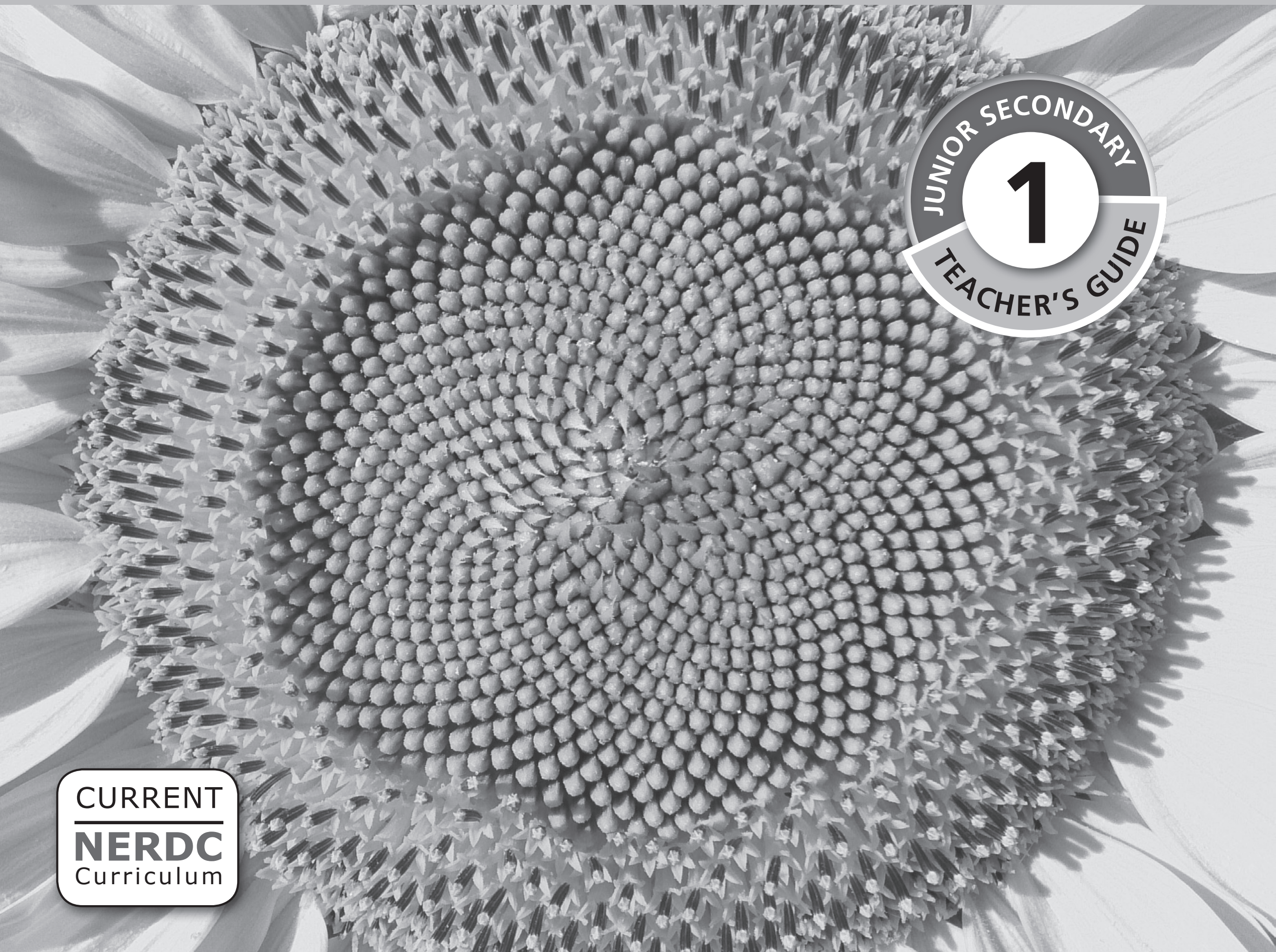
Excellence in Mathematics



CAMBRIDGE UNIVERSITY PRESS

Excellence in
Mathematics

JUNIOR SECONDARY
1
TEACHER'S GUIDE

CAMBRIDGE
UNIVERSITY PRESS

CAMBRIDGE
UNIVERSITY PRESS

Published by Cambridge University Press
University Printing House, Cambridge CB2 8BS, United Kingdom

Distributed in Nigeria by Cambridge University Press Nigeria Ltd
252E Muri Okunola Street, Victoria Island, Lagos State, Nigeria

Cambridge University Press is part of the University of Cambridge.

It furthers the University's mission by disseminating knowledge in the pursuit of education, learning and research at the highest international levels of excellence.

www.cambridge.org
Information on this title: www.cambridge.org/9781316608654

First published 2016

Printed in India by Multivista Global Pvt Ltd.

ISBN 9781316652046 Adobe Reader

Author: Jimmy Sanby
Editor: Shirley Sanby
Artists: Maryke Goldie, Brink Publishing & Design
Designer: Mellany Fick
Typesetter: Brink Publishing & Design
Cover image: ShutterStock©Aleksandar Mijatovic/Shutterstock

Contents

Introduction

The purpose of the curriculum

The main objectives of the curriculum are to prepare the students 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 within the study of Mathematics
- take advantage of the numerous career opportunities provided by Mathematics
- become prepared for further studies in Mathematics and other 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 students.
The teacher has to:

- be as well informed as possible on the Mathematics scheme of work
- know the aims and objectives of each topic
- select appropriate content material
- decide on the best methods of presentation such as group work, worksheets, question-answer sessions and debate
- 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 students.

To be effective in presentation, the teacher must do 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 students requiring extension or learning support (remedial).

The teacher must prepare each topic in advance. Many teachers go into the classroom inadequately prepared. It is your responsibility as a Mathematics teacher to involve your students actively in the learning process. It is a proven fact that students learn far more by *doing* than by *listening*.

Mathematics involves being curious and asking questions. When possible, teachers must ask questions to engage the students, encourage independent thought processes and help students develop problem-solving skills. Teachers need to start lessons by asking the students to write down answers to a few questions related to the lesson (approximately five). This will help students focus on the lesson. Teachers can use different types of questions in lessons:

- diagnostic questions help teachers to determine students prior knowledge on the topic
- consolidation questions help students master challenging concepts
- questions can stimulate students' interest in the subject
- questions can be used to help conclude a lesson. This will help teachers to find out whether students have understood the concepts and terminology in the lesson. Such questions will also highlight areas that students need to revise at home or that teachers will need to revisit in the next lesson.

Teachers must ensure that they do not appear to have favourites in the class. They must devise a system to ensure that they ask questions fairly and are careful not to embarrass weak students if they cannot answer questions.

How to use the scheme of work

A scheme of work is defined as the part of the curriculum that teachers are required to teach in their subjects. The primary function of the scheme of work is to provide an outline of the subject matter and its content, and to indicate how much work a student should cover in any particular class. A scheme of work 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 a scheme of work are continuity in learning and progression of experience. Teachers can add their own notes to the scheme of work provided on pages viii to xii.

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

Planning for the year

The year is divided into three terms. Each term is divided into 13 weeks. There are 6 topics in Term 1, 8 topics in Term 2 and 8 topics in Term 3. The end of term allows time for revision and an examination. This time frame may vary depending on the planning of a particular school. The worksheets in the Workbook give students the opportunity to apply what they have learnt. References in the Student's Book indicate the best time to use the worksheets in the Workbook.

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 discipline strategies. 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 (do not make empty threats) and consistently adhere to rules.

A teacher of Mathematics is a professional instructor who facilitates, promotes and influences students to achieve the outcomes of the scheme of work. It is the wish of the authors that the students 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.

Scheme of work

Term 1

Topic	Lesson objectives Students should be able to:	SB pages	WB pages
1. Whole numbers	• Count and write in millions, billions and trillions. • Solve problems involving quantitative reasoning using large numbers.	1–5	1–5
2. Fractions	• State the meaning of fractions. • Name types of fractions (proper and improper). • Change improper fractions to mixed fractions and vice versa. • Name equivalent fractions. • Apply equivalent fractions in sharing commodities. • Solve quantitative aptitude problems involving equivalent fractions. • Arrange given order of fractions in order of magnitude. • Convert fractions to percentage and vice versa. • Convert fractions to decimals and vice versa.	6–16	6–9
3. Addition and subtraction of fractions	• Add and subtract fractions using diagrams and calculations. • Add and subtract fractions with different denominators using diagrams and calculations. • Add and subtract mixed fractions. • Solve combined addition and subtraction of fractions problems. • Interpret and solve word problems on combined addition and subtraction of fractions.	17–18	10–12

Topic	Lesson objectives Students should be able to:	SB pages	WB pages
4. Multiplication and division of fractions	• Multiply and divide fractions using diagrams and direct calculation. • Multiply and divide mixed numbers by direct calculation. • Interpret and solve word problems involving multiplication and division of fractions. • Name prime numbers and factors of numbers.	19–21	13–17
5. HFC and LCM of whole numbers	• State the meaning of HFC and LCM. • Find HFC and LCM of whole numbers. • Find HFC and LCM of numbers by formulae. • Solve quantitative reasoning problems on HFC and LCM of whole numbers.	22–27	18–25
6. Estimation	• Estimate dimensions and distances within the school. • Estimate capacity and mass of given objects. • Estimate other things in day to day activities. • Solve problems on quantitative reasoning in estimation.	28–33	26–27
Term 1 Revision exercises		34–40	

Term 2

Topic	Lesson objectives Students should be able to:	SB pages	WB pages
1. Approximation	• Determine the degree of accuracy of certain numbers. • Round numbers off to given significant figures, decimal places, nearest whole numbers, tens, hundreds and thousands. • Round numbers off to the nearest tenth, hundredth and thousandth. • Approximate answers from problems on addition, subtraction, multiplication and division to a given degree of accuracy. • Apply approximation in solving basic operations in practical life activities. • Solve problems on quantitative reasoning.	41–46	28–29

Topic	Lesson objectives Students should be able to:	SB pages	WB pages
2. Counting in base 2	• Count in groups of twos.	47–49	30–31
3. Conversion of base 10 numerals to binary numbers	• Convert base 10 numerals to binary numbers.	50–51	32–33
4. Addition and subtraction of numbers in base 2 numerals	• Add 2- or 3-digit binary numbers. • Subtract 2- or 3-digit binary numbers.	52–53	34–37
5. Multiplication of numbers in base 2 numerals	• Multiply 2-digit binary numbers. • Solve problems involving quantitative reasoning on number base.	54	38–39
6. Addition and subtraction	• Add and subtract numbers with emphasis on place value using spike or abacus (TH, H, T, U). • Add and subtract numbers using the number line. • Add and subtract positive and negative integers correctly on the number line. • Add and subtract by collecting like terms. • Interpret and relate positive and negative numbers to everyday activities. • Solve problems on quantitative reasoning with reference to basic operations.	55–65	40–43
7. Use of symbols	• Solve problems expressed in open sentences. • Use letters to represent symbols or shapes in open sentences. • Solve word problems involving use of symbols. • Solve quantitative aptitude problems on the use of symbols and brackets.	66–71	44–49
8. Simplification of algebraic expressions	• Identify coefficients of terms of algebraic expressions. • Collect like terms for basic arithmetic operations. • Simplify like terms.	72–83	50–54

Topic	Lesson objectives Students should be able to:	SB pages	WB pages
	• Use brackets effectively to solve simple algebraic problems. • Solve basic arithmetic operations in algebraic processes.		
Term 2 Revision exercises		84–94	

Term 3

Topic	Lesson objectives Students should be able to:	SB pages	WB pages
1. Simple equations	• Use balance or see-saw to illustrate the principle of equality. • Translate word sentences into mathematical equations. • State the concept of equality in mathematics. • Solve simple equations and cross-check the answers.	95–105	55–60
2. Plane shapes	• Mention types of plane shapes and state at least two properties of each shape. • State the similarities and differences between the following: square, rectangle, triangle, trapezium, parallelogram and circle. • Find the perimeter of a regular polygon. • Find the areas of plane shapes such as squares, rectangles parallelograms, etc.	106–145	61–69
3. Three-dimensional figures	• Identify 3-dimensional shapes. • Identify the properties of cubes and cuboids. • Identify the properties of pyramids and cones. • Identify the properties of cylinders and spheres. • Find volume of cubes and cuboids.	145–166	70–75

Topic	Lesson objectives Students should be able to:	SB pages	WB pages
4. Angles	• Measure angles. • Identify vertically opposite angles, adjacent, alternate and corresponding angles. • Solve simple problems on sum of angles on a straight line, supplementary and complementary angles. • Solve triangles by application of the fact that the sum of the angles of a triangle is 180°.	167–193	76–81
5. Construction	• Construct parallel and perpendicular lines. • Bisect a given line segment. • Construct angles 90° and 60°.	194–201	82–83
6. Need for statistics	• Explain the meaning of statistics. • List the purposes of statistics and their usefulness in planning and prediction.	202–203	86–87
7. Data collection	• Know the statistical terms in collection of data. • Know how to interpret data.	204–207	88–90
8. Data presentation	• Prepare a frequency table from raw data. • Determine the median of a given set of data.	208–211	91–92
Term 3 Revision exercises		212–228	

THEME 1 Numbers and numeration

Topic 1: Whole numbers

Teaching guidelines and solutions

In this topic the focus is on reading, writing and counting very large numbers, including millions, billions and trillions. Start with revision of previous work. Knowledge of large numbers is expanded from millions and billions to include trillions. Students should be able to count, read and write numbers in numerals and words.

Unit 1: Working with large numbers

Place value

Use this time to ensure that students understand the concept of place value. Prepare a place value chart like the one on page 1 in the Student's Book to display in your classroom. This will help those students who struggle to expand their prior knowledge to include bigger and bigger numbers. It will be a useful reference aid as they solve problems in this unit. For those students who really struggle with large numbers, revise hundreds, tens and units.

Exercise 1

(SB page 2)

1. **a)** billions
b) hundred millions
c) hundred thousands
d) hundreds
e) trillions
f) thousands
g) ten thousands

2.

Number	Billions			Millions			Thousands			H	T	U
	HB	TB	B	HM	TM	M	HTh	TTh	Th	H	T	U
38 927								3	8	9	2	7
972 140							9	7	2	1	4	0
731										7	3	1
912										9	1	2
1 361 500						1	3	6	1	5	0	0
27 714 403					2	7	7	1	4	4	0	3
319 707 055				3	1	9	7	0	7	0	5	5
1 010 313 001			1	0	1	0	3	1	3	0	0	1
1 910 275 615			1	9	1	0	2	7	5	6	1	5
25 592 716 320		2	5	5	9	2	7	1	6	3	2	0
15 000 310 111		1	5	0	0	0	3	1	0	1	1	1
19 436 792 002		1	9	4	3	6	7	9	2	0	0	2

Unit 2: Writing numbers in words

The spelling of number words may be a problem for some students. Display a chart similar to the note on page 3 in the Student's Book. Adapt this list to include words that your students find particularly difficult.

Ensure that students know how to use spaces and commas when writing numbers in words. It is essential to break large numbers into readable groups. Work through the examples on page 3 to assess how much practice your students will need.

Worksheet 1

(WB page 1)

1. **a)** 500 **b)** 5
c) 500 000 **d)** 0.05

2. **a)** Two billion, four hundred and fifty-five million, one hundred and sixty-four thousand, five hundred and seventy-one.
b) Three million, four hundred and forty-five thousand, eight hundred and seventy-two.
c) Thirty-two and four hundred and forty-eight thousandths.

3. **a)** 2 165 **b)** 3 200 430 708
c) 22.240 **d)** 11.005

Students must be able to solve problems involving quantitative reasoning using large numbers. Working with population figures gives the opportunity to explore large numbers in a real context. Exercise 2 in the Student's Book requires students to use data presented in a graphic format and manipulate the numbers to answer the questions.

Exercise 2 (SB page 4)

1. 22

2. **a)** Cape Verde & Equatorial Guinea
b) five hundred thousand

3. **a)** Nigeria
b) one hundred and thirty-seven million, three hundred thousand

4. **a)** Nigeria, Egypt, Democratic Republic of Congo, South Africa and Kenya
b) Nigeria: one hundred and thirty-seven million, three hundred thousand
Egypt: seventy-three million, four hundred thousand
Democratic Republic of Congo: fifty-eight million, three hundred thousand
South Africa: forty-six million, nine hundred thousand
Kenya: thirty-two million, four hundred thousand

Exercise 3 (SB page 5)

1. **a)** eight hundred thousand, eight hundred
b) nine hundred and six thousand, one hundred and four
c) one million, six hundred and fifty thousand, nine hundred and fifty
d) two million, eighty-nine thousand, four hundred and five
e) six million, seven hundred and sixty-nine thousand and ninety-eight
f) six million, nine hundred thousand and sixty-five
g) ten million, fifty-four thousand, seven hundred and thirty-four
h) twenty-eight million, nine hundred and thirty-seven thousand, two hundred and eleven
i) ten million, seventy-six thousand, two hundred and twenty-five

j) eight trillion, seven hundred and thirty-two billion, one hundred and sixty-three million, four hundred and sixty-two thousand, seven hundred and five

2. **a)** 342 000 **b)** 850 325
c) 4 000 000 226 400 **d)** 2 435 620
e) 7 860 315 **f)** 10 578 050
g) 15 753 912 **h)** 22 950 034

3. Students to work with a partner for this question.
Answer: 87 654 321

Worksheet 2

(WB page 3)

1. **a)**

$$\begin{array}{r} 457\ 819 \\ +\ \underline{334\ 592} \\ 792\ 411 \end{array}$$

b)

$$\begin{array}{r} 5\ 873\ 440 \\ +\ \underline{21\ 304\ 287} \\ 27\ 177\ 727 \end{array}$$

c)

$$\begin{array}{r} 103\ 451\ 998 \\ +\ \underline{982\ 377} \\ 104\ 434\ 375 \end{array}$$

d)

$$\begin{array}{r} 862\ 351 \\ -\ \underline{442\ 787} \\ 419\ 564 \end{array}$$

e)

$$\begin{array}{r} 23\ 224\ 123 \\ -\ \underline{5\ 231\ 578} \\ 17\ 992\ 545 \end{array}$$

f)

$$\begin{array}{r} 19\ 581\ 643 \\ -\ \underline{10\ 983\ 267} \\ 8\ 598\ 376 \end{array}$$

2. Cole's salary for first 3 months:

$$\begin{array}{r} 129\ 995 \\ \times\ \underline{3} \\ \text{₦}389\ 985 \end{array}$$

Cole's salary for remainder of the year:

$$\begin{array}{r} 145\ 499 \\ \times\ \underline{9} \\ \text{₦}1\ 309\ 491 \end{array}$$

Cole earned after a year:

$$\begin{array}{r} 389\ 985 \\ +\ \underline{1\ 309\ 491} \\ \text{₦}1\ 699\ 476 \end{array}$$

3. **a)**

$$\begin{array}{r} 110\ 530.50 \\ \times\ \underline{8} \\ \text{₦}884\ 244.00 \end{array}$$

b)

$$\begin{array}{r} 956\ 880.45 \\ -\ \underline{884\ 224.00} \\ \text{₦}72\ 636.45 \end{array}$$

c)

$$\begin{array}{r} 110\ 530.50 \\ \times\ \underline{2} \\ \text{₦}221\ 060.00 \end{array}$$

4.

$$\begin{array}{r} 5\ 038 \\ +\ \underline{4\ 281} \\ \text{₦}9\ 319 \end{array}$$

Kokumo spent: ₦9 319

Topic 2: Fractions

Teaching guidelines and solutions

This topic starts with revision of the parts of a fraction and types of fractions. Students must be able to identify equivalent fractions, compare and order fractions and convert fractions to decimal numbers and percentages and vice versa.

Unit 1: The parts of a fraction

This is important revision. Students must be confident in their knowledge of naming and identifying the parts of a fraction. Assess how much support is required and design the lesson to include as many practical examples as you think necessary. You might want to display a poster showing the numerator and the denominator.

Unit 2: Types of fractions

Proper, improper and mixed fractions

Explain the different types of fractions: proper, improper and mixed. When the value is greater than one whole number, it may be written as an improper fraction with the numerator greater than the denominator, or as a mixed number with a whole number part and a fraction part. Students must be able to change mixed numbers to improper fractions and vice versa.

Exercise 1

(SB page 7)

1. improper fraction
2. proper fraction
3. mixed fraction
4. proper fraction
5. proper fraction
6. mixed fraction
7. proper fraction
8. improper fraction

Unit 3: Equivalent fractions

Explain that there is a difference between *equal* and *equivalent*. Ensure that students understand the meaning of equivalent. Work through the examples on page 9 in the Student's Book. If your students find this concept difficult and time permits, allow them to work in pairs and do example 3 as a practical exercise.

Exercise 2

(SB page 8)

1. **a)** 3 **b)** 6 **c)** 12

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

3. **a)** $\frac{1}{3} = \frac{2}{6} = \frac{4}{12}$, yes

b) equivalent fractions

4. Equivalent means that the fractions represent the same value.

Exercise 3

(SB page 10)

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

$\frac{2}{3}$

$\frac{2}{5}, \frac{4}{10}$

$\frac{1}{5}$

b) $\frac{1}{3}, \frac{2}{6}, \frac{2}{6}$

$\frac{1}{5}$

$\frac{4}{8}, \frac{5}{10}, \frac{6}{12}, \frac{3}{6}$

$\frac{1}{6}$

c) $\frac{1}{3}, \frac{2}{6}, \frac{3}{9}, \frac{2}{6}$

$\frac{2}{3}, \frac{4}{6}$

$\frac{4}{5}, \frac{8}{10}$

$\frac{2}{10}$

d) $\frac{1}{3}, \frac{4}{12}, \frac{5}{15}, \frac{2}{6}$

$\frac{4}{6}$

$\frac{6}{6}$

$\frac{3}{4}$

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

e) $\frac{1}{4}, \frac{1}{4}, \frac{2}{8}, \frac{3}{12}$

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

$\frac{3}{4}$

$\frac{1}{6}$

f) $\frac{4}{16}, \frac{5}{20}$

$\frac{2}{7}$

$\frac{4}{7}$

$\frac{6}{7}$

$\frac{3}{5}$

$\frac{4}{5}$

$\frac{5}{5}$

g) $\frac{2}{8}, \frac{3}{12}$

$\frac{3}{8}$

$\frac{4}{8}, \frac{6}{12}$

$\frac{1}{5}, \frac{2}{10}, \frac{3}{15}$

$\frac{4}{12}$

h) $\frac{2}{10}, \frac{4}{20}, \frac{5}{25}$

$\frac{2}{5}, \frac{4}{10}$

$\frac{5}{10}, \frac{2}{4}$

$\frac{2}{8}, \frac{1}{4}$

i) $\frac{2}{5}, \frac{4}{10}, \frac{6}{15}$

$\frac{3}{6}$

$\frac{3}{9}$

$\frac{3}{12}$

$\frac{1}{7}$

$\frac{1}{14}$

$\frac{1}{28}$

j) $\frac{6}{15}, \frac{8}{20}, \frac{10}{25}$

$\frac{1}{15}$

$\frac{2}{20}$

$\frac{4}{20}$

$\frac{4}{6}$

$\frac{3}{6}$

$\frac{2}{6}$

2. **a)** $\frac{1}{4} = \frac{1}{4}$ or $\frac{2}{4} = \frac{1}{2}$

b) $\frac{1}{4} = \frac{8}{32}$ or $\frac{2}{4} = \frac{8}{16}$

c) $\frac{4}{8} = \frac{12}{24} = \frac{18}{36}$

d) $\frac{7}{14} = \frac{12}{24} = \frac{18}{36} = \frac{28}{56}$

e) $\frac{1}{5} = \frac{5}{25}$

f) $\frac{4}{6} = \frac{32}{48}$

g) $\frac{2}{3} = \frac{4}{6}$

h) $\frac{3}{7} = \frac{27}{63}$

3. Answers may differ.

a) $\frac{2}{4} = \frac{1}{2} = \frac{4}{8}$

b) $\frac{3}{5} = \frac{6}{10} = \frac{9}{15}$

c) $\frac{6}{7} = \frac{12}{14} = \frac{18}{21}$

d) $\frac{9}{13} = \frac{18}{26} = \frac{27}{39}$

e) $\frac{12}{17} = \frac{24}{34} = \frac{36}{51}$

f) $\frac{4}{9} = \frac{8}{18} = \frac{12}{27}$

4. Answers may differ.

a) $\frac{3}{5} = \frac{6}{10}$

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

c) $\frac{11}{17} = \frac{22}{34}$

d) $\frac{13}{14} = \frac{26}{28}$

5. 2 blocks

6. 4 comic frames

7. 2 pieces of cake

8. The first strip has 3 out of 15 shaded: $\frac{3}{15} = \frac{1}{5}$

A: $\frac{3}{12} = \frac{1}{4}$

B: $\frac{2}{4} = \frac{1}{2}$

C: $\frac{1}{5}$

D: $\frac{4}{10} = \frac{2}{5}$

The answer is C.

Worksheet 3

(WB page 6)

1\. a) $\frac{1}{2}$ $\frac{2}{4}$ $\frac{3}{2}$ $\frac{6}{3}$ $\frac{12}{24}$ $\frac{4}{10}$ $\frac{25}{50}$

b) $\frac{4}{16}$ $\frac{1}{5}$ $\frac{4}{1}$ $\frac{2}{8}$ $\frac{3}{12}$ $\frac{6}{23}$ $\frac{1}{4}$

c) $\frac{1}{3}$ $\frac{9}{3}$ $\frac{4}{5}$ $\frac{6}{2}$ $\frac{26}{23}$ $\frac{6}{15}$ $\frac{24}{8}$

d) $\frac{6}{36}$ $\frac{7}{6}$ $\frac{2}{12}$ $\frac{45}{270}$ $\frac{3}{4}$ $\frac{96}{16}$ $\frac{1}{6}$

2\. a) $\frac{1}{2}; \frac{3}{6}$ b) $\frac{4}{5}; \frac{20}{25}$ c) $\frac{18}{8}; \frac{36}{16}$ d) $\frac{17}{3}; \frac{34}{6}$ e) $\frac{26}{34}; \frac{39}{51}$

3\. a) 27 b) 6 c) 15 d) 3 e) 6

4\. a) 2 slices of pizza

b) $\frac{45}{180} = \frac{1}{4} = \frac{2}{8}$

$\therefore$ he ate 2 slices, so he ate his fair share.

c) $\frac{2}{8} = \frac{?}{24}$ $\therefore$ each boy gets 6 slices.

5\. a) $\frac{18}{54} = \frac{1}{3}$

$\frac{12}{36} = \frac{1}{3}$

$\frac{2}{6} = \frac{1}{3}$ $\therefore$ yes, each took $\frac{1}{3}$ of the money.

b) ₦2 100 ÷ 3 = ₦700

Unit 4: Comparing fractions

Work through examples of how to compare fractions by converting them to the same denominator. Knowledge of lowest common multiple (LCM) is essential when converting fractions. Students should have encountered LCM in previous years, but this will be covered in more detail in the next section.

Exercise 4

(SB page 12)

1\. a) $\frac{3}{5} = \frac{6}{10}$ b) $\frac{8}{12} = \frac{2}{3}$ c) $\frac{2}{7} = \frac{14}{49}$

d) $\frac{22}{33} = \frac{2}{3}$ e) $\frac{2}{5} = \frac{4}{10} = \frac{8}{20} = \frac{14}{35}$

2\. a) $\frac{15}{27} = \frac{5}{9}$ b) $\frac{150}{250} = \frac{15}{25} = \frac{3}{5}$ c) $\frac{96}{144} = \frac{8}{12} = \frac{2}{3}$

d) $\frac{192}{264} = \frac{8}{11}$ e) $\frac{224}{254} = \frac{112}{127}$

3\. a) $\frac{8}{11}$ b) $\frac{9}{19}$ c) $2\frac{3}{4}$

4\. a) $\frac{13}{18} < \frac{17}{18}$ b) $\frac{1}{10} < \frac{1}{8}$ c) $4\frac{2}{3} > 4\frac{1}{5}$

Unit 5: Conversions

Converting fractions to decimal numbers and vice versa

Ensure that students understand that decimal numbers are fractions with denominators that are multiples of 10. When converting from a fraction to a decimal number, they must determine whether the required decimal will be a tenth, hundredth or thousandth. Work through the examples on page 13 before students tackle Exercise 5.

Exercise 5

(SB page 14)

1. **a)** 0.5 **b)** 0.25 **c)** 0.125
d) 0.75 **e)** 0.375 **f)** 0.875
g) 0.2 **h)** 0.625 **i)** 0.6
j) 0.3 **k)** 0.454 **l)** 2.75
m) 5.8 **n)** 1.55 **o)** 5.375

2. **a)** $\frac{1}{10}$ **b)** $\frac{3}{10}$ **c)** $\frac{3}{4}$
d) $\frac{65}{100} = \frac{13}{20}$ **e)** $\frac{35}{100} = \frac{7}{20}$ **f)** $\frac{95}{100} = \frac{19}{20}$
g) $\frac{85}{100} = \frac{17}{20}$ **h)** $\frac{9}{10}$ **i)** $\frac{37}{100}$
j) $\frac{5}{100} = \frac{1}{20}$ **k)** $1\frac{412}{1\,000} = 1\frac{103}{250}$ **l)** $2\frac{915}{1\,000} = 2\frac{183}{200}$
m) $4\frac{76}{100} = 4\frac{19}{25}$ **n)** $3\frac{85}{100} = 3\frac{17}{20}$ **o)** $5\frac{1}{100}$

3. Answers may differ, some examples are: $\frac{1}{2}, \frac{2}{4}, \frac{3}{6}, \frac{4}{8}$.

Conversion of fractions to percentages and vice versa

Work through the examples with the class. The quarter slice of cake as described in the Student's Book on pages 6 and 14, provides a good practical example. This also uses the visual image of the quarter slice as something that can be expressed as a fraction $\left(\frac{1}{4}\right)$, a decimal number (0.25) and a percentage (25%).

Exercise 6

(SB page 16)

1. **a)** 5% **b)** 10% **c)** 20% **d)** 70% **e)** 15%
f) 45% **g)** 80% **h)** 35% **i)** 16% **j)** 4%

2. **a)** $\frac{2}{5}$ **b)** $\frac{9}{10}$ **c)** $\frac{1}{2}$ **d)** $\frac{7}{10}$ **e)** $\frac{4}{5}$
f) $\frac{1}{4}$ **g)** $\frac{1}{20}$ **h)** $\frac{19}{20}$ **i)** $\frac{7}{20}$ **j)** $\frac{3}{4}$

Worksheet 4

(WB page 8)

1. 7 : 8

2. $\frac{9}{45} = \frac{1}{5} = 20\%$

3. $\frac{25}{100} = \frac{1}{4}$

4. $16 : 3 = \frac{16}{3}$

5. $\frac{14}{100} = \frac{7}{50}$

6. $\frac{8}{32} = \frac{1}{4} = 0.25$

7.

Simplified fraction	Decimal number	Percentage
$\frac{12}{100} = \frac{3}{25}$	0.12	12%
$\frac{5}{4}$	1.25	125%

8. $0.5 = 0.5$

$\frac{4}{5} = 0.8$

$2\frac{3}{5} = 2.6$

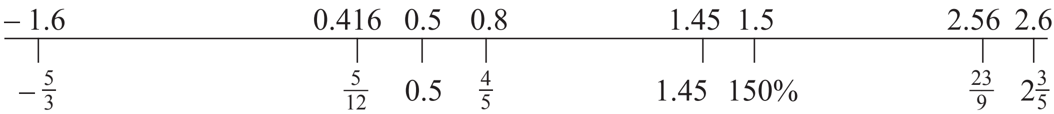
$1.45 = 1.45$

$\frac{5}{12} = 0.416$

$150\% = 1.5$

$-\frac{5}{3} = -1.6$

$\frac{23}{9} = 2.56$



Topic 3: Addition and subtraction of fractions

Teaching guidelines and solutions

In this topic we focus on adding and subtracting fractions. Remind students that the fractions must be written with the same denominator before they can add or subtract the numerators.

Unit 1: Addition of fractions

Work through the example on page 17. Ensure that students understand how to convert the fractions to equivalent fractions with the same denominators.

Exercise 1

(SB page 17)

1. a) $\frac{2}{7} + \frac{4}{7}$

$= \frac{2+4}{7}$

$= \frac{6}{7}$

b) $\frac{15}{28} + \frac{17}{28}$

$= \frac{15+17}{28}$

$= \frac{32}{28}$

$= 1\frac{4}{28}$

$= 1\frac{1}{7}$

2. a) $\frac{2}{5} + \frac{1}{4}$

$= \frac{8}{20} + \frac{5}{20}$

$= \frac{8+5}{20}$

$= \frac{13}{20}$

b) $\frac{2}{3} + \frac{4}{5}$

$= \frac{10}{15} + \frac{12}{15}$

$= \frac{22}{15}$

$= 1\frac{7}{15}$

c) $\frac{1}{2} + \frac{6}{5} + \frac{4}{3}$

$= \frac{15}{30} + \frac{36}{30} + \frac{40}{30}$

$= \frac{15+36+40}{30}$

$= \frac{91}{30}$

$= 3\frac{1}{30}$

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

$= \frac{3}{2} + \frac{7}{8}$

$= \frac{12}{8} + \frac{7}{8}$

$= \frac{12 + 7}{8}$

$= \frac{19}{8}$

$= 2\frac{3}{8}$

b) $3\frac{1}{3} + 5\frac{2}{5}$

$= \frac{10}{3} + \frac{27}{5}$

$= \frac{50 + 81}{15}$

$= \frac{131}{15}$

$= 8\frac{11}{15}$

Unit 2: Subtraction of fractions

With subtraction, fractions must be manipulated in the same way as for addition of fractions. Ensure that students do not become confused with the use of negative numbers.

Exercise 2

(SB page 18)

1. a) $\frac{5}{8} - \frac{3}{8}$

$= \frac{5 - 3}{8}$

$= \frac{2}{8}$

$= \frac{1}{4}$

b) $\frac{2}{3} - \frac{5}{8}$

$= \frac{16}{24} - \frac{15}{24}$

$= \frac{16 - 15}{24}$

$= \frac{1}{24}$

c) $\frac{3}{4} - \frac{2}{3}$

$= \frac{9}{12} - \frac{8}{12}$

$= \frac{9 - 8}{12}$

$= \frac{1}{12}$

2. a) $5\frac{1}{3} - 3\frac{1}{7}$

$= \frac{16}{3} - \frac{22}{7}$

$= \frac{112}{21} - \frac{66}{21}$

$= \frac{112 - 66}{21}$

$= \frac{46}{21}$

$= 2\frac{4}{21}$

b) $7\frac{4}{5} - 3\frac{2}{7}$

$= \frac{39}{5} - \frac{23}{7}$

$= \frac{273}{35} - \frac{115}{35}$

$= \frac{(273 - 115)}{35}$

$= \frac{158}{35}$

$= 4\frac{18}{35}$

3. a) $\frac{5}{7} - \frac{2}{7}$

$= \frac{5 - 2}{7}$

$= \frac{3}{7}$

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

$= \frac{12}{20} - \frac{5}{20}$

$= \frac{12 - 5}{20}$

$= \frac{7}{20}$

c) $\frac{3}{4} - \frac{1}{3}$

$= \frac{9}{12} - \frac{4}{12}$

$= \frac{5}{12}$

d) $3\frac{1}{2} + 2\frac{1}{4}$

$= \frac{7}{2} + \frac{9}{4}$

$= \frac{14}{4} + \frac{9}{4}$

$= \frac{14 + 9}{4}$

$= \frac{23}{4}$

$= 5\frac{3}{4}$

e) $7\frac{1}{4} + 5\frac{3}{7}$

$= \frac{29}{4} + \frac{38}{7}$

$= \frac{203}{28} + \frac{152}{28}$

$= \frac{203 + 152}{28}$

$= \frac{355}{28}$

$= 12\frac{19}{28}$

f) $1\frac{1}{5} + 2\frac{1}{3}$

$= \frac{6}{5} + \frac{7}{3}$

$= \frac{18}{15} + \frac{35}{15}$

$= \frac{18 + 35}{15}$

$= \frac{53}{15}$

$= 3\frac{8}{15}$

g) $\frac{2}{3} - 4\frac{1}{5}$

$= \frac{2}{3} - \frac{21}{5}$

$= \frac{10}{15} - \frac{63}{15}$

$= \frac{10 - 63}{15}$

$= -\frac{53}{15}$

$= -3\frac{8}{15}$

h) $10\frac{1}{12} - 2\frac{4}{7}$

$= \frac{121}{12} - \frac{18}{7}$

$= \frac{847}{84} - \frac{216}{84}$

$= \frac{631}{84}$

$= 7\frac{43}{84}$

Worksheet 5

(WB page 10)

1. $\frac{3}{4} + \frac{2}{4}$

$= \frac{5}{4}$

$= 1\frac{1}{4}$

2. $\frac{11}{36} + \frac{7}{36}$

$= \frac{18}{36}$

$= \frac{1}{2}$

3. $\frac{1}{5} + \frac{2}{6}$

$= \frac{6}{30} + \frac{10}{30}$

$= \frac{16}{30}$

$= \frac{8}{15}$

4. $\frac{3}{7} + \frac{2}{3}$

$= \frac{9}{21} + \frac{14}{21}$

$= \frac{23}{21}$

$= 1\frac{2}{21}$

5. $\frac{1}{2} + \frac{4}{5} + \frac{2}{9}$
$= \frac{45}{90} + \frac{72}{90} + \frac{20}{90}$
$= \frac{137}{90}$
$= 1\frac{47}{90}$

6. $\frac{2}{5} - \frac{1}{8}$
$= \frac{16}{40} - \frac{5}{40}$
$= \frac{11}{40}$

7. Subtract $\frac{2}{3}$ from $\frac{9}{10}$.
$\therefore \frac{9}{10} - \frac{2}{3}$
$= \frac{27}{30} - \frac{20}{30}$
$= \frac{7}{30}$

8. $2\frac{3}{4} + 1\frac{2}{5}$
$= \frac{11}{4} + \frac{7}{5}$
$= \frac{55}{20} + \frac{28}{20}$
$= \frac{83}{20}$
$= 4\frac{3}{20}$

9. $7\frac{3}{7} + 2\frac{1}{8}$
$= \frac{52}{7} + \frac{17}{8}$
$= \frac{416}{56} + \frac{119}{56}$
$= \frac{535}{56}$
$= 9\frac{31}{36}$

10. $10\frac{1}{2} - 4\frac{5}{6}$
$= \frac{21}{2} - \frac{29}{6}$
$= \frac{63}{6} - \frac{29}{6}$
$= \frac{34}{6}$
$= \frac{17}{3}$
$= 5\frac{2}{3}$

11. $\frac{5}{7} - 2\frac{4}{9}$
$= \frac{5}{7} - \frac{22}{9}$
$= \frac{45}{63} - \frac{154}{63}$
$= -\frac{109}{63}$
$= -1\frac{46}{63}$

12. $\frac{3}{4} + 6\frac{2}{5} - 3\frac{1}{3}$
$= \frac{3}{4} + \frac{32}{5} - \frac{10}{3}$
$= \frac{15}{20} + \frac{128}{20} - \frac{10}{3}$ or $= \frac{45}{60} + \frac{384}{60} - \frac{200}{60}$
$= \frac{143}{20} - \frac{10}{3}$ $\qquad = \frac{45 + 384 - 200}{60}$
$= \frac{429}{60} - \frac{200}{60}$ $\qquad = \frac{229}{60}$
$= \frac{229}{60}$ $\qquad = 3\frac{49}{60}$
$= 3\frac{49}{60}$

Topic 4: Multiplication and division of fractions

Teaching guidelines and solutions

In this topic we look at multiplication and division of fractions. Students should understand the relationship between multiplication and division. They must be able to solve problems involving multiplication and division of fractions.

Unit 1: Multiplication and division

Ensure that students understand that there is no need to find a common denominator when multiplying fractions. Introduce the use of reciprocals to assist with division.

Multiplication of fractions

Work through the examples on page 19. Emphasise how to multiply mixed fractions.

Exercise 1

(SB page 19)

1. a) $\frac{2}{3} \times \frac{8}{15}$

$= \frac{(2 \times 8)}{(3 \times 15)}$

$= \frac{16}{45}$

b) $\frac{3}{5} \times \frac{6}{7} \times \frac{3}{8}$

$= \frac{3}{5} \times \frac{3}{7} \times \frac{3}{4}$ (simplify)

$= \frac{27}{140}$

c) $\frac{3}{4} \times \frac{4}{7} \times \frac{7}{9}$

$= \frac{1}{1} \times \frac{1}{1} \times \frac{1}{3}$ (simplify)

$= \frac{1}{3}$

2. a) $3\frac{1}{3} \times 1\frac{4}{5}$

$= \frac{10}{3} \times \frac{9}{5}$

$= \frac{2}{1} \times \frac{3}{1}$ (simplify)

$= 6$

b) $1\frac{3}{4} \times 2\frac{4}{5} \times 3\frac{1}{3}$

$= \frac{7}{4} \times \frac{14}{5} \times \frac{10}{3}$

$= \frac{7}{4} \times \frac{14}{1} \times \frac{2}{3}$ (simplify)

$= \frac{7}{2} \times \frac{14}{1} \times \frac{1}{3}$ (simplify)

$= \frac{7}{1} \times \frac{7}{1} \times \frac{1}{3}$ (simplify)

$= \frac{49}{3}$

$= 16\frac{1}{3}$

Division of fractions

Explain that division is the reciprocal operation of multiplication. Work through the examples on page 20.

Exercise 2

(SB page 20)

1. $10 \times \frac{1}{10} = \frac{10}{1} \times \frac{1}{10} = 1$

   reciprocal is $\frac{1}{10}$

2. $\frac{1}{12} \times \frac{12}{1} = 1$

   reciprocal is 12

3. $\frac{5}{8} \times \frac{8}{5} = 1$

   reciprocal is $\frac{8}{5} = 1\frac{3}{5}$

4. $\frac{27}{13} \times \frac{13}{27} = 1$

   reciprocal is $\frac{13}{27}$

5. $4\frac{3}{5} = \frac{23}{5}$

   $\frac{23}{5} \times \frac{5}{23} = 1$

   reciprocal is $\frac{5}{23}$

Exercise 3

(SB page 21)

1. a) $\frac{2}{3} \times \frac{10}{11}$

   $= \frac{(2 \times 10)}{(3 \times 11)}$

   $= \frac{20}{33}$

   b) $\frac{5}{7} \times \frac{7}{8}$

   $= \frac{35}{56}$ or $= \frac{5}{1} \times \frac{1}{8}$

   $= \frac{5}{8}$ $\quad = \frac{5}{8}$

   c) $\frac{3}{5} \times \frac{2}{3}$

   $= \frac{2}{5}$

   d) $\frac{3}{5} \times \frac{5}{9} \times \frac{3}{4}$

   $= \frac{(3 \times 5 \times 3)}{(5 \times 9 \times 4)}$

   $= \frac{(1 \times 5 \times 1)}{(5 \times 1 \times 4)}$ (simplify)

   $= \frac{(1 \times 1 \times 1)}{(1 \times 1 \times 4)}$

   $= \frac{1}{4}$

   e) $3\frac{1}{3} \times 1\frac{4}{5}$

   $= \frac{10}{3} \times \frac{9}{5}$

   $= \frac{(10 \times 9)}{(3 \times 5)}$

   $= \frac{(2 \times 9)}{(3 \times 1)}$ (simplify)

   $= \frac{(2 \times 3)}{(1 \times 1)}$ (simplify)

   $= 6$

   f) $1\frac{3}{4} \times 2\frac{4}{5} \times 3\frac{1}{3}$

   $= \frac{7}{4} \times \frac{14}{5} \times \frac{10}{3}$

   $= \frac{(7 \times 14 \times 10)}{(4 \times 5 \times 3)}$

   $= \frac{(7 \times 14 \times 2)}{(4 \times 1 \times 3)}$ (simplify)

   $= \frac{(7 \times 14 \times 1)}{(2 \times 1 \times 3)}$ (simplify)

   $= \frac{(7 \times 7 \times 1)}{(1 \times 1 \times 3)}$ (simplify)

   $= \frac{49}{3}$

   $= 16\frac{1}{3}$

g) $\frac{4}{5}$ of 20

$= \frac{4}{5} \times \frac{20}{1}$

$= \frac{4}{1} \times \frac{4}{1}$ (simplify)

$= 16$

2. a) $\frac{2}{5} \div \frac{1}{3}$

$= \frac{2}{5} \times \frac{3}{1}$

$= \frac{6}{5}$

$= 1\frac{1}{5}$

b) $5\frac{1}{4} \div 1\frac{1}{5}$

$= \frac{21}{4} \div \frac{6}{5}$

$= \frac{21}{4} \times \frac{5}{6}$

$= \frac{(21 \times 5)}{(4 \times 6)}$

$= \frac{(7 \times 5)}{(4 \times 2)}$ (simplify)

$= \frac{35}{8}$

$= 4\frac{3}{8}$

c) $3\frac{3}{4} \div 1\frac{1}{4}$

$= \frac{15}{4} \div \frac{5}{4}$

$= \frac{15}{4} \times \frac{4}{5}$

$= \frac{(15 \times 4)}{(4 \times 5)}$ (simplify)

$= \frac{(15 \times 1)}{(1 \times 5)}$ (simplify)

$= \frac{(3 \times 1)}{(1 \times 1)}$ (simplify)

$= 3$

d) $\frac{4}{3} \div \frac{5}{2}$

$= \frac{4}{3} \times \frac{2}{5}$

$= \frac{(4 \times 2)}{(3 \times 5)}$

$= \frac{8}{15}$

e) $1\frac{1}{2} \div \frac{4}{5} \div \frac{2}{3}$

$= \frac{3}{2} \div \frac{4}{5} \div \frac{2}{3}$

$= \frac{3}{2} \times \frac{5}{4} \times \frac{3}{2}$

$= \frac{(3 \times 5 \times 3)}{(2 \times 4 \times 2)}$

$= \frac{45}{16}$

$= 2\frac{13}{16}$

Worksheet 6

(WB page 13)

1. $\frac{4}{5} \times \frac{7}{8}$

$= \frac{7}{10}$

2. $\frac{3}{2} \times \frac{2}{6}$

$= \frac{1}{2}$

3. $\frac{7}{9} \times \frac{11}{14}$

$= \frac{11}{18}$

4. $\frac{1}{4} \times \frac{8}{3} \times \frac{9}{10}$

$= \frac{6}{10}$

$= \frac{3}{5}$

5. $1\frac{2}{7} \times 2\frac{2}{6}$

$= \frac{9}{7} \times \frac{14}{6}$

$= \frac{3}{1} \times \frac{2}{2}$

$= 3$

6. $3\frac{1}{4} \times 5\frac{1}{4} \times \frac{3}{26}$

$= \frac{13}{4} \times \frac{21}{4} \times \frac{3}{26}$

$= \frac{63}{32}$

$= 1\frac{31}{32}$

7. $\frac{6}{7}$ of 28

$= \frac{6}{7} \times \frac{28}{1}$

$= 24$

8. $\frac{1}{3} \div \frac{2}{9}$

$= \frac{1}{3} \times \frac{9}{2}$

$= \frac{3}{2}$

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

9. $\frac{4}{7} \div \frac{1}{2}$

$= \frac{4}{7} \times \frac{2}{1}$

$= \frac{8}{7}$

$= 1\frac{1}{7}$

10. $\frac{2}{11} \div \frac{3}{22} \div \frac{2}{3}$

$= \frac{2}{11} \times \frac{22}{3} \times \frac{3}{2}$

$= 2$

11. $5\frac{1}{4} \div \frac{7}{3}$

$= \frac{21}{4} \times \frac{3}{7}$

$= \frac{9}{4}$

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

12. $\frac{3}{7} \div \frac{14}{5} \div 3\frac{1}{6}$

$= \frac{3}{7} \times \frac{5}{14} \times \frac{6}{19}$

$= \frac{45}{931}$

13. $7\frac{1}{2} \div \left(6\frac{1}{2} - 2\frac{3}{4}\right)$

$= \frac{15}{2} \div \left(\frac{13}{2} - \frac{11}{4}\right)$

$= \frac{15}{2} \div \left(\frac{26}{4} - \frac{11}{4}\right)$

$= \frac{15}{2} \div \frac{15}{4}$

$= \frac{15}{2} \times \frac{4}{15}$

$= 2$

14. $\left(5\frac{3}{5} + 2\frac{2}{3}\right)$ of $1\frac{1}{4}$

$= \left(\frac{28}{5} + \frac{8}{3}\right) \times \frac{5}{4}$

$= \left(\frac{84}{15} + \frac{40}{15}\right) \times \frac{5}{4}$

$= \frac{124}{15} \times \frac{5}{4}$

$= \frac{31}{3}$

$= 10\frac{1}{3}$

Worksheet 7

(WB page 16)

1. $\frac{5}{6}$ of the class is 120 students, therefore $\frac{1}{5}$ would be 120 ÷ 5 = 24 students.
The entire class is $\frac{6}{6}$, which is 6 times $\frac{1}{5}$.
So, 24 × 6 = 144 students in the Form 1 class altogether.

2. This is the same as saying: "How many $\frac{2}{3}$ are there in 4?"
$4 \div \frac{2}{3}$
$= 4 \times \frac{3}{2}$
$= 6$

3. $\frac{1}{5}$ of 250 ml: $250 \div 5 = 50$. Ifede left 50 ml in the can.
She had $\frac{4}{5}$ of the drink: $50 \times 4 = 200$ ml.

4. a)
$$\begin{array}{r} 172\ 723.27 \\ +\quad 400.00 \\ +\ \underline{90\ 000.00} \\ 263\ 123.27 \end{array}$$

b) $172\ 723.27 \times \frac{1}{7} = 24\ 674.75$
∴ flight = 172 723.27 – 24 674.75 = ₦148 048.52
$400 \times \frac{2}{5} = 160$
∴ airport = 400 + 160 = ₦560
$90\ 000 \times \frac{6}{11} = 49\ 090.91$
∴ spent = 90 000 – 49 090.91 = ₦40 909.09
∴ Total = 148 048.52 + 560 + 40 909.09 = ₦189 517.61

THEME 1

Numbers and numeration

Term 1

Topic 5: HCF and LCM of whole numbers

Teaching guidelines and solutions

In this topic, the focus is on identifying common factors of two or more whole numbers and finding the HCF, identifying common multiples of two or more whole numbers and finding the LCM, identifying the difference between HCF and LCM and solving problems involving LCM and HCF.

Unit 1: Factors and multiples

Factors and HCF

It is essential that students are confident in their knowledge of factors and HCF. Revise the terms and their meanings. Ensure that students understand that the HCF is the *highest* factor that the numbers have in common.

Multiples and LCM

Knowledge of multiples and LCM is also critical. Revise these terms and their meanings. Ensure that students understand that the LCM is the *smallest* multiple the numbers have in common. It will be equal to or larger than the largest number. For example, the LCM of 2, 3 and 6 is 6. It is interesting that 6 is also the HCF of 2, 3 and 6.

Explain to students that every number is both a multiple and factor of itself. It may be useful to reproduce the facts alongside as a poster to display in your classroom.

Work through Exercise 1 and Worksheet 8.

Any factor of a number <= the number itself.

Any multiple of a number => the number itself.

Every number is both a factor and multiple of itself.

Exercise 1

(SB page 23)

1. a) Factors of 14: 1, 2, 7, 14
b) Factors of 72: 1, 2, 3, 4, 6, 8, 9, 12, 18, 24, 36, 72
c) Factors of 87: 1, 3, 29, 87
d) Factors of 84: 1, 2, 3, 4, 6, 7, 12, 21, 28, 42, 84
e) Factors of 49: 1, 7, 49
f) Factors of 57: 1, 3, 19, 57

2. None.

3. a) Factors of 6: 1, 2, 3, **6**
Factors of 12: 1, 2, 3, 4, **6**, 12
HCF is 6.

b) Factors of 8: **1**, 2, 4, 8
Factors of 25: **1**, 5, 25
HCF is 1.

c) Factors of 24: 1, 2, 3, 4, 6, 8, **12**, 24
Factors of 60: 1, 2, 3, 4, 5, 6, 10, **12**, 15, 20, 30, 60
HCF is 12.

d) Factors of 100: 1, 2, 4, **5**, 10, 20, 25, 50, 100
Factors of 45: 1, 2, 3, **5**, 9, 15, 45
HCF is 5.

e) Factors of 33: 1, 3, **11**, 33
Factors of 77: 1, 7, **11**, 77
HCF is 11.

f) Factors of 24: 1, 2, 3, 4, 6, **8**, 12, 24
Factors of 64: 1, 2, 4, **8**, 16, 32, 64
HCF is 8.

4. a) 6, 12, 18, 24, 30, 36
b) 9, 18, 27, 36, 45, 54
c) 36

5. a) 24 **b)** 36 **c)** 40 **d)** 12
e) 60 **f)** 80 **g)** 45 **h)** 336

Worksheet 8

(WB page 18)

1. **a)** factors of 18 are: 1, 2, 3, 6, 9, 18

   factors of 48 are: 1, 2, 3, 4, 6, 8, 12, 16, 24, 48

   b) factors of 12 are: 1, 2, 3, 4, 6, 12

   factors of 36 are: 1, 2, 3, 4, 6, 9, 12, 18, 36

   c) factors of 20 are: 1, 2, 4, 5, 10, 20

   factors of 80 are: 1, 2, 4, 5, 8, 10, 16, 20, 40, 80

   d) factors of 15 are: 1, 3, 5, 15

   factors of 90 are: 1, 2, 3, 5, 6, 9, 10, 15, 18, 30, 45, 90

2. **a)** factors of 16 are: 1, 2, 4, 8, 16

   factors of 24 are: 1, 2, 3, 4, 6, 8, 12, 24

   HCF = 8

   b) factors of 48 are: 1, 2, 3, 4, 6, 8, 12, 16, 24, 48

   factors of 72 are: 1, 2, 3, 4, 6, 8, 9, 12, 18, 24, 36, 72

   HCF = 24

   c) factors of 27 are: 1, 3, 9, 27

   factors of 54 are: 1, 2, 3, 6, 9, 18, 27, 54

   HCF = 27

   d) factors of 120 are: $2^3 \times 3 \times 5$

   factors of 108 are: $2^2 \times 3^2$

   HCF = $2^2 \times 3 = 12$

   e) factors of 6 are: 2×3

   factors of 9 are: 3^2

   factors of 18 are: 2×3^2

   HCF = 3

   f) factors of 4 are: 2^2

   factors of 16 are: 2^4

   factors of 24 are: $2^3 \times 3$

   HCF = $2^2 = 4$

   g) factors of 16 are: 2^4

   factors of 48 are: $2^4 \times 3$

   factors of 72 are: $2^3 \times 3^2$

   HCF = $2^3 = 8$

Unit 2: Prime numbers

Revise the definition of prime numbers. Stress that the number 1 is not prime and that 2 is the only even prime number. Working through Exercise 2 gives students a method to identify the prime numbers up to 100. Think of creative ways to complete this exercise. It could be a group exercise or even a class activity.

Exercise 2

(SB page 23)

1.

~~1~~	2	3	~~4~~	5	~~6~~	7	~~8~~	~~9~~	~~10~~
11	~~12~~	13	~~14~~	~~15~~	~~16~~	17	~~18~~	19	~~20~~
~~21~~	~~22~~	23	~~24~~	~~25~~	~~26~~	~~27~~	~~28~~	29	~~30~~
31	~~32~~	~~33~~	~~34~~	~~35~~	~~36~~	37	~~38~~	~~39~~	~~40~~
41	~~42~~	43	~~44~~	~~45~~	~~46~~	47	~~48~~	~~49~~	~~50~~
~~51~~	~~52~~	53	~~54~~	~~55~~	~~56~~	~~57~~	~~58~~	59	~~60~~
61	~~62~~	~~63~~	~~64~~	~~65~~	~~66~~	67	~~68~~	~~69~~	~~70~~
71	~~72~~	73	~~74~~	~~75~~	~~76~~	~~77~~	~~78~~	79	~~80~~
~~81~~	~~82~~	83	~~84~~	~~85~~	~~86~~	~~87~~	~~88~~	89	~~90~~
~~91~~	~~92~~	~~93~~	~~94~~	~~95~~	~~96~~	97	~~98~~	~~99~~	~~100~~

2. 2, 3, 5, 7, 11, 13, 17

3. 19 is a prime number. 81 is not a prime number, it is divisible by 7 and 13.

4. **a)** Factors of 27: 1, 3, 9, 27
b) Multiples of 4: 4, 12, 24, 48, 80, 84, 92
c) Prime numbers: 2, 3, 7, 19
d) Even prime numbers: 2

Prime factorisation

When students are confident with identifying prime numbers, explain what prime factors are. Work through the example on page 24 in the Student's Book. The ladder method provides a format for identifying prime factors.

Exercise 3

(SB page 25)

1. Prime factors of 36: $2 \times 2 \times 3 \times 3$

2. Prime factors of 45: $5 \times 3 \times 3$

3. a)

2	600
2	300
2	150
3	75
5	25
5	5
	1

Therefore, $600 = 2 \times 2 \times 2 \times 3 \times 5 \times 5 = 2^3 \times 3 \times 5^2$

b)

2	500
2	250
5	125
5	25
5	5
	1

Therefore, $500 = 2 \times 2 \times 5 \times 5 \times 5 = 2^2 \times 5^3$

c)

3	693
3	231
7	77
1	11
	1

Therefore, $693 = 3 \times 3 \times 7 \times 11 = 3^2 \times 7 \times 11$

d)

2	528
2	264
2	132
2	66
3	33
11	11
	1

Therefore, $528 = 2 \times 2 \times 2 \times 2 \times 3 \times 11 = 2^4 \times 3 \times 11$

Finding the HCF using prime factors

Ensure that students understand that to find the HCF they must include only those prime factors that are common to all the numbers.

Worksheet 9

(WB page 20)

1. 2, 3

2. 3, 7, 21

3. **a)** 168
b) 220

4.

2	144
2	72
2	36
2	18
3	9
3	3
	1

$144 = 2^4 \times 3^2$

5.

2	588
2	294
3	147
7	49
7	7
	1

$588 = 2^2 \times 3 \times 7^2$

6. a)

3	45
3	25
5	5
	1

$45 = 3^2 \times 5$

2	90
3	45
3	15
5	5
	1

$90 = 2 \times 3^2 \times 5$

b) HCF $= 3^2 \times 5 = 45$

7. a)

2	200
2	100
2	50
5	25
5	5
	1

$200 = 2^3 \times 5^2$

2	60
2	30
3	15
5	5
	1

$60 = 2^2 \times 3 \times 5$

b) HCF $= 2^2 \times 5 = 20$

8. $105 = 3 \times 5 \times 7$
$150 = 2 \times 3 \times 5^2$
$75 = 3 \times 5^2$
HCF $= 3 \times 5 = 15$ packets

Finding the LCM using prime factors

Once we have written numbers as products of their prime factors, we can also find the LCM. Stress the difference between finding the HCF and the LCM. To find the LCM students must use every factor that occurs in all the numbers.

Exercise 4

(SB page 26)

1. a) 300: $2^2 \times 3 \times 5^2$
90: $2 \times 3^2 \times 5$
b) HCF: $2 \times 3 \times 5 = 30$

2. a) 126: $2 \times 3^2 \times 7$
60: $2^2 \times 3 \times 5$
b) HCF: $2 \times 3 = 6$

3. a) 48: $2^4 \times 3$
72: $2^3 \times 3^2$
LCM: $2^4 \times 3^2 = 144$
b) 42: $2 \times 3 \times 7$
70: $2 \times 5 \times 7$
LCM: $2 \times 3 \times 5 \times 7 = 210$
c) 105: $3 \times 5 \times 7$
63 $3^2 \times 7$
LCM: $3^2 \times 5 \times 7 = 315$
d) 72: 3×3^2
120 $2^3 \times 3 \times 5$
LCM: $2^3 \times 3^2 \times 5 = 360$
e) 18: 2×3^2
30: $2 \times 3 \times 5$
42: $2 \times 3 \times 7$
LCM: $2 \times 3^2 \times 5 \times 7 = 630$

4. LCM of 7 and 20 is 140.

5. Factors of 12 are 1, 2, 3, 4, 6, 12.
Factors of 18 are 1, 2, 3, 6, 9, 18.
2 chocolate pieces and 3 cheesecake pieces per platter gives 6 platters.

6. LCM of 13 and 18 is 234.

7. Factors of 45 are $3^2 \times 5$.
Factors of 75 are 3×5^2.
Factors of 81 are 3^4.
HCF is 3 cm.
Therefore, the longest length of rope is 3 cm.

8. HCF is 1 m.

Worksheet 10

(WB page 23)

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

2. a) 7: 7, 14, 21, 28, 35, 42, 49, 56
8: 8, 16, 24, 32, 40, 48, 56
LCM = 56

b) 3: 3, 6, 9
6: 6, 12
LCM = 6

c) 5: 5, 10, 15, 20, 25, 30, 35
7: 7, 14, 21, 28, 35
LCM = 35

d) $11 = 11$
$9 = 3^2$
$\text{LCM} = 11 \times 3^2 = 99$

e) $2 = 2^1$
$3 = 3^1$
$4 = 2^2$
$\text{LCM} = 2^2 \times 3 = 12$

f) $3 = 3^1$
$5 = 5^1$
$6 = 2 \times 3$
$\text{LCM} = 2 \times 3 \times 5 = 30$

g) $2 = 2^1$
$18 = 2^1 \times 3^2$
$36 = 2^2 \times 3^2$
$\text{LCM} = 2^2 \times 3^2 = 36$

3. $12 = 2^3 \times 3$
$15 = 3 \times 5$
$24 = 2^3 \times 3$
$\text{LCM} = 2^3 \times 3 \times 5 = 120$

Topic 6: Estimation

Teaching guidelines and solutions

In this topic, the focus is on estimation. Students should be able to estimate dimensions and distances, capacity and mass of objects and other values, such as age and time, used in daily activities.

Unit 1: Estimation and measurement

Estimation

Work through various estimation exercises using objects in the classroom and around the school. Ensure that students understand that estimating is a rough guess of a measurement. Discuss methods of estimation such as using known values in order to estimate unknown values.

Units of measurement

Students should be able to identify the appropriate units of measurement when estimating values for various applications. Initiate a class discussion about common objects and the appropriate units of measurement. Create a poster similar to the table on page 28 showing common objects and the appropriate unit of measurement. You may expand the list to include timed activities.

Unit 2: Estimating length

Show the students some handy measurements which can be used to assist in estimating lengths as described on page 29.

Unit 3: Estimating mass

Ask students to bring some household items to the class to estimate their weight.

Unit 4: Estimating volume

Explain how they can use the known volume of an item such as a cold drink can or a cup to assist in estimating the volume of an unknown item such as a bottle or jug. If time permits, do practical activities with estimation followed by measurement.

Exercise 1

(SB page 31)

1.

cm	ml	g
flower slip slops/sandals	tin/jerry can keyhole/lock plate jug tea pot	flower slip slops/sandals keyhole/lock plate

2. **a)** cm **b)** cm **c)** ℓ **d)** ml **e)** cm

3.-11. Answers will differ. Encourage class discussion so that students can compare results and estimation techniques.

Other estimates

Have a class discussion on estimation in daily activities. Ask students to identify ways in which we estimate values every day. This may include the time it will take to complete various tasks, estimation of temperature, estimation of age and estimation of speed. Explain how they can use known values to assist with estimation.

Worksheet 11

(WB page 26)

1. **a)** ml **b)** kg **c)** m **d)** ℓ
e) g **f)** km **g)** kl **h)** mm or cm

2.- 5. Students' answers will differ. Allow students to present their answers to the class. Use this opportunity to monitor their understanding of estimation. Encourage the class to share how they went about estimating.

TERM 1

Revision

You may use the revision questions or a selection thereof 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 exercise solutions

Whole numbers

1.

Number	Billions			Millions			Thousands			H	T	U
23 959								2	3	9	5	9
736										7	3	6
1 345 500						1	3	4	5	5	0	0
342 707 055				3	4	2	7	0	7	0	5	5
98 592 176 320		9	8	5	9	2	1	7	6	3	2	0

2. **a)** one hundred and thirty-two thousand and forty-four
b) seven hundred and ninety thousand, two hundred and fifty-six
c) two million, five hundred and sixty-seven thousand, nine hundred and eight
d) eleven million, four hundred thirty-seven, nine hundred and twenty-six
e) two hundred and three million, four hundred and ninety-one thousand and twenty-one
f) one hundred and thirty-six billion, thirty-five million, six hundred and twenty-five thousand, four hundred and sixty-three
g) nine hundred and thirteen billion, four hundred and seventy-two million, five hundred and seventy-seven thousand and ten

3. **a)** 135 **b)** 592 **c)** 2 384
d) 7 600 **e)** 33 041 **f)** 1 086 000
g) 11 201 055 **h)** 13 020 **i)** 12 005 000
j) 10 142 605 091

Fractions

1. a) $\frac{2}{3} = \frac{8}{12}$ b) $\frac{4}{5} = \frac{24}{30}$ c) $\frac{1}{3} = \frac{6}{18}$ d) $\frac{2}{5} = \frac{18}{45}$ e) $\frac{3}{7} = \frac{15}{35}$
   f) $\frac{4}{7} = \frac{12}{21}$ g) $\frac{3}{5} = \frac{30}{50}$ h) $\frac{5}{6} = \frac{20}{24}$ i) $\frac{5}{6} = \frac{35}{42}$ j) $\frac{9}{12} = \frac{36}{48}$

2. a) $\frac{11}{2} = 5\frac{1}{2}$ b) $\frac{7}{3} = 2\frac{1}{3}$ c) $\frac{7}{4} = 1\frac{3}{4}$ d) $\frac{13}{2} = 6\frac{1}{2}$ e) $\frac{13}{4} = 3\frac{1}{4}$
   f) $\frac{8}{5} = 1\frac{3}{5}$ g) $\frac{11}{3} = 3\frac{2}{3}$ h) $\frac{15}{4} = 3\frac{3}{4}$ i) $\frac{21}{2} = 10\frac{1}{2}$ j) $\frac{12}{5} = 2\frac{2}{5}$

3. a) $1\frac{1}{3} = \frac{4}{3}$ b) $2\frac{4}{5} = \frac{14}{5}$ c) $4\frac{3}{5} = \frac{23}{5}$ d) $3\frac{3}{4} = \frac{15}{4}$ e) $6\frac{1}{6} = \frac{7}{6}$
   f) $8\frac{6}{7} = \frac{62}{7}$ g) $9\frac{5}{7} = \frac{68}{7}$ h) $5\frac{3}{8} = \frac{43}{8}$ i) $7\frac{1}{4} = \frac{29}{4}$ j) $2\frac{9}{10} = \frac{29}{10}$

4. a) $\frac{1}{3} = \frac{4}{12}$; $\frac{1}{4} = \frac{3}{12}$
   $\frac{1}{3} > \frac{1}{4}$
   b) $\frac{1}{5} = \frac{6}{30}$; $\frac{1}{6} = \frac{5}{30}$
   $\frac{1}{5} > \frac{1}{6}$
   c) $\frac{2}{3} = \frac{8}{12}$; $\frac{3}{4} = \frac{9}{12}$
   $\frac{2}{3} < \frac{3}{4}$
   d) $\frac{2}{5} = \frac{6}{15}$; $\frac{1}{3} = \frac{5}{15}$
   $\frac{2}{5} > \frac{1}{3}$
   e) $\frac{2}{3} = \frac{4}{6}$; $\frac{1}{6} = \frac{1}{6}$
   $\frac{2}{3} > \frac{1}{6}$
   f) $\frac{3}{4} = \frac{9}{12}$; $\frac{5}{6} = \frac{10}{12}$
   $\frac{3}{4} < \frac{5}{6}$
   g) $\frac{7}{9} = \frac{14}{18}$; $\frac{5}{6} = \frac{15}{18}$
   $\frac{7}{9} < \frac{5}{6}$
   h) $\frac{7}{10} = \frac{21}{30}$; $\frac{2}{3} = \frac{20}{30}$
   $\frac{7}{10} > \frac{2}{3}$

5. a) $\frac{7}{10} = \frac{70}{100} = 70\%$ b) $\frac{10}{50} = \frac{20}{100} = 20\%$ c) $\frac{5}{20} = \frac{25}{100} = 25\%$
   d) $\frac{6}{10} = \frac{60}{100} = 60\%$ e) $\frac{9}{20} = \frac{45}{100} = 45\%$ f) $\frac{7}{50} = \frac{14}{50} = 14\%$
   g) $\frac{3}{25} = \frac{12}{100} = 12\%$ h) $\frac{12}{20} = \frac{60}{100} = 60\%$ i) $\frac{9}{25} = \frac{45}{100} = 45\%$
   j) $\frac{3}{4} = \frac{75}{100} = 75\%$ k) $\frac{2}{5} = \frac{40}{100} = 40\%$ l) $\frac{17}{20} = \frac{85}{100} = 85\%$
   m) $\frac{22}{25} = \frac{88}{100} = 88\%$ n) $\frac{19}{20} = \frac{95}{100} = 95\%$ o) $\frac{1}{4} = \frac{25}{100} = 25\%$

6. a) $25\% = \frac{25}{100} = \frac{1}{4}$ b) $75\% = \frac{75}{100} = \frac{3}{4}$ c) $45\% = \frac{45}{100} = \frac{9}{10}$
   d) $80\% = \frac{80}{100} = \frac{4}{5}$ e) $95\% = \frac{95}{100} = \frac{19}{20}$ f) $12\% = \frac{12}{100} = \frac{3}{25}$
   g) $42\% = \frac{42}{100} = \frac{21}{50}$ h) $10\% = \frac{10}{100} = \frac{1}{10}$ i) $68\% = \frac{68}{100} = \frac{17}{25}$
   j) $20\% = \frac{20}{100} = \frac{1}{5}$

7. **a)** History: $\frac{35}{50} = 70\%$ Geography: $\frac{8}{10} = 80\%$
English: $\frac{13}{20} = 65\%$ Mathematics: $\frac{21}{25} = 84\%$
French: $\frac{3}{4} = 75\%$ Music: $\frac{2}{5} = 40\%$
b) Mathematics: 84%, Geography: 80%, French: 75%, History: 70%, English: 65%, Music: 40%.

8. **a)** $\frac{3}{4} = 0.75$ **b)** $\frac{3}{5} = 0.6$ **c)** $\frac{7}{10} = 0.7$
d) $\frac{1}{8} = 0.125$ **e)** $\frac{3}{10} = 0.3$ **f)** $\frac{9}{12} = 0.75$
g) $\frac{7}{8} = 0.875$ **h)** $\frac{9}{20} = 0.45$ **i)** $\frac{5}{8} = 0.625$
j) $\frac{4}{25} = 0.16$

9. **a)** $1.51 = \frac{151}{100} = 1\frac{51}{100}$
b) $0.37 = \frac{37}{100}$
c) $3.12 = \frac{312}{100} = \frac{156}{50} = \frac{78}{25} = 3\frac{3}{25}$
d) $5.96 = \frac{596}{100} = \frac{298}{50} = \frac{149}{25} = 5\frac{24}{25}$
e) $2.08 = \frac{208}{100} = \frac{52}{25} = 2\frac{2}{25}$
f) $0.05 = \frac{5}{100} = \frac{1}{20}$
g) $1.13 = \frac{113}{100} = 1\frac{13}{100}$
h) $1.62 = \frac{162}{100} = \frac{81}{50} = 1\frac{31}{50}$
i) $3.48 = \frac{348}{100} = \frac{87}{25} = 3\frac{12}{25}$
j) $0.73 = \frac{73}{100}$

10. **a)** $\frac{6}{20}$ **b)** 30% **c)** 0.3

Addition and subtraction of fractions

1. $\frac{2}{7} + \frac{2}{3}$
$= \frac{6 + 14}{21}$
$= \frac{20}{21}$

2. $6 - \frac{3}{4}$
$= \frac{24 - 18}{4}$
$= \frac{6}{4}$
$= 1\frac{2}{4}$
$= 1\frac{1}{2}$

3. $\frac{7}{12} - \frac{4}{9}$
$= \frac{21 - 16}{36}$
$= \frac{5}{36}$

4. $\frac{1}{2} + \frac{1}{3}$
$= \frac{(3 + 2)}{6}$
$= \frac{5}{6}$

5. $7 - \frac{1}{6}$
$= \frac{(42 - 1)}{6}$
$= \frac{41}{6}$
$= 6\frac{5}{6}$

6. $\frac{7}{8} - \frac{5}{12}$
$= \frac{21 - 10}{24}$
$= \frac{11}{24}$

7. $\frac{7}{9} + \frac{4}{11}$
$= \frac{77 + 36}{99}$
$= \frac{113}{99}$
$= 1\frac{14}{99}$

8. $3\frac{1}{3} - 2\frac{3}{4}$
$= \frac{10}{3} - \frac{11}{4}$
$= \frac{(40 - 33)}{12}$
$= \frac{7}{12}$

9. $\frac{7}{12} + \frac{1}{6}$
$= \frac{7 + 2}{12}$
$= \frac{9}{12}$
$= \frac{3}{4}$

10. $\frac{3}{4} - \frac{1}{2}$
$= \frac{3 - 2}{4}$
$= \frac{1}{4}$

11. $\frac{1}{3} + \frac{3}{4} + \frac{1}{6}$
$= \frac{4 + 9 + 2}{12}$
$= \frac{15}{12}$
$= 1\frac{3}{12}$
$= 1\frac{1}{4}$

12. $2\frac{1}{2} + 5\frac{1}{3} - 1\frac{1}{4}$
$= \frac{5}{2} + \frac{16}{3} - \frac{5}{4}$
$= \frac{30 + 64 - 15}{12}$
$= \frac{79}{12}$
$= 6\frac{7}{12}$

Multiplication and division of fractions

1. a) $\frac{1}{3} \times \frac{1}{2} = \frac{1}{6}$

b) $\frac{2}{5} \times \frac{3}{7} = \frac{6}{35}$

c) $\frac{1}{5} \times \frac{1}{2} = \frac{1}{10}$

d) $2\frac{1}{2} \times 3\frac{1}{3}$
$= \frac{5}{2} \times \frac{10}{3}$
$= \frac{5}{1} \times \frac{5}{3}$
$= \frac{25}{3}$
$= 8\frac{1}{3}$

e) $1\frac{1}{10} \times 3\frac{3}{4}$
$= \frac{11}{10} \times \frac{15}{4}$
$= \frac{11}{2} \times \frac{3}{4}$
$= \frac{33}{8}$
$= 4\frac{1}{8}$

f) $1\frac{1}{2} \times 3\frac{1}{2} \times 2\frac{1}{3}$
$= \frac{3}{2} \times \frac{7}{2} \times \frac{7}{3}$
$= \frac{1}{2} \times \frac{7}{2} \times \frac{7}{1}$
$= \frac{49}{4}$
$= 12\frac{1}{4}$

2. a) 2 **b)** 6 **c)** $\frac{3}{8}$ **d)** $\frac{4}{3}$ **e)** $\frac{5}{2}$

3. a) $\frac{1}{4} \div \frac{1}{2}$
$= \frac{1}{4} \times 2$
$= \frac{2}{4} = \frac{1}{2}$

b) $3 \div \frac{1}{2}$
$= 3 \times 2$
$= 6$

c) $\frac{5}{3} \div \frac{15}{6}$
$= \frac{5}{3} \times \frac{6}{15}$
$= \frac{1}{1} \times \frac{2}{3} = \frac{2}{3}$

d) $\frac{4}{3} \div \frac{4}{6}$
$= \frac{4}{3} \times \frac{6}{4}$
$= \frac{1}{1} \times \frac{2}{1} = 2$

e) $\frac{6}{25} \div \frac{6}{5}$
$= \frac{6}{25} \times \frac{5}{6}$
$= \frac{1}{5} \times \frac{1}{1} = \frac{1}{5}$

f) $1\frac{7}{9} \div 1\frac{2}{9}$
$= \frac{16}{9} \times \frac{9}{11}$
$= \frac{16}{1} \times \frac{1}{11} = 1\frac{5}{11}$

g) $3\frac{1}{3} \div 8\frac{1}{2}$

$= \frac{10}{3} \times \frac{2}{17}$

$= \frac{20}{51}$

h) $\frac{5}{8} \times \frac{2}{5} \div \frac{1}{4}$

$= \frac{5}{8} \times \frac{2}{5} \times \frac{4}{1}$

$= \frac{1}{4} \times \frac{1}{1} \times \frac{4}{1} = 1$

i) $\frac{11}{15} \div \left(\frac{1}{3} \div \frac{1}{5}\right)$

$= \frac{11}{15} \div \left(\frac{1}{3} \times \frac{5}{1}\right)$

$= \frac{11}{15} \div \frac{5}{3}$

$= \frac{11}{15} \times \frac{3}{5} = \frac{11}{25}$

j) $\frac{5}{9} \div (\frac{5}{3} \times \frac{5}{3})$

$= \frac{5}{9} \div \frac{25}{9}$

$= \frac{5}{9} \times \frac{9}{25}$

$= \frac{1}{1} \times \frac{1}{5} = \frac{1}{5}$

k) $\frac{\frac{1}{4}}{\frac{1}{2}}$

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

$= \frac{1}{2} \times \frac{1}{1} = \frac{1}{2}$

4. Total pieces cut: $30\frac{3}{4} + 27\frac{1}{2} + 40\frac{4}{5}$

$= 97\frac{15 + 10 + 16}{20}$

$= 97\frac{41}{20}$

$= 99\frac{1}{20}$ m

Cloth remaining on roll: $150 - 99\frac{1}{20}$

$= 50\frac{19}{20}$ m

5. The woman spent: $\frac{1}{8} + \frac{1}{5} + \frac{1}{4}$

$= \frac{5 + 8 + 10}{40}$

$= \frac{23}{40}$

Fraction of original money left: $\frac{40}{40} - \frac{23}{40}$

$= \frac{17}{40}$

6. This is the same as asking: $2 \div \frac{1}{4}$

$= 2 \times 4 = 8$

7. Area $= l \times b$

$15\frac{1}{3} = l \times 3\frac{5}{6}$

$l = 15\frac{1}{3} \div 3\frac{5}{6}$

$= \frac{46}{3} \times \frac{6}{23}$

$= \frac{2}{1} \times \frac{2}{1}$

$= 4$ m

HCF and LCM of whole numbers

1. Factors of 20: 1, 2, 4, 5, 10, 20

2.

	Prime number	Not a prime number
Multiple of 4		72, 74, 80
Not a multiple of 4	71, 73, 79	75, 76, 77, 78

3. **a)** $45 = 3 \times 3 \times 5 = 3^2 \times 5$ **b)** $410 = 2 \times 5 \times 41$

4. **a)** $12 = 2 \times 2 \times 3 = 2^2 \times 3$
$36 = 2 \times 2 \times 3 \times 3 = 2^2 \times 3^2$
$42 = 2 \times 3 \times 7$
The HCF is $2 \times 3 = 6$

b) $72 = 2 \times 2 \times 2 \times 3 \times 3 = 2^3 \times 3^2$
$120 = 2 \times 2 \times 2 \times 3 \times 5 = 2^3 \times 3 \times 5$
The HCF is $2^3 \times 3 = 24$

c) $90 = 2 \times 3 \times 3 \times 5 = 2 \times 3^2 \times 5$
$162 = 2 \times 3 \times 3 \times 3 \times 3 = 2 \times 3^4$
The HCF is $2 \times 3^2 = 18$

d) $72 = 2 \times 2 \times 2 \times 3 \times 3 = 2^3 \times 3^2$
$108 = 2 \times 2 \times 3 \times 3 \times 3 = 2^2 \times 3^3$
The HCF is $2^2 \times 3^2 = 36$

5.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100
101	102	103	104	105	106	107	108	109	110
111	112	113	114	115	116	117	118	119	120

a) See circled numbers in the table.
b) See underlined numbers in the table.
c) 35 (shaded in the table).
d) No, they are both prime numbers.

6. a) $95 = 5 \times 19$
$120 = 2 \times 2 \times 2 \times 3 \times 5 = 2^3 \times 3 \times 5$
$\text{LCM} = 2^3 \times 3 \times 5 \times 19 = 2\ 280$
b) $100 = 2 \times 2 \times 5 \times 5 = 2^2 \times 5^2$
$125 = 5 \times 5 \times 5 = 5^3$
$\text{LCM} = 2^2 \times 5^3 = 500$
c) $52 = 2 \times 2 \times 2 \times 13 = 2^3 \times 13$
$78 = 2 \times 3 \times 13$
$\text{LCM} = 2^3 \times 3 \times 13 = 312$

Estimation

1. a) 1.5 metres
b) 20 metres
c) 2 metres
d) 10 metres

2. Answers will differ. Students should show a reasonable understanding of measurements. Ask some students to present their answers to the class.

3. Answers will differ. Students should show a reasonable understanding of the volume of a cup and a bucket. A 5-litre bucket should take 20 cups and a 10-litre bucket should take about 40 cups. An average cup holds about 250 ml.

4. Less. A typical glass jug would hold 1 to 2 litres. Allow students to explain their reasoning if they have vastly different answers.

THEME 2 Basic operations

Topic 1: Approximation

Teaching guidelines and solutions

In this topic we work with approximate values. Students should be able to approximate values to a given degree of accuracy, use rounded numbers to do calculations and round numbers to a certain number of decimal places and significant figures.

Unit 1: Rounding to the nearest ten, hundred and thousand

This is revision of previous work. Ensure that students understand the concept of rounding numbers to a given decimal place.

Exercise 1

(SB page 42)

1. **a)** 10 **b)** 20 **c)** 20 **d)** 30 **e)** 20
f) 20 **g)** 20 **h)** 10 **i)** 30 **j)** 20
k) 30 **l)** 10 **m)** 50 **n)** 60 **o)** 810

2. **a)** 100 **b)** 300 **c)** 200 **d)** 100 **e)** 200
f) 200 **g)** 300 **h)** 100 **i)** 300 **j)** 300
k) 300 **l)** 400 **m)** 100 **n)** 600 **o)** 800

3. **a)** 2 000 **b)** 3 000 **c)** 3 000 **d)** 4 000 **e)** 2 000
f) 2 000 **g)** 4 000 **h)** 3 000 **i)** 4 000 **j)** 4 000
k) 4 000 **l)** 2 000 **m)** 5 000 **n)** 6 000 **o)** 9 000

4. **a)** 2 640; 2 600; 3 000 **b)** 4 470; 4 500; 4 000
c) 1 660; 1 700; 2 000 **d)** 3 260; 3 300; 3 000
e) 6 520; 6 500; 7 000 **f)** 8 180; 8 200; 8 000
g) 7 230; 7 200; 7 000 **h)** 9 650; 9 600; 10 000
i) 8 930; 8 900; 9 000 **j)** 9 100; 9 100; 9 000

Unit 2: Rounding to a given number of decimal places

Work through the example on page 43. Students may find it difficult to manage examples that have zeroes within the numbers.

Exercise 2

(SB page 44)

1.	**a)** 4.8	**b)** 6.3	**c)** 7.4	**d)** 5.1	**e)** 9.3
	f) 2.6	**g)** 3.4	**h)** 1.0	**i)** 12.4	**j)** 18.8
2.	**a)** 0.47	**b)** 0.73	**c)** 0.39	**d)** 0.49	**e)** 0.37
	f) 0.6	**g)** 0.72	**h)** 0.99	**i)** 3.72	**j)** 4.8
3.	**a)** 0.025	**b)** 0.005	**c)** 2.138	**d)** 0.017	**e)** 3.496
	f) 0.04	**g)** 0.026	**h)** 1.474	**i)** 7.295	**j)** 0.573

Unit 3: Degrees of accuracy

Significant figures

This may be a completely new concept for some students. Work through the examples with the class.

Exercise 3

(SB page 45)

1.	**a)** 0.006	**b)** 0.004	**c)** 0.0004	**d)** 0.0004	**e)** 0.00002
	f) 0.04	**g)** 0.0009	**h)** 0.4	**i)** 0.00001	**j)** 0.001
2.	**a)** 0.0048	**b)** 0.0034	**c)** 0.0002	**d)** 0.00036	**e)** 0.000083
	f) 0.048	**g)** 0.00089	**h)** 0.33	**i)** 0.000011	**j)** 0.0008

3.	**a)** 0.00437	**b)** 0.00364	**c)** 0.000421
	d) 0.000353	**e)** 0.00007	**f)** 0.0426
	g) 0.000893	**h)** 0.361	**i)** 0.000813
	j) 0.000957		

Worksheet 12

(WB page 28)

1. 340	**2.** 410	**3.** 7 800
4. 2 000	**5.** 15 000	**6.** 24 000
7. 4.2	**8.** 44.0	**9.** 0.12
10. 2.90	**11.** 0.002	**12.** 1.573
13. 7 000	**14.** 6 700	**15.** 6 740
16. 0.09	**17.** 0.087	**18.** 0.0872

Unit 4: Calculations involving approximation

It is important that students are able to apply approximation to perform calculations. Show students how to use approximation as a quick check of their answers when doing long calculations.

Exercise 4

(SB page 45)

1. a) $999 + 11$
$\approx 1\,000 + 10$ (round to the nearest 10)
$= 1\,010$

b) 35×12
$\approx 40 \times 10$ (round to the nearest 10)
$= 400$

c) $83 \div 20$
$\approx 80 \div 20$ (round to the nearest 10)
$= 4$

d) $109 - 69$
$\approx 110 - 70$ (round to the nearest 10)
$= 40$

e) $273 - 87$
$\approx 270 - 90$ (round to the nearest 10)
$= 180$

f) $767 - 55$
$\approx 770 - 60$ (round to the nearest 10)
$= 710$

g) 56×24
$\approx 60 \times 20$ (round to the nearest 10)
$= 1\,200$

h) $312 \div 12$
$\approx 310 \div 10$ (round to the nearest 10)
$= 31$

2. a) $1.31 + 5.7$
$\approx 1.3 + 5.7$ (rounded to one decimal place)
$= 7$

b) $9.711 + 0.27$
$\approx 9.7 + 0.3$ (rounded to one decimal place)
$= 10$

c) $1.83 + 5.15$
$\approx 1.9 + 5.2$ (rounded to one decimal place)
$= 7$

d) 1.362 + 1.694
$\approx$ 1.4 + 1.7 (rounded to one decimal place)
= 3

e) 7.6 – 8.569
$\approx$ 7.6 – 8.6 (rounded to one decimal place)
= 16

f) 8.112 – 0.027
$\approx$ 8.1 – 0 (rounded to one decimal place)
= 8

g) 14.28 ÷ 4.2
$\approx$ 14.3 ÷ 4.2 (rounded to one decimal place)
= 3.5

h) 41.60 ÷ 6.4
$\approx$ 41.6 ÷ 6.4 (rounded to one decimal place)
= 6.5

i) 3.52 × 66
$\approx$ 3.6 × 66 (rounded to one decimal place)
= 238

j) 0.45 × 2.9
$\approx$ 0.5 × 2.9 (rounded to one decimal place)
= 1.5

Unit 5: Approximation in everyday activities

Approximating calculations is an important skill in everyday life. Allow students to discuss how this can be applied in their lives, for example while shopping.

Exercise 5

(SB page 46)

1. 43 × 62
$\approx$ 40 × 60
= 2 400 m^2

2. 4.6 + 3.71
$\approx$ 5 + 4
= 9 m

3. $\frac{1.26 + 1.41 + 1.13 + 1.3 + 1.07}{5}$
$\approx \frac{1.3 + 1.4 + 1.1 + 1.3 + 1.1}{5}$
$= \frac{6.2}{5}$
= 1.24 m

4. 4.8 + 9.34
$\approx$ 5 + 9
= 14 km

Worksheet 13

(WB page 29)

1. 47×20
$\approx 50 \times 20$
$= 1\ 000$

2. 13×0.467
$\approx 10 \times 0.5$
$= 5$

3. 1.2×68
$\approx 1 \times 70$
$= 70$

4. $\frac{18}{99}$
$\approx \frac{20}{100}$
$= \frac{1}{5}$

5. $\frac{306}{47}$
$\approx \frac{300}{50}$
$= 6$

6. $\frac{5.7}{0.029}$
$\approx \frac{6}{0.03}$
$= 200$

Topic 2: Counting in base 2

Teaching guidelines and solutions

In this topic the focus is on counting in the base 2 number system. Introduce students to the binary or base 2 number system.

Resources required

Packs of binary cards are used to explain the concept. Ensure that you have these resources available before starting this topic. If possible, have one set of cards per student.

Unit 1: The binary number system

Start this topic by revising the base 10 number system. Explain this in terms of the digits used (0-9) and place values (multiples of 10). Then introduce the idea that we could use any number as the base of a number system. Explain the base 2 or binary system. Display a place value table for base 2 in the classroom. This will be useful as a reference tool when working through this section.

Place values for the base 2 number system							
$2^7 = 128$	$2^6 = 64$	$2^5 = 32$	$2^4 = 16$	$2^3 = 8$	$2^2 = 4$	$2^1 = 2$	$2^0 = 1$

Unit 2: Counting in base 2

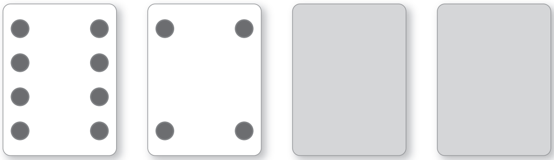
Allow students to "play" with their binary cards. They must understand that the value of each card is double that of the previous card. It is essential to remember that counting in binary starts at 1 as $2^0 = 1$. Compare this to counting in base 10, which also starts at 1 as $10^0 = 1$.

Explain how to use the cards. The number of dots represents the place value, or the base ten value of a "1" in that position. Remind students that we can only use digits 1 or 0. The cards are either face up (1) or face down (0). Call out numbers and ask students to make these numbers with their cards. Allow time for them to become familiar with the concept. The use of visual aids such as the cards and practical activities like "making" the number will reinforce the concept.

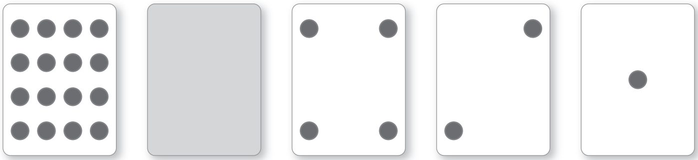
Exercise 1

(SB page 48)

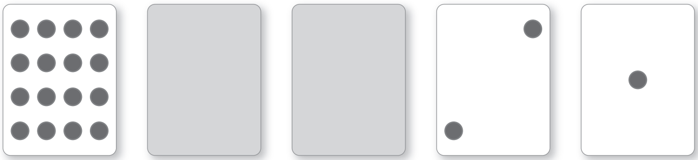
1. a) 12, when written in binary is 1100.



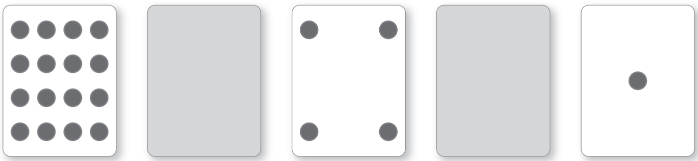
b) 23, when written in binary is 10111.



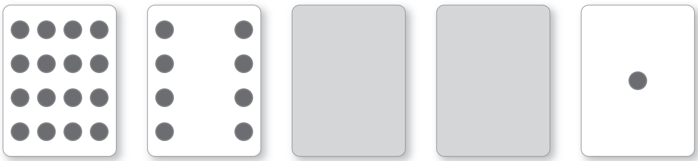
c) 19, when written in binary is 10011.



d) 21, when written in binary is 10101.



e) 25, when written is binary is 11001.



2. a) 101 in binary is 5 in base ten.
b) 1011 in binary is 11 in base ten.
c) 10110 in binary is 22 in base ten.

3. a) 1 = 1 in binary
2 = 10 in binary
3 = 11 in binary
4 = 100 in binary
5 = 101 in binary
6 = 110 in binary
7 = 111 in binary

b) 3 = 11 in binary
6 = 110 in binary
9 = 1001 in binary
12 = 1100 in binary
15 = 1111 in binary
18 = 10010 in binary

c) 4 = 100 in binary
8 = 1000 in binary
12 = 1100 in binary
16 = 10000 in binary
20 = 10100 in binary

d) 5 = 101 in binary
10 = 1010 in binary
15 = 1111 in binary
20 = 10100 in binary
25 = 11001 in binary

4. 6, 12, 18, 24

Worksheet 14

(WB page 30)

1. a) $8 = 1 \times 2^3$
b) $11 = 1 \times 2^3 + 1 \times 2^1 + 1 \times 2^0$
c) $23 = 1 \times 2^5 + 1 \times 2^2 + 1 \times 2^1 + 1 \times 2^0$
d) $26 = 1 \times 2^5 + 1 \times 2^4 + 1 \times 2^2$
e) $30 = 1 \times 2^5 + 1 \times 2^4 + 1 \times 2^3 + 1 \times 2^2$

2. a) 1×2^0
$= 1$
b) $1 \times 2^3 + 0 \times 2^2 + 1 \times 2^1 + 0 \times 2^0$
$= 8 + 2$
$= 10$
c) $1 \times 2^4 + 0 \times 2^3 + 1 \times 2^2 + 0 \times 2^1 + 0 \times 2^0$
$= 14 + 4$
$= 20$
d) $1 \times 2^5 + 0 \times 2^4 + 0 \times 2^3 + 0 \times 2^2 + 0 \times 2^1 + 1 \times 2^0$
$= 32 + 1$
$= 33$
e) $1 \times 2^3 + 1 \times 2^2 + 1 \times 2^1 + 1 \times 2^0$
$= 8 + 4 + 2 + 1$
$= 15$

Topic 3: Conversion of base 10 numerals to binary numbers

Teaching guidelines and solutions

The focus of this topic is on converting numbers from base ten to base two.

Unit 1: Converting to binary

Reassure your students that this is not a difficult process. They need to remember that they are counting in powers of 2 and only have 2 digits to choose from. Remind students that they may use their binary cards. Work through the examples on pages 50 and 51 in the Student's Book.

Exercise 1

(SB page 51)

1. **a)** 6 **b)** 15 **c)** 9
   d) 13 **e)** 17 **f)** 27

2. **a)** 1001 **b)** 1000 **c)** 1110
   d) 10001 **e)** 10010 **f)** 11110

Worksheet 15

(WB page 32)

1.

Base ten number	Value in powers of 2	Binary number
1	1×2^0	1
2	$1 \times 2^1 + 0 \times 2^0$	10
3	$1 \times 2^1 + 1 \times 2^0$	11
4	$1 \times 2^2 + 0 \times 2^1 + 0 \times 2^0$	100
5	$1 \times 2^2 + 0 \times 2^1 + 1 \times 2^0$	101
6	$1 \times 2^2 + 1 \times 2^1 + 0 \times 2^0$	110
7	$1 \times 2^2 + 1 \times 2^1 + 1 \times 2^0$	111
8	$1 \times 2^3 + 0 \times 2^2 + 0 \times 2^1 + 0 \times 2^0$	1000
9	$1 \times 2^3 + 0 \times 2^2 + 0 \times 2^1 + 1 \times 2^0$	1001
10	$1 \times 2^3 + 0 \times 2^2 + 1 \times 2^1 + 0 \times 2^0$	1010

2. a) 7

$= 1 \times 2^2 + 1 \times 2^1 + 1 \times 2^0$

$= 111$

b) 13

$= 1 \times 2^3 + 1 \times 2^2 + 0 \times 2^1 + 1 \times 2^0$

$= 1101$

c) 19

$= 1 \times 2^4 + 0 \times 2^3 + 0 \times 2^2 + 1 \times 2^1 + 1 \times 2^0$

$= 10011$

d) 28

$= 1 \times 2^4 + 1 \times 2^3 + 1 \times 2^2 + 0 \times 2^1 + 0 \times 2^0$

$= 11100$

e) 34

$= 1 \times 2^5 + 0 \times 2^4 + 0 \times 2^3 + 0 \times 2^2 + 1 \times 2^1 + 0 \times 2^0$

$= 100010$

3. a) 110

$= 4 + 2 + 0$

$= 6$

b) 1011

$= 8 + 2 + 1$

$= 11$

c) 10110

$16 + 4 + 2$

$= 22$

d) 11100

$= 16 + 8 + 4$

$= 28$

e) 111001

$= 32 + 16 + 8 + 1$

$= 57$

Topic 4: Addition and subtraction of numbers in base 2 numerals

Teaching guidelines and solutions

In this topic the focus is on addition and subtraction of binary numbers.

Unit 1: Addition in binary

Students must learn the rules of adding in binary. This might be difficult to grasp at first. Work through the examples and encourage students to use the column method of adding at least until they are confident in applying the rules. Display the rules in your classroom to act as a visual reminder.

Worksheet 16

(WB page 34)

1.

$$\begin{array}{r} 111 \\ +\ \underline{101} \\ \underline{1100} \end{array}$$

$= 2^3 + 2^2 + 0 + 0$
$= 12$

2.

$$\begin{array}{r} 10110 \\ +\ \underline{1100} \\ \underline{100010} \end{array}$$

$= 2^5 + 0 + 0 + 0 + 2^1 + 0$
$= 34$

3.

$$\begin{array}{r} 01110 \\ +\ \underline{01010} \\ \underline{11000} \end{array}$$

$= 2^4 + 2^3 + 0 + 0 + 0$
$= 24$

4.

$$\begin{array}{r} 1001 \\ +\ \underline{100} \\ 1101 \\ +\ \underline{11001} \\ \underline{100110} \end{array}$$

$= 2^5 + 0 + 0 + 2^2 + 2^1 + 0$
$= 38$

Unit 2: Subtraction in binary

As with addition, students must learn the four basic rules of subtraction in binary. Have the rules on display in the classroom for students to use as a reference.

Exercise 1

(SB page 53)

1. a)
$$\begin{array}{r} 01010 \\ +\ 01011 \\ \hline 10101 \\ \hline \end{array}$$

b)
$$\begin{array}{r} 01011 \\ +\ 10101 \\ \hline 100000 \\ \hline \end{array}$$

c)
$$\begin{array}{r} 10101 \\ +\ 11110 \\ \hline 110011 \\ \hline \end{array}$$

d)
$$\begin{array}{r} 11110 \\ -\ 01001 \\ \hline 10101 \\ \hline \end{array}$$

e)
$$\begin{array}{r} 01100 \\ -\ 01001 \\ \hline 00011 \\ \hline \end{array}$$

f)
$$\begin{array}{r} 01100 \\ +\ 11100 \\ \hline 101000 \\ \hline \end{array}$$

g)
$$\begin{array}{r} 11100 \\ -\ 10010 \\ \hline 01010 \\ \hline \end{array}$$

h)
$$\begin{array}{r} 10010 \\ -\ 10000 \\ \hline 00010 \\ \hline \end{array}$$

i)
$$\begin{array}{r} 10000 \\ +\ 01101 \\ \hline 11101 \\ \hline \end{array}$$

j)
$$\begin{array}{r} 11011 \\ -\ 01101 \\ \hline 01110 \\ \hline \end{array}$$

2. a) 11101 is 29; 1110 is 14.
b) $29 + 14 = 43$
c)
$$\begin{array}{r} 11101 \\ +\ 1110 \\ \hline 101011 \\ \end{array}$$

d) 101011 is 43. The values are the same.

3. a) 11101 is 29; 10111 is 23.
b) $29 - 23 = 6$
c) 110
d)
$$\begin{array}{r} 11101 \\ -\ 10111 \\ \hline 110 \\ \hline \end{array}$$

110, the values are the same.

Worksheet 17

(WB page 36)

1.

$$\begin{array}{r} 1101 \\ -\quad 11 \\ \hline 1010 \\ \hline \end{array}$$

$= 2^3 + 0 + 2^1 + 0$
$= 10$

2.

$$\begin{array}{r} 10010 \\ -\quad 110 \\ \hline 1100 \\ \hline \end{array}$$

$= 2^3 + 2^2 + 0 + 0$
$= 12$

3.

$$\begin{array}{r} 01110 \\ -\ 10101 \\ \hline 111 \\ \hline \end{array}$$

$= 2^2 + 2^1 + 2^0$
$= 7$

4.

$$\begin{array}{r} 111001 \\ -\quad 1010 \\ \hline 101111 \\ -\quad 111 \\ \hline 101000 \\ \hline \end{array}$$

$= 2^5 + 0 + 2^3 + 0 + 0 + 0$
$= 40$

Topic 5: Multiplication of numbers in base 2 numerals

Teaching guidelines and solutions

In this topic we look at the multiplication of binary numbers.

Unit 1: Multiplication in binary

Reassure students that multiplication in binary is very similar to multiplication with base ten numbers. Write the numbers in column format and be sure to align them correctly. As with addition and subtraction, there are four rules for multiplying binary digits.

Exercise 1

(SB page 54)

1. a)

$$\begin{array}{r} 111 \\ \times\quad 10 \\ \hline 000 \\ +\ 1110 \\ \hline 1110 \\ \hline \end{array}$$

b)

$$\begin{array}{r} 1100 \\ \times\quad 100 \\ \hline 0000 \\ 00000 \\ +\ 110000 \\ \hline 110000 \\ \hline \end{array}$$

c)

$$\begin{array}{r} 101 \\ \times\quad 1000 \\ \hline 101000 \\ \hline \end{array}$$

d)

$$\begin{array}{r} 111 \\ \times \underline{\quad 11} \\ 111 \\ + \underline{1110} \\ \underline{10101} \end{array}$$

e)

$$\begin{array}{r} 1101 \\ \times \underline{\quad 101} \\ 1101 \\ 00000 \\ + \underline{110100} \\ \underline{1000001} \end{array}$$

f)

$$\begin{array}{r} 1101 \\ \times \underline{\quad 11} \\ 1101 \\ + \underline{11010} \\ \underline{100111} \end{array}$$

g)

$$\begin{array}{r} 1111 \\ \times \underline{\quad 110} \\ 0000 \\ 11110 \\ + \underline{111100} \\ \underline{101010} \end{array}$$

2. a) $15 \times 13 = 195$

b) 11000011

c) 1111; 1101

Worksheet 18

(WB page 38)

1.

$$\begin{array}{r} 100 \\ \times \underline{\quad 11} \\ 100 \\ \underline{1000} \\ \underline{1100} \end{array}$$

$= 2^3 + 2^2 + 0 + 0$

$= 12$

2.

$$\begin{array}{r} 1001 \\ \times \underline{\quad 110} \\ 0000 \\ 10010 \\ \underline{100100} \\ \underline{110110} \end{array}$$

$= 2^5 + 2^4 + 0 + 2^2 + 2^1 + 0$

$= 54$

3.

$$\begin{array}{r} 1111 \\ \times \underline{\quad 101} \\ 1111 \\ 00000 \\ \underline{111100} \\ \underline{1001011} \end{array}$$

$= 2^6 + 0 + 0 + 2^3 + 0 + 2^1$
$+ 2^0$

$= 75$

4.

$$\begin{array}{r} 11001 \\ \times \underline{\quad 111} \\ 11001 \\ 110010 \\ \underline{1100100} \\ \underline{10101111} \end{array}$$

$= 2^7 + 0 + 2^6 + 0 + 2^3 + 2^2 +$
$2^1 + 2^0$

$= 175$

Topic 6: Addition and subtraction

Teaching guidelines and solutions

In this topic we revise the addition and subtraction of numbers. Students should be able to use a number line to do addition and subtraction of positive and negative integers.

Unit 1: Revision of addition and subtraction

Work through the examples on page 55 in the Student's Book. Evaluate how much revision is necessary for your students. It may be possible to move quickly through this section. However, if there are students who are still struggling with the methods used to add and subtract, then ensure that they have adequate support. The skills revised in this section provide an important foundation for future work.

Exercise 1 (SB page 56)

1. 8 567 **2.** 6 899 **3.** 15 466

4. **a)** A
b) 1 668

Exercise 2 (SB page 56)

1. 10 301 **2.** 8 110 **3.** 8 201

4. 11 233 **5.** 8 006 **6.** 4 693

7. 423 **8.** 2 000 **9.** 15 328

10. 1 001 **11.** 3 310 **12.** 18 806

Exercise 3 (SB page 57)

1. **a)** 672 **b)** 8 206 **c)** 4 827 **d)** 778 **e)** 798
f) 4 384 **g)** 5 500 **h)** 8 728 **i)** 7 600 **j)** 4 452

2. 3 143 + 5 278 = 8 421 new books

3. 4 278 + 5 545 = 9 823 customers

4. 134 + 254 + 205 = 593 pieces of fruit

Exercise 4

(SB page 57)

1. **a)** 615 **b)** 2 378 **c)** 6 325
   d) 3 840 **e)** 3 146 **f)** 5 942
   g) 1 464 **h)** 588 **i)** 5 925
   j) 2 227 **k)** 905 **l)** 1 290

2. **a)**
$$\begin{array}{r} 9\,567 \\ -\ 3\,567 \\ \hline 6\,000 \\ \hline \end{array}$$
b)
$$\begin{array}{r} 8\,437 \\ -\ 1\,518 \\ \hline 6\,919 \\ \hline \end{array}$$
c)
$$\begin{array}{r} 4\,435 \\ -\ 4\,124 \\ \hline 311 \\ \hline \end{array}$$
d)
$$\begin{array}{r} 6\,197 \\ -\ 5\,384 \\ \hline 813 \\ \hline \end{array}$$
e)
$$\begin{array}{r} 8\,103 \\ -\ 652 \\ \hline 7\,451 \\ \hline \end{array}$$
f)
$$\begin{array}{r} 1\,336 \\ -\ 1\,041 \\ \hline 295 \\ \hline \end{array}$$
g)
$$\begin{array}{r} 9\,962 \\ -\ 8\,520 \\ \hline 1\,442 \\ \hline \end{array}$$
h)
$$\begin{array}{r} 7\,633 \\ -\ 6\,714 \\ \hline 919 \\ \hline \end{array}$$
i)
$$\begin{array}{r} 6\,407 \\ -\ 4\,808 \\ \hline 1\,599 \\ \hline \end{array}$$
j)
$$\begin{array}{r} 8\,421 \\ -\ 7\,001 \\ \hline 1\,420 \\ \hline \end{array}$$

3. **a)** 5 545 – 4 228 = 1 317 **b)** 4 079 – 3 786 = 293
   c) 2 110 – 1 673 = 437 **d)** 6 305 – 1 006 = 5 299
   e) 5 807 – 3 241 = 2 566 **f)** 4 420 – 3 210 = 1 210

4. ₦9 000 – ₦5 250 – ₦2 500 = ₦1 250

5. 6 712 – 3 964 = 2 748 books

6. ₦6 500 – ₦3 650 = ₦2 850

7. 7 590 g – 6 295 g = 1 295 g

8. Students could do this as a practical exercise and weigh the milk or they could do research on the internet or at the library. Milk is approximately 1.03 kg per litre. A litre of milk is 30 g heavier than a litre of water.

9. 7 268 – 5 859 = 1 409 yams

10. January 31 days
February 28 days
March 31 days
April 30 days
May 31 days
June 30 days
Total: 181 days in the first 6 months
365 – 181 = 184 days are left in the year.

11. Answers will differ. Use this activity to initiate a class discussion. Those students who are confident with addition and subtraction may be given the question as an advanced activity.

Unit 2: Integers on the number line

Ensure that students understand the concepts of *equal to*, *greater than* and *less than*. Explain that there is a set of whole numbers, called integers, that includes positive numbers, negative numbers and zero. Demonstrate the use of a number line. Think of creative practical ways to present this to the class. You might hang a piece of string across the classroom. Have a set of positive and negative numbers and zero written on card or paper. Get students to hang the numbers in the correct positions on the line using clothes pegs.

Work through the explanation of integers on the number line on page 59 in the Student's Book, before students attempt Exercise 5. Explain that numbers are assumed to be positive, so positive numbers are not often written with a "+" in front of the number. Negative numbers however, must always have a negative sign "–".

Exercise 5 (SB page 60)

1. **a)** The point A is <u>2</u> units to the right of 0.
   b) The point B is <u>5</u> units to the left of C.
   c) The point D is <u>5</u> units to the left of A.
   d) The point F is <u>4</u> units to the left of E.
   e) The point C is <u>0</u> units to the right of C.
   f) The point E is <u>8</u> units to the left of A.
   g) The point 0 is <u>10</u> units to the right of F.
2. **a)** –2, 3 **b)** –4, –1, 1, 4
   c) –2, 0 **d)** –12, –10, –3, 1, 5

3. **a)** $-2 < 4$ **b)** $-2 < 1$ **c)** $3 > -5$
d) $-3 < 2$ **e)** $8 > -8$ **f)** $0 > -4$
g) $-7 < 6$

4. **a)** –4, –3, 2 **b)** –4, –2, –1 **c)** –9, –2, –1, 6, 8
d) –9, –6, –5, 0, 1 **e)** –4, –3, 1, 4, 5

Unit 3: Addition and subtraction of positive integers

Work through the explanation on pages 60 and 61 in the Student's Book. Relate addition and subtraction to movements on the number line. Use practical examples to demonstrate the concept.

Exercise 6

(SB page 61)

1. **a)** 0 **b)** –7 **c)** 0 **d)** 2

2. **a)** $5 - 4 = 1$ **b)** $3 - 0 = 3$ **c)** $4 - 6 = -2$
d) $7 - 16 = -9$ **e)** $-2 + 5 = 3$ **f)** $-5 + 6 = 1$
g) $-4 - 3 = -7$ **h)** $-3 + 7 = 4$

3. **a)** 8 **b)** 1 **c)** –7
d) 15 **e)** –8 **f)** –3
g) 1 **h)** 5 **i)** 12
j) 6 **k)** –14 **l)** –6
m) 9 **n)** 1 **o)** 4
p) 6 **q)** 0 **r)** –16
s) –2 **t)** 8 **u)** 5

Unit 4: Addition and subtraction of negative integers

Allow students to explore the concept of calculating with negative numbers by doing numerous examples on the number line. Ensure that students understand that adding a negative number is the same as subtracting a positive number.

Exercise 7

(SB page 63)

1. **a)** –4 **b)** –15 **c)** –4
d) +4 **e)** –10 **f)** 0
g) +3 **h)** –10 **i)** –5
j) –6 **k)** –6 **l)** –5
m) +11 **n)** +5 **o)** +1
p) –9 **q)** –7 **r)** –13
s) +4 **t)** +8 **u)** +1

Unit 5: Daily use of negative numbers

Students may struggle with the concept of negative numbers as an abstract mathematical idea. Relating negative numbers to everyday situations will make the concept more accessible. Think of examples where negative numbers are commonly used. Some instances are depth measurements under water, temperatures below zero and a negative balance on an account.

Exercise 8

(SB page 64)

1. **a)** 4 °C **b)** 6 °C **c)** 9 °C **d)** 9 °C
e) 3 °C **f)** 7 °C **g)** 3 °C **h)** 9 °C

2. 13 °C

3. No, her balance is now ₦2 500.

4. –75 + 40 = –35 m

5. –60 + 340 = 400 m

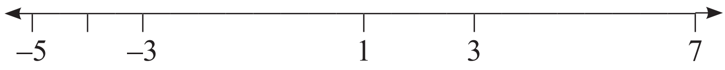
6. –18 + 5 = –13 °C

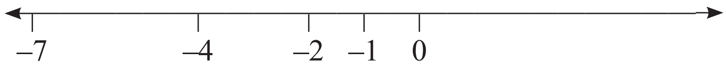
7. **a)** (2 × 5) + (–5) = 5
b) 5 + (2 × (–5)) = 5 + (–10) = –5
c) –15 + 10 –5 = –10
d) –5 – 15 = –20

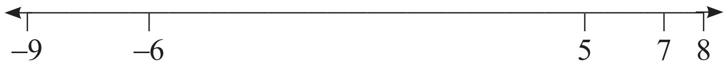
Worksheet 19

(WB page 40)

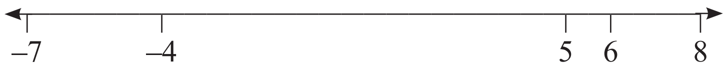
1. **a)** –3 < 6
b) 5 > –8
c) 4 > –5
d) –2 > –4
e) 0 > –2

2. a) 

b) 

c) 

d) 

e) 

3. a) 6	**b)** –2	**c)** –6
d) 1	**e)** 0	**f)** –3
g) 2	**h)** –3	**i)** –2
j) –3	**k)** 17	**l)** –6

4. 260 m + 67 m = 327 m

5. ₦978.98 – ₦126.78 = ₦852.20

6. 8 + 3 = 11 C°

Unit 6: Puzzles with integers

Addagons, number pyramids, magic squares

Some number puzzles using positive and negative integers are described in the Student's Book. These are particularly valuable for those students who need more challenging problems.

THEME 3 Algebraic processes

Topic 7: Use of symbols

Teaching guidelines and solutions

In this topic we introduce the students to algebra. The focus is on solving problems expressed in open sentences, using letters to represent symbols or shapes in open sentences and translating word problems into mathematical expressions.

Algebra is an important branch of Mathematics and forms the basis of much of secondary Mathematics. As the use of variables is an abstract concept, some students may struggle with the idea of an unknown quantity. They will need to be guided carefully through the steps of solving a simple open sentence such as, "What should be added to 6 to get 13?" to solving a complex equation such as $x^2 + 5x - (3y + 2) = 22 + 2x$. Recognise that there are students who will find Algebra exciting and enjoy solving problems. For others, this is where Mathematics becomes a daunting, scary subject. Provide the necessary support to ensure that your students develop a solid understanding of algebraic principles.

Unit 1: Open sentences

Students should have been introduced to the concept of open sentences in their senior primary years. Revise the basic idea of an open sentence. Work through a few quick examples with the class. Use sentences that require simple logic or quick investigation.

Exercise 1

(SB page 66)

1. **a)** $3 + 8 = 11$ **b)** $65 = 38 + 27$ **c)** $73 - 4 = 69$
d) $4 - 4 = 0$ **e)** $5 \times 3 = 15$ **f)** $9 - 3 = 6$
g) $6 - 2 = 4$ **h)** $\frac{18}{2} = 9$ **i)** $-5 + 4 = -1$
j) $-5 \times 15 = -75$ **k)** $16 + 9 = 25$ **l)** $36 - 17 = 19$
m) $8 = -4 + 12$ **n)** $-1 = 14 - 15$ **o)** $20 = 30 - 10$
p) $-165 = 15 \times -11$ **q)** $-15 = -11 + -4$ **r)** $7 = \frac{84}{12}$
s) $96 = 8 \times 12$

2. **a)** $3 \times 1 = 3$
$3 \times 2 = 6$
$3 \times 3 = 9$

b) $-1 + 7 = 6$
$-2 + 7 = 5$
$-3 + 7 = 4$

c) $5 \times 2 + 2 = 12$
$5 \times 4 + 2 = 22$
$5 \times 6 + 2 = 32$

d) $-\frac{4}{2} = -2$
$\frac{4}{2} = 2$
$-\frac{16}{2} = -8$

e) $-2 \times -2 - 4 = 0$
$-2 \times -4 - 4 = 4$
$-2 \times -6 - 4 = 8$

3. **a)** $6 + 6 = 12$ **b)** $\frac{56}{8} = 7$ **c)** $6 \times 5 = 30$
d) $2 \times 5 - 1 = 9$ **e)** $3 = \frac{15 - 3}{2 + 2}$

Worksheet 20

(WB page 44)

1. **a)** 10 **b)** 41 **c)** 36 **d)** 4

2. **a)** 6 **b)** 4 **c)** 14 **d)** 7 **e)** 3
f) 6 **g)** 20 **h)** –6 **i)** –8 **j)** 0

3. **a)** $a + b$
$= 4 + (-2)$
$= 2$

b) $a - b$
$= 4 - (-2)$
$= 6$

c) ab
$= 4(-2)$
$= -8$

d) $\frac{a}{b}$
$= \frac{4}{-2}$
$= -2$

Unit 2: Letters to represent numbers

Students may have started using letters instead of shapes in their senior primary years. Explain that as we are dealing with unknown values we could call it anything. Using letters has become the standard format for writing the unknown value. In this way, variables written as letters become part of the language of Mathematics.

It is important that students understand that a mathematical sentence may consist of both variables and constants. Relate the new words back to simple familiar language (constants are numbers, variables are letters) until your students are comfortable with the new terms.

Work through the examples on page 67 using both familiar and new terminology.

Exercise 2

(SB page 67)

1. a) $7 + 4 = 11; m = 7$ **b)** $9 - 9 = 0; k = 9$

c) $2 \times 5 + 2 = 12; y = 5$ **d)** $5 \times -10 = -50; x = -10$

e) $\frac{15}{3} = 5; z = 15$ **f)** $3 \times -2 + 5 = -1; x = -2$

g) $12 - 8 = 4; m = 8$ **h)** $-7 - 3 = -10; p = -7$

i) $3 - 2 \times -1 = 5; r = -1$ **j)** $13 - 5 = 7; q = -5$

k) $6 \times 7 = 42; x = 7$ **l)** $45 = 15 + 30; x = 15$

m) $2 \times 5 - 1 = 9; x = 5$ **n)** $\frac{500}{5} = 100; x = 500$

o) $3 = \frac{36}{12}; x = 36$ **p)** $50 - 10 = 40; x = 10$

q) $12 \times 8 = 96; x = 8$ **r)** $3 \times 12 + 7 = 43; x = 12$

s) $9 \times 5 - 40 = 5; x = 5$ **t)** $5 = \frac{100}{20}; x = 100$

2. a) $15 + 6 = 21$ **b)** $15 \times 6 = 90$

c) $15 - 3 \times 6 = -3$ **d)** $\frac{15}{6} + 1 = 3\frac{3}{6} = 3\frac{1}{2}$

3. a) $2 \times 5 + 3 = 13$
b) $2 \times 9 + 3 = 21$
c) $2 \times -5 + 3 = -7$

4. a) $2p + 1 = 7$
$2p = 7 - 1$
$2p = 6$
$p = 3$

b) $2p + 3 = 7$
$2p = 7 - 3$
$2p = 4$
$p = 2$

c) $2p + 5 = 7$
$2p = 7 - 5$
$2p = 2$
$p = 1$

Worksheet 21

(WB page 46)

1. a) $a + 13 = 17$
$a = 4$

b) $b - 4 = 12$
$b = 16$

c) $6 \times c = 42$
$c = 7$

d) $2 + d - 7 = 20$
$d = 25$

e) $3 \times e + 5 = 38$
$3e = 33$
$e = 11$

f) $\frac{f}{5} - 2 = 10$
$\frac{f}{5} = 12$
$f = 60$

g) $10 + g \times 3 = -11$
$3g = -21$
$g = -7$

h) $16 = \frac{h}{8} + 3$
$13 = \frac{h}{8}$
$h = 104$

i) $i - 4 \times 2 = 7$
$i - 8 = 7$
$i = 15$

j) $45 = 23 + \frac{x}{-6}$
$22 = \frac{x}{-6}$
$x = -132$

2. $y = -5 + 2$
$\therefore y = -3$
$z = 4(-5)(-3)$
$\therefore z = 60$

3. $m = 4(3) + 2$
$\therefore m = 14$
$n = 3 + \frac{14}{-7}$
$\therefore n = 1$

Unit 3: Translating word problems to mathematical expressions

This is the next step in the introduction to Algebra. Students must be able to translate problems phrased in English into mathematical language in order to write mathematical expressions. It is important to develop students' vocabulary of mathematical language.

Work through the jelly bean example on pages 68-69 in the Student's Book. Find other practical ways to demonstrate simple word problems. Use familiar scenarios within the classroom. Make a point of identifying the language used to phrase the problems.

Discuss the mind map on page 69 in the Student's Book. Develop your own class vocabulary list to display as a poster. Involve the entire class in creating the poster. Encourage students to use the tips on translating expressions on page 70 in the Student's Book together with the poster of Mathematics vocabulary when working through Exercise 3 and Worksheet 22.

Exercise 3

(SB page 70)

1. a) One chocolate bar costs ₦150.
Two chocolate bars cost: ₦150 × 2 = ₦300
Six chocolate bars cost: ₦150 × 6 = ₦900
x chocolate bars cost: ₦150 × x = ₦150x

b) If Yetunde is now 13 years old, then:
In 1 year's time, Yetunde will be 14 years old.
In 4 years' time Yetunde will be 17 years old.
In x years' time Yetunde will be $13 + x$ years old.

c) If the sum of a boy's and a girl's ages is 20 years, then:
If the boy is 5 years old, the girl is 15 years old.
If the boy is 7 years old, the girl is 13 years old.
If the boy is x years old, the girl is $20 - x$ years old.

2. a) $x + 2$ **b)** $\frac{t}{8}$ **c)** $9m$

d) $c - 5$ **e)** $y + 7$ **f)** $\frac{3}{7}h$

g) $3d$ **h)** $n + \frac{1}{4}$ **i)** $b - 10$

j) $\frac{k}{2}$ **k)** $1 + 4t$ **l)** $3c - 6$

m) $2b - \frac{1}{2}$ **n)** $4x - \frac{1}{4}$ **o)** $\frac{1}{6} + 3n$

p) $8 + 4y$ (Note: some students may interpret it as $(8 + 4)y$. This would be correct if the question were "total of 8 and 4, times y". As no comma exists in the question, the first answer is correct.)

q) $18 - \frac{1}{5}x$ **r)** $\frac{2}{5}x - 7$

3. a) $x + 3 = 5$
$x = 5 - 3$
$x = 2$

b) $2b = 8$
$b = \frac{8}{2}$
$b = 4$

c) $23 - y = 12$
$y = 23 - 12$
$y = 11$

d) $4z = 16$
$z = \frac{16}{4}$
$z = 4$

e) $m + 3 = 21$
$m = 21 - 3$
$m = 18$

f) $\frac{b}{6} = 1$
$b = 1 \times 6$
$b = 6$

g) $n - 2 = 16$
$n = 16 + 2$
$n = 18$

h) $11p = 33$
$p = \frac{33}{11}$
$p = 3$

i) $c + 20 = 18$
$c = 18 - 20$
$c = -2$

j) $\frac{1}{2}x = 3$
$x = 3 \times 2$
$x = 6$

k) $x + 6 = 15$
$x = 15 - 6$
$x = 9$

l) $x - 20 = 5$
$x = 5 + 20$
$x = 25$

m) $2x = 60$
$x = \frac{60}{2}$
$x = 30$

n) $x - 30 = 20$
$x = 20 + 30$
$x = 50$

o) $\frac{x}{4} = 25$
$x = 25 \times 4$

p) $3x + 4 = 19$
$3x = 19 - 4$
$3x = 15$
$x = \frac{15}{3}$
$x = 5$

q) $5x - 3 = 17$
$5x = 17 + 3$
$5x = 20$
$x = \frac{20}{5}$
$x = 4$

4. a) $30n = 690$
$n = \frac{690}{30}$
$n = 23$

b) $50 - n = 42$
$n = 50 - 42$
$n = 8$

c) $3 + n = 12$
$n = 12 - 3$
$n = 9$

d) $n = \frac{25\ 500}{2\ 125}$
$n = 12$

e) $n = 3(3\ 000)$
$n = 9\ 000$

f) $20a = 460$
$a = \frac{460}{20}$
$a = 23$

g) $3n + 10 = 16$
$3n = 16 - 10$
$n = \frac{6}{3}$
$n = 2$

h) $n + 4 = 11$
$n = 11 - 4$
$n = 7$

Worksheet 22 (WB page 48)

1. **a)** $4 + x$ **b)** $7 - y$

c) $\frac{2}{3}z - 5$ **d)** $\frac{6x}{2}$

2. **a)** $x + 2x = 21$

$3x = 21$

$x = 7$

b) $4x = 48$

$x = 12$

c) $12 - 3x = 36$

$-3x = 24$

$x = -8$

d) $\frac{x}{3} + 2 = 15$

$\frac{x}{3} = 13$

$x = 39$

3. $3 + (3 + x) = 18$

$x = 12$

Udo has 15 sweets.

4. $2x + 2(x - 2) = 24$

$2x + 2x - 4 = 24$

$4x = 28$

$x = 7$

$\therefore$ sides = 7 cm and 5 cm

5. Let the man's age be x.

The grandfather's age is $\frac{3}{2}x$.

The grandson is $x - 27$.

We know that: $\frac{3}{2}x + x + x - 27 = 127$

$\frac{7}{2}x = 154$

$x = 44$

So, the man is 44 years old.

Grandfather is $\frac{3}{2}x = 66$ years old.

Grandson is $x - 27 = 17$ years old.

Topic: 8 Simplification of algebraic expressions

Teaching guidelines and solutions

The focus in this topic is on simplifying algebraic expressions and using algebraic terminology. Students should be able to identify expressions, like and unlike terms and coefficients, and apply the basic rules for grouping and manipulating terms.

Unit 1: The language of algebra

Algebraic expressions, terms and coefficients

The next step in learning Algebra is also about vocabulary. Stress the importance of understanding and using the correct language when solving problems. It is essential for reading and interpreting questions correctly and also for being able to present solutions that can be understood. Work through the information presented on page 72. This serves as a summary of the essential algebraic facts.

Exercise 1

(SB page 73)

1.

Term	Coefficient
$m \times 8 = 8m$	8
$-4y$	-4
$\frac{3}{4}x$	$\frac{3}{4}$
p	1
$-b$	-1
$3 \times 2 \times y = 6y$	6

2. **a)** the product of 4 and r
   b) the product of 6 and y
   c) the product of 2 and w
   d) the product of negative 5 and q
   e) the product of 7 and g
   f) the product of 5 and d
   g) the product of negative p and q
   h) the product of d and e
   i) the product of negative 2 and y
   j) d squared

3. **a)** $2e$ **b)** $-3m$ **c)** $6c$ **d)** $-bd$ **e)** $5ab$

Worksheet 23

(WB page 50)

1. **a)** 2 **b)** $\frac{1}{7}$ **c)** -13 **d)** $\frac{1}{4}$

2. Subtract the result of two divided by *b* from five multiplied by *a* and add twenty-three and *c* multiplied by itself.

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

Like and unlike terms

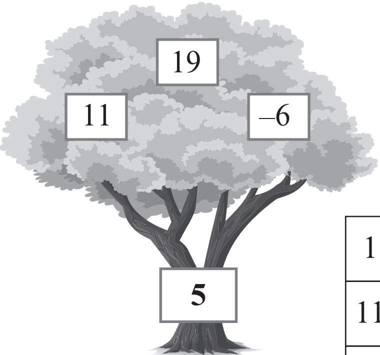
The ability to identify like and unlike terms is essential in the process of simplifying (and solving) expressions. Work through the sorting activity on page 74 in the Student's Book. Explain that like terms have the same variables and the same indices, unlike terms have different variables.

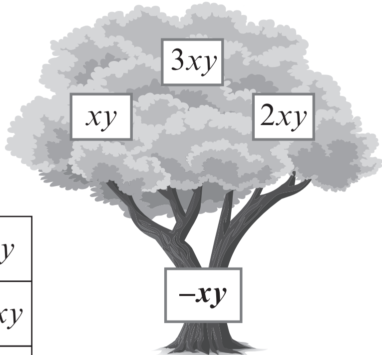
Exercise 2

(SB page 75)

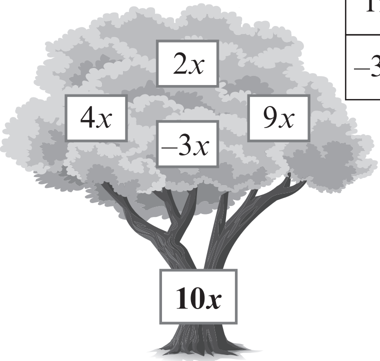
1. **a)** b **b)** $5y$ **c)** 7 **d)** $5x^2$ **e)** $3a$

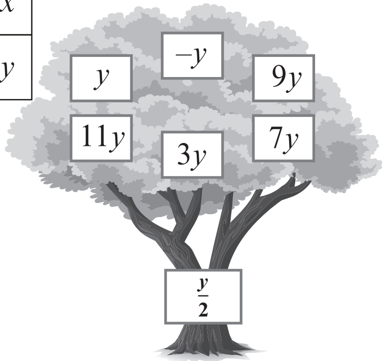
2.





11	xy	y	$9y$
$11y$	$4x$	$-y$	$3xy$
19	$3y$	$2x$	$9x$
$-3x$	$2xy$	-6	$7y$





3.

	Group 1	Group 2	Group 3
$6a$; $3g$; $12a$; $8a$; $-2g$	$6a$; $8a$; $12a$	$-2g$; $3g$	
2; $3m$; $\frac{1}{2}m$; -5; m	$3m$; $\frac{1}{2}m$; m	-5; 2	
mn; $4m$; $-m$; 2; $3mn$; -7; $10m$	-7; 2	$-m$; $4m$; $10m$	mn; $3mn$
x; xy; $2xy$; $-8x$; $5x$; y	$-8x$; x; $5x$	y	xy; $2xy$
$15abc$; ab; $3ab$; $3abc$; $-2abc$	ab; $3ab$	$-2abc$; $3abc$; $15abc$	

4. Answers will differ. Let students work in groups and compare their answers.

Unit 2: Manipulating terms in expressions

Addition and subtraction of like terms

Once we have identified like terms, the first step in simplifying the expression is to combine the like terms. We add, or subtract, the coefficients and write the variable. Work through the explanation and examples on page 76. Remind students that we cannot add or subtract unlike terms.

Exercise 3

(SB page 76)

1. **a)** $5x - 2x = 3x$ **b)** $7r + 5r = 12r$
c) $-2r - 3r = -5r$ **d)** $-f + 2f = 2f - f = f$
e) $2b + 5x$ **f)** $8c + 5r + 2f = 8c + 2f + 5r$
g) $-2x + 2x = 0$

2. **a)** $a + a + a = 3a$ **b)** $2t + t = 3t$ **c)** $2c + 3c = 5c$
d) $5p + 2p = 7p$ **e)** $4f + 9f = 13f$ **f)** $7u - 3u = 4u$
g) $6g - 2g = 4g$ **h)** $9w - 2w = 7w$ **i)** $5y - y = 4y$
j) $5r - 2r = 3r$ **k)** $4r + 7r = 11r$ **l)** $8h - 3h = 5h$
m) $7n - 2n = 5n$ **n)** $6g + 9g = 15g$ **o)** $8u - u = 7u$

Grouping like terms

It is easier to perform calculations when you first rewrite the expression with all like terms together. The convention is to write an expression with variables in alphabetical order and in ascending order of indices. Explain that we may use brackets for grouping if we wish, but it is not essential. Students must be aware of the effect of brackets on negative numbers. The use of brackets will be explained in more detail later on in this section.

Exercise 4

(SB page 78)

1. a) $6a + 12 + 2a + 5$
$= 6a + 2a + 12 + 5$
$= (6a + 2a) + (12 + 5)$

b) $7b + 16 - 5b - 8$
$= 7b - 5b + 16 - 8$
$= (7b - 5b) + (16 - 8)$

c) $15a - 3a + 5 - 2a + 7 + b$
$= 15a - 3a - 2a + b + 5 + 7$
$= (15a - 3a - 2a) + b + (5 + 7)$

d) $\frac{3}{2}x + \frac{5}{4}y - \frac{1}{2}x - \frac{7}{4}y$
$= \frac{3}{2}x - \frac{1}{2}x + \frac{5}{4}y - \frac{7}{4}y$
$= (\frac{3}{2}x - \frac{1}{2}x) + (\frac{5}{4}y - \frac{7}{4}y)$

2. a) $(6a + 2a) + (12 + 5)$
$= 8a + 17$

b) $(7b - 5b) + (16 - 8)$
$= 2b + 8$

c) $(15a - 3a - 2a) + b + (5 + 7)$
$= 10a + b + 12$

d) $(\frac{3}{2}x - \frac{1}{2}x) + (\frac{5}{4}y - \frac{7}{4}y)$
$= \frac{2}{2}x + (-\frac{2}{4}y) = \frac{2}{2}x - \frac{2}{4}y$
$= x - \frac{1}{2}y$

3. a) $12x + 3x$
$= 15x$

b) $10y + 5 + 6y$
$= 16y + 5$

c) $8n + 7n - 13n + 5$
$= 2n + 5$

d) $5a + 6 + 3b + a - 7$
$= 6a + 3b - 1$

e) $6t + 11q + 8$
$= 11q + 6t + 8$

f) $9m - 5n - 10m - 2n$
$= -1m - 7n$

g) $9a + 11b - 5a - 8b - 3a$
$= a + 3b$

4. a) $2a + 3b + 4a$
$= 6a + 3b$

b) $7v + 2u + 4v$
$= 2u + 11v$

c) $9f + 4g + 2f$
$= 11f + 4g$

d) $7c - 8d + 5c$
$= 12c - 8d$

e) $9u - 2u + 6v$
$= 7u + 6v$

f) $5a - 4a + 2b$
$= a + 2b$

g) $7j - 4j + 7k$
$= 3j + 7k$

h) $9s - 6s + 3t$
$= 3s + 3t$

i) $6f + 9g - 8f$
$= -2f + 9g$

j) $-9p + 5q - 2p$
$= -11p + 5q$

k) $7y + 2z - 5y$
$= 2y + 2z$

l) $4d + 5e - 7d$
$= -3d + 5e$

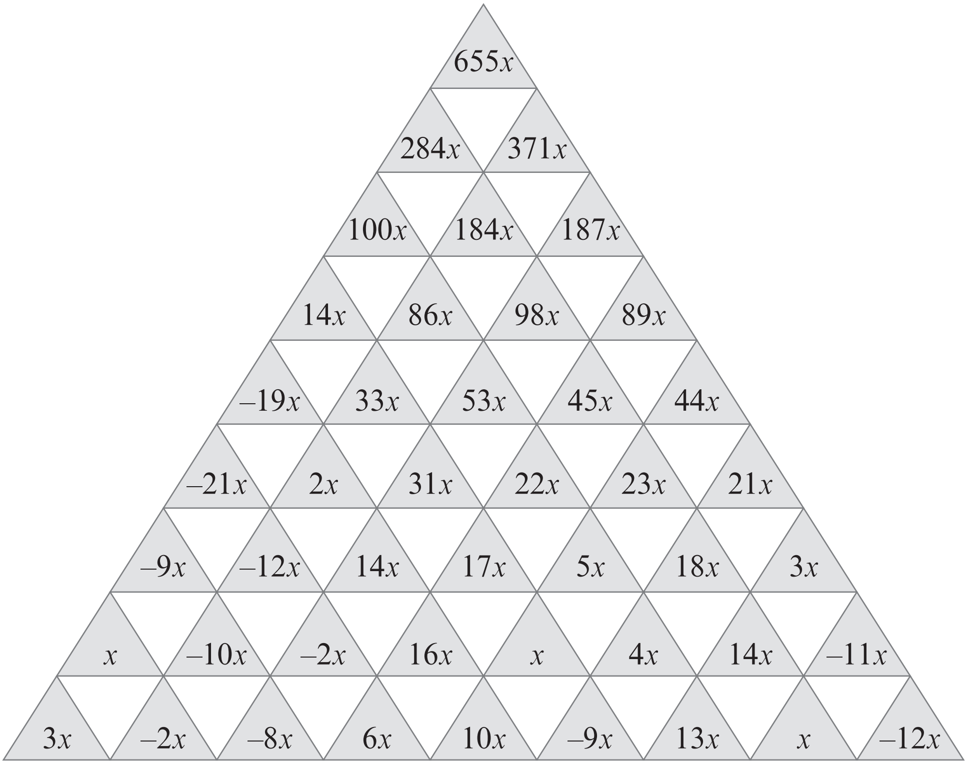
m) $7r + 2s + 5r + s$
$= 12r + 3s$

n) $9u + v + 7u + 3v$
$= 16u + 4v$

o) $2d + e + d - 8e$
$= 3d - 7e$

p) $5f + 2g - f + g$
$= 4f + 3g$

5. Students complete the task in pairs or groups.



6. **a)** $(3x - 1) + (x + 5) + (2x + 3)$
$= (3x + x + 2x) + (-1 + 5 + 3)$
$= 6x + 7$

b) $(4x + 3) + (x + 2) + (3x - 3)$
$= (4x + x + 3x) + (3 + 2 - 3)$
$= 8x + 2$

c) $(4x - 1) + (3x + 2) + (x + 7)$
$= (4x + 3x + x) + (-1 + 2 + 7)$
$= 8x + 8$

7. **a)**
$27p$
$13p$ | $14p$
$8p$ | $5p$ | $9p$

b)
$15d$
$7d$ | $8d$
$2d$ | $5d$ | $3d$

c)
$23h$
$13h$ | $10h$
$4h$ | $9h$ | h

d)
$29r$
$13r$ | $16r$
$6r$ | $7r$ | $9r$

Multiplying algebraic terms

Remind students that the multiplication sign is understood between a coefficient and a variable. So $3ay$ means $3 \times a \times y$, not $3 + a + y$. When we multiply terms, we multiply the coefficients and write the variables alongside each other.

Exercise 5

(SB page 80)

1. **a)** $2e \times 3 = 6e$ **b)** $3d \times 4 = 12d$ **c)** $2w \times 5 = 10w$
d) $5 \times 3d = 15d$ **e)** $4 \times 7g = 28g$ **f)** $2 \times 5d = 10d$
g) $2q \times 7 = 14q$ **h)** $6 \times 4b = 24b$ **i)** $8 \times 2g = 16g$
j) $9s \times 5 = 45s$ **k)** $3a \times 4a = 12a^2$ **l)** $2d \times 5d = 10d^2$
m) $4b \times 6b = 24b^2$ **n)** $3c \times 6c = 18c^2$ **o)** $7u \times 4u = 28u^2$

Worksheet 24

(WB page 51)

1. **a)** $6a$ **b)** $8b$ **c)** $6c$
d) $4d$ **e)** $5e + 4f$ **f)** $3f + g$
g) $10g + 10h$ **h)** $4h$ **i)** $17j - 12i$
j) $46j - 13a + 12$ **k)** $20k + 19b + 10$

Removing brackets

Revise the acronym BODMAS. Remind students that brackets are always worked out first. Ensure that students understand how to use negative numbers and subtraction when using brackets. Work through the explanation on page 80 and examples on page 81 in the Student's Book.

Exercise 6 allows students to first practise calculations with brackets and no variables before tackling expressions with variables, brackets and negative numbers. The last question in this exercise consolidates all the steps covered so far. Students must apply their algebraic skills to solve word problems. This exercise will provide a good indication of how well your students have understood their introduction to Algebra.

Exercise 6

(SB page 81)

1. a) $8 + (4 + 2) = 14$
b) $(15 + 1) - 7 = 9$
c) $8 - (2 + 6) = 0$
d) $10 + (7 - 1) = 16$
e) $(4 + 2) - (9 - 2) = -1$
f) $28 + (4 - 2) = 30$
g) $-(3 + 1) + (6 - 3) = -4 + 3 = -1$
h) $11 - (3 - 1) = 9$

2. a) $2 + (2x + 3x) = 5x + 2$
b) $x - (x - 1) = x - x + 1 = 1$
c) $12xy - (5xy + 4xy) = 3xy$
d) $3x - 2 + (x + 3) = 4x + 1$
e) $6x + (1 + x) + 3 = 7x + 4$
f) $(3x - 2x) + (4x - 2x) = x + 2x = 3x$
g) $(x - 3) - (2x + 1) = x - 3 - 2x - 1 = -x - 4$
h) $x - 1 - (x - 1) = x - 1 - x + 1 = 0$
i) $(3x - 10y) + (x - 7y) = 4x - 17y$
j) $(10x - x) + (5x - 3x) = 9x + 2x = 11x$
k) $(5x + y) - (x + 2y) = 5x + y - x - 2y = 4x - y$
l) $(4a + 3a) - (4a + 3a) = 4a + 3a - 4a - 3a = 0$
m) $(u + 3v) - 4v = u - v$
n) $(5 \times a) + (3 \times a) = 8a$
o) $3ab + (5ab + ba) = 9ab$
p) $2ab - (b - c) = 2ab - b + c$
q) $p - (2p + 5p) + 2 - 7 = -6p - 5$

r) $(5a + a) + a + (b + 2b) = 7a + 3b$
s) $(x - 2y) + (x - y) - (3x - 3y) = x - 2y + x - y - 3x + 3y = -x$
t) $(3 - x) + (x - 4) - (1 - 2x) = 3 - x + x - 4 - 1 + 2x = 2x - 2$

3. a) $x + (x - 12) = 2x - 12$
b) ₦p – ₦q
c) $l \times b$
d) $2l + 2b$
e) $(m + 1) + (m + 2) = 2m + 3$
f) ₦$150y$
g) $h + 3$
h) $30 - b$
i) $20 - p$
j) ₦$300 - x$

Worksheet 25

(WB page 52)

1. a)

	$7a$	
$2a$		$5a$
$4a$	$-2a$	$7a$

b)

	$15a$	
$6a$		$-9a$
$4a$	$-2a$	$7a$

c)

	$112a$	
$-8a$		$-14a$
$4a$	$-2a$	$7a$

2. a) $8a$ **b)** $12x^2$ **c)** $-24m^2n$ **d)** $\frac{2ab}{c}$ **e)** $\frac{pq^2}{3}$

3. a) $5(a - 1)$
$= 5a - 5$

b) $4x(2 - 3x)$
$= 8x - 12x^2$

c) $-f(-2f + 3f)$
$= 2f^2 - 3f^2$
$= -f^2$

d) $6t(3t - 4q + 7)$
$= 18t^2 - 24qt + 42t$

e) $-2w(w + 2w)$
$= -2w(3w)$
$= -6w^2$

f) $2p - (q - 3)$
$= 2p - q + 3$

g) $(a + 3) + (a - 1)$
$= a + 3 + a - 1$
$= 2a + 2$

h) $(x + 3y) + (2x - y)$
$= x + 3y + 2x - y$
$= 3x + 2y$

i) $-(3c + d) + 2(c + 4d)$
$-3c - d + 2c + 8d$
$-c + 7d$

j) $3(4e - 2f) - 4(e - f)$
$= 12e - 6f - 4e + 4f$
$= 8e - 2f$

TERM 2 Revision

You may use the revision questions or a selection thereof 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 exercise solutions

Approximation

1. **a)** 1 330 cm **b)** 1 300 cm **c)** 4
d) 4.5 **e)** 5 **f)** 200
g) 0.045

2. **a)** 480 **b)** 1 270 **c)** 4 860
d) 8 020 **e)** 23 430 **f)** 254 900

3. **a)** 3 400 **b)** 8 700 **c)** 42 100
d) 122 500 **e)** 85 300 **f)** 367 800

4. **a)** 74 000 **b)** 51 000 **c)** 128 000
d) 831 000 **e)** 2 431 000 **f)** 672 000

5. **a)** 40 000 **b)** 130 000 **c)** 150 000
d) 910 000 **e)** 790 000 **f)** 580 000

6. **a)** 3 548.0 **b)** 8.4 **c)** 3.0
d) 6.8 **e)** 9.5 **f)** 11.1
g) 25.7 **h)** 10.1 **i)** 79.0

7. **a)** 3.55 **b)** 8.38 **c)** 2.96
d) 6.80 **e)** 9.46 **f)** 11.15
g) 25.68 **h)** 10.07 **i)** 78.95

8. **a)** 6.807 **b)** 8.630 **c)** 9.713 **d)** 45.515 **e)** 20.017
f) 162.615 **g)** 212.947 **h)** 99.320 **i)** 315.480 **j)** 845.610

9. **a)** 1.86 **b)** 27.5 **c)** 0.75 **d)** 4 700
e) 6 450 **f)** 5 400 **g)** 900 **h)** 3 000
i) 40.6 **j)** 0.71 **k)** 0.08 **l)** 0.1
m) 0.7 **n)** 60 **o)** 100 **p)** 474 000

10. a) 1.7 **b)** 4 **c)** 4.91 **d)** 22.5 **e)** 8.878

11. a) 4.1 **b)** 12.57 **c)** 10.84 **d)** 26.977 **e)** 33.8

The binary number system

1. 10010 **2.** 11001 **3.** 10010

4. a) 1101 **b)** 1011 **c)** 11000
d) 1100 **e)** 11001 **f)** 11100
g) 1010 **h)** 10110 **i)** 11000
j) 1011111 **k)** 100111011 **l)** 101100101

5. a) 13 **b)** 11 **c)** 24 **d)** 12
e) 25 **f)** 28 **g)** 10 **h)** 22
i) 24 **j)** 95 **k)** 315 **l)** 357

6. a) 100110 **b)** 100001 **c)** 110010
d) 10110 **e)** 1111

7. a) 7 **b)** 53 **c)** 97 **d)** 75 **e)** 24

Addition and subtraction

1. a) 11 189 **b)** 10 328 **c)** 7 423
d) 13 390 **e)** 10 790 **f)** 13 833
g) 7 930 **h)** 9 220 **i)** 13 788
j) 10 628 **k)** 12 570 **l)** 11 755

2. a) 1 769 **b)** 3 881 **c)** 4 605
d) 2 173 **e)** 6 185 **f)** 2 777
g) 19 **h)** 1 660 **i)** 4 781
j) 7 272 **k)** 2 999 **l)** 119

3. a) –9, –3, 1, 2, 5 **b)** –6, –2, 3, 4, 7
c) –8, –6, –2, 4, 7 **d)** –9, 0, 2, 5, 8
e) –5, –4, 3, 6, 7 **f)** –5, –4, 0, 3, 9
g) –8, –6, –2, 0, 5 **h)** –4, –3, –2, 2, 6

4. a) 2 **b)** 7 **c)** 3 **d)** 8 **e)** –9
f) –13 **g)** 0 **h)** –7 **i)** –7 **j)** 16

5. a) –11 **b)** 2 **c)** 10
d) 9 **e)** –3 **f)** –3
g) –4 **h)** 7 **i)** –18
j) 1 **k)** 0 **l)** 11
m) –13 **n)** 5 **o)** –2

6. **a)** –3 **b)** 0 **c)** –7
d) –5 **e)** 10 **f)** –1
g) 0 **h)** –4 **i)** –4
j) 10 **k)** –8 **l)** –8
m) –10 **n)** 12 **o)** 0

7. **a)** 3 **b)** –12 **c)** 1
d) 1 **e)** –5 **f)** 3
g) –13 **h)** 7 **i)** –2
j) 6 **k)** –5 **l)** –11
m) –3 **n)** –3 **o)** 5

8. **a)** –4 **b)** 0 **c)** –10
d) –8 **e)** 13 **f)** 1
g) 12 **h)** –7 **i)** –4
j) –4 **k)** –2 **l)** 15
m) 6 **n)** –18 **o)** 0

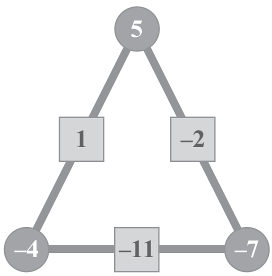
9. **a)** 14 °C **b)** 2 °C **c)** –3 °C **d)** 2 °C **e)** –13 °C
f) 5 °C **g)** –20 °C **h)** –2 °C **i)** –4 °C **j)** –11 °C

10. **a)** **i.** –280 m **ii.** –220 m **iii.** –100 m
b) 6

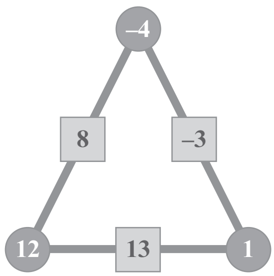
11. 146 °C

12. 325 m

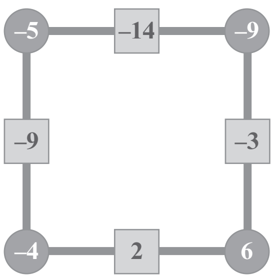
13. **a)**



b)



c)



Use of symbols

1. a) $5 - 4 = 1$ **b)** $6 + 3 = 9$ **c)** $-3 \times -5 = 15$

d) $\frac{18}{2} = 9$ **e)** $-11 + 5 = -6$ **f)** $4 \times 5 = 20$

g) $-4 = -2 - 2$ **h)** $\frac{68}{-2} = -34$ **i)** $1 - 7 = -6$

j) $50 = 5 \times 10$

2. a) $2 \times 6 = 12$ **b)** $3 \times 3 = 9$ **c)** $6 + 3 = 9$
d) $3 + 2 \times 6 = 15$ **e)** $3 + 4 \times 6 = 27$ **f)** $4 \times 3 - 6 = 6$

3. a) $x + 4 = 9$
$x = 9 - 4$
$x = 5$

b) $x + 7 = 16$
$x = 16 - 7$
$x = 9$

c) $3 + x = 9$
$x = 9 - 3$
$x = 6$

d) $-30 = 2q$
$q = -\frac{30}{2}$
$q = -15$

e) $x - 3 = 7$
$x = 7 + 3$
$x = 10$

f) $x - 4 = 6$
$x = 6 + 4$
$x = 10$

g) $x + 6 = 19$
$x = 19 - 6$
$x = 13$

h) $x + 3 = 7$
$x = 7 - 3$
$x = 4$

i) $4 + x = 6$
$x = 6 - 4$
$x = 2$

j) $45 = 5e$
$e = \frac{45}{5}$
$e = 9$

k) $a - 4 = 2$
$a = 2 + 4$
$a = 6$

l) $72 = -9u$
$u = -\frac{72}{9}$
$u = -8$

m) $d + 2 = 6$
$d = 6 - 2$
$d = 4$

4. a) $3a = 3(4) = 12$
b) $4a + 2 = 4(4) + 2 = 18$
c) $5 + 2a = 5 + 2(4) = 13$
d) $14 - 3a = 14 - 3(4) = 2$
e) $12a - 9 = 12(4) - 9 = 39$

5. **a)** $4t = 4(-4) = -16$
b) $5t + 4 = 5(-4) + 4 = -16$
c) $6t + 9 = 6(-4) + 9 = -15$
d) $16 - 5t = 16 - 5(-4) = 36$
e) $4 + 2t = 4 + 2(-4) = -4$

6. **a)** $2m + 3n = 2(4) + 3(-2) = 2$
b) $3m - 5n = 3(4) - 5(-2) = 22$
c) $3mn = 3(4)(-2) = -24$
d) $2m - 5n = 2(4) -5(-2) = 18$
e) $mn + 4 = (4)(-2) + 4 = -4$

7.

The difference between a number and 10	$p - 10$
A number doubled and increased by 6	$2p + 6$
Half of a number decreased by 4	$\frac{p}{2} - 4$
5 times a certain number	$5p$
A number increased by 5	$p + 5$
7 less than a certain number	$p - 7$

8. **a)** $\frac{y}{2} - 5$ **b)** $1 + 4t$ **c)** $3c - 6$
d) $2b - \frac{1}{2}$ **e)** $4x - \frac{1}{4}$ **f)** $\frac{1}{6} + 3n$
g) $8 + 4y$ **h)** $18 - \frac{1}{5}x$ **i)** $\frac{5 + p}{2}$
j) $6x + 12$ **k)** $\frac{z}{5} + \frac{1}{2}$ **l)** $2(7x - 4)$

9. **a)** $t + 3$ **b)** $t - 6$ **c)** $3t$

10. **a)** $x + 7$ **b)** $4x$ **c)** $\frac{x}{2}$

11. 95 – 12 = 83 trees

12. 55 – 18 = 37 books

13. $\frac{₦1200}{₦80}$ = 15 cold drinks

14. **a)** $7g$ **b)** $4g + 6$ **c)** $9g - 15$

15. Answers will differ. Allow students to check each other's answers.

Simplification of algebraic expressions

1. **a)** 5 **b)** $z \times y$ **c)** $\frac{1}{4}$

d) $-2m$, $3m$ **e)** m

2. To combine like terms means to add terms with like variables.

3.

$14a$	$5ab$	$3b$	$3a^2$
$4b^2$	~~17~~	~~100~~	$14ab$
$4a$	$16b$	$7ab$	$5b^2$

4.

$-2b$ b

$-4e$ $3e$

$-8h$ $2h$ $4h$ $5h$

$2k$ $9k$

$3t$ $7t$

5. **a)** $4x - 6x = 2x$
b) $7y + 5y - 5y = 7y$
c) $4r + 4y - 8 = 4r + 4y - 8$
d) $3m + 4n - 6n = 3m - 2n$
e) $4g + 6g - 3g = 7g$
f) $15f - 5 + 2f = 17f - 5$
g) $13x - 7y + 4x = 17x - 7y$
h) $4b + 7a - 8 = 4b + 7a - 8$
i) $13r + 5s - 2r = 11r + 5s$
j) $a + a + 3b + b = 2a + 4b$
k) $3y - 3y = 0$
l) $(3a - b) + 2a = 5a - b$
m) $2w + 4w - 5 = 6w - 5$
n) $a - 3b + 5c + 4a = 5a - 3b + 5c$
o) $2x + 7x - 6x + 8 = 3x + 8$
p) $11q + 5p - 9q + 7p = 2q + 12p$
q) $3mn + 4m - 2mn = mn + 4m$
r) $t - 9t + 6u + 4u = -8t + 10u$
s) $11d + 5f - 21d + 5 - 8 = -10d + 5f - 3$
t) $12 + 9x - 6x - 19 = 3x - 7$
u) $2 - 5t + 8 + 5t - 8 = 2$

6. **a)** $4a + (3a - 7) = 4a + 3a - 7 = 7a - 7$
b) $5a - (3a - 5a) - 3 = 5a + 2a - 3 = 7a - 3$
c) $a - (2a + 2a) + 4 = a - 4a + 4 = -3a + 4$
d) $(5a - 2b) - (7a - b) = 5a - 2b - 7a + b = -2a - b$
e) $-(3a + 2a) + 5 = -3a - 2a + 5 = -5a + 5$
f) $6a + 3b - (a - 3) = 6a + 3b - a + 3 = 5a + 3b + 3$
g) $(4a - 3b) - a + 2b = 3a - b$
h) $5 - (2a - a) = 5 - 2a + a = 5 - a$
i) $(7a - 3a) - 4a = 7a - 3a - 4a = 0$
j) $(3x + y) + 5x + y = 3x + y + 5x + y = 8x + 2y$

7. **a)** $x + (x + 4) + (x + 3) = 3x + 7$
b) $x + (2x + 1) + 2x = 5x + 1$
c) $(x + 1) + x + (x + 1) = 3x + 2$
d) $x + 2x + (2x + 5) = 5x + 5$

8. a)

	$9a$	
$3a$		$6a$
$2a$	a	$5a$

b)

	$23h$	
$13h$		$10h$
$4h$	$9h$	h

c)

	$56q$		
	$25q$	$31q$	
$8q$	$17q$	$14q$	
$3q$	$5q$	$12q$	$2q$

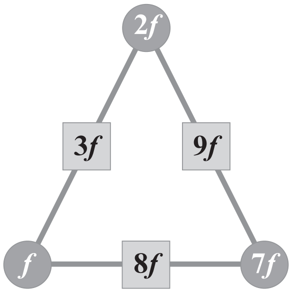
d)

	$16c + 14d$	
$6c + 6d$		$10c + 8d$
$2c + d$	$4c + 5d$	$6c + 3d$

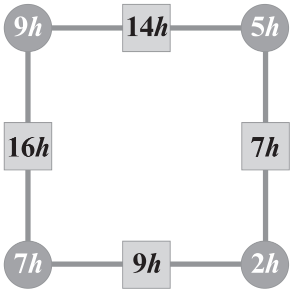
e)

	$7x + 17y$	
$4x + 9y$		$3x + 8y$
$3x + 4y$	$x + 5y$	$2x + 3y$

9. a)



b)



THEME 3 Algebraic processes

Topic 1: Simple equations

Teaching guidelines and solutions

In this topic we focus on the difference between algebraic equations and expressions, how to write mathematical equations and methods used to solve equations.

Unit 1: Equations and expressions

In this section we are still working on the language of Mathematics. Ensure that students understand the difference between "expression" and "equation" and also the difference between "simplifying" and "solving".

Exercise 1

(SB page 96)

1. **a)** true **b)** false **c)** true **d)** false **e)** false

2. **a)** C **b)** C **c)** A

3. **a)** 9 **b)** 21 **c)** +7 **d)** 8 **e)** ÷5

4. **a)** $x = 21$ **b)** $m = -1$ **c)** $p = -9$
d) $x = 4$ **e)** $m = -8$ **f)** $p = 18$
g) $x = 12$ **h)** $n = 8$ **i)** $p = 24$

5. **a)** $v = 15$ **b)** $b = 15$ **c)** $p = 9$
d) $g = 24$ **e)** $j = 24$ **f)** $q = 12$
g) $w = 18$ **h)** $k = 7$ **i)** $n = 17$
j) $t = 3$

Unit 2: Translating and making equations

Expand on the work done in the previous section. Work through the instructions and examples on pages 97 and 98 in the Student's Book. Take note of any misconceptions students may have. Take time to address these problems and ensure that students fully understand the language.

Exercise 2

(SB page 99)

1.

English phrase	Algebraic expression
The sum of 7 and the product of two different numbers	$7 + (a \times b)$
The difference between half a number and 23	$23 - \frac{a}{2}$
A number squared	a^2
The cube root of a number	$\sqrt[3]{a}$
The square root of the sum of twice x and a third of y	$\sqrt{(2x + \frac{y}{3})}$

2. **a)** $a + 5$ **b)** $2a$
   c) $\frac{a}{2}$ **d)** $a - 2$
   e) $7x$ **f)** $p < q$
   g) $a + b$ **h)** xy

3. **a)** $2x = 12$
   b) $3x + 5 = 12$
   c) $x + (2x) + (x + 1) = 180°$
   d) $x + (x + 1) + (x - 1) = 20$ cm
   e) $x + (x + 1) + 2x + (x + 1) = 100$ cm
   f) $x + 2x =$ ₦3 000
   g) $x + (x + 200) =$ ₦7 000
   h) $30n =$ ₦690
   i) $2x + 4 = 5x$
   j) $5x - 4 = 3x$
   k) $x + 6 = 4x$
   l) $2(x - 4) = 40$
   m) $10x = x + 60$
   n) $2x + 1 = x + 1$
   o) $3(x - 4) = 15$
   p) $4x + 6 = 14$
   q) $4x - 5 = 31$ years
   r) $3x + 10 = 55$ minutes
   s) $2x + 2(x + 3) = 34$ metres

Worksheet 26

(WB page 55)

1.

a)	7 →	+ 3 →	= 10
b)	19 →	– 5 →	= 14
c)	– 4 →	+ 8 →	= 4
d)	3 →	× 7 →	= 21
e)	18 →	÷ 6 →	= 3

2. **a)** $5x - x = 23$
   b) $4\,500 + 1\,200 = x$
   c) $4(3x) = 96$
   d) $\frac{1}{2}x(x + 2) = 48$
   e) $11 - 6x + 13 = 40$

3. The exact wording may differ. Allow students to work in groups to check each other's sentences.
   a) A number added to three, is eight.
   b) A number subtracted from five is eleven.
   c) Fifteen added to a number multiplied by two, is thirty-five.
   d) A number added to three and then subtracted from twelve, is negative two.
   e) A number divided by five and added to three quarters, is seven.

Unit 3: Additive and multiplicative inverses

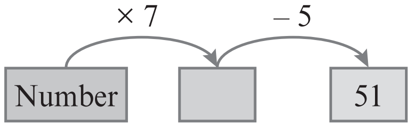
Explain to students that they have used the additive and multiplicative inverse many times without giving a name to the process. Inverse is the mathematical language for opposite.

Exercise 3

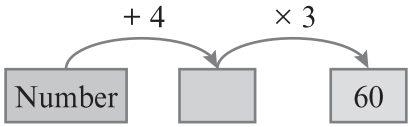
(SB page 101)

1. a) $(\square - 3) \times 7 = 42$ so $(42 \div 7) + 3 = 9$
b) $(\square + 5) \div 4 = 24$ so $(24 \times 4) - 5 = 91$
c) $(\square + 4) \times 2 = 18$ so $(18 \div 2) - 4 = 5$
d) $(\square \div 2) + 4 = 16$ so $(16 - 4) \times 2 = 24$
e) $(\square \div 5) - 3 = 38$ so $(38 + 3) \times 5 = 205$
f) $(\square - 2) \div 7 = 3$ so $(3 \times 7) + 2 = 23$

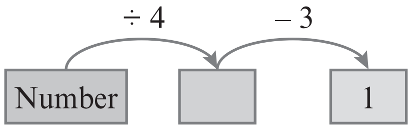
2. a) Number $\times 7 - 5 = 51$ so, $(51 + 5) \div 7 = 8$, number = 8



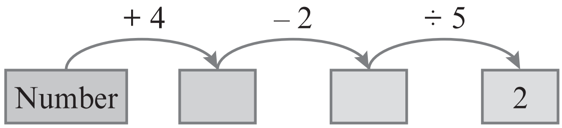
b) Number $+ 4 \times 3 = 60$ so, $(60 \div 3) - 4 = 16$, number = 16



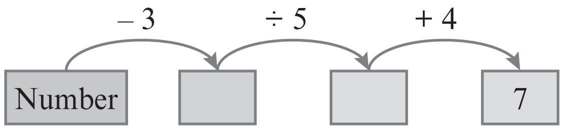
c) Number $\div 4 - 3 = 1$ so, $(1 + 3) \times 4 = 16$, number = 16



d) Number $+ 4 - 2 \div 5 = 2$ so, $((2 \times 5) + 2) - 4 = 8$, number = 8



e) Number $- 3 \div 5 + 4 = 7$ so, $((7 - 4) \times 5) + 3 = 18$, number = 18



Worksheet 27 (WB page 57)

1. a) Input: 2 → × 7 → + 2 → 16

b) Input: 92 → + 8 → ÷ 4 → 25

c) Input: 2 → + 4 → × 3 → 18

d) Input: 7 → × 7 → – 5 → 44

e) Input: 66 → ÷ 2 → – 11 → 22

2. a) Input: x → × 2 → – 6 → 44

Unknown number: 25

b) Input: x → ÷ 7 → + 5 → 8

Unknown number: 21

c) Input: x → + 12 → ÷ 4 → 4

Unknown number: 4

d) Input: x → – 9 → × 2 → 6

Unknown number: 12

e) Input: x → + 5 → × 3 → – 8 → 28

Unknown number: 7

Unit 4: Solving simple equations

Using the balance method to solve equations

We use the balance method to solve equations in Algebra. It is essential that students understand the concept of keeping the left-hand side and right-hand side of an equation in balance. There are clear descriptions in the Student's Book on page 102.

If you find that students are struggling with the concept, bring a balance scale to class and allow them to do practical examples of keeping the scale in balance.

Exercise 4

(SB page 103)

1. Subtract 3 from each side, $x = 15$.
2. Add 5 to each side, $x = 8$.
3. Divide each side by 2, $x = 7$.
4. Multiply each side by 4, $x = 12$.
5. Add 7 to each side, $x = 20$.
6. Add 2 to each side then divide each side by 3, $x = 7$.

Exercise 5

(SB page 104)

1. a)
$$26 = 8 + v$$
$$26 - 8 = 8 + v - 8$$
$$18 = v \text{ or } v = 18$$

b)
$$3 + p = 8$$
$$3 + p - 3 = 8 - 3$$
$$p = 5$$

c)
$$15 + b = 23$$
$$15 + b - 15 = 23 - 15$$
$$b = 8$$

d)
$$-15 + n = -9$$
$$-15 + n + 15 = -9 + 15$$
$$n = 6$$

e)
$$m + 4 = -12$$
$$m + 4 - 4 = -12 - 4$$
$$m = -16$$

f)
$$x - 7 = 13$$
$$x - 7 + 7 = 13 + 7$$
$$x = 20$$

g)
$$m - 9 = -13$$
$$m - 9 + 9 = -13 + 9$$
$$m = -4$$

h)
$$p - 6 = -5$$
$$p - 6 + 6 = -5 + 6$$
$$p = 1$$

i)
$$v - 15 = -27$$
$$v - 15 + 15 = -27 + 15$$
$$v = -12$$

j)
$$n + 16 = 9$$
$$n + 16 - 16 = 9 - 16$$
$$n = -7$$

2. a)
$$9x - 8 = -6$$
$$9x = -6 + 8$$
$$9x = 2$$
$$x = \frac{2}{9}$$

b)
$$9x - 7 = -7$$
$$9x = -7 + 7$$
$$9x = 0$$
$$x = 0$$

c)
$$-5 = -5 + 2z$$
$$2z = -5 + 5$$
$$2z = 0$$
$$z = 0$$

d)
$$8n + 7 = 31$$
$$8n = 31 - 7$$
$$8n = 24$$
$$n = 3$$

e) $-4 = 4 + \frac{x}{2}$
$\frac{x}{2} = -4 - 4$
$\frac{x}{2} = -8$
$x = -16$

f) $9 + 9n = 9$
$9n = 9 - 9$
$9n = 0$
$n = 0$

g) $\frac{x}{-2} + 6 = -1$
$\frac{x}{-2} = -1 - 6$
$\frac{x}{-2} = -7$
$x = 14$

h) $\frac{m}{9} - 1 = -2$
$\frac{m}{9} = -2 + 1$
$\frac{m}{9} = -1$
$m = -9$

i) $-9x + 1 = -80$
$-9x = -80 - 1$
$-9x = -81$
$x = 9$

j) $-10 = -2f + 5$
$-2f = -10 - 5$
$-2f = -15$
$f = 7\frac{1}{2}$

k) $5 = 29 + 4x$
$4x = 5 - 29$
$4x = -24$
$x = -6$

l) $4 - 6g = 28$
$6g = 28 - 4$
$6g = 24$
$g = 4$

m) $\frac{e}{5} + 6 = 2$
$\frac{e}{5} = 2 - 6$
$\frac{e}{5} = -4$
$e = -20$

n) $7f = 4f - 36$
$7f - 4f = -36$
$3f = -36$
$f = -12$

o) $-4 = 5 - 6h$
$-4 - 5 = -6h$
$-9 = -6h$
$h = \frac{9}{6}$
$h = 1\frac{1}{2}$

p) $7 = 3a + 20$
$3a = 7 - 20$
$3a = -13$
$a = -\frac{13}{3}$
$a = -4\frac{1}{3}$

q) $27 = 3 + 4y$
$4y = 27 - 3$
$4y = 24$
$y = 6$

r) $\frac{x}{2} + 3 = 5$
$\frac{x}{2} = 5 - 3$
$\frac{x}{2} = 2$
$x = 4$

s) $2x + 1 = 9$
$2x = 9 - 1$
$2x = 8$
$x = 4$

t) $52 + 9x = 7$
$9x = 7 - 52$
$9x = -45$
$x = -5$

Worksheet 28

(WB page 59)

1. $a + 4 = 10$
$a = 6$

2. $7 = 4 - b$
$b = -3$

3. $12 + c = 17$
$c = 5$

4. $d - 4 = -9$
$d = -5$

5. $3 + 3e = 9$
$e = 2$

6. $-6 + 4f = 8 + 2$
$4f = 16$
$f = 4$

7. $7 = 11 - \frac{k}{2}$
$-4 = -\frac{k}{2}$
$8 = k$

8. $n + 16 = 3n$
$16 = 2n$
$n = 8$

9. $12 - 6p = p - 9$
$-7p = -21$
$p = 3$

10. $\frac{q}{3} = \frac{q}{2}$
$2q = 3q$
$0 = q$

11. $\frac{1}{4} = \frac{5r}{2}$
$\frac{1}{2} = 5r$
$\frac{1}{10} = r$

12. $15t - 5 + t = -2t + 3$
$18t = 8$
$t = \frac{9}{4} = 2\frac{1}{4}$

13. $-y - 3 + 2y = \frac{1}{2}y + 1$
$\frac{1}{2}y = 4$
$y = 8$

Topic 2: Plane shapes

Teaching guidelines and solutions

In this topic the focus is on the properties, perimeter and area of plane shapes.

Resources required

There are practical activities within this topic. Be well prepared with the correct resources required. Students will also need basic stationery such as blank paper, a pencil, ruler and scissors.

For Exercise 1 on pages 107 in the Student's Book, each student will need a copy of a square and rectangle as shown.

For Exercise 3 question 11 on page 111 in the Student's Book, each student will need nine straws or sticks to recreate the pattern.

For Exercise 3 question 12 on page 112 in the Student's Book, a copy of the triangle diagram is required for each student.

Dot paper is required for Exercise 3 question 1 on page 110 and question 10 on page 111 in the Student's Book.

Grid paper is required for Exercise 3 questions 13 and 14 on page 112, and Exercise 6 question 1 on page 117.

A protractor and a compass or round template as well as basic stationery is required for the practical investigation on page 140.

If resources are limited and it is not possible to supply resources for each student, allow students to work in groups or even carry out the activity as a class.

Unit 1: Properties of plane shapes

Students should be familiar with two-dimensional plane shapes. You may use the images on page 106 or pictures from a magazine or newspaper to use as an introduction to the topic. Asking students to identify plane shapes within complex pictures will indicate how well they are able to identify and name shapes.

Quadrilaterals

Properties of rectangles and squares

Two-dimensional shapes will not be new material for the students but it is now important that they are able to formally identify the properties of each shape and identify the differences between shapes. Display a diagram in the classroom, similar to the one on page 107. Exercise 1 provides an opportunity for the class to investigate and compare the properties of squares and rectangles.

Exercise 1 (SB page 107)

Supply large squares and rectangles for students to complete this exercise.

Questions 1.–5. should be completed as a class project.

6.

Property	Square	Rectangle
All angles are right angles.	✓	✓
All sides are equal.	✓	
Opposite sides are equal.	✓	✓
Both pairs of opposite sides are parallel.	✓	✓
Both pairs of opposite angles are equal.	✓	✓
Diagonals bisect each other.	✓	✓
Diagonals are equal in length.	✓	✓

7. All features are the same except for the lengths of all sides.

Triangles

Start this section with a practical activity. Exercise 2 provides an opportunity for the class to investigate and identify different kinds of triangles. Right-angled triangles are not included in the investigation, as students will have worked with right-angled triangles previously. Discuss why a right-angled triangle may be scalene or isosceles, but not equilateral.

Exercise 2

(SB page 109)

1. Students should consider the fold lines and indentations made by drawing the ruled line.
   a) triangle
   b) Two sides are equal.
   c) Two angles are 90º.
   d) Students compare sketches.

2. Students should consider the fold lines and indentations made by drawing the ruled line.
   a) triangle
   b) All sides are different.
   c) All angles are different.
   d) Answers may differ slightly, students compare their summaries.

3. **a)** triangle
   b) All sides are all equal.
   c) All angles are all equal.
   d) Answers may differ slightly, students compare their summaries.

Exercise 3

(SB page 110)

Ensure that students have all the necessary resources before starting Exercise 3.

1. **a)** Answers will differ, students to compare answers.
   b) **i)** Answers will differ. One example is: it has three sides.
      ii) Answers will differ. One example is: all angles are 90º.
      iii) Answers will differ. One example is: opposite sides are parallel.

2. **a)–c)** Allow students to check the accuracy of each other's drawings.

3. The shape is a square. It is also a rectangle. It conforms to all the properties of a rectangle.

4.

Rectangle	Square
Opposite sides are equal.	All side are equal.
Diagonals bisect each other.	Diagonals bisect each other.
Diagonals are equal.	Diagonals are equal.
All angles are 90º.	All angles are 90º.

5. A square must have all sides equal, a rectangle may have only opposite sides equal.

6. **a–e)** Allow students to check the accuracy of each other's drawings.

7. Two sides are equal in length.
The base angles are equal in size.

8. **a)** triangle **b)** three
c) equilateral **d)** 90
e) scalene **f)** three
g) two **h)** no

9. **a)** isosceles **b)** isosceles
c) scalene **d)** scalene (possibly obtuse)
e) right-angled **f)** isosceles (possibly acute)

10. **a–c)** Practical activity.

11. **a–e)** Practical activity.

12. Practical activity.

13. **a–d)** Practical activity.

14. **a–d)** Practical activity. The activity should demonstrate how to create triangles and rectangles from squares.
e) There are four ways to fold a square into two equal shapes.

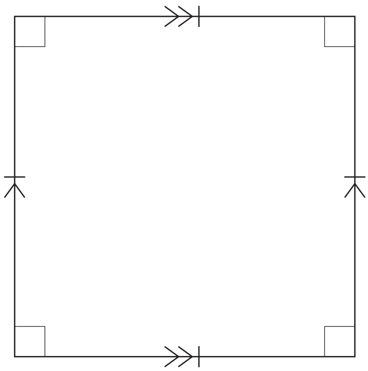
15. Allow students to compare answers.

Worksheet 29

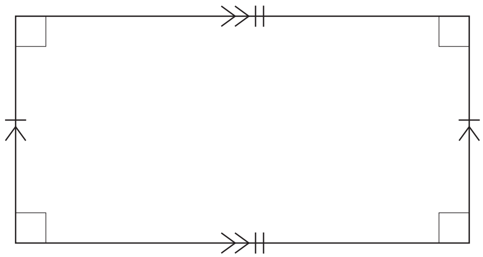
(WB page 61)

1.

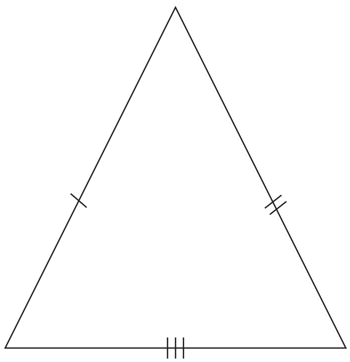
Square



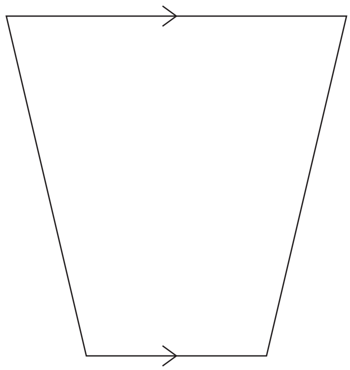
Rectangle



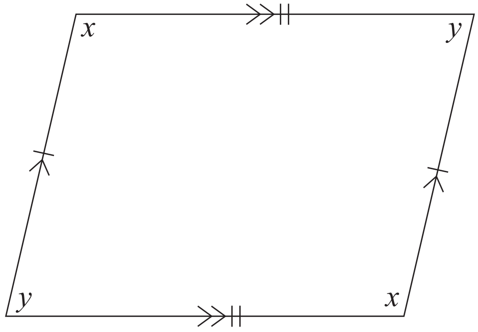
Triangle



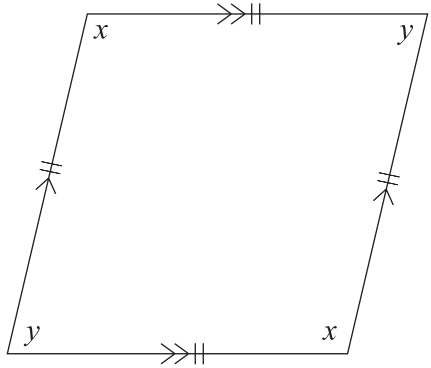
Trapezium



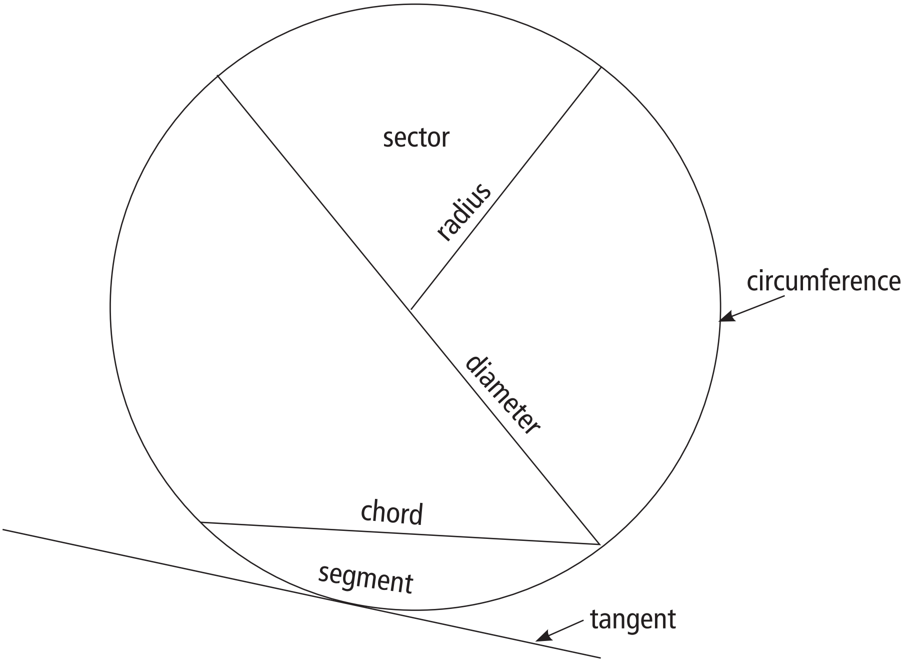
Parallelogram



Rhombus



2.



3. a) ... four right angles,
... two pairs of parallel and equal sides.
b) ... a square has all four sides equal.
c) ... two pairs of opposite sides that are equal and parallel.
d) ... a rectangle has four right angles.
... a parallelogram does not necessarily have right angles.

4. a) False, a square is a special kind of rectangle.
b) False, a square is always a rhombus.
c) False, a parallelogram has both pairs of opposite sides parallel; a trapezium has exactly one pair of opposite sides parallel.

Circles

As with the other plane shapes, students should be familiar with circles. Students should develop clear definitions in mathematical terms of what a circle is. Work through the definitions of terms related to circles on pages 113 and 114 in the Student's Book.

Exercise 4 (SB page 115)

1. **a)** Radius **b)** Diameter **c)** Tangent
   d) Chord **e)** Segment **f)** Circumference
   g) Sector

2. Yes. A diameter is a special type of chord, which passes through the centre of the circle. It is always the longest chord of any circle.

3. No, the radius starts at the centre of the circle and a chord joins two points, both on the circumference.

4. The radius and the diameter pass through the centre of the circle. The chord does not necessarily pass through the centre as it joins any two points on the circumference of the circle.

5. The diameter is twice the length of the radius.

6. The circumference is a line drawn around the centre of the circle, always the same distance from the centre.

Unit 2: Perimeter of plane shapes

Revise the definition of perimeter. Encourage students to identify other non-mathematical words such as border, edge and boundary that are used informally to identify the perimeter of shapes. This section includes informal and formal methods for calculating perimeter.

Calculate perimeter by counting squares

This section provides an introduction for calculating perimeter. Work through the example on page 116.

Exercise 5 (SB page 116)

A = 4 + 5 + 4 + 5 = 18
B = 3 + 6 + 3 + 6 = 18
C = 2 + 7 + 2 + 7 = 18
D = 5 + 6 + 5 + 6 = 22
E = 2 + 11 + 2 + 11 = 26

Exercise 6 (SB page 117)

Provide grid paper for the exercise.

1. **a–c)** Answers will differ, students should compare their answers.

2. a) 18 cm **b)** 18 cm **c)** 18 cm

3. a) $2 \times 15 + 2 \times 47 = 124$ mm
b) $2 \times 5.3 + 2 \times 3.9 = 18.4$ cm
c) $4 + 4 + 6 + 6 = 20$ cm
d) $4 \times 9 = 36$ mm
e) $4 \times 15 = 60$ m

4. a) They are both 15 blocks long.
b) They will arrive at the same time.

5. Students will have different methods to calculate the answer.
$2b + 2 \times 5b = 72$ m
$12b = 72$ m
$b = 6$ m
The length of each square is 6 m.

Using formulae to calculate perimeter

This section will generalise the methods previously used to develop a formula that can be used in all situations. In this way students develop understanding of where the formula comes from. Show how understanding of the properties of the shape will allow understanding of the perimeter formula. Work through the sections on formula for the perimeter of a square, a parallelogram, a trapezium and a triangle.

Exercise 7

(SB page 122)

1. $2 \times (8 + 6) = 2 \times 14 = 28$ cm

2. $9 + 6 + 5 + 6 = 26$ cm

3. $7 + 7 + 5 = 19$ cm

4. $4 \times 17.5 = 70$ cm

5. $3 \times 32 = 96$ cm

6. $2 \times (40 + 25) = 130$ cm

7. $2 \times (2.4 + 4) = 12.8$ m

8. $\frac{48}{4} = 12$ m

9. a) $2 \times (74 + 30) = 208$ mm **b)** $2 \times (25 + b) = 90$
$25 + b = 45$
$b = 20$ mm

c) $2 \times (1.125 + l) = 6.25$
$1.125 + l = 3.125$
$l = 2$ cm

d) $2 \times (5.5 + b) = 22$
$5.5 + b = 11$
$b = 5.5$ cm

e) $2 \times (7.5 + 3.8) = 22.6$ m

f) $2 \times (l + 2.5) = 12$
$l + 2.5 = 6$
$l = 3.5$ m

Unit 3: Perimeter of compound shapes

Have a discussion about irregular or compound shapes. Ask students to supply examples of irregular shapes and discuss how they would set about calculating the perimeters.

Exercise 8

(SB page 124)

1. $7 + 12 + 12 + 10 + 19 + 22 = 82$ m

2. $26 + 17 + 26 + 17 = 86$ cm

3. $12 \times 2 = 24$ cm

4. $6 + 2 + 4 + 3 + 4 + 2 + 6 + 7 = 34$ cm

5. $5 + 1 + 4 + 2 + 4 + 4 + 5 + 1 + 4 + 2 + 4 + 4 = 40$ m

6. $5 + 6 + 2 + 2 + 2 + 2 + 5 + 10 = 34$ cm

Circumference of a circle

Explain to students that since a circle is different to other shapes in that it has a curved edge, the perimeter of a circle is calculated differently. It is called the circumference.

The constant π

Follow the investigation into the ratio of circumference to diameter. Explain that this ratio is known as pi and that it is a constant value, regardless of the size of the circle.

Exercise 9

(SB page 127)

1. a) $C = 2\pi r$
$C = 2\pi 10$
$= 62.83$ cm

b) $C = 2\pi r$
$C = 2\pi 18$
$= 113.1$ m

c) $C = \pi d$
$C = \pi 12$
$= 37.7$ cm

d) $C = \pi d$
$C = \pi 16$
$= 50.27$ cm

2. **a)** $d = \frac{C}{\pi}$

$d = \frac{20}{\pi}$

$= 6.37$ cm

b) $d = \frac{C}{\pi}$

$d = \frac{105}{\pi}$

$= 33.42$ cm

c) $d = \frac{C}{\pi}$

d) $d = \frac{2.3}{\pi}$

$= 0.73$ m

3. **a)** $\frac{2\pi(4.5)}{2} + 9 = 23.14$ cm

b) $2\pi7 = 43.98$ cm

c) $\frac{(2\pi8)}{4} + 16 = 28.57$ cm

d) $2\pi4.5 = 28.27$ cm

4. **a)** $6 + 4 + \frac{2\pi2}{2} + \frac{2\pi3}{2} = 25.7$ cm

b) $\frac{2\pi6}{2} + \frac{2\pi3}{2} + \frac{2\pi3}{2} = 37.7$ cm

c) $8 + 6 + 12 + 10 + \frac{2\pi4}{4} = 42.28$ cm

5. **a)** $C = 2\pi r$

$C = 2\pi20$

$= 125.6$ cm

b) 125.6 cm

c) $\frac{8\,000}{125.6} = 63.69$

So, in order to travel 80 m, the wheel must make 64 complete revolutions.

Worksheet 30

(WB page 64)

1. $P = 4(6)$

$= 24$ cm

2. $P = 2(13) + 2(8)$

$= 42$ cm

3. $P = 2(7) + 2(3)$

$= 20$ cm

4. $P = 14 + 7 + 6 + 5$

$= 32$ cm

5. $C = 2\pi(10)$

$= 62.83$ cm

6. $24 = 3x$

$\therefore x = 8$ cm

7. $2(18) + 2x = 58$

$2x = 22$

$\therefore x = 11$ cm

8. $94.25 = 2\pi r$

$\therefore r = 15$

$\therefore d = 30$

9. **a)** $P = 2 + 4 + 2 + 2 + 4 + 4 + 8 + 6 = 32$ m

b) $P = 4 + 8 + 4 + 20 + 16 = 52$ cm

c) $P = 12 + x + \frac{(2\pi12)}{2} + x + 5$

From the diagram, $x = 12$ mm

$P = 12 + 12 + \frac{(2\pi12)}{2} + 17 = 78.70$ mm

Unit 4: Areas of plane shapes

Revise the definition of area. Once again we start simply by counting squares and develop the process of calculating area to the use of a formula. Ensure that students understand the difference between perimeter and area and that they know when to use square units.

Calculate the area by counting squares

Work through the explanation on pages 128–129.

Area of a rectangle

Students work through the examples on page 130. Exercise 10 gives students practice in calculating the area of simple square and rectangle shapes using various methods.

Exercise 10

(SB page 130)

1. **A** = 8 squares **B** = 4 squares **C** = 6 squares
   D = 14 squares **E** = 9 squares

2. **a–c)** Answers will differ.

3. **a)**

No.	Name of shape	Perimeter (cm)	Area (cm^2)
1	Square	8	4
2	Rectangle	26	30
3	Rectangle	22	30
4	Rectangle	34	30
5	Rectangle	34	72

   b) There is no relationship, the formulae are different.

4. **a)** 432 m^2 **b)** 550 cm^2
   c) 61.5 m^2 **d)** 2 500 m^2

5. **a)** length =12 cm, breadth = 7 cm
   b) length =13 cm, breadth = 6 cm

6. **a)** 10 m **b)** 80 m^2

7. $2l + 2b = 64$ but $l = 3b$
   $2(3b) + 2b = 64$
   $6b + 2b = 64$
   $8b = 64$
   $b = 8$ cm = side of square
   $\therefore$ area of square = $b^2 = 64$ cm^2

Areas of compound shapes

The area of compound or irregular shapes can be found by breaking them up into recognisable regular shapes. We find the area of each regular shape and add the areas together. Students should be confident in their knowledge of regular shapes and their properties.

Exercise 11

(SB page 134)

One method is given here. Other solutions may be correct, but all methods should give the same answer.

1. $30 \times 10 + 18 \times 10 = 480 \text{ m}^2$

2. $6 \times 6 + 2 \times 5 = 46 \text{ cm}^2$

3. $11 \times 7 - 3 \times 4 = 65 \text{ cm}^2$

4. $10 \times 3 + 3 \times 4 = 42 \text{ m}^2$

5. $4 \times 19 + 12 \times 4 + 12 \times 4 = 172 \text{ cm}^2$

Area of a parallelogram

Explain the formula for calculating the area of a parallelogram. Once again, students should be confident in their knowledge of the properties of the parallelogram.

Exercise 12

(SB page 136)

1. **a)** $13 \times 10 = 130 \text{ mm}^2$ **b)** $20 \times 12 = 240 \text{ cm}^2$
c) $6 \times 10 = 60 \text{ cm}^2$ **d)** $8 \times 8 = 64 \text{ km}^2$
e) $4 \times 4.5 = 18 \text{ m}^2$

2. **a)** base = 9.5 cm, area = 93.1 cm^2 $\therefore$ height = $\frac{93.1}{9.5}$ = 9.8 cm

b) height = 14.6 cm, area = 124.1 cm^2 $\therefore$ base = $\frac{124.1}{14.6}$ = 8.5 cm

c) height = 21 cm, area = 504 cm^2 $\therefore$ base = $\frac{504}{21}$ = 24 cm

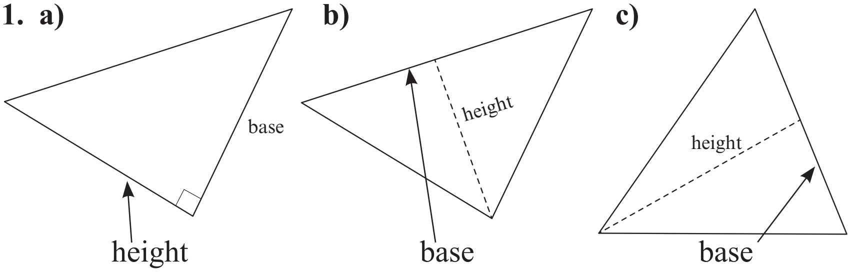
Area of a triangle

Work through the explanation in the Student's Book on pages 136 and 137. Ensure that students understand the parts of the formula, $\frac{1}{2}$, base and height and why they are important. Students must also understand how to choose the base and where the perpendicular height is found. The height of obtuse triangles may be a difficult concept.

Exercise 13

(SB page 137)

1. a) b) c)



2. **a)** 24 cm^2 **b)** 24 cm^2 **c)** 12 cm^2

3. **a)** 210 mm^2 **b)** 576 m^2 **c)** 240 cm^2
   d) 285 cm^2 **e)** 170 cm^2 **f)** 325 m^2

4. **a)** height $= \frac{(252 \times 2)}{24} = 21$ m

   b) base $= \frac{(133 \times 2)}{14} = 19$ cm

5. area 1: $2 \times 8 = 16$ km^2
   area 2: $\frac{1}{2}4 \times 8 = 16$ km^2
   area 3: $4 \times 4 = 16$ km^2
   $\therefore$ All areas are the same size and the land distribution is fair.

6. **a)** $8 \times 10 - \frac{1}{2}5 \times 2 = 80 - 5 = 75$ cm^2

   b) $12 \times 6 - \frac{1}{2}2 \times 6 - \frac{1}{2}6 \times 2 = 72 - 6 - 6 = 60$ cm^2

Area of a circle

The investigation on page 140 provides a practical way to derive the formula to calculate the area of a circle. Be sure to have enough resources for everyone to participate. This provides a tangible practical way to support learning in your classroom. Work through the examples on page 141 before tackling Exercise 14. Worksheet 31 gives practice in finding the area of a variety of shapes.

Exercise 14

(SB page 142)

1. **a)** 28.3 cm^2 **b)** 176.7 cm^2 **c)** 10.2 cm^2

2. 4 778.98 m^2 **3.** 6 939.8 mm^2 **4.** 1 963.5 cm^2

5. $r = \sqrt{\frac{450}{\pi}} = 12$ cm

6. $r = \sqrt{\frac{324}{\pi}} = 10.16$ cm

   $\therefore d = 20.32$ cm

7. **a)** $\frac{1}{2}\pi r^2$ **b)** $\frac{1}{4}\pi r^2$

8. **a)** $12 \times 12 = 144 \text{ cm}^2$
   b) $\sqrt{\frac{144}{\pi}} = 6.77 \text{ cm}$
   c) 42.54 cm

9. **a)** $\frac{\pi 202}{2} = 628.3 \text{ cm}^2$ **b)** $\pi 42 = 50.27 \text{ cm}^2$

Worksheet 31

(WB page 67)

1. $A = \frac{1}{2}(6)(8)$
   $= 24 \text{ cm}^2$

2. $A = 21 \times 14$
   $= 294 \text{ cm}^2$

3. $A = \frac{1}{2}(10 + 6) \times 4$
   $= 32 \text{ cm}^2$

4. $A = \pi(13)^2$
   $= 530.93 \text{ cm}^2$

5. First calculate the height of the triangle.
   $152 - 92 = h^2$
   $144 = h^2$
   $h = 12 \text{ cm}$
   $A = \frac{1}{2}(18)(12)$
   $= 108 \text{ cm}^2$

6. $49 = s^2$
   $s = 7 \text{ mm}$

7. $104 = 13 \times x$
   $x = 8 \text{ cm}$

8. **a)** $A = \frac{1}{2}(10.5)(9) + \frac{1}{2}(10.5+3) \times 6$
   $= 87.75 \text{ cm}^2$
   b) $A = (6 \times 3) + (9 \times 3) + \frac{1}{2}(4)(3)$
   $= 51 \text{ m}^2$

Summary of area and perimeter formulae

A formulae summary is provided on page 144 as a useful reference for students.

Topic 3: Three-dimensional figures

Teaching guidelines and solutions

In this topic we investigate the properties and volume of figures with three dimensions: length, breadth and height. They may also be called solids or objects. Some examples of these are cuboids, cubes, cones, spheres, pyramids and cylinders.

Resources required

There are practical activities within this topic. Be well prepared with the correct resources required. Students will also need basic stationery such as blank paper, a pencil, ruler, scissors and sticky tape (or glue).

For Exercise 1 on page 145 in the Student's Book, a variety of boxes, tins and containers are required.

Toothpaste boxes (or any cuboid containers) are needed to explore the net of a cuboid on page 148 in the Student's Book.

Cube containers such as stock cube wrappings are needed to explore the net of a cube on page 149 in the Student's Book.

Matchboxes are needed for Exercise 3 on page 149 in the Student's Book.

Unit 1: Properties of three-dimensional figures

Start this section by revising terms such as vertices, edges and faces. Discuss the idea of dimensions and what is meant by two-dimensional and three-dimensional. The practical activity in Exercise 1 and investigation in Exercise 2 provide the basis for working with the properties of specific figures. It is important that students are familiar with the properties before they calculate volume.

Exercise 1 (SB page 145)

1. Practical activity. If time permits, allow students to present their findings to the class.

Exercise 2

(SB page 146)

1. a), b), e), f), and g) are all solid figures as they are all three-dimensional.
   c) and d) are plane figures as they are two-dimensional.

2.

	Figure	Faces(3)	Edges(4)s	Vertices(5)
a)	Cuboid	6	12	8
b)	Cylinder	3	2	0
e)	Triangle prism	5	9	6
f)	Pyramid	5	8	5
g)	Cone	2	1	1

Cuboids and cubes

On pages 147 to 149 in the Student's Book we explore the properties of cuboids and cubes. Students should be able to relate the rectangle and square shapes to cuboid and cube figures. Investigating the nets of these figures will allow them to see the shapes that are within the figure and transform the two-dimensional shapes into three-dimensional figures and vice versa.

Exercise 3

(SB page 149)

These are practical activities to investigate and explore the properties of cubes and cuboids. Ensure that students have the required resources. Guide students as they carry out the exercise as a class activity.

Drawing a cuboid and a cube

If time permits, work through the instructions on how to draw a cube or cuboid. Discuss how we use the two dimensions available on paper to represent three-dimensional objects.

Cones

Work through the properties of cones. Ensure that students are able to name the parts of a cone. Examining the net of a cone will show that the cone is made up of a circular base and one curved face. Constructing a paper cone will demonstrate how the dimensions are related. The construction will also show how important it is to know the formula for perimeter or circumference ($C = 2\pi r$).

Spheres and pyramids

Discuss spherical objects. Ask students to identify spheres found within the classroom and in their homes. Ensure that students understand that the radius of a circle is the same as the radius of a sphere.

Pyramids are not found as commonly in packaging as are cuboids and cubes. Discuss why this may be the case. Work through the description of pyramids. Ensure that students are able to identify the parts of a pyramid and different types of pyramids.

Exercise 4

(SB page 157)

1.

	Pyramid	Faces	Edges	Vertices
a)	triangular-based	4	6	4
b)	rectangular-based	5	8	5
c)	pentagonal-based	6	10	6

2. – 4. Answers will differ.

5. – 8. Practical activities. Use these activities to consolidate the information covered in this section. Some students may struggle with the more creative or practical activities. Reassure them that the knowledge of the properties and formula are essential, the practical work is for extension and consolidation.

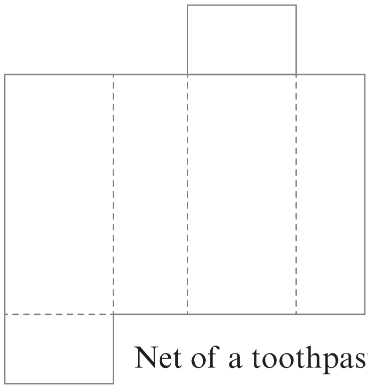
Worksheet 32

(WB page 70)

1. A pyramid always has an apex.
A prism has a face that remains the same from the top to the bottom of the prism.

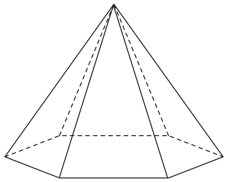
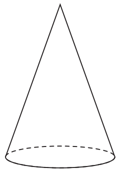
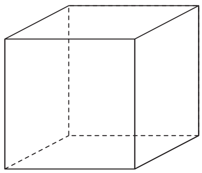
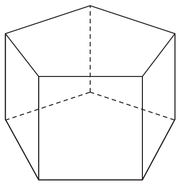
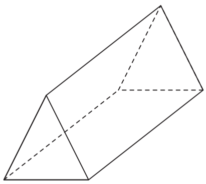
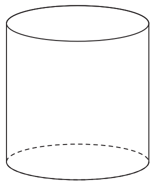
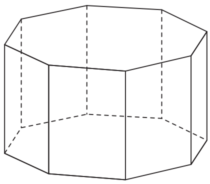
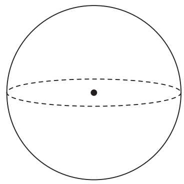
2. **a)** pyramid **b)** pyramid **c)** prism

3.



Net of a toothpaste box

4.

 Answer: Hexagonal pyramid	 Answer: Cone
 Answer: Cube	 Answer: Pentagonal prism
 Answer: Triangular prism	 Answer: Cylinder
 Answer: Octagonal prism	 Answer: Sphere

5. a) A sphere is a round solid three-dimensional object. Every point on the surface is the same distance from the centre.

b) A cylinder is a solid three-dimensional object with two flat circular ends with straight parallel sides.

c) A cube is a box-shaped three-dimensional object with six identical faces. All the faces are squares.

d) A cuboid is a box-shaped three-dimensional object with six faces. All the faces are rectangles.

e) A cone is a three-dimensional object with a circular flat base. Its curved side ends in an apex.

f) A pyramid is a three-dimensional object with a base of a polygon. Its sides are triangles that meet in an apex.

Unit 2: Volume of three-dimensional shapes

Students must be able to make the distinction between area and volume. It is also important to remember to use cubed units.

Volume of a cube and cuboid

Work through the description and examples of the volumes of cubes and cuboids. Exercise 5 allows students to investigate cubic measurement.

Exercise 5

(SB page 158)

1. $1 \times 1 \times 1 = 1 \text{ cm}^3$

2. 80

3. 6

4. $10 \times 8 \times 6 = 480 \text{ cm}^3$

Exercise 6

(SB page 160)

1. $4 \times 8 \times 4 = 128 \text{ cm}^3$

2. **a)** $90\,000 \text{ cm}^3$ **b)** 27 cm^3

3. $200 \times 10 \times 0.5 = 1\,000 \text{ cm}^3$

4. $36\,000 = 40 \times 25 \times h$

$h \times 25 = \frac{36\,000}{40}$

$h = \frac{900}{25}$

$h = 36 \text{ cm}$

Cylinders

Previously, we looked at cones. Cylinders also have a curved face, but they may have a base (circle) at either end. Work through the description of cylinders on pages 160 to 164. Ensure that students understand and know how to use the terms used to describe cylinders. Exercise 7 gives students practice in working with cylinders.

Exercise 7

(SB page 164)

1.– 2. Answers will differ. This may be given as a class project.

3. Practical activity. You may ask students to construct the cylinders physically or you might ask them to calculate the remaining dimensions as if they are going to do the construction.

Volume of a cylinder

Work through the explanation for finding the volume of a cylinder. Remind students that when there are units involved, volume is always written as units^3.

Exercise 8

(SB page 165)

1. a) $V = \pi r^2 h$
$= \pi 8^2(8)$
$= 1\ 608.5 \text{ cm}^3$

b) $V = \pi r^2 h$
$= \pi 4^2(10)$
$= 502.65 \text{ cm}^3$

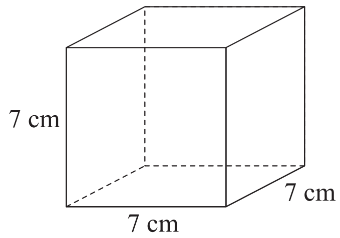
c) $V = \pi r^2 h$
$= \pi 2^2(13)$
$= 163.36 \text{ cm}^3$

2. $V = \pi r^2 h$
$= \pi 6^2(8)$
$= 905 \text{ cm}^3$

Worksheet 33

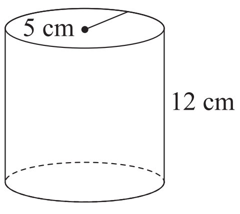
(WB page 75)

1. A cube with sides of 7 cm.



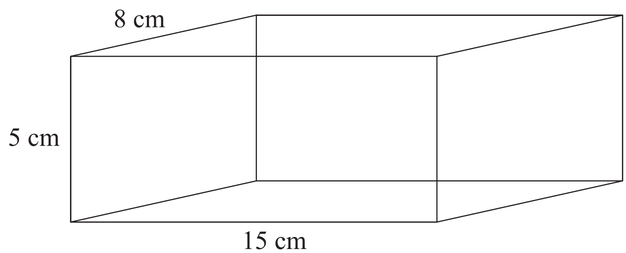
$V = l \times b \times h$
$= 7 \times 7 \times 7$
$= 343 \text{ cm}^3$

2. A cylinder with a radius of 5 cm and a height of 12 cm.



$V = \pi r^2 h$
$= \pi(5)^2 \times 12$
$= 942.48 \text{ cm}^3$

3. A cuboid with a length of 8 cm, a width of 5 cm and a height of 15 cm.



$V = l \times b \times h$
$= 8 \times 5 \times 15$
$= 600 \text{ cm}^3$

Topic 4: Angles

Teaching guidelines and solutions

In this topic the focus is on naming angles, measuring angles and identifying adjacent, vertically opposite, complementary, supplementary, alternate and corresponding angles.

Unit 1: What is an angle?

Start this section with a review of the origin of angles and their measurement. There are a variety of terms used to name the movement or distance covered about a point. Encourage discussion of these terms and ensure that students understand the meaning of revolution, turn, rotation and circle.

Revolutions

Have a large clock face with minutes and seconds clearly marked to show the relationship between 60 minutes (360 seconds) in an hour and 360 degrees in a circle. Explain that a turn and a revolution are essentially the same thing.

Exercise 1

(SB page 168)

1. a) $\frac{2}{12}$ **b)** $\frac{10}{12}$

2. a) $\frac{3}{12} = \frac{1}{4}$ **b)** $\frac{6}{12} = \frac{1}{2}$ **c)** $\frac{11}{12}$

Degrees

Explain that degrees are the unit of measurement for angles. The measurement of any angle is based on the premise that there must be 360 degrees in a complete revolution. Work through the example on page 168 in the Student's Book.

Unit 2: Types of angles

Naming angles

Spend some time in class allowing students to practise naming angles. The essential rule is that the vertex must be included in the name and there should be no ambiguity about the relevant angle.

Types of angles

Students should previously have encountered acute, obtuse, right, reflex and straight angles. Revise the terminology and ensure there ae no misconceptions. Use Exercise 2 as a revision exercise.

Exercise 2

(SB page 170)

1. **a)** right angle **b)** obtuse angle
c) acute angle **d)** reflex angle

2. **a)** $360° - 288° = 72°$ **b)** $360° - 28° = 332°$
c) $360° - 82° = 278°$ **d)** $360° - 128° = 232°$

3.

Type of angle	Size of angle
Acute	0° < angle < 90°
Right	90°
Obtuse	90° < angle < 180°
Straight	180°
Reflex	180° < angle < 360°
Revolution	360°

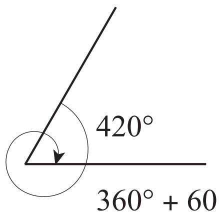
4. **a)** $\frac{420°}{360°} = 1\frac{60°}{360°} = 1\frac{1}{6}$ turns

b) $\frac{450°}{360°} = 1\frac{90°}{360°} = 1\frac{1}{4}$ turns

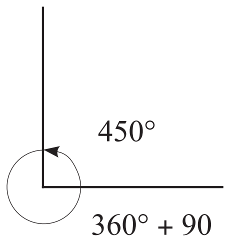
c) $\frac{540°}{360°} = 1\frac{180°}{360°} = 1\frac{1}{2}$ turns

d) $\frac{1\,080°}{360°} = 3$ turns

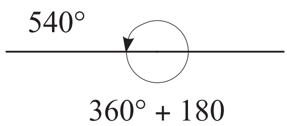
5. **a)**



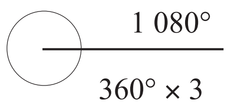
b)



c)



d)



Unit 3: Measurement of angles

Measuring angles

Revise the use of a protractor. Remind students that the protractor may be read from left to right or right to left. Ensure that they are confident with reading and drawing angles greater than 180°.

Exercise 3

(SB page 173)

Answers are given for the intended sizes of these angles. Allow students some variance in their answers.

1. 80° **2.** 135° **3.** 25°
4. 135° **5.** 340° **6.** 250°

Exercise 4

(SB page 175)

1. a) $\frac{1}{12}$ turn **b)** $\frac{1}{3}$ turn **c)** $\frac{7}{12}$ turn
d) $\frac{3}{4}$ turn **e)** 1 turn **f)** 0 or 2 turns

2. a) 144 **b)** 480 **c)** 310 **d)** 720
e) $\frac{3}{8}$ **f)** $\frac{260}{360} = \frac{26}{36} = \frac{13}{18}$ **g)** 5 **h)** $\frac{210}{360} = \frac{21}{36} = \frac{7}{12}$

3. a) 155° **b)** 30° **c)** 130°
d) 300° **e)** 35°

4. You might offer this as a group activity. Each student constructs the angles and they then compare their angles with others in their group.

Unit 4: Angles at a point

In this section, we look at the features of angles at a point. Work through the examples. Ensure that students clearly understand the difference between adjacent angles and vertically opposite angles.

Exercise 5

(SB page 178)

1. a) A, C, D, E
b) BCA & ACD, ACD & DCE, DCE & ECB, ECB & BCA, ADC & CDE
c) BCA = acute
ACD = acute
DCE = obtuse
ECB = obtuse

2. **a)** p **b)** r **c)** q

3. **a)** $b = 360° - 78° - 90° - 28° = 164°$
   b) $a = 45°$
   c) $w = 360° - 100° - 43° - 59° = 158°$
   d) $r = 12°$, $u = 180° - 73° - 12° = 95°$, $t = 95°$, $s = 73°$
   e) $k = 66°$, $j = 32°$, $m = 180° - 66° - 45° - 32° = 37°$

Unit 5: Angles that add up to 90°, 180° and 360°

These are naming conventions. Work through enough examples and exercises so that students are confident in identifying the relevant pairs of angles. Ensure that they understand that complementary or supplementary angles are not necessarily adjacent.

Exercise 6 (SB page 180)

1. The angles R_1 and R_2 are approximately 30° and 60°. Together they are 90°.

2. 60°

3. 22°

4. 139°

5. 97°

6. $90° - x$

7. $180° - (90° - x) = 90° + x$

8. x

9. No, complementary angles add up to 90°. A complementary angle must be less than 90°.

10. **a)** complementary **b)** supplementary
    c) neither **d)** supplementary
    e) complementary **f)** supplementary
    g) neither

Angles on a straight line

Angles on a straight line are supplementary. We can use this fact to find the values of unknown angles.

Exercise 7 (SB page 182)

1. a) m = 180° – 63° = 117°
b) p = 180° – 97° = 83°
c) f = 130°, g = 180° – 130° = 50°
d) m = 145°, n = 180° – 145° = 35°
e) f = 35°, g =145° – 64° = 81°

2. a) x = 90° – 72° = 18°
b) y = 90° – 30° – 25° = 35°
c) z = 180° – 30° = 150°
d) p = 180° – 51° – 45° = 84°
e) u = 180° – 63° – 29° = 88°
f) $r + c$ = 180° – 108° = 72°. The sum of r and c is 72°. No further calculations can be made.
g) x = 130°, y = 180° – 130° = 50°
h) a = 75°

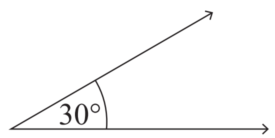
Unit 6: Parallel lines

There are relationships between the angles created by transversals cutting parallel lines. Encourage students to look for the "Z"-shape of alternate angles and the "F"-shape of corresponding angles. Include co-interior angles in your lesson. This is not strictly required but allows students to name another angle that is always present when there are parallel lines and transversals. Allow students to work out through discussion and investigation why co-interior angles are supplementary. Worksheet 34 provides good practice at identifying types of angles.

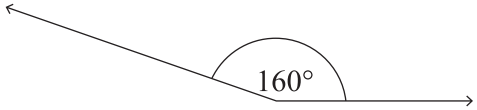
Worksheet 34 (WB page 76)

Answers will differ; ensure that students understand the range of each type of angle.

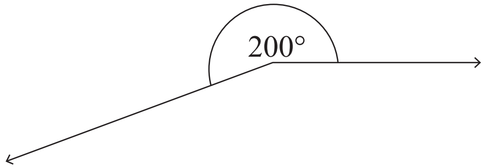
1. a) any angle between 0° and 90°



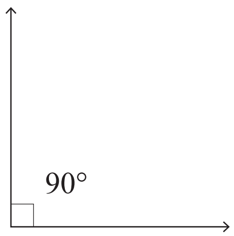
b) any angle between 90° and 180°



c) any angle between 180° and 360°



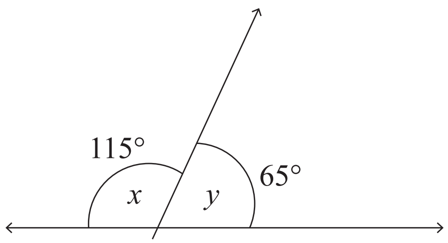
d) an angle of exactly 90°



e) Students must indicate one complete revolution.

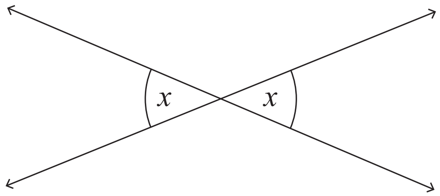
Answers will differ; ensure that students understand the position of each type of angle.

2. a) Any two angles next to each other, sharing a vertex and arm. The example is supplementary adjacent.

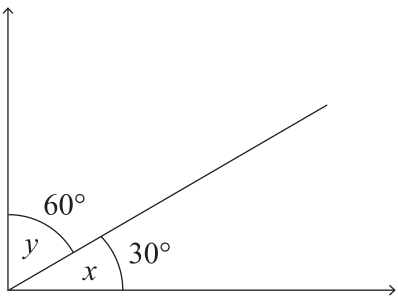


b) Show any number of angles, all sharing the same vertex, the sum of which make 360°.

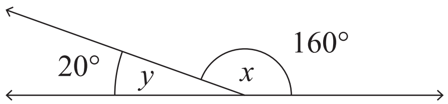
c) Any two angles created by two intersecting straight lines.



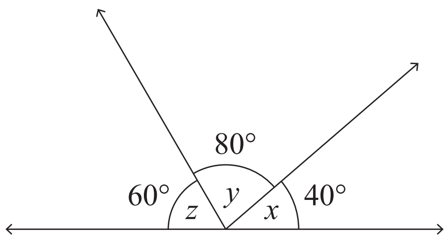
d) Any angles, the sum of which is 90°.



e) Any angles, the sum of which is 180°.

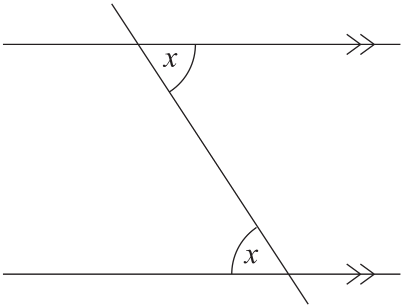


f) Any number of angles that together form a straight line, or 180°

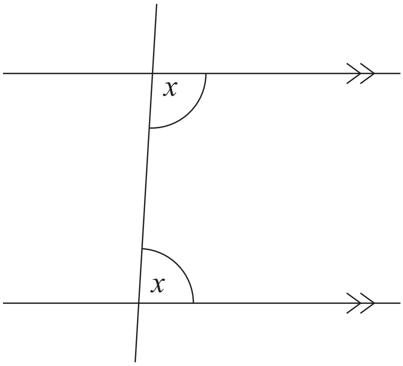


Answers will differ; ensure that students understand the position of each type of angle.

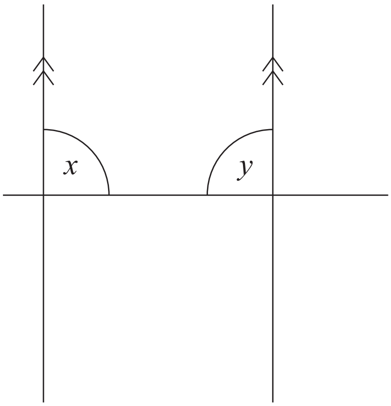
3. a)



b)



c)



Exercise 8 (SB page 188)

1.– 3. Practical activity. Allow students to check each other's answers.

4. a) PX̂Y
b) WX̂Q
c) SŶZ
d) XŶS or TŶZ
e) Yes, they are alternate angles.
f) TŶZ

Exercise 9 (SB page 190)

1. a) $x = 136°$ **b)** $x = 53°$ **c)** $x = 70°$

2. P = 120°, Q = 120°

3. $n = 53°$, $m = 127°$

4. a) $a = 51°$, $b = 100°$, $c = 80°$
b) $d = 118°$, $e = 62°$, $f = 118°$, $g = 62°$

Worksheet 35 (WB page 80)

1. a) 52 **b)** 135 **c)** $90 + x$
d) co-interior **e)** 87

2. a) $a = 123°$ (vertically opposite)
$b = 57°$ (angles on a straight line)
b) $c = 86°$ (alternate angles; XY||WZ)
$d = 86°$ (vertically opposite angles)
c) $e = 110°$ (corresponding angles; KL || MN)
$f = 35°$ (base angles of isosceles triangle)
$g = 145°$ (angles on a straight line)
d) $h = 66°$ (exterior angles = sum of interior opposite angles)
$i = 48°$ (angles on straight line)
or, $i = 48°$ (angles on straight line)
$h = 66°$ (base angles of isosceles triangle)

Unit 7: Sum of the angles of a triangle

Knowing that the interior angles of a triangle are supplementary is a valuable mathematical fact. Carry out the practical demonstration as a class activity. Choose some students to come forward and display to the rest of the class how the three corners of all triangles always equal 180°.

Exercise 10 (SB page 193)

1. ? = 180° – 60° – 60° = 60°

2. ? = 180° – 90° – 45° = 45°

3. ? = 180° – 70° – 80° = 30°

4. ? = 180° – 65° – 57° = 58°

5. ? = 180° – 40° – 90° = 50°

6. ? = 180° – 85° – 50° = 45°

Topic 5: Construction

Teaching guidelines and solutions

In this topic the focus is on constructing angles, parallel and perpendicular lines and bisecting line segments. The exercises and worksheets allow students to practise their construction skills.

Resources required

This section includes many practical activities. Ensure that students are well prepared with the correct resources required:

- a ruler
- a compass
- a protractor
- a sharp pencil
- an eraser
- plain sheets of paper.

Unit 1: Angle constructions

Remind students that they should always make a rough sketch first. Work through the step-by-step instructions on pages 194 to 197 in the Student's Book.

Exercise 1 (SB page 197)

1.– 3. Practical activity.

Worksheet 36 (WB page 82)

1.– 4. Practical activities.

Unit 2: Line constructions

Work through the step-by-step instructions on pages 198 to 200 in the Student's Book.

Exercise 2 (SB page 200)

1.– 8. Practical activities.

Worksheet 37 (WB page 84)

1.– 4. Practical activities.

THEME 5 Everyday statistics

Term 3

Topic 6: Need for statistics

Teaching guidelines and solutions

In this topic the focus is on the meaning and purpose of statistics and how we use statistics in planning and prediction in everyday life.

Unit 1: Statistics provide information

Encourage class discussion as you introduce this topic. Be sure to have a variety of examples that illustrate how statistics can be used within the school or classroom as well as in global situations. Both Exercise 1 and Worksheet 38 use statistics on Nigeria. Use this fact to illustrate that statistics can be tailored to fit different requirements. Also point out that the common statistic of population figures differs as the statistics were gathered at different times.

Exercise 1 (SB page 203)

1.– 3. Practical activities.
Use these activities to encourage discussion and lead students to understand the purpose of statistics.

Worksheet 38 (WB page 86)

1. **a)** The population of Nigeria as at 1 July 2014
b) The government
c) If you place all the ages in ascending order, the middle age is 17.8 years.
d) No, you would need to take other factors into account such as the mortality rate.

2. Answers will differ. Ask some students to present their answers to the class.

Topic 7: Data collection

Teaching guidelines and solutions

In this topic the focus is on methods of collecting data.

Unit 1: Methods of data collection

This topic should be introduced with active class discussion. Allow students to find and present examples of data collection. The focus is on questionnaires as these are the most formal method. Discuss more informal examples of data collection such as observation and interviews.

Unit 2: Frequency tables

The process of collecting data includes recording data. Start with small sample sizes and allow students to explore how they would record results. Develop this to an explanation of frequency tables. It is important for students to understand that this is a formal method and that the conventions used must be observed.

Exercise 1

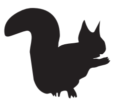
(SB page 205)

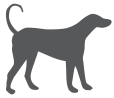
1.– 2. Practical activities. These may be done as class projects.

3.

Colour	Tally	Frequency
Red	~~||||~~ ||	7
Green	|||	3
Blue	~~||||~~	5
Yellow	||	2
Total		17

4. a)

Animal	Tally	Frequency
	~~||||~~ ||	7
	||||	4

Animal	Tally	Frequency
	~~||||~~	5
	||	2
Total		18

b) 5 **c)** 2 **d)** 18

5. **a)** Practical activity. Answers should be similar to this example.

Subjects	Tally	Frequency
Mathematics	~~||||~~ ||	7
P.E.	~~||||~~ |	6
English	||||	4
French	||||	4
Science	|	1
Total		22

b) 22 people

c) 7 people prefer Mathematics, 4 prefer English. So, the difference is 3 people.

d) Mathematics is the favourite subject.

6. Practical activity. Answers should be similar to this example.

Data items	Tally	Frequency
1	~~||||~~	5
2	~~||||~~ |	6
3	~~||||~~	5
4	~~||||~~ ||||	9
5	~~||||~~ ~~||||~~	10
6	||||	4
7	|||	3
8	~~||||~~	5
9	|||	3
Total		50

Worksheet 39 (WB page 88)

1. a) 0; 0; 0; 0; 1; 1; 1; 1; 1; 1; 1; 2; 2; 2; 2; 2; 2; 3; 3; 3; 3; 3; 4; 4; 4; 5; 5; 5; 5; 7

b)

Number of times travelled	Tally	Number of students
0						4
1	~~||||~~ ||	7
2	~~				~~		6
3	~~||||~~	5
4					3
5 or more	~~||||~~	5

c) 1

d) 5

2. a) Answers will differ.
Students should list only 5 questions, for example:
List your 3 favourite sports.
List the sports you play this year.
List the sports you wish to play next year.
List your 3 least favourite sports.
Rank your sports from 1 to 8; 1 being your favourite.

b)

Sport	Tally	Number of students
Rugby	~~||||~~	5
Cricket	|||	3
Soccer	||||	4
Swimming	||	2
Dancing			1
Running	~~||||~~		6
Basketball	~~||||~~ ||	7
Tennis	||	2

c) 30

d) Basketball

e) Dancing

f) Dancing
Swimming
Tennis

g) No. These results are only from one class. It is not a big enough sample to represent the entire school.

Topic 8: Data presentation

Teaching guidelines and solutions

The focus in this topic is on methods of presenting statistical data as averages.

Unit 1: Averages

The mean, median and mode are three ways of finding the average of a data set. We generally think of the average as the typical value of a data set. Explain that these values are also known as measures of central tendency. Ensure that students understand the differences between these values. There are advantages and disadvantages to using different values as being representative of the entire set.

Exercise 1

(SB page 209)

1. a) 17, 17, 18, 19, 19, 21, 23
mean = 19.14, mode = 17 and 19, median = 19

b) 3, 3, 3, 4, 5, 6, 7, 9
mean = 5, mode = 3, median = 4.5

c) 12, 14, 14, 14, 16, 18, 19, 20
mean = 15.875, mode = 14, median = 15

d) 4.2 cm, 6.4 cm, 6.7 cm, 7.2 cm, 7.2 cm, 7.3 cm
mean = 6.5 cm, mode = 7.2 cm, median = 6.95 cm

e) 172 ml, 193 ml, 240 ml, 251 ml, 257 ml, 276 ml, 298 ml, 301 ml
mean = 248.5 ml, mode = none, median = 254 ml

2. a) $\frac{(5 \times 1 + 6 \times 2 + 7 \times 4 + 8 \times 3 + 9 \times 2)}{(1 + 2 + 4 + 3 + 2)}$

$= \frac{87}{12}$

$= 7\frac{3}{12}$

$= 7\frac{1}{4}$

b) $\frac{(35 \times 2 + 36 \times 5 + 37 \times 3 + 38 \times 1 + 39 \times 1)}{(2 + 5 + 3 + 1 + 1)}$

$= \frac{438}{12}$

$= 36\frac{6}{12}$

$= 36\frac{1}{2}$

c) $\frac{(9 \times 9 + 10 \times 14 + 11 \times 17 + 12 \times 21 + 13 \times 6)}{(9 + 14 + 17 + 21 + 6)}$

$= \frac{738}{67}$

$= 11\frac{1}{67}$

3. 59, 67, 72, 75, 76, 85, 91, 98
mean = $77\frac{7}{8}$ kg, mode = none, median = 75.5 kg

4. a) 16 °C, 18 °C, 19 °C, 20 °C, 21 °C, 22 °C, 22 °C, 23 °C, 27 °C, 31 °C
mean = 21.9 °C, mode = 22 °C, median = 21.5 °C

b) The median provides the best average. The mode and the mean could be skewed by a small number (such as 16 °C) or a large number (such as 31 °C) which are both outside the norm.

5. Mean for week 1 is 14 mm; mean for week 2 is 12.4 mm.

Worksheet 40

(WB page 91)

1. a) Mean: $\frac{241}{25} = 9.64$
Median: 8
Mode: 6

b) Mean: $\frac{4.02}{12} = 0.335$
Median: 0.34
Mode: 0.34

2. a) $\frac{984}{30} = 32.8$

b) 11 out of 50 or 22%

c) 47 out of 50 or 94%

d) Yes. The average mark was 65.6% which is a good average. 9 students achieved 80% or more.

e) 37 and 40

TERM 3

Revision

You may use the revision questions or a selection thereof 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 exercise solutions

Simple equations

1. a) Answers will differ.

b) Answers will differ.

c) x

$2x$

$2x + 12$

$\frac{2x + 12}{2}$ simplified $x + 6$

$x + 6 - x = 6$

2. a)
$$5x + 3 = 23$$
$$5x = 20$$
$$x = \frac{20}{5}$$
$$x = 4$$

b)
$$4x - 7 = 25$$
$$4x = 32$$
$$x = \frac{32}{4}$$
$$x = 8$$

c)
$$3(x - 5) = 30$$
$$x - 5 = \frac{30}{3}$$
$$x = 10 + 5$$
$$x = 15$$

d) $6p - 7$

e) i. $P = f + (f + 4) + (f + 5)$

ii.
$$P = 51$$
$$\therefore f + (f + 4) + (f + 5) = 51$$
$$3f + 9 = 51$$
$$3f = 42$$
$$f = \frac{42}{3}$$
$$f = 14$$

3. a)
$$x + 4 = 6$$
$$x = 2$$

b)
$$x + 7 = 17$$
$$x = 10$$

c)
$$7 + y = 19$$
$$y = 12$$

d)
$$x - 2 = 4$$
$$x = 6$$

e) $y - 7 = 11$
$y = 18$

f) $a - 9 = 18$
$a = 27$

g) $6 - y = 4$
$y = 2$

h) $12 - x = 2$
$x = 10$

i) $19 - x = 5$
$x = 14$

j) $12a = 36$
$a = \frac{36}{12}$
$a = 3$

k) $6x = 42$
$x = \frac{42}{6}$
$x = 7$

l) $8y = 36$
$y = \frac{36}{8}$
$y = 4\frac{4}{8}$
$y = 4\frac{1}{2}$

m) $7b = -35$
$b = -\frac{35}{7}$
$b = -5$

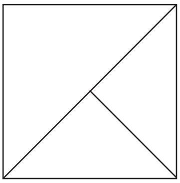
n) $4y = -24$
$y = -\frac{24}{4}$
$y = -6$

o) $4b = -10$
$b = -\frac{10}{4}$
$b = -2\frac{2}{4}$
$b = -2\frac{1}{2}$

Plane shapes

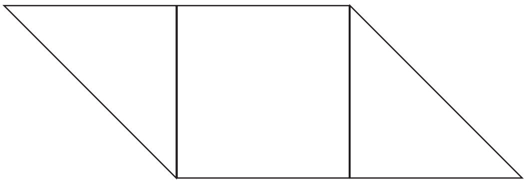
1. a) Answers will differ; one example is shown for each question.

i.

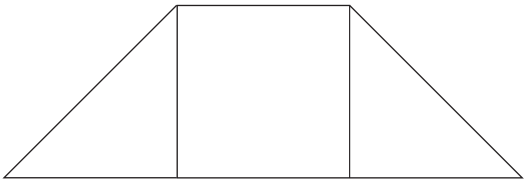


ii.

iii.



iv.



b) Both a square and a rectangle have: 4 sides; 4 right angles; opposite sides equal; opposite sides parallel.
c) Rectangles have 4 right angles, a parallelogram has 2 sets of equal angles.
d) Yes, because a parallelogram has opposite sides equal and parallel.

2. **a)** A, C, D **b)** B, C

3. **a)** arc **b)** sector **c)** radius
d) chord **e)** circumference **f)** segment
g) diameter

4.

No.	Name	Area
a)	Square	4 cm^2
b)	Isosceles triangle	8 cm^2
c)	Isosceles triangle	2 cm^2
d)	Isosceles triangle	8 cm^2
e)	Parallelogram	4 cm^2
f)	Isosceles triangle	2 cm^2
g)	Isosceles triangle	4 cm^2

5. **a)** P = 2(3 + 3) = 12 cm
A = 3 × 3 = 9 cm^2
b) P = 2(6 + 8) = 28 cm
A = 6 × 8 = 48 cm^2
c) P = 2(9 + 3.4) = 24.8 cm
A = 9 × 3.4 = 30.6 cm^2
d) P = 2(8.4 + 9.3) = 35.4 cm
A = 8.4 × 9.3 = 78.122 cm^2
e) P = 2(1.2 + 80) = 162.4 cm
A = 1.2 × 80 = 96 cm^2
f) P = 2(160 + 0.9) = 321.8 metres
A = 160 × 0.9 = 144 meters

6. 20 cm^2

7. **a)** $A = l \times b = 12 \times 8 = 96$ cm^2
b) $A = \frac{1}{2}b \times h = \frac{1}{2}(13.3) \times 12 = 79.8$ cm^2
c) $A = \frac{a+b}{2}h = \frac{7+12}{2}11 = 104.5$ cm^2

d) $A = \frac{1}{2}b \times h = \frac{1}{2}(6) \times 5 = 15\ cm^2$

e) $A = \pi r^2 = \pi \frac{35}{2}^2 = 962.11\ cm^2$

f) $A = l \times b = 10.5 \times 6.2 = 65.1\ cm^2$

8. a) $C = 2\pi r = 2\pi\frac{25}{2} = 78.53\ cm^2$

b) $A = \pi r^2 = \pi\frac{25}{2}^2 = 490.87\ cm^2$

9. $A = \pi r^2$

$1\ 520.53 = \pi r^2$

$\frac{1\ 520.53}{\pi} = r^2$

$\sqrt{483.9997312} = r$

$r = 22\ (21.99999389)$ cm

10. $A = \pi r^2 - \pi r^2$

$A = \pi 15^2 - \pi 9^2$

$A = 706.86 - 254.47$

$A = 452,39\ cm^2$

11. a) $P = 12 + 9 + 15 = 36$ cm

b) $A = \frac{ab}{2} = [12 \times 9] = 54\ cm^2$

12. $A = l \times b$

$l = \frac{A}{b}$

$l = \frac{48}{6}$

$l = 8$ cm

13. $A = \frac{b}{2}h$

$b = \frac{2A}{h}$

$b = \frac{2(250)}{25}$

$b = 20$ cm

14. a) total $A = A_1 + A_2$

$= (7 \times 8) + (5 \times 2)$

$= 56 + 10$

$= 66\ cm^2$

b) There are a number of ways to find the answer; this is one example.

total $A = 2(A_1) + A_2$

$= 2(22 \times 10) + (40 \times 8)$

$= 440 + 320$

$= 760\ cm^2$

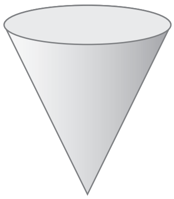
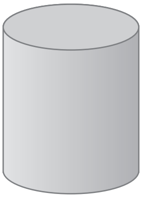
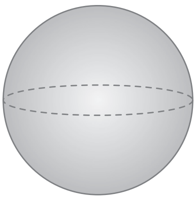
Three-dimensional shapes

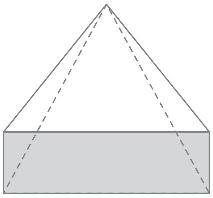
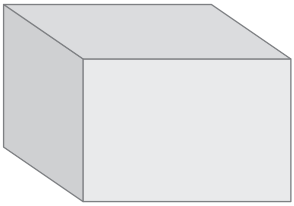
1. Match each word to the right meaning.

cone	figure with a circle base and one point
cylinder	figure shaped like a can
edge	line where two sides meet
vertex	a point
solid figure	3-dimensional figure
plane figure	2-dimensional figure
rectangular prism	figure with rectangle faces

2. **a)** Cone
b) Cube
c) Cylinder
d) Rectangular-based pyramid
e) Triangular prism

3.

Shape	Name	Everyday object
	Cone	Answers will differ
	Cylinder	Answers will differ
	Sphere	Answers will differ

Shape	Name	Everyday object
	Rectangular-based pyramid	Answers will differ
	Cuboid	Answers will differ

4. a) A cone **b)** A sphere **c)** A cylinder

5. a) V = $l \times b \times h$ = 4.3 × 4.3 ×4.3 = 79.51 cm^3
b) V = $\pi r^2 \times h$ = $\pi 3.7^2$ × 7.1 = 305.36 cm^3
c) V = $l \times b \times h$ = 12.4 × 4.1 ×18.6 = 945.62 cm^3
d) V = $\pi r^2 \times h$ = $\pi 4^2$ × 13 = 653.45 cm^3
e) V = $l \times b \times h$ = 20 × 5 × 13 = 1 300 cm^3

Construction

1. Practical activity.

2. Practical activity.

3. Practical activity.
This construction shows the interior angles of a triangle equal 180°.

4. Practical activity.
This construction shows how to draw a square.

5. Practical activity.
This construction shows how to draw an equilateral triangle.

6. Practical activity.

Angles

1. a) 90° **b)** 6 **c)** 240°

2. a) Answers will differ
b) Answers will differ

c) The following pairs are adjacent: A1 and A2; A2 and A3; A3 and A4; A4 and A5; A5 and A1; B1 and B2; C1 and C2.
d) Any angle except A_5 and B_2

3. a) Complementary angles
b) 165°
c) Complementary
d) 180°
e) A scalene triangle
f) A reflex angle

4. a) Vertically opposite angles are equal.
b) *b, d*
c) 360°. Angles around a point (a circle) are equal to 360°.

5. a) Alternate angles are equal.
b) Corresponding angles are equal.
c) *g*, *i*
d) *h, i* or *e, g*
e) *h*, vertically opposite angles or,
i, corresponding angle or,
e, alternate angle.

6. a) $a = 117°$
b) $g = 144°$
c) $x = 155°$
d) $c = 45°$
$b = 35°$
e) $x = 102°$
f) $a = 105°$
$b = 75°$
$c = 75°$
g) $d = 44°$
$e = 56°$
$f = 80°$
$g = 136°$

7. a) 50°
b) 110°
c) $c = 44°$
$d = 134°$
d) $c = 49°$
$d = 131°$
$e = 99°$
$f = 130°$

Everyday statistics

1. **a)** Answers will differ.
   b) 0; 0; 1; 1; 1; 1; 1; 2; 2; 3; 3; 3; 3; 4; 4; 5; 6; 6; 7; 8
   5 + 4 + 12 + 8+ 5 + 12 + 7 + 8 = 61
   $\frac{61}{20} = 3.05$
   c) 3
   d) 1
   e) Thursday
   f) Answers will differ.

2. Planning
   Decision making
   Assessment and monitoring of a situation or trend.

3. Answers will differ.

4. **a)** Drawing **b)** Embroidery
   c) 15 **d)** 42

5.

Temperature	Tally
17 °C	||||
18 °C	|||| ||
19 °C	|||| |||
20 °C	|||| |
21 °C	||||

6. **a)** 46, 46, 48, 49, 50, 51, 52, 52, 53, 54, 55, 55, 57, 59, 60
   b) 52.47
   c) 52
   d) 46, 52, 55

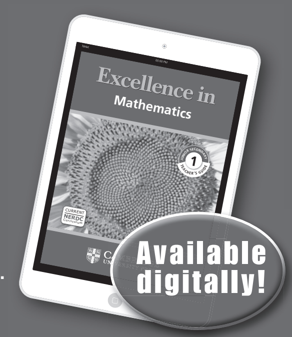
Aim for Excellence with Cambridge!

Cambridge Excellence in Mathematics Junior Secondary brings you a first-class print and digital course for mathematics. The course has been developed in accordance with the 2013 **NERDC** Curriculum and follows a clear Scheme of Work. It offers students accessible, high quality content aimed at developing logical reasoning.

Cambridge Excellence in Mathematics Junior Secondary 1 has three components.

A Student's Book which offers:

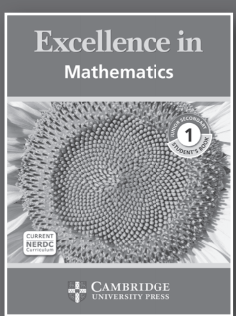
- accessible content, supported by functional illustrations
- the opportunity to investigate mathematical problems through a variety of stimulating exercises
- questions to help students develop creative problem-solving skills
- revision sections throughout the book.



A Workbook which offers:

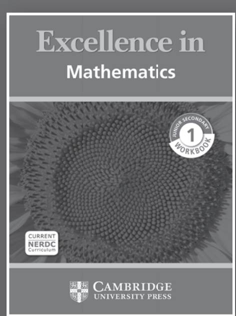
- exercises that will consolidate the skills learnt in the Student's Book.

Student's Book



ISBN: 9781316608630

Workbook



ISBN: 9781316608647

FREE

A Teacher's Guide which offers:

- Schemes of Work to help plan lessons
- clear teaching guidelines
- answers to exercises and activities in the Student's Book and Workbook
- evaluation tools to help assess the students' development of specific skills.

CAMBRIDGE
UNIVERSITY PRESS
www.cambridge.org