times 3\,385\,500$ = ₹169 275	$\frac{105}{100} \times 3\,385\,500 = \text{₹}3\,554\,775$ Or, $3\,385\,500 + 169\,275$ = ₹3 554 775

## Shares and dividends

When people buy shares, they are investing money in a business that they think will help their money grow. Take a newspaper to class to show pupils recent share prices. Work with the class to track the share prices for at least three shares for two weeks. Display newspaper clippings in class.

### Workbook: Exercise 44

(WB page 57)

- $0.25 \times 4\,000 = 1\,000.00$
  - $1.00 \times 480 = 480.00$
  - $2.90 \times 3\,500 = 10\,150.00$
  - $7.10 \times 600 = 4\,260.00$
  - $6.45 \times 735 = 4\,740.75$
- $\frac{450\,000}{75\,000} = \text{₹}6$
  - $\frac{2\,500\,000}{1\,000\,000} = \text{₹}2.50$
  - $\frac{890\,000}{50\,000} = \text{₹}17.80$
  - $\frac{661\,187.50}{7\,450} = \text{₹}88.75$
  - $\frac{912\,500}{2\,000} = \text{₹}456.25$

### Exercise 3

(PB page 149)

- $\text{₹}0.45 \times 900 = \text{₹}405$
  - She can buy 750 shares
- $\text{₹}0.55 \times 1\,500 = \text{₹}825.00$ ;  $1.15 \times 1\,500 = \text{₹}1\,725.00$   
Profit =  $\text{₹}1\,725.00 - \text{₹}825.00$   
= ₹900
- $\text{₹}0.62 \times 6\,000\,000 = \text{₹}3\,720\,000$

4. Omolola spent ₦9 500 when she bought 2 500 shares.

a)  $\frac{9\,500}{2\,500} = \text{₦}3.80$

b) She paid ₦3.80 per share.

Selling price per share =  $\frac{18\,250}{2\,500} = \text{₦}7.30$

Profit per share =  $7.30 - 3.80 = \text{₦}3.50$

## Currencies

Take newspapers to class to show pupils how exchange rates are published. Track the exchange rates for at least four currencies (including the naira and the US dollar) for two weeks.

Make a poster to show current exchange rates for a few currencies. Include the countries for which exchange rates are included in the Pupil's Book (on page 150) and in the Workbook (on page 58). Display the poster in class.

Ask pupils to discuss currencies with people they know who have travelled overseas and find out what, for example, an apple costs in the countries they have visited. Pupils who have found information can share their information with the class.

### Exercise 4 (challenge)

(PB page 150)

North America: United States of America US dollar (US\$)

South America: Brazil real (R\$)

Argentina: Argentine peso (ARS\$)

Britain: British pound (£)

Europe: Different countries euro (€)

Africa: Nigeria naira (₦)

South Africa rand (R)

Asia: India Indian rupee (₹)

China: China renminbi (¥)

Japan: Japanese yen (¥)

Australia: Australia dollar (AUS\$)

### Workbook: Exercise 45

(WB page 58)

- |       |          |    |           |    |           |
|-------|----------|----|-----------|----|-----------|
| 1. a) | AUS\$640 | b) | R\$1 625  | c) | E£8 830   |
| d)    | €405     | e) | £360      | f) | KSh50 500 |
| g)    | ₦180 505 | h) | R5 970    |    |           |
| 2. a) | AUS\$180 | b) | R\$499.09 | c) | E£2 455   |
| d)    | €115     | e) | £100      | f) | KSh14 040 |
| g)    | R1 670   | h) | US\$140   |    |           |

## Exercise 5

(PB page 151)

- Brazil:  $75 \times 3.25 = \text{R}\$243.75$   
Cameroon:  $75 \times 531.91 = \text{FCFA}39\ 893.25$   
Egypt:  $75 \times 17.66 = \text{E}\pounds 1\ 324.50$   
Europe:  $75 \times 0.81 = \text{€}60.75$   
Britain:  $75 \times 0.72 = \text{£}54$   
Nigeria:  $75 \times 361.01 = \text{N}\pounds 27\ 075.75$   
South Africa:  $75 \times 11.94 = \text{R}895.50$
- $\text{E}\pounds 700 \div 17.66 = 39.637 \approx \text{US}\$39.64$
  - $\text{€}20 \div 0.81 = 24.691 \approx \text{US}\$24.69$
  - $\text{R}400 \div 11.94 = \text{US}\$33.50$
  - $\text{R}\$250 \div 3.25 = 76.923 \approx \text{US}\$76.92$
- $350\ 000 \div 307.61 = 1\ 137.804 \approx \text{£}1\ 137.80$
  - $300\ 000 \div 226.62 = \text{€}1\ 323.80$
- $\text{£}155 \times 307.61 = \text{N}\pounds 47\ 679.55$
  - $\text{€}95 \times 226.62 = \text{N}\pounds 21\ 528.90$

## Exercise 6

(PB page 152)

- $\frac{105}{100} \times 150 = 157.50$ ;  $\frac{115}{100} \times 150 = 172.50$   
Difference =  $172.50 - 157.50 = \text{N}\pounds 15.00$
  - $\frac{105}{100} \times 4\ 275 = 4\ 488.75$ ;  $\frac{115}{100} \times 4\ 275 = 4\ 915.25$   
Difference =  $4\ 915.25 - 4\ 488.75 = \text{N}\pounds 427.50$
  - $\frac{105}{100} \times 3\ 500 = 3\ 675$ ;  $\frac{115}{100} \times 3\ 500 = 4\ 025$   
Difference =  $4\ 025 - 3\ 675 = \text{N}\pounds 350$
  - $\frac{105}{100} \times 3\ 650 = 3\ 832.50$ ;  $\frac{115}{100} \times 3\ 650 = 4\ 197.50$   
Difference =  $4\ 197.50 - 3\ 832.50 = \text{N}\pounds 365.00$
  - $\frac{105}{100} \times 9\ 475 = 9\ 948.75$ ;  $\frac{115}{100} \times 9\ 475 = 10\ 896.25$   
Difference =  $10\ 896.25 - 9\ 948.75 = \text{N}\pounds 947.50$
  - $\frac{105}{100} \times 77\ 495 = 81\ 369.75$ ;  $\frac{115}{100} \times 77\ 495 = 89\ 119.25$   
Difference =  $89\ 119.25 - 81\ 369.75 = \text{N}\pounds 7\ 749.50$
- $1\ 200 \times \text{N}\pounds 0.80 = \text{N}\pounds 960.00$
- $550\ 750 \times \text{N}\pounds 0.45 = \text{N}\pounds 247\ 837.50$
- Numbers of shares bought:  
Chinelo:  $\frac{5\ 000}{2.50} = 2\ 000$  shares  
Azeez:  $\frac{5\ 000}{0.80} = 6\ 250$  shares  
Brima:  $\frac{5\ 000}{6.25} = 800$  shares

- b) Numbers of shares sold:  
 Chinelo:  $2\ 000 \times 2.52 = \text{₦ } 5\ 040.00$   
 Azeez:  $6\ 250 \times 0.87 = \text{₦ } 5\ 437.50$   
 Brima:  $800 \times 1.73 = \text{₦ } 1\ 384.00$   
 Azeez made the most profit (₦ 437.50).  
 (Brima made a huge loss.)

5. a) Country A; 50% of its population is younger than 15 years and thus at school.  
 b) Country B; 67% of its population is in the age group 15 years to 64 years; this is the group of people who earn money and pay taxes.  
 c) Country B; 16% of its population is retired.

### Workbook: Exercise 46

(WB page 59)

1. a)  $5\ 000.00 - 1\ 351.70 = 3\ 648.30$   
 b)  $5\ 000.00 - 4\ 510.30 = 489.70$
2. a) VAT:  $3\ 450 \times \frac{105}{100} = 3\ 622.50$   
 Change:  $10\ 000 - 3\ 622.50 = 6\ 377.50$   
 b) VAT:  $6\ 225 \times \frac{105}{100} = 6\ 536.25$   
 Change:  $10\ 000 - 6\ 536.25 = 3\ 463.75$   
 c) VAT:  $486 \times \frac{105}{100} = 510.30$   
 Change:  $10\ 000 - 510.30 = 9\ 489.70$   
 d) VAT:  $9\ 465 \times \frac{105}{100} = 9\ 938.25$   
 Change:  $10\ 000 - 9\ 938.25 = 61.75$

### Exercise 7 (challenge)

(PB p. 153)

1. a)

Currency	September 2015		February 2018	
	US\$1	US\$100	US\$1	US\$100
Australian dollar	AUS\$1.42	AUS\$142	AUS\$1.28	AUS\$128
Brazilian real	R\$3.97	R\$397	R\$3.25	R\$325
Egyptian pound	£7.83	£783	£17.66	£1 766
European euro	€0.89	€89	€0.81	€81
British pound	£0.65	£65	£0.72	£72
Nigerian naira	₦199.26	₦19 926	₦361.01	₦36 101
South African rand	R13.92	R1 392	R11.94	R1 194

- b) Egyptian pound  
 c) British pound  
 d) In 2018, US\$100 would give ₦36 101 – this is ₦16 175 more than in 2015.  
 e) In 2018, someone would have received £1 766 for US\$100 and in 2015, someone would have received £783. The difference is £983.
2. a) 2015: ₦996 300                      b) 2015: R\$99.25  
 2018: ₦1 805 050                      2018: R\$81.25
3. a) The euro weakened compared to the US dollar from 2015 to 2018.  
 b) The British pound strengthened compared to the US dollar from 2015 to 2018.

### Workbook: Exercise 47

(PB page 60)

**Note:** All answers are given in naira (₦).

Number of items	Price for each item					
	50k	80k	₦1	₦7.50	₦50	₦75
1	0.50	0.80	1	7.50	50	75
2	1.00	1.60	2	15.00	100	150
3	1.50	2.40	3	22.50	150	225
4	2.00	3.20	4	30.00	200	300
5	2.50	4.00	5	37.50	250	375
10	5.00	8.00	10	75.00	500	750
15	7.50	12.00	15	112.50	750	1 125
20	10.00	16.00	20	150.00	1 000	1 500
25	12.50	20.00	25	187.50	1 250	1 875
30	15.00	24.00	30	225.00	1 500	2 250
35	17.50	28.00	35	262.50	1 750	2 625
40	20.00	32.00	40	300.00	2 000	3 000
45	22.50	36.00	45	337.50	2 250	3 375
50	25.00	40.00	50	375.00	2 500	3 750
55	27.50	44.00	55	412.50	2 750	4 125

Number of items	Price for each item					
	50k	80k	₦1	₦7.50	₦50	₦75
60	30.00	48.00	60	450.00	3 000	4 500
70	35.00	56.00	70	525.00	3 500	5 250
100	50.00	80.00	100	750.00	5 000	7 500
200	100.00	160.00	200	1 500.00	10 000	15 000
300	150.00	240.00	300	2 250.00	15 000	22 500

## Unit 16: Working with length

### Teaching guidelines and solutions

In this unit, the focus is on measuring heights and lengths, revising metric units, and converting lengths between units. Pupils will also draw right-angled triangles and identify the hypotenuse, opposite and adjacent sides in right-angled triangles, use Pythagoras' rule to calculate the lengths of unknown sides, and solve problems involving Pythagoras' rule.

### Measure height and length

Make a chart with the metric units that are used to measure length (millimetre (mm), centimetre (cm), metre (m) and kilometre (km)) and convert between units. You could copy the conversion diagram on page 155 in the Pupil's Book. Work through the examples with the class.

#### Exercise 1

(PB page 156)

- 1 m 20 cm = 120 cm
  - 700 mm = 70 cm
  - 2 750 mm = 275 cm
  - 930 mm = 93 cm
- 35 m = 3 500 cm
  - 1 m 5 cm = 105 cm
  - 7 m 50 cm = 750 cm
  - 8 000 mm = 800 cm
- 11 cm 1 mm = 111 mm
  - 190 mm = 19 cm
  - 4 300 cm = 43 m
  - 68 000 m = 68 km
- 480 m = 0.48 km
  - 1 945 m = 1.945 km
  - 924 m = 0.924 km
  - 750 m = 0.75 km

5. 1 500 m = 1.5 km      6. 368 km = 368 000 m  
 7. a) 2.1 km = 2 100 m      b) 2.1 km = 210 000 cm

### Measuring length

Ask pupils to use a ruler to measure the height of the classroom door. When they realise how difficult it is to use such a short instrument, they will realise why we use different instruments to measure different lengths.

Pupils can make a trundle wheel using a car tyre or a piece of strong cardboard cut into a circle. They need to make a mark on their trundle wheels and align the mark on the wheel with a mark on the ground at the start of a straight line. They could draw a line on the ground or use the line between tiles. When they have rolled the wheel once, they need to make another mark on the ground and then measure the distance between the two marks. When using their trundle wheel to measure a length, they must start with the mark on the ground and count how many times it touches the ground again as they roll it carefully.

### Workbook: Exercise 48

(WB page 61)

1.

	Kilometre (km)	Metre (m)	Centimetre (cm)	Millimetre (mm)
	2	2 000	200 000	2 000 000
a)	0.075	75	7 500	75 000
b)	0.5	500	50 000	500 000
c)	0.375	375	37 500	375 000
d)	4.5	4 500	450 000	4 500 000
e)	0.9623	962.3	96 230	962 300
f)	4.765	4 765	476 500	4 765 000

2. a) distance between two towns

b) height of a wall

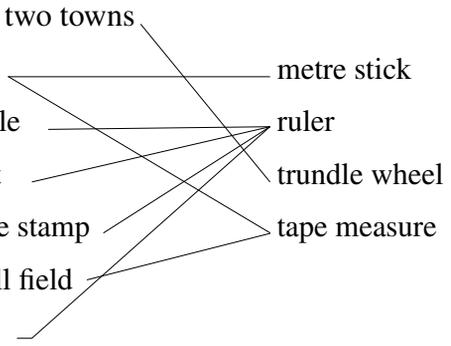
c) length of a floor tile

d) width of your foot

e) height of a postage stamp

f) length of a football field

g) width of a spade



## Exercise 2

(PB page 157)

1. Length of red part: 15 mm
2. 53 mm

## Exercise 3

(PB page 157)

- 1,2 a) 60 mm      b) 15 mm      c) 77 mm  
d) 45 mm      e) 115 mm      f) 38 mm  
g) 95 mm

3. Practical measurement task for pairs
4. Practical measurement task for groups

## Workbook: Exercise 49

(WB page 62)

1. 3 cm
2. 6 cm
3. 2 cm
4. 4 cm
5. 8 cm
6. 5 cm
7. 10 cm
8. 1 cm
9. 7 cm
10. 9 cm

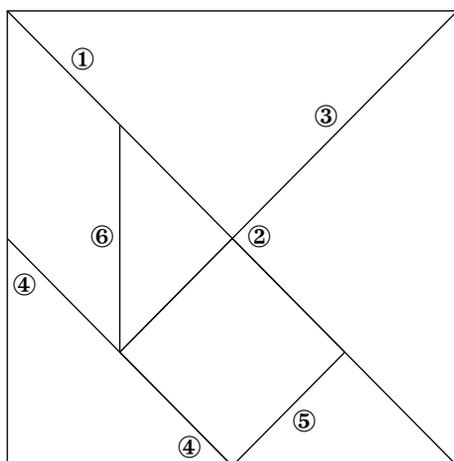
## Workbook: Exercise 50

(WB page 63)

Pupils can discuss the best strategy to use to draw the enlargement of the tangram.

Steps they can use refer to numbers on the diagram.

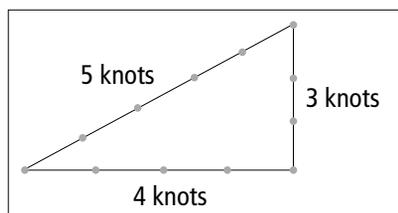
- ① Draw the diagonal.
- ② Measure the length of the diagonal (170 mm) and mark its centre (85 mm).
- ③ Measure the length of the next longest line. Multiply its length by 2. Draw the line through the centre of the diagonal.



- ④ Measure the length of the line at the end of the second longest line (42 mm). Draw the line with 42 mm on either side.
- ⑤ Draw a line to form a square with side length 42 mm.
- ⑥ Measure the last line (30 mm), double its length and draw it.

## Right-angled triangles

The Egyptians used right-angled triangles in constructions centuries ago. They placed a rope, knotted at regular intervals, on the ground to form a right-angled 3–4–5-triangle (see the diagram). If time permits, ask pupils to work in groups and make such a rope. They can use their rope to check if corners such as those on a football field are  $90^\circ$ .

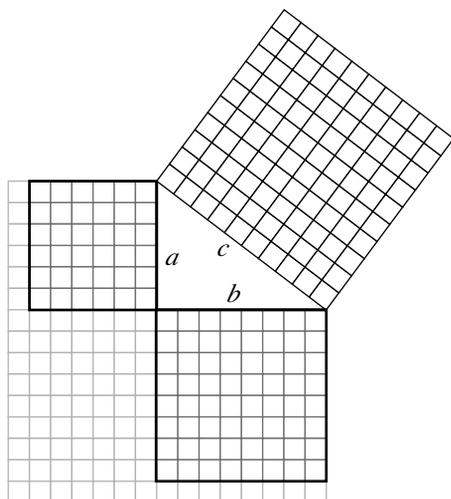


## Draw right-angled triangles

Before pupils can learn to draw accurate triangles, they need to learn to draw lines of accurate lengths. They will need sharp pencils, rulers and a compass (but no protractor) for these constructions. Recreate the construction of a right-angled triangle as illustrated on pages 159 and 160 in the Pupil's Book on the board.

## Workbook: Exercise 51

(WB page 64)



$$\begin{aligned} a^2 + b^2 &= 6^2 + 8^2 \\ &= 36 + 64 \\ &= 100 \end{aligned}$$

$$c^2 = 10^2 = 100$$

$$\text{So, } a^2 + b^2 = c^2$$

## Exercise 4

(PB page 160)

Construction activity.

1. AB should be about 72 mm.
2. AB should be about 56 mm.

## Pythagoras' rule

Discuss the diagram on page 161 in the Pupil's Book with the class. It shows what Pythagoras' rule means. Use it to show pupils how to find the length of a missing side in a right-angled triangle. So, for example, ask them how they could find the length of  $a$  if given the lengths of  $b$  and  $c$ :

$$a^2 = c^2 - b^2; 25 - 16 = 9; \text{ so, } a = 3.$$

The square of the hypotenuse equals the sum of the squares of the other two sides! Work through the examples on pages 161 to 163 in the Pupil's Book with the class.

## Workbook: Exercise 52

(WB page 65)

1. a) AB = 3 cm                      b) BC = 6.5 cm  
    c) AB = 4 cm                    d) AC = 5.7 cm
2. Pupils make accurate constructions of triangles.

## Exercise 5

(PB page 163)

1. a) AB = 37 mm, AC = 35 mm and BC = 12 mm  
    b)  $37^2 = 1\,369 \text{ mm}^2$   
         $35^2 = 1\,225 \text{ mm}^2$  and  $12^2 = 144$   
         $1\,225 + 144 = 1\,369$   
        The triangle is right-angled.
2. a)  $25^2 = 625$   
         $20^2 = 400 \text{ mm}^2$  and  $18^2 = 324$   
         $400 + 324 = 724$   
        The triangle is not right-angled.  
    b)  $17^2 = 289$   
         $15^2 = 225$  and  $8^2 = 64$   
         $225 + 64 = 289$   
        The triangle is right-angled.  
    c)  $10^2 = 100$   
         $8^2 = 64 \text{ mm}^2$  and  $6^2 = 36$   
         $64 + 36 = 100$   
        The triangle is right-angled.

3. a)  $60^2 = 3\ 600$ ,  $12^2 = 144$  and  $13^2 = 169$   
 $144 + 169 = 313$   
 The triangle is not right-angled.
- b)  $25^2 = 625$ ,  $24^2 = 576$  and  $7^2 = 49$   
 $576 + 49 = 625$   
 The triangle is right-angled.
- c)  $17^2 = 289$ ,  $11^2 = 121$  and  $9^2 = 81$   
 $121 + 81 = 202$   
 The triangle is not right-angled.
- d)  $61^2 = 3\ 721$ ,  $60^2 = 3\ 600$  and  $11^2 = 121$   
 $3\ 600 + 121 = 3\ 721$   
 The triangle is right-angled.
4. a)  $BC^2 = 52 - 32$   
 $= 25 - 9$   
 $= 16$   
 $BC = 4\text{ cm}$
- b)  $AB^2 = 5^2 + 12^2$   
 $= 25 + 144$   
 $= 169$   
 $AB = 13\text{ mm}$
- c)  $AC^2 = 5^2 + 7^2$   
 $= 25 + 49$   
 $= 74$   
 $BC = \sqrt{74}\text{ m}$
- d)  $BC^2 = 4^2 + 8^2$   
 $= 16 + 64$   
 $= 80$   
 $BC = \sqrt{80}\text{ cm}$
- e)  $AB^2 = 15^2 - 12^2$   
 $= 225 - 144$   
 $= 81$   
 $AB = 9\text{ m}$
- f)  $BC^2 = 17^2 - 15^2$   
 $= 289 - 225$   
 $= 64$   
 $BC = 8\text{ cm}$
5.  $\text{Diagonal}^2 = 24^2 + 10^2$   
 $= 576 + 100$   
 $= 676$   
 $\text{diagonal} = 26\text{ cm}$
6.  $\text{Diagonal}^2 = 9^2 + 5^2$   
 $= 81 + 25$   
 $= 106$   
 $\text{diagonal} = \sqrt{106}\text{ cm}$
7.  $\text{Side}^2 = 13^2 - 10^2$   
 $= 169 - 100$   
 $= 69$   
 $\text{side} = \sqrt{69}\text{ cm}$
8. hypotenuse

$$\begin{aligned}
 9. \quad x^2 &= 26^2 - 24^2 \\
 &= 676 - 576 \\
 &= 100
 \end{aligned}$$

$x = 10$  The length of the shortest side is 10 cm.

$$\begin{aligned}
 10. \text{ a) } x^2 &= 8^2 + 4^2 \\
 &= 64 + 16 \\
 &= 80 \\
 x &= \sqrt{80}
 \end{aligned}$$

$$\begin{aligned}
 \text{b) } x^2 &= 5^2 - 4^2 \\
 &= 25 - 16 \\
 &= 9 \\
 x &= 9
 \end{aligned}$$

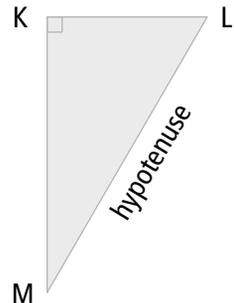
$$\begin{aligned}
 \text{c) } x^2 &= 9^2 - 6^2 \\
 &= 81 - 36 \\
 &= 45 \\
 x &= \sqrt{45}
 \end{aligned}$$

## Summary of properties of a right-angled triangle

Make a chart that shows the properties of right-angled triangles to display in class. You can use the information below.

In  $\triangle KLM$ :

- $\hat{K} = 90^\circ$
- $\hat{L} + \hat{M} = 90^\circ$
- The hypotenuse is opposite the right angle.
- The square of the hypotenuse = the sum of the squares on the other two sides.



### Exercise 6

(PB page 165)

1.  $16^2 = 256$ ,  $13^2 = 169$  and  $9^2 = 81$   
 $169 + 81 = 250$ ; the corner is not  $90^\circ$ .
2.  $13^2 = 169$ ,  $12^2 = 144$  and  $5^2 = 25$   
 $144 + 25 = 169$ ; the corner is  $90^\circ$ .
3.  $18^2 = 324$ ,  $15^2 = 225$  and  $8^2 = 64$   
 $225 + 64 = 289$ ; the corner is not  $90^\circ$ .
4.  $37^2 = 1\ 369$ ,  $35^2 = 1\ 225$  and  $12^2 = 144$   
 $1\ 225 + 144 = 1\ 369$ ; the corner is  $90^\circ$ .
5.  $65^2 = 4\ 225$ ,  $45^2 = 2\ 025$  and  $33^2 = 1\ 089$   
 $2\ 025 + 1\ 089 = 3\ 114$ ; the corner is not  $90^\circ$ .
6.  $29^2 = 841$ ,  $22^2 = 484$  and  $20^2 = 400$   
 $484 + 400 = 884$ ; the corner is not  $90^\circ$ .

## Exercise 7 (challenge)

(PB page 166)

1.  $x^2 = 3^2 + 4^2$   
 $x^2 = 25$   
 $x = 5$   
 $y^2 = 13^2 - x^2$   
 $y^2 = 169 - 25$   
 $y^2 = 144$   
 $y = 12$   
 $x = 5$  and  $y = 12$
2.  $x^2 = 10^2 - 6^2$   
 $x^2 = 100 - 36$   
 $x^2 = 64$   
 $x = 8$   
 $y^2 = 17^2 - x^2$   
 $y^2 = 289 - 64$   
 $y^2 = 225$   
 $y = 15$   
 $x = 8$  and  $y = 15$
3.  $x^2 = 68^2 - 32^2$   
 $x^2 = 4\,624 - 1\,024$   
 $x^2 = 3\,600$   
 $x = 60$   
 $y^2 = 61^2 - x^2$   
 $y^2 = 3\,721 - 3\,600$   
 $y^2 = 121$   
 $y = 11$   
 $x = 60$  and  $y = 11$
4.  $x^2 = 33^2 + 56^2$   
 $x^2 = 1\,089 + 3\,136$   
 $x^2 = 4\,225$   
 $x = 65$   
 $y^2 = x^2 - 63^2$   
 $y^2 = 4\,225 - 3\,969$   
 $y^2 = 256$   
 $y = 16$   
 $x = 65$  and  $y = 16$

## Unit 17: Weight (mass)

### Teaching guidelines and solutions

In this unit, the focus is on using scales to measure weight (mass), expressing masses in different units (gram (g), kilogram (kg) and tonne (t)) and solving word problems that involve mass.

Make a chart similar to the one on page 167 in the Pupil's Book to show conversions between tonnes (t), kilograms (kg) and grams (g).

### Workbook: Exercise 64

(WB page 78)

1.

	Tonne (t)	Kilogram (kg)	Gram (g)
a)	0.25	250	250 000
b)	12	12 000	12 000 000
c)	7.75	7 750	7 750 000
d)	100	100 000	100 000 000

	Tonne (t)	Kilogram (kg)	Gram (g)
e)	1.75	1 750	1 750 000
f)	93.5	93 500	93 500 000

2. a) the weight of a large truck  
 b) the weight of an egg  
 c) the weight of a baby  
 d) the weight of a house  
 e) the weight of a marble  
 f) your weight
- kilogram  
 tonne  
 gram
- 

### Exercise 1

(PB page 168)

1. a)  $127 \text{ kg} = 127\,000 \text{ g}$       b)  $1 \text{ t} = 1\,000\,000 \text{ g}$   
 c)  $5\,500 \text{ g} = 5.5 \text{ kg}$       d)  $93\,000 \text{ kg} = 93 \text{ t}$   
 e)  $500 \text{ kg} = 500\,000 \text{ g}$       f)  $2.3 \text{ kg} = 23\,000 \text{ g}$   
 g)  $0.4 \text{ kg} = 400 \text{ g}$       h)  $5\,000 \text{ kg} = 5 \text{ t}$   
 i)  $10 \text{ t} = 10\,000 \text{ kg}$       j)  $3\,250 \text{ g} = 3.250 \text{ kg}$

2.  $25 \text{ kg} = 25\,000 \text{ g}$

3.  $2\,400 \text{ g} = 2.4 \text{ kg}$

## Measure weight (mass)

Take a bathroom and a kitchen scale to class. Ask pupils to take turns to weigh themselves and objects such as pens and books.

### Exercise 2

(PB page 168)

1. Practical activity for pairs of pupils; pupils to record the masses of objects.
2. a) an apple – grams  
 b) a car – tonnes  
 c) a five-year old pupil – kilograms
3. a)  $2\,500 \text{ g}$  is greater.      b)  $12\frac{1}{2} \text{ kg}$  is greater.  
 c)  $4\,001 \text{ g}$  is greater.      d)  $6\,755 \text{ g}$  is greater.  
 e)  $9\,002 \text{ kg}$  is greater.      f)  $2\,510 \text{ g}$  is greater.
4. a) Chinasa,  $70\,000 \text{ g}$  of rice is the largest.  
 b)  $7 + 7\frac{1}{5} + 70 = 84.2 \text{ kg}$

## Calculations with weights

Check that the weights are all in the same unit before adding or subtracting weights. Show pupils how to choose one unit in a calculation and convert the other weights to that unit before adding or subtracting. The examples on page 169 in the Pupil's Book show how to multiply and divide with weights. Pupils must use their skills for working with decimal numbers and fractions when multiplying weights.

### Exercise 3

(PB page 170)

- $24 + 35 + 52 = 111$  kg
  - $458 + 421 + 1\ 081 + 135 = 2\ 095$  g = 2.095 kg
  - $0.725 + 0.250 + 0.025 + 1.2 = 2.2$  kg
  - $12 + 24 + 83 + 49 = 168$  g = 0.168 kg
  - $901 + 1\ 200 + 7\ 500 + 800 = 10\ 401$  kg
  - $12\ 000 + 8\ 400 + 39\ 000 + 4\ 900 = 64\ 300$  kg
- $2\ 000 - 825 = 1\ 175$  g
  - $2\ 000 - 1\ 290 = 710$  g
  - $2\ 000 - 449 = 1\ 551$  g
  - $2\ 000 - 55 = 1\ 945$  g
  - $2\ 000 - 1\ 257 = 743$  g
  - $2\ 000 - 823 = 1\ 177$  g
- $34 + 50 + 63 + 39 + 66 + 49 + 52 + 55 + 64 + 48 = 520$  g
  - Mass of basket =  $1\ 450 - 520 = 930$  g

### Exercise 4

(PB page 171)

- $49.2$  g  $\times 32 = 1\ 574.4$  g
  - $9.1$  t  $\times 15 = 136.5$  t
  - $47$  kg  $\times 93 = 4\ 371$  kg
  - $720$  g  $\times 80\% = 576$  g
- $48$  kg  $\div 96 = 0.5$  kg
  - $\frac{4}{5}$  t  $\div 20 = 0.04$  t
  - $961$  kg  $\div 31 = 31$  kg
  - $490$  kg  $\div 100 = 4.9$
- $25$  kg  $- (12 \times 500$  g) =  $25 - 6 = 19$  kg
- $56.5$  g  $\times 75 = 4\ 237.5$  g
- $45$  kg  $\div 500$  g =  $45\ 000 \div 500 = 90$  packets of rice

### Workbook: Exercise 65

(WB page 79)

- $91 + 190 = 281$  kg
  - $8.5 + 72.8 = 81.3$  kg
  - $45.8 + 250 = 295.8$  kg
  - $1\ 080 + 635 = 1\ 715$  kg
  - $372.5 + 285 = 657.5$  kg
  - $26 + 1\ 800 = 1\ 826$  g

2. a) Heavier animal: adult male lion;  
difference =  $190 - 91 = 99$  kg
- b) Heavier animal: ostrich; difference =  $72.8 - 8.5 = 64.3$  kg
- c) Heavier animal: cow calf;  
difference =  $250 - 45.8 = 204.2$  kg
- d) Heavier animal: bull; difference =  $1\ 080 - 635 = 445$  kg
- e) Heavier animal: adult zebra;  
difference =  $372.5 - 285 = 87.5$  kg
- f) Heavier animal: owl; difference =  $1\ 800 - 26 = 1\ 774$  g
3. a)  $12 \times 91$  kg = 1 092 kg
- b)  $25 \times 72.8$  kg = 1 820 kg
- c)  $72 \times 8.5$  kg = 612 kg
- d)  $30 \times 45.8$  kg = 1 374 kg
- e)  $43 \times 635$  kg = 27 305 kg
- f)  $64 \times 372.5$  kg = 23 840 kg
- g)  $83 \times 26$  g = 2 158 g = 2.158 kg
- h)  $125 \times 1.8$  kg = 225 kg

### Exercise 5

(PB page 171-172)

1.  $1\ 200 + 46 + 78 + 59 + 84 + 103 = 1\ 570$  kg
2.  $250 \times 8 = 2\ 000$  g of flour;  $125 \times 8 = 1\ 000$  g of sugar
3.  $500 - (37 \times 2) = 500 - 74 = 426$  kg
4. a)  $243 - 232 = 11$  g
- b)  $80 \times 243 - 80 \times 232 = 19\ 440 - 18\ 560 = 880$  g
- c) Cola contains sugar and diet cola does not contain sugar.
5. a)  $(5 \times 1\ 650) + (5 \times 1\ 400) = 8\ 250 + 7\ 000 = 15\ 250$  kg
- b)  $8\ 250 - 7\ 000 = 1\ 250$  kg
6. a)  $435 - 58 = 377$  g
- b)  $(20 \times 58) + (20 \times 435) = 1\ 160 + 8\ 700 = 9\ 860$  g  
(9 860 g = 9.86 kg)

## Unit 18: Working with time

### Teaching guidelines and solutions

In this unit, the focus is on telling time in seconds and minutes, working out how long certain activities take, solving problems that involve time, reading transport timetables and determining



- d) quarter past 12; 00:15 (00:15 a.m.); 12:15 (12:15 p.m.)
- e) quarter to 11; 10:45 (10:45 a.m.); 22:45 (10:45 p.m.)
- f) 10 minutes to 3; 02:50 (2:50 a.m.); 14:50 (2:50 p.m.)
- g) half past 6; 06:30 (6:30 a.m.); 18:30 (6:30 p.m.)
- h) 20 minutes to 5; 04:40 (4:40 a.m.); 16:40 (4:40 p.m.)
- i) 25 minutes past 8; 08:25 (8:25 a.m.); 20:25 (8:25 p.m.)

2. a) 9:10 a.m.      b) 12:30 p.m.      c) 3:20 p.m.  
 d) 10:36 a.m.      e) 5.55 p.m.      f) 11:15 p.m.  
 g) 7:45 p.m.      h) 5:35 a.m.      i) 12:25 a.m.
3. a) 02:10:30      b) 04:35:20      c) 07:13:25  
 d) 10:37:45      e) 12:00:15      f) 11:20:35  
 g) 03:45:20      h) 01:25:40      i) 06:50:10

### Workbook: Exercise 66

(WB page 81)

4:45  
 1:25  
 11:20  
 18:35  
 12:00  
 20:50  
 14:55  
 19:40  
 12:30  
 18:15  
 11:30  
 6:45

## Convert lengths of time

Make a copy of the conversion diagram for lengths of time on page 177 in the Pupil's Book.

Pupils complete Workbook: Exercise 67 before they tackle Exercise 3.

### Workbook: Exercise 67

(WB page 82)

- 6 weeks = 42 days
  - $2\frac{1}{2}$  years =  $365 + 365 + 182\frac{1}{2} = 912\frac{1}{2}$  days
  - 45 weeks = 315 days
  - Answers will differ.
- half an hour = 30 min.
  - 1 h = 60 min.
  - 3 h 45 min. = 225 min.
  - 1 day = 1 440 min.
  - Answers will differ.
- half an hour = 1 800 s
  - 45 min. = 2 700 s
  - 5 h 15 min. = 18 900 s
  - 1 day = 86 400 s

### Exercise 3

(PB page 178)

- 2 min. = 120 s
  - 30 min. = 1 800 s
  - 3 600 s = 1 h
  - 1 day = 24 h
  - 1 500 s = 25 min.
  - $2\,700\text{ s} = 0.75\text{ h} = \frac{3}{4}\text{ h}$
  - 4 200 s = 70 min.
  - 4 h and 6 min. = 14 760 s
  - 1 day and 4 h = 1 680 min.
  - 3 h and 20 min. = 12 000 s
- 7 min. = 420 s
  - 300 min. = 5 h
  - 48 h = 2 day
  - 21 days = 3 weeks
  - 1 440 min. = 1 day
  - 86 400 s = 1 day
  - 1 week = 168 h
  - 9 h = 32 400 s
  - 180 000 s = 50 h
  - 30 days = 2 592 000 s
- 6 weeks = 1 008 h
  - 9 h = 32 400 s
  - 840 000 h = 35 000 days
  - 4 320 000 s = 1 200 h

## Quantitive reasoning and problem-solving

Workbook: Exercise 68 and Exercise 4 give pupils many opportunities to solve problems related to time.

## Workbook: Exercise 68

(WB page 83)

Pupils answer the questions in their workbooks.

1. a) quarter past midnight  
b) half past 10 in the morning  
c) twenty to seven in the morning  
d) quarter to two in the afternoon  
p.m.  
e) midnight  
f) noon  
g) ten-thirty in the evening
- 6.40 a.m.  
13:45  
00:15  
10.30  
12:00  
10:30  
00:00
2. a) 76 minutes 15 seconds    b) 64 minutes 5 seconds  
c) 15 minutes 43 seconds    d) 6 minutes 5 seconds
3. a) 44 minutes 17 seconds    b) 31 minutes 38 seconds  
c) 15 minutes 47 seconds    d) 2 minutes 1 second

## Exercise 4

(PB page 180)

1. a) 10 a.m.                      b) 10:30 a.m.  
c) 4:10 p.m.                    d) 3:10 a.m.
2. a) 7:15 p.m.  
b) 10:40 a.m.
3.  $1972 - 1886 = 86$  years
4.  $8 \times 5 = 40$  hours
5. a) 20 min.                      b) 720 min.                      c) 135 min.  
d) 12 min.                      e) 60 min.                      f) 282 min.
6. 6 h 30 min.
7. Five times
8.  $2 \text{ h} + 35 \text{ min.} + 45 \text{ min.} + 1 \text{ h } 15 \text{ min.} + 55 \text{ min.}$   
 $= 120 + 35 + 45 + 75 + 55$   
 $= 330 \text{ min.}$   
 $= 5 \text{ h } 30 \text{ min.}$
9. a) 1h 30 min.  
b)  $15 \text{ min.} + 15 \text{ min.} + 30 \text{ min} = 1 \text{ h}$   
c) 10.45 p.m.  
d)  $10.45 - 3.30 = 7 \text{ h } 15 \text{ min.}$

## Exercise 5 (challenge)

(PB page 182)

1. Removing tiles and screeding floor:  $30 + 5 = 35$  h  
= 4 days and 3 hours

The workers have to wait for four hours for screeding to dry. So, they can only work one more hour on day five. But they cannot do anything as they must wait for the tiles to dry!

Tiling, grouting and cleaning tiles:  $12 + 4 + 2 = 18$  h  
= 2 days and 2 h

Total time needed: 5 days + 2 days 2 h less 1 h = 7 days 1 h

Why do we subtract one hour?

The contractor will probably ask workers to work overtime for one hour so that the job can be completed in seven days.

2.  $2015 - 1993 = 22$  years
3. Answers will differ.
4. The twin who was born first is 25 minutes older than the other twin.
5. a) Flights to Abuja, Port Harcourt and Benin City are national (inside Nigeria).  
Flights to Casablanca, Abu Dhabi, London and Doha are international.
- b) One hour and ten minutes or 1 h 10 min.
- c) Three hours and thirty-five minutes or 3 h 35 min.
- d) Length of flight 9J 351: 1 h 25 min.  
Length of flight FRN 100: 1 h 20 min.  
Flight FRN 100 is 5 minutes shorter than flight 9J 351.
- e) The shortest flight is W3 620. It is one hour.
- f) International flights:  
Casablanca AT 554: 3 h 35 min.  
Abu Dhabi EY 674: 12 h 15 min.  
London VS 652: 5 h 55 min.  
Doha QR 1408: 11 h 35 min.  
The flight to Casablanca is the shortest (3 h 35 min.)  
and the flight to Abu Dhabi is the longest (12 h 15 min.).
6. She works for nine hours.
7. Answers may differ. Pupils can discuss their schedules for Godwin.

## Exercise 6

(PB page 183)

1. Clock A: Leaves are used to show hours and thin leaves show the time.  
Clock B: Vegetables and fruits are used to show hours and carrots show the time.  
Clock C: Eggs are used to show hours and spoons show the time.
2. 12:00, 2:00, 4:00, 6:00, 8:00 and 10:00
3. Pupils work in groups and create fun clock faces.

## Unit 19: Perimeter and area

### Teaching guidelines and solutions

In this unit, the focus is on drawing rectangles accurately, discovering and proving that rectangles with the same area can have different perimeters, calculating the areas of trapeziums and other figures by dividing them into rectangles and triangles, finding areas in square metres and converting to hectares, using a map to calculate land areas in hectares.

Remind pupils of the difference between perimeter (the distance around a shape) and area (the amount of space a shape covers).

### Perimeter

Exercise 1 gives pupils the opportunity to work out the perimeter of different shapes. After completing Exercise 2, pupils can tackle Workbook: Exercise 53.

### Exercise 1

(PB page 186)

1. Perimeter =  $2(25) + 2(12) = 50 + 24 = 74$  cm
2. Perimeter =  $2(72) + 2(35) = 144 + 70 = 214$  cm
3. Perimeter =  $4(17) = 68$  m
4. Perimeter =  $2(33) + 2(40) = 66 + 80 = 146$  m
5. Perimeter =  $4(28) = 112$  cm
6. Perimeter =  $2(85) + 2(115) = 170 + 230 = 400$  m
7. Perimeter =  $2(13) + 2(76) = 26 + 152 = 178$  cm
8. Perimeter =  $4(60) = 240$  cm
9. Perimeter =  $2(31) + 2(92) = 62 + 184 = 246$  cm

## Exercise 2

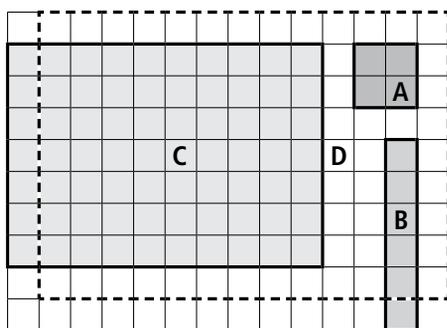
(PB page 187)

1. Perimeter =  $4 + 7 + 6 = 17$  cm
2. Perimeter =  $14 + 26 + 10 + 26 = 76$  m
3. Perimeter =  $216 + 40 + 216 = 472$  cm
4. Perimeter =  $12 + 12 + 24 + 18 + 24 = 90$  cm
5. Perimeter =  $55 + 34 + 43 = 132$  m
6. Perimeter =  $6 + 2 + 2 + 5 + 2 + 2 + 6 + 2 + 2 + 5 + 2 + 2$   
 $= 38$  m

## Workbook: Exercise 53

(WB page 67)

Four examples are shown on the grid. Many other shapes can also be correct. (The grid has been rotated.)



## Exercise 3

(PB page 187)

1. He needs  $50 \times 4 = 200$  m plus a length for the knot.
2. Length of trench =  $2(257 + 213) = 2 \times 470 = 940$  m
3. Length of ribbon =  $2(31 + 23) = 2 \times 54 = 108$  cm
4. Distance  
 $= 6(125 + 50 + 50 + 125 + 50 + 50) = 6 \times 450 = 2\,700$  m
5. Distance =  $4 \times 120 = 480$  m
6. a) Perimeter =  $4 \times 6 = 24$  cm  
b) Perimeter =  $2(7 + 8) = 30$  m

## Area

We measure area by counting squares. Units for area include square millimetres ( $\text{mm}^2$ ), square centimetres ( $\text{cm}^2$ ) and square metres ( $\text{m}^2$ ).

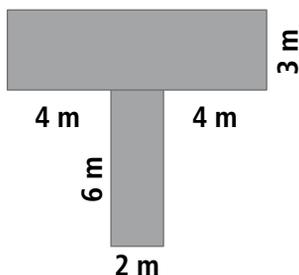
Write the formula for calculating area on the board where pupils can refer to it as necessary: area = length  $\times$  breadth =  $l \times b$ .

Exercise 4 illustrates how shapes with the same area need not have the same perimeter. Pupils complete Workbook: Exercise 54 after completing Exercise 4.

## Exercise 4

(PB page 188)

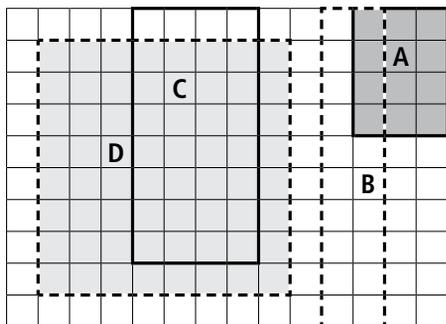
- Perimeter A =  $4 \times 6 = 24$   
Perimeter B =  $2(9 + 4) = 26$   
Perimeter C =  $2(12 + 3) = 30$   
Perimeter D =  $2(18 + 2) = 40$
  - D (40), C (30), B (26), A (24)
  - Area A =  $6 \times 6 = 36$   
Area B =  $9 \times 4 = 36$   
Area C =  $12 \times 3 = 36$   
Area D =  $18 \times 2 = 36$
  - The areas are all the same (36).
  - The perimeter of the square is the smallest. Its length and breadth are identical.
  - The square gives the same area as the other shapes, but uses less fencing and so it would be the best shape to use for a pen.
- Answers will differ. Pupils can swap answers and check the area of each other's shapes.
- Area =  $9 \times 4 = 36 \text{ cm}^2$
  - Area =  $7 \times 5 = 35 \text{ m}^2$
- Area =  $10 \times 4 = 40 \text{ cm}^2$
  - Area =  $16 \times 9 = 144 \text{ m}^2$
  - Area =  $35 \times 30 = 1\,050 \text{ cm}^2$
  - Area =  $23 \times 8 = 184 \text{ mm}^2$
  - Area =  $20 \times 13 = 260 \text{ m}^2$
  - Area =  $12 \times 7 = 84 \text{ km}^2$
- Perimeter =  $2(10 + 20) + 2(6 + 16) = 60 + 44 = 104 \text{ m}$   
Area =  $(10 \times 20) - (6 \times 16) = 200 - 96 = 104 \text{ m}^2$
- Perimeter =  $3 + 4 + 6 + 2 + 6 + 4 + 3 + 10 = 38 \text{ m}$   
Area =  $3 \times 10 + 2 \times 6 = 30 + 12 = 42 \text{ m}^2$



## Workbook: Exercise 54

(WB page 68)

Four examples are shown on the grid. Many other shapes can also be correct. (The grid has been rotated.)



## Area of a triangle

Draw a rectangle with a diagonal like the one on page 190 in the Pupil's Book on the board. Pupils need to understand why the formula for the area of a triangle includes  $\frac{1}{2}$ , base and perpendicular height. Work through the examples on page 191 in the Pupil's Book with the class. Pupils complete Exercise 5 and then Workbook: Exercise 55.

### Exercise 5

(PB page 191)

- a)  $\text{Area} = \frac{1}{2} \times 6 \times 10 = \frac{1}{2} \times 60 = 30 \text{ cm}^2$

b)  $\text{Area} = \frac{1}{2} \times 1.5 \times 4 = \frac{1}{2} \times 6 = 3 \text{ m}^2$

c)  $\text{Area} = \frac{1}{2} \times 5.6 \times 10 = \frac{1}{2} \times 56 = 28 \text{ cm}^2$

d)  $\text{Area} = \frac{1}{2} \times 5 \times 12 = \frac{1}{2} \times 60 = 30 \text{ cm}^2$

e)  $\text{Area} = \frac{1}{2} \times 3 \times 5.6 = \frac{1}{2} \times 16.8 = 8.4 \text{ mm}^2$

f)  $\text{Area} = \frac{1}{2} \times 15 \times 18 = \frac{1}{2} \times 270 = 135 \text{ cm}^2$
- a)  $\text{Height} = 2 \times \frac{60}{10} = 12 \text{ cm}$     b)  $\text{Base} = 2 \times \frac{45}{18} = 5 \text{ m}$

c)  $\text{Height} = 2 \times \frac{31.6}{8} = 7.9 \text{ cm}$     d)  $\text{Base} = 2 \times \frac{66}{12} = 11 \text{ cm}$

e)  $\text{Height} = 2 \times \frac{143}{26} = 11 \text{ cm}$     f)  $\text{Base} = 2 \times \frac{85}{34} = 5 \text{ m}$
- a)  $\text{Area} = \frac{1}{2} \times 6 \times 7 = 21 \text{ cm}^2$

b)  $\text{Base} = 2 \times \frac{16}{8} = 4 \text{ cm}$

c)  $\text{Height} = 2 \times \frac{24}{8} = 6 \text{ cm}$

## Workbook: Exercise 55

(WB page 69)

1. Perimeter =  $3 + 4 + 5 = 12$  cm  
Area =  $\frac{1}{2}b \times h = \frac{1}{2} \times 3 \times 4 = 6$  cm<sup>2</sup>
2. Perimeter =  $4 + 4 + 5.7 = 13.7$  cm  
Area =  $\frac{1}{2}b \times h = \frac{1}{2} \times 4 \times 4 = 8$  cm<sup>2</sup>
3.  $CD^2 + 3^2 = 5^2$   
 $CD^2 = 25 - 9$   
 $CD^2 = 16$   
 $CD = 4$  cm

Perimeter of ACD =  $3 + 4 + 5 = 12$  cm

Area of ADC =  $\frac{1}{2} \times 3 \times 4 = 6$  cm<sup>2</sup>

Perimeter of ABC =  $5 + 5 + 6 = 16$  cm

Perimeter of four large triangles =  $4 \times 16 = 64$  cm

Area of four large triangles =  $8 \times 6 = 48$  cm<sup>2</sup>

## Area of a trapezium

Make sure pupils understand that a trapezium always has one pair of parallel sides. Work through the explanation and examples on pages 192 and 193 with the class. Pupils should make rough sketches of diagrams so that they can show how to divide a shape into different parts.

### Exercise 6

(PB page 194)

1. Area =  $8 \times \frac{6+14}{2} = 8 \times 10 = 80$  mm<sup>2</sup>
2. Area =  $5 \times \frac{8+11}{2} = 5 \times 9.5 = 47.5$  cm<sup>2</sup>
3. Area =  $5 \times \frac{2+12}{2} = 5 \times 7 = 35$  m<sup>2</sup>
4. Area =  $3 \times \frac{12+14}{2} = 3 \times 13 = 39$  m<sup>2</sup>
5. Area =  $8 \times \frac{14+10}{2} = 8 \times 12 = 96$  m<sup>2</sup>
6.  $\frac{10+15}{2} = 12.5$   
Height =  $\frac{1000}{12.5} = 80$  m

### Exercise 7

(PB page 194)

1. a) Area =  $8 \times \frac{30+25}{2} = 8 \times 27.5 = 220$  m<sup>2</sup>  
b) Area =  $21 \times \frac{35+35}{2} = 21 \times 35 = 735$  m<sup>2</sup>

$$\begin{aligned}
 2. \text{ Area} &= (10.5 - 2.0 - 2.0) \times (7.5 - 2.0 - 2.0) \\
 &= 6.5 \times 3.5 \\
 &= 22.75 \text{ m}^2
 \end{aligned}$$

$$\text{Price of carpet} = 22.75 \times 4\,000 = \text{R}91\,000$$

### Workbook: Exercise 56

(WB page 70)

$$\begin{aligned}
 1. \quad AE^2 &= BE^2 - AB^2 \\
 AE^2 &= 10^2 - 6^2 \\
 AE^2 &= 100 - 36 \\
 AE^2 &= 64 \\
 AE &= 8
 \end{aligned}$$

$$\begin{aligned}
 \text{Perimeter ACDBE} \\
 &= 6 + 3 + 4 + 5 + 10 + 8 = 36
 \end{aligned}$$

$$\begin{aligned}
 \text{Area ABE} + \text{area BCD} \\
 &= \frac{1}{2}(6 \times 8) + \frac{1}{2}(3 \times 4) = \frac{1}{2}(48) + \frac{1}{2}(12) = \frac{1}{2}(60) = 30 \text{ units}^2
 \end{aligned}$$

$$\begin{aligned}
 2. \quad BD^2 &= 12^2 + 5^2 \quad (\text{Pythagoras' rule}) \\
 &= 144 + 25 \\
 &= 169 \\
 BC &= 13 \text{ cm}
 \end{aligned}$$

$$\text{Perimeter} = 2 + 13 + 14 + 5 = 34 \text{ cm}$$

$$\text{Area} = h \times \frac{a+b}{2} = 5 \times \frac{2+14}{2} = 5 \times 8 = 40 \text{ cm}^2$$

$$3. \quad \text{Area} = h \times \frac{a+b}{2} = 3 \times \frac{3+6}{2} = 3 \times 4.5 = 13.5 \text{ cm}^2$$

### Workbook: Exercise 57

(WB page 71)

$$\begin{aligned}
 1. \quad \text{Perimeter A} &= 2(4 + 14) = 36 \text{ cm}; \text{ area A} = 4 \times 14 = 56 \text{ cm}^2 \\
 \text{Perimeter B} &= 2(3 + 15) = 36 \text{ cm}; \text{ area B} = 3 \times 15 = 45 \text{ cm}^2 \\
 \text{Perimeter C} &= 2(6 + 12) = 36 \text{ cm}; \text{ area C} = 6 \times 12 = 72 \text{ cm}^2 \\
 \text{Perimeter D} &= 2(7 + 11) = 36 \text{ cm}; \text{ area D} = 7 \times 11 = 77 \text{ cm}^2 \\
 \text{Perimeter E} &= 2(8 + 10) = 36 \text{ cm}; \text{ area D} = 8 \times 10 = 80 \text{ cm}^2 \\
 \text{Perimeter F} &= 2(9 + 9) = 35 \text{ cm}; \text{ area F} = 81 \text{ cm}^2
 \end{aligned}$$

2. The perimeters are identical (36 cm). As the difference between the lengths of the sides is reduced, the area enlarges. The square has the largest area.

3. Rectangle 1: length 16, width 2  
 Rectangle 2: length 17, width 1

	Side length	Area as power (square units)	Area as number (square units)
1.	2	$2^2$	4
2.	3	$3^2$	9
3.	4	$4^2$	16
4.	5	$5^2$	25
5.	6	$6^2$	36
6.	7	$7^2$	49
7.	8	$8^2$	64
8.	9	$9^2$	81
9.	10	$10^2$	100
10.	11	$11^2$	121
11.	12	$12^2$	144
12.	13	$13^2$	169
13.	14	$14^2$	196
14.	15	$15^2$	225
15.	20	$20^2$	400
16.	50	$50^2$	2 500
17.	60	$60^2$	3 600
18.	80	$80^2$	6 400
19.	100	$100^2$	10 000
20.	200	$200^2$	40 000

### Calculate area of land in hectares

Take a few newspaper advertisements for farmland sold in hectares (ha) to class. The hectare is the metric unit used in many countries for land measurement. You will also find advertisements where the land size is given in acres. The acre is an imperial measure used in countries such as the USA. One hectare is roughly 2.47 acres, and an acre is about 40% of a hectare. You could ask pupils to convert hectares to acres and/or acres to hectares so that they can compare

the land prices. Work through the example on page 195 with the class before pupils tackle Exercise 8.

### Exercise 8

(PB page 195)

1. Area =  $500 \times \frac{500+800}{2} = 500 \times 650 = 325\,000 \text{ m}^2$   
 $325\,000 \text{ m}^2 = 325\,000 \div 10\,000 = 32.5 \text{ ha}$
2. Area =  $4 \times 10 = 40 \text{ km}^2$   
 $40 \times 100 = 4\,000 \text{ ha}$
3. Area =  $\frac{1}{2} \times 1\,500 \times 2\,000 = 1\,500\,000 \text{ m}^2$   
 $1\,500\,000 \div 10\,000 = 150 \text{ ha}$
4. Area =  $\frac{1}{2} \times 6 \times 8 = 24 \text{ km}^2$   
 $24 \times 100 = 2\,400 \text{ ha}$

## Unit 20: Volume and capacity

### Teaching guidelines and solutions

In this unit, the focus is on calculating the volume and capacity of prisms, cylinders and spheres and solving problems that involve the volume of prisms, cylinders and spheres.

Volume refers to the amount of space an object takes up and capacity refers to the amount of liquid a container can hold. If a jug with a capacity of 1 ℓ is half full of water, the volume of water inside the jug is 500 ml. This does not affect the capacity of the jug – it remains 1 ℓ. At this level, this distinction is not important. However, pupils must read questions carefully.

### Units for measuring volume and capacity

Draw the three images at the bottom of page 196 in the Pupil's Book on the board and use them to help explain the difference between the length unit (centimetres (cm)), the area unit (square centimetres (cm<sup>2</sup>)) and the volume unit (cubic centimetres (cm<sup>3</sup>)).

Draw the conversion diagram on page 197 in the Pupil's Book on the board and work through a few examples with the class. The diagram shows how to convert between kilolitres or cubic metres, litres and millilitres or cubic centimetres.

Pupils use the conversion diagram when they answer the questions in Workbook: Exercise 59.

## Workbook: Exercise 59

(WB page 73)

1.

	Kilolitre (kl) Cubic metre (m <sup>3</sup> )	Litre (ℓ)	Millilitre (ml) Cubic centimetre (cm <sup>3</sup> )
	4	4 000	4 000 000
a)	0.8	800	800 000
b)	2.5	2 500	2 500 000
c)	10.5	10 500	10 500 000
d)	1.2	1 200	1 200 000
e)	75	75 000	75 000 000
f)	1	1 000	1 000 000

- 2.
- a) the volume of a swimming pool
  - b) the volume of a teaspoon
  - c) the volume of a large dam
  - d) the volume of a petrol tank
  - e) a dose of medicine
  - f) the volume of a glass
- litres  
 kilolitres  
 millilitres
- 

## Prisms

Take examples of prisms to class. The easiest ones to find are boxes. Show pupils boxes that are cubes or almost cubes and cereal boxes. Both are rectangular prisms. A dice is a cube.

### Exercise 1

(PB page 198)

- 1.
- a) square
  - b) equilateral triangle
  - c) square or rectangle
  - d) regular pentagon
- 2.
- a) Edges: 12, faces: 6
  - b) Edges: 15, faces: 7
  - c) Edges: 9, faces: 5

## Volume of a prism

Write the formulae for calculating the volume of prisms on the board or on posters to display in the classroom. Use the diagrams on page 198 in the Pupil's Book to help explain the concepts.

Formulae for calculating volume and capacity:

- Volume of a rectangular prism = length  $\times$  width  $\times$  height
- Volume of triangular prism  
= area of base triangle  $\times$  perpendicular height of prism

Pupils use the formulae to complete the volume calculations in Workbook: Exercise 60.

## Exercise 2

(PB page 200)

1. Volume =  $14 \times 11 \times 9 = 1\,386 \text{ cm}^3$
2. Volume =  $15 \times 18 \times 20 = 5\,400 \text{ cm}^3$
3. Volume =  $2.5 \times 3.6 \times 1.1 = 9.9 \text{ m}^3$
4. Width =  $\frac{45}{12.5} = 3.6$ ; volume =  $12.5 \times 12.5 \times 3.6 = 562.5 \text{ mm}^3$   
or area of base  $\times$  height;  $45 \times 12.5 = 562.5 \text{ mm}^3$
5. Volume =  $5 \times 6 \times 2 = 60 \text{ cm}^3$
6. Volume =  $3 \times 8 \times 12 = 288 \text{ cm}^3$
7. Volume =  $3.2 \times 10.6 \times 8.5 = 288.32 \text{ cm}^3$
8. Volume =  $\frac{1}{2} \times 5 \times 7 \times 7 = 122.5 \text{ cm}^3$
9. Volume =  $\frac{1}{2} \times 12 \times 8 \times 2 = 96 \text{ cm}^3$

## Workbook: Exercise 60

(WB page 74)

1. Volume = length  $\times$  width  $\times$  height =  $3 \times 3 \times 3 = 27 \text{ cm}^3$
2. Volume  
=  $\frac{1}{2}$  base  $\times$  perpendicular height of base  $\times$  height of prism  
=  $\frac{1}{2} (4 \times 3 \times 4)$   
=  $24 \text{ cm}^3$
3. Volume = length  $\times$  width  $\times$  height =  $3 \times 4 \times 2 = 24 \text{ cm}^3$

## Exercise 3

(PB page 160)

1. a) Volume =  $5.7 \times 5.7 \times 5.7 = 185.193 \text{ cm}^3$   
b) Volume =  $3.1 \times 3.1 \times 3.1 = 29.791 \text{ cm}^3$   
c) Volume =  $0.01 \times 0.01 \times 0.01 = 0.000001 \text{ cm}^3$
2. a) Volume =  $1 \times 2 \times 2 = 4 \text{ cm}^3$   
b) Volume =  $6 \times 3 \times 5 = 90 \text{ m}^3$
3. a) Volume  
=  $(16 \times 12 \times 9) - (14 \times 10 \times 7) = 1\,728 - 980 = 748 \text{ cm}^3$   
b) Volume  
=  $(10 \times 9 \times 5) - (9 \times 8 \times 4) = 450 - 288 = 162 \text{ cm}^3$

## Cylinders

Take a few examples of cylinders to class. The easiest ones to find are tins of food, a whole roll of toilet paper (or just the inside cardboard cylinder) and a piece of pipe.

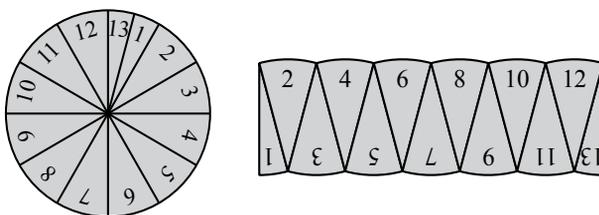
Before pupils can work with the formula for calculating the volume of a cylinder (or a sphere), you need to introduce them to the value of pi ( $\pi$ ). You can draw the diagrams below to help explain these concepts.

### Note:

- All the points on the circumference of a circle are the same distance from the centre.
- The diameter is twice the length of the radius.
- The value pi ( $\pi$ ) is the ratio of the circumference to the diameter of a circle. This value is the same for all circles. We use  $\frac{22}{7}$  as the value for pi ( $\pi$ ) in the formulae we use to calculate the area or volume of circles, and the volume of spheres. (You could also use 3.14 as the decimal value for pi.)

The first diagram shows a circle divided into 12 equal segments. One segment is divided into two equal parts (1 and 13).

When you place the segments as shown in the diagram, a rectangle is formed. Pupils know how to calculate the area of a rectangle ( $l \times b$ ). When working with a circle, the length is the circumference and the breadth is the radius.



Formula for calculating the area of a circle:

Area of circle =  $\pi r^2$ , where  $\pi$  is the value  $\frac{22}{7}$  and  $r$  is the radius.

To calculate the volume of a cylinder, multiply the area of the base circle by the height of the cylinder.

Formula for calculating the volume of a circle:

Volume of circle = area of circle  $\times$  height =  $\pi r^2 \times h$

Pupils complete the volume calculations for cylinders in Workbook: Exercise 61 (question 1).

## Workbook: Exercise 61

(WB page 75)

- Volume =  $\pi r^2 \times h = \frac{22}{7} \times 7^2 \times 7 = 1\,078 \text{ mm}^3$
  - Volume =  $\pi r^2 \times h = \frac{22}{7} \times 35^2 \times 100 = 385\,000 \text{ mm}^3$
- Volume of swimming pool
  - $= \pi r^2 \times h$
  - $= \frac{22}{7} \times 3.5^2 \times 2$
  - $= \frac{22 \times 12.25 \times 2}{7}$
  - $= 22 \times 1.75 \times 2$
  - $= 77 \text{ m}^3$

## Exercise 4

(PB page 203)

- Volume =  $\pi r^2 \times h = \frac{22}{7} \times 6^2 \times 20 = 2\,262.8 \text{ cm}^3$
  - Volume =  $\pi r^2 \times h = \frac{22}{7} \times 4^2 \times 16 = 804.57 \text{ cm}^3$
- Volume =  $\pi r^2 \times h = \frac{22}{7} \times 4^2 \times 18 = 905.14 \text{ cm}^3$
  - Volume =  $\pi r^2 \times h = \frac{22}{7} \times 2^2 \times 23 = 289.14 \text{ cm}^3$
  - Volume =  $\pi r^2 \times h = \frac{22}{7} \times 3^2 \times 10$   
 $= 282.857 \approx 282.86 \text{ mm}^3$
  - Volume =  $\pi r^2 \times h = \frac{22}{7} \times 6^2 \times 13$   
 $= 1\,470.857 \approx 1\,470.86 \text{ cm}^3$
  - Volume =  $\pi r^2 \times h = \frac{22}{7} \times 15^2 \times 8$   
 $= 5\,657.14 \text{ cm}^3$
  - Volume =  $\pi r^2 \times h = \frac{22}{7} \times 6.2^2 \times 7.8$   
 $= 942.329 \approx 942.33 \text{ cm}^3$

## Exercise 5

(PB page 204)

- Volume =  $\pi r^2 \times h = 62 \times 15 = 930 \text{ cm}^3$
  - Volume =  $\pi r^2 \times h = 175 \times 33 = 5\,775 \text{ cm}^3$
  - Volume =  $\pi r^2 \times h = 9 \times 6 = 54 \text{ cm}^3$
  - Volume =  $\pi r^2 \times h = 10 \times 7 = 70 \text{ cm}^3$
- $\pi r^2 \times h = 4\,019.2$   
 $\frac{22}{7} \times 8^2 \times h = 4\,019.2$   
 $201.14 \times h = 4\,019.2$   
 $h = \frac{4\,019.2}{201.14}$   
 $= 19.98 \text{ cm}$

## Spheres

Take a few spheres to class. Easy examples to find are a netball, a football ball and marbles. A sphere has a curved surface where every point on the surface is the same distance from the centre of the circle.

The volume of a sphere refers to the number of cubed units that will fit inside a sphere.

Formula for calculating the volume of a sphere:

$$\text{Volume of a sphere} = \frac{4}{3}\pi r^3$$

Pupils complete Workbook: Exercise 62 before answering the questions in Exercise 6 and Exercise 7.

### Workbook: Exercise 62

(WB page 76)

$$\begin{array}{ll} 1. \quad \text{a)} \quad \text{Volume} = \frac{4}{3}\pi r^3 & \text{b)} \quad \text{Volume} = \frac{4}{3}\pi r^3 \\ & = \frac{4}{3} \times \frac{22}{7} \times 14^3 \\ & = 11\,498.67 \text{ mm}^3 \end{array}$$

$$= \frac{4}{3} \times \frac{22}{7} \times 8^3$$

$$= 2\,145.52 \text{ mm}^3$$

2. Volume of tennis ball

$$\begin{aligned} &= \frac{4}{3}\pi r^3 \\ &= \frac{4}{3} \times \frac{22}{7} \times 3.5^3 \\ &= \frac{4}{3} \times \frac{22}{7} \times \frac{42.825}{1} \\ &= \frac{4}{3} \times \frac{134.75}{1} \\ &= \frac{539}{3} \\ &= 179.66 \\ &\approx 180 \text{ cm}^3 \end{aligned}$$

Volume of football

$$\begin{aligned} &= \frac{4}{3}\pi r^3 \\ &= \frac{4}{3} \times \frac{22}{7} \times 11^3 \\ &= \frac{4}{3} \times \frac{22}{7} \times \frac{1\,331}{1} \\ &= \frac{4 \times 22 \times 1\,331}{3 \times 7} \\ &= \frac{117\,128}{21} \\ &= 5\,577.52 \\ &\approx 5\,578 \text{ cm}^3 \end{aligned}$$

$$\begin{aligned} \text{Difference} &= 5\,578 - 180 \\ &= 5\,398 \text{ cm}^3 \end{aligned}$$

## Exercise 6

(PB page 205)

Calculate the volume of a sphere with each radius. Use  $\frac{22}{7}$  for  $\pi$ .

1. Volume =  $\frac{4}{3}\pi r^3 = \frac{4}{3} \times \frac{22}{7} \times 1^3 = 4.19 \text{ m}^3$
2. Volume =  $\frac{4}{3}\pi r^3 = \frac{4}{3} \times \frac{22}{7} \times 2^3 = 33.52 \text{ m}^3$
3. Volume =  $\frac{4}{3}\pi r^3 = \frac{4}{3} \times \frac{22}{7} \times 3^3 = 113.14 \text{ cm}^3$
4. Volume =  $\frac{4}{3}\pi r^3 = \frac{4}{3} \times \frac{22}{7} \times 4^3 = 268.19 \text{ cm}^3$

## Exercise 7

(PB page 206)

Practical task. Pupils work in groups.

## Problem-solving

Exercise 8 and Exercise 9 give pupils the opportunity to apply everything they have learnt in this unit when solving problems.

### Exercise 8

(PB page 206)

1. a) 1  $\ell$  = 1 000 ml                      b) 5 000 ml = 5  $\ell$   
c) 250 ml = 250  $\text{cm}^3$                       d) 2 kl = 2 000  $\ell$   
e) 1 000  $\ell$  = 1 kl                              f) 6 kl = 6  $\text{m}^3$
2. a) 2 kg    b)  $\frac{1}{2}$  kg

### Exercise 9

(PB page 207)

1. a) Capacity =  $50 \times 20 \times 20 = 20\,000 \text{ cm}^3 = 20 \ell$   
b) Capacity =  $25 \times 25 \times 20 = 12\,500 \text{ cm}^3 = 12.5 \ell$   
c) Capacity =  $80 \times 50 \times 10 = 40\,000 \text{ cm}^3 = 40 \ell$
2. a) 20 kg                      b) 12.5 kg                      c) 40 kg
3.  $\frac{2\,000}{250} = 8$ ; you can fill the cup eight times.
4. a) Capacity of trailer =  $10 \times 4 \times 6 = 240 \text{ m}^3$   
Capacity of one brick =  $0.8 \times 0.5 \times 0.4 = 0.16 \text{ m}^3$   
Number of bricks:  $\frac{240}{0.16} = 1\,500$   
1 500 bricks can be packed into the trailer.  
b) No space remains unfilled.
5. Capacity =  $2.4 \times 7.5 \times 12 = 216 \text{ cm}^3 = 0.216 \ell$
6. Base =  $14 \times 10 = 140 \text{ cm}^3$   
Two identical sides =  $2(15 \times 5) = 150 \text{ cm}^3$   
Two identical sides =  $2(11 \times 5) = 110 \text{ cm}^3$   
Total volume =  $140 + 150 + 110 = 400 \text{ cm}^3$   
Mass =  $8.45 \times 400 = 3\,380 \text{ g}$

7. Volume of cylinder =  $\pi r^2 \times h = \frac{22}{7} \times 4^2 \times 7 = 352 \text{ cm}^3$   
 Approximate volume of one toothpick =  $\frac{352}{100} = 3.52 \text{ cm}^3$
8. Capacity =  $16 \times 8 \times 11 = 1\,408 \text{ cm}^3$
9. a) Volume of air =  $9 \times 7 \times 10 = 630 \text{ m}^3$   
 b)  $\frac{630}{70} = 9$  pupils
10.  $12\,000 \text{ cm}^3 = 12 \ell$
11. a) Volume of earth =  $3.5 \times 4 \times 50 = 700 \text{ m}^3$   
 b)  $\frac{700}{2.5} = 280$ ;  $280 \times 150 = \text{N}420\,000$   
 c)  $\frac{700}{10} = 70 \text{ m}^3$   
 d)  $\frac{420\,000}{10} = \text{N}42\,000$  per day  
 e)  $700 \times 80 = 56\,000 \text{ kg}$

### Exercise 10 (challenge)

(PB page 209)

1. Pupils guess which container has the greater volume.  
 Pupils can ignore  $\pi$  as it is common to the formulae.  
 $22 \times 3 = 4 \times 3 = 12 < 42 \times 1 = 16$
- a) Volume of A =  $\pi r^2 \times h = \frac{22}{7} \times 2^2 \times 3 = 37.71 \text{ cm}^3$   
 Volume of B =  $\pi r^2 \times h = \frac{22}{7} \times 4^2 \times 1 = 50.285 \approx 50.29 \text{ cm}^3$
- b) Difference in volume =  $50.29 - 37.71 = 12.58 \text{ cm}^3$
2. Volume of ball ( $r = 10 \text{ cm}$ )  
 $= \frac{4}{3}\pi r^3 = \frac{4}{3} \times \frac{22}{7} \times 10^3 = 4\,190.476 \approx 4\,190.48 \text{ cm}^3$   
 Volume of ball ( $r = 12 \text{ cm}$ )  
 $= \frac{4}{3}\pi r^3 = \frac{4}{3} \times \frac{22}{7} \times 12^3 = 7\,241.14 \text{ cm}^3$   
 Difference in volume =  $7\,241.14 - 4\,190.48 = 3\,050.66 \text{ cm}^3$
3. Volume =  $\frac{1}{2} \times 6 \times 8 \times 3 = 72 \text{ m}^3$
4. Petrol needed for 150 km =  $\frac{3}{2} \times 10 = 15 \ell$   
 $55 - 15 = 40 \ell$  remains in the tank.

### Workbook: Exercise 63

(WB page 77)

1. a) Eye drops are measured in millilitres.  
 b) Petrol is measured in litres.
2. a)  $850 \ell \div 1\,000 = 0.85 \text{ kl}$   
 b)  $850 \ell \times 1\,000 = 850\,000 \text{ ml}$

3. Make sure pupils realise when they have finished calculations that all three solids have the same height and the same width. They should not be surprised that the cube has the largest and the sphere the smallest volume.

a) Volume of cube =  $l \times b \times h = 3 \times 3 \times 3 = 27 \text{ cm}^3$

b) Volume of sphere =  $\frac{4}{3}\pi r^3$   
 $= \frac{4}{3} \times \frac{22}{7} \times 1.5^3$   
 $= \frac{4}{3} \times \frac{22}{7} \times \frac{3.375}{1}$   
 $= \frac{4 \times 22 \times 1.125}{7}$   
 $= \frac{99}{7}$   
 $= 14.14$   
 $\approx 14 \text{ cm}^3$

c) Volume of cylinder =  $\pi r^2 h$   
 $= \frac{22}{7} \times 1.5^2 \times 3$   
 $= \frac{22}{7} \times 2.25 \times 3$   
 $= \frac{22 \times 2.25 \times 3}{7}$   
 $= \frac{147.5}{7}$   
 $= 21.21$   
 $\approx 21 \text{ cm}^3$

## Unit 21: Speed

### Teaching guidelines and solutions

In this unit, the focus is on calculating average speed (average speed =  $\frac{\text{distance covered}}{\text{time}}$ ), working with athletes' speeds and times for races and solving problems that involve time, speed and distance.

Speed refers to the distance covered in a certain time. Make a copy of the speed–distance–time triangle to display in class and show pupils how to use the triangle to write the formulae:

$$\text{speed} = \frac{\text{distance}}{\text{time}}$$

$$\text{time} = \frac{\text{distance}}{\text{speed}}$$

$$\text{distance} = \text{speed} \times \text{time}.$$

Work through the examples on pages 210 and 211 in the Pupil's Book with the class. Pupils complete Workbook: Exercise 69 before tackling the exercises in the Pupil's Book.

### Workbook: Exercise 69

(WB page 84)

1.  $\text{Speed} = \frac{\text{distance}}{\text{time}}$   
 $\text{Time} = \frac{\text{distance}}{\text{speed}}$   
 $\text{Distance} = \text{speed} \times \text{time}$
2. a)  $100 \times 2 = 200 \text{ km}$   
 b)  $\frac{159}{53} = 3 \text{ h}$   
 c)  $\frac{400}{48} = 8.3 \text{ m/s}$   
 d)  $\frac{42}{2.5} = 16.8 \text{ km/h}$   
 e)  $20 \times 4 = 80 \text{ km}$   
 f)  $\frac{100}{1\,000} = 0.1 \text{ h} = 6 \text{ min.}$   
 g)  $\frac{10}{90} = 0.1 \text{ m/s}$

### Exercise 1

(PB page 211)

1. a)  $\text{Speed} = \frac{45}{9} = 5 \text{ km/h}$   
 b)  $\text{Speed} = \frac{120}{10} = 12 \text{ km/h}$   
 c)  $\text{Speed} = \frac{3}{10} = 0.3 \text{ km/h}$   
 d)  $\text{Speed} = \frac{300}{2} = 150 \text{ m/s}$
2. a)  $\text{Average speed} = \frac{20}{1} = 20 \text{ km/h}$   
 b)  $\text{Average speed} = \frac{150}{6} = 25 \text{ km/h}$   
 c)  $\text{Average speed} = \frac{250}{4} = 62.5 \text{ km/h}$   
 d)  $\text{Average speed} = \frac{1\,000}{25} = 40 \text{ km/h}$

3.

	Distance	Time	Speed
a)	25 m	5 s	$\frac{25}{5} = 5 \text{ m/s}$
b)	$2 \times 15 = 30 \text{ km}$	2 h	15 km/h
c)	120 m	$\frac{120}{36} = 3 \text{ h } 20 \text{ min.}$	36 m/s

**Workbook: Exercise 70**

(WB page 85)

Time for all calculations: 45 min.

Speed	Distance
10 km/h	Distance = speed $\times$ 45 = 4 km
40 km/h	Distance = speed $\times$ 45 = 30 km
110 km/h	Distance = speed $\times$ 45 = 82.5 km
12 km/h	Distance = speed $\times$ 45 = 9 km
25 km/h	Distance = speed $\times$ 45 = 19.5 km
52 km/h	Distance = speed $\times$ 45 = 39 km
200 km/h	Distance = speed $\times$ 45 = 150 km
150 km/h	Distance = speed $\times$ 45 = 112.5 km
180 km/h	Distance = speed $\times$ 45 = 135 km
500 km/h	Distance = speed $\times$ 45 = 375 km

**Exercise 2**

(PB page 212)

- Average speed =  $\frac{200}{5} = 40$  km/h
- Average speed =  $\frac{250}{5} = 50$  km/h
- Distance =  $86 \times 2 \text{ h } 30 \text{ min.} = 86 \times 2\frac{1}{2} = 215$  km  
Average speed =  $\frac{215}{2} = 107.5$  km/h
- Average speed =  $\frac{90 + 70}{2} = 80$  km/h
- Distance =  $85 \times 3 = 255$  km
- Distance =  $\frac{3}{2} \times 60 = 90$  km
- Distance =  $40 \times \frac{45}{60} = 30$  km

**Exercise 3**

(PB page 213)

Calculate the missing information in the table. Remember to include the unit with each answer.

	Distance	Time	Speed
1.	312 km	6 h	52 km/h
2.	200 km	2 h	100 km/h
3.	90 m	4.5 s	20 s
4.	9 500 m	190 s	50 m/s

	Distance	Time	Speed
5.	540 m	27 s	20 m/s
6.	450 m	45 s	10 m/s
7.	4 800 km	30 h	160 km/h
8.	630 m	7 s	90 m/s
9.	2 250 km	25 h	90 km/s
10.	4 500 km	18 h	250 km/h
11.	5 760 km	48 h	120 km/h
12.	40 m	5 s	8 m/s
13.	2 700 km	3 h	900 km/h
14.	432 m	6 s	72 m/s
15.	150 km	5 h	30 km/h

### Workbook Exercise 71

(WB page 86)

Distance for all calculations: 100 m

Animal	Time (s)	Speed (m/s)
Cheetah	3	Speed = $\frac{100}{3} = 33.3$ m/s
Fox	5	Speed = $\frac{100}{5} = 20$ m/s
Lizard	12	Speed = $\frac{100}{12} = 8.3$ m/s
Mouse	28	Speed = $\frac{100}{28} = 3.6$ m/s
Rabbit	7	Speed = $\frac{100}{7} = 14.3$ m/s
Snail	60	Speed = $\frac{100}{60} = 1.7$ m/s
Squirrel	18	Speed = $\frac{100}{18} = 5.6$ m/s

Animals from fastest to slowest: cheetah, fox, rabbit, lizard, squirrel, mouse, snail

### Exercise 4

(PB page 214)

- Average speed =  $\frac{216}{6} = 36$  km/h  
Distance =  $54 \times 36 = 1\,944$  km
- Average speed =  $\frac{800}{3} = 266.67$  km  
Distance =  $266.67 \times 15 = 4\,000.05$  km (The .05 is caused by a rounding off error; the distance should be 4 000 km.)

3. Distance =  $50 \times 30 = 1\,500 \text{ m} = 1.5 \text{ km}$
4. Average speed =  $\frac{300}{20} = 15 \text{ m/min.}$
5. Distance =  $40 \times 30 = 1\,200 \text{ m} = 1.2 \text{ km}$
6. Time =  $\frac{490}{40} = 12.25 \text{ h} = 12 \text{ h } 15 \text{ min.}$
7. Time =  $\frac{480}{60} = 8 \text{ h}$
8. Speed =  $\frac{100}{2} = 50 \text{ m/min.}$   
Time =  $\frac{2\,000}{50} = 40 \text{ min.}$
9. Time =  $\frac{5}{10} = 0.5 \text{ h} = 30 \text{ min.}$
10. Time =  $\frac{5\,000}{1\,250} = 4 \text{ h}$

## Athletes' times

Athletes' time is an example of data that we do not round off. Athletes work hard to improve their time for events. If they were to round off times, the top athletes would all have the same time for an event!

Speeds for different records in athletics are given in metres per second (m/s). Discuss with the class why such times are not given in kilometres per hour. You can show pupils how to convert a few speeds in metres per second to kilometres per hour. Start by converting 1 km to 1 000 m and 1 h to 3 600 s.

Examples:

$$45 \text{ km/h} = \frac{4\,500}{3\,600} = 12.5 \text{ m/s}$$

$$\text{and } 10 \text{ m/s} = 10 \times \frac{3\,600}{1\,000} = 36 \text{ km/h}$$

### Exercise 5

(PB page 215)

1.
  - a) Usain Bolt's time for the 200-m race is more than double his time for the 100-m race ( $2 \times 9.58 = 19.16 \text{ s}$ ).
  - b) Average speed for 100 m = 10.43 m/s (from example in the Pupil's Book)  
Average speed for 200 m =  $\frac{200}{19.19} = 10.422 \text{ m/s}$
  - c) Bolt's time for 100 m is faster than his time for 200 m. This is understandable as he had to run twice the distance and could not maintain the same speed as for 100 m.
2.
  - a) Average speed =  $\frac{400}{43.18} = 9.26 \text{ m/s}$
  - b) 1 min. 40.91 s = 100.91 s  
Average speed =  $\frac{800}{100.91} = 7.9278 \approx 7.928 \text{ m/s}$

c) 2 min.  $11.96 \text{ s} = 131.96 \text{ s}$

$$\text{Average speed} = \frac{1000}{131.96} = 7.578 \text{ m/s}$$

3. Difference in times =  $43.18 - 36.84 = 6.34 \text{ s}$

Four athletes each run 100 m for the relay race and one athlete runs the whole 400 m race. The four athletes in the relay race run faster than the 400 m-athlete as they each only run 100 m.

4. a)  $20 \text{ km} = 20\,000 \text{ m}$ ,  $55.21 = 3\,321 \text{ s}$   
and  $1 \text{ h } 16.36 = 4\,596 \text{ s}$

$$\text{Average speed } 20 \text{ km run} = \frac{20\,000}{3\,321} = 6.02 \text{ m/s}$$

$$\text{Average speed } 20 \text{ km walk} = \frac{20\,000}{4\,596} = 4.35 \text{ m/s}$$

b) As one would expect, the time for the run is faster than the time for the walk.

5.  $14:11.15 = 851.15$

$$\text{Average speed} = \frac{5\,000}{851.15} = 5.87 \text{ m/s}$$

## Workbook: Exercise 72

(WB page 87)

1. Time =  $\frac{200}{40} = 5 \text{ hours}$

2. Speed =  $\frac{\text{distance}}{\text{time}}$

$$\text{Distance} = 100 \times 2 + 70 \times 2 = 340 \text{ m}$$

$$\text{Time} = 70 \text{ seconds}$$

$$\text{Speed} = \frac{340}{70} = 4.8 \text{ m/s}$$

3. 15 minutes = 900 seconds

$$\text{Distance} = 15 \times 900 = 13\,500 \text{ m}$$

4. Distance =  $70 \times 3.5 = 245 \text{ km}$

5. Distance =  $96 \times 0.5 = 48 \text{ km}$

6. Time =  $\frac{150\,000\,000}{300\,000} = 500 \text{ seconds} = 8 \text{ minutes } 20 \text{ seconds}$

## Exercise 6

(PB page 216)

1.  $8\,000 \text{ m} = 8 \text{ km}$ ; average speed =  $\frac{8}{4} = 2 \text{ km/h}$

2. Average speed =  $\frac{231}{6} = 38.5 \text{ km/h}$

3. Average speed =  $\frac{100}{10} = 10 \text{ m/s}$

4. Distance =  $8 \times 6 = 48$  km
5. a)  $\frac{5\,000}{250} = 20$  laps  
b)  $5\,000$  m = 5 km
6. Distance =  $8 \times 125 = 1\,000$  m
7. Time =  $\frac{1\,500}{100} = 15$  s
8. Time =  $\frac{350}{120} = 2.916 \approx 2.92$  h  $\approx 2$  h 55 min.

### Exercise 7 (challenge)

(PB page 217)

1. Distance =  $8 \times 7 = 56$  km
2. a) 10 a.m.  
b) Oluwa's distance =  $2 \times 16 = 32$  km  
Ganiro's distance =  $2 \times 26 = 52$  km  
c) Oluwa's time =  $\frac{84}{16} = 5.25$  h = 5 h 15 min.  
Ganiro's time =  $\frac{84}{26} = 3.23$  h  
 $= 3$  h 13.8 min.  $\approx 3$  h 14 min.
3. Distance =  $4 \times 15 = 60$  km  
Average speed =  $\frac{60}{3} = 20$  min.
4. Average speed =  $\frac{42}{7} = 6$  km/h
5. a) Average speed =  $\frac{10}{2} = 5$  km/h  
b) Time =  $\frac{10}{6} = 1.67$  h = 1 h 40 min.  
Finishing time = 6:50 + 1:40 = 8.30 a.m.

### Exercise 8

(PB page 218)

1. C 14 km/h
2. C 4.58 km
3. A 120 km/h
4. D 50 m
5. B 1.43 s
6. A 1 min. 36 s
7. C 10:21:58 a.m.
8. B 2.5 m/s
9. A 4.5 km
10. B 1 h 30 min.

Teachers may select revision questions for the final term assessment. The questions and problems involve work covered throughout the term. Problems include routine questions and those involving quantitative reasoning.

## Revision

(PB page 220)

$$1. \quad 6a = 21 - 3$$

$$6a \div 6 = 18 \div 6$$

$$a = 3$$

$$2. \quad \frac{12}{a} = 2^2$$

$$\frac{12}{a} \times \frac{a}{1} = 4 \times a$$

$$12 = 4a$$

$$\frac{12}{4} = \frac{4a}{4}$$

$$a = 3$$

$$3. \quad \text{a) } 3b + 12b = 5 \times 6$$

$$15b = 30$$

$$\frac{15b}{15} = \frac{30}{15}$$

$$b = 2$$

$$\text{b) } 7p - p + 2p \times 3 = 120$$

$$6p + 6p = 120$$

$$12p = 120$$

$$\frac{12p}{12} = \frac{120}{12}$$

$$p = 10$$

$$4. \quad 1\frac{1}{2}a = 60$$

$$\frac{3a}{2} = 60$$

$$\frac{3a}{2} \times 2 = 60 \times 2$$

$$3a = 120$$

$$\frac{3a}{3} = \frac{120}{3}$$

$$a = 40$$

Brother's mass: 40 kg

Sister's mass:  $\frac{40}{2} = 20$  kg

$$5. \quad \text{a) Price} = \frac{105}{100} \times 1\,800 = \text{N}1\,890$$

$$\text{b) Price} = \frac{105}{100} \times 4\,400 = \text{N}4\,620$$

$$\text{c) Price} = \frac{105}{100} \times 5\,650 = \text{N}5\,932.50$$

6.  $3\,500 \times 0.72 = \text{N}2\,520.00$ ;  $3\,500 \times 0.97 = \text{N}3\,395.00$   
 Profit =  $3\,395 - 2\,520 = \text{N}875$

7. Dividends =  $975\,000 \times 2.30 = \text{N}2\,242\,500$

8. a)  $\frac{850}{195} = \text{US}\$4.358 \approx \text{US}\$4.36$

b)  $\frac{220}{0.90} = \text{US}\$244.44$

9.  $\triangle ABC$  and  $\triangle CDA$  are both right-angled triangles.

a) Hypotenuse.

b)  $\hat{BAC} = 45^\circ$ ,  $\hat{BCA} = 45^\circ$ ,  $\hat{DAC} = 45^\circ$ ,  $\hat{DCA} = 45^\circ$ .

Sum:  $4 \times 45 = 180^\circ$

10. Pythagoras' theorem

11. a)  $DE = 29$  mm,  $FE = 21$  mm and  $DF = 20$  mm

b)  $29^2 = 841$ ;  $21^2 = 441$  and  $20^2 = 400$

$441 + 400 = 841$

$\triangle DEF$  is right-angled as the square on the hypotenuse equals the sum of the squares on the other two sides.

12. a)  $2\frac{1}{4}$  kg = 2 250 g

b) 1 kg = 1 000 g

c) 900 g = 0.9 kg

d) 250 g = 0.25 kg

13. Area =  $5^2 = 25$  cm<sup>2</sup>

14. Side length =  $\sqrt{81 \text{ m}^2} = 9$  m

15.  $\frac{36}{9} = 4$  squares

16. Area =  $\frac{1}{2} \times 5 \times 4 = 10$  cm<sup>2</sup>

17. Perpendicular height =  $\frac{15 \text{ cm}^2}{6 \text{ cm} \times 2} = 5$  cm

18. a) Area =  $\frac{1}{2} \times 9 \times 6 = 27$  cm<sup>2</sup>

b) Area =  $\frac{1}{2} \times 5 \times 7 = 17.5$  cm<sup>2</sup>

19. Side length =  $\sqrt{625 \text{ m}^2} = 25$  m

20. Side length =  $\sqrt{400 \text{ m}^2} = 20$  m

21. Area =  $112.6 \times 74.8 = 8\,422.48$  m<sup>2</sup>.

Each child gets  $\frac{8\,422.48}{4} = 2\,105.62$  m<sup>2</sup>

22. Area =  $\frac{1}{2} \times 20.5 \times 12.2 = \frac{1}{2} \times 250.1 = 125.05$  cm<sup>2</sup>

23. a) Length =  $\frac{1200}{25} = 48$  cm    b) Length =  $\frac{1200}{20} = 60$  cm  
 c) Length =  $\frac{1200}{30} = 40$  cm    d) Length =  $\frac{1200}{75} = 16$  cm
24. Height =  $2 \times \frac{72}{48} = 3$  m
25. a) Area =  $6 \times 6 + \frac{1}{2} \times 4 \times 6 = 36 + 12 = 48$  cm<sup>2</sup>  
 b) Area =  $10 \times 45 + \frac{1}{2} \times 5 \times 45 = 450 + 112.5 = 562.5$  m<sup>2</sup>  
 c) Area =  $7 \times 9 + \frac{1}{2} \times 7 \times 3 + \frac{1}{2} \times 7 \times 4$   
 $= 63 + 10.5 + 14 = 87.5$  m<sup>2</sup>  
 d) Area =  $18 \times 14 - \frac{1}{2} \times 14 \times 7 = 252 - 49 = 203$  cm<sup>2</sup>
26. Time =  $\frac{1500}{60} = 25$  h
27. Time =  $\frac{225}{75} = 3$  h
28. Time spent walking after lunch =  $8 - (3.5 + 1.5) = 3$  h  
 Distance =  $5 \times 3.5 + 5 \times 3 = 17.5 + 15 = 32.5$  km
29. Utibe's distance =  $4 \times 27 = 108$  km  
 Zaki's distance =  $2 \times 56 = 112$  km  
 Zaki rode further than Utibe.
30. a) Volume =  $\frac{4}{3}\pi r^3 = \frac{4}{3} \times \frac{22}{7} \times 4^3 = \frac{4}{3} \times \frac{22}{7} \times 64 = \frac{5632}{21}$   
 $= 268.19$  cm<sup>3</sup>  
 b) Volume =  $\frac{4}{3}\pi r^3 = \frac{4}{3} \times \frac{22}{7} \times 6^3 = \frac{4}{3} \times \frac{22}{7} \times 216 = \frac{19008}{21}$   
 $= 905.14$  cm<sup>3</sup>
31. Number of pictures shown in 15 minutes  
 $= 2760 \times 15$   
 $= 41400$  pictures
32. a) Volume =  $\pi r^2 \times h = \frac{22}{7} \times 7^2 \times 21 = 3234$  mm<sup>3</sup>  
 b) Volume =  $\pi r^2 \times h = \frac{22}{7} \times 21^2 \times 10 = 13860$  cm<sup>3</sup>
33. a) Pupils estimate which solid has the greatest volume.  
 b) Volume of A =  $\pi r^2 \times h = \frac{22}{7} \times 10.5^2 \times 21 = 7276.5$  cm<sup>3</sup>  
 Volume of B =  $\frac{4}{3}\pi r^3 = \frac{4}{3} \times \frac{22}{7} \times 10.5^3 = 4851$  cm<sup>3</sup>  
 Volume of C =  $21 \times 21 \times 21 = 9261$  cm<sup>3</sup>  
 c) Square: 9261 cm<sup>3</sup>  
 Cylinder: 7276.5 cm<sup>3</sup>  
 Sphere: 4851 cm<sup>3</sup>



**Unit 22: Properties of plane figures****Teaching guidelines and solutions**

In this unit, the focus is on identifying perpendicular and parallel lines, the basic properties of plane figures such as rectangles and squares, working with equal sides, parallel sides, right angles and diagonals and drawing parallel lines, perpendicular lines, squares and rectangles accurately.

You can use a picture of an apple and a real apple to illustrate the difference between a plane figure and a solid. Pupils can then work in groups and collect examples of plane figures and solids.

**Parallel lines and perpendicular lines**

Explain parallel lines and ask pupils to give real-life examples of parallel lines. Examples include the opposite edges of a piece of paper, the side edges of a wall and train tracks.

Explain perpendicular lines and ask pupils to give examples from everyday life. Examples include the bottom and side edges of a piece of paper, the floors and walls in a room, and the trunk of a tree that grows upright and the ground.

Make a poster that includes the markers (including those for parallel lines and perpendicular lines) we use in geometry to display in the class.

**Workbook: Exercise 76**

(WB page 92)

Pupils draw a pattern on a grid. Patterns must include perpendicular and parallel lines.

**Exercise 1**

(PB page 226)

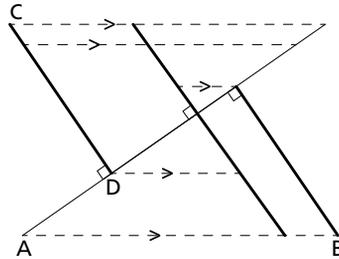
- $JC \parallel IE$  and  $BF \parallel AG$
  - $BF$
  - $ID \perp BF$
- Pupils draw parallel lines. The lines are parallel if they remain the same distance apart.

3. Pupils draw perpendicular lines. Lines are perpendicular if they intersect at  $90^\circ$ .
4. Pupils use parallel and perpendicular lines to draw a house.

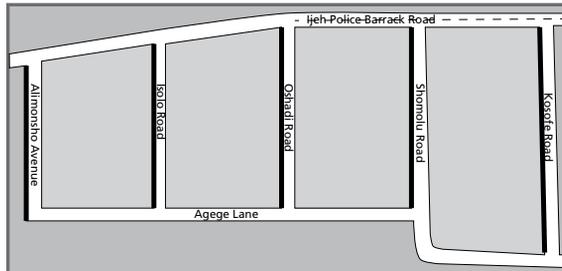
### Workbook: Exercise 77

(WB page 93)

1. a,b) In the diagram, red lines are represented by broken lines and blue lines are represented by thick lines.



- c) All the lines that are parallel to CD are perpendicular to AD.
2. a,b) Red lines are represented by broken lines and blue lines are represented by thick lines.



- c) Kosofe Rd and Shomolu Rd

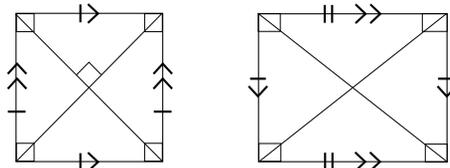
## Basic properties of rectangles and squares

Work through the properties of rectangles and squares in the table on page 227 in the Pupil's Book with the class. Workbook: Exercise 78 gives pupils the opportunity to use markers on diagrams.

### Workbook: Exercise 78

(WB page 94)

- 1, 2.



3. Patterns will differ. Pupils can swap patterns and check that a partner's pattern consists of squares and rectangles.

## Exercise 2

(PB page 227)

1. All four angles are  $90^\circ$  and opposite sides are parallel.
2. In squares, diagonals intersect at  $90^\circ$ . In rectangles, diagonals do not intersect at  $90^\circ$ .
3. B A square is a special type of rectangle.
4. a) There are 14 squares.    b) There are 22 rectangles.
5. a) There are eight squares.    b) There are 24 rectangles.
6. a) In the first shape, all sides are the same length, but not in the second shape.  
b) In the second shape, all sides are the same length, but not in the first shape.  
c) In the second shape, all angles are  $90^\circ$ , but not in the first shape.  
d) In the second shape, both pairs of opposite sides are parallel, but in the first shape only one pair of opposite sides is parallel. In the second shape, all angles are  $90^\circ$ , but in the first shape, no angles are  $90^\circ$ .  
e) In the first shape, all angles are  $90^\circ$ , but not in the second shape.
7. a)  $AB \parallel FE$   
b)  $FG, AG$  and  $BG$  are equal to  $EG$ .  
c)  $CD$  is parallel to  $BE$  and to  $AF$ .  
d)  $BH, EH$  and  $DH$  are equal to  $CH$ .  
e) Diagonals  $AE$  and  $FB$  intersect at  $90^\circ$ .  
f)  $ABEF, ACDF$  and  $BCDE$  are rectangles.

## Draw parallel lines and perpendicular lines accurately

Learning to make accurate constructions is an important skill in Mathematics. Ask pupils to draw as many constructions as you see are necessary until they have improved their skills. Work through the instructions and diagrams on pages 229 to 232 in the Pupil's Book with the class. Pupils complete the constructions in Workbook: Exercise 79.

### Workbook: Exercise 79

(WB page 95)

Pupils can work in pairs and check each other's parallel and perpendicular lines.

### Workbook: Exercise 80

(WB page 96)

Pupils can work in pairs and check each other's constructions of a square and a rectangle.

### Exercise 3

(PB page 232)

Pupils can work in pairs, swap constructions and check each other's work.

### Workbook: Exercise 81

(WB page 97)

Pupils can check each other's constructions. They can use one corner of a piece of paper to check whether angles are right angles.

## Unit 23: Measuring angles

### Teaching guidelines and solutions

In this unit, the focus is on measuring angles such as  $30^\circ$ ,  $45^\circ$ ,  $60^\circ$  and  $90^\circ$  using a clock, using a protractor to measure angles correctly in degrees and measuring angles in shapes.

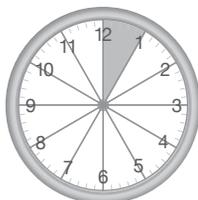
### Using a clock to measure angles

It is useful to be able to measure or estimate angles using a clock. The workbook exercise gives pupils ample opportunity to use a clock to show angles of different sizes.

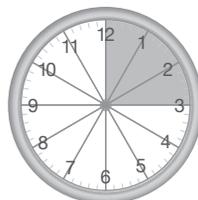
### Workbook: Exercise 82

(WB page 98)

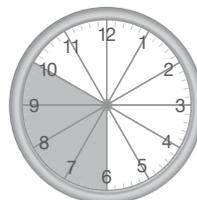
1.  $30^\circ$



2.  $90^\circ$



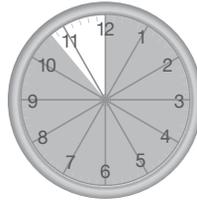
3.  $120^\circ$



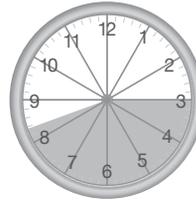
4.  $210^\circ$



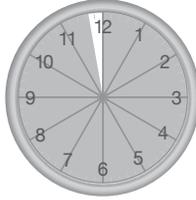
5.  $320^\circ$



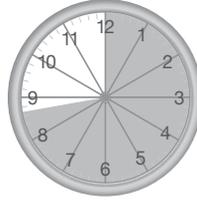
6.  $160^\circ$



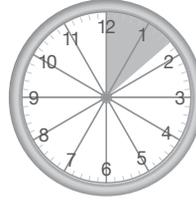
7.  $350^\circ$



8.  $260^\circ$



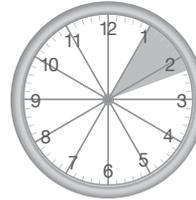
9.  $70^\circ$



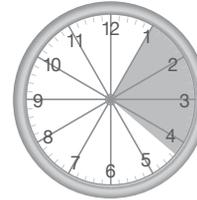
### Workbook: Exercise 83

(WB page 99)

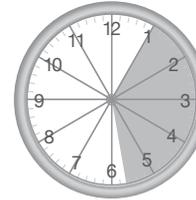
1.  $30^\circ$



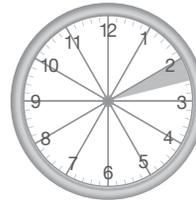
2.  $90^\circ$



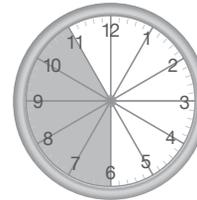
3.  $120^\circ$



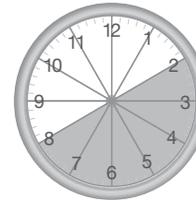
4.  $15^\circ$



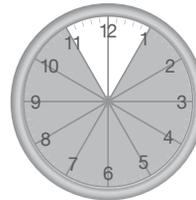
5.  $150^\circ$



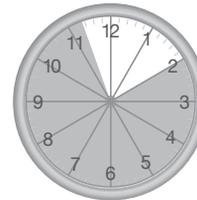
6.  $180^\circ$



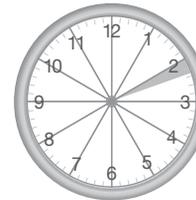
7.  $300^\circ$



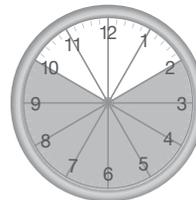
8.  $280^\circ$



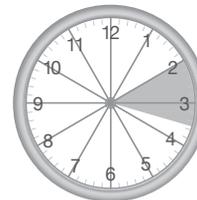
9.  $10^\circ$



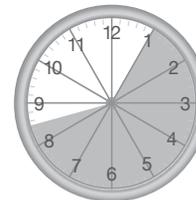
10.  $240^\circ$



11.  $45^\circ$



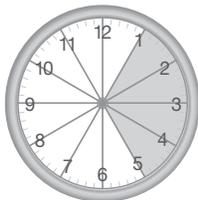
12.  $225^\circ$



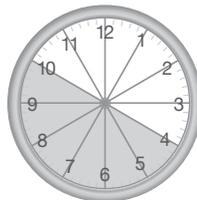
## Exercise 1

(PB page 234)

1. a)  $120^\circ$



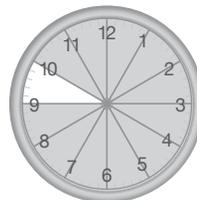
b)  $180^\circ$



c)  $270^\circ$



d)  $330^\circ$



2. a)  $150^\circ$

b)  $360^\circ$

3. a)  $120^\circ$

b)  $210^\circ$

c)  $330^\circ$

## Exercise 2

(PB page 235)

1. a)  $a = 150^\circ$  and  $b = 210^\circ$     b)  $150^\circ + 210^\circ = 260^\circ$

2. a)  $a = 60^\circ + 12^\circ = 72^\circ$ ,  $b = 180^\circ$ ,  $c = 90^\circ + 18^\circ = 108^\circ$  and  $d = 270^\circ + 18^\circ = 288^\circ$

b)  $288^\circ + 72^\circ = 360^\circ$  and  $72^\circ + 180^\circ + 108^\circ = 360^\circ$

3. a)  $a = 36^\circ$ ,  $b = 42^\circ$ ,  $c = 60^\circ$ ,  $d = 90^\circ$  and  $e = 132^\circ$

b)  $36^\circ + 42^\circ + 60^\circ + 90^\circ + 132^\circ = 360^\circ$

4. a)  $60^\circ$ : The hand is at 2.

b)  $90^\circ$ : The hand is at 3.

c)  $45^\circ$ : The hand is halfway between 1 and 2.

d)  $240^\circ$ : The hand is at 8.

5. a)  $15^\circ$

b)  $72^\circ$



c)  $342^\circ$

d)  $246^\circ$



## Using a protractor to measure angles

A protractor is the instrument we usually use to measure angles. Draw a protractor on the board and show how to measure angles using both the inner and outer scales. Check how well pupils answer the questions in the Workbook exercise.

### Workbook: Exercise 84

(WB page 100)

- $\hat{A}$  is an acute angle. Read the size on the inner scale.  
 $\hat{A}$  is  $45^\circ$
  - $\hat{B}$  is an obtuse angle. Read its size on the outer scale.  
 $\hat{B}$  is  $135^\circ$ .
- $\hat{A} = 100^\circ$
  - $\hat{B} = 80^\circ$

### Exercise 3

(PB page 238)

- $79^\circ$
  - $138^\circ$
  - $26^\circ$
  - $139^\circ$
  - $340^\circ$
  - $250^\circ$
  - $40^\circ$
- $x = 24^\circ$
  - $x = 45^\circ$
  - $x = 18^\circ$
  - $x = 139^\circ$
  - $x = 52^\circ$
  - $x = 87^\circ$

## Using a protractor to draw angles

Pupils can follow the steps in the examples on pages 241 to 243 in the Pupil's Book to use a protractor to draw accurate angles.

### Exercise 4

(PB page 243)

Pupils use a protractor to draw angles accurately. Pupils can work in pairs or in small groups and check each other's angles.

## Measure angles in shapes

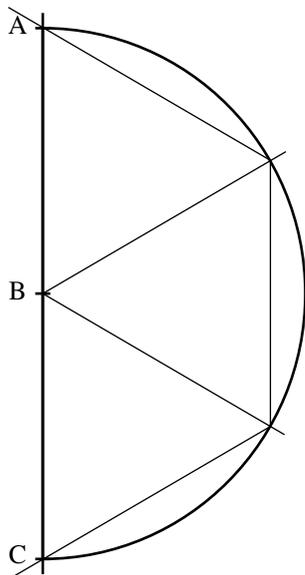
Draw a few large triangles, quadrilaterals and other shapes on the board or on poster paper and ask pupils to take turns to measure the angles in each shape. Check how well pupils place the protractor's base on a shape.

For Workbook: Exercise 86, pupils measure angles between straight lines between cities and towns in Nigeria. This activity can prepare pupils for work with bearing in later years.

## Workbook: Exercise 85

(WB page 101)

Learners draw angles of  $60^\circ$  inside the semicircle. If they work accurately, they will construct three identical equilateral triangles.



## Workbook: Exercise 86

(WB page 102)

Pupil's answers can differ by  $2^\circ$  from the given answers.

A  $80^\circ$ , B  $228^\circ$ , C  $61^\circ$ ,

D  $261^\circ$ , E  $92^\circ$ , F  $80^\circ$ ,

G  $113^\circ$ , H  $310^\circ$ , I  $44^\circ$

## Exercise 5

(PB page 245)

- $45^\circ + 50^\circ + 85^\circ = 180^\circ$
- $60^\circ + 60^\circ + 60^\circ = 180^\circ$
- $90^\circ + 35^\circ + 55^\circ = 180^\circ$
- $40^\circ + 40^\circ + 140^\circ = 180^\circ$
- $60^\circ + 75^\circ + 45^\circ = 180^\circ$
- $30^\circ + 120^\circ + 30^\circ = 180^\circ$

## Sum of the angles of a triangle

Use the triangles you drew on poster paper again. Pupils can work in groups of three and each measure one angle in a triangle and then find the sum of these angles. This will help them realise that they need to measure angles carefully and accurately when they realise that the sum of the angles in any triangle is  $180^\circ$ .

## Workbook: Exercise 87

(WB page 103)

- $25^\circ + 100^\circ + 55^\circ = 180^\circ$
  - $40^\circ + 50^\circ + 90^\circ = 180^\circ$
- $25^\circ + 45^\circ + 110^\circ = 180^\circ$
  - $112^\circ + 30^\circ + 38^\circ = 180^\circ$
  - $80^\circ + 50^\circ + 50^\circ = 180^\circ$
  - $60^\circ + 60^\circ + 60^\circ = 180^\circ$
  - $70^\circ + 70^\circ + 40^\circ = 180^\circ$
  - $35^\circ + 65^\circ + 80^\circ = 180^\circ$

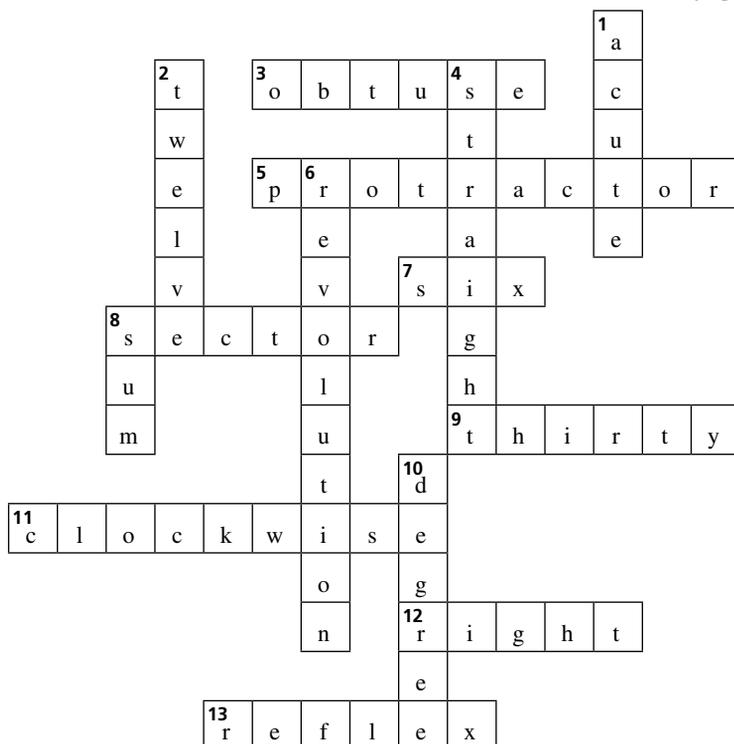
## Exercise 6

(PB page 247)

- $\hat{B} = 180^\circ - (45^\circ + 45^\circ)$   
 $= 90^\circ$
  - $\hat{B} = 180^\circ - (125^\circ + 22^\circ)$   
 $= 180^\circ - 147^\circ$   
 $= 33^\circ$
  - $\hat{E} = 180^\circ - (82^\circ + 41^\circ)$   
 $= 180^\circ - 123^\circ$   
 $= 57^\circ$
  - $\hat{P} = 180^\circ - (73^\circ + 17^\circ)$   
 $= 90^\circ$
  - $\hat{F} = 180^\circ - (70^\circ + 70^\circ)$   
 $= 180^\circ - 140^\circ$   
 $= 40^\circ$
  - $\hat{X} = 180^\circ - (15^\circ + 55^\circ)$   
 $= 110^\circ$
- $82^\circ + 8^\circ = 90^\circ$ ;  
triangle is right-angled ( $180^\circ - 90^\circ = 90^\circ$ )
  - $34^\circ + 56^\circ = 90^\circ$ ;  
triangle is right-angled ( $180^\circ - 90^\circ = 90^\circ$ )
- Two sides are the same length as the base angles are both  $45^\circ$ .
  - All three sides are the same length;  $\triangle DEF$  is an equilateral triangle.
  - Two sides are the same length as the base angles are both  $45^\circ$ .
  - $\triangle ABC$  is an isosceles triangle as the base angles are both  $70^\circ$ .

## Workbook: Exercise 88

(WB page 104)



## Unit 24: Measuring heights and distances

### Teaching guidelines and solutions

In this unit, the focus is on measuring the heights of people, buildings and trees, and distances in metres and kilometres (project) and using a metre rule to measure heights and lengths such as the classroom and a flower bed, and a tape measure and a click wheel (or trundle wheel) to measure larger distances and heights.

The Workbook exercise gives pupils the opportunity to estimate the heights of buildings.

### Workbook: Exercise 89

(WB page 105)

An easy way to estimate the heights of the buildings is to take the height of one floor as 3 m and then multiply 3 by the number of floors.

A:  $3 \times 14 = 42$  m, B:  $3 \times 9 = 27$  m, C:  $3 \times 22 = 66$  m,

D:  $3 \times 40 = 120$  m, E:  $3 \times 30 = 90$  m

## Measuring heights and distances

This unit is practical. Pupils need to use rulers, measuring tapes, metre sticks and trundle wheels to measure heights and distances. Ensure you have measuring instruments for pupils to use.

### Exercise 1

(PB page 248)

Pupils work on the practical activity in small groups. Discuss pupils' findings with them. Pupils should make large isosceles right-angled triangles to estimate heights for question 5. Help groups identify suitable buildings or trees and then use their triangles and the instructions in the Pupil's Book to estimate the height of these buildings or trees. Groups that estimate the height of the same object should compare their findings.

## Unit 25: Polygons and polyhedra

### Teaching guidelines and solutions

Polygons and polyhedra are two-dimensional shapes and three-dimensional solids. In this unit, the focus is on polygons (naming and identifying the features of shapes such as triangles, squares, rectangles, rhombi and parallelograms, solving problems involving two-dimensional shapes, identifying lines of symmetry, the number of sides and the number of angles) and polyhedra (naming and giving the features of solids, solving problems involving two or more polyhedra and giving the numbers of sides, edges and vertices of objects).

Ask pupils to explain the difference between polygons and polyhedra. Remind pupils that they worked with shapes in Unit 22.

### Polygons

Make a poster of polygons with three to eight sides (similar to the table on page 253 in the Pupil's Book) to display in the class. Your poster should include regular and irregular shapes.

Write the information about the features of polygons (see page 254 in the Pupil's Book) on the board and ask pupils to look for examples in everyday life where the word parts tri-, quad-, penta-, and octa- are used. Examples include tricycles (three wheels), quad bikes and quadrupeds (animal with four

legs), the Pentagon (headquarters of the US Department of Defence) and octopuses (sea creatures with eight tentacles).

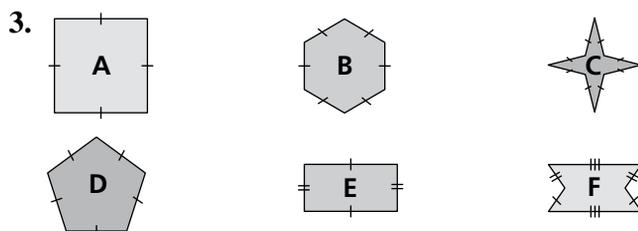
Check how well pupils answer the questions in Workbook: Exercise 90.

### Workbook: Exercise 90

(WB page 106)

Pupils complete the exercise in their workbooks.

1. Regular shapes: A and C
2. A: triangle, B: quadrilateral, C: hexagon, D: octagon, E: heptagon, F: triangle



### Exercise 1

(PB page 254)

1. B and C are not polygons as they both have curved sides.
2. A pentagon, B circle, C cone, D hexagon, E octagon, F octagon
3. Regular shapes: C, F, H  
Irregular shapes: A, B, D, E, G, I
4. Answers will differ. Examples include, erasers have sides that are rectangles, a cube has sides that are squares, a kite has a kite shape (E).
5. Answers will differ. Pupils draw two irregular shapes.
6. a) A cube, C cylinder, D cone, F rectangular prism  
b) B octagon, E hexagon, G pentagon, H circle

## Triangles

Pupils worked with right-angled triangles earlier this year. Make a chart of the different types of triangle (scalene, isosceles, equilateral and right-angled) with triangles that are similar to those in the table on page 255 in the Pupil's Book to display in the class.

## Exercise 2

(PB page 256)

- right-angled triangle
  - scalene triangle
  - equilateral triangle
  - scalene triangle
  - isosceles triangle
  - isosceles triangle
  - right-angled triangle
  - equilateral triangle
- Triangle is isosceles and right-angled.
  - Triangle is isosceles and right-angled.
  - Triangle is isosceles.
  - Triangle is right-angled.

## Quadrilaterals

The properties of parallelograms, rectangles, rhombi and squares are given on page 257 in the Pupil's Book. Draw each quadrilateral on the board and ask pupils to take turns to add markers to show the properties of each shape.

Ask pupils to complete Workbook: Exercise 91.

### Workbook: Exercise 91

(WB page 107)

- Properties of a rhombus.
- Properties of a rectangle.



- Properties of a parallelogram.
- Properties of a square.



## Exercise 3

(PB page 258)

- All angles in squares are  $90^\circ$ . This is not true for rhombi.
- All sides are the same length and opposite sides are parallel. All angles in squares are  $90^\circ$ , but this is not the case in a rhombus.
- All angles are  $90^\circ$  and opposite sides are parallel.
- All angles are  $90^\circ$  in rectangles, but not in parallelograms.
- Five triangles, one square and one parallelogram
  - The two large triangles are the same size and the two small triangles are the same size.
  - Combine the red triangle with the two small triangles to form a square.
  - Pupils draw a tangram, cut it out and form pictures A, B and C.

## Lines of symmetry

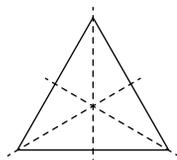
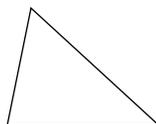
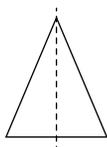
Draw a few shapes on paper, cut each one out and show the class how to fold the shapes to show lines of symmetry. Pupils can work in pairs and repeat this activity. This activity will show them which shapes have lines of symmetry and which shapes do not have lines of symmetry. They can also discover that certain shapes have more than one line of symmetry.

Pupils complete Workbook: Exercise 92. Guide pupils to realise that when there are two or more lines of symmetry for a shape, these lines all go through the centre of the shape. So, if they have measured carefully and drawn two lines of symmetry, they should be able to use the point where the two lines of symmetry cross when drawing the other lines of symmetry.

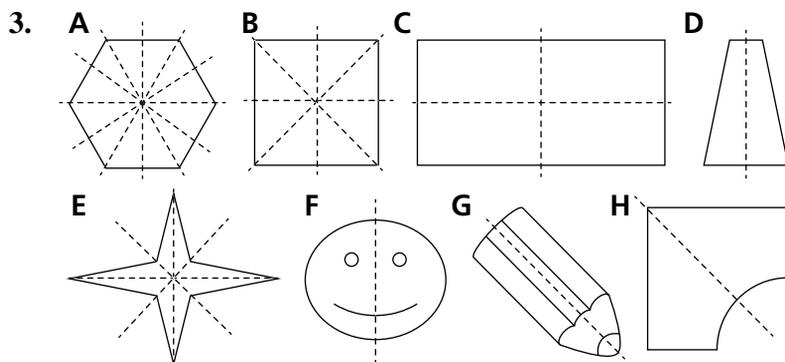
### Workbook: Exercise 92

(WB page 108)

1. a) Isosceles      b) Scalene      c) Equilateral

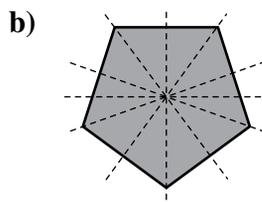
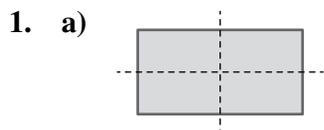


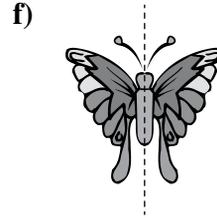
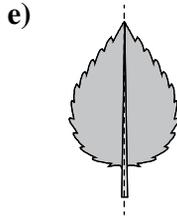
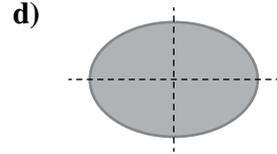
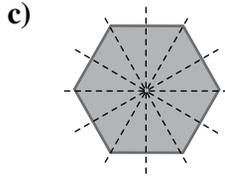
2. Scalene triangles have **no** lines of symmetry.  
 Isosceles triangles have **one** line of symmetry.  
 Equilateral triangles have **three** lines of symmetry.



### Exercise 4

(PB page 260)



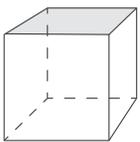


2. a) Practical investigation  
b) Isosceles triangles have one line of symmetry and equilateral triangles have three lines of symmetry.
3. a) No lines of symmetry: F, J, N, S  
b) One line of symmetry: A, D, M  
c) Two lines of symmetry: H, O
4. a) No    b) Yes    c) No    d) Yes    e) No  
f) Yes    g) Yes    h) Yes    i) Yes

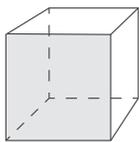
## Polyhedra

In Unit 20, pupils worked with the volume and capacity of prisms, cylinders and spheres. Take prisms, cylinders and spheres to class for pupils to inspect and to which they can refer. Pupils can count each prism's number of faces. You can create diagrams similar to those below to show a cube's faces.

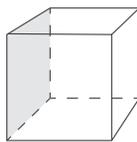
### Surface area of a prism



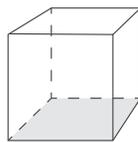
Top



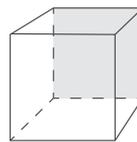
Front



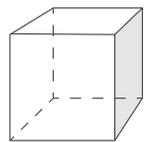
Left



Bottom



Back



Right

### Exercise 5

(PB page 262)

- |             |            |              |
|-------------|------------|--------------|
| 1. Cylinder | 2. Pyramid | 3. Cube      |
| 4. Sphere   | 5. Prism   | 6. Prism     |
| 7. Prism    | 8. Cone    | 9. Prism     |
| 10. Sphere  | 11. Prism  | 12. Pyramid  |
| 13. Sphere  | 14. Prism  | 15. Cylinder |
| 16. Pyramid |            |              |

## Net of a solid

Take a few boxes to class for pupils to open up and flatten out so that they can see all the faces. Ask them to show you which faces are identical. Also show them flaps that are used to make a box sturdy.

After pupils have completed Exercise 6, it should be quite easy for them to complete Workbook: Exercise 93.

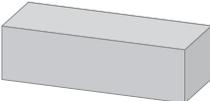
### Exercise 6

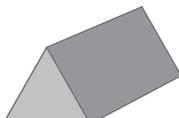
(PB page 265)

Practical task where pupils work in small groups. They should cut out and make their models. If a model does not work, they should work out what the problem was with the net.

### Workbook: Exercise 93

(WB page 109)

1.  Rectangular prism

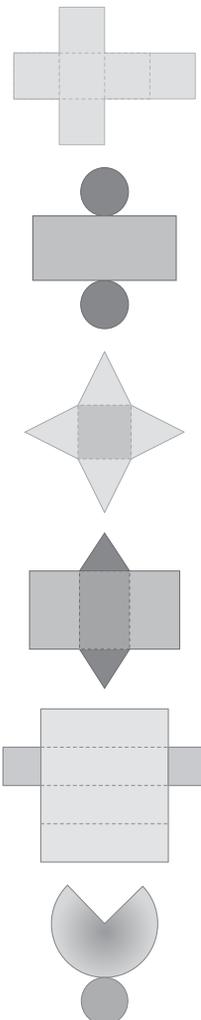
2.  Triangular prism

3.  Cone

4.  Square-based pyramid

5.  Cylinder

6.  Cube



The diagram shows six 3D solids on the left and their corresponding nets on the right. Lines connect each solid to its net:

- 1. Rectangular prism connects to the first net (a cross shape).
- 2. Triangular prism connects to the second net (a rectangle with a triangle on top and bottom).
- 3. Cone connects to the third net (a sector and a circle).
- 4. Square-based pyramid connects to the fourth net (a square with four triangles).
- 5. Cylinder connects to the fifth net (a rectangle with two circles).
- 6. Cube connects to the sixth net (a cross shape with flaps).

## Exercise 7

(PB page 265)

1. 

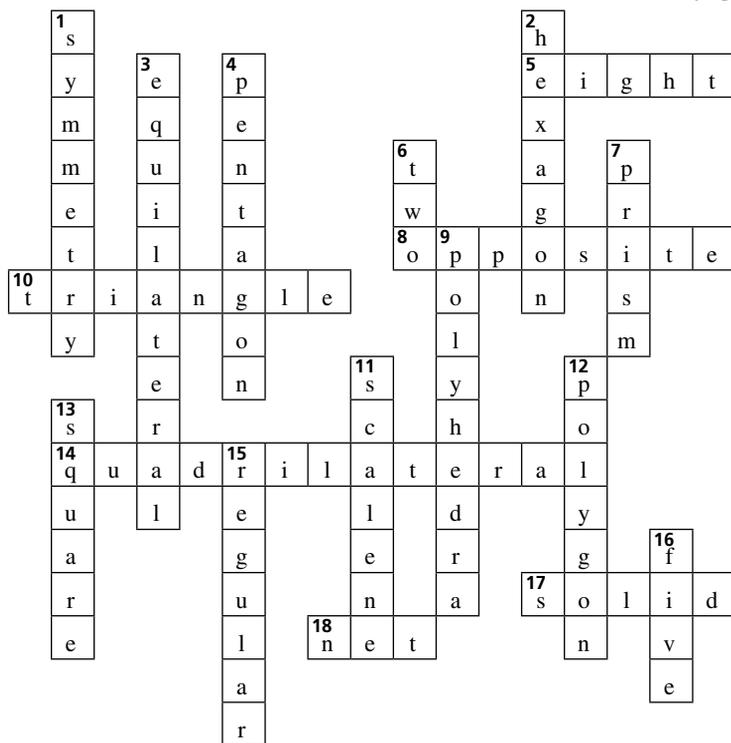
a) Six	b) Three
c) Two	d) Six
e) Five	f) One
g) Six	
2. Sphere
3.
  - a) All the cube's faces are squares. Two of the rectangular prism's faces are squares, the other six faces are rectangles.
  - b) The base in the triangular prism is an equilateral triangle and the base in the pentagonal prism is a regular pentagon.
  - c) All faces in the cube are squares. The triangular prism has two faces that are equilateral triangles and three faces that are rectangles.
  - d) The rectangular prism has two faces that are squares and six faces that are rectangles. The pentagonal prism has two faces that are regular pentagons and five faces that are rectangles.
4. 

a) Sphere	b) Triangular pyramid
c) Cylinder	d) Cone
e) Rectangular prism	
5. A cylinder's bases are circles and it has one rectangular face. A prism has two bases that are polygons and at least three rectangular faces (for a triangular prism).
6.
  - a) Cylinder; tins of food and cool drink cans
  - b) Sphere; balls for different sports
  - c) Cone; funnels

## Exercise 8

(PB page 266)

1. Cylinder
2. Rectangular prism
3. Rectangular prism
4. Triangular prism
5. Cone
6. Sphere
7. Cube
8. Pyramid



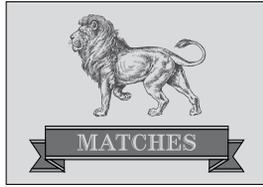
## Unit 26: Working with scale drawings

### Teaching guidelines and solutions

In this unit, the focus is on drawing plans to a given scale, converting the lengths and distances of objects to different scales, measuring the dimensions of items and reducing these dimensions to a given scale, converting dimensions on a scale plan to the dimensions of the object in real life and determining the actual dimensions of objects that have been drawn to scale.

### Calculating and using scales

Discuss the diagram of the matchbox drawn to real size and the reduction of it in the Pupil's Book page 267 with the class. All dimensions must be reduced by the same scale factor. Below are a few reductions of the matchbox that have clearly not been reduced by the same scale factor. All the dimensions of a shape must be enlarged or reduced by the same scale factor.



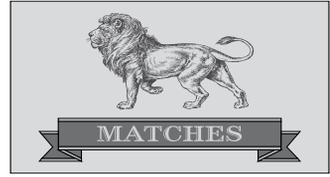
**Original shape**



**Reduction 1**



**Reduction 2**



**Reduction 3**

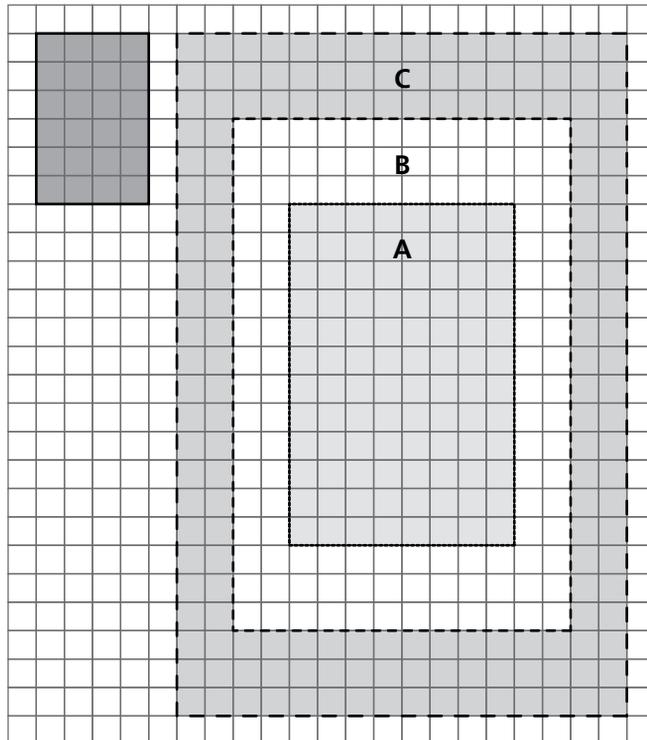
Work through the examples and the guidelines on scale factors and how to make a scale drawing on pages 268 and 269 in the Pupil's Book with the class.

Ask pupils to complete Workbook: Exercise 95, Exercise 96 and Exercise 97. Make sure they realise that diagrams may overlap or they can draw some enlargements inside other enlargements.

**Workbook: Exercise 95**

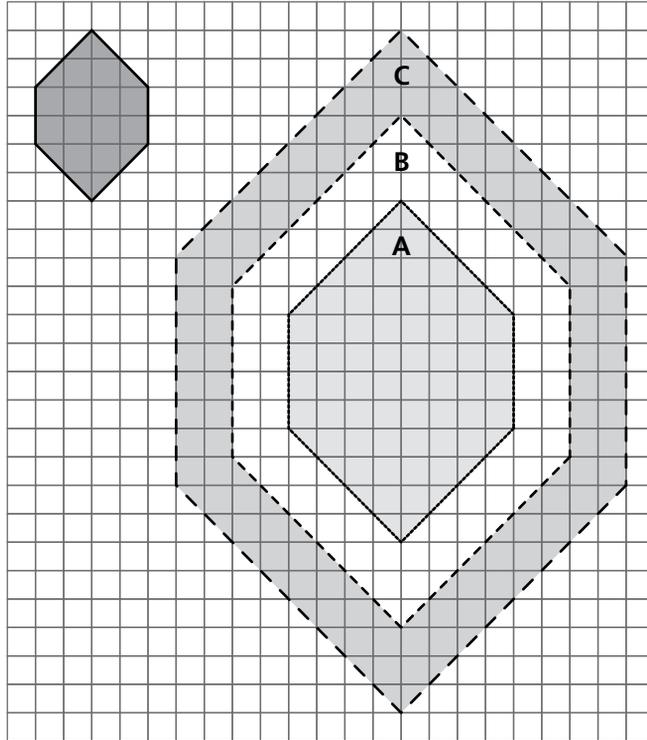
(WB page 111)

Many answers can be correct. Below are examples.



## Workbook: Exercise 96

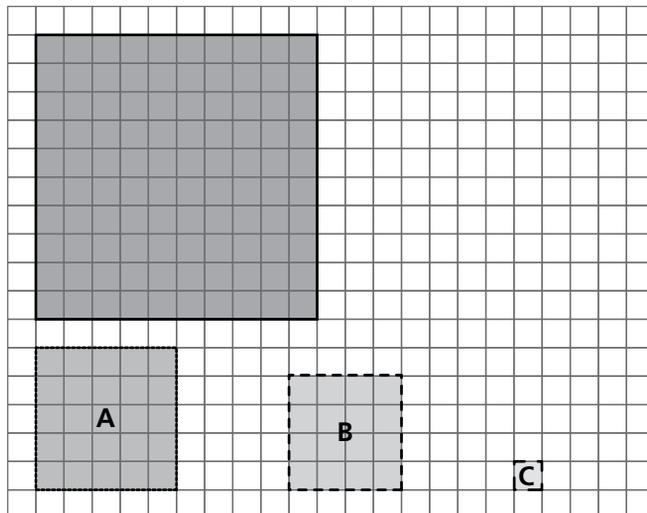
(WB page 112)



## Workbook: Exercise 97

(WB page 113)

Make scale reductions A, B and C of the shape. The scale for A is 2 to 1, the scale for B is 5 to 1 and the scale for C is 10 to 1.



Pupils complete Exercise 1 and 2 in the Pupil's Book before attempting Workbook Exercise 98 and Exercise 99.

When drawing the reductions and enlargement for Workbook: Exercise 97, Exercise 98 and Exercise 99, pupils must count blocks and mark off a number of points. They can then link these points with lines that have the same shape as the lines on the original maps.

### Exercise 1

(PB page 270)

1. Practical task for small groups to complete. Groups can compare their scale diagrams.
2. B and D will work best. If you use B, the length will be 3 cm and if you use D, the length will be 4 cm on the scale drawing. (If you use A, the length will be 15 mm, which is quite small, and if you use C, the length will be 15 cm, which is quite large.)
3. Pupils make scale drawings.
4. Answers may differ. A suitable example is 1 cm represents 1 m.
5.  $2 \text{ m} = 200 \text{ cm}$   
Ask learners to compare their scale drawings.

### Exercise 2

(PB page 270)

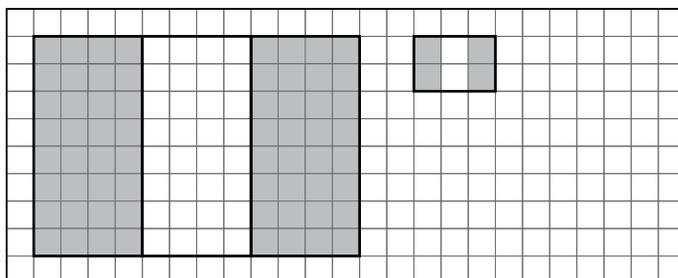
1.  $1 : 300\,000$ ;  $1 \text{ cm} : 300\,000 \text{ cm}$ ;  $1 \text{ cm} : 3\,000 \text{ m}$ ;  
 $1 \text{ cm}$  represents  $3 \text{ km}$
2.  $5 \text{ cm} : 15 \text{ km}$ ;  $5 \text{ cm} : 1\,500\,000 \text{ cm}$ ;  $1 \text{ cm} : 300\,000 \text{ cm}$ ;  
 $1$  to  $300\,000$ ;  $(1 : 300\,000)$
3.  $1 \text{ cm} : 1\,500 \text{ cm}$ ;  $1 \text{ cm}$  represents  $15 \text{ m}$ .
4.  $2 \text{ cm} : 12 \text{ km}$ ;  $2 \text{ cm} : 1\,200\,000 \text{ cm}$ ;  $1 \text{ cm}$  to  $600\,000 \text{ cm}$   
 $(1 : 600\,000)$
5.  $1 \text{ cm} : 10\,000 \text{ cm}$ ;  $1 \text{ cm} : 100 \text{ m}$ ;  $1 \text{ cm}$  represents  $0.1 \text{ km}$ .
6.  $1 \text{ cm} : 1\,500 \text{ cm}$ ;  $1 \text{ cm} : 15 \text{ m}$ ;  $4 \text{ cm}$  represents  $60 \text{ m}$

### Workbook: Exercise 98

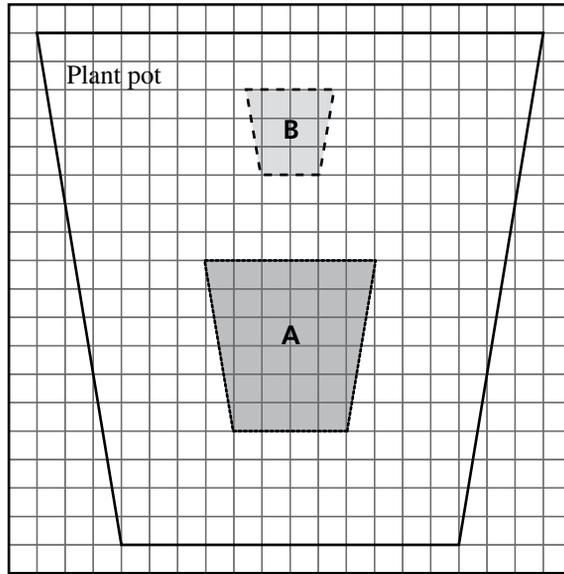
(WB page 114)

A section of four blocks on the original flag or two blocks on the original map will be one block on the reduction.

1. Nigerian flag



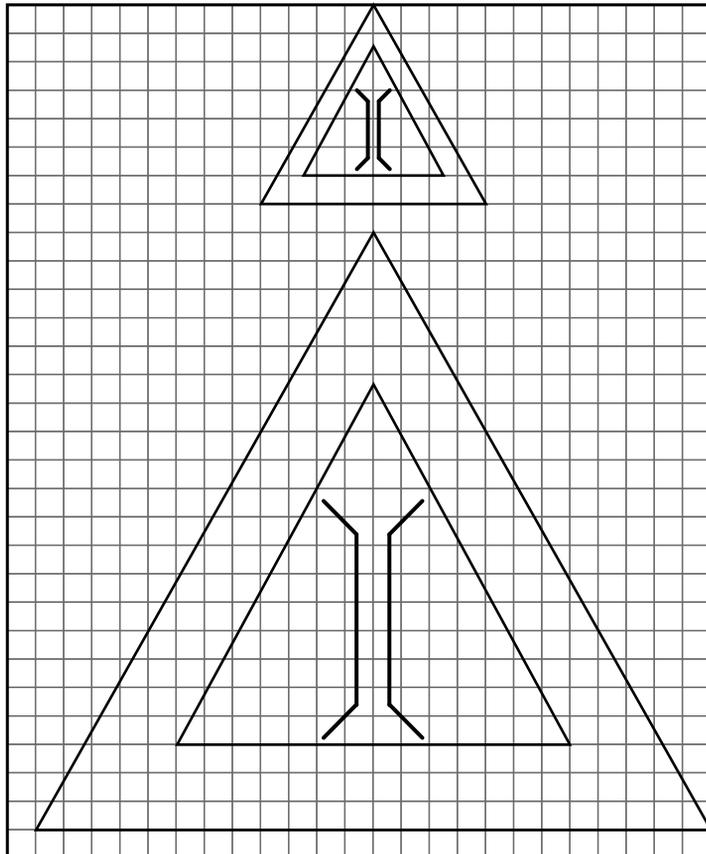
2.



### Workbook: Exercise 99

(WB page 115)

Pupils complete the exercise in their workbooks.



### Exercise 3

(PB page 271)

1. 1 cm : 700 cm; 1 cm represents 7 m  
Building A: 5.3 cm long and 1 cm wide  
Building B: 5 cm long and 1 cm wide  
Building C: 0.9 cm = 9 mm long and 0.7 cm = 7 mm wide
2. Practical activity for pupils to complete in small groups.
3. Pupils can work in pairs to complete this practical activity, swap scale drawings with another pair and check each other's drawings.
4.
  - a) 100 mm
  - b) 40 mm
  - c) 1 cm : 10 000 000 cm; 1 cm: 100 km; 5 cm
  - d) 1 cm: 50 000 000 cm; 1 cm: 500 km; 1 cm
5. 1 cm : 700 000 cm; 1 cm: 7 000 m; 1 cm : 7 km;  
6 cm represents 420 km
6. 1 cm represents 500 000 000 cm or 5 000 000 m or 5 000 km
  - a) 1 cm represents 5 000 km
  - b) 20 mm = 2 cm; 2 cm represents 10 000 km
  - c) 30 mm = 3 cm; 3 cm represents 15 000 km
7.
  - a)  $42 : 3 = 14 : 1$
  - b)  $20 : 5 = 4 : 1$
8. Tell pupils that the distances on the map are distances as the crow flies. The distances by road between towns will be further.  
1 mm represents 10 000 000 mm or 10 km
  - a) 42 mm represents 420 km
  - b) 61 mm represents 610 km
  - c) 58 mm represents 580 km
  - d) 57 mm represents 570 km

**Unit 27: Population and measures of central tendency****Teaching guidelines and solutions**

In this unit, the focus is on interpreting pictograms and bar graphs, using pictograms and bar graphs to represent population of people or data, collecting and summarising data and finding the mode of data, and organising data and calculating the mean of the data set.

**Population**

Discuss the importance of research with the class. Governments, businesses and the general public use the results of research in areas such as budgeting, planning treatment for illnesses such as HIV/AIDS, and deciding which goods to sell.

Explain the meaning of the word *population* in the context of statistics with the class. Then ask pupils to give more examples.

**Exercise 1**

(PB page 274)

1. C Girls in Class 1 at your school
2. D All pupils at the school

**Collecting and organising data**

When discussing a set of data with the class, make sure pupils understand the difference between organised and raw (unorganised) data.

**Exercise 2**

(PB page 276)

1. Pupils can arrange the masses of the eggs in ascending or descending order.  
Ascending order: 47 g, 51 g, 54 g, 56 g, 57 g, 68 g  
Descending order: 68 g, 57 g, 56 g, 54 g, 51 g, 47 g

2.

Number	Tally marks	Totals
H		11
T		9

3.

Number	Tally marks	Totals
1		3
2		3
3		5
4		3
5		3
6		3

4. Draw up a table to show 40 Class 1 pupil's favourite colours.

Colours	Numbers	Totals
Red		12
Blue		10
Green		12
Yellow		6
<b>Total</b>		<b>40</b>

5. Class survey.

## Pictograms

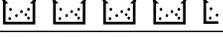
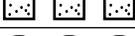
Pictograms use pictures to represent data items that can be counted. Pupils can use any symbol as the picture – they should not spend a lot of time drawing the pictures. So, for example, the pictures in all the pictograms they draw, can be small circles. Make sure pupils understand that we need a key to help readers interpret the data on a pictogram.

### Exercise 3

(PB page 278)

- Farmer D
  - Farmer C
  - $110 - 70 = 40$  bags of corn
  - $160 + 110 + 70 + 200 = 540$  bags of corn

2. a) Ten birds  
 b) They saw 30 pigeons, 40 doves, 10 grass birds and 20 other birds.  
 c)  $40 - 10 = 30$   
 d)  $30 + 40 + 10 + 20 = 100$  birds
3. Different symbols can be used as the key.

	Number of loaves of bread sold
<b>Monday</b>	
<b>Tuesday</b>	
<b>Wednesday</b>	
<b>Thursday</b>	
<b>Friday</b>	
<b>Saturday</b>	
<b>Sunday</b>	

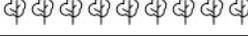
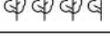
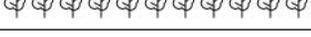
Key:  represents two loaves of bread

4. Different symbols can be used as the key.

	Number of pupils at four schools
<b>School A</b>	
<b>School B</b>	
<b>School C</b>	
<b>School D</b>	

Key:  represents 25 pupils

5. Half a tree represents 10 trees.

	Number of trees
<b>Boabab trees</b>	
<b>Date palms</b>	
<b>Horseradish trees</b>	
<b>Toothbrush trees</b>	
<b>Charcoal trees</b>	
<b>Other trees</b>	

Key:  represents 20 trees

6. a)

	Numbers of eggs
<b>Sunday</b>	○○○○○○○○○○
<b>Monday</b>	○○○○○○∩
<b>Tuesday</b>	○○○○○○○○○○
<b>Wednesday</b>	○○○○∩
<b>Thursday</b>	○○○○○○○○∩
<b>Friday</b>	○○○○○○○○○○○○
<b>Saturday</b>	○○○○

Key: ○ represents 10 eggs

b) Somebody may have stolen eggs on Saturday and Wednesday as the farmer collected fewer eggs on those days.

7. a) Thirty pupils took part in the survey.

Fruit	Numbers	Totals
<b>Banana</b>		7
<b>Mango</b>		8
<b>Orange</b>		6
<b>Pawpaw</b>		4
<b>Watermelon</b>		5
<b>Total</b>		<b>30</b>

	Favourite fruits
<b>Banana</b>	●●●●●●●●
<b>Mango</b>	●●●●●●●●
<b>Orange</b>	●●●●●●
<b>Pawpaw</b>	●●●●
<b>Watermelon</b>	●●●●●

Key: ● represents one fruit

8. a)

Equipment for making constructions	
Sharp pencils	
Rulers	
Protractors	

 represents two items.

- b) Not all pupils seem ready. Eight protractors is too few for a class of 35 pupils.

## Bar graphs

Draw the horizontal and vertical axes on the board and show pupils how to mark off intervals on both axes. If they draw bar graphs in exercise books, they can use the rules for the horizontal axis and other horizontal lines.

Discuss the features of bar graphs on page 281 in the Pupil's Book with the class. Discuss with the class why it is important for a bar graph to have a heading and labels on the axes.

For Workbook: Exercise 100, pupils have to interpret a pictogram and a bar graph and complete a pictogram and a bar graph.

### Workbook: Exercise 100

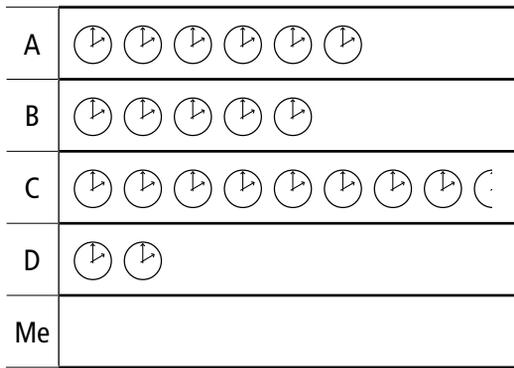
(WB page 116)

Pupils complete the exercise in their workbooks.

- 2 fruits
  - 16 pupils
  - 7 pupils
  - 45 pupils
  - Answers may differ.
- Pupils may use the key to represent different numbers of pupils. In the pictogram, the clock represents two hours. Answers will differ for the last row in the pictogram and the last bar in the bar graph.

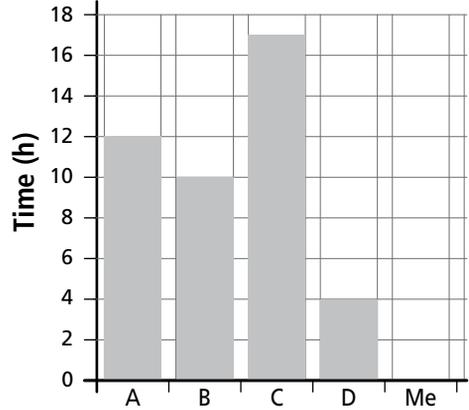
a–c)

**Time spent doing homework (h)**



Key: represents 2 hours

**Time spent doing homework**



d) Answers may differ.

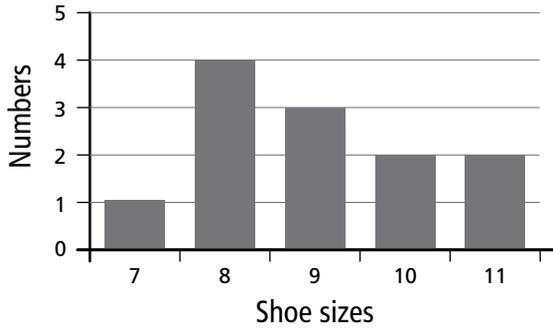
**Exercise 4**

(PB page 283)

1. a) 7, 8, 8, 8, 8, 9, 9, 9, 9, 10, 10, 11, 11

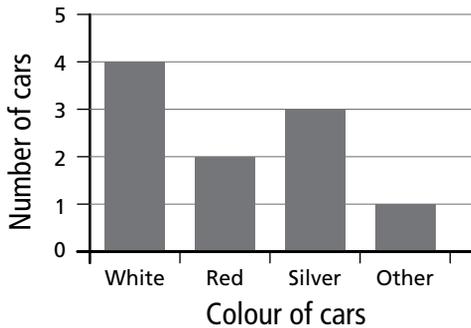
b)

**Shoe sizes of 12 boys**



2. a)

**Colours of ten cars**

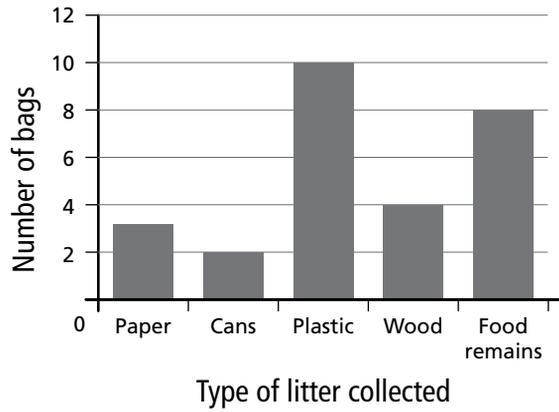


b) White cars

c) A colour car that was not white, red or silver

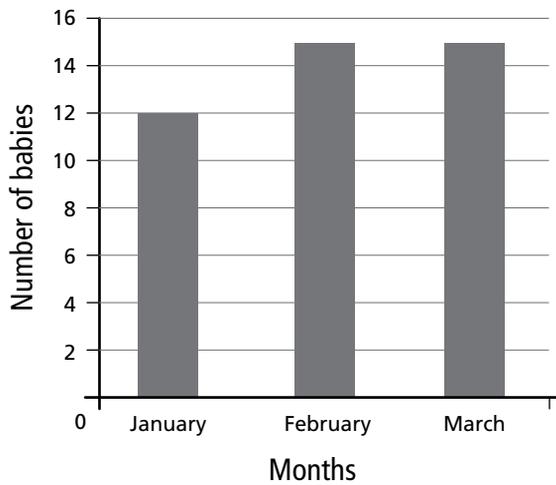
3.

**Bags of litter collected**



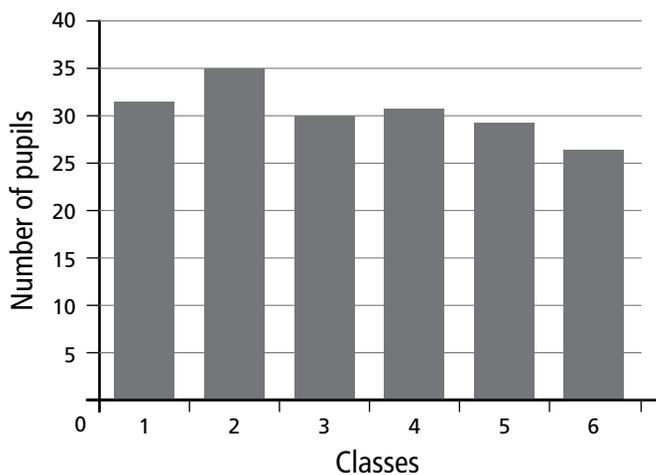
4.

**Babies delivered at clinic**

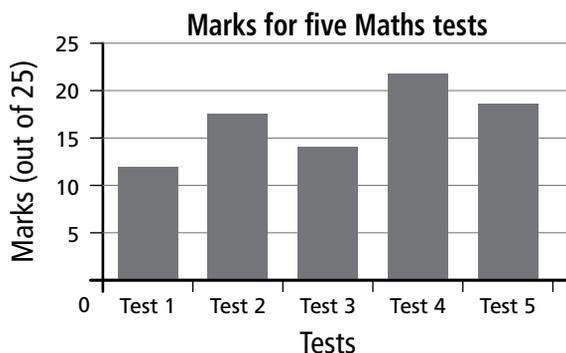


5.

**Pupils enrolled at a school**



6.



7. Bar graphs will depend on the number of pupils who are present and absent.

8. a) Household F

b) Households B and F

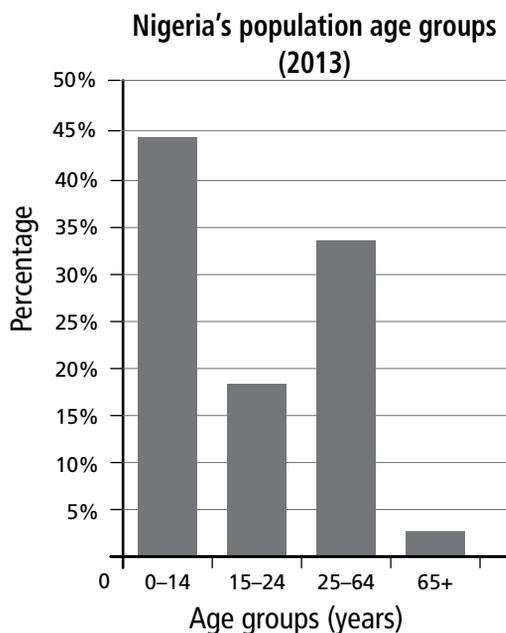
c) Household C

d) Household E uses the most water and so it probably has the most members.

e) Household B: 150, Household F: 200, Household A: 250, Household C: 300, Household D: 350, Household E: 450

f) Water is a scarce resource. It must be purified before it can be supplied to households and so it is wise to use water well and not waste it.

9.



10. Bar graphs depend on pupils' trials.

## Workbook: Exercise 101

(WB page 118)

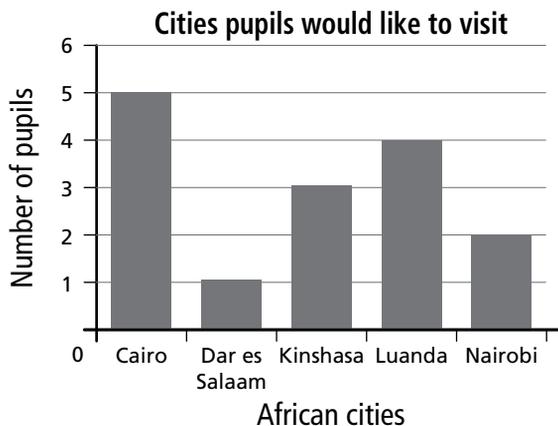
1. Answers depend on data pupils collect. Below is an example.

Cities	Tally marks	Totals
Nairobi		2
Kinshasa		3
Cairo		5
Dar es Salaam		1
Luanda		4

2. Answers depend on data pupils collect. The above example is used again in the table.

Cities	Totals
Cairo	5
Luanda	4
Kinshasa	3
Nairobi	2
Dar es Salaam	1

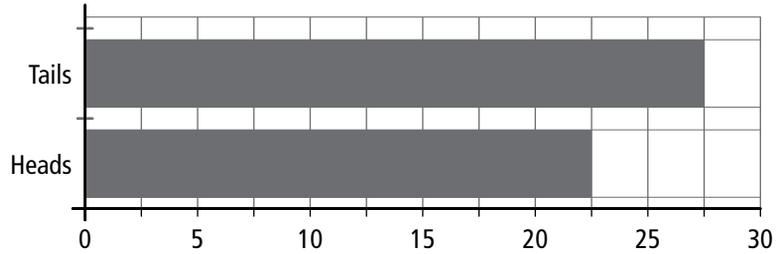
3. Answers depend on data pupils collect. Below is the above example represented on a bar graph.



4. Experiments will differ. Below is an example.

Outcome	Tally marks	Totals
<b>H</b>		23
<b>T</b>		27

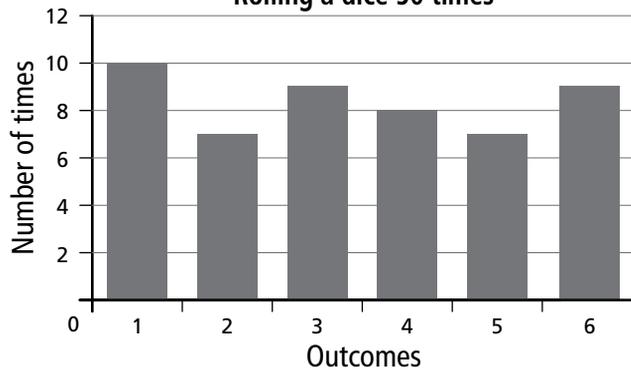
Tossing a coin 50 times



5. Experiments will differ. Below is an example.

	Tally marks	Totals
1	_	10
2		7
3		9
4		8
5		7
6		9

Rolling a dice 50 times



**Workbook: Exercise 102**

(WB page 120)

1. a)

Sizes	Tally marks	Totals
6	_	11
7	_	10
8		7
9		8
10		4

b)

Outcome	Tally marks	Totals
<b>H</b>		9
<b>T</b>	-	11

c)

Order	Tally marks	Totals
<b>C</b>		12
<b>T</b>		8

d)

L or R	Tally marks	Totals
<b>L</b>		4
<b>R</b>		36

2. Pupils draw a pictogram and a bar graph to represent data in question 1. Below are a few examples.

### Pictograms

Coffee and tea orders	
<b>C</b>	
<b>T</b>	

Key:  represents 2 cups

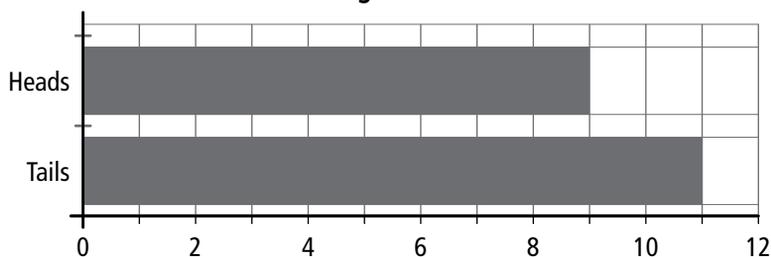
Left- and right-handed pupils	
<b>L</b>	
<b>R</b>	

Key:  represents 4 pupils

### Bar graphs



Tossing a coin 20 times



## Measures of central tendency

The problems in the examples and the exercises is that they do not contain large amounts of data. Explain to pupils that research generally includes thousands of pieces of information. Researchers use measures of central tendency (the mean, mode and median) to summarise data so that it is easy to note trends (general tendencies) and interpret data.

Make a chart with short explanations of the mean, median and mode. Ask pupils to complete Workbook: Exercise 103.

### Workbook: Exercise 103

(WB page 122)

1. mode: 6

2. a)

Data set	Ascending order	Mode	Median
2, 5, 6, 1, 4, 2, 3, 1, 7, 2, 4, 8, 1, 4, 7, 2	1, 1, 1, 2, 2, 2, 2, 3, 4, 4, 4, 5, 6, 7, 7, 8	2	$\frac{3+4}{2} = 3.5$
16, 19, 15, 17, 15, 16, 14, 12, 18, 11	11, 12, 14, 15, 15, 16, 16, 17, 18, 19	15, 16	$\frac{15+16}{2} = 15.5$
22, 20, 23, 27, 25, 21, 22, 25, 24, 22	20, 21, 22, 22, 22, 23, 24, 25, 25, 27	22	$\frac{22+23}{2} = 22.5$
55, 53, 59, 51, 53, 57, 49, 52, 50, 58	49, 50, 51, 52, 53, 53, 55, 57, 58, 59	53	53
2.1, 2.6, 2.4, 2.2, 2.4, 2.5, 2.3, 2.9	2.1, 2.2, 2.3, 2.4, 2.4, 2.5, 2.6, 2.9	2.4	2.4
88, 85, 84, 80, 87, 81, 86, 83, 89, 84	80, 81, 83, 84, 84, 85, 86, 87, 88, 89	84	$\frac{84+85}{2} = 84.5$
8.7, 8.4, 8.4, 8.1, 7.9, 8.5, 9.3, 8.2	7.9, 8.1, 8.2, 8.4, 8.4, 8.5, 8.7, 9.3	8.4	8.4

	Data set	Ascending order	Mode	Median
h)	2, 2, 2, 6, 3, 1, 5, 4, 3, 3, 4, 2, 6, 5	1, 2, 2, 2, 2, 3, 3, 3, 4, 4, 5, 5, 6, 6	2	3
i)	18, 11, 14, 12, 12, 19, 20, 14, 16, 11, 13, 17, 19, 10, 20, 17, 15, 11, 10, 13	10, 10, 11, 11, 11, 12, 12, 13, 13, 14, 14, 15, 16, 17, 17, 18, 19, 19, 20, 20	11	14
j)	34, 33, 28, 30, 29, 31, 32, 37, 28, 34, 35, 35, 33, 31, 32, 35, 28, 30, 34, 35	28, 28, 28, 29, 30, 30, 31, 31, 32, 32, 33, 33, 34, 34, 34, 35, 35, 35, 35, 37	35	$\frac{32+33}{2} = 32.5$

	Data set	Calculate mean
3. a)	2, 5, 6, 1, 4, 2, 3, 1, 7, 2, 4, 8, 1, 4, 7, 2	Sum of items: 52; number of items: 15 Mean = $\frac{51}{15} = 3.4666 \approx 3.5$
b)	16, 19, 15, 17, 15, 16, 14, 12, 18, 11	Sum of items: 153; number of items: 10 Mean = $\frac{153}{10} = 15.3$
c)	22, 20, 23, 27, 25, 21, 22, 25, 24, 22	Sum of items: 231; number of items: 10 Mean = $\frac{231}{10} = 23.1$
d)	55, 53, 59, 51, 53, 57, 49, 52, 50, 58	Sum of items: 537; number of items: 10 Mean = $\frac{537}{10} = 53.7$
e)	2.1, 2.6, 2.4, 2.2, 2.4, 2.5, 2.3, 2.9	Sum of items: 19.4; number of items: 8 Mean = $\frac{19.4}{8} = 2.425 \approx 2.4$
f)	88, 85, 84, 80, 87, 81, 86, 83, 89, 84	Sum of items: 847; number of items: 10 Mean = $\frac{846}{10} = 84.7$
g)	8.7, 8.4, 8.4, 8.1, 7.9, 8.5, 9.3, 8.2	Sum of items: 67.5; number of items: 8 Mean = $\frac{67.5}{8} = 8.4375 \approx 8.4$
h)	2, 2, 2, 6, 3, 1, 5, 4, 3, 3, 4, 2, 6, 5	Sum of items: 48; number of items: 14 Mean = $\frac{48}{14} = 3.428 \approx 3.4$
i)	18, 11, 14, 12, 12, 19, 20, 14, 16, 11, 13, 17, 19, 10, 20, 17, 15, 11, 10, 13	Sum of items: 292; number of items: 20 Mean = $\frac{292}{20} = 14.6$

	Data set	Calculate mean
j)	34, 33, 28, 30, 29, 31, 32, 37, 28, 34, 35, 35, 33, 31, 32, 35, 28, 30, 34, 35	Sum of items: 644; number of items: 20 Mean = $\frac{644}{20} = 32.2$
k)	1, 0, 4, 2, 5, 9, 0, 3, 5, 6, 1, 1, 8, 1, 4, 5, 2, 3, 7, 7, 8	Sum of items: 82; number of items: 21 Mean = $\frac{82}{21} = 3.9$

### Exercise 5

(PB page 287)

1. **A** 4, 5, 6, 7, 7, 8, 8, 9, 9, 10, 10
  - a) Mean:  $\frac{83}{11} = 7.54 \approx 7.5$
  - b) Median: 8
  - c) Mode: There are four modes: 7, 8, 9 and 10
  
- B** 1.1, 1.1, 1.2, 1.4, 1.4, 1.4, 1.5, 1.7, 1.8, 1.9, 1.9, 2.1, 2.2, 2.3, 2.4, 2.4, 2.7, 3.1, 3.7, 7.3
  - a) Mean:  $\frac{44.6}{20} = 2.23$
  - b) Median: 1.9
  - c) Mode: 1.4
  
- C** 107, 241, 297, 312, 391, 442, 511, 548, 639, 663, 721, 895, 999
  - a) Mean:  $\frac{6766}{13} = 520.46 \approx 520.5$
  - b) Median: There is no median value.
  - c) Mode: 511
  
2. **a)** 25, 28, 29, 29, 39, 40, 43, 54, 54, 59, 61, 63, 66, 73, 85, 86, 87, 89, 94, 96
  - b) Mode: 29 and 54
  - c) Median:  $\frac{(59 + 61)}{2} = 60$
  - d) Mean =  $\frac{1200}{20} = 60$
  
3. **a)** 57, 62, 63, 70, 71, 74, 74, 81, 82, 89, 95, 99, 101, 103, 105
  - b) Mean:  $\frac{1226}{15} = 81.73 \approx 81.7$
  - c) Mode: 74
  - d) Median: 81

4. a) 38 people
- b) Atinuke: 0, 0, 0, 0, 1, 1, 2, 2, 2, 2, 2, 3, 3, 4, 4, 5, 5, 7, 9  
 Mean:  $\frac{52}{19} = 2.7$   
 Median: 2  
 Mode: 2
- Hameed: 0, 0, 0, 0, 0, 1, 1, 1, 1, 2, 2, 2, 2, 2, 2, 3, 3, 3, 4  
 Mean:  $\frac{29}{19} = 1.5$   
 Median: 2  
 Mode: 2
- c) Answers will differ.

### Exercise 6 (challenge)

(PB page 288)

1. a) Sum of temperatures: 330  
 Mean =  $\frac{330}{10} = 33$  °C
- b) Mode =  $33 + \frac{34}{2} = 33.5$  °C
- c) Median: 35 °C
- d) The mode (33.5 °C) is lower than the median. It is more representative of the temperatures.
2. a) January, February, November and December
- b) June
- c) Sum of days with rain: 99  
 Mean =  $\frac{99}{12} = 8.25$
- d) Modes: 2, 11 and 12
- e) Median =  $\frac{9+11}{2} = 10$

Teachers may select revision questions for the final term assessment. The questions and problems involve work covered throughout the term. Problems include routine questions and those involving quantitative reasoning.

## Revision

(PB page 289)

- Both squares and rectangles have four angles of  $90^\circ$  and opposite sides parallel. All sides in a square are the same length. Opposite sides in rectangles are the same length.
- Pupils construct a square with sides of 45 mm.
- Pupils construct a rectangle 65 mm by 30 mm.
- $150^\circ$
  - $240^\circ$
  - $360^\circ$
  - $30^\circ$
  - $330^\circ$
  - $180^\circ$
- At 6
  - Halfway between 4 and 5
  - At 7
  - At 10

6. a)



b)



c)



d)



- Pupils draw angles accurately.
- $\triangle DEF$  is not right-angled.
  - $\triangle XYZ$  is right-angled.

- c)  $\triangle ABC$  is not right-angled.  
 d)  $\triangle RST$  is right-angled.
9.  $\hat{A} = 180^\circ - (35^\circ + 20^\circ) = 180^\circ - 55^\circ = 125^\circ$
10. a) A, D, E, I  
 b) B, C, F, G, H
11. a) Faces: 6  
 b) Edges: 12  
 c) Vertices: 8
12. a) Bases and two pairs of opposite side faces are parallel.  
 b) Both bases are perpendicular to each of the four side faces. Each side face is perpendicular to both adjacent side faces.
13. All six angles in a regular hexagon are the same size and all six sides the same length. In an irregular hexagon, angles are not all the same size and sides are not all the same length.
- 14, 15. Pupils draw a scale diagram.
16. Area =  $(25 \times 7) \times (25 \times 5) = 175 \times 125 = 21\,875 \text{ m}^2$
17. Pupils draw a line of 5 cm.
18. A Ordered: 105, 108, 112, 115, 117, 118, 123, 124, 126, 154, 155, 161, 172  
 Mean:  $\frac{1690}{13} = 130$   
 Median: 123  
 Mode: No mode.
- B Ordered: 20, 22, 23, 26, 27, 28, 29, 30, 32, 33, 35, 37, 38, 38, 40, 42, 44  
 Mean:  $\frac{544}{17} = 32$   
 Median: 32  
 Mode: 38
- C Ordered: 9.8, 11.1, 12.6, 12.8, 13.1, 13.2, 14.0, 14.7, 15.2, 15.2, 15.9, 15.9  
 Mean:  $\frac{163.5}{12} = 16.6$   
 Median:  $\frac{(13.2 + 14.0)}{2} = 13.6$   
 Mode: 15.2 and 15.9





# Example Examination papers memoranda

## Term 1 examination paper

(PB page 307)

**Total: 50 marks**

1. a) 491: four hundred and ninety-one  
b) 4 910: four thousand, nine hundred and ten  
c) 49 100: forty-nine thousand (3)
2.  $491 + 4\,910 = 5\,401$  (1)
3. a) 89 601: The value of 6 is 600.  
b) 76 553: The value of 6 is 6 000.  
c) 65 731 408: The value of 6 is 60 000 000. (3)
4.  $89\,601 - 76\,553 = 13\,048$  (1)
5. a)  $\frac{2}{3}$  of 60 = 40    b)  $\frac{3}{4}$  of 60 = 45    c)  $\frac{3}{5}$  of 60 = 36    d)  $\frac{3}{10}$  of 60 = 18 (4)
6.  $\frac{3}{10}, \frac{3}{5}, \frac{2}{3}, \frac{3}{4}$  (1)
7. a) LCM of 2, 3 and 4: 12                      b) LCM of 6, 9 and 15: 90  
c) LCM of 5, 8 and 12: 120 (6)
8. a) HCF of 32 and 60: 4                      b) HCF of 74 and 222: 74 (4)
9. a) Imo:  $3\,927\,563 \approx 3\,927\,600$               b) Borno:  $4\,171\,104 \approx 4\,171\,100$   
c) Kano:  $9\,401\,288 \approx 9\,401\,300$               d) Lagos:  $9\,113\,605 \approx 9\,113\,600$  (4)
10. a) Imo:  $5\,408\,800 - 3\,927\,600 = 1\,480\,200$   
b) Borno:  $5\,860\,200 - 4\,171\,100 = 1\,689\,100$  (2)
11. a)  $0.5 = \frac{5}{10} = \frac{1}{2}$                               b)  $1.8 = 1\frac{8}{10} = 1\frac{4}{5}$   
c)  $2.25 = 2\frac{25}{100} = 2\frac{1}{4}$                       d)  $0.55 = \frac{55}{100} = \frac{11}{20}$  (4)
12. a) 8 mm to 12 mm = 8 : 12 = 2 : 3  
b) 15 min. to 2 h = 15 : 120 = 1 : 8  
c) 50 g to 1 kg = 50 : 1 000 = 1 : 20 (3)
13. a)  $\frac{125}{100} \times 900 = \text{N}1\,125$                       b)  $\frac{125}{100} \times 2\,500 = \text{N}3\,125$   
c)  $\frac{125}{100} \times 750\,000 = \text{N}937\,500$  (3)

$$14. \text{ a) } \frac{95}{100} \times 760 = \text{R}722$$

$$\text{b) } \frac{95}{100} \times 45\,500 = \text{R}43\,225$$

$$\text{c) } \frac{95}{100} \times 750\,000 = \text{R}712\,500$$

(3)

$$15. \frac{7}{9} + \frac{2}{3} = \frac{7+6}{9} = \frac{13}{9} = 1\frac{4}{9}$$

(1)

$$16. \frac{7}{9} - \frac{2}{3} = \frac{7-6}{9} = \frac{1}{9}$$

(1)

$$17. 115.5 \div 3 = 38.5 \approx 39 \text{ floors}$$

(2)

$$18. \text{ a) } 523 \times 5 = 2\,615$$

$$\text{b) } 2.218 \times 20 = 4.36$$

$$\text{c) } 1\frac{3}{5} \times 2\frac{1}{2} = \frac{8}{5} \times \frac{5}{2} = 4$$

$$\text{d) } 45\,870 \div 15 = 3\,058$$

(4)

## Term 2 examination paper

(PB page 309)

**Total: 75 marks**

1. Find the value of  $a$ .

$$\text{a) } 4a + 5 = 25$$

$$4a = 20$$

$$a = 5$$

$$\text{b) } 2a^2 = 18$$

$$a^2 = 9$$

$$a = 3$$

$$\text{c) } 24a + 11a - 5a + 12 = 72$$

$$20a = 60$$

$$a = 3$$

$$\text{d) } 5a^2 + 2 = 26 - a^2$$

$$6a^2 = 24$$

$$a^2 = 4$$

$$a = 2$$

$$\text{e) } a + 5a + 3 \times 3a = 80 \div 2 + 5$$

$$15a = 45$$

$$a = 3$$

$$\text{f) } 30a - 5 \times 2a + 8 = 48$$

$$20a = 40$$

$$a = 2$$

(12)

$$2. 4x - 12 = 2x$$

$$2x = 12$$

$$x = 6$$

(3)

$$3. \frac{7}{100} \times 300\,000 = 21\,000$$

$$\frac{11}{100} \times 300\,000 = 33\,000$$

$$\frac{15}{100} \times 500\,000 = 75\,000$$

$$\frac{19}{100} \times 500\,000 = 95\,000$$

$$\frac{21}{100} \times 1\,000\,000 = \underline{210\,000}$$

$$\text{Total} \quad \text{R}434\,000$$

(6)

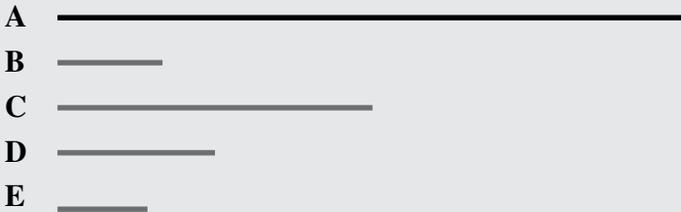
4. a) Tinned fish:  $\text{VAT} = \frac{5}{100} \times 750 = \text{N}37.50$   
 Apple pie:  $\text{VAT} = \frac{5}{100} \times 900 = \text{N}45$   
 Baby food (no VAT)  
 Shoes:  $\text{VAT} = \frac{5}{100} \times 2\,400 = \text{N}120$
- b)  $(750 + 37.50) + (900 + 45) + 650 + (2\,400 + 120) = \text{N}4\,902.50$  (6)
5.  $3\,000 \times 95 = 285\,000\text{k} = \text{N}2\,850$  (2)
6. The exchange rate of US dollars to Nigerian naira if US\$1 = N360.
- a)  $360 \times 250 = \text{N}90\,000$       b)  $\frac{2\,880\,000}{360} = \text{US}\$8\,000$  (2)
7. a)  $100 \times 600 = \text{N}60\,000$       b)  $250 \times 600 = \text{N}150\,000$  (2)
8. a)  $21\text{ cm} = 210\text{ mm}$       b)  $55\text{ km} = 55\,000\text{ m}$       c)  $2\,650\text{ mm} = 2.65\text{ m}$  (3)
9. a) Perimeter A =  $15 + 20 + 25 = 60$   
 Perimeter B =  $5 + 11 + 13 = 29$   
 Perimeter C =  $9 + 12 + 15 = 36$  (3)
- b) Triangle A:       $25^2 = 625$   
 $15^2 + 20^2 = 225 + 400 = 625$   
 Triangle A is a right-angled triangle.
- Triangle B:       $13^2 = 169$   
 $5^2 + 11^2 = 25 + 121 = 146$   
 Triangle B is not a right-angled triangle.
- Triangle C:       $15^2 = 225$   
 $9^2 + 12^2 = 81 + 144 = 225$   
 Triangle C is a right-angled triangle. (6)
10. a) Triangle A:      Triangle B:  
 $BC^2 = 8^2 + 15^2$        $BC^2 = 20^2 - 16^2$   
 $BC^2 = 64 + 225$        $BC^2 = 400 - 256$   
 $BC^2 = 289$        $BC^2 = 144$   
 $BC = 17$        $BC = 12$  (2)
- b) Perimeter A =  $8 + 15 + 17 = 40$   
 Perimeter B =  $12 + 16 + 20 = 48$  (2)
- c) Area A =  $\frac{8 \times 15}{2} = \frac{120}{2} = 60$  square units  
 Area B =  $\frac{12 \times 16}{2} = \frac{192}{2} = 96$  square units (2)



4. a) E has one line of symmetry.  
 b) C and G each have two lines of symmetry.  
 c) D has three lines of symmetry.  
 d) B has four lines of symmetry.  
 e) F has six lines of symmetry.  
 f) A has an infinite number of lines of symmetry. (7)

5. A sphere has one curved surface and a cylinder has two plane faces and one curved surface. (2)

6. Lines B, D, D and E are reductions of line A. Measure the lengths of the lines carefully.



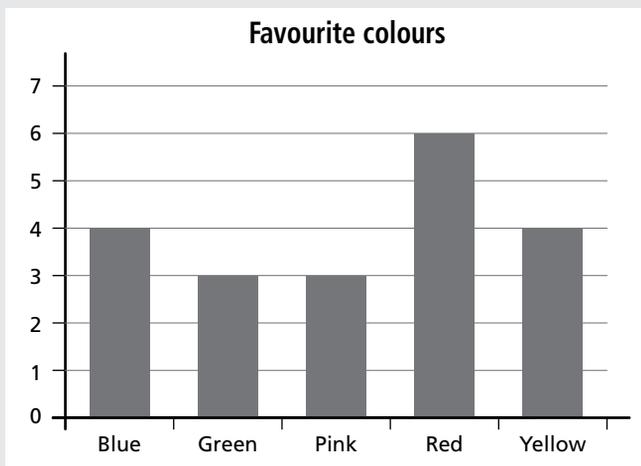
- a) E is a 7 to 1 reduction of A.      b) C is a 2 to 1 reduction of A.  
 c) B is a 6 to 1 reduction of A.      d) D is a 4 to 1 reduction of A. (4)

7. 45 mm represents 2 250 km. (1)

8. a) In Nigeria, cars drive on the right side of the road.  
 b) LHT:  $(3 \times 20) + 10 + 5 = 75$  countries  
 c) RHT:  $(8 \times 20) + 5 = 165$  countries (3)

9. Mean =  $\frac{218}{25} = 8.72$       Mode = 9      Median = 9 (3)

10. a)



(4)

- b) Red is most popular with the 20 children who took part in the survey. (1)