Nigeria

Junior Secondary Maths

Form 1

Teacher’s Guide for NGM JSS1
This is the first time in two decades that a teacher’s component has been prepared for the *New General Mathematics* series, which previously consisted of the Student’s Book and the Student’s Practice Book. In this revision, the Student’s Practice Book has been called the Workbook. This Teacher’s Guide supports the *New General Mathematics* for Junior Secondary Schools 1–3 series as revised to align to the 2013 NERDC curriculum.

The Teacher’s Guide contains:
- information on how to use the course as a whole
- a suggested scheme of work for the year and a curriculum matching chart
- additional chapters not included in the Student’s Book. You can use these with your class if time permits
- suggested lesson plans of how to break each chapter down into teachable portions, as well as notes on foundation knowledge required and assessment milestones
- printable test papers for the chapter revision and term revision tests
- answers for the puzzle corners, chapter revision tests, and term revision tests, which were deliberately excluded from the Student’s Book
- workbook marking sheets.

We hope that you will find this guide a useful resource for you as a teacher. We welcome any comments or suggestions you may have, and ask you to direct your comments through the publisher, using our website address [www.pearsonnigeria.com](http://www.pearsonnigeria.com).
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The chart on the following pages also appears in the Students’ Book. It combines a Scheme of Work for JSS1 with corresponding themes and objectives that appear in the current NERDC basic mathematics curriculum for Junior Secondary schools.

Scheme of Work
The Scheme of Work appears in the three left-hand columns of the chart. The Scheme follows the chapter order of *New General Mathematics* JSS Student’s Book 1 and is based on an average school term of ten effective teaching weeks. The chapters in the book have been carefully arranged in a sequence that combines a logical coverage of the curriculum topics with a spiral approach to learning. By spiral approach, we mean that instead of treating a curriculum theme (such as algebra) all at once, the chapters return to a theme throughout the year, enabling step-by-step learning so as to develop competence and capacity over time. Note that the Scheme of Work makes allowance for end-of-term revision and testing, an important component of the school year.

The chapter order provides a sound and carefully thought-out Scheme of Work. However, other schemes are perfectly possible. Your school, district or State may have a preferred approach. We advise that you follow the official scheme where it exists. Otherwise, simply follow the chapter order of *New General Mathematics* JSS Student’s Book 1.

Curriculum matching chart
The two right-hand columns of the chart show how the chapters of *New General Mathematics* JSS Student’s Book 1 match with the National Curriculum as published by NERDC in 2013. The first column shows the five curriculum themes and related topics and the page number in the NERDC curriculum where they may be found. The curriculum themes are:

- Number and numeration
- Basic operations
- Algebraic processes
- Mensuration and geometry
- Everyday statistics

The final column contains related curriculum performance objectives.

Together, these columns show that *New General Mathematics* JSS Student’s Book 1 fully covers the NERDC curriculum. However, due to space restrictions, NERDC references have been abbreviated. We advise that you refer to the full 36-page Mathematics Curriculum document (NERDC, 2013).

We wish to draw your attention to the performance objectives. The objectives state what students should be able to do after they have been taught a topic. Objectives are spelled out in full at the beginning of each chapter of NGM and are reflected in the Chapter Summary that appears at the end of the chapter. Each chapter contains an end-of-chapter test to help you to measure student attainment of the objectives.
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<td>Add, subtract numbers correctly</td>
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<td>Count and write in millions, billions, trillions Count, write and read large quantities Develop QR with large numbers</td>
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<td>Number &amp; Numeration, pp. 1–2 Topics 2 and 3: LCM, HCF</td>
<td>Find LCM and HCF of whole numbers Develop QR with LCM and HCF</td>
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<td>Identify and use equivalent fractions Arrange fractions in ascending and descending order Convert fractions to percentages Add and subtract fractions</td>
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<td>Measure and identify angles</td>
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<td>Algebraic Processes, p. 11 Topic 1: Use of symbols Algebraic Processes, p. 12 Topic 2: Simplification of algebraic expressions</td>
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<td>Solve open sentences involving two arithmetic operations Solve word problems and QR involving use of symbols Write word problems in symbolic terms</td>
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<td>Identify various plane shapes by name and property</td>
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<td>Directed numbers: Addition and subtraction</td>
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<td>Draw and use the number line to illustrate directed numbers Relate negative numbers to everyday activities Add and subtract positive and negative numbers</td>
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<td>Find the perimeter of regular polygons (square, rectangle, triangle, trapezium, parallelogram and circle)</td>
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<td>Geometry and Mensuration, p. 14 Topic 1: Plane shapes</td>
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<td>Find the area of regular and irregular shapes (square, rectangle, triangle, trapezium, parallelogram and circle) Relate finding area to real-life situations</td>
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<td>Algebraic simplification 2: Brackets</td>
<td>15</td>
<td>Algebraic Processes, p. 12 Topic 2: Simplification of algebraic expressions</td>
<td></td>
<td>Insert/remove brackets Simplify algebraic expressions Write word problems in symbolic terms Develop QR in problems involving brackets</td>
</tr>
<tr>
<td>Week 8</td>
<td>Ch 16</td>
<td>Solids 2: Volume</td>
<td>16</td>
<td>Geometry and Mensuration, p. 15 Topic 2: Three-dimensional figures</td>
<td></td>
<td>Find the volume of cubes, cuboids</td>
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NERDC JSS1 Scheme of Work and Curriculum matching chart
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<td>Statistics 1: Purpose and data collection</td>
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<td>Everyday Statistics, p. 17 Topic 1: Need for statistics Topic 2: Data collection</td>
<td>List purposes of statistics Use statistics for planning, analysis and prediction Collect statistical data</td>
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<td>Week 2</td>
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<td>Statistics 2: Presentation of data</td>
<td>18</td>
<td>Everyday Statistics, p. 17 Topic 3: Data presentation</td>
<td>Present statistical data in lists, tables and graphs</td>
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<td>Week 3</td>
<td>Ch 19</td>
<td>Simple equations</td>
<td>19</td>
<td>Algebraic Processes, pp. 11, 13 Topic 1: Use of symbols Topic 3: Simple equations</td>
<td>Solve open sentences involving two operations Translate word sentences into equations Solve simple equations and check the solution of an equation</td>
</tr>
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<td>Week 4</td>
<td>Ch 20</td>
<td>Angles 2: Angles between lines; angles in a triangle</td>
<td>20</td>
<td>Geometry and Mensuration, p. 16 Topic 4: Angles</td>
<td>Identify and recall the properties of vertically opposite angles, angles at a point, angles on a straight line, adjacent angles, alternate angles, corresponding angles Find the sum of the angles of a triangle Relate angles to real situations</td>
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<td>Geometrical constructions</td>
<td>21</td>
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<td>Construct parallel and perpendicular lines Bisect a line segment Construct angles of 90° and 60°</td>
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<td>Statistics 3: Averages</td>
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<td>Everyday Statistics, p. 17 Topic: Averages</td>
<td>Determine the mean, median and mode of a set of data</td>
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<td>Estimation and approximation</td>
<td>23</td>
<td>Basic Operations pp. 7–8 Sub theme: Derived operations Topic 1: Estimation Topic 2: Approximation</td>
<td>Estimate dimensions lengths, distances, capacities and mass of various objects Approximate answers to addition, subtraction, multiplication and division problems Round off numbers to various degrees of accuracy Apply approximation to everyday life Use QR in estimation and approximation</td>
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<td>24</td>
<td>Number &amp; Numeration, p. 3 Topic 4: Counting in base two Topic 5: Conversion of base ten numerals to binary numbers Basic Operations, p. 9 Topics 3, 4, 5: Addition, Subtraction and Multiplication of numbers in base two</td>
<td>Count and group objects in twos Convert numbers between bases ten and two Add and subtract with binary numbers up to 3 digits Multiply with binary numbers up to 2 digits</td>
</tr>
<tr>
<td>Week 9</td>
<td>Revision Exercises and Tests, Ch 17–24</td>
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<td>Use revision exercises and tests to consolidate Term 3 content</td>
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| Week 10 | End of Term 3 |

**Note:** QR means Quantitative Reasoning (ability to cope with numbers and calculation).
**Features of the Student's Book**

The *New General Mathematics* JSS Student's Book 1 consists of 24 chapters. Each chapter starts with a list of objectives, or commonly known as performance objectives (as listed in NERDC, 2013), that will be covered in each chapter.

In addition, the exercises in the Student's Book have been carefully developed to ensure integration of the performance objectives from the curriculum, and a steady progression of skills throughout the year.

The curriculum matching chart and scheme of work provide a suggested order for you to follow.

The chapters follow a ‘teach and practise’ approach:
- **Teaching and learning materials** are suggested. This section gives suggestions on what teachers and student should bring to each lesson. We understand that it is not always possible to provide everything listed. However, always remember that Mathematics is a ‘doing’ subject. Therefore every student will need at least an exercise book, a pen, a drawing set and, when appropriate, graph (grid or block) paper.
- **New concepts** are explained and given context in their meaning. A full glossary is included at the back of the Student’s Book as well.
- **Worked-through examples** provide students with guidelines and models for setting out mathematical work. In some cases, we have added mark schemes to show students and teachers how marks are earned.
- **Exercises** allow students to practise on their own.
- Exercises are graded by writing the question numbers in three different ways:
  1. You must do all of these questions if you are to understand the topic.
  2. You should do these questions if possible.
  3. If you want a challenge, then you could do these questions.
- At the end of each chapter is a chapter **summary** that lists the main learning outcomes students need to achieve.
- **Revision** exercises round off each chapter as a mixed exercise covering all the problems addressed in the chapter.
- **Summative assessment** activities are provided at the end of every term in the three revision chapters. These assessments test students on all the knowledge and skills they have gained in each term.

Additional features include:
- **Key words**: Key terminology, with definitions, is highlighted for the students.
- **Puzzle corners**: Additional problems, usually in a real-life context to help grow an appreciation of mathematics in everyday life.
- **Quantitative reasoning [QR]**
  Where you see QR beside an exercise or a question, this stands for Quantitative Reasoning. Students should do and discuss these questions with you and their classmates. They give special practice at improving the students’ number work and their ability to calculate.

**Features of the Teacher’s Guide**

This *New General Mathematics* JSS Teacher’s Guide 1 is lesson-based. The chapters of the Student’s Book are organised into a series of lessons. Chapters include the following features:
- The performance objectives from the curriculum that are covered in the chapter
- A list of suggested resources you will need
- Definitions for the key words in the Student’s Book
- Foundation knowledge students need at the start of the chapter
- Suggested focus for each lesson
- Answers to the Puzzle corners and Workbook
- Assessment notes on how to evaluate students on key learning milestones.

The intention behind the puzzle corners is to provide students and the teachers with some
challenges that both can engage in. Many of the puzzles are open-ended and therefore do not have a ‘final answer’. Think of them as a journey rather than a destination, i.e. a process, not a product. To save space we have not included solutions that require extensive artwork. However, the authors are happy to engage with readers if they care to get in touch with them via the publisher.

Note: The lesson-based guidelines are suggestions only. You, as the teacher, will need to assess how much your students are able to cover in each lesson.

Additional Preliminary or Enrichment chapters are also provided if you have additional teaching time. These can be done at any point during the year, as you feel necessary.

The Teacher’s Guide also includes resources for testing and marking:

- **Chapter revision test sheets:** These are printable test sheets that you can use for formally assessing your class. They are based on the chapter revision tests at the end of each chapter.

- **Chapter revision test answers:** The answers for all the chapter revision tests are provided in the Teacher’s Guide.

- **Term revision test sheets:** These are printable test sheets that you can use for formally assessing your class. They are based on the term revision tests at the end of each term.

- **Term revision test answers:** These are answers that you can use as a guide to formally assess your class. These answers are based on the term revision tests at the end of each term.

- **Workbook answer sheets:** The answers to the Workbook are given in the form of completed worksheets, with the answers filled in. These can be used as marking memoranda for the worksheets.

**Features of the Workbook**

The New General Mathematics JSS Workbook 1 provides a worksheet for every chapter in the Student’s Book. Students use these worksheets to practise the specific mathematical skills and concepts covered in each chapter. It forms as a consolidation of the students’ understanding and is a useful resource for homework assignments.

Students can record their answers and calculations in the spaces provided on each of the worksheets. The answers to these worksheets are all provided in the Teacher’s Guide.

**Methodology**

Mathematics teaching and learning goes beyond reaching the correct answer. Many mathematical problems have a range of possible answers. Students need to understand that Mathematics is a tool for solving problems in the real world; not just about giving the correct answers.

The Mathematics classroom must therefore provide an environment in which problem-solving is seen as integral to the teaching programme, and where learning activities are designed to provide students with opportunities to think.

Working mathematically involves:

- questioning
- applying strategies
- communicating
- reasoning
- reflecting.

Alongside developing the necessary problem-solving skills and strategies, the New General Mathematics JSS Teacher’s Guide 1 focuses on students to gain specific mathematical knowledge as tools for problem-solving. At Junior Secondary 1, these tools include:

- Counting and writing in millions, billions and trillions
- Applying counting, reading and writing of large numbers in real life
- Identifying common multiples of two or more whole numbers
- Finding the LCM and HCF of whole numbers
- Identifying common factors of whole numbers
- Identifying the difference between LCM and HCF
- Counting in groups of 2s
- Converting base-ten numerals to binary numbers
- Identifying equivalent fractions of any given fraction
- Applying equivalent fractions in sharing of commodities
- Finding equivalence of any given fractions
Arranging given fractions either in ascending or descending order
Converting decimals to fractions and fractions to decimals
Converting fractions to percentages and percentages to fractions
Adding and subtracting any given numbers (up to four digits)
Stating the place value of each number in the sum or difference
Drawing and using number lines to illustrate directed numbers
Adding and subtracting positive and negative integers on the number line
Interpreting and relating positive and negative numbers to everyday activities
Estimating the dimensions and distances within the school
Estimating the capacity and mass of given objects
Estimating other things in day-to-day activities
Approximating answers to addition and subtraction problems to a given degree of accuracy
Approximating answers to multiplication and division problems to a given degree of accuracy
Rounding off numbers to the nearest 10, 100 and 1 000
Applying approximation involving basic operations in everyday life activities
Adding two or three 3-digit binary numbers
Subtracting two 3-digit binary numbers
Multiplying two 2-digit binary numbers
Working with open sentences
Identifying the relationship between addition and subtraction, multiplication and division
Using letters to represent symbols or shapes in open sentences
Identifying and collecting like terms in a given expression
Identifying the coefficient of a given algebraic term
Identifying the positive and negative coefficients of a given algebraic term
Performing basic arithmetic operations on expressions of similar terms
Inserting/removing brackets and simplifying expressions
Translating word sentences into mathematical equations
Using mathematical equations to represent word sentences
Stating the similarities and differences between the square, rectangle, triangle, trapezium, parallelogram and circle
Finding the perimeter of a rectangular polygon, square, rectangle, triangle, trapezium, parallelogram and circle
Finding the area of plane shapes such as squares, rectangles and parallelograms
Finding the area of real-life plane objects
Identifying the properties of cubes and cuboids, pyramids and cones, cylinders and spheres
Find the volume of a cube and cuboid
Constructing parallel and perpendicular lines
Bisecting a given line segment
Constructing angles of 60° and 90°
Measuring angles
Identifying vertically opposite, adjacent, alternate and corresponding angles
Stating properties of angles
Identifying angles at a point and angles on a straight line, and state their properties
Listing purposes of statistics
Recognising the usefulness of statistics for planning purposes
Applying the occurrence of chance events/application of probabilities in everyday life
Recognising the usefulness of statistics for prediction purposes
Collecting data
Determining the median of a given set of data.

Puzzle corners: Strategies, solutions, answers
In order to promote discussion between users of New General Mathematics (teachers and students) and where possible between users and the authors, we have provided a selection of solutions, partial solutions and answers to the puzzle corners that appear in the Student’s Books.

Why include puzzle corners?
The inclusion of puzzle corners is to promote the idea that mathematics is not always about ‘getting the right answer’. In many cases, mathematics is a journey where we sometimes go along pathways
that lead nowhere, or, hopefully more often, that lead to expected and even unexpected discoveries. Think of mathematics as a process, not a product … or as a journey, not a destination.

It is not always necessary to use conventional methods. There are various strategies that often help (in real life as well as in mathematics). For example, you can tell students to try the following approaches:

(1) **Trial and improvement** [sometimes called trial and error]

Make a guess at the solution and see if it works. If it doesn't, refine your first guess and try again, aiming to get closer to the desired result. This is a perfectly legitimate thing to do.

(2) **Try a simpler version of the problem**

Instead of jumping in at the deep end, try the puzzle with easier numbers or reduced options. You will find some examples in the lesson plans.

(3) **Use knowledge of numbers, geometry and algebra where appropriate**

Don’t devalue what you already know and have learned in class!

In what follows we use the above strategies to provide a variety of full and partial solutions. Sometime we give answers without explanation. We have generally not included solutions to problems that involve extensive (and expensive) diagrams. The authors are happy to engage. Contact us at www.pearsoneducation.com.
Section 1 provides you with optional chapters that you can use with your class. The preliminary chapter is intended for use as revision and to reinforce foundation knowledge that is needed in the year. You may wish to assign work from this chapter as remedial activities for students who struggle with the main course work.
Preliminary chapter

Basic operations; the SI system

### Objectives

By the end of the chapter, each student should be able to:
- Add, subtract, multiply and divide whole numbers
- Add, subtract, multiply, divide and simplify elementary fractions and decimals
- State and apply the basic units of length, mass, capacity and time
- Convert measurements from one unit to another.

### Teaching and learning materials

**Teacher:** Addition and multiplication wall charts; metre rule, measuring tape, 1 kg mass, 1-litre container (e.g. empty juice packet or bottle), clock

### P.1 Basic operations

You must be able to add, subtract, multiply and divide whole numbers. These skills will help you in **quantitative reasoning** (QR) and will be useful throughout school and in later life.

This chapter contains tests to give you practice in the basic number skills. There are tests in each of the following:
- **Addition skills** (Tests A–J, page 3)
- **Subtraction skills** (Tests A–J, page 4)
- **Multiplication skills** (Tests A–J, page 5)
- **Division skills** (Tests A–J, page 6)
- **Fractions and decimals** (Tests A–J, page 7)

Each test is in the column under the test heading. Do each test as follows.

- **a** Allow 10 minutes to do each test.
- **b** Try to do every item.
- **c** Use the answers in the back of the book to correct the test.
- **d** If you get an item wrong, find the line that the item was in. Then do all the items in that line right across the page. For example, suppose you get item 6 wrong in Test B. Do all the items 6 in Tests A, B, C, D, and E.

- **e** If you still get these items wrong, ask your teacher for assistance.

There are many different methods of adding, subtracting, multiplying and dividing. Use the method you already know. If you make too many mistakes, your teacher may show you another method.

Do not do all the tests at once. There are enough tests to do one every week of the school year. Your teacher will tell you when to do the tests.

The following tables are useful. Try to memorise them.

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Your teacher will show you how to use this table for simple subtraction facts.

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Your teacher will show you how to use this table for division facts.

### Fractions, decimals, percentages

**Equivalence:** e.g. (a) $56\% = \frac{56}{100} = 0.56$

(b) $\frac{56}{100} = \frac{14}{25}$ (lowest terms)

**Conversion:** e.g. (c) $\frac{3}{4} = \frac{3.00}{4} = 0.75 = \frac{75}{100} = 75\%$
Addition: Revision and practice

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### Multiplication: Revision and practice

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<td>② $2 \times 8 \times 2$</td>
<td>$5 \times 2 \times 6$</td>
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<tr>
<td>⑥ $36 \times 100$</td>
<td>$1 000 \times 52$</td>
<td>$860 \times 10$</td>
<td>$100 \times 4$</td>
<td>$7 \times 1 \ 000$</td>
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<tr>
<td>⑦ $428 \times 7$</td>
<td>$8 431 \times 5$</td>
<td>$325 \times 9$</td>
<td>$3 781 \times 3$</td>
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<tr>
<td>⑧ $3 126 \times 4$</td>
<td>$335 \times 6$</td>
<td>$7 735 \times 3$</td>
<td>$172 \times 7$</td>
<td>$8 549 \times 2$</td>
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<tr>
<td>⑨ $5 \times 2 \times 34$</td>
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<td>$26 \times 6 \times 5$</td>
<td>$8 \times 65 \times 5$</td>
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<td>$57 \times 30$</td>
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<td>$90 \times 61$</td>
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<tr>
<td>⑪ $43 \times 52$</td>
<td>$254 \times 61$</td>
<td>$74 \times 39$</td>
<td>$820 \times 29$</td>
<td>$93 \times 17$</td>
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<tr>
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<td>$425 \times 409$</td>
<td>$257 \times 830$</td>
<td>$621 \times 341$</td>
<td>$542 \times 209$</td>
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<tbody>
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<td>① $9 \times 4$</td>
<td>$6 \times 8$</td>
<td>$9 \times 7$</td>
<td>$7 \times 7$</td>
<td>$9 \times 9$</td>
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<tr>
<td>② $3 \times 8 \times 2$</td>
<td>$3 \times 7 \times 3$</td>
<td>$4 \times 6 \times 2$</td>
<td>$3 \times 3 \times 5$</td>
<td>$2 \times 3 \times 7$</td>
</tr>
<tr>
<td>③ $53 \times 0$</td>
<td>$2 \times 23$</td>
<td>$30 \times 3$</td>
<td>$4 \times 22$</td>
<td>$3 \times 23$</td>
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<tr>
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<td>$6 \times 19$</td>
<td>$7 \times 13$</td>
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<td>⑤ $48 \times 3$</td>
<td>$28 \times 7$</td>
<td>$83 \times 6$</td>
<td>$24 \times 9$</td>
<td>$37 \times 4$</td>
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<td>⑥ $10 \times 60$</td>
<td>$508 \times 100$</td>
<td>$1 \ 000 \times 90$</td>
<td>$10 \times 1 \ 000$</td>
<td>$100 \times 300$</td>
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<td>⑦ $8307 \times 2$</td>
<td>$904 \times 8$</td>
<td>$3 \ 941 \times 4$</td>
<td>$861 \times 8$</td>
<td>$6 \ 275 \times 5$</td>
</tr>
<tr>
<td>⑧ $156 \times 9$</td>
<td>$2 \ 369 \times 3$</td>
<td>$138 \times 8$</td>
<td>$6 \ 141 \times 5$</td>
<td>$346 \times 8$</td>
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<tr>
<td>⑨ $5 \times 78 \times 6$</td>
<td>$25 \times 67 \times 2$</td>
<td>$3 \times 19 \times 10$</td>
<td>$5 \times 58 \times 8$</td>
<td>$15 \times 37 \times 4$</td>
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<tr>
<td>⑩ $30 \times 62$</td>
<td>$29 \times 80$</td>
<td>$50 \times 38$</td>
<td>$87 \times 60$</td>
<td>$20 \times 93$</td>
</tr>
<tr>
<td>⑪ $713 \times 35$</td>
<td>$87 \times 71$</td>
<td>$389 \times 17$</td>
<td>$62 \times 36$</td>
<td>$105 \times 47$</td>
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<tr>
<td>⑫ $485 \times 485$</td>
<td>$647 \times 392$</td>
<td>$705 \times 516$</td>
<td>$470 \times 288$</td>
<td>$452 \times 219$</td>
</tr>
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</table>
**Division: Revision and practice**

Note: $12 \div \frac{1}{6}$ of $12$, $\frac{12}{6}$ are different ways of writing $12$ divided by $6$.

<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>$9 + 3$</td>
<td>$\frac{1}{4}$ of $8$</td>
<td>$\frac{8}{2}$</td>
<td>$3\sqrt{6}$</td>
<td>$6 \div 2$</td>
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<tr>
<td>$\frac{64}{8}$</td>
<td>$3\sqrt{24}$</td>
<td>$42 \div 6$</td>
<td>$\frac{1}{8}$ of $72$</td>
<td>$\frac{54}{9}$</td>
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<tr>
<td>$\frac{1}{2}$ of $72$</td>
<td>$\frac{80}{2}$</td>
<td>$2\sqrt{90}$</td>
<td>$52 + 2$</td>
<td>$\frac{1}{2}$ of $86$</td>
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<td>$5\sqrt{65}$</td>
<td>$56 \div 4$</td>
<td>$\frac{1}{6}$ of $72$</td>
<td>$\frac{91}{7}$</td>
<td>$3\sqrt{51}$</td>
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<td>$196 + 7$</td>
<td>$\frac{1}{6}$ of $150$</td>
<td>$\frac{154}{7}$</td>
<td>$600 \div 100$</td>
<td>$10\sqrt{8000}$</td>
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<tr>
<td>$\frac{62}{100}$</td>
<td>$\frac{455}{7}$</td>
<td>$5\sqrt{960}$</td>
<td>$3828 \div 4$</td>
<td>$\frac{1}{8}$ of $464$</td>
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<tr>
<td>$\frac{1}{6}$ of $258$</td>
<td>$3\sqrt{927}$</td>
<td>$4\sqrt{2032}$</td>
<td>$5\sqrt{535}$</td>
<td>$4\sqrt{2408}$</td>
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<tr>
<td>$8\sqrt{624}$</td>
<td>$5\sqrt{6005}$</td>
<td>$5202 + 9$</td>
<td>$4\sqrt{4008}$</td>
<td>$7206 + 2$</td>
</tr>
<tr>
<td>$1072 + 8$</td>
<td>$25\sqrt{525}$</td>
<td>$44\sqrt{9108}$</td>
<td>$30\sqrt{1680}$</td>
<td>$45\sqrt{9135}$</td>
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<td>$31\sqrt{162}$</td>
<td>$59\sqrt{18054}$</td>
<td>$32\sqrt{2752}$</td>
<td>$92\sqrt{10580}$</td>
<td>$57\sqrt{3591}$</td>
</tr>
<tr>
<td>$43\sqrt{1247}$</td>
<td>$37\sqrt{30451}$</td>
<td>$90\sqrt{26100}$</td>
<td>$33\sqrt{25971}$</td>
<td>$69\sqrt{57822}$</td>
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</table>

<table>
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<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>$7 + 7$</td>
<td>$5 \div 1$</td>
<td>$\frac{4}{2}$</td>
<td>$\frac{1}{3}$ of $3$</td>
<td>$0 \div 2$</td>
</tr>
<tr>
<td>$9\sqrt{45}$</td>
<td>$63 \div 7$</td>
<td>$\frac{1}{7}$ of $49$</td>
<td>$\frac{48}{8}$</td>
<td>$7\sqrt{70}$</td>
</tr>
<tr>
<td>$\frac{58}{2}$</td>
<td>$2\sqrt{98}$</td>
<td>$36 + 2$</td>
<td>$\frac{1}{2}$ of $76$</td>
<td>$\frac{34}{2}$</td>
</tr>
<tr>
<td>$84 + 6$</td>
<td>$\frac{1}{8}$ of $96$</td>
<td>$\frac{117}{9}$</td>
<td>$4\sqrt{68}$</td>
<td>$128 + 8$</td>
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<tr>
<td>$\frac{1}{8}$ of $192$</td>
<td>$\frac{189}{9}$</td>
<td>$5\sqrt{135}$</td>
<td>$234 \div 9$</td>
<td>$\frac{1}{4}$ of $116$</td>
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<tr>
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<td>$\frac{1}{100}$ of $1000$</td>
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<td>$\frac{1000}{1000}$</td>
<td>$\frac{466}{6}$</td>
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<td>$\frac{1}{5}$ of $1165$</td>
<td>$\frac{700}{100}$</td>
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<tr>
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<td>$3\sqrt{618}$</td>
<td>$6\sqrt{4224}$</td>
<td>$9\sqrt{972}$</td>
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<td>$5\sqrt{7700}$</td>
<td>$8007 \div 3$</td>
</tr>
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<td>$76\sqrt{8056}$</td>
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<td>$55\sqrt{16940}$</td>
<td>$41\sqrt{12505}$</td>
<td>$66\sqrt{6798}$</td>
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<tr>
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<td>$35\sqrt{455}$</td>
<td>$48\sqrt{41952}$</td>
<td>$37\sqrt{3478}$</td>
<td>$23\sqrt{11661}$</td>
</tr>
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<td>$21\sqrt{20265}$</td>
<td>$72\sqrt{58176}$</td>
<td>$57\sqrt{52155}$</td>
<td>$45\sqrt{32625}$</td>
<td>$18\sqrt{16344}$</td>
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## Fractions and decimals: Revision and practice

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<tbody>
<tr>
<td>12/24</td>
<td>27/36</td>
<td>66/99</td>
<td>5/20</td>
<td>21/28</td>
</tr>
</tbody>
</table>

1. Reduce to the lowest term.

2. Which is bigger?

3. Arrange in ascending order.

4. Change to a decimal.

5. Change to a fraction.

6. Change to a percentage.

7. Add.

8. Subtract.


10. Divide.

11. Simplify.

12. Simplify.

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>6/12</td>
<td>3/24</td>
<td>17/51</td>
<td>7/21</td>
<td>63/84</td>
</tr>
<tr>
<td>11/12 or 2/3</td>
<td>11/24 or 11/25</td>
<td>2/3 or 3/4</td>
<td>1/2 or 3/7</td>
<td>2/9 or 1/5</td>
</tr>
</tbody>
</table>

1. Reduce to the lowest term.

2. Which is bigger?

3. Arrange in ascending order.

4. Change to a decimal.

5. Change to a fraction.

6. Change to a percentage.

7. Add.

8. Subtract.


10. Divide.

11. Simplify.

12. Simplify.

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>(1/2 + \frac{1}{3})</td>
<td>0.29 + 0.37</td>
<td>(\frac{1}{4} + \frac{1}{8})</td>
<td>33% + 42%</td>
<td>0.55 + 0.73</td>
</tr>
<tr>
<td>(\frac{5}{8} - \frac{2}{4})</td>
<td>2.82 – 1.71</td>
<td>(\frac{1}{2} - \frac{3}{10})</td>
<td>9.31 – 4.88</td>
<td>7.89 – 3.51</td>
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<tr>
<td>(\frac{1}{5} \times \frac{3}{3})</td>
<td>0.4 \times 0.4</td>
<td>(\frac{5}{9} \times \frac{3}{4})</td>
<td>0.21 \times 0.04</td>
<td>0.3 \times 0.8</td>
</tr>
<tr>
<td>(\frac{1}{8} + \frac{1}{2})</td>
<td>0.9 + 0.45</td>
<td>(\frac{2}{3} + \frac{4}{5})</td>
<td>2.7 + 0.18</td>
<td>0.45 + 0.5</td>
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<tr>
<td>(\frac{3}{4}) of 80%</td>
<td>(1.1 + 0.3) + 0.7</td>
<td>(\frac{4}{5} \times \frac{1}{2} - \frac{1}{10})</td>
<td>0.2 \times 5.5 – 0.07</td>
<td>25% of ((2.1 + 1.5))</td>
</tr>
<tr>
<td>(\frac{9}{10} + (\frac{3}{10} - \frac{1}{5}))</td>
<td>0.8 + (0.17 – 0.09)</td>
<td>60% of (\frac{1}{4})</td>
<td>6.3 + 0.5 \times 4.8</td>
<td>0.64 + (0.27 – 0.11)</td>
</tr>
</tbody>
</table>
The SI system of units is an internationally agreed method of measuring quantities such as length, mass, capacity and time. SI is short for Système International d'Unités (International System of Units). Nearly every country in the world uses the SI system.

Except for the measurement of time, the SI system uses decimal multiples to build up tables connecting the units for each quantity. The basic quantities are length, mass, capacity and time. Other quantities, such as area, volume, speed and density, can be expressed in terms of the basic quantities.

### Length

The metre is the basic unit of length. The metre was first taken as one ten-millionth part of the distance between the North Pole and the Equator. In Table P.1, Greek prefixes are used for multiples of a metre (distances greater than a metre). Latin prefixes are used for sub-multiples of a metre (distances less than a metre).

The value of each unit is ten times that of the unit just below it. 1 km = 10 hm, 1 cm = 10 mm, etc. This is the same as the decimal place-value system in which digits increase in value by ten times as they move one place to the left.

We don’t use the hectometre, decametre and decimetre very often. The centimetre is useful for measuring short lengths but industry prefers to give such lengths in millimetres. This leaves the kilometre, the metre and the millimetre.

Table P.1 gives the common units for length.

### Mass

The gram is the basic unit of mass. A gram is the mass of 1 cubic centimetre of water at a temperature of 4 °C. This is a very small unit. For this reason, the kilogram (1 000 grams) has become the standard unit of mass.

The prefixes are the same as those for lengths. The abbreviations follow those for length but are based on g, the abbreviation of gram.

The kilogram, the gram and the milligram are the only units used for practical purposes. A further unit is used for large masses, the tonne (t).

Table P.2 gives the common units for mass:

### Capacity

The litre is the basic unit of capacity. One litre is the space occupied by 1 kg of water at standard temperature and pressure. Only the kilolitre, litre and millilitre are used for practical and scientific purposes (Table P.3).

### Time

The second is the basic unit of time. Units of time do not follow the decimal system (Table P.4).

---

**Table P.1**

<table>
<thead>
<tr>
<th>length</th>
<th>abbreviation</th>
<th>relationship to basic unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 kilometre</td>
<td>1 km</td>
<td>1 000 m</td>
</tr>
<tr>
<td>1 metre</td>
<td>1 m</td>
<td>1 m</td>
</tr>
<tr>
<td>1 centimetre</td>
<td>1 cm</td>
<td>0.01 m</td>
</tr>
<tr>
<td>1 millimetre</td>
<td>1 mm</td>
<td>0.001 m</td>
</tr>
</tbody>
</table>

**Table P.2**

<table>
<thead>
<tr>
<th>mass</th>
<th>abbreviation</th>
<th>relationship to basic unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 tonne</td>
<td>1 t</td>
<td>1 000 000 g = 1 000 kg</td>
</tr>
<tr>
<td>1 kilogram</td>
<td>1 kg</td>
<td>1 000 g</td>
</tr>
<tr>
<td>1 gram</td>
<td>1 g</td>
<td>1 g</td>
</tr>
<tr>
<td>1 milligram</td>
<td>1 mg</td>
<td>0.001 g</td>
</tr>
</tbody>
</table>

**Table P.3**

<table>
<thead>
<tr>
<th>capacity</th>
<th>abbreviation</th>
<th>relationship to basic unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 kilolitre</td>
<td>1 kl</td>
<td>1 000 ℓ</td>
</tr>
<tr>
<td>1 litre</td>
<td>1 ℓ</td>
<td>1 ℓ</td>
</tr>
<tr>
<td>1 millilitre</td>
<td>1 ml</td>
<td>0.001 ℓ</td>
</tr>
</tbody>
</table>

**Table P.4**

<table>
<thead>
<tr>
<th>time</th>
<th>abbreviation</th>
<th>relationship to basic unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 second</td>
<td>1 s</td>
<td>1 s</td>
</tr>
<tr>
<td>1 minute</td>
<td>1 min</td>
<td>60 s</td>
</tr>
<tr>
<td>1 hour</td>
<td>1 h</td>
<td>3 600 s = 60 min</td>
</tr>
</tbody>
</table>
Many countries in the world use a decimal system for money. For example, in Nigeria the basic unit, the naira (₦), is divided into 100 kobo (k):

1 naira (₦) = 100 kobo (k)

At present, the kobo is seldom used. In some countries, the smaller units are commonly used:

- In the USA, 1 dollar ($) = 100 cents (c)
- In Europe, 1 euro (€) = 100 cents (c)
  (Note: not all of the countries in Europe use the euro.)
- In the UK, 1 pound (£) = 100 pence (p)

Many countries have undivided currencies, for example, in French-speaking countries in West Africa, the franc (CFA) is undivided.

In a decimal system, it is easy to write down compound quantities as decimals without doing any calculation. For example:

- a 1 metre and 67 centimetres = 1.67 m = 167 cm = 14 003 000 ml
- b 34 euro and 75 cents = €34.75 = 3 475c
- c 14 kilolitres and 3 litres = 14.003 kl = 14 003 ℓ = 14 003 000 ml

Exercise Pa

[Oral/QR]

1. Express the following in metres.
   a 3 km
   b 5 km
   c 8 km
   d 2 km
   e 6 km
   f 10 km
   g 9 km
   h 13 km
   i 7 km
   j 4 km
   k 3.5 km
   l 4.2 km
   m 6.8 km
   n 8.1 km
   o 5.9 km
   p 10.4 km
   q 2.7 km
   r 9.3 km

2. Express the following in metres.
   a 3.85 km
   b 2.44 km
   c 8.39 km
   d 6.05 km
   e 9.14 km
   f 1.07 km
   g 4.124 km
   h 2.993 km
   i 7.625 km
   j 5.704 km
   k 3.009 km
   l 2.058 km
   m 9 km and 400 m
   n 4 km and 620 m
   o 3 km and 315 m
   p 1 km and 82 m
   q 5 km and 50 m
   r 6 km and 847 m
   s 10 km and 500 m
   t 8 km and 420 m
   u 1 km and 440 m
   v 9 km and 25 m
   w 5 km and 5 m
   x 2 km and 9 m

4. Express the following in metres.
   a 173 cm
   b 458 cm
   c 843 cm
   d 150 cm
   e 105 cm
   f 280 cm
   g 101 cm
   h 100 cm
   i 99 cm
   j 53 cm
   k 40 cm
   l 8 cm
   m 19 cm
   n 5 cm
   o 50 cm

5. Express the following in metres.
   a 1 000 mm
   b 2 000 mm
   c 7 000 mm
   d 6 800 mm
   e 4 100 mm
   f 1 400 mm
   g 3 726 mm
   h 9 504 mm
   i 8 119 mm
   j 600 mm
   k 300 mm
   l 200 mm
   m 51 mm
   n 60 mm
   o 3 mm

Exercise Pb

1. Add and give the answers in kg.
   a 2.3 kg, 5.8 kg, 2.1 kg
   b 785 g, 97 g, 605 g
   c 574 g, 1.706 kg, 605 g
   d 2.8 t, 450 kg, 1.37 t

2. Add and give the answers in litres (ℓ).
   a 3.7 ℓ, 2.4 ℓ, 1.8 ℓ
   b 400 ml, 800 ml, 80 ml
   c 1.588 ℓ, 475 ml, 2.014 ℓ
   d 2 kl, 2.3 kl, 850 ℓ

3. Add and give the answers in naira.
   a ₦420, ₦360, ₦2 200
   b ₦950, ₦1 875, ₦350
   c ₦77, ₦125, ₦505
   d ₦15, ₦35, ₦825

4. Add and give the answers:
   i) in dollars,   ii) in cents.
   a 84c, 36c, 19c
   b 77c, $1.23, 50c
   c $14.99, $3.65, 89c
   d $5.55, $9.99, $2.22

5. How many minutes in:
   a 2 1 _ 2   h
   b 1 1 _ 4   h
   c 1 _ 5   h
   d 2 _ 2   h
   e 180 s
   f 150 s

6. How many seconds in:
   a 5 min
   b 1 _ 3   min
   c 1 _ 4   h
   d $1.50
Preliminary chapter

Answers

Addition

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Division

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### Fractions and decimals

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Exercise Pa

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Exercise Pa

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Section 1: Additional material
Section 2 contains suggested lesson plans for each chapter in the Student’s Book. These are guidelines for how to break up the content in each chapter into teaching lessons.

Each chapter contains:
- Teaching and learning materials needed for completing the chapter
- Key word definitions for mathematical terminology
- Foundation knowledge needed by students to be able to complete the chapter
- Lesson guidelines
- Answers to the puzzle corners and Workbook
- Notes to assess learning milestones.
Chapter 1  Development of number systems

Objectives
By the end of the chapter, each student should be able to:
• Count in tens and other number groupings (e.g. twenties, sevens, sixties)
• Write Roman and Hindu-Arabic numerals
• Use simple number codes for phrases and sentences
• Add and subtract numbers using a simple paper counting board or an abacus
• State the place values of digits in whole numbers and decimal fractions.

Teaching and learning materials
Teacher: Counters (e.g. smooth stones or pebbles, large seeds, bottle tops); sheet of large plain paper (e.g. A4); an abacus or counting frame (if possible)
Students: Counters (e.g. smooth stones or pebbles, large seeds, bottle tops)

Key word definitions
count: find the quantity of number of items
base ten: system of counting in tens
decimal system: base ten system
symbols: signs used for writing languages
numerals: symbols for numbers
tally: to count
abacus: a frame with beads used for calculations
place value system: the value of a numeral according to its position in a number
units: values from 1 to 9
tens: values from 10 to 90
hundreds: values from 100 to 900
thousands: values from 1 000 to 9 000
zero: the value 0 (nothing)
digits: the ten symbols we use for numbers (0, 1, 2, 3, 4, 5, 6, 7, 8, 9)
fraction: part of a number
decimal point: symbol that separates whole numbers from fractions
tenths: values from 0.1 to 0.9
hundredths: values from 0.01 to 0.09
thousandths: values from 0.001 to 0.009

Revision
Students need to be able to:
• count in tens and other number groups
• know symbols for numbers, e.g. Roman numerals

Lesson 1  Counting
Student's Book page 1; Workbook page 5
The focus of this lesson is other bases of counting (seven and sixty).
Work through Examples 1–4 with the class.
All students must complete the ‘must do’ questions of Exercises 1a–b.
Stronger students can complete question 8 of Exercise 1b.
Assign question 1 from Worksheet 1 as homework.

Lesson 2  Symbols for numbers
Student's Book page 3; Workbook page 5
The focus of this lesson is tally systems, the Roman system, simple codes, the counting board and the abacus.
Work through Examples 5–11 with the class.
All students must complete the ‘must do’ questions of Exercises 1c–f.
Assign questions 2, 4 and 7 from Worksheet 1 as homework.
Lesson 3  The place-value system

Student's Book page 7; Workbook page 5

The focus of this lesson is the Hindu-Arabic system and decimal fractions.

All students must complete the ‘must do’ questions of Exercises 1g–h.

Stronger students can complete the Switching Units and Tens puzzle on page 9 of the Student’s Book.

Assign questions 3, 5 and 6 from Worksheet 1 as homework.

Answers

Puzzle: Switching Units and Tens

Notice that 32 × 46 = 32 × 2 × 23 (= 1472)
and 23 × 64 = 23 × 2 × 32 = 32 × 2 × 23 (= 1472)

Similarly 43 × 2 × 34 = 43 × 68 (= 2924)
and 34 × 2 × 43 = 34 × 86 (= 2924)

The strategy for solving this puzzle is to notice that 2 is a common multiplier.

Worksheet 1

The marking memorandum for Worksheet 1 is included under Section 4.

Assessment

Students should be able to count in tens and other number groupings (e.g. twenties, sevens, sixties), write Roman and Hindu-Arabic numerals and use simple number codes for phrases and sentences.

They should also be able to add and subtract numbers using a simple paper counting board or an abacus and state the place values of digits in whole numbers and decimal fractions.
Chapter 2  Large and small numbers

Objectives
By the end of the chapter, each student should be able to:
• Count, read and write large numbers (millions, billions, trillions)
• Write and read small numbers and express them accurately
• Solve problems expressed in large and small numbers.

Teaching and learning materials
Teacher: Graph paper divided into mm; 1 square metre made out of 1 mm graph paper; poster made from newspaper headlines that contain numerical references
Students: Bring a newspaper article to school that uses large numbers

Key word definitions
No key words in this chapter

Revision
Students need to be able to:
• count, read and write large numbers up to millions
• solve problems of up to 4-digit numbers.

Lesson 1  Large numbers
Student’s Book page 10; Workbook page 7
The focus of this lesson is how big a million is.
All students must complete the ‘must do’ questions of Exercise 2a.
Stronger students can extend a million to a trillion.
Assign questions 1 and 2 from Worksheet 2 as homework.

Lesson 2  Reading and writing large numbers
Student’s Book page 11; Workbook page 7
The focus of this lesson is grouping digits and digits and words.
Work through Examples 1–3 with the class.
All students must complete the ‘must do’ questions of Exercises 2b–c.
Stronger students can write larger numbers in words.
Assign questions 3 to 7 from Worksheet 2 as homework.

Lesson 3  Small numbers
Student’s Book page 12
The focus of this lesson is decimal fractions.
Work through Example 4 with the class.
All students must complete the ‘must do’ questions of Exercise 2d.
Stronger students can complete the Infinity and Beyond puzzle on page 13 of the Student’s Book.

Answers
Puzzle: Infinity and Beyond
Let \( S = \frac{1}{4} + \frac{1}{4^2} + \frac{1}{4^3} + \ldots \) etc.
Then \( S = \frac{1}{4}(1 + \frac{1}{4} + \frac{1}{4^2} + \ldots) \rightarrow S = \frac{1}{4}(1 + S) \)
\( \rightarrow 4S = (1 + S) \rightarrow 3S = 1 \)
\( \rightarrow S = \frac{1}{3} \)

Worksheet 2
The marking memorandum for Worksheet 2 is included under Section 4.

Assessment
Students should be able to count, read and write large numbers (millions, billions, trillions) and read and write small numbers accurately. They should also be able to solve problems expressed in large and small numbers.
Chapter 3  Factors and multiples

Objectives
By the end of the chapter, each student should be able to:
• Define and identify prime numbers
• Find the factors of a given whole number
• Express a number as product of its factors in index form
• Find the highest common factor (HCF) of two or more whole numbers
• Write down two or more multiples of a given number
• Find the lowest common multiple (LCM) of two or more whole numbers.

Teaching and learning materials
Teacher: 1 to 100 number square chart or poster

Key word definitions
factor: a number that divides into another without remainder
product: the result of multiplying two or more numbers together
prime number: a whole number with only two factors (itself and 1)
prime factor: a factor that is a prime number
index (plural indices): 3 is the index in the number 43
power: another word for index
square (numerical): a number with index 2
cube (numerical): a number with index 3
common factor: a factor of more than one number
highest common factor (HCF): the biggest number that will divide two or more numbers
multiple: the result of multiplying factors together
common multiple: a multiple of two or more numbers
lowest (or least) common multiple (LCM): the smallest number that two or more numbers will divide

Revision
Students need to be able to:
• know what a prime number is
• know their multiplication times table to understand multiples and factors.

Lesson 1 Factors
Student’s Book page 15; Workbook page 9

The focus of this lesson is prime numbers, prime factors, index form and common factors.
Work through Examples 1–2 with the class.
All students must complete the ‘must do’ questions of Exercises 3a–e.
Stronger students can complete question 4 of Exercise 3d.
Assign questions 2 and 5 from Worksheet 3 as homework.

Lesson 2 Highest common factor (HCF)
Student’s Book page 17; Workbook page 9

The focus of this lesson is highest common factors.
Work through Examples 3–4 with the class.
All students must complete the ‘must do’ questions of Exercise 3f.
Stronger students can complete question 4 of Exercise 3f.
Assign questions 6 to 8 from Worksheet 3 as homework.
Lesson 3  Multiples

Student's Book page 19; Workbook page 9

The focus of this lesson is common multiples.

Work through Example 5 with the class.

All students must complete the ‘must do’ questions of Exercises 3g–h.

Stronger students can complete the Factor this puzzle on page 20 of the Student’s Book.

Assign question 1 from Worksheet 3 as homework.

Lesson 4  Lowest common multiple (LCM)

Student's Book page 19; Workbook page 9

The focus of this lesson is lowest or least common multiples.

Work through Examples 6–7 with the class.

All students must complete the ‘must do’ questions of Exercise 3i.

Stronger students can complete the Got the wrong bucket puzzle on page 20 of the Student’s Book.

Assign questions 3 and 4 from Worksheet 3 as homework.

Answers

Puzzle: Got the wrong buckets?

Step 1  Fill the 7 ℓ bucket and pour its contents into the 10 ℓ bucket.

Step 2  Fill the 7 ℓ bucket, pour 3 ℓ into the 10 ℓ bucket, leaving 4 ℓ in the 7 ℓ bucket. Empty the 10 ℓ bucket and pour the 4 ℓ in the 7 ℓ bucket into the 10 ℓ bucket.

Step 3  Fill the 7 ℓ bucket, pour 6 ℓ into the 10 ℓ bucket, leaving 1 ℓ in the 7 ℓ bucket. Empty the 10 ℓ bucket and pour the 1 ℓ in the 7 ℓ bucket into the 10 ℓ bucket.

Step 4  Fill the 7 ℓ bucket and pour into the 10 ℓ bucket, making 8 ℓ in that bucket.

Step 5  Fill the 7 ℓ bucket, pour 2 ℓ into the 10 ℓ bucket, leaving 5 ℓ in the 7 ℓ bucket. Empty the 10 ℓ bucket and pour the 5 ℓ in the 7 ℓ bucket into the 10 ℓ bucket.

Step 6  Fill the 7 ℓ bucket and pour 5 ℓ into the 10 ℓ bucket, leaving 2 ℓ in the 7 ℓ bucket. Empty the 10 ℓ bucket and pour the 2 ℓ into the 10 ℓ bucket.

Step 7  Fill the 7 ℓ bucket and pour it into the 10 ℓ bucket, making a total of 9 ℓ in the bigger bucket.

Note: This wastes a lot of water!

Puzzle: Factor this

90 of the numbers have an even number of factors. Only the ten perfect squares (1, 4, 9, …, 100) have an odd number of factors.

Worksheet 3

The marking memorandum for Worksheet 3 is included under Section 4.

Assessment

Students should be able to define and identify prime numbers, find the factors of a given whole number, express a number as product of its factors in index form and find the highest common factor (HCF) of two or more whole numbers.

They should also be able to write down two or more multiples of a given number and find the lowest common multiple (LCM) of two or more whole numbers.
**Objectives**

By the end of the chapter, each student should be able to:

- Express quantities in terms of common fractions and mixed numbers where appropriate
- Change mixed numbers to improper fractions and vice versa
- Obtain equivalents of a given fraction
- Reduce fractions to their lowest terms
- Arrange fractions in ascending or descending order of size
- Add, subtract, multiply and divide fractions
- Express a quantity as a fraction or percentage of another quantity
- Convert fractions to percentages and vice versa
- Solve word problems involving fractions.

**Teaching and learning materials**

**Teacher:** Objects that can be divided into fractional parts, e.g. food (oranges, bananas, bread, pie) or other items such as money, chalk, pencils, sheets of paper, string

**Key word definitions**

- **fraction:** part of a number
- **denominator:** number below the line in a fraction
- **numerator:** number above the line in a fraction
- **mixed number:** a number with a whole number and a fraction
- **improper fraction:** a fraction where numerator > denominator
- **proper fraction:** a fraction where numerator < denominator
- **equivalent fraction:** a fraction with the same value as another
- **lowest common denominator:** the smallest denominator common to two or more fractions
- **lowest terms:** a fraction where the numerator and denominator have no common factor
- **simplest form:** see lowest terms
- **reciprocal:** the inverse of a fraction (the fraction turned upside down)
- **percentage (%) or per cent:** a fraction with a denominator of 100

**Revision**

Students need to be able to:

- identify the numerator and denominator in a fraction
- understand, read and write basic fractions $\frac{1}{2}$, $\frac{1}{3}$ and $\frac{1}{4}$
- understand, read and write mixed numbers e.g. $2\frac{1}{2}$
- convert between mixed numbers and improper fractions e.g. $2\frac{1}{2}$ and $\frac{5}{2}$

**Lesson 1 Common fractions**

*Student’s Book page 22; Workbook page 11*

The focus of this lesson is mixed numbers.

Work through Examples 1–2 with the class.

All students must complete the ‘must do’ questions of Exercise 4a.

Stronger students can create a fraction wall of all the fractions from $\frac{1}{2}$ to $\frac{1}{12}$.

Assign questions 1, 2, 7 and 8 from Worksheet 4 as homework.
Lesson 2 Equivalent fractions

Student's Book page 23; Workbook page 11

The focus of this lesson is equivalent fractions and lowest terms.
Work through Examples 3–4 with the class.
All students must complete the ‘must do’ questions of Exercises 4b–d.
Stronger students can complete question 2 of Exercise 4d.
Assign questions 3 and 5 from Worksheet 4 as homework.

Lesson 3 Basic operations on fractions

Student's Book page 25; Workbook page 11

The focus of this lesson is addition and subtraction, multiplication and division.
Work through Examples 5–13 with the class.
All students must complete the ‘must do’ questions of Exercises 4e–i.
Stronger students can complete questions 21–24 of Exercise 4h and questions 29–35 of Exercise 4i.
Assign question 9 from Worksheet 4 as homework.

Lesson 4 Percentages

Student's Book page 30; Workbook page 11

The focus of this lesson is expressing one quantity as a fraction or percentage of another.
Work through Examples 14–17 with the class.
All students must complete the ‘must do’ questions of Exercises 4k–n.
Stronger students can complete the From A to B and Number Pyramid puzzles on page 32 of the Student’s Book.
Assign questions 4, 6, 10 and 11 from Worksheet 4 as homework.

Answers

Puzzle: From A to B
Start with simpler versions of the problem.
For example, first use a 1 × 1 square (2 ways), then a 2 × 2 square (6 ways).
Using these results, there are 36 ways for a 3 × 3 square.

Puzzle: Number pyramid
Strategy: Use algebra – let the middle number in the bottom row be $x$.
The five numbers in the bottom row are 7, 5, $x$, 4, 19.
The four numbers in the second row are 12, 5 + $x$, 4 + $x$, 19.
From this we see that $(5 + x) + (4 + x) = 23$,
i.e. $x = 7$.
Continue in this way up the pyramid.
The missing number is 47.

Worksheet 4
The marking memorandum for Worksheet 4 is included under Section 4.

Assessment

Students should be able to express quantities in terms of common fractions and mixed numbers where appropriate, change mixed numbers to improper fractions and vice versa, obtain equivalents of a given fraction and reduce fractions to their lowest terms.
They should also be able to arrange fractions in ascending or descending order of size, add, subtract, multiply and divide fractions, express a quantity as a fraction or percentage of another quantity, convert fractions to percentages and vice versa and solve word problems involving fractions.
Objectives
By the end of the chapter, each student should be able to:
• Find the missing number in an open sentence
• Use letters to stand for numbers when writing and solving simple algebraic sentences.

Teaching and learning materials
No materials for this chapter

Key word definitions
open sentence: a sentence that may be true or false
generalised arithmetic: mathematical statements that use letters and numbers together
algebra: the mathematical word for generalised arithmetic
algebraic sentence: a statement with an equals sign

Revision
Students need to be able to:
• read, write and solve basic open sentences
e.g. \( y + 5 = 7 \) or \( 10 - y = 4 \)

Lesson 1 Open sentences
Student’s Book page 34; Workbook page 13
The focus of this lesson is writing and solving open sentences.
All students must complete the ‘must do’ questions of Exercises 5a–c.
Stronger students can complete the Add the rows and columns puzzle on page 37 of the Student’s Book.
Assign questions 1 to 6 from Worksheet 5 as homework.

Lesson 2 Letters for numbers
Student’s Book page 35; Workbook page 13
The focus of this lesson is algebra and algebraic sentences.
All students must complete the ‘must do’ questions of Exercises 5d–g.
Stronger students can complete the Funny fractions puzzle on page 37 of the Student’s Book.
Assign questions 7 and 11 from Worksheet 5 as homework.

Answers
Puzzle: Add rows and columns
Strategy: Replace the symbols by algebraic letters \( x, y, z \).
Form simultaneous equations in \( x, y \) and \( z \) and solve.
Total in bottom row = \( 2x + z + y = 137 \)

Puzzle: Funny fractions
Strategy: As above, replace the heart symbol by \( x \):
\[
\frac{x}{x} - \frac{x}{6} = \frac{x}{12}
\]
It then becomes much easier:
\[
1 = \frac{x}{12} + \frac{x}{6} = \frac{x + 2x}{12} = \frac{3x}{12} = \frac{x}{4}
\]
\[
x = 4
\]

Worksheet 5
The marking memorandum for Worksheet 5 is included under Section 4.

Assessment
Students should be able to find the missing number in an open sentence and use letters to stand for numbers when writing and solving simple algebraic sentences.
Objectives
By the end of the chapter, each student should be able to:
• Identify and name common three-dimensional shapes (cuboids, cubes, cylinders, prisms, cones, pyramids, spheres)
• Identify, count and name the faces, edges and vertices of a solid shape
• Draw skeleton views of solids
• Make nets of solids.

Teaching and learning materials
Teacher: Empty containers (matchboxes, chalk boxes, soap packets, tin cans), wooden off-cuts, building blocks, balls; cardboard, wire, drinking straws, glue, sticky tape, scissors or a sharp knife for making models
Students: Empty matchbox (one each) and other packets and solid shapes (as above)

Key word definitions
solid: any object that takes up space
three dimensional: having length, breadth and height
irregular: (in mathematics): without a clear pattern
regular: (in mathematics): with a clear pattern
geometrical solid: a shape with regular features
cuboid: a shape with six rectangular faces
face: a surface of solid shape
draw: a line on a solid where two faces meet
vertex (pl vertices): a point or corner on a solid, usually where edges meet
skeleton view: a drawing of a 3D shape on plane paper
net: a flat shape that you can fold to make a solid
cube: a solid with six square faces
cylinder: a solid with two plane circular faces and one curved face
prism: a solid with two plane end faces
cone: a solid with a circular base rising to a single vertex
pyramid: a solid with non-circular base and triangular sides rising to a single vertex
sphere: a ball shape
hemisphere: half a sphere
intersect: meet

Revision
Students need to be able to:
• identify a 2D shape and 3D object
• name the basic 2D shapes: square, circle, rectangle, triangle, pentagon, hexagon
• name the basic 3D objects: cube, pyramid, sphere, cylinder, cone.

Lesson 1 Three-dimensional shapes
Student's Book page 38
The focus of this lesson is basic three-dimensional shapes.
All students must complete the ‘must do’ questions of Exercise 6a.

Lesson 2 Cuboids and cubes
Student's Book page 40; Workbook page 14
The focus of this lesson is cuboids and cubes.
All students must complete the ‘must do’ questions of Exercise 6b.
Stronger students can build their own nets of a cube and a cuboid.
Assign questions 1a–b, 2a–b and 4 from Worksheet 6 as homework.
Lesson 3  Cylinders and prisms
Student’s Book page 42; Workbook page 14

The focus of this lesson is cylinders and prisms.
All students must complete the ‘must do’ questions of Exercise 6c.
Stronger students can build their own nets of a cylinder and a prism.
Assign questions 1c–d and 2c–d from Worksheet 6 as homework.

Lesson 4  Cones and pyramids
Student’s Book page 44; Workbook page 14

The focus of this lesson is cones and pyramids.
All students must complete the ‘must do’ questions of Exercise 6d.
Stronger students can build their own nets of a cone and a pyramid.
Assign questions 1e and 6 from Worksheet 6 as homework.

Lesson 5  Spheres
Student’s Book page 46; Workbook page 14

The focus of this lesson is spheres.
All students must complete the ‘must do’ questions of Exercise 6e.
Stronger students can complete the Look before you leap puzzle on page 48 of the Student’s Book.
Assign question 1f from Worksheet 6 as homework.

Lesson 6  Naming vertices, edges, faces
Student’s Book page 47; Workbook page 14

The focus of this lesson is naming the properties (vertices, edges and faces) of 3D shapes.
All students must complete the ‘must do’ questions of Exercises 6f.
Stronger students can complete the Complete the square puzzle on page 48 of the Student’s Book.
Assign questions 3 and 5 from Worksheet 6 as homework.

Answers

Puzzle: Complete the square
Use a ‘trial and improvement’ approach. Try values until they satisfy the conditions.
Answer: 4

Puzzle: Look before you leap!
The last bracket has value 0. Anything multiplied by 0 is 0.
Moral: Always look at a question properly before solving.

Worksheet 6
The marking memorandum for Worksheet 6 is included under Section 4.

Assessment
Students should be able to identify and name common three-dimensional shapes (cuboids, cubes, cylinders, prisms, cones, pyramids, spheres).
They should also be able to identify, count and name the faces, edges and vertices of a solid shape, draw skeleton views of solids and make nets of solids.
Objectives
By the end of the chapter, each student should be able to:
• State the coefficient of an algebraic term
• Group positive and negative terms to simplify an algebraic expression
• Group like and unlike terms to simplify an algebraic expression
• Solve word problems by forming and simplifying algebraic expressions.

Teaching and learning materials
There are no materials in this chapter.

Key word definitions
algebraic expression: a statement that uses letters for numbers
coefficient: a number multiplying an algebraic letter
terms in x: algebraic expressions with the letter x
simplify (simplified): to make simpler
grouping terms: putting terms together
positive terms: terms with a + sign in front
negative terms: terms with a - sign in front
like terms: terms with the same algebraic letters
unlike terms: terms with different algebraic letters
word problems: written problems that use algebra

Revision
Students need to be able to:
• understand basic algebra and algebraic expressions.

Lesson 1 Coefficients
Student’s Book page 50; Workbook page 18
The focus of this lesson is algebra and coefficients.
Work through Example 1 with the class.
All students must complete the ‘must do’ questions of Exercises 7a–c.
Stronger students can complete the Visualise this puzzle on page 54 of the Student’s Book.
Assign questions 1 to 3 from Worksheet 7 as homework.

Lesson 2 Grouping positive and negative terms
Student’s Book page 51; Workbook page 18
The focus of this lesson is grouping positive and negative terms.
Work through Example 3 with the class.
All students must complete the ‘must do’ questions of Exercises 7d–e.
Stronger students can complete the Three 9s and a minus puzzle on page 54 of the Student’s Book.
Assign question 4 from Worksheet 7 as homework.

Lesson 3 Grouping like and unlike terms
Student’s Book page 52; Workbook page 18
The focus of this lesson is grouping like and unlike terms.
Work through Examples 4–6 with the class.
All students must complete the ‘must do’ questions of Exercises 7f–g.
Stronger students can complete questions 25–40 of Exercise 7g.
Assign question 5 from Worksheet 7 as homework.

Lesson 4 Word problems
Student’s Book page 53
The focus of this lesson is word problems.
Work through Example 7 with the class.
All students must complete the ‘must do’ questions of Exercise 7h.
Stronger students can complete question 10 of Exercise 7h.

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**Answers**

**Puzzle: Visualise this**
Make a paper model and fold it into a cube.
Face C is opposite F.

**Puzzle: Three 9s and a minus**

\[ 9^9 - 9 \]

Any number raised to power 0 has a value 1.

This puzzle works for *any* three digits, for example \(4^{1 - 9} = 1\).

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**Worksheet 7**
The marking memorandum for Worksheet 7 is included under Section 4.

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**Assessment**

Students should be able to state the coefficient of an algebraic term.
They should also be able to group positive and negative terms to simplify an algebraic expression, group like and unlike terms to simplify an algebraic expression and solve word problems by forming and simplifying algebraic expressions.
Objectives
By the end of the chapter, each student should be able to:
- Identify angles between two lines
- Interpret angle as a measure of rotation and its measurement in terms of revolution (or parts of a revolution)
- Name angles using capital letters
- Measure a given angle to the nearest degree using a protractor
- Construct a given angle using a protractor.

Teaching and learning materials
Teacher: Chalk board instruments (ruler and protractor); cardboard, paper, scissors
Students: Mathematical set: protractor and ruler are essential for this topic

Key word definitions
angle: amount of turn from one direction to another
turn: rotation
revolution: a rotation in a complete circle
degree (°): an angle measure, $360° = 1$ revolution
acute angle: an angle between $0°$ and $90°$
right angle: an angle of $90°$
obtuse angle: an angle between $90°$ and $180°$
straight angle: an angle of $180°$
half turn: a straight angle ($180°$)
reflex angle: an angle between $180°$ and $360°$
protractor: an instrument for measuring angles
anticlockwise: turning in the opposite direction of clock hands
clockwise: turning in the direction of clock hands

Revision
Students need to be able to:
- identify angles and lines
- know how to use a protractor to measure angles.

Lesson 1 Angle as rotation
Student’s Book page 56
The focus of this lesson is angles.
Read through the introductory text with the class.

Lesson 2 Angles between lines
Student’s Book page 56; Workbook page 20
The focus of this lesson is identifying and naming angles.
Work through Example 1 with the class.
All students must complete the ‘must do’ questions of Exercise 8a.
Stronger students can complete questions 5–6 of Exercise 8a.
Assign question 1 from Worksheet 8 as homework.

Lesson 3 Measuring angles
Student’s Book page 58; Workbook page 20
The focus of this lesson is measuring angles.
Work through Example 2 with the class.
All students must complete the ‘must do’ questions of Exercise 8b.
Stronger students can complete Exercise 8c.
Assign questions 2 and 6 from Worksheet 8 as homework.
Lesson 4  Constructing angles

Student's Book page 62; Workbook page 20

The focus of this lesson is constructing angles.
Work through Example 3 with the class.
All students must complete the ‘must do’ questions of Exercises 8d–e.
Stronger students can write instructions on how to measure shapes with specific angles and swap with other students to complete.
Assign questions 3, 4 and 5 from Worksheet 8 as homework.

Answers

Worksheet 8
The marking memorandum for Worksheet 8 is included under Section 4.

Assessment

Students should be able to identify angles between two lines, interpret angle as a measure of rotation and its measurement in terms of revolution (or parts of a revolution), name angles using capital letters and measure a given angle to the nearest degree using a protractor.
They should also be able to construct a given angle using a protractor.
Chapter 9  Fractions 2: Decimals and percentages

Objectives
By the end of the chapter, each student should be able to:
• Add and subtract numbers containing decimal fractions
• Multiply and divide decimal numbers by powers of 10
• Multiply and divide numbers containing decimal fractions
• Convert fractions to decimal fractions and vice versa
• Convert percentages to decimal fractions and vice versa
• Solve word problems involving decimal fractions.

Teaching and learning materials
Teacher: Abacus (or paper abacus as in Chapter 1) with a decimal place holder

Key word definitions
decimal fraction: in base ten
units: values from 1 to 9
decimal point: symbol that separates whole numbers from fractions
multiply: to increase
divide: share equally
divisor: the number that divides into another number
terminating decimal: a fraction with a fixed number of digits after the decimal point
recurring decimal: a fraction with a never-ending number of digits after the point
percentage: a fraction with a denominator of 100

Revision
Students need to be able to:
• work with decimal fractions
• understand and apply the place value system.

Lesson 1 Decimals
Student’s Book page 69

The focus of this lesson is decimal fractions.
All students must complete the ‘must do’ questions of Exercise 9a.

Lesson 2 Addition and subtraction
Student’s Book page 69; Workbook page 23

The focus of this lesson is adding and subtracting decimals.
All students must complete the ‘must do’ questions of Exercise 9b.
Assign question 6a–b from Worksheet 9 as homework.

Lesson 3 Multiplication and division
Student’s Book page 70; Workbook page 23

The focus of this lesson is multiplying and dividing by powers of 10, and multiplying and dividing decimals.
Work through Examples 1–7 with the class.
All students must complete the ‘must do’ questions of Exercises 9c–g.
Stronger students can complete questions 6–10 of Exercise 9e and questions 6–10 of Exercise 9g.
Assign question 6c–d from Worksheet 9 as homework.
Lesson 4 Conversion

Student's Book page 74; Workbook page 23

The focus of this lesson is changing fractions to decimals and vice versa.

Work through Examples 8–12 with the class.

All students must complete the ‘must do’ questions of Exercises 9h–j.

Stronger students can complete questions 4–10 of Exercise 9i.

Assign questions 3 and 7 from Worksheet 9 as homework.

Lesson 5 Decimals and percentages

Student’s Book page 76; Workbook page 23

The focus of this lesson is decimals and percentages.

All students must complete the ‘must do’ questions of Exercises 9k–l.

Stronger students can complete questions 6–10 of Exercise 9l.

Assign questions 1, 2, 4, 5, 8 and 9 from Worksheet 9 as homework.

Answers

Worksheet 9

The marking memorandum for Worksheet 9 is included under Section 4.

Assessment

Students should be able to add and subtract numbers containing decimal fractions, multiply and divide decimal numbers by powers of 10, and multiply and divide numbers containing decimal fractions.

They should also be able to convert fractions to decimal fractions and vice versa, convert percentages to decimal fractions and vice versa, and solve word problems involving decimal fractions.
Chapter 10 Use of symbols 2: Word problems

Objectives
By the end of the chapter, each student should be able to:
• Use letters to express mathematical statements
• Solve simple word problems using algebra.

Teaching and learning materials
Teacher: Counters (e.g. smooth stones or pebbles, large seeds, bottle tops); sheet of large plain paper (e.g. A4); an abacus or counting frame (if possible)
Students: Counters (e.g. smooth stones or pebbles, large seeds, bottle tops)

Key word definitions
No key words in this chapter

Revision
Students need to be able to:
• understand all the content of Chapter 5 before proceeding with this chapter.

Lesson 1 Algebra from words
Student’s Book page 78; Workbook page 25

The focus of this lesson is solving algebraic word problems.
Work through Examples 1–3 with the class.
In Example 2, the variable \( a \) should be the number 14. The question should read “A girl is 14 years old.” Ask students to make this correction in their books.
All students must complete the ‘must do’ questions of Exercises 10a–f.

Stronger students can complete the Freight train and Square and add puzzles on page 81 of the Student’s Book.
Assign all the questions from Worksheet 10 as homework.

Answers
Puzzle: Freight train
6 minutes
[It has to travel its own length + the length of the bridge, i.e. 2 km at 20 km/hour.]

Puzzle: Square and add
You have to try this and observe what happens. You will find:
The sequence either reduces to 1 (which repeats) or enters a loop containing the sequence 89, 145, 42, 20, 4, 16, 37, 58, 89 (which repeats).

Worksheet 10
The marking memorandum for Worksheet 10 is included under Section 4.

Assessment
Students should be able to use letters to express mathematical statements and solve simple word problems using algebra.
Chapter 11  Plane shapes 1: Properties

Objectives
By the end of the chapter, each student should be able to:
• Identify, name and state the properties of common plane shapes (rectangles, squares, triangles, regular polygons, circles)
• Distinguish between different types of triangles (scalene, isosceles, equilateral)
• Construct plane shapes by (a) paper folding, (b) using a pair of compasses
• Identify by name the various parts of a circle (circumference, arc, radius, diameter, sector, semi-circle, segment).

Teaching and learning materials
Teacher: Chalk board instruments, cardboard, paper, scissors, model pyramid
Students: Old newspapers; mathematical sets (ruler and pair of compasses)

Key word definitions
plane shape: any shape on a flat surface
rectangle: plane shape with 4 sides and 4 right angles
diagonal: line joining two corners of a plane shape
centre: middle
side: an edge or boundary of a plane shape
line of symmetry: line dividing a shape into two matching halves
square (geometry): rectangle with four equal sides
triangle: plane shape with 3 sides
isosceles triangle: triangle with 2 equal sides
equilateral triangle: triangle with 3 equal sides
polygon: plane shape with 3 or more sides
quadrilateral: any 4-sided shape
regular polygon: polygon with equal sides and angles
parallelogram: a quadrilateral with 2 pairs of parallel sides
circle: a perfectly round shape
circumference: boundary of a circle
arc: part of the circumference of a circle
radius (plural radii): straight line from the centre to the circumference of a circle

Revision
Students need to be able to:
• identify and name basic plane shapes, e.g. square, rectangle, triangle, circle.

Lesson 1  Rectangles and squares
Student’s Book page 82; Workbook page 27

The focus of this lesson is rectangles and squares.
All students must complete the ‘must do’ questions of Exercises 11a–b.
Stronger students can find more rectangular and square faces in the objects around them.
Assign questions 5a–c and 6a–b from Worksheet 11 as homework.
Lesson 2 Triangles

Student’s Book page 84; Workbook page 27

The focus of this lesson is isosceles and equilateral triangles.

All students must complete the ‘must do’ questions of Exercises 11c–d.

Stronger students can find more triangular faces in the objects around them.

Assign question 6c–d from Worksheet 11 as homework.

Lesson 3 Polygons

Student’s Book page 85; Workbook page 27

The focus of this lesson is regular polygons and quadrilaterals.

Read through the text in the Student’s Book.

Assign questions 1 to 4 from Worksheet 11 as homework.

Lesson 4 Circles

Student’s Book page 86; Workbook page 27

The focus of this lesson is parts of a circle.

All students must complete the ‘must do’ questions of Exercise 11e.

Stronger students can complete the Who’s who puzzle on page 88 of the Student’s Book.

Assign question 5d–g from Worksheet 11 as homework.

Answers

Puzzle: Who’s who?

<table>
<thead>
<tr>
<th>Olanna (youngest)</th>
<th>Red dress</th>
<th>Teacher</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amina</td>
<td>Green dress</td>
<td>Lawyer</td>
</tr>
<tr>
<td>Chiamaka (oldest)</td>
<td>Yellow dress</td>
<td>Doctor</td>
</tr>
</tbody>
</table>

[Use trial and improvement – check solutions against the statements and make sure they all work correctly.]

Worksheet 11

The marking memorandum for Worksheet 11 is included under Section 4.

Assessment

Students should be able to identify, name and state the properties of common plane shapes (rectangles, squares, triangles, regular polygons, circles) and distinguish between different types of triangles (scalene, isosceles, equilateral).

They should also be able to construct plane shapes by (a) paper folding, (b) using a pair of compasses and identify by name the various parts of a circle (circumference, arc, radius, diameter, sector, semi-circle, segment).
Objectives
By the end of the chapter, each student should be able to:
• Draw and use a number line to represent directed numbers (positive and negative numbers)
• Interpret and relate positive and negative numbers to everyday activities
• Arrange directed numbers in order of size
• Add and subtract positive and negative numbers, using the number line.

Teaching and learning materials
Teacher: Long strips of paper for number lines

Key word definitions
number line: a line extending above and below zero (0)
zero: the only number that is neither positive or negative
negative number: a number less than 0
positive number: any number greater than 0
directed numbers: positive and/or negative numbers

Revision
Students need to be able to:
• understand and draw a basic number line
• use a number line to add and subtract small numbers.

Lesson 1 The number line
Student’s Book page 90; Workbook page 30

The focus of this lesson is number lines, positive and negative numbers in mathematics and in daily life.

Work through Examples 1–6 with the class.
All students must complete the ‘must do’ questions of Exercises 12a–c.
Stronger students can complete question 18 of Exercise 12c.

Assign questions 1 and 2 from Worksheet 12 as homework.

Lesson 2 Directed numbers
Student’s Book page 94; Workbook page 30

The focus of this lesson is directed numbers.
All students must complete the ‘must do’ questions of Exercise 12d.
Stronger students can complete questions 34 of Exercise 12d.
Assign questions 3 and 4 from Worksheet 12 as homework.

Lesson 3 Adding and subtracting positive numbers
Student’s Book page 95; Workbook page 30

The focus of this lesson is adding and subtracting positive numbers.
Work through Example 7 with the class.
All students must complete the ‘must do’ questions of Exercises 1e–g.
Stronger students can complete questions 17–20 of Exercise 12g.
Assign question 5 from Worksheet 12 as homework.
Lesson 4  Adding and subtracting negative numbers

Student's Book page 97; Workbook page 30

The focus of this lesson is adding and subtracting negative numbers.

All students must complete the ‘must do’ questions of Exercises 12h–i.

Stronger students can complete question 2 of Exercise 12i.

Assign questions 6 and 7 from Worksheet 12 as homework.

Answers

Worksheet 12

The marking memorandum for Worksheet 12 is included under Section 4.

Assessment

Students should be able to draw and use a number line to represent directed numbers (positive and negative numbers) and interpret and relate positive and negative numbers to everyday activities.

They should also be able to arrange directed numbers in order of size and add and subtract positive and negative numbers, using the number line.
Chapter 13  Plane shapes 2: Perimeter

Objectives
By the end of the chapter, each student should be able to:
• Find the perimeter of regular and irregular shapes by direct measurement, using a ruler and thread/string where necessary
• Derive and apply appropriate formulae to calculate the perimeter of rectangles, squares, parallelograms and circles
• Find perimeters of shapes made up by combining basic shapes.

Teaching and learning materials
Teacher: Large regular and irregular cardboard shapes; large leaves; flat stones; rulers, tape measures (small, as used by tailors; and large, as used by surveyors); thread or string; tin cans or bottles
Students: Rulers, thread or string; large leaves, flat stones, tin cans or bottles

Key word definitions
perimeter: the length of the outside edge of a shape
regular (in mathematics): with a clear pattern
irregular (in mathematics): without a clear pattern
rectangle: a plane shape with four right angles
length (of rectangle): the longer sides of a rectangle
breadth (of rectangle): the shorter sides of a rectangle
formula: a general expression for solving problems
square (geometry): a rectangle with four equal sides
parallelogram: a plane shape with two pairs of parallel sides
circumference: the perimeter of a circle
pi: ratio of circumference to diameter of a circle
diameter: straight line through the centre of a circle, joining opposite points on the circumference
measure: find a size using a ruler or measuring device
calculate: use reasoning [QR] or a formula to find a value

Revision
Students need to be able to:
• understand all the content of Chapter 11 before proceeding with this chapter.

Lesson 1 Measuring perimeters
Student’s Book page 101; Workbook page 32

The focus of this lesson is perimeter of regular and irregular shapes.
Work through Examples 1–3 with the class.
All students must complete the ‘must do’ questions of Exercise 13a.
Stronger students can complete the Page numbers puzzle on page 109 of the Student’s Book.
Assign questions 1, 2 and 3 from Worksheet 13 as homework.

Lesson 2 Using formulae to calculate perimeters
Student’s Book page 103; Workbook page 32

The focus of this lesson is perimeter of rectangles, squares and parallelograms.
Note: correction to formula for finding the length of side of square = \( \frac{\text{perimeter of square}}{4} \)
Work through Examples 4–9 with the class.
All students must complete the ‘must do’ questions of Exercise 13b.
Stronger students can complete the Pentagon and triangles puzzle on page 109 of the Student’s Book.
Assign questions 5 and 6 from Worksheet 13 as homework.
Lesson 3 Perimeter of circles

Student’s Book page 106; Workbook page 32

The focus of this lesson is measuring the circumference of circles and applying the formula.
Work through Examples 10–12 with the class.
All students must complete the ‘must do’ questions of Exercises 13c–e.
Stronger students can complete questions 9–12 of Exercise 13c.
Assign questions 4 and 7 from Worksheet 13 as homework.

Answers

Puzzle: Page numbers
First, consider how many digits are required for pages 1–100.
Pages 1 to 9 = 1 × 9 = 9 digits
Pages 10 to 99 = 2 × 90 = 180 digits
Page 100 = 3 digits
Total: 192 digits
Now do the same for pages 101 to 200 (= 3 × 100 = 300 digits).
Likewise for pages 201 to 300 (= 300 digits).

Thus 300 pages require 792 digits.
852 – 792 = 60 digits, equivalent to 20 pages at 3 digits per page.
320 pages require 852 digits.
Calculation of the number of times digit 7 appears is left as a discussion exercise.
You should find that 7 appears 62 times.

Puzzle: Pentagon and triangles
(1) 5 triangles
(2) 20 triangles

Worksheet 13
The marking memorandum for Worksheet 13 is included under Section 4.

Assessment
Students should be able to find the perimeter of regular and irregular shapes by direct measurement, using a ruler and thread/string where necessary, and derive and apply appropriate formulae to calculate the perimeter of rectangles, squares, parallelograms and circles. They should also be able to find perimeters of shapes made up by combining basic shapes.
Chapter 14  Plane shapes 3: Area

Objectives
By the end of the chapter, each student should be able to:
• Find the area of regular and irregular shapes by drawing them on squared paper
• Derive and apply appropriate formulae to calculate the area of rectangles, squares, parallelograms, triangles and trapeziums
• Calculate the area of a circle using the formula $A = \pi r^2$
• Calculate the areas of shapes made by combining other basic shapes.

Teaching and learning materials
Teacher: Regular and irregular cardboard shapes; large leaves; flat stones; squared paper; poster of Figure 14.30; tin cans or bottles
Students: Large leaves; flat stones; squared paper (graph exercise book); scissors; protractor; tin cans or bottles

Key word definitions
area: measure of the amount that a surface covers
square metre ($m^2$): area of a square 1 m by 1 m
square centimetre ($cm^2$): area of a square 1 cm by 1 cm

Revision
Students need to be able to:
• understand all the content of Chapter 13 before proceeding with this chapter.

Lesson 2 Area of rectangles and squares
Student’s Book page 112; Workbook page 35
The focus of this lesson is area of rectangles and squares.
Work through Examples 1–7 with the class.
All students must complete the ‘must do’ questions of Exercise 14b.
Stronger students can complete questions 14–15 of Exercise 14b.
Assign questions 1i, ii and iv and 2 from Worksheet 14 as homework.

Lesson 3 Area of parallelograms
Student’s Book page 115; Workbook page 35
The focus of this lesson is area of parallelograms.
Work through Examples 8–10 with the class.
Note that the last line in Example 10 should read “thus $b = 3$ cm”.
All students must complete the ‘must do’ questions of Exercise 14c.
Stronger students can complete question 4 of Exercise 14c.
Assign question 4 from Worksheet 14 as homework.
Lesson 4 Area of triangles and trapeziums

Student’s Book page 116; Workbook page 35

The focus of this lesson is on the area of right-angled and any other triangles and trapeziums. Work through Examples 11–15 with the class. All students must complete the ‘must do’ question of Exercise 14d. Stronger students can complete question 2 of Exercise 14d. Assign questions 1iii and 2 from Worksheet 14 as homework.

Lesson 5 Area of circles

Student’s Book page 119; Workbook page 35

The focus of this lesson is area of circles. Work through Examples 16–17 with the class. All students must complete the ‘must do’ questions of Exercise 14e.

Stronger students can complete questions 4–10 of Exercise 14e. Assign questions 1v, 2, 5, 6 and 7 from Worksheet 14 as homework.

Answers

Worksheet 14

The marking memorandum for Worksheet 14 is included under Section 4.

Assessment

Students should be able to find the area of regular and irregular shapes by drawing them on squared paper, and derive and apply appropriate formulae to calculate the area of rectangles, squares, parallelograms, triangles and trapeziums. They should also be able to calculate the area of a circle using the formula \( A = \pi r^2 \) and calculate the areas of shapes made by combining other basic shapes.
Chapter 15  Algebraic simplification 2: Brackets

Objectives
By the end of the chapter, each student should be able to:
• Multiply and divide algebraic terms
• Simplify algebraic expressions by following an agreed order of operations
• Remove brackets from simple numerical and algebraic expressions
• Solve simple word problems that involve brackets and algebraic terms.

Teaching and learning materials
There are no materials for this chapter.

Key word definitions
BODMAS: order of operations: Brackets, Of, Division, Multiplication, Addition, Subtraction
consecutive: following one after another

Revision
Students need to be able to:
• understand all the content of Chapter 7 before proceeding with this chapter.

Lesson 1  Multiplying and dividing algebraic terms
Student’s Book page 123; Workbook page 38
The focus of this lesson is multiplying and dividing algebraic terms.
Work through Examples 1–3 with the class.
All students must complete the ‘must do’ questions of Exercises 15a–b.
Stronger students can complete the algebra puzzle on page 124 of the Student’s Book.
Assign questions 1, 2 and 9 from Worksheet 15 as homework.

Lesson 2  Order of operations
Student’s Book page 125; Workbook page 38
The focus of this lesson is order of operations (BODMAS).
Work through Examples 4–7 with the class.
All students must complete the ‘must do’ questions of Exercises 15c–d.
Stronger students can complete questions 16–24 of Exercise 15d.
Assign questions 3 and 6 from Worksheet 15 as homework.

Lesson 3  Removing brackets
Student’s Book page 126; Workbook page 38
The focus of this lesson is positive and negative signs before brackets.
Work through Examples 8–15 with the class.
All students must complete the ‘must do’ questions of Exercises 15e–k.
Stronger students can complete questions 7–10 of Exercise 15k.
Assign questions 4, 5, 7 and 8 from Worksheet 15 as homework.

Answers
Worksheet 15
The marking memorandum for Worksheet 15 is included under Section 4.

Assessment
Students should be able to multiply and divide algebraic terms, and simplify algebraic expressions by following an agreed order of operations. They should also be able to remove brackets from simple numerical and algebraic expressions and solve simple word problems that involve brackets and algebraic terms.
Chapter 16 Solids 2: Volume

Objectives
By the end of the chapter, each student should be able to:
• Express the volume of solids in appropriate units
• Calculate the volume of cuboids and cubes
• Express the capacity of containers in appropriate units
• Calculate the capacity of simple containers
• Calculate the volume of triangular prisms.

Teaching and learning materials
Teacher: Unit cubes; cuboids (e.g. bricks, building blocks); empty packets (e.g. matchbox, chalk box)
Students: Empty packets

Key word definitions
volume: the space that solid object occupies
cubic metre (m³): volume of a cube 1 m by 1 m by 1 m
cubic centimetre (cm³): volume of a cube 1 cm by 1 cm by 1 cm
product: the result of multiplying numbers together
capacity: the space inside a container; the amount that it will hold
litre: basic measure of capacity (1 000 cm³)
kilolitre: 1 000 ℓ

Revision
Students need to be able to:
• understand all the content of Chapter 6 before proceeding with this chapter.

Lesson 1 Volume
Student’s Book page 130
The focus of this lesson is units of volume.
Work through the text with the students before starting the next lesson.

Lesson 2 Volume of cuboids and cubes
Student’s Book page 131; Workbook page 40
The focus of this lesson is volume of cuboids and cubes.

Lesson 3 Capacity of containers
Student’s Book page 132; Workbook page 40
The focus of this lesson is capacity.
Work through Example 4 with the class.
Work through Examples 1–3 with the class.
All students must complete the ‘must do’ questions of Exercise 16a.
All students must complete the ‘must do’ questions of Exercise 16a.
Stronger students can complete questions 11–15 of Exercise 16a.
Assign questions 1, 2, 3, 4, 5 and 9 from Worksheet 16 as homework.

Lesson 4 Volume of right-angled triangular prism
Student’s Book page 133; Workbook page 40
The focus of this lesson is volume of prisms.
Work through Example 5 with the class.
Work through Example 5 with the class.
All students must complete the ‘must do’ questions of Exercise 16c.
Stronger students can complete the Sums and products puzzle on page 134 of the Student’s Book. Assign questions 11 and 12 from Worksheet 16 as homework.

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**Answers**

**Puzzle: Sums and products**

*Strategy:* Use trial and improvement:

\[ 36 = 3 \times 3 \times 4 \]

**Puzzle: Shake hands**

9 people: 36 handshakes

\[ = 8 + 7 + 6 + 5 + 4 + 3 + 2 + 1 \]

5 people: 10 handshakes

\[ = 4 + 3 + 2 + 1 \]

In general, for \( n \) people, number of handshakes

\[ = \frac{n(n - 1)}{2} \]

---

So, for 500 people there are \( \frac{500 \times 499}{2} \) handshakes (= 124 750 handshakes).

**Worksheet 16**

The marking memorandum for Worksheet 16 is included under Section 4.

**Assessment**

Students should be able to express the volume of solids in appropriate units, calculate the volume of cuboids and cubes and express the capacity of containers in appropriate units. They should also be able to calculate the capacity of simple containers and the volume of triangular prisms.
Chapter 17  Statistics 1: Purpose and data collection

Objectives
By the end of the chapter, each student should be able to:
• Analyse and interpret statistical data presented in tables
• Use statistical data for planning purposes
• Collect and record statistical data in a systematic fashion.

Teaching and learning materials
Teacher: Data, tables, charts, graphs from newspapers, magazines and other relevant sources (to include data on drug abuse, population trends, election results, HIV&AIDS and other emerging issues); metre rule; bathroom scales
Students: Every student to bring a newspaper that contains some numerical or graphical information

Key word definitions
information: knowledge about something
data: basic information; usually numerical
statistics: the treatment and study of numerical information
probability: the likelihood of something happening
record: written information
questionnaire: a set of questions in a written form

Revision
Students need to be able to:
• recognise and draw up basic bar graphs
• understand how to collect data.

Lesson 1 The need for statistics
Student's Book page 140; Workbook page 43

The focus of this lesson is statistical data and the purpose of statistics.
All students must complete the ‘must do’ questions of Exercise 17a.
Stronger students can complete the Two dice puzzle on page 145 of the Student’s Book.
Assign questions 1 and 2 from Worksheet 17 as homework.

Lesson 2 Data collection
Student's Book page 142; Workbook page 43

The focus of this lesson is data collection.
All students must complete the ‘must do’ questions of Exercise 17b.
Stronger students can complete the Roman numerals puzzle on page 144 of the Student’s Book.
Assign questions 3 to 6 from Worksheet 17 as homework.

Answers

Puzzle: Two dice
Make a grid showing the outcomes:

The shaded square shows the required outcomes.
= \frac{16}{36} or \frac{4}{9} (four-ninths)

Puzzle: Roman numerals
(a) and (b) I, V, X, L, C, D, M
(c) MDCLXVI (= 1666)

Worksheet 17
The marking memorandum for Worksheet 17 is included under Section 4.

Assessment
Students should be able to analyse and interpret statistical data presented in tables, use statistical data for planning purposes and collect and record statistical data in a systematic fashion.
## Objectives
By the end of the chapter, each student should be able to:
- Present statistical data in rank order
- Construct a frequency table from given data
- Present statistical data graphically in pictograms, bar charts and/or pie charts
- Interpret statistical data presented numerically and graphically.

### Teaching and learning materials
**Teacher:** Chalk board instruments (ruler, protractor, compasses); make sure students have the data they collected for Exercise 17b
**Students:** Mathematical set (ruler, protractor, compasses); data from Exercise 17b

### Key word definitions
- **presentation:** way of showing things
- **list:** basic information arranged in a row or column
- **table:** (statistics) information arranged in rows and columns
- **graph:** a picture showing numerical information
- **rank order:** in order of size, usually from highest to lowest
- **frequency:** how often something happens
- **frequency table:** a table showing how often things happen
- **pictogram:** a graph with pictures showing frequencies
- **bar chart:** a graph where the length of a bar or column shows frequency
- **pie chart:** a graph showing parts of a whole, using degrees adding up to 360°

### Revision
Students need to be able to:
- understand all the content of Chapter 17 before proceeding with this chapter.

### Lesson 1 Types of presentation, lists and tables
*Student’s Book page 146; Workbook page 46*

The focus of this lesson is presentation of data, rank order lists and frequency tables.
Work through the explanatory text in the Student’s Book.
Assign questions 1 and 3 from Worksheet 18 as homework.

### Lesson 2 Graphical presentation
*Student’s Book page 147; Workbook page 46*

The focus of this lesson is pictograms, bar charts, and pie charts.
All students must complete the ‘must do’ questions of Exercises 18a–b.
Stronger students can complete questions 11–15 of Exercise 18b.
Assign questions 2 and 4 from Worksheet 18 as homework.

### Answers
**Worksheet 18**
The marking memorandum for Worksheet 18 is included under Section 4.

### Assessment
Students should be able to present statistical data in rank order and construct a frequency table from given data.
They should also be able to present statistical data graphically in pictograms, bar charts and/or pie charts and interpret statistical data presented numerically and graphically.
Chapter 19  Simple equations

Objectives
By the end of the chapter, each student should be able to:
• Identify an equation as an algebraic sentence involving equality
• Distinguish between true and false open sentences
• Solve simple equations using the balance method
• Check your solution to an equation.

Teaching and learning materials
Teacher: Flash cards of open sentences such as

\[ 3 \times \square - 5 = 13 \]

Key word definitions
algebraic sentence: a sentence with symbols instead of words
equation: an algebraic sentence with an equals sign
equation in x: an equation where x is the unknown
unknown(s): symbols or symbols in an algebraic sentence
open sentence: a sentence that may be true or false
solution: the value of the unknown(s) that makes an equation true
to solve an equation: to find the value of the unknown(s) that makes an equation true
LHS/RHS: the left-hand side or right-hand side of an equation
balances (an equation): do the same to both sides

Revision
Students need to be able to:
• how to write an open sentence
• how to write a basic algebraic sentence.

Lesson 1 Equations
Student’s Book page 152; Workbook page 50

The focus of this lesson is true and false open sentences.
Work through Examples 1–2 with the class.
All students must complete the ‘must do’ questions of Exercise 19a.
Stronger students can complete the Snail on the wall puzzle on page 157 of the Student’s Book.

Assign questions 1 and 2 from Worksheet 19 as homework.

Lesson 2 Solution of an equation
Student’s Book page 153; Workbook page 50

The focus of this lesson is the balance method of solving equations and checking the solution.
Work through Examples 3–11 with the class.
All students must complete the ‘must do’ questions of Exercises 19b–e.
Stronger students can complete Exercise 19f.
Assign questions 3 and 4 from Worksheet 19 as homework.

Answers
Puzzle: Snail on the wall
In every 24 hours, the snail gains 200 cm.
After 22 complete days, it has gained 22 × 200 cm (= 4.4 metres).
On the 23rd day it climbs the remaining 600 cm and gets out of the well.
Answer: 23 days

Worksheet 19
The marking memorandum for Worksheet 19 is included under Section 4.

Assessment
Students should be able to identify an equation as an algebraic sentence involving equality and distinguish between true and false open sentences. They should also be able to solve simple equations using the balance method and check the solution to an equation.
Chapter 20 Angles 2: Angles between lines; angles in a triangle

Objectives
By the end of the chapter, each student should be able to:
• Calculate the sizes of angles between lines, using the properties of adjacent angles, vertically opposite angles and angles at a point
• Calculate the sizes of angles between parallel lines and a transversal, using the properties of alternate and corresponding angles
• Use the sum of the angles of a triangle to find unknown angles in a triangle.

Teaching and learning materials
Teacher: Chalk board instruments (ruler and protractor); cardboard, paper, scissors
Students: Mathematical set: protractor and ruler are essential for this chapter

Key word definitions
adjacent: beside or next to
vertically opposite: angles opposite each other where straight lines cross
calculate: use reasoning (not measurement)
produce: (a line) make a line longer
parallel: pointing in the same direction
transversal: line crossing two or more parallel lines
corresponding angles: angles in the same position
F angles: another term for corresponding angles
alternate angles: angles in a Z position
Z angles: another term for alternate angles

Revision
Students need to be able to:
• understand all the content of Chapter 8 before proceeding with this chapter.

Lesson 1 Angles between lines
Student's Book page 159
The focus of this lesson is revising what was learnt in Chapter 8, i.e. adjacent angles on a straight line, vertically opposite angles and angles meeting at a point.

All students must complete the ‘must do’ questions of Exercise 20a.

Lesson 2 Calculating the sizes of angles
Student's Book page 160; Workbook page 52
The focus of this lesson is calculating sizes of angles.
Work through Examples 1–4 with the class.
All students must complete the ‘must do’ questions of Exercises 20b–c.
Stronger students can complete question 6 of Exercise 20b.
Assign question 1 from Worksheet 20 as homework.

Lesson 3 Parallel lines
Student's Book page 162; Workbook page 52
The focus of this lesson is corresponding angles and alternate angles.
All students must complete the ‘must do’ questions of Exercises 20d–f.
Stronger students can complete questions 3–5 of Exercise 20d.
Lesson 4  Angles in a triangle

Student's Book page 165; Workbook page 52

The focus of this lesson is angles in a triangle.
All students must complete the ‘must do’ questions of Exercises 20g–i.
Stronger students can complete questions 3–5 of Exercise 20i.
Assign questions 2 and 3 from Worksheet 20 as homework.

Answers

Worksheet 20
The marking memorandum for Worksheet 20 is included under Section 4.

Assessment

Students should be able to calculate the sizes of angles between lines, using the properties of adjacent angles, vertically opposite angles and angles at a point, as well as calculate the sizes of angles between parallel lines and a transversal, using the properties of alternate and corresponding angles.
They should also be able to use the sum of the angles of a triangle to find unknown angles in a triangle.
Objectives
By the end of the chapter, each student should be able to:
• Construct parallel lines using ruler and set square
• Construct perpendiculars to a line, or from a point to a line, using ruler and set square
• Bisect a straight line segment
• Construct angles of 90° and 60°.

Teaching and learning materials
Teacher: Chalk board instruments (ruler, set square); plain paper, scissors
Students: Mathematical set: ruler and set square are essential for this topic

Key word definitions
construct (geometry): draw accurately using geometrical instruments
construction (in mathematics): an accurate drawing
rough sketch: a drawing that is not accurate
bisect: cut in half
rhombus: a parallelogram with all sides the same length
perpendicular: meeting at right angles
perpendicular distance: the length of a perpendicular line between the point where it bisects to another point
line segment: part of a line
perpendicular bisector: line bisecting another line at right angles

Revision
Students need to be able to:
• draw straight lines to a specific measurement using a ruler.

Lesson 1 Construction, constructing parallel lines
Student’s Book page 170; Workbook page 56
The focus of this lesson is constructing parallel lines. Work through Example 1 with the class.

Lesson 2 Constructing perpendiculars
Student’s Book page 174; Workbook page 56
The focus of this lesson is constructing lines perpendicular from a point on a line and to a point outside a line. Work through the text example with the class. All students must complete the ‘must do’ questions of Exercise 21b. Stronger students can complete questions 5–6 of Exercise 21b. Assign question 1c–d from Worksheet 21 as homework.

Lesson 3 To bisect a straight line
Student’s Book page 175; Workbook page 56
The focus of this lesson is bisecting a straight line. Work through the text example with the class. All students must complete the ‘must do’ questions of Exercise 21c. Stronger students can complete questions 5–8 of Exercise 21c.
Assign question 2 from Worksheet 21 as homework.

**Lesson 4 To construct an angle of 90°**

*Student’s Book page 175; Workbook page 56*

The focus of this lesson is constructing an angle of 90°.

Work through the text example with the class.

All students must complete the ‘must do’ questions of Exercise 21d.

Stronger students can complete the Five past five puzzle on page 177 of the Student’s Book.

Assign question 1e from Worksheet 21 as homework.

**Answers**

**Puzzle: Five past five**

At 5 o’clock the angle is \( \frac{5}{12} \) of 360° (= 150°).

At 5 past 5 the minute hand has moved \( \frac{1}{12} \) of 360° (= 30°)

and the hour hand has moved \( \frac{1}{12} \) of 30° (= 2°).

Angle between the hands at five past five

\[= 150° - 30° + 2° = 122°\]

**Puzzle: Consecutive products**

*Strategy: Trial and improvement:*

(a) \(12 = 3 \times 4\)

(b) \(162 = 54 \times 3\)

**Worksheet 21**

The marking memorandum for Worksheet 21 is included under Section 4.

**Assessment**

Students should be able to construct parallel lines using ruler and set square, and construct perpendiculars to a line, or from a point to a line, using ruler and set square.

They should also be able to bisect a straight line segment and construct angles of 90° and 60°.
Objectives
By the end of the chapter, each student should be able to:
• Calculate the mean of a given set of numbers
• Obtain the median and mode of a given set of data
• Find the mean, median and mode of statistical data based on studies of the environment.

Key word definitions
average: a value typical of a set of numbers
mean (of n numbers): the sum of the numbers in a set divided by n
median: the middle value when numbers are arranged in order of size
mode: the number that appears most often in a set of numbers
frequency: the number of times that a piece of data occurs
bimodal: having two modes

Revision
Students need to be able to:
• understand all the content of Chapter 18 before proceeding with this chapter.

Lesson 1 Averages and the mean
Student's Book page 179; Workbook page 59
The focus of this lesson is averages and the mean.
Work through Examples 1–2 with the class.
All students must complete the ‘must do’ questions of Exercise 22a.
Assign questions 1 and 2 from Worksheet 22 as homework.

Lesson 2 The median
Student's Book page 180; Workbook page 59
The focus of this lesson is the median.
Work through Examples 3–4 with the class.
All students must complete the ‘must do’ questions of Exercise 22b.
Assign questions 3 and 4 from Worksheet 22 as homework.

Lesson 3 The mode
Student's Book page 181; Workbook page 59
The focus of this lesson is the mode.
Work through Examples 5–7 with the class.
Note these corrections to Example 5 with the students: cross out the first line of ordered absences, which clearly doesn't fit here; the mean (not median) = 4 days.
All students must complete the ‘must do’ questions of Exercises 22c–d.
Stronger students can complete Exercise 22e.
Assign questions 5 and 6 from Worksheet 22 as homework.

Answers
Worksheet 22
The marking memorandum for Worksheet 22 is included under Section 4.

Assessment
Students should be able to calculate the mean of a given set of numbers, obtain the median and mode of a given set of data and find the mean, median and mode of statistical data based on studies of the environment.
Objectives
By the end of the chapter, each student should be able to:
- Estimate quantities
- Decide which common units of measurement to use in a given situation
- Use body measures and empty containers to estimate distances and quantities
- Round off numbers to a given degree of accuracy
- Use rounded numbers to approximate the answers to addition, subtraction, multiplication and division problems
- Apply the principles of estimation and approximation to everyday situations and activities.

Teaching and learning materials
Teacher: Metre rule, measuring tape, 1 kg mass, scales, 1-litre container, containers, bottles, stones
Students: Empty bottles and juice packets, stones

Key word definitions
approximate: find a close value
round off: find an approximate value
nearest unit (ten, hundred, tenth, and so on): an approximate value to within one unit (ten, and so on)
approximation: the process of using of rounded numbers
rough calculation: approximation to find a close value
significant figure(s): the leading value(s) in a number

Revision
Students need to be able to:
* round off to the nearest 10 and 100
* estimate small numbers.

Lesson 1 Estimation
Student’s Book page 185; Workbook page 61
The focus of this lesson is common measures and body measures.
All students must complete the ‘must do’ questions of Exercises 23a–b.

Lesson 2 Rounding off numbers
Student’s Book page 187; Workbook page 61
The focus of this lesson is rounding off.
Work through Examples 1–2 with the class.
All students must complete the ‘must do’ questions of Exercise 23d.
Stronger students can complete the Prime addition puzzle on page 191 of the Student’s Book.
Assign questions 3 and 4 from Worksheet 23 as homework.

Lesson 3 Approximation
Student’s Book page 188; Workbook page 61
The focus of this lesson is approximating to one significant figure/nearest whole number.
Work through Examples 3–6 with the class.
All students must complete the ‘must do’ questions of Exercises 23e–f.
Stronger students can complete Exercise 23g.
Assign questions 5 and 6 from Worksheet 23 as homework.
Answers

Puzzle: Prime addition

99 is an odd number. An even number + and odd number = an odd number, so one of P or Q must be even.

2 is the only even prime number, so there can only be one result: P = 2 and Q = 97.

Worksheet 23

The marking memorandum for Worksheet 23 is included under Section 4.

Assessment

Students should be able to estimate quantities, decide which common units of measurement to use in a given situation and use body measures and empty containers to estimate distances and quantities.

They should also be able to round off numbers to a given degree of accuracy, use rounded numbers to approximate the answers to addition, subtraction, multiplication and division problems and apply the principles of estimation and approximation to everyday situations and activities.
Chapter 24  Base two arithmetic

Objectives
By the end of the chapter, each student should be able to:
• Expand numbers expressed in various bases
• Express base ten numbers in base two
• Convert binary (base two) numbers to base ten
• Add, subtract and multiply binary numbers.

Teaching and learning materials
Teacher: Counters (e.g. matchsticks, bottle tops, pebbles)
Students: Matchsticks, bottle tops, pebble

Key word definitions
base (numbers): number and counting system
base ten: most common way of counting in 10s or powers of 10
base two: counting in 2s
binary number: a base two number

Revision
Students need to be able to:
• count in twos
• add and subtract 4- and 5-digit numbers.

Lesson 1 Number bases
Student’s Book page 193; Workbook page 63

The focus of this lesson is number bases.
Work through Example 1 with the class.
All students must complete the ‘must do’ questions of Exercise 24a.
Stronger students can complete the Three bags of mangoes puzzle on page 198 of the Student’s Book.
Assign questions 1 and 2 from Worksheet 24 as homework.

Lesson 2 Binary numbers
Student’s Book page 193; Workbook page 63

The focus of this lesson is binary numbers and converting between base ten and base two.
Work through Examples 2–4 with the class.
All students must complete the ‘must do’ questions of Exercises 24b–c.
Stronger students can complete the Think of a number puzzle on page 198 of the Student’s Book.
Assign question 3 from Worksheet 24 as homework.

Lesson 3 Operations with binary numbers
Student’s Book page 196; Workbook page 63

The focus of this lesson is adding, subtracting and multiplying base numbers.
Work through Examples 5–7 with the class.
All students must complete the ‘must do’ questions of Exercise 24d.
Stronger students can complete question 5 of Exercise 24d.
Assign questions 4 to 7 from Worksheet 24 as homework.
**Answers**

**Puzzle: Three bags of mangoes**

1 mango
[One bag with 1 mango, inside a second bag, inside the third bag.]

**Puzzle: Think of a number**

He removed a 2. [The total of the digits must equal a number divisible by 9.]

**Worksheet 24**

The marking memorandum for Worksheet 24 is included under Section 4.

**Assessment**

Students should be able to expand numbers expressed in various bases, express base ten numbers in base two, convert binary (base two) numbers to base ten and add, subtract and multiply binary numbers.
Section 3: Revision tests

Section 3 provides additional resources for the chapter and term revision tests found in the Student's Book. The chapter and term tests have been recreated into easy to print test sheets that you can use for formal assessment with your class.

The answers to the chapter and term tests were not given in the Student’s Book answers section, so you can conduct your assessments knowing that the students can’t copy the answers from their Student’s Book.

There are four sub-sections:
1. Chapter revision test sheets for printing
2. Answers to the chapter revision tests
3. Term revision test sheets for printing
4. Answers to the term revision tests

The chapter revision tests show how well the students have grasped the content of the chapter. There are a number of possible ways of managing the chapter revision tests:
1. As a formal class test on completion of the work of the chapter
2. As homework, after completing the work of the chapter
3. As classwork, where students, in pairs or small groups, work through the test in discussion with each other and the teacher
4. As a formal test at some point in the school year after revising the chapter topic

Given the time constraints of the school year, we strongly recommend that methods 2 or 3 be considered. As the only person with direct access to the answers, teacher participation is essential.

For ease of completion, the chapter revision tests are included as independent worksheets in the section that follows. Students simply write down their answers on these sheets. In some instances, students need to construct diagrams on separate pieces of paper. When this happens, make sure that the students write their names and class and the chapter number at the top of the sheets of paper.
Chapter 1 Revision test

1. A baby is 40 days old. What is its age in weeks and days?

2. Add the following times: 2 hours 12 minutes 48 seconds + 55 minutes 22 seconds.

3. LXXIV is in Roman numerals. What number does it represent?

4. Which year were you born? Write this in Roman numerals.

Use the code in Table 1.3 of the Student’s Book to answer questions 5 and 6.

5. Translate the following: (6, 9, 7, 8, 20) (13, 1, 12, 1, 18, 9, 1)

6. Translate PURE WATER into code.

7. Use a paper counting board (SB Fig. 1.3) or an abacus (SB Fig. 1.11) to calculate:
   a. 347 + 288
   b. 921 – 129

8. a. Use Table 1.4 of the Student’s Book to change the number 805 to Arabic numerals.
   b. Write your age in Arabic numerals.

9. Given the number 34 059. What is the value of the following?
   a. the 9
   b. the 5
   c. the 0
   d. the 4
   e. the 3

10. Set out the following subtraction correctly.

   \[ \begin{array}{c}
     634.7 \\
     - 7.425
   \end{array} \]
Chapter 2 Revision test

1 Write the following numbers using 1s and 0s.
   a a billion
   b a trillion

2 Convert 10 000 metres to millimetres. Give the answer without using numerals.

3 How many seconds in January? [Use a calculator.]

4 Write the following numbers correctly (grouping digits in threes from the decimal point).
   a 6 billion
   b 35028641
   c 4560244

5 Write the following numbers correctly (grouping digits in 3s from the decimal point).
   a 48 millionths
   b 0.5028641
   c 4.78400672

6 A newspaper headline says: EXPORTS IN APRIL REACH $2.65 TRILLION. Write this number using digits only.

7 Express the following measures in digits only.
   a 0.7 million litres
   b US$90 billion

8 The Sun is 149 600 000 km from our planet Earth. Write this number in a mixture of digits and words.

9 Write 7 ten thousandths as a decimal fraction.

10 Write the following as decimal fractions.
   a 74 thousandths
   b \( \frac{750}{1 000 000} \)
Chapter 3 Revision test

1 Find all the factors of 36.

2 Which of the numbers 2, 3, 4, 5, 6, 7, 8 and 9 are factors of 42?

3 Write down all the prime numbers between 30 and 60.

4 Express 140 as a product of prime factors.

5 Express 144 as a product of primes in index form.

6 Write the common factors of 24 and 84.

7 Find the HCF of 24, 84 and 120.

8 The grid contains three multiples of 4. Complete the grid with six other multiples of 4.

<table>
<thead>
<tr>
<th>8</th>
<th>12</th>
<th>16</th>
</tr>
</thead>
</table>

9 Write down two common multiples of 2, 5 and 7.

10 Find the LCM of $2^3 \times 3^2 \times 5$, $2 \times 3^2 \times 7$ and $2^2 \times 3 \times 5^2$. Leave your answer in prime factors in index form.
Chapter 4 Revision test

1. Find the missing numbers.
   a. \( \frac{17}{6} = \square \) \( \frac{2}{6} \) ______________________
   b. \( \frac{7}{8} = \square \) \( \frac{8}{8} \) ______________________
   c. \( \frac{4}{7} = \square \) \( \frac{56}{7} \) ______________________

2. Reduce the following fractions to their lowest terms.
   a. \( \frac{15}{100} \) ______________________
   b. \( \frac{30}{78} \) ______________________
   c. \( \frac{98}{112} \) ______________________

3. Simplify the following.
   a. \( \frac{5}{6} + \frac{3}{4} \) ______________________
   b. \( \frac{11}{12} - \frac{3}{8} \) ______________________
   c. \( 1\frac{1}{3} + 3\frac{1}{4} + 2\frac{1}{2} \) ______________________

4. During a day a student spends 7 hours sleeping, \( \frac{1}{4} \) of the day studying and \( \frac{1}{6} \) of the day travelling. What fraction of the day is left for other things?

5. Simplify.
   a. \( \frac{5}{6} \times 12 \) ______________________
   b. \( \frac{2}{3} \) of 8 ______________________
   c. \( \frac{5\frac{1}{3}}{3\frac{1}{4}} \) ______________________

   a. \( \frac{6\frac{3}{4}}{9} \) ______________________
   b. \( \frac{4\frac{2}{7}}{\frac{3}{14}} \) ______________________
   c. \( \frac{5\frac{2}{5}}{4\frac{2}{3}} \) ______________________

7. A clinic uses \( \frac{1}{3} \) of its budget for anti-malarial drugs. It uses \( \frac{3}{5} \) of the remaining budget for immunisations. What fraction of the budget is left for other things?

8. Express 2 min 30 sec as a fraction of \( \frac{3}{4} \) hour. Give your answer in its lowest terms.

9. Express 250 ml as a percentage of 2 litres.

10. A trader starts with 80 mangoes. She sells 36 during the day. What percentage remains at the end of the day?
Chapter 5 Revision test

1 Find the number that makes each sentence true.
   a  \( 9 + 6 = \square \) ______________________
   b  \( 9 - \square = 6 \) ______________________
   c  \( 24 = \square \times 3 \) ______________________
   d  \( \square \div 7 = 6 \) ______________________

2 There is more than one box in each sentence. Put the same number in both boxes to make the sentence true.
   a  \( 33 = \square + \square + \square \) ______________________
   b  \( \square = 26 - \square \) ______________________
   c  \( 36 = \square \times \square \) ______________________
   d  \( \square + \square = 45 - \square \) ______________________

3 Find the value of the following if 7 goes in each box.
   a  \( \square + \square \) ______________________
   b  \( 18 - (\square + \square) \) ______________________
   c  \( \square \times \square + 1 \) ______________________
   d  \( \square - (21 \div \square) \) ______________________

4 Each sentence is true. Find the values of \( p \), \( q \), \( r \) and \( s \).
   a  \( p = 8 + 3 \) ______________________
   b  \( q = 7 - 4 \) ______________________
   c  \( 14 - r = 8 \) ______________________
   d  \( 19 = s + 3 \) ______________________

5 Each sentence is true. Find the values of \( w \), \( x \), \( y \) and \( z \).
   a  \( w = 21 + 3 \) ______________________
   b  \( x = 3 \times 8 \) ______________________
   c  \( 39 = y \times 3 \) ______________________
   d  \( 9 = z + 8 \) ______________________

6 Each sentence is true. Find the numbers that the letters stand for.
   a  \( m + m = 20 \) ______________________
   b  \( 32 - n = n \) ______________________
   c  \( 64 + p = p \) ______________________
   d  \( q \times q = 1 \) ______________________

7 Find the value of the following when \( y = 5 \).
   a  \( y + 9 \) ______________________
   b  \( 9 - y \) ______________________
   c  \( 5 + y \) ______________________
   d  \( y \times 8 \) ______________________

8 Find the value of the following when \( z = 11 \).
   a  \( z + z \) ______________________
   b  \( z - z \) ______________________
   c  \( 9 + (z + z) \) ______________________
   d  \( z + (5 \times z) \) ______________________

9 A graph book costs \( x \). The cost of 5 graph books is 450.
   a  What is the value of \( x \)? ______________________
   b  What would be the total cost of a graph book and a pen costing 60?

10 A tank contains 6 000 litres of water. After taking 20 buckets of water from the tank, only 5 700 litres remain. If each bucket contains \( n \) litres, what is the value of \( n \)?

Chapter 6 Revision test

1 Write down at least ten everyday objects that have a geometrical solid shape.

__________________________________________________________________________
__________________________________________________________________________

2 Look at Fig. 1. There are four layers made of small cubes. Each layer has 9 small cubes. Suppose you have a cuboid with five such layers.

Fig. 1

a Make a sketch of the five-layer cuboid.
b How many small cubes altogether does it contain?
_______________________________________________________________________
c If each small cube is 1 cm × 1 cm × 1 cm, how long is the longest edge of the cuboid?
_______________________________________________________________________

3 Look at the hexagonal prism in Fig. 2. Copy and complete Table 1.

Fig. 2

<table>
<thead>
<tr>
<th>Number of vertices, faces and edges that I can see in Fig. 2</th>
<th>Number of vertices, faces and edges altogether on a solid hexagonal prism</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vertices</td>
<td>Faces</td>
</tr>
<tr>
<td>----------</td>
<td>-------</td>
</tr>
</tbody>
</table>

Table 1
4 Fig. 3 and Fig. 4 show different nets that will fold to make a cube.

Fig. 3

Fig. 4

Draw another different net of a cube. (There are nine more altogether.)

5 Use the method of Fig. 6.22 on page 43 of the Student’s Book to draw a skeleton view of a triangular prism.

6 A wire cuboid is 10 cm long, 8 cm wide and 6 cm high. What is the total length of the wire in the cuboid?
7 Draw a skeleton view of a pentagonal-based pyramid. (A pentagon has five sides.) How many vertices, faces and edges does the pyramid have?

__________________________________________________________________________

8 Look at Fig. 5. If you fold this net to make a cuboid:

![Fig. 5]

a Which edge will join to IJ? _______________________________
b Which points will join to point J? _______________________________

9 Look at Fig. 6.

![Fig. 6]

a Along which edges do EFGH and BCHG meet? _______________________________
b Which edges meet at vertex C? _______________________________

10 Look carefully at the drawings in Student’s Book Chapter 6. Write down the figure numbers of those solids with:

a no vertices _______________________________
b only one vertex _______________________________
Chapter 7 Revision test

1 Write \( b + b + b + b + b + b + b \) in a shorter way.

2 \( 8y = \square \times \square \). What should go in the boxes?

3 a Is \( 8y \) a positive or negative term?

   b What is the coefficient of \( y \) in \( 8y \)?

4 a Are \( 8y \) and \( 3z \) like terms or unlike terms?

   b Is it possible to simplify \( 8y + 3z \)?

   c Why?

5 Simplify \( 12m - 19m + 10m \).

6 Simplify \( 3x + 10y + 6x \).

7 Simplify \( 7r - 2s - 6r \).

8 \( 7a + 12b - 3a - 7b \) simplifies to \( \square a + \square b \). What numbers go in the boxes?

9 \( 9b + 2 - 9 + h \) simplifies to \( 10b \square 7 \). What sign goes in the box?

10 A village contains \( n \) people. A medical team inoculates \( m \) people each day against yellow fever. After four days, how many people still need to be inoculated?
Chapter 8 Revision test

1. A student makes a note of the positions of the hands of a clock at 9 a.m. and 12 midday.
   a. How many revolutions did the minute hand make during this time?
   _______________________________________________________________________
   b. How many revolutions did the hour hand make in the same time?
   _______________________________________________________________________

2. What is the obtuse angle between the hour hand and the minute hand of a clock at 8 o’clock?
   _______________________________________________________________________

3. Find, in degrees, the angle between the hour hand and the minute hand of a clock at:
   a. 14 to 5 _______________________
   b. 14 past 3 _______________________

4. Refer to Fig. 7. Copy and complete Table 2.

Fig. 7

<table>
<thead>
<tr>
<th>angle</th>
<th>name of angle</th>
<th>type of angle</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>PQR or RQP</td>
<td>acute</td>
</tr>
<tr>
<td>b</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d</td>
<td></td>
<td></td>
</tr>
<tr>
<td>e</td>
<td></td>
<td></td>
</tr>
<tr>
<td>f</td>
<td></td>
<td></td>
</tr>
<tr>
<td>g</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2
5 Read the sizes of the angles in Fig. 8.

\[ \begin{align*}
\text{a} & \quad \text{b} \\
\end{align*} \]

\[ \text{Fig. 8} \]

6 Use a protractor to measure angles \( a, b, c, d, e, f, g \) in Fig. 7.

\[ \quad \]

\[ \quad \]

7 Use a protractor to construct an angle of:

\[ \begin{align*}
\text{a} & \quad 55^\circ \\
\text{b} & \quad 116^\circ.
\end{align*} \]

8 Draw any four-sided shape (i.e. a quadrilateral).

\[ \begin{align*}
\text{a} & \quad \text{Use a protractor to measure the four angles of the quadrilateral.} \\
\text{b} & \quad \text{Find the sum of the four angles.}
\end{align*} \]
Section 3: Revision tests

9 Repeat question 8 with a different quadrilateral. What do you notice?

__________________________________________________________________________
__________________________________________________________________________

10 Draw a triangle such that one of its angles is obtuse. Measure the three angles of the triangle. Find their sum. What do you notice?

__________________________________________________________________________
__________________________________________________________________________
Chapter 9 Revision test

1 Do the following mentally. Write down the answers only.
   a 0.5 + 0.2 _____________________________________________________________
   b 0.5 – 0.2 _____________________________________________________________
   c 1.6 + 0.9 _____________________________________________________________
   d 7 – 3.6 _____________________________________________________________
   e 7.8 + 1.5 _____________________________________________________________
   f 0.59 – 0.36 _____________________________________________________________
   g 24.8 + 8.8 _____________________________________________________________
   h 21.2 – 16.7 _____________________________________________________________

2 What is the difference between 59.2 cm and 14.6 cm?
________________________________________________________________________

3 Write the following as decimal numbers.
   a 5.93 × 1 000 __________________________________________________________
   b 23.8 ÷ 100 __________________________________________________________

4 Express 675 cm in metres.
________________________________________________________________________

5 The total mass of eight identical building blocks is 31.52 kg. Find the mass of 1 block.
________________________________________________________________________

6 Express the following as terminating decimals.
   a \( \frac{13}{25} \) __________________________________________________________
   b \( \frac{7}{16} \) __________________________________________________________

7 Express the following as terminating decimals.
   a \( \frac{5}{9} \) __________________________________________________________
   b \( \frac{41}{6} \) __________________________________________________________

8 Express the following as fractions in their lowest terms.
   a 0.85 ________________________________________________________________
   b 3.68 ________________________________________________________________

9 Express the following decimals as percentages.
   a 0.75 ________________________________________________________________
   b 0.175 ________________________________________________________________
   c 0.002 ________________________________________________________________
   d 0.1\dot{6} ____________________________________________________________

10 What is the total pay for someone who works 42 hours and gets 645 per hour?
________________________________________________________________________
Chapter 10 Revision test

1. David has 80 more than Mary.
   a. If Mary has 340, how much does David have? ________________
   b. If Mary has \( n \) Naira, how much does David have? ________________

2. Daudu is 7 cm taller than Mariamu.
   a. If Daudu is 1 m 65 cm tall, how tall is Mariamu? ________________
   b. If Daudu is \( x \) cm tall, how tall is Mariamu? ________________
   c. If Mariamu is \( 8y \) cm tall, how tall is Daudu? ________________

3. a. How many days are there in 3 weeks? ________________
   b. How many days are there in \( w \) weeks? ________________
   c. I spent \( x \) days in another town last year. How many weeks was this? ________________

4. a. What is the cost of 4 chairs at \( N10000 \) per chair? ________________
   b. What is the cost of \( m \) of the above chairs? ________________
   c. What is the cost of 6 chairs at \( Ny \) per chair? ________________

5. A book has a mass of \( k \) kg. What is its mass in grams? ________________

6. A piece of string is 5 m long. It is cut into \( n \) pieces, each the same length. What is the length of each piece:
   a. in metres ________________
   b. in cm? ________________

7. Team A scored three times as many points as Team B.
   a. Which team scored more points? ________________
   b. If Team A scored \( n \) points, how many points did Team B score? ________________

8. A square mat has a side of length 3 metres. What is the total area of \( x \) of these mats? ________________

9. During a period of \( x \) weeks there were 13 days when it didn't rain.
   On how many days did it rain? ________________

10. A sum of \( N5000 \) is shared equally between \( x \) girls. One of the girls spends \( N360 \).
    How many naira does she have left? ________________
Chapter 11 Revision test

In Fig. 9, ABCD is a rectangle with centre O.
Use Fig. 9 to answer Questions 1 to 3.

1 a Name a line equal in length to AB. _________
   b Name a line equal in length to AC. _________
   c Name a line equal in length to AD. _________
   d Name a line equal in length to AO. _________

2 Name two obtuse angles. ______________________________________________________

3 Name three angles equal in size to OÂB. _________________________________________

In Fig. 10, PQRS is a square with centre M.
Use Fig. 10 to answer Questions 4 and 5.

4 Name as many isosceles triangles as you can.
   __________________________________________________

5 What are the sizes of the angles in all these triangles?
   __________________________________________________

In Fig. 11, △XYZ is isosceles. MY is its line of symmetry.
Use Fig. 11 to answer Questions 6 and 7.

6 If XYZ = 34°, find the sizes of as many of the other angles in Fig. 11 as you can.
   __________________________________________________

7 If XM = 5 cm, what is the length of the shortest side of △XYZ?
   __________________________________________________

8 How many equilateral triangles can you see in each of the shapes in Fig. 12?
   __________________________________________________
9 a Are all the shapes in Fig. 13 quadrilaterals? 

![Diagram of various shapes]

Fig. 13

b Name as many of the quadrilaterals as you can.

10 Draw a circle of radius 3 cm. Mark about 12 points on its circumference. Name the top point P. (See Fig. 14) Draw a circle with one of the other points as centre so that the circumference goes through P. Repeat this for every point on the circumference. What shape does your final pattern look like?

![Diagram of a circle with marked points]
Chapter 12 Revision test

1 Which is greater?
   a  –3 or 4  _____________________
   b  –4 or –7  _____________________
   c  –5 or 3  _____________________
   d  0 or –5  _____________________
   e  2 or –15  _____________________
   f  –7 or –10  _____________________

2 The temperature during the day in a cold country is 9 °C. At night the temperature falls by 13 °C. What is the night temperature?
__________________________________________________________________________

3 Abudu and Baba have no money, but Abudu owes $450 to Baba. When Friday comes they both get the same wages. Abudu repays his debt to Baba. Baba now has more money than Abudu. How much more?
__________________________________________________________________________

4 What must be added to:
   a  3 to make 8      _________________________________________________________
   b  –1 to make 2     _________________________________________________________
   c  16 to make 4     _________________________________________________________
   d  3 to make –8     _________________________________________________________
   e  –35 to make –27   _________________________________________________________
   f  –6 to make –4?    _________________________________________________________

5 What must be subtracted from:
   a  12 to make 8      _________________________________________________________
   b  6 to make –10   _________________________________________________________
   c  –2 to make –7    _________________________________________________________
   d  8 to make 12     _________________________________________________________
   e  –3 to make 4     _________________________________________________________
   f  –10 to make –3?  _________________________________________________________

6 A woman has $23 467 in her bank account. She writes a cheque for $39 500. How much will she be overdrawn?
__________________________________________________________________________

7 In the year AD45 a man was 63 years old. In which year was he 5 years old?
__________________________________________________________________________
8 Copy and complete the tables in Fig. 15. For example, in:
   a  \((-1) + (+3) = +2\) enter +2 across from \(-1\) and under +3.
   b  \((-1) - (+3) = -4\) enter -4 across from \(-1\) and under +3.

<table>
<thead>
<tr>
<th></th>
<th>First</th>
<th>Second</th>
</tr>
</thead>
<tbody>
<tr>
<td>add</td>
<td>-3</td>
<td>-2</td>
</tr>
<tr>
<td>-3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>+1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>+2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>+3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Fig. 15

9 Simplify the following.
   a \(-7 - (-16) - 3\)

   b \(1 + (-4) - (-3)\)

   c \(800 - (+500) - (-150)\)

   d \(-50 + (-25) - (+45)\)

   e \(6x - 9x - (-5x)\)

   f \(24y + 12y - (-10y)\)

10 Simplify the following.
   a \(1\frac{3}{4} - 2\frac{1}{4}\)

   b \(-2.8 + 6.3\)

   c \(4.8 - (-3.9)\)

   d \(1\frac{1}{2} - 3\frac{2}{3}\)

   e \(7.2 ^\circ C - 9.6 ^\circ C\)

   f \(-5.4 ^\circ C + 8.6 ^\circ C\)
Chapter 13 Revision test

1 Place your textbook on your desk. Measure the perimeter of its front cover.

2 Place your non-writing hand flat on a large sheet of paper. Draw around the hand. Measure the perimeter of your hand.

3 Table 3 gives details about some rectangles and squares.

<table>
<thead>
<tr>
<th></th>
<th>length</th>
<th>breadth</th>
<th>perimeter</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>8 m</td>
<td>5 m</td>
<td></td>
</tr>
<tr>
<td>b</td>
<td>9.3 m</td>
<td>7 m</td>
<td></td>
</tr>
<tr>
<td>c</td>
<td>7 cm</td>
<td>7 cm</td>
<td></td>
</tr>
<tr>
<td>d</td>
<td>5.1 km</td>
<td></td>
<td>15.4 km</td>
</tr>
<tr>
<td>e</td>
<td>4.4 cm</td>
<td></td>
<td>25 cm</td>
</tr>
<tr>
<td>f</td>
<td>12 cm</td>
<td></td>
<td>48 cm</td>
</tr>
</tbody>
</table>

Table 3

a Complete the table.

b Which of the shapes recorded in the table are squares?

4 A football pitch measures 80 m by 50 m. In a training session, the coach tells the team to run 10 times round the pitch. How far do they run?

5 Find the perimeter of the parallelogram and trapezium in Fig. 16.

Fig. 16
6 The perimeter of a parallelogram is 33 cm. One of its sides is 9 cm long. What are the lengths of its three other sides?

7 The minute hand of a clock is 10.5 cm long. How far does the tip of the hand travel in one hour? (Use the value 3.14 for π.)

8 A disc has a diameter of 30 cm and rotates at $33\frac{1}{3}$ revolutions per minute. How far does a point on the edge of the disc travel in a minute? Use the value 3.14 for π and give your answer in metres.

9 A bicycle wheel is 56 cm in diameter. How many complete turns does it make in travelling 1 km? Use the value $\frac{22}{7}$ for π.

10 Calculate the perimeter of the shapes in Fig. 17.

Fig. 17
Chapter 14 Revision test

1 Table 4 gives details about some rectangles and squares. Complete the table.

<table>
<thead>
<tr>
<th></th>
<th>length</th>
<th>breadth</th>
<th>area</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>8 m</td>
<td>5 m</td>
<td></td>
</tr>
<tr>
<td>b</td>
<td>7 cm</td>
<td>7 cm</td>
<td></td>
</tr>
<tr>
<td>c</td>
<td>9.3 m</td>
<td>7 m</td>
<td></td>
</tr>
<tr>
<td>d</td>
<td>5.1 km</td>
<td></td>
<td>30.6 km²</td>
</tr>
<tr>
<td>e</td>
<td></td>
<td>3.2 cm</td>
<td>28 cm²</td>
</tr>
<tr>
<td>f</td>
<td>11 m</td>
<td></td>
<td>121 m²</td>
</tr>
</tbody>
</table>

Table 4

2 Calculate the shaded areas in the diagrams in Fig. 18. All lengths are in metres and all angles are right angles.

Fig. 18
3 A concrete floor is 4 m long and $3\frac{1}{2}$ m wide. Calculate:
   a  the area of the floor,

   b  the cost of making the floor if concrete is N\$2,400 per m$^2$.

4 What is the area, in m$^2$, of the floor of a hall that is 6 metres square? (6 metres square means 6 m by 6 m.)

5 A sheet of 150 gsm drawing paper measures 0.8 m by 0.6 m. 150 gsm means that the mass of the paper is 150 g per square metre. Find the mass of 10 sheets of drawing paper.

6 Calculate the areas of the parallelograms in Fig. 19.

   ![Fig. 19](image)

7 Calculate the height of the parallelogram in Fig. 20.

   ![Fig. 20](image)
8 Calculate the areas of the quadrilaterals in Fig. 21.

![Fig. 21](image)

9 Complete Table 5 on circles. Use the value $\frac{22}{7}$ for $\pi$.

<table>
<thead>
<tr>
<th></th>
<th>radius</th>
<th>diameter</th>
<th>area</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>35 cm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b</td>
<td>8 m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c</td>
<td></td>
<td></td>
<td>1 386 cm$^2$</td>
</tr>
</tbody>
</table>

Table 5

10 A circular carpet has a diameter of 3 m.

a What is its radius?

b Calculate its area. Use the value 3.14 for $\pi$ and round your answer to the nearest whole number.
Chapter 15 Revision test

1 Simplify the following.
a \( 9 \times p \) ____________________  
b \( 3mn \times 6 \) ____________________  
c \( 4a \times 5ab \) ____________________

2 Simplify the following.
a \( \frac{18n + 6}{9} \) ____________________  
b \( \frac{15n^2}{5} \) ____________________  
c \( \frac{4ax^2}{4xy} \) ____________________

3 Simplify as far as possible.
a \( 7x \times 3 - 13x \) ____________________  
b \( 8n + 18n + 6 \) ____________________

4 Simplify as far as possible.
a \( 8m - 3 \times 5m + 6m \times 2 \) ____________________  
b \( (8a - 5) + (4 - 3a) \) ____________________

5 Simplify as far as possible.
a \( 28r + 4 + 2r + 1 \times 5r - 5 \) ____________________  
b \( 3s \times 2 + 8s + 2 - 9s \) ____________________

6 Write the following without brackets.
a \( (p + 4q) - r \) ____________________  
b \( 8a + (5b - 3c) - 9d \) ____________________

7 Write the following without brackets.
a \( (p - q) - (r + s) \) ____________________  
b \( (12x + 5y) - (5p - q) \) ____________________

8 Remove the brackets and then simplify.
a \( (12x + 5y) - (5x - 8y) \) ____________________  
b \( (5x - 7) - (6 - 4x) \) ____________________

9 A phone card costs \( \text{N}\) and a book costs \( \text{N}200 \) more than a phone card.
a What is the cost of a book? ____________________  
b What is the total cost of 3 phone cards and a book? ____________________

10 The lower of two consecutive odd numbers is \( n \). What is the sum of the two numbers? ____________________
Chapter 16 Revision test

1–4 Complete the table of cuboids (Table 6).

<table>
<thead>
<tr>
<th>Qu</th>
<th>length</th>
<th>breadth</th>
<th>height</th>
<th>volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>8 m</td>
<td>5 m</td>
<td>2 m</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>9 cm</td>
<td>4 cm</td>
<td>2 ½ cm</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>3 m</td>
<td>7 m</td>
<td></td>
<td>84 m³</td>
</tr>
<tr>
<td>4</td>
<td>4 cm</td>
<td>30 cm</td>
<td></td>
<td>180 cm²</td>
</tr>
</tbody>
</table>

Table 6

5 What is the difference in volume between a 5 cm × 5 cm × 5 cm cube and a 2 cm × 4 cm × 16 cm cuboid?

__________________________________________________________________________
__________________________________________________________________________

6 A classroom is 2.8 m high and has a volume of 182 m³. Calculate the floor area of the classroom.

__________________________________________________________________________
__________________________________________________________________________

7 The internal dimensions of a fuel can are 10 cm by 20 cm by 25 cm. What is its capacity in litres?

__________________________________________________________________________
__________________________________________________________________________

8 A village water tank measures 8 m × 5 m × 3 m.
   a What is the capacity of the tank when full?

__________________________________________________________________________
__________________________________________________________________________

   b If the village uses about 15 000 litres per day, how many days will a full tank last?

__________________________________________________________________________
__________________________________________________________________________

9–10 Complete Table 7 on prisms.

<table>
<thead>
<tr>
<th>height of prism</th>
<th>area of end face</th>
<th>volume of prism</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>35 cm</td>
<td>4 cm²</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td>14 m²</td>
</tr>
</tbody>
</table>

Table 7
Chapter 17 Revision test

Table 8 shows the numbers of educational institutions in a country for the years 2003 and 2013. Use the table to answer the questions that follow.

<table>
<thead>
<tr>
<th>Education institution</th>
<th>2003</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nursery schools</td>
<td>34</td>
<td>340</td>
</tr>
<tr>
<td>Primary schools</td>
<td>2143</td>
<td>2696</td>
</tr>
<tr>
<td>Junior Secondary Schools (only)</td>
<td>0</td>
<td>157</td>
</tr>
<tr>
<td>Senior Secondary Schools (only)</td>
<td>0</td>
<td>49</td>
</tr>
<tr>
<td>Combined Secondary Schools (JSS + SSS)</td>
<td>212</td>
<td>439</td>
</tr>
<tr>
<td>Teacher Colleges</td>
<td>22</td>
<td>24</td>
</tr>
<tr>
<td>Universities</td>
<td>1</td>
<td>4</td>
</tr>
</tbody>
</table>

Table 8

1. Which type of educational institution:
   a. do you attend now ____________________________
   b. have you attended in the past? ________________

2. How many primary schools were there in the country in 2013? ____________________________

3. How many primary schools were built between 2003 and 2013? ____________________________

4. Which type of school showed the greatest rate of increase? ____________________________

5. Mention one possible reason for this increase. ____________________________

6. How many schools accepted Primary School leavers in 2003? ____________________________

7. How many schools altogether accepted Primary School leavers in 2013? ____________________________

8. On average, in this country, each JSS can accommodate pupils from four primary schools. Do you think that there will be enough places at JSSs in the years after 2013? ____________________________

9. Name one reason for the introduction of JSS (only) schools during the period. ____________________________

10. Do you think that 24 Teacher Colleges will be enough after 2013? Give reasons. ____________________________
Chapter 18 Revision test

Fig. 22 is a bar chart showing the rainfall (cm) in Kano for each month in a year. Use Fig. 22 to answer the questions that follow.

1. There are 3 Js in Fig. 22. What do they stand for?

2. Which month had most rainfall?

3. How many cm of rain fell during that month?

4. Which months had no rainfall?

5. Which months had less than 10 cm of rain?

6. List the six wettest months in rank order.

7. The wet season is when there is more than 15 cm of rain per month. Name the months in the wet season.

8. The dry season is when the rainfall is less than 5 cm per month. List the months in the dry season.

9. Write the total rainfall for the year in centimetres.

10. Is it true that over half the rainfall for the year fell in just two months? Give a reason.
Chapter 19 Revision test

1. Say whether the following are true or false.
   a. $\Box - 8 = 5$ when 13 goes in the box.
   b. $11 + \Box = 15$ when 26 goes in the box.
   c. $\frac{\Box}{8} = 4$ when 2 goes in the box.
   d. $19 \times 2 = \Box$ when 28 goes in the box.

2. Say whether the following are true or false.
   a. $24 = 3x$ when $x = 8$.
   b. $\frac{y}{10} = 3$ when $y = 30$.
   c. $\frac{48}{m} = 6$ when $m = 12$.
   d. $17 = x - 8$ when $x = 25$.

3. Solve the following equations.
   a. $14 + x = 16$
   b. $\frac{y}{6} = 10$
   c. $17 - m = 12$
   d. $\frac{45}{x} = 18$

4. Solve.
   a. $7x = 28$
   b. $\frac{1}{3}y = 4$
   c. $m - 1 = 6$
   d. $32 = 8q$

5. Use the balance method to solve.
   a. $5x = 40$
   b. $\frac{1}{2}m = 16$
   c. $n - 1 = 31$
   d. $7\frac{1}{2} = \frac{2}{3}q$

Use the balance method to solve the following.

6. $7x + 5 = 40$
7. $26 = 3q + 5$
8. $3x - 13 = 0$
9. $37 = 1 + 4m$
10. $10 = 8y - 52$
Chapter 20 Revision test

1 Find the sizes of the lettered angles in Fig. 23. Write them in the diagrams.

   a
   
   b

Fig. 23

2 In Fig. 24, $\angle BXC = 36^\circ$ and $\angle AXD = 126^\circ$.
   a If $\angle BXD$ is a right angle, calculate $\angle CXD$ and $\angle AXB$.

   b Find the size of $\angle AXC$.

   c In what way could the drawing be improved?

3 In Fig. 25, $\angle EKF = x^\circ$, $\angle FKG$ is twice as big as $\angle EKF$, $\angle GKH$ is three times as big as $\angle EKF$ and $\angle HKE$ is four times as big as $\angle EKF$. Solve the equation and find the four angles.

4 Draw a pair of parallel lines. Then draw a transversal to cut the lines at P and Q. If one of the angles at P is $112^\circ$, fill in the sizes of all the other angles in your drawing.
5 Find the sizes of the lettered angles in Fig. 26.

_____________________________________
_____________________________________
_____________________________________

6 Study each diagram in Fig. 27.
Fill in the sizes of the missing angles.

7 State the sizes of the lettered angles in Fig. 28. Give reasons.

_____________________________________
_____________________________________

8 Two angles of a triangle are 45° and 76°. Calculate the size of its third angle.

__________________________________________________________________________

9 Draw \( \triangle PQR \) and show \( \hat{P} \) as \( x^\circ \). \( \hat{Q} \) is twice as big as \( \hat{P} \) and \( \hat{R} = 51^\circ \).
   a Make an equation in \( x \).
       ________________________________
   b Solve the equation.
       ________________________________
   c Fill in the three angles of the triangle.

10 Study the diagram in Fig. 29. Fill in the sizes of the missing angles.
Chapter 21 Revision test

1 Use a ruler, set square and protractor to construct a parallelogram with two sides of 7 cm and 4 cm containing an angle of 50° on a separate sheet of paper.

2 On a separate sheet of paper, construct a trapezium PQRS so that QR = 8 cm, PQ = 5 cm, \( Q = 70° \) and \( R = 80° \). Measure PR.

3 Look at Fig. 30. Measure the perpendicular distance of point E from the top edge of the page of this book.

4 Use ruler and set square to construct two parallel lines which are 4.5 cm apart.

5 Measure the perpendicular distance between the parallel sides of trapezium PQRS that you drew in question 2.
6 Complete the following diagram on a separate sheet of paper.
   a  Draw a line AC 8 cm long.
   b  Construct the perpendicular bisector of AC.
   c  Construct square ABCD with AC as diagonal. (Make a rough sketch first.)
   d  Measure the length of AB.

7 Complete the following diagram on a separate sheet of paper.
   a  Construct an isosceles ∆ABC, such that BA = BC, its base AC = 6 cm and the length of the perpendicular from B to AC is 7 cm. (Make a rough sketch first.)
   b  Measure AB.
   c  Measure AÊBÊC.

8 Complete the following diagram on a separate sheet of paper.
   a  Construct a square with sides 5.4 cm long.
   b  Measure the length of its diagonal.

9 Complete the following diagram on a separate sheet of paper.
   a  Draw any large ∆ABC.
   b  Draw the perpendicular bisectors of all three sides. They should meet at one point, O.
   c  With centre O and radius OA, draw a circle.
   d  What do you notice about this circle?

10 Complete the following diagram on a separate sheet of paper.
    a  Draw any large ∆PQR.
    b  Use a ruler and a pair of compasses to find the mid-point of each side.
    c  Join P to the mid-point of QR. Likewise, join Q and R to the mid-points of their opposite sides.
    d  What do you notice?
Chapter 22 Revision test

1 Calculate the mean of the following.
   a 7, 5, 14, 12, 5, 11

   b N2400, N1800, N1400, N1400, N1200

2 In four successive days a market trader sold 24, 48, 12 and 60 oranges. Calculate the mean daily sale of oranges.

3 The temperatures at midday during a week in Lagos were:
   Calculate, to the nearest degree, the mean midday temperature for the week.

4 State the median of the following.
   a 2, 7, 19, 22, 34

   b 78, 67, 55, 45, 39, 29

5 Arrange the following in rank order. Find the median.
   a 18, 13, 25, 6, 9, 16, 8

   b N280, N750, N320, N960, N990, N480

6 State the modes of the following.
   a 18, 18, 18, 26, 26, 36, 37

   b N200, N700, N700, N900, N900, N900
7 Find the mode (or modes) of the following.
   a  9, 10, 8, 10, 5, 4, 4, 5, 7, 10
   b  0, 4, 0, 6, 1, 3, 0, 2, 1, 5, 1, 6, 0

8 In a weekly test out of 10, the marks obtained were as follows:

   6, 8, 8, 8, 7, 5, 4, 6, 9, 10, 7, 7, 8, 9, 5, 10, 8.

   a  Complete Table 9.

   mark
   | 5 | 6 | 7 | 8 | 9 | 10 |
   ---|---|---|---|---|---|----|
   frequency

   Table 9

   b  Find the mode (or modes) of the data.

9 Arrange the following numbers in order of size. Find their mean, median and mode.

   8, 10, 7, 9, 13, 8, 12, 6, 8

10 Table 10 gives the ages and frequencies of girls in a choir.

   age (years) | 14 | 15 | 16 | 17 |
   -----------|----|----|----|----|
   frequency  | 3  | 4  | 5  | 3  |

   Table 10

   Find:

   a  the number of girls in the choir

   b  the modal and median ages of the choir

   c  the mean age of the choir.
Chapter 23 Revision test

1 To keep fit, my father walks 10 000 paces each day. If his pace is 68 cm, estimate how far he walks each day (to the nearest km).

2 Which of the following are sensible? Tick those you agree with.
   a My pencil is 18 m long.
   b The car weighs about 1 tonne.
   c My mother is 150 mm tall.
   d He took 2 hours to tie his shoelaces.
   e The chicken cost 5.

3 Approximate 67 548 to the nearest:
   a thousand __________
   b hundred __________
   c ten. __________

4 Round off the following to the nearest tenth.
   a 0.53 __________
   b 8.57 __________
   c 6.25 __________

5 Approximate 28.07 to the nearest:
   a ten __________
   b whole number __________
   c tenth __________

6 Round off the following to one significant figure.
   a 693 __________
   b 0.266 __________
   c 54 849 __________

7 Round off the numbers in question 6 to 2 significant figures.

8 Round off each number to the nearest whole number. Then find an approximate answer.
   a 14.8 × 3.3

   b \[ \frac{12}{3} + \frac{91}{2} \]

9 a Estimate the value of 28 × 0.745 by rounding to 1 s.f.

   b Which of the following is likely to be the accurate value of 28 × 0.745:
      i 2.086 ii 20.86 iii 208.6?

10 A cup has a capacity of 320 ml. It takes 58 cups to fill a bucket and 298 buckets to fill a tank. By rounding to 1 significant figure, estimate the capacity of the tank in litres.
Chapter 24 Revision test

Expand the following in the powers of their bases.

1. \(7408_{\text{ten}}\)

2. \(314_{\text{five}}\)

3. \(11010_{\text{two}}\)

Convert the following.

4. \(55_{\text{ten}}\) to a binary number

5. \(11110_{\text{two}}\) to a base ten number

6. Find the value of the square of \(101_{\text{two}}\). Give your answer in base two and base ten.

Calculate the following. Do all working in base two.

7. \(11_{\text{two}} + 110_{\text{two}}\)

8. \(101_{\text{two}} - 10_{\text{two}}\)

9. \(1101_{\text{two}} + 110_{\text{two}} + 111_{\text{two}}\)

10. \(1011_{\text{two}} \times 110_{\text{two}}\)
Chapter 1 Revision test
1  5 weeks 5 days
2  3 h 8 min 10 s
3  74
4  Students’ own answers
5  FIGHT MALARIA
6  (16, 21, 18, 5)(23, 1, 20, 5, 18)
7  a  635  b  792
8  Students’ own answers
9  a  9 units  b  5 tens  c  0 hundreds
d  4 thousands  e  3 ten-thousands
10  634.7 –  7.425

Chapter 2 Revision test
1  a  1 000 000 000  b  1 000 000 000 000
2  ten million millimetres
3  2 678 400 s
4  a  6 000 000 000  b  35 028 641
c  4 560 244
5  a  0.000 048  b  0.502 864 1
c  4.784 006 72
6  650 000 000 000
7  a  700 000 ℓ  b  US$90 000 000 000
8  149.6 million km
9  0.000 7
10  a  0.074  b  0.000 75

Chapter 3 Revision test
1  1, 2, 3, 4, 6, 9, 12, 18, 36
2  2, 3, 6, 7
3  31, 37, 41, 43, 47, 53, 57, 59
4  140 = 2 × 2 × 5 × 7 = 2² × 5 × 7
5  144 = 2⁴ × 3²
6  2, 3, 4, 6, 12
7  12
8  Some of the multiples are shown below.
   8 12 16
   20 24 28
   32 36 40
9  70, 140, …
10  2³ × 3² × 5² × 7

Chapter 4 Revision test
1  a  5  b  55  c  32
2  a  ÷ 20  b  5  c  7 8
3  a  19 7 12  b  13 24  c  85 12 (7 1 12)
4  7 24
5  a  10  b  5 3  c  17 3
6  a  3 4  b  20  c  81 70 (1 11 70)
7  4 15 8 1 18 9 12 1 2% 10 55%

Chapter 5 Revision test
1  a  15  b  3  c  8  d  42
2  a  11  b  13  c  6  d  15
3  a  14  b  4  c  50  d  4
4  a  11  b  3  c  6  d  16
5  a  7  b  24  c  13  d  72
6  a  10  b  16  c  8  d  1
7  a  14  b  4  c  1  d  40
8  a  22  b  0  c  10  d  66
9  a  N90  b  N150
10  15

Chapter 6 Revision test
1  boxes (matchbox, chalk box), packets (butter, cornflakes, soap powder, tea), tin cans (soup, beans, oil, coffee), drum (musical, oil), tubes, balls, pencils, rolls of paper, bottles, buildings, containers
2  a  Students’ sketches  b  45  c  5 cm
3

<table>
<thead>
<tr>
<th>Number of vertices,</th>
<th>Number of vertices,</th>
</tr>
</thead>
<tbody>
<tr>
<td>faces</td>
<td>edges</td>
</tr>
<tr>
<td>vertices edges</td>
<td>vertices faces edges</td>
</tr>
<tr>
<td>10 4 13</td>
<td>12 8 18</td>
</tr>
</tbody>
</table>
4 Nets of a cube:

Fig. 31

5 Students’ sketches
6 96 cm
7 6 vertices, 6 faces, 10 edges
8 a FG  b F, D
9 a GH  b CB, CD, CH
10 a 6.2d, 6.2e, 6.19, 6.25b, 6.25c, 6.25d, 6.37, 6.38  
   b 6.2c, 6.28, 6.29, 6.30, 6.39a, 6.39b

Chapter 7 Revision test

1 7b
2 8, y (there are other solutions as well, e.g. 2, 4y or 1, 8y)
3 a positive  b 8
4 a unlike  b no  
   c They are unlike terms.
5 3m
6 9x + 10y
7 r – 2s
8 4 and 5 9 – (minus) 10 n – 4m

Chapter 8 Revision test

1 a 3  b 1/4
2 120°
3 a 133°  b 13°

<table>
<thead>
<tr>
<th>angle</th>
<th>name of angle</th>
<th>type of angle</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>PR or RP</td>
<td>acute</td>
</tr>
<tr>
<td>b</td>
<td>QU or UQ</td>
<td>obtuse</td>
</tr>
<tr>
<td>c</td>
<td>PT or TP</td>
<td>right</td>
</tr>
<tr>
<td>d</td>
<td>US or SU</td>
<td>straight</td>
</tr>
<tr>
<td>e</td>
<td>TR or RT</td>
<td>acute</td>
</tr>
<tr>
<td>f</td>
<td>QS or SQ</td>
<td>obtuse</td>
</tr>
<tr>
<td>g</td>
<td>QS or SQ</td>
<td>reflex</td>
</tr>
</tbody>
</table>

Table 11

5 a 117°  b 161°

6 a = 25°, b = 100°, c = 90°, d = 180°, e = 55°, 
   f = 100°, g = 260°
7 Construction of angles
8 a Students measure angles  b 360°
9 The sum of the angles is also 360°.
10 The sum of the angles of the triangle is 180°.

Chapter 9 Revision test

1 a 0.7  b 0.3  c 2.5  d 3.4  
   e 9.3  f 0.23  g 33.6  h 4.5
2 46.6 cm
3 a 5.930  b 0.238
4 6.75 metres
5 3.94 kg
6 a 0.52  b 4.4375
7 a 0.5  b 4.16
8 a 17 20  b 31 25
9 a 75%  b 17 1/2  c 0.2%  d 16 2/3%
10 N = 27 090

Chapter 10 Revision test

1 a N = 420  b N = (n + 80)
2 a 1 m 58 cm  b (x – 7) cm  
   c (8y + 7)
3 a 21  b 7w  c 4 7
4 a N= 40 000  b N=10 000  c N=6y
5 1 000 kg
6 a 5/n m  b 500/n cm
7 a Team A  b n/3 points
8 9x m²
9 (7x – 13) days
10 N = (5000/n – 360)

Chapter 11 Revision test

1 a DC  b DB  c BC  
   d BO, CO, DO
2 AÔB, CÔD
3 OBA, ÔCD, ÔDC
4 PQR, QRS, RSP, SPQ, PMQ, QMR, RMS, SMP
5 45°, 90°, 45°
6 XYM = ZYM = 17°, YÇX = YMX = 90°, 
   MXY = MZY = 73°
7 10 cm
8 8, 14
9 a yes
Chapter 12 Revision test

1 a 4, b -4, c 3

d 0, e 2, f -7

2 4 °C

3 4

4 a +5, b +3, c -12

d -11, e +8, f +2

5 a +4, b +16, c +5

d -4, e -7, f -7

6 16033

7 13 BC

8

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<tr>
<th></th>
<th>-3</th>
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<th>-1</th>
<th>0</th>
<th>+1</th>
<th>+2</th>
<th>+3</th>
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<td>a</td>
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<td>-3</td>
<td>-6</td>
<td>-5</td>
<td>-4</td>
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<td>0</td>
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<tr>
<td></td>
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9

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<thead>
<tr>
<th>a</th>
<th>+6</th>
<th>b</th>
<th>0</th>
<th>c</th>
<th>+450</th>
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<tbody>
<tr>
<td>d</td>
<td>-120</td>
<td>e</td>
<td>+2x</td>
<td>f</td>
<td>+46y</td>
</tr>
</tbody>
</table>

10 a -1/2, b +3.5, c +8.7

d -2 1/6, e -2.4 °C, f +3.2 °C

Chapter 13 Revision test

1 Discuss with classmates

2 Compare with classmates

Table 12

<table>
<thead>
<tr>
<th>length</th>
<th>breadth</th>
<th>perimeter</th>
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<tbody>
<tr>
<td>a</td>
<td>8 m</td>
<td>5 m</td>
</tr>
<tr>
<td>b</td>
<td>9.3 m</td>
<td>7 m</td>
</tr>
<tr>
<td>c</td>
<td>7 cm</td>
<td>7 cm</td>
</tr>
<tr>
<td>d</td>
<td>5.1 km</td>
<td>2.6 km</td>
</tr>
<tr>
<td>e</td>
<td>8.1 cm</td>
<td>4.4 cm</td>
</tr>
<tr>
<td>f</td>
<td>12 cm</td>
<td>12 cm</td>
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</table>

Table 13

<table>
<thead>
<tr>
<th>length</th>
<th>breadth</th>
<th>area</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>8 m</td>
<td>5 m</td>
</tr>
<tr>
<td>b</td>
<td>7 cm</td>
<td>7 cm</td>
</tr>
<tr>
<td>c</td>
<td>9.3 m</td>
<td>7 m</td>
</tr>
<tr>
<td>d</td>
<td>5.1 km</td>
<td>6 km</td>
</tr>
<tr>
<td>e</td>
<td>8.75 cm</td>
<td>3.2 cm</td>
</tr>
<tr>
<td>f</td>
<td>11 m</td>
<td>11 m</td>
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Table 14

<table>
<thead>
<tr>
<th>radius</th>
<th>diameter</th>
<th>area</th>
</tr>
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<tbody>
<tr>
<td>a</td>
<td>35 cm</td>
<td>70 cm</td>
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<tr>
<td>b</td>
<td>4 m</td>
<td>8 m</td>
</tr>
<tr>
<td>c</td>
<td>21 cm</td>
<td>42 cm</td>
</tr>
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</table>

10 a 1.5 m, b 7 m² (actually 7.065 m²)
Chapter 15 Revision test

1. a) \(9p\)  
   b) \(18mn\)  
   c) \(20a^2b\)

2. a) \(3n\)  
   b) \(3m\)  
   c) \(11y\)

3. a) \(8x\)  
   b) \(11n\)

4. a) \(5m\)  
   b) \(5a - 1\)

5. a) \(14r - 5\)  
   b) \(s\)

6. a) \(p + 4q - r\)  
   b) \(8a + 5b - 3c - 9d\)

7. a) \(p - q - r - s\)  
   b) \(12x + 5y - 5p + q\)

8. a) \(7x + 13y\)  
   b) \(9x - 13\)

9. a) \(N(p + 200)\)  
   b) \(N(4p + 200)\)

10. \(2n + 1\)

Chapter 16 Revision test

<table>
<thead>
<tr>
<th>Qu.</th>
<th>length</th>
<th>breadth</th>
<th>height</th>
<th>volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>8 m</td>
<td>5 m</td>
<td>2 m</td>
<td>80 (m^3)</td>
</tr>
<tr>
<td>2</td>
<td>9 cm</td>
<td>4 cm</td>
<td>2(\frac{1}{2}) cm</td>
<td>90 (cm^3)</td>
</tr>
<tr>
<td>3</td>
<td>3 m</td>
<td>7 m</td>
<td>4 m</td>
<td>84 (m^3)</td>
</tr>
<tr>
<td>4</td>
<td>4 cm</td>
<td>1.5 cm</td>
<td>30 cm</td>
<td>180 (cm^3)</td>
</tr>
</tbody>
</table>

Table 15

<table>
<thead>
<tr>
<th>Qu.</th>
<th>height of prism</th>
<th>area of end face</th>
<th>volume of prism</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>3 cm^3</td>
<td>66 m^2</td>
<td>75 (ℓ)</td>
</tr>
<tr>
<td>8 a</td>
<td>120 kl</td>
<td>8 days</td>
<td></td>
</tr>
</tbody>
</table>

Table 16

Chapter 17 Revision test

1. Students’ own answers

2. 696

3. 5 643

4. Junior Secondary School

5. People are increasingly realising the value of early childhood education.

6. 212

7. 596 (157 JSS + 439 Secondary)

8. Probably not enough. 2 696 primary schools would need about 674 schools offering JSS places. 596 may not be quite enough.

9. Universal Basic Education (UBE) was introduced in 2006, aiming to provide every child with 9 years of basic education (6 years primary + 3 years junior secondary). There was a need for more JSS places.

10. No, more schools will require more teachers.

Chapter 18 Revision test

1. January, June, July

2. August

3. 35 cm

4. January, February, November, December

5. January, February, March, April, May, October, November, December

6. August, July, June, September, May, October

7. June, July, August

8. January, February, March, April, November, December

9. 108 cm

10. Yes, in August and July 59 cm of rain fell.

Chapter 19 Revision test

1. a) true  
   b) false  
   c) false  
   d) false

2. a) true  
   b) true  
   c) false  
   d) true

3. a) \(x = 2\)  
   b) \(y = 60\)  
   c) \(m = 5\)  
   d) \(x = 2\frac{1}{2}\)

4. a) \(x = 4\)  
   b) \(y = 12\)  
   c) \(m = 7\)  
   d) \(q = 4\)

5. a) \(x = 8\)  
   b) \(m = 32\)  
   c) \(n = 32\)  
   d) \(q = 11 \frac{1}{4}\)

6. a) \(6 \times 5\)  
   b) \(7 q = 7\)  
   c) \(8 x = 4\frac{1}{3}\)

7. \(m = 9\)

8. \(y = 7\frac{3}{4}\)

Chapter 20 Revision test

1. a) \(t = 122°\) (angles on a straight line)  
   \(v = 23°\) (\(v + 35°\) vertically opposite to 58°)  
   \(w = 122°\) (vertically opposite to \(t\))  
   \(x = 90°\) (angles on a straight line)  
   \(y = 62°\) (\(y + 28°\) vertically opposite to right angle)  
   \(z = 49°\) (\(z + 41°\) vertically opposite to \(x\))

2. a) \(\angle CXD = 54°\), \(\angle AXB = 144°\)
   b) \(\angle AXC = 180°\)
   c) \(\angle AXC\) is a straight line.

3. \(x + 2x + 3x + 4x = 360\), \(x = 36\); \(EKF = 36°\), \(FKG = 72°\), \(GKH = 108°\), \(HKE = 144°\)

4. Acute angles are 68°; obtuse angles are 112°.

5. \(w = 42°\) (alternate angles)  
   \(x = 138°\) (angles on a straight line)  
   \(y = 63°\) (angles on a straight line)  
   \(z = 63°\) (alternate angles)

6. a) \(45°\), \(45°\), \(105°\)  
   b) \(4 \times 75°\), \(2 \times 105°\), \(2 \times 65°\), \(2 \times 40°\)
7 $w = 25^\circ$ (alternate angles)
$x = 60^\circ$ (sum of angles of triangle)
y = 110° (angles on a straight line)
z = 45° (sum of angles of triangle)

8 59°
9 a $x + 2x + 51^\circ = 180^\circ$  b $x = 43^\circ$
c 43°, 51°, 86°
10 3 × 20°, 2 × 30°, 2 × 50°, 2 × 130°, 1 × 60°, 1 × 70°, 1 × 110°

Chapter 21 Revision test
1 Compare with classmates
2 PR = 7.9 cm
3 Compare with classmates
4 Compare with classmates
5 4.7 cm
6 a–c Construction of □ABCD
d AB = 5 cm
7 a Construction of △ABC  b AB = 7.6 cm
c ABC = 46.4°
8 a Construction of □ with sides 5 cm
  b 7.6 cm
9 a–c Any large △ABC
d The circle passes through A, B and C.
10 a–c Any large △PQR
d The three lines meet at a single point.

Chapter 22 Revision test
1 a 9  b 1640
2 36 3 25 °C
4 a 19  b 50
5 a 13  b 615
6 a 18  b 900
7 a 5 and 10 (bimodal)  b 0

8 a

<table>
<thead>
<tr>
<th>mark</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
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<tr>
<td>frequency</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>5</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

Table 17
b 8 marks
9 6, 7, 8, 8, 9, 10, 12, 13; mean = 9, median = 8, mode = 8
10 a 15 girls
  b mode = 16 years, median = 16 years
  c mean = 15 8/15 years

Chapter 23 Revision test
1 7 km 2 b
3 a 68 000 b 67 500 c 67 550
4 a 0.5 b 8.6 c 6.3 d 4.0
5 a 30 b 28 c 28.1
6 a 700 b 0.3 c 50 000
7 a 690 b 0.27 c 55 000
8 a 45 b 12 (round 1 1/2 up)
9 a 21 b 20.86
10 5 400 l

Chapter 24 Revision test
1 7 × 10^3 + 4 × 10^2 + 0 × 10^1 + 8 × 1
2 3 × 5^2 + 1 × 5^1 + 4 × 1
3 1 × 2^4 + 1 × 2^3 + 0 × 2^2 + 1 × 2^1 + 0 × 1
4 110111 (= 1 × 2^5 + 1 × 2^4 + 0 × 2^3 + 1 × 2^2
  + 1 × 2^1 + 1 × 1)
5 30
6 11001_{two} = 25_{ten}
7 1001_{two}
8 11_{two}
9 11010_{two}
10 100010_{two}
The term revision tests show how well the students have grasped the content of the term. There are a number of possible ways of managing the chapter revision tests:

1. As a formal class test at the end of the term
2. As homework, after completing the work that term
3. As classwork, where students, in pairs or small groups, work through the test in discussion with each other and the teacher
4. As a formal test at some point in the school year after revising the term’s work

Given the time constraints of the school year, we strongly recommend that methods 2 or 3 be considered. As the only person with direct access to the answers, teacher participation is essential.

For ease of completion, the term revision tests are included as independent worksheets in the section that follows. Students simply write down their answers on these sheets. In some instances, students need to construct diagrams on separate pieces of paper. When this happens, make sure that the students write their names and class and the test details at the top of the sheets of paper.
Term Revision test 1 (Chapters 1, 2, 3)

Circle the correct answer for Questions 1–5. Circle the letter only.

1. The value of the 8 in 18 214 is:
   - A 8 units
   - B 8 tens
   - C 8 hundreds
   - D 8 thousands
   - E 8 ten thousands

2. The Roman numerals CXCIV represent the number:
   - A 194
   - B 196
   - C 214
   - D 215
   - E 216

3. The value of is:
   - A 12
   - B 24
   - C 26
   - D 36
   - E 62

4. 5 300 ml expressed in litres is:
   - A 0.053
   - B 0.53
   - C 5.3
   - D 53
   - E 530

5. The number of minutes in $1 \frac{1}{2}$ hours is:
   - A 30
   - B 45
   - C 65
   - D 75
   - E 90

6. Express 60 as a product of prime factors.

7. Find the LCM of 6 and 14.

8. Find the HCF of 32, 40 and 56.

9. Find the sum of 2.82 t and 893 kg. Express the answer in tonnes.

10. Find the difference between 1.42 m and 29 cm. Express the answer in cm.
Term Revise 2 (Chapter 4)

Circle the correct answer for Questions 1–5. Circle the letter only.

1 Which one of the following is not equivalent to \(\frac{13}{2}\)?
   A \(\frac{9}{18}\)  B \(\frac{11}{22}\)  C \(\frac{15}{30}\)
   D \(\frac{16}{32}\)  E \(\frac{24}{42}\)

2 If \(5\frac{1}{7}\) is expressed as an improper fraction, its numerator will be:
   A 8  B 12  C 13
   D 35  E 36

3 To express the fraction \(\frac{30}{48}\) in its lowest terms, divide the numerator and denominator by:
   A 2  B 3  C 5
   D 6  E 8

4 45 minutes, expressed as a fraction of one hour, is:
   A \(\frac{1}{60}\)  B \(\frac{1}{45}\)  C \(\frac{3}{4}\)
   D \(\frac{4}{5}\)  E \(\frac{4}{3}\)

5 \(\frac{4}{25}\) expressed as a percentage is:
   A 4%  B 6\(\frac{1}{4}\)%  C 8%
   D 12%  E 16%

6 Simplify \(5\frac{1}{4} + 1\frac{1}{6} - 3\frac{2}{3}\).
   ____________________________

7 Simplify \(6\frac{1}{4} \times 1\frac{3}{5}\).
   ____________________________

8 Simplify \(6\frac{3}{4} + 5\frac{5}{8}\).
   ____________________________

9 During a radio programme lasting 1 hour, there were 18 minutes of talking; the rest was music. What percentage of the radio programme was music?
   ____________________________

10 One-sixth of a stick is cut off and then three-tenths of the remaining piece is thrown away. What fraction of the original stick remains?
   ____________________________
**Term Revision test 3 (Chapters 5, 7)**

*Circle the correct answer for Questions 1–5. Circle the letter only.*

1. When \( x = 8 \), the value of \( 18 - x \) is:
   - A 1
   - B 8
   - C 10
   - D 18
   - E 26

2. If \( 13 = a - 9 \) is a true sentence, then \( a = \):
   - A 0
   - B 4
   - C 9
   - D 13
   - E 22

3. Maria is \( x \) years old. In two years’ time she will be 16 years old. \( x = \):
   - A 2
   - B 7
   - C 8
   - D 14
   - E 18

4. The number which is 6 less than \( m \) is:
   - A \( m - 6 \)
   - B \( 6 - m \)
   - C \( 6m \)
   - D \( \frac{m}{6} \)
   - E \( m + 6 \)

5. When \( x = 4 \), the value of \( 8x \) is:
   - A 2
   - B 4
   - C 12
   - D 32
   - E 84

6. Simplify: \( a - 5a + 8a - 2a \).

7. Simplify: \( 6x - 2y - 5y - 3x \).

8. A girl has \( \mathbf{N} n \). She gives \( \mathbf{N} 180 \) to her brother and spends the other \( \mathbf{N} 220 \). What is the value of \( n \)?

9. A cup holds \( d \) ml of tea. A student drinks one-fifth of the tea. How much tea is left?

10. A trader buys 30 shirts for \( \mathbf{N} x \) each. He sells them all for \( \mathbf{N} y \) each. What is his profit?
Term Revision test 4 (Chapters 6, 8)

Circle the correct answer for Questions 1–5. Circle the letter only.

1. Each face of a cuboid is in the shape of a:
   A. triangle  
   B. rectangle  
   C. square  
   D. hexagon  
   E. circle.

2. Which net in Fig. 32 is the net of a triangular prism?

   ![Net Options](image_url)

   Fig. 32

3. The angle between the hands of a clock at 2 o’clock is:
   A. 2°  
   B. 24°  
   C. 30°  
   D. 60°  
   E. 72°.

4. The number of degrees in $\frac{1}{8}$ of a revolution is:
   A. 8  
   B. $12\frac{1}{2}$  
   C. $22\frac{1}{2}$  
   D. 45  
   E. 90

5. It takes 72 cm of wire to make a skeleton model of a cube. The length of one edge of the cube is:
   A. 6 cm  
   B. 8 cm  
   C. 9 cm  
   D. 12 cm  
   E. 18 cm

6. Fig. 33 shows the cuboid ABCDEFGH.

   ![Cuboid Diagram](image_url)

   Fig. 33

   a. Faces ABGF and BCHG meet along which edge? _________________________________

   b. Which edges meet at vertex H? _____________________________________________

   c. Edges BG and AB meet at which vertex? _________________________________
7 Use a protractor to measure $\angle ABC$ in the triangle in Fig. 34.

![Fig. 34](image)

8 Use a protractor to construct an angle of $56^\circ$.

![Fig. 35](image)

9 Fig. 35 shows the net of a triangular-based pyramid.

![Fig. 35](image)

If the net is folded to make the pyramid:

a which edge will join to edge BC?

b which point will join to point A?

10 Find, in degrees, the angle between the hour hand and the minute hand of a clock at $\frac{1}{2}$ past 6.
Term General revision test A (Chapters 1–8)

Circle the correct answer for Questions 1–10. Circle the letter only.

1. The value of the 3 in 24.635 is:
   A. 3 thousandths
   B. 3 hundredths
   C. 3 tenths
   D. 3 units
   E. 3 tens

2. The HCF of 24 and 60 is:
   A. 2
   B. 3
   C. 4
   D. 6
   E. 12

3. A distance of 3 km and 29 m, expressed in metres is:
   A. 3.029
   B. 3.29
   C. 329
   D. 3.029
   E. 3.290

4. The lowest common denominator of \(\frac{2}{3}, \frac{4}{5}, \frac{5}{6}\) and \(\frac{3}{10}\) is:
   A. 15
   B. 30
   C. 50
   D. 60
   E. 900

5. Four pages of a 16-page newspaper are missing. The percentage missing is
   A. \(\frac{1}{4}\%\)
   B. 4%
   C. 16%
   D. 25%
   E. 75%

6. If \(26 - x = x\) is a true sentence, the value of \(x\) is:
   A. 0
   B. 2
   C. 13
   D. 24
   E. 26

7. If \(x = 3\), the value of \(7x - 2x\) is:
   A. 6
   B. 8
   C. 15
   D. 21
   E. 53

8. Which one of the following statements about a cylinder is false?
   A. A cylinder has two vertices.
   B. A cylinder has two plane faces.
   C. A cylinder has two curved edges.
   D. A cylinder has one curved face.
   E. The net of a cylinder has one rectangle and two circles.

9. The angle between the hands of a clock at 8 o’clock is:
   A. 20°
   B. 40°
   C. 60°
   D. 90°
   E. 120°

10. \(\frac{3}{5}\) of \(\frac{5}{3}\) is:
    A. \(\frac{1}{5}\)
    B. \(\frac{1}{3}\)
    C. \(\frac{9}{25}\)
    D. 1
    E. \(2\frac{7}{9}\)

11. Express this year’s date in Roman numerals.
12 Find the LCM of 20, 24 and 30.

13 Find the sum of 600 ml, 900 ml and 60 ml. Give your answer in litres.

14 Simplify the following.
   a \( \frac{1}{20} + \frac{3}{5} \)
   b \( \frac{5}{8} - \frac{4}{3} \)
   c \( \frac{3}{4} \times \frac{1}{2} \)
   d \( \frac{3}{3} + \frac{2}{9} \)

15 A woman gives \( \frac{1}{2} \) of a cake to her son, \( \frac{1}{4} \) to her daughter and \( \frac{1}{3} \) to her husband. What fraction is left for herself?

16 A farmer sells \( \frac{2}{5} \) of his cattle. He gives \( \frac{1}{3} \) of the remainder to his son. What fraction of the cattle is left?

17 A student walks for \( 3 \frac{1}{2} \) minutes and runs for \( 8 \frac{1}{2} \) minutes. What percentage of the journey time is spent running?

18 If \( x = 2 \), find the value of the following.
   a \( 7 - x \)
   b \( 5x - 3 \)
   c \( \frac{3}{4}x \)
   d \( 4 - 2x \)

19 I buy 5 metres of cloth at \( \text{₦}x \) per metre. How much change will I get from \( \text{₦}7000 \)?

20 Make a drawing like that in Fig. 36, such that \( \angle ACD = 114^\circ \). \( \hat{A} \) and \( \hat{B} \) can be any size. Measure \( \hat{A} \) and \( \hat{B} \). Find the sum of \( \hat{A} \) and \( \hat{B} \).

![Fig. 36](image.png)
Term Revision test 5 (Chapter 9)

Circle the correct answer for Questions 1–5. Circle the letter only.

1. Select the correct answer to the following. $0.017 \times 100 =$
   A. 0.00017  
   B. 0.0017  
   C. 0.17  
   D. 1.7  
   E. 17

2. Select the correct answer to the following. $0.5 \times 0.2 =$
   A. 0.001  
   B. 0.01  
   C. 0.1  
   D. 1  
   E. 10

3. Select the correct answer to the following. $24 \div 10\,000 =$
   A. 0.000024  
   B. 0.00024  
   C. 0.0024  
   D. 0.024  
   E. 0.24

4. Select the correct answer to the following. $1200 \div 0.04 =$
   A. 30000  
   B. 3000  
   C. 300  
   D. 30  
   E. 3

5. If $23 \times 54 = 1.242$, then $1.242 \div 0.54 =$
   A. 0.023  
   B. 0.23  
   C. 2.3  
   D. 23  
   E. 230

6. A piece of string 1.82 metres long is cut from a string 6.58 metres long. What length of string is left?

7. Find the product of 0.17 and 5.2.

8. What percentage of 2 km is 800 m?

9. How many cans, each 1.8 ℓ in capacity, can be filled from a tank containing 54 ℓ of water?

10. The value of a house when new was $25,350,000. After 5 years its value had increased by $33\frac{1}{3}\%$. Calculate its value after 5 years.
Term Revision test 6 (Chapters 10, 11)

Circle the correct answer for Questions 1–5. Circle the letter only.

1. The number which is 5 times greater than \(a\) is:
   - A \(5 - a\)
   - B \(\frac{a}{5}\)
   - C \(5 + a\)
   - D \(5a\)
   - E \(a - 5\)

2. The sum of \(a\) minutes and \(b\) seconds, expressed in minutes, is:
   - A \(60a + b\)
   - B \(a + 60b\)
   - C \(a + b\)
   - D \(\frac{a}{60 + b}\)
   - E \(\frac{a + b}{60}\)

3. The number of years in \(x\) calendar months is:
   - A \(12 + x\)
   - B \(\frac{x}{12}\)
   - C \(12x\)
   - D \(\frac{12}{x}\)
   - E \(12 - x\)

4. Which one of the following has no lines of symmetry?
   - A circle
   - B regular hexagon
   - C isosceles triangle
   - D equilateral triangle
   - E scalene triangle

5. The diagonals of one of the following always cross at right angles. Which one?
   - A rectangle
   - B square
   - C parallelogram
   - D trapezium
   - E regular pentagon

6. How many sweets at 50 kobo each can be bought for \(N5\)?

7. Express:
   - a \(w\) kilograms in grams
   - b \(b\) centimetres in millimetres
   - c \(d\) kobo in naira.

8. Name four quadrilaterals that have at least one pair of parallel sides.

9. What angle does the diagonal of a square make with its sides?

10. A girl is \(c\) years old. Her brother is twice as old. How old will the brother be in \(d\) years’ time?
Term Revision test 7 (Chapters 12, 15)

Circle the correct answer for Questions 1–5. Circle the letter only.

1 Which one of the following numbers is the greatest?
   A 22   B 230   C 2100   D 250   E 23

2 Select the correct answer to the following. \(-20 - (-70) =
   A \quad 290   \quad B \quad 250   \quad C \quad 150   \quad D \quad 190   \quad E \quad \text{None of these}

3 Select the correct answer to the following. \(13 - (-8) - 5 =
   A \quad 212   \quad B \quad 22   \quad C \quad 16   \quad D \quad 112   \quad E \quad 116

4 Select the correct answer to the following. \(9 \times 2 - 12 \div 2 + 2 =
   A \quad 243   \quad B \quad 218   \quad C \quad 5   \quad D \quad 14   \quad E \quad 15

5 Daudu is \(n\) years old. His twin sisters are two years younger than he is. The sum of his sisters’ ages, in years, is:
   A \quad n - 2   \quad B \quad n - 4   \quad C \quad 2n   \quad D \quad 2n - 2   \quad E \quad 2n - 4

6 The temperature inside a refrigerator is 2.4 °C. What will be the temperature if it falls by 3.9 °C?
   ________________________________________________________________

7 Simplify the following.
   a \(3xy \times 9y\) ______________________________________________________
   b \(2n \times 5an^2\) ______________________________________________________
   c \(36a^2b + 12ab\) ______________________________________________________
   d \(\frac{5c^3}{x}\) ______________________________________________________

8 Simplify the following.
   a \(3 - 11\) ______________________________________________________
   b \(-9 + 4\) ______________________________________________________
   c \(8 - (-15)\) ______________________________________________________
   d \(-6 + (-6)\) ______________________________________________________

9 Simplify the following.
   a \(-3a + (6y - 8a) + y\) ______________________________________________________
   b \(-2x - 5b - (8b - 5x)\) ______________________________________________________

10 Find the sum of the whole number \(n\) and the next two whole numbers greater than \(n\).
   ______________________________________________________
Term Revision test 8 (Chapters 13, 14, 16)

Circle the correct answer for Questions 1–5. Circle the letter only.

1. The perimeter of a rectangle is 26 cm. Its breadth is 4 cm. Its length is:
   A 9 cm  B 11 cm  C 13 cm  D 17 cm  E 22 cm

2. The exact value of π is:
   A 3.142  B 3\frac{1}{7}  C 3.14  D 3.1  E impossible to find.

3. The area of a floor 3 metres square (3 m by 3 m) is:
   A 3 m²  B 6 m²  C 9 m²  D 300 m²  E 90 000 m²

4. A triangle and a parallelogram have the same base and same area. If the height of the triangle is 5 cm, the height of the parallelogram is:
   A 1.25 cm  B 2.5 cm  C 5 cm  D 10 cm  E 25 cm

5. Which of the following is the number of cm³ in 1 m³?
   A 100  B 1 000  C 10 000  D 100 000  E 1 000 000

6. Calculate the area of a rectangle that measures 11 cm by 3 cm. Calculate the area of a square with the same perimeter.

7. Use 3.14 for π to calculate the area of a circle of radius 3 m.

8. Calculate the area of the triangle in Fig. 37. Calculate the height \( h \) shown in the diagram.

9. A floor 4 m long by \( 2\frac{1}{2} \) m wide is concreted to a thickness of 10 cm. Calculate the volume of the concrete.

10. Calculate the area of the shape shown in Fig. 38. Use \( \frac{22}{7} \) for π.
Term General revision test B (Chapters 9–16)

Circle the correct answer for Questions 1–10. Circle the letter only.

1. Select the correct answer to the following. \(3.2 \div 8000 =\)
   - A 0.0004
   - B 0.004
   - C 0.04
   - D 4
   - E 400

2. Which of the following is 20% of 1 hour?
   - A 5 min
   - B 6 min
   - C 12 min
   - D 20 min
   - E 30 min

3. The difference, in grams, between \(x\) kg and 50 \(x\) g is:
   - A \(x - 50x\)
   - B 49\(x\)
   - C 50\(x\)
   - D 950\(x\)
   - E 9.050\(x\)

4. Which one of the following has two (and only two) lines of symmetry?
   - A square
   - B rectangle
   - C isosceles triangle
   - D regular pentagon
   - E equilateral triangle

5. If \(3.4 \times 1.8 = 6.12\), then \(61.2 \div 0.18 =\)
   - A 0.34
   - B 3.4
   - C 34
   - D 340
   - E 3400

6. Which of the following is the difference between temperatures of 17 °C above zero and 12 °C below zero?
   - A 5 °C
   - B 12 °C
   - C 17 °C
   - D 22 °C
   - E 29 °C

7. Select the correct answer to the following. \(3a - (9a - 5b) =\)
   - A \(a + 5b\)
   - B \(6a - 5b\)
   - C \(-6a - 5b\)
   - D \(b - 6a\)
   - E \(5b - 6a\)

8. Select the correct answer to the following. \(12x^2y + 3x =\)
   - A \(4xy\)
   - B \(8y\)
   - C \(9xy\)
   - D \(12xy\)
   - E \(16y\)

9. A farmer buys \(n\) sheep at \(N_a\) each and sells them at \(N_b\) each. Which of the following is his profit in naira?
   - A \(an - bn\)
   - B \(bn - an\)
   - C \(a - b\)
   - D \(b - a\)
   - E \(\frac{b-a}{n}\)

10. A square has the same perimeter as a 5 cm by 7 cm rectangle. Which of the following is the area of the square?
    - A 9 cm\(^2\)
    - B 25 cm\(^2\)
    - C 35 cm\(^2\)
    - D 36 cm\(^2\)
    - E 49 cm\(^2\)
11 A thread is wound 100 times round a reel of diameter 3 cm. Calculate the length of the thread. 
(Use 3.14 for π.)
__________________________________________________________________________

12 A student walks at the rate of 88 paces to the minute. If each pace is 0.85 m long, how far does the student walk in 10 minutes?
__________________________________________________________________________

13 A price of ₹1 250 is marked down by ₹50. By what percentage is the price reduced?
__________________________________________________________________________

14 What fraction of $1.75 is 77c? Express this fraction as a percentage.
__________________________________________________________________________

15 From a piece of string $3\frac{1}{2}$ m long, a length of $55x$ cm is cut off. Find the length of the remaining string in cm.
__________________________________________________________________________

16 A boy is half his mother’s age. If the boy is $y$ years old, what will be the sum of their ages in $z$ years’ time?
__________________________________________________________________________

17 Simplify the following.
   a $-4 - 9$
   b $5 - (-12)$
   c $-8 - (-3)$
   d $10 + (-9)$

18 Simplify the following.
   a $21 - (7x + 5)$
   b $3a + 8 - (8 - 3a)$
   c $6 - (9x - 7) + 2x$

19 Four discs, each of radius 1 cm, are cut from a 5 cm by 5 cm cardboard square. Use the value 3.14 for π to find the area of cardboard left over.
__________________________________________________________________________

20 One litre of water is poured into a rectangular container. Find the height that the water will rise if the area of the base of the container is 80 cm².
__________________________________________________________________________
Term Revision test 9 (Chapters 17, 18, 22)

Circle the correct answer for Questions 1–5. Circle the letter only.

1. When recording data, the tally marks \text{||| \text{||| \text{||| \text{|||}} represent the number:}
   
   \begin{array}{c|c|c|c|c|c}
   \text{A} & 13 & \text{B} & 15 & \text{C} & 18 \\
   \text{D} & 20 & \text{E} & 33 \\
   \end{array}

2. After five games, a football team’s goal average is 2.8. After one more game the goal average is 3. The number of goals scored in the 6th game was:
   
   \begin{array}{c|c|c|c|c|c}
   \text{A} & 3 & \text{B} & 4 & \text{C} & 5 \\
   \text{D} & 6 & \text{E} & 7 \\
   \end{array}

Use the following set of numbers in questions 3, 4 and 5.

\begin{array}{c|c|c|c|c|c|c|c|c|c|c}
2 & 2 & 2 & 5 & 5 & 8 & 9 & 10 & 11 \\
\end{array}

3. The mode of the above set of numbers is:
   
   \begin{array}{c|c|c|c|c|c}
   \text{A} & 2 & \text{B} & 3 & \text{C} & 5 \\
   \text{D} & 6 & \text{E} & 9 \\
   \end{array}

4. The median of the above set of numbers is:
   
   \begin{array}{c|c|c|c|c|c}
   \text{A} & 2 & \text{B} & 3 & \text{C} & 5 \\
   \text{D} & 6 & \text{E} & 9 \\
   \end{array}

5. The mean of the above set of numbers is:
   
   \begin{array}{c|c|c|c|c|c}
   \text{A} & 2 & \text{B} & 3 & \text{C} & 5 \\
   \text{D} & 6 & \text{E} & 9 \\
   \end{array}

6. 100 people were asked their ages; the results are given in Table 18.

\begin{tabular}{|c|c|c|c|c|}
\hline
\text{age} & \text{<15} & \text{15–29} & \text{30–44} & \text{45–59} & \text{>60} \\
\hline
\text{frequency} & 43 & 32 & 17 & 5 & 3 \\
\hline
\end{tabular}

Table 18

a. What fraction of the people were under 30?

b. What percentage of the people were between 45 and 59?

Use a sheet of grid paper to draw your answers to questions 7–9.

7. Draw a bar chart to show the information in question 6.

8. A book has 120 pages of drawings, 72 pages of photographs and 168 pages of writing. Show this information on a pie chart.

9. Show the information from question 8 on a pictogram. (Let each symbol represent 24 pages.)

10. During a week, the midday temperatures were: 28, 29, 29, 33, 28, 24 and 25 °C. Calculate the mean midday temperature.
Term Revision test 10 (Chapter 19)

Circle the correct answer for Questions 1–5. Circle the letter only.

1. If $13 = x – 5$, then $x =$
   - A 1
   - B 8
   - C 9
   - D 16
   - E 18

2. The value of $x$ that makes $\frac{24}{x} = 8$ true is:
   - A 3
   - B 8
   - C 16
   - D 32
   - E 192

3. If $x – 10 = 10$, then $x =$
   - A 0
   - B 1
   - C 10
   - D 20
   - E 100

4. If $6x + 7 = 55$, then $x =$
   - A 7
   - B $8\frac{1}{3}$
   - C 10
   - D 42
   - E 48

5. The smaller of two consecutive numbers is doubled and added to the greater. If the smaller number is $n$, then the total will be:
   - A $2n$
   - B $2n + 1$
   - C $3n$
   - D $3n + 1$
   - E $3n + 2$

6. Solve the following.
   a. $13 – x = 10$
   b. $\frac{a}{3} = 3$
   c. $y + 8 = 20$

7. Solve the following.
   a. $4n – 3 = 17$
   b. $50 = 7d + 1$
   c. $12x + 8 = 20$

8. Two consecutive whole numbers are such that twice the smaller added to the greater make a total of 52. Find the numbers.

9. A packet of candles and a box of matches cost $420. The candles cost 20 times as much as the matches. Find the cost of the matches.

10. A number, $x$, is multiplied by 3; 5 is subtracted from the result. The final answer is 16. Make an equation in $x$ and find the value of $x$. 
Term Revision test 11 (Chapters 20, 21)

Circle the correct answer for Questions 1–5. Circle the letter only.

1. XÖY and YÖZ are adjacent on a straight line XOZ. If XÖY = 58°, then YÖZ =
   A 32°  B 122°  C 132°  D 238°  E 302°

2. Complete the following sentence correctly. Vertically opposite angles …
   A are alternate  B add up to 180°  C are corresponding
   D are equal  E add up to 360°.

3. Three lines meet at a point. If the sum of two of the angles formed is 163°, the other angle is:
   A 17°  B 73°  C 163°  D 197°  E 343°

4. Two angles of ΔABC are 46° and 67°. Calculate the third angle of ΔABC. Hence decide which one of the following kinds of triangle it is.
   A equilateral triangle  B isosceles triangle  C right-angled triangle
   D scalene triangle  E obtuse-angled triangle.

5. In ΔXYZ, XY = 5 cm, XŶZ = 40° and XŶY = 60°. Which sketch in Fig. 39 shows this information correctly?

   A  
   B  
   C  
   D  
   E

   Fig. 39

6. Construct ΔABC in which BC = 4 cm, AĈB = 50° and AB = 6 cm.
7 In Fig. 40, find \(a, b, c\).

![Fig. 40](image)

8 In Fig. 41, find \(a, b, c, d\).

![Fig. 41](image)

9 Construct a parallelogram ABCD in which \(AB = 4\) cm, \(\angle BAC = 70^\circ\) and \(BC = 5\) cm. Measure the distance between one pair of parallels and hence calculate the area of the parallelogram.

10 In Fig. 42, find \(a, b, c\).

![Fig. 42](image)
Term Revision test 12 (Chapters 23, 24)

Circle the correct answer for Questions 1–5. Circle the letter only.

1. 67.053 to the nearest tenth =
   A 70  B 67  C 67.0  D 67.1  E 67.05

2. 41 300 = 41 285 to the nearest:
   A ten thousand  B thousand  C hundred  
   D ten  E whole number

3. Which one of the following is usually measured in metres?
   A thickness of a pencil  B width of a book
   C diameter of a coin  D distance from Enugu to Benin
   E distance round a running track

4. Which one of the following is most likely to be the correct value of €3.90 \times 7.8?
   A 50c  B €20  C €21.50  D €30.42  E €33.00

5. Which one of the following is not sensible?
   A The woman’s hand-span was 20 cm.  B The boy ran 100 km in an hour.
   C The height of the tree was 5.8 m.  D The capacity of the cup was 280 ml.
   E It took a day to cycle from Lagos to Ibadan.

6. Convert the following:
   a. 110110_{two} to base ten ________________________________
   b. 25_{ten} to base two ________________________________

7. Calculate the following, leaving your answer in base two.
   a. 101 + 111 ________________________________
   b. 111 − 10 ________________________________
   c. 101 × 11 ________________________________

8. Estimate the cost of 20.5 hectares of land at ₦196 000 per hectare.
   ______________________________________

9. A hotel bill for nine days was ₦59 690. Estimate the daily cost.
   ______________________________________

10. To estimate the length of a room without a tape measure, a person ‘measures’ the room on the floor as about eleven shoe-lengths long. Later, the shoes are found to be 28 cm long. Find the approximate length of the room in metres.
Term General revision test C (Chapters 17–24)

Circle the correct answer for Questions 1–10. Circle the letter only.

1. The mean of 3, 5, 4, 8, 6, 4, 6, 2, 3, 6 is:
   A 4.5  B 4.7  C 5  D 6.1  E 10

2. A number is trebled and then 17 is subtracted. If the result is 40, the original number is:
   A \( \frac{7}{3} \)  B 11  C 19  D 57  E 69

3. \( 16 - x = x \) is true when \( x = \)
   A 0  B 8  C 14  D 16  E 32

4. In Fig. 43, the value of \( x \) is:
   A 28°  B 31°  C 33°  D 56°  E 62°

5. The mass of which one of the following is usually measured in tonnes?
   A a parcel  B a packet of sugar  C a person’s body
   D a packet of biscuits  E a lorry’s load

6. The mean of three numbers is 6. The mode of the three numbers is 7. The lowest of the three numbers is:
   A 2  B 3  C 4  D 6  E 7

7. If \( \frac{x}{12} = 3 \), then \( x = \)
   A \( \frac{1}{4} \)  B 3  C 4  D 9  E 36

8. In Fig. 44, \( a = \)
   A 21  B 24  C 42  D 48  E 69

9. In 2006, the estimated population of Nigeria was 131,000,000. The area of Nigeria is 923,768 square km. In 2006, Nigeria’s population density (i.e. the number of people per square km) was approximately:
   A 13  B 40  C 130  D 400  E 1,300

10. \( x = 23\frac{4}{5} + 8\frac{1}{2} \). Use estimation to decide which one of the following is the accurate value of \( x \).
    A \( 2\frac{1}{2} \)  B \( 2\frac{2}{3} \)  C \( 1\frac{2}{5} \)  D \( 2\frac{4}{5} \)  E \( 3\frac{3}{5} \)
11 Solve the following.
   a  $5 + 8a = 37$ ___________________
   b  $40 = 14a - 30$ ___________________
   c  $2a - 1 = 31$ ___________________

12 A traffic survey gave the results shown in Table 18.

<table>
<thead>
<tr>
<th>vehicles</th>
<th>car</th>
<th>lorry</th>
<th>bus</th>
<th>bicycle</th>
</tr>
</thead>
<tbody>
<tr>
<td>frequency</td>
<td>12</td>
<td>10</td>
<td>5</td>
<td>23</td>
</tr>
</tbody>
</table>

Table 19

a  How many lorries were there for every one bus? _______________________

b  What percentage of the vehicles were bicycles? _______________________

13 Represent the data in question 12 on a bar chart. Use a separate sheet of grid paper.

14 Solve the following.
   a  $3x - 4 = 1$ ___________________
   b  $7 = 5 + 5x$ ___________________
   c  $7 + 8x = 9$ ___________________

15 In Fig. 45, find $a$, $b$, $c$.

   ____________________________________
   ____________________________________

Fig. 45

16 Ten tomatoes have a mass of 628 g. A woman buys 2.12 kg of tomatoes. 
   Approximately how many tomatoes will she get? _______________________

17 Find the mean, median and mode of 4 hours, 2 hours, 3 hours and 2 hours.

   ____________________________________

18 A plate costs twice as much as a saucer. Three plates and four saucers cost N1 800. 
   How much does each cost? _______________________________________

19 On a separate sheet of paper, construct $\triangle ABC$ in which $BC = 6$ cm, $\angle ABC = 30^\circ$ and 
   $\angle BAC = 100^\circ$. Measure the perpendicular distance of $A$ from $BC$ and hence calculate the area of 
   the triangle.

20 Calculate the following, leaving your answer in base two.
   a  $101 + 11$ _______________________
   b  $101 - 10$ _______________________
   c  $101 \times 11$ _____________________
Please note that the multiple choice detractors (A, B, C, D, E) in the Student’s Book have mistakenly been written with lower case letters, in some instances. Explain to your students that these should always be capital letters, and that their answers to the multiple choice questions should also be in capital letters.

**Term Revision test 1 (Chapters 1, 2, 3)**
1 D 2 A 3 D 4 C 5 E  
6 \(60 = 2^2 \times 3 \times 5\)  
8 8 9 3.713 t  
10 113 cm

**Term Revision test 2 (Chapter 2)**
1 E 2 E 3 D 4 C 5 E  
6 \(2\frac{3}{4}\) 7 10 8 1\(\frac{1}{5}\) 9 70% 10 \(\frac{7}{12}\)

**Term Revision test 3 (Chapters 5, 7)**
1 C 2 E 3 D 4 A 5 D  
6 \(2a\) 7 \(3x - 7y\) 8 400  
9 \(\frac{4d}{5}\) ml 10 \(30y - 30x, \text{or } 30(y - x)\)

**Term Revision test 4 (Chapters 6, 7)**
1 B 2 E 3 D 4 D 5 A  
6 a BG b CH, EH, GH c B  
7 125° 8 Discuss with students  
9 a CD b E  
10 15°

**Term General revision test A (Chapters 1–8)**
1 B 2 E 3 D 4 B 5 D  
6 C 7 C 8 A 9 E 10 D  
11 MM will be the first two letters.  
12 120 13 1.56 litres  
14 a \(1\frac{13}{20}\) b \(\frac{5}{8}\) c \(\frac{5}{8}\) d \(1\frac{1}{3}\)  
15 \(\frac{1}{6}\) 16 \(\frac{2}{5}\) 17 \(70\%\)  
18 a 5 b 7 c \(\frac{1}{2}\) d 0  
19 \(\approx 7000 - 5x\) or \(\approx (7000 - 5x)\)  
20 114°

**Term Revision test 5 (Chapter 9)**
1 D 2 C 3 C 4 A 5 C  
6 4.76 m 7 0.884 8 40%  
9 30 10 \(\approx 338000\)

**Term Revision test 6 (Chapters 10, 11)**
1 D 2 E 3 B  
4 E 5 B 6 10 sweets  
7 a \(1000w\) b \(10b\) c \(\frac{d}{100}\)  
8 square, rectangle, parallelogram, trapezium, rhombus  
9 45° 10 \((2c + d)\) years old

**Term Revision test 7 (Chapters 12, 15)**
1 C 2 E 3 C 4 D 5 E  
6 \(-1.5\) °C  
7 a 27xy² b \(10an^3\) c \(3a\) d \(5x\)  
8 a \(-8\) b \(-5\) c \(+23\) d \(-12\)  
9 a \(7y - 11a\) b \(3x - 13b\)  
10 \(3n + 3\)

**Term Revision test 8 (Chapters 13, 14, 16)**
1 A 2 E 3 C 4 B 5 E  
6 \(33\) cm², \(49\) cm²  
7 28.26 m²  
8 \(36\) cm², \(b = 9\) cm  
9 \(1\) m³  
10 \(357\) m²

**Term General revision test B (Chapters 9–16)**
1 A 2 C 3 D 4 B 5 D  
6 E 7 E 8 A 9 B 10 D  
11 \(942\) cm 12 \(748\) m  
13 4% 14 \(\frac{11}{25}\), \(44\%\)  
15 \(295x\) cm 16 \(3y + 2z\)  
17 a \(-13\) b \(17\) c \(-5\) d 1  
18 a \(16 - 7x\) b \(6a\) c \(13 - 7x\)  
19 \(12.44\) cm² 20 \(12\frac{1}{2}\) cm
Term Revision test 9 (Chapters 17, 18, 22)
1 C 2 B 3 A 4 C 5 D
6 a 3/4 b 5%
7 Discuss with students
8 A pie chart with angles of 120° (drawings), 72° (photos), 168° (writing)
9 Discuss with students
10 28 °C

Term Revision test 10 (Chapter 19)
1 E 2 A 3 D 4 B 5 D
6 a x = 3 b a = 9 c y = 12
7 a n = 5 b d = 7 c x = 1
8 17, 18 9 20
10 3x − 5 = 16, x = 7

Term Revision test 11 (Chapters 20, 21)
1 B 2 D 3 D 4 B 5 E
6 Students exchange books and mark each other’s drawings.
7 a = 118°, b = 118°, c = 112°
8 a = 70°, b = 38°, c = 72°, d = 38°
9 4.7 cm or 3.8 cm, 18.8 cm²
10 a = 70°, b = 68°, c = 42°, d = 68°

Term Revision test 12 (Chapters 13, 14, 16)
1 D 2 C 3 E 4 D 5 B
6 a 54° b 1101 two
7 a 1100 b 101 c 1111
8 4 000 000 9 6 000
10 3 metres

Term General revision test C
(Chapters 17–24)
1 B 2 C 3 B 4 A 5 E
6 C 7 E 8 A 9 C 10 D
11 a a = 4 b a = 5 c a = 16
12 a 2 b 46%
13 Students exchange books and mark each other’s drawings.
14 a x = 1 2/3 b x = 2/5 c x = 1/4
15 a = 35°, b = 110°, c = 250°
16 340
17 mean = 2 3/4 h, median = 2 1/2 h, mode = 2 h
18 saucer: 180, plate: 360
19 area = 7 cm²
20 a 1 000 b 11 c 1 111
Section 4 contains the completed Worksheets from the NGM Workbook. The final answers have been overlaid onto the actual Workbook pages, making these quick and easy memoranda that you can use when marking.
Development of number systems

**Worked example**

Add the following times together. Give the answers in hours and minutes.

3 h 40 min, 2 h 25 min, 28 min, 1 h 35 min

<table>
<thead>
<tr>
<th>h</th>
<th>min</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>40</td>
</tr>
<tr>
<td>2</td>
<td>25</td>
</tr>
<tr>
<td>28</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>35</td>
</tr>
</tbody>
</table>

Method in minutes column:

\[40 + 25 + 28 + 35 = 128 \text{ min}\]

\[2 \times 60 \text{ min} + 8 \text{ min} = 2 \text{ h} 8 \text{ min}\]

write down 8 min and carry 2 h

\[8 \quad 8\]

answer: 8 h 8 min

1. Complete these number patterns.
   a. 10; 20; 30; 40; 50; 60; 70; 80; 90; 100; 110; 120; 130
   b. 25; 50; 75; 100; 125; 150; 175; 200; 225; 250; 275; 300; 325
   c. 9; 18; 27; 36; 45; 54; 63; 72; 81; 90; 99; 108; 117
   d. 40; 43; 46; 49; 52; 55; 58; 61; 64; 67; 70; 73; 76

2. a. Complete the pattern: I; II; III; IV; V; VI; VII; VIII; IX
   b. Name the number system. Roman numerals
   c. Which numbers do these letters represent?
      \[M = \quad 1 \quad 0 \quad 0 \quad 0\]
      \[D = \quad 5 \quad 0 \quad 0\]
      \[C = \quad 1 \quad 0 \quad 0\]
      \[L = \quad 5 \quad 0\]
   d. Write the year in which you were born as Roman numerals. Students' own answer

3. a. Complete the table.

<table>
<thead>
<tr>
<th>Thousands</th>
<th>Hundreds</th>
<th>Tens</th>
<th>Units</th>
<th>tenths</th>
<th>hundredths</th>
</tr>
</thead>
<tbody>
<tr>
<td>67</td>
<td></td>
<td>6</td>
<td>7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23.9</td>
<td></td>
<td>2</td>
<td>3</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>123</td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>0.08</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>8</td>
</tr>
<tr>
<td>6 666</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>34.34</td>
<td></td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>90.7</td>
<td></td>
<td>9</td>
<td>0</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>677</td>
<td></td>
<td>6</td>
<td>7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>56.09</td>
<td></td>
<td>5</td>
<td>6</td>
<td>0</td>
<td>9</td>
</tr>
</tbody>
</table>

   b. What do we use to separate whole numbers from decimals? decimal point
c  Give an example of your answer to question 3b. any decimal number e.g. 5.67

d  What number is the base of this number system? 10

4 Can you write the number words for one, two and three in any other three other languages besides English?

Students' own answer

5 Although our number system is a decimal system, we count time in different number patterns.

<table>
<thead>
<tr>
<th>a</th>
<th>How many months in one year?</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>b</td>
<td>How many weeks in one year?</td>
<td>52</td>
</tr>
<tr>
<td>c</td>
<td>How many days in one year?</td>
<td>365 except in Leap Year, then 366</td>
</tr>
<tr>
<td>d</td>
<td>How many days in one week?</td>
<td>7</td>
</tr>
<tr>
<td>e</td>
<td>How many minutes in one hour?</td>
<td>60</td>
</tr>
</tbody>
</table>

6 Calculate.

<table>
<thead>
<tr>
<th>a</th>
<th>Add: 7 h 15 min, 12h 48 min and 3 h 12 min.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>23 h 15 min</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>b</th>
<th>Write 2 567 weeks as years and weeks.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>49 years and 19 weeks</td>
</tr>
</tbody>
</table>

7 Which numbers have the same meaning as these?

<table>
<thead>
<tr>
<th>a</th>
<th>Penta = 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>b</td>
<td>Tri = 3</td>
</tr>
<tr>
<td></td>
<td>--------------------------------------------</td>
</tr>
<tr>
<td>c</td>
<td>Quad = 4</td>
</tr>
<tr>
<td></td>
<td>--------------------------------------------</td>
</tr>
<tr>
<td>d</td>
<td>Hexa = 6</td>
</tr>
<tr>
<td></td>
<td>--------------------------------------------</td>
</tr>
<tr>
<td>e</td>
<td>Bi = 2</td>
</tr>
</tbody>
</table>
**Large and small numbers**

**Worked example**

Express the following in a mixture of digits and words.

<table>
<thead>
<tr>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>N3 000 000</td>
<td>b</td>
<td>6 800 000 000</td>
</tr>
<tr>
<td>a</td>
<td>= N3 × 1 000 000</td>
<td>= 6.8 × 1 000 000 000</td>
<td>= N3 million</td>
</tr>
<tr>
<td>c</td>
<td>= 240 × 1 000 000</td>
<td>= 0.5 trillion or 500 billion</td>
<td></td>
</tr>
<tr>
<td>or</td>
<td>240 000 000</td>
<td>= 0.24 × 1 000 000 000</td>
<td></td>
</tr>
<tr>
<td>= 0.24 billion (or 240 million)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. **a** Our number system is based on a certain number. Underline this number.
   
   2 10 12 25

   **b** Write down the digits used in this number system.
   
   0, 1, 2, 3, 4, 5, 6, 7, 8, 9

2. **a** Complete the table.

<table>
<thead>
<tr>
<th>Thousand million</th>
<th>Hundred million</th>
<th>Ten millions</th>
<th>Millions</th>
<th>Hundred thousands</th>
<th>Ten thousands</th>
<th>Thousands</th>
<th>Hundreds</th>
<th>Tens</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 000 000 000</td>
<td>100 000 000</td>
<td>10 000 000</td>
<td>1 000 000</td>
<td>100 000</td>
<td>10 000</td>
<td>100</td>
<td>10</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

   **b** Write the value of the underlined digit in each number.
   
   879 70
   5 631 5 000
   27 694 20 000
   223 970 900
   7 444 707 400 000
   23 777 692 3 000 000
   934 567 089 30 000 000
   1 204 567 876 1 000 000 000

   **c** Four of the numbers in question 2b contain zeros. For each number, write which place value each zero holds.
   
   7 444 707 = tens
   934 567 089 = hundreds
   233 970 = units
   1 045 678 76 = ten millions

3. **a** If 0 × 1 = 0 and 1 × 0 = 0, write the answers to:
   
   i) 9 567 932 × 0 = 0
   ii) 0 × 9 567 932 = 0

   **b** If 0 + 1 = 1 and 1 + 0 = 1, write the answers to:
   
   i) 0 + 23 765 892 = 23 765 892
   ii) 23 765 892 + 0 = 23 765 892

4. A builder plans to build 10 houses. Each house will cost N7 500 000 to build. He wants to sell the houses for N15 000 000 each.
   
   **a** How much will it cost to build 10 houses?
b How much will the builder receive if he sells all 10 houses?

\[ 15 \times 10 \times 10 = 150 \text{ Naira} \]

c How much profit will the builder make?

\[ 150 \text{ Naira} - 75 \text{ Naira} = 75 \text{ Naira} \]

5 In a report, the population of Nigeria was 170,000,000, of Cameroon was 21,000,000, of Chad was 13,000,000 and of Niger was 18,000,000.

a What is the total population of all four countries?

222,000,000

b What is the difference between the population of the country with the most people, and the country with the least?

\[ 170,000,000 - 13,000,000 = 157,000,000 \]

c What is the total population of Cameroon, Chad and Niger together?

52,000,000

d Make up your own word problem with the populations. Swap with a classmate and work out the answer.

Students create own problems

6 Calculate.

\begin{align*}
a & \quad 7 + 6 = 13 \\
b & \quad 77 + 49 = 126 \\
c & \quad 398 + 821 = 1249 \\
d & \quad 9 - 4 = 5 \\
e & \quad 92 - 65 = 27 \\
f & \quad 704 - 379 = 325
\end{align*}

7 Calculate.

\begin{align*}
a & \quad 457 + 198 = 655 \\
b & \quad 7369 + 778 = 8147 \\
c & \quad 894 - 456 = 438 \\
d & \quad 92304 - 74894 = 17410 \\
e & \quad 523 \times 317 = 165791 \\
f & \quad 250 \times 893 = 3575
\end{align*}

\[ 10 \times 7,500,000 = 75,000,000 \]

\[ 15,000,000 \times 10 = 150,000,000 \]
**Factors and multiples**

**Worked example**

Express:

- **a** \(9 \times 9 \times 9 \times 9\) in index form
- **b** 675 as a product of primes in index form.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>(9 \times 9 \times 9 \times 9 = 9^4) (There are four 9s multiplied together.)</td>
</tr>
<tr>
<td>b</td>
<td>(675 = 3 \times 3 \times 3 \times 5 \times 5) (= 3^3 \times 5^2)</td>
</tr>
</tbody>
</table>

1. Underline the correct answer.

   - **a** When you multiply a whole number by another whole number, the product is called **factor**
   - **b** When you divide a whole number by another whole number, the answer is called **multiple**

2. Circle the numbers in brackets that are factors of each given number.

   - **a** 144 \(\{1; 2; 3; 4; 5; 6; 7; 8; 9; 10; 11; 12\}\)
   - **b** 375 \(\{5; 10; 15; 20; 25; 30; 35; 40; 45; 50\}\)

3. Circle the numbers in brackets that are multiples of each given number.

   - **a** 11 \(\{1; 11; 21; 31; 41; 51; 61; 71; 81\}\)
   - **b** 50 \(\{5; 10; 20; 25; 50; 75; 100; 120; 150\}\)

4. Write down the multiples of each given number.

   - **a** 5 \(5, 10, 15, 20, 25, 30, ...\)
   - **b** 3 \(3, 6, 9, 12, 15, 18, 21, ...\)
   - **c** Which multiples are common to 5 and 3? \(15, 30, 45, ...\)
   - **d** Which is the Lowest Common Multiple (LCM)? \(15\)

5. Write down the factors of each given number.

   - **a** 27 \(1, 3, 9, 27\)
   - **b** 36 \(1, 2, 3, 4, 6, 9, 12, 18, 36\)
   - **c** 63 \(1, 3, 7, 9, 21, 63\)
   - **d** Which factors are common to 27, 36 and 63? \(1, 3, 9\)
   - **e** Which is the Highest Common Factor (HCF)? \(9\)
A prime number has only two factors: 1 and itself.

Write the factors of each number. Tick if they are prime numbers.

<table>
<thead>
<tr>
<th>Number</th>
<th>Factors</th>
<th>Prime number?</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>1, 7</td>
<td>yes</td>
</tr>
<tr>
<td>35</td>
<td>1, 5, 7, 35</td>
<td></td>
</tr>
<tr>
<td>44</td>
<td>1, 2, 4, 11, 22, 44</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>1, 23</td>
<td>yes</td>
</tr>
<tr>
<td>150</td>
<td>1, 2, 5, 10, 15, 25, 30, 50, 75, 150</td>
<td></td>
</tr>
</tbody>
</table>

Choose the correct answer to complete the statement.

<table>
<thead>
<tr>
<th>multiple</th>
<th>composite</th>
<th>counting</th>
</tr>
</thead>
</table>

A number that is not a prime number is called a **composite** number.

a Colour all the prime numbers.

b Choose any six numbers that are not coloured in. Write all the factors of each number.

Students select their own numbers and write the factors

Examples: 1, 2, 4

1, 2, 7, 14


c Underline the prime factors in each set of factors in question 8b.
Fractions 1: Fractions and percentages

**Worked example**

a Express $\frac{4}{5} \div 6$ as an improper fraction.

\[
\frac{4}{5} = 4 + \frac{5}{6} = \frac{24}{6} + \frac{5}{6} = \frac{29}{6}
\]

or, more quickly,

\[
\frac{4}{5} = 4 \times 6 + \frac{5}{6} = 24 + \frac{5}{6} = \frac{29}{6}
\]

b Express $\frac{19}{8}$ as a mixed number.

\[
\frac{19}{8} = 16 + \frac{3}{8} = 16 + \frac{3}{8} = 2 + \frac{3}{8} = \frac{23}{8}
\]

or, more quickly,

\[
\frac{19}{8} = 19 \div 8 = 2 \text{ with remainder } 3,
\]

but the remainder is also divided by 8:

\[
19 \div 8 = 2 + \frac{3}{8} = \frac{23}{8}
\]

1. Write the answers as common fractions.

a \(12 \div 23 = \frac{12}{23}\)

b \(31 \div 42 = \frac{31}{42}\)

c \(101 \div 200 = \frac{101}{200}\)

d \(7 \div 15 = \frac{7}{15}\)

e \(1 \div 9 = \frac{1}{9}\)

2. Write the answers as improper fractions and as mixed numbers.

a \(120 \div 23 = \frac{120}{23} = \frac{5}{23}\)

b \(301 \div 42 = \frac{301}{42} = \frac{7}{42}\)

c \(507 \div 200 = \frac{507}{200} = \frac{207}{200}\)

d \(77 \div 15 = \frac{77}{15} = \frac{5}{15}\)

3. Convert these fractions into their simplest form by dividing the numerator and denominator by the same number. Remember: \(\frac{2}{2} = \frac{3}{3} = \frac{4}{4} = \frac{67}{67} = 1\)

a \(\frac{25}{30} = \frac{5}{6}\)

b \(\frac{49}{70} = \frac{7}{10}\)

c \(\frac{81}{180} = \frac{9}{20}\)

d \(\frac{150}{200} = \frac{3}{4}\)

4. Write these fractions as percentages.

a \(\frac{21}{100} = 21\%\)

b \(\frac{59}{100} = 59\%\)

5. Convert these fractions to equivalent fractions with a denominator of 100. Then write each answer as a percentage:

a \(\frac{9}{25} = \frac{36}{100} = 36\%\)

b \(\frac{17}{50} = \frac{34}{100} = 34\%\)

c \(\frac{98}{200} = \frac{49}{100} = 49\%\)

d \(\frac{150}{300} = \frac{50}{100} = 50\%\)
Express these fractions as percentages by multiplying them by $\frac{100}{1}$.

a) $\frac{17}{20} \times \frac{100}{1} = \frac{1700}{20} = 85\%$

b) $\frac{49}{50} \times \frac{100}{1} = \frac{4900}{50} = 98\%$

c) $\frac{14}{25} \times \frac{100}{1} = \frac{1400}{25} = 56\%$

d) $\frac{140}{200} \times \frac{100}{1} = \frac{14000}{200} = 70\%$

Write the first quantity as a fraction of the second quantity.

a) 15 min; 1 hour = $\frac{15}{60}$ in its simplest form.
This = $\frac{1}{4}$. Convert to a percentage = 25\%.

b) 8 mm; 1 cm = $\frac{80}{100}$ in its simplest form.
This = $\frac{4}{5}$. Convert to a percentage = 80\%.

c) 500 m; 2 km = $\frac{250}{1000}$ in its simplest form.
This = $\frac{1}{4}$. Convert to a percentage = 25\%.

Rewrite these mixed numbers as improper fractions.

a) $2\frac{1}{2} = \frac{5}{2}$

b) $3\frac{4}{5} = \frac{19}{5}$

c) $9\frac{7}{10} = \frac{97}{10}$

d) $31\frac{11}{12} = \frac{383}{12}$

Find the lowest common denominator of each pair of numbers. Then add.

a) $\frac{3}{4} + \frac{7}{8} = \frac{3 \times 2}{4 \times 2} + \frac{7}{8} = \frac{3}{8} + \frac{7}{8} = \frac{13}{8} = 1\frac{5}{8}$

b) $\frac{9}{10} + \frac{4}{5} = \frac{9 \times 1}{10 \times 1} + \frac{4 \times 2}{5 \times 2} = \frac{9}{10} + \frac{8}{10} = \frac{17}{10} = 1\frac{7}{10}$

c) $\frac{6}{7} + \frac{3}{5} = \frac{6 \times 5}{7 \times 5} + \frac{3 \times 7}{5 \times 7} = \frac{30}{35} + \frac{21}{35} = \frac{51}{35} = 1\frac{16}{35}$

d) $\frac{2}{9} + \frac{5}{12} = \frac{2 \times 4}{9 \times 4} + \frac{5 \times 3}{12 \times 3} = \frac{8}{36} + \frac{15}{36} = \frac{23}{36}$

Write these percentages as fractions. Then convert them to their simplest form.

a) 25% = $\frac{25}{100} = \frac{1}{4}$

b) 52% = $\frac{52}{100} = \frac{13}{25}$

c) 150% = $\frac{150}{100} = \frac{3}{2}$

Colour 45% of the grid in red and $\frac{21}{70}$ in blue.
Use of symbols I: Letters for numbers

### Worked example

Find the number that makes each sentence true.

- **a** $9 + 6 = \square$
- **b** $9 - \square = 6$
- **c** $24 = \square \times 3$
- **d** $\square \div 7 = 6$

#### Checking method:

- **a** $\square = 15$ \hspace{1cm} $(9 + 6 = 15)$
- **b** $\square = 3$ \hspace{1cm} $(9 - 6 = 3)$
- **c** $\square = 8$ \hspace{1cm} $(24 \div 3 = 8)$
- **d** $\square = 42$ \hspace{1cm} $(6 \times 7 = 42)$

1. Fill in the numbers to make each open sentence true.
   - **a** $0 + 9 = \square$
   - **b** $2 + 7 = \square$
   - **c** $4 + 5 = \square$
   - **d** $8 + 1 = \square$

2. Replace the symbols with numbers to make each open sentence true.
   - **a** If $y + 19 = 21$ then $y = \square$
   - **b** If $z + 46 = 90$ then $z = \square$
   - **c** If $a + 8 = 21$ then $a = \square$
   - **d** If $b + 53 = 121$ then $b = \square$
   - **e** If $c + 11 = 77$ then $c = \square$

3. Replace the symbols with numbers to make each open sentence true.
   - **a** If $y - 19 = 21$ then $y = \square$
   - **b** If $x - 46 = 90$ then $x = \square$
   - **c** If $a - 8 = 21$ then $a = \square$
   - **d** If $b - 53 = 121$ then $b = \square$
   - **e** If $c - 11 = 77$ then $c = \square$

4. Replace the symbols with numbers that will make the sentences true.
   - **a** If $2 \times y = 24$ then $y = \square$
   - **b** If $3 \times z = 90$ then $z = \square$
   - **c** If $9 \times a = 63$ then $a = \square$
   - **d** If $b \times 7 = 140$ then $b = \square$
   - **e** If $c \times 11 = 88$ then $c = \square$

5. A boy has $y$ marbles and his friend has 9 marbles. If together they have 12 marbles, how many marbles does each boy have?

   If $y + 9 = 12$ then $y = \square$

__________________________________________________________________________
5 A girl has 24 sweets. She gives $x$ sweets to her friend. If she has 10 sweets left, how many sweets did she give to her friend?

If $24 - x = 10$ then $x = 14$

7 If $y = 40$ and $z = 5$, calculate the following.

a $y + z = 40 + 5 = 45$

b $y - z = 40 - 5 = 35$

c $y \times z = 40 \times 5 = 200$

d $y + z = \frac{40}{5} = 8$

8 A man is 25 years older than his youngest child. If the child is 12 years old, find the man’s age by finding the value of $a$ in $12 + 25 = a$. $a = 37$

9 In $\triangle ABC$, $AC = x$ cm, $AB = 4$ cm, $BC = 5$ cm and the perimeter of the triangle is 14 cm. Find the value of $x$.

$x + 4 + 5 = 14$, so $x = 5$

10 Find the value of each letter if the following sentences are true.

a If $2 \times y = 20$ then $y = \frac{20}{2} = 10$.

b If $5 \times y = y + y + y + y + y = 45$ then $y = \frac{45}{5} = 9$.

c If $34 - a = 7$ then $a = 34 - 7 = 27$.

d If $81 \div b = 3 \times 3$ then $b = \frac{81}{9} = 9$.

11 a The highest monthly temperature in Nigeria is 30 °C in April and the lowest monthly temperature is 24 °C in January. Write a number sentence to show this. Then calculate the difference.

Example:

$30 - 24 = a$ so $a = 6 ^\circ C$

b The lowest expected rainfall in Nigeria is 4 mm in December and the highest is 228 mm in August. Write a number sentence to show this. Then calculate the difference.

Example:

$4 \text{ mm} + b = 228 \text{ mm}$ so $b = 224 \text{ mm}$
1. Name these three-dimensional objects.

   a. [Diagram of a rectangular prism/cuboid]
   b. [Diagram of a cube]
   c. [Diagram of a triangular prism]
   d. [Diagram of a triangular-base pyramid]
   e. [Diagram of a cylinder]
   f. [Diagram of a sphere]

2. Draw the nets for the objects in question 1 a, b, c and d.

   a. [Nets diagram of a cuboid]
   b. [Nets diagram of a cube]
Complete the table about the objects in question 1.

<table>
<thead>
<tr>
<th>Name</th>
<th>Number of faces</th>
<th>Number of edges</th>
<th>Number of vertices</th>
</tr>
</thead>
<tbody>
<tr>
<td>a rectangular prism</td>
<td>6</td>
<td>12</td>
<td>8</td>
</tr>
<tr>
<td>b cube</td>
<td>6</td>
<td>12</td>
<td>8</td>
</tr>
<tr>
<td>c triangular prism</td>
<td>5</td>
<td>9</td>
<td>6</td>
</tr>
<tr>
<td>d triangular-base pyramid</td>
<td>4</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>e cylinder</td>
<td>2 flat, 1 curved</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>f sphere</td>
<td>1 curved</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

a Draw a skeleton view of a cube. Remember to draw in broken lines to show the edges you can’t see.

b Use capital letters of the alphabet, starting at A, to name the vertices of the cube you have drawn.

c Name the edges of the cube.
AB, BC, CD, DA, AE, EH, DH, GH, EF, FG, BF, CG
d  Name the faces of the cube.
   ABCD, ADHE, EFGH, BCGF, ABFE, CDHG

  

  

e  Which edges meet at vertex A?
   AB, AD, AE

  

  

f  Which edges meet at vertex B?
   BA, BC, BF

  

  

g  Which edges meet at vertex G?
   CG, FG, HG

  

  

h  Name the edges that intersect.
   AE intersects CD, EF intersects CG

  

  

③ Complete the table.

<table>
<thead>
<tr>
<th>Objects</th>
<th>Number of faces</th>
<th>Number of vertices</th>
<th>Number of edges</th>
<th>Examples found in your town or classroom</th>
</tr>
</thead>
<tbody>
<tr>
<td>Square-based pyramid</td>
<td>5</td>
<td>5</td>
<td>8</td>
<td>Roof of house</td>
</tr>
<tr>
<td>Cube</td>
<td>6</td>
<td>8</td>
<td>12</td>
<td>Dice</td>
</tr>
<tr>
<td>Cuboid</td>
<td>6</td>
<td>8</td>
<td>12</td>
<td>Book</td>
</tr>
<tr>
<td>Cylinder</td>
<td>3</td>
<td>0</td>
<td>2</td>
<td>Tin can</td>
</tr>
<tr>
<td>Triangular prism</td>
<td>5</td>
<td>6</td>
<td>9</td>
<td>Toblerone chocolate</td>
</tr>
<tr>
<td>Cone</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>Ice cream cone</td>
</tr>
</tbody>
</table>

④ Draw a skeleton view and a net of a square-based pyramid.
Algebraic simplification 1: Grouping terms

Worked example

a In \( \frac{3}{4} \), \( \frac{3}{4} \) is the coefficient of \( x \).
b In \( \frac{2a}{3}, \frac{2}{3} \) is the coefficient of \( a \) (since \( \frac{2a}{3} = \frac{2}{3}a \)).
c In \( \frac{z}{5}, \frac{1}{5} \) is the coefficient of \( z \).

1) If \( 5a = 5 \times a = a + a + a + a + a \), then 5 is the coefficient of \( x \). What are the coefficients in these?

- \( 7y \) \( \frac{7}{4} \) of \( y \)
- \( 23x \) \( \frac{23}{5} \) of \( x \)
- \( 14a \) \( \frac{14}{2} \) of \( a \)
- \( \frac{5d}{6} \) \( \frac{5}{6} \) of \( d \)

2) Simplify.

- \( 3x + 5x = \) \( 8x \)
- \( 7a + 5a = \) \( 12a \)
- \( 9b + 2b = \) \( 11b \)
- \( 5c + 4d \) ? Explain:
  no, because they have different terms (\( c \) and \( d \))

3) Simplify.

- \( 9e - 4e = \) \( 5a \)
- \( 15f - 7f = \) \( 8f \)
- \( 13g - 8g = \) \( 5g \)

4) Simplify.

- \( 7a + 15a - 10a = \) \( 12a \)
- \( 12b + 13b - 4b = \) \( 21b \)
- \( 7c + c + c + 5c - 2c = \) \( 12c \)
- \( 8d - 4d + 3d = \) \( 7d \)
- \( 5e - 2e + 9e = \) \( 12e \)
\[
\begin{align*}
\text{f} & \quad f - 12f + 14f = 3f \\
\text{g} & \quad 2g + 3g - 15g + 10g = 0a \\
\text{h} & \quad 18b - 19b + 3b - b = b \\
\end{align*}
\]

5. Simplify where possible.

a. \[2b + 7 + 5c - 3 + 7b - 3c = 9b + 4 + 2c\]

b. \[12h - 20g + 17 + 52g - 11 - 3b = 9b + 32g - 6\]

c. \[3x - 5x - 7y + 9 - 2 + 3x + 10y = x + 3y + 7\]

d. \[24a + 19b + 36 - (12a + 17b + 10) = 12a + 2b + 26\]
Worked example

Measure the size of the obtuse angle $PÔQ$ in the figure below. Calculate the size of reflex angle $PÔQ$.

Place the protractor on the angle with its centre on $O$ and its base line on $OP$ or $OQ$.

obtuse $PÔQ = 125°$ (by measurement)
reflex $PÔQ = 360° - 125° = 235°$

① Estimate the size of each angle. Write your answers in the table in question 2.

② Measure each angle in question 1. Complete the table.
3. Use a protractor and ruler to draw these angles.
   a. An acute angle

   ![Diagram of an acute angle](image1)

   b. An obtuse angle

   ![Diagram of an obtuse angle](image2)

   c. An acute angle

   ![Diagram of an acute angle](image3)

   d. A right angle

   ![Diagram of a right angle](image4)
4. Label the angles you drew in question 3 using capital letters such as A, B, C, etc. Remember the angle is at the vertex.

5. Write the name of each angle you drew and labelled, for example DÆF:
   a. ABC
   b. DÆF
   c. MÆN
   d. RÆT

6. Measure the angles in each triangle. Then complete the table.

<table>
<thead>
<tr>
<th>Shape</th>
<th>Number of sides</th>
<th>Names of sides</th>
<th>Number of angles</th>
<th>Names of angles</th>
<th>Size of angles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Triangle</td>
<td>3</td>
<td>e.g. AB</td>
<td>3</td>
<td>e.g. CÆB</td>
<td>28°</td>
</tr>
<tr>
<td>ABC</td>
<td></td>
<td>BC</td>
<td></td>
<td>BCA</td>
<td>124°</td>
</tr>
<tr>
<td></td>
<td></td>
<td>AC</td>
<td></td>
<td>ABC</td>
<td>28°</td>
</tr>
<tr>
<td>Rectangle</td>
<td>4</td>
<td>PS</td>
<td>4</td>
<td>PÆR</td>
<td>72°</td>
</tr>
<tr>
<td>PÆQRS</td>
<td></td>
<td>SR</td>
<td></td>
<td>PÆR</td>
<td>64°</td>
</tr>
<tr>
<td></td>
<td></td>
<td>QR</td>
<td></td>
<td>SÆPQ</td>
<td>119°</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PQ</td>
<td></td>
<td>SÆRQ</td>
<td>105°</td>
</tr>
</tbody>
</table>
Worksheet 9

Worked example

Write the following as decimal numbers.

a \( \frac{23}{1000} \)  
\[ \frac{23}{1000} = 23 \div 1000 = 23 \div 103 = 0.023 \]

b \( 120 \div 100\,000 \)  
\[ 120 \div 100\,000 = 120 \div 105 = 0.00120 \]

It is not necessary to write zeros to the right of a decimal fraction. For example, 0.200 000 is just the same as 0.2.

1

Write these percentages as fractions.

a 7\% = \frac{7}{100}  
b 17\% = \frac{17}{100}  
c 29\% = \frac{29}{100}  
d 37\% = \frac{37}{100}  
e 51\% = \frac{51}{100}  
f 63\% = \frac{63}{100}

2

Write these percentages as fractions. Then convert them to their simplest terms.

a 10\% = \frac{10}{100} = \frac{1}{10}  
b 25\% = \frac{25}{100} = \frac{1}{4}  
c 50\% = \frac{50}{100} = \frac{1}{2}  
d 90\% = \frac{90}{100} = \frac{9}{10}

3

Complete the table.

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Fraction with denominator of 100</th>
<th>Decimal</th>
<th>Fraction with denominator &gt; 100</th>
<th>Fraction with denominator &lt; 100</th>
</tr>
</thead>
<tbody>
<tr>
<td>75%</td>
<td>( \frac{75}{100} )</td>
<td>0.75</td>
<td>( \frac{150}{200} )</td>
<td>( \frac{3}{4} )</td>
</tr>
<tr>
<td>50%</td>
<td>( \frac{50}{100} )</td>
<td>0.5</td>
<td>( \frac{150}{300} )</td>
<td>( \frac{1}{2} )</td>
</tr>
<tr>
<td>25%</td>
<td>( \frac{25}{100} )</td>
<td>0.25</td>
<td>( \frac{50}{200} )</td>
<td>( \frac{1}{4} )</td>
</tr>
<tr>
<td>50%</td>
<td>( \frac{50}{100} )</td>
<td>0.5</td>
<td>( \frac{100}{200} )</td>
<td>( \frac{25}{50} )</td>
</tr>
<tr>
<td>35%</td>
<td>( \frac{35}{100} )</td>
<td>0.35</td>
<td>( \frac{70}{200} )</td>
<td>( \frac{7}{20} )</td>
</tr>
</tbody>
</table>
4 Convert these fractions to decimals. Write them in under the correct column:

\[
\begin{array}{l}
\text{a} \quad \frac{4}{5} \quad 0.8 \\
\text{b} \quad \frac{18}{200} \quad 0.09 \\
\text{c} \quad \frac{9}{20} \quad 0.45 \\
\text{d} \quad \frac{12}{25} \quad 0.48 \\
\end{array}
\]

5 Change these fractions to percentages by multiplying them by 100.

\[
\begin{array}{l}
\text{a} \quad \frac{17}{25} \quad 17 \times 4 = 68\% \\
\text{b} \quad \frac{49}{50} \quad 49 \times 2 = 98\% \\
\text{c} \quad \frac{66}{150} \quad \frac{66}{3} \times 2 = 44\% \\
\end{array}
\]

6 Calculate.

\[
\begin{array}{l}
\text{a} \quad 1.39 + 2.564 \\
\text{b} \quad 7.05 - 3.879 \\
\text{c} \quad 2.06 \times 17.3 \\
\text{d} \quad 8.73 \div 0.9 \\
\end{array}
\]

7 Write these fractions as recurring decimals.

\[
\begin{array}{l}
\text{a} \quad \frac{1}{3} \quad 0.3333\ldots \\
\text{b} \quad \frac{4}{9} \quad 0.4444\ldots \\
\text{c} \quad \frac{7}{11} \quad 0.636363\ldots \\
\end{array}
\]

8 Aisha and Cerena both got good marks for their Mathematics test.

\[
\begin{array}{l}
\text{a} \quad \text{Work out their percentages if Aisha got } \frac{24}{30} \text{ and Cerena got } \frac{30}{40}. \\
\quad \text{Aisha got 80\%.} \\
\quad \text{Cerena got 75\%.} \\
\text{b} \quad \text{Find the difference in their percentages.} \\
\quad 5\% \\
\end{array}
\]

9 Write these percentages as fractions and as decimals.

\[
\begin{array}{l}
\text{a} \quad 73\% = \frac{73}{100} = 0.73 \\
\text{b} \quad 99\% = \frac{99}{100} = 0.99 \\
\text{c} \quad 45\% = \frac{45}{100} = 0.45 \\
\end{array}
\]
### Worked example

A girl is 14 years old. How old will she be in \(x\) years’ time?

Use 2 and 10 instead of \(x\):

- In 2 years’ time the girl will be \(14 + 2\) years old (16 years old).
- In 10 years’ time the girl will be \(14 + 10\) years old (24 years old).

So, in \(x\) years’ time the girl will be \(14 + x\) years old. \(14 + x\) will not simplify.

The girl will be \(14 + x\) years old.

---

1. Find the value of the alphabetical letters.
   - \(a\) \[b + 19 = 26\] \[b = 7\]
   - \(b\) \[43 - c = 11\] \[c = 32\]
   - \(c\) \[9 \times d = 72\] \[d = 8\]
   - \(d\) \[132 + e = 11\] \[e = 12\]

2. Solve.
   - \(a\) A boy has 7 marbles. He gets \(z\) more. How many does he have altogether?
     \[7 + z\]
   - \(b\) There are 100 cm in 1 m. How many cm in \(b\) m?
     \[100b\]
   - \(c\) A woman bakes \(c\) biscuits and shares them among her 3 children. How many biscuits does each child get?
     \[
     \frac{c}{3}
     \]
   - \(d\) A man buys 10 fruit trees. He gives \(d\) to his brother. How many trees does he have left?
     \[10 - d\]

3. A triangle has two sides each \(g\) mm long, and a third side 15 mm long. What is the perimeter of the triangle?
   \[2g + 15\ mm\]

   - \(b\) A rectangle has sides \(h\) cm wide and \(j\) cm long. The perimeter is 90 cm. What are the lengths of the two sides?
     \[2h + 2j = 90\ cm\ so\ 2h = 90 - 2j\ and\ \(h = \frac{90 - 2j}{2}\)\]

   - \(c\) A farm is divided into small plots. Each plot is 1 acre and the farm is \(k\) acres. How many plots can the farm be divided into?
     \[\frac{k}{1}\ plots\]
4 A school period is \( m \) minutes long. There are 12 periods in a school day.
   a How many minutes are there in the school day?
      \[ 12m \text{ minutes} \]
   b How many hours are there in the school day?
      \[ \frac{12m}{60} \text{ hours} \]

5 A woman is three times as old as her daughter and half the age of her mother. The daughter is \( n \) years old.
   a How old is the woman?
      \[ 3n \text{ years old} \]
   b How old is her mother?
      \[ 2 \times 3n \text{ years old} \]

6 A farmer has \( q \) hens. Each hen lays 1 egg a day.
   a How many eggs will be laid in 10 days?
      \[ 10q \text{ eggs} \]
   b If \( r \) eggs are broken, how many will be left?
      \[ 10q - r \text{ eggs} \]

7 A man wants to tile his veranda. The veranda is 15 m by 12 m in size. Each tile is \( v \) cm by \( v \) cm.
   a What is the area of the veranda in metres?
      \[ 12 \text{ m} \times 15 \text{ m} = 180 \text{ sq.m} \]
   b What is the area of the veranda in centimetres?
      \[ 1200 \text{ cm} \times 1500 \text{ cm} = 1800000 \text{ sq.cm} \]
   c What is the area of each tile?
      \[ v \times v \text{ sq.cm} \]
   d How many tiles will the man need to tile the veranda?
      \[ \frac{1800000}{v^2} \text{ tiles} \]

8 A boy is 1.3 m tall. His brother is \( x \) cm taller and his sister is \( y \) cm shorter than he is.
   a How tall is the brother?
      \[ 130 + x \text{ cm} \]
   b How tall is the sister?
      \[ 130 - y \text{ cm} \]
   c What is the difference in height between the brother and sister of the boy?
      \[ (130 + x) - (130 - y) \]
   d If the boy grows 1 cm, what will the differences be then?
      His brother will be \( 131 + x \) cm tall. His sister will be \( 131 - y \) cm tall.
      So, the difference is \( (131 + x) - (131 - y) \)
Name the shapes.

a) square  b) triangle  c) circle  d) pentagon  e) hexagon  f) octagon

1. Study these plane shapes. Then complete the table.
<table>
<thead>
<tr>
<th>Name of shape</th>
<th>Number of sides</th>
<th>Number of angles</th>
<th>Length of sides</th>
<th>Size of angles</th>
</tr>
</thead>
<tbody>
<tr>
<td>a rectangle</td>
<td>4</td>
<td>4</td>
<td>54 mm 31 mm</td>
<td>90°</td>
</tr>
<tr>
<td>b equilateral triangle</td>
<td>3</td>
<td>3</td>
<td>41 mm</td>
<td>60°</td>
</tr>
<tr>
<td>c pentagon</td>
<td>5</td>
<td>5</td>
<td>22 mm</td>
<td>108°</td>
</tr>
<tr>
<td>d isosceles triangle</td>
<td>3</td>
<td>3</td>
<td>44 mm 22 mm</td>
<td>67°, 66°</td>
</tr>
<tr>
<td>e parallelogram</td>
<td>4</td>
<td>4</td>
<td>52 mm 27 mm</td>
<td>103°, 77°</td>
</tr>
<tr>
<td>f square</td>
<td>4</td>
<td>4</td>
<td>36 mm</td>
<td>90°</td>
</tr>
</tbody>
</table>

2) Use the plane shapes in question 1 to complete this table.

<table>
<thead>
<tr>
<th>Name of shape</th>
<th>Sum of angles</th>
<th>Relationship of sides e.g. opposite sides are equal</th>
</tr>
</thead>
<tbody>
<tr>
<td>a rectangle</td>
<td>360°</td>
<td>opposite sides are equal</td>
</tr>
<tr>
<td>b equilateral triangle</td>
<td>180°</td>
<td>all sides are equal</td>
</tr>
<tr>
<td>c pentagon</td>
<td>540°</td>
<td>all sides are equal</td>
</tr>
<tr>
<td>d isosceles triangle</td>
<td>180°</td>
<td>two sides are equal</td>
</tr>
<tr>
<td>e parallelogram</td>
<td>360°</td>
<td>opposite sides are equal</td>
</tr>
<tr>
<td>f square</td>
<td>360°</td>
<td>all sides are equal</td>
</tr>
</tbody>
</table>

3) What do you notice about the following?

   a The sum of 3 angles of any triangle.
   
   equals 180°

   b The sum of 4 angles of any rectangle.
   
   equals 360°

   c The sum of 5 angles of any pentagon.
   
   equals 540°

4) a What do you call a closed shape with 3 or more straight sides?
   
   polygon

   b What do you call a closed shape with 6 straight and equal sides?
   
   hexagon

   c What do you call a closed shape with 8 straight and equal sides?
   
   octagon
5 a) Draw a square 6 cm by 6 cm.
   b) Label the square ABCD.
   c) Join AC and BD. Mark the point where AC and BD intersect E.
   d) Draw a circle with E as the centre and EA as the length of the radius.
   e) Draw the diameter FG of the circle through E.
   f) Draw a radius EH of the circle.
   g) Label the circumference, the diameter, the radius, a semi-circle and a sector of the circle.

5 a) Draw a square ABCD with sides 4 cm long.
   b) Draw diagonals AC and BD on the square.
   c) Draw an equilateral triangle EFG with sides 4 cm long.
   d) Draw three lines of symmetry on the triangle.
Worked example

a  Use a number line to complete $1 + 4 = \underline{\phantom{0}}$.

b  Use a number line to complete $6 - 2 = \underline{\phantom{0}}$.

a  This number line shows the addition.

Follow the arrows. Start at 1. Move four places to the right. Finish at 5.

$1 + 4 = 5$

b  This number line shows the subtraction.

Follow the arrows. Start at 6. Move two places to the left. Finish at 4.

$6 - 2 = 4$

1  a  Fill in the missing numbers on the number line.

$$-6 \quad -5 \quad -4 \quad -3 \quad -2 \quad -1 \quad 0 \quad +1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6$$

b  Use arrows on the number line to calculate the following.

i)  $1 + 3 - 7 = \underline{-3}$

ii)  $-2 + 2 - 5 = \underline{-5}$

2  Use the number line to calculate the answer.

$$-20 \text{ cm} \quad -15 \text{ cm} \quad -10 \text{ cm} \quad -5 \text{ cm} \quad 0 \text{ cm} \quad 5 \text{ cm} \quad 10 \text{ cm} \quad 15 \text{ cm} \quad 20 \text{ cm}$$

A boy and his sister are playing on the beach. He digs a hole 15 cm deep (negative number). She builds a castle 20 cm high. What is the measurement from the bottom of the hole to the top of the castle?

$35 \text{ cm}$

3  Draw a number line to help you calculate.

A kite is flying 5 m above the surface of the sea. A child is snorkling 3 m below the surface. How far is the child from the kite?

$8 \text{ m}$
4. Draw number lines to help you calculate.
   a. A treasure chest is buried 4 m below the ground (negative number). A pole 7 m high is planted to mark the spot (positive number). What is the distance from the treasure chest to the top of the pole?

   ![Number line showing 4 + 7 = 11]

   11 m

   b. The lowest temperature recorded in the Antarctic is –89 °C and the highest is 14.6 °C. What is the difference between these temperatures?

   ![Number line showing 89 + 14.6 = 103.6]

   103.6 °C

   c. In Ajuba, January is the driest month with an average of 9 mm of rain recorded. June is the wettest month with 173 mm of rain recorded. What is the difference between highest and lowest recorded rainfall?

   ![Number line showing 173 – 9 = 164]

   164 mm

5. The school bell rings 5 minutes early, and your watch is 7 minutes slow. Your teacher tells you the correct time is 8:15. What time will your watch show and what time will the school clock show?

   School clock: 8:15 + 5 min = 8:20
   Watch: 8:15 – 7 min = 8:08

6. Place the correct sign ( =, > or <) between the numbers to make the sentence true.
   a. 7 __ 3  b. –7 __ 3  c. 7 __ –3
   d. –7 __ –3  e. 23 __ –4  f. –23 __ –4

7. Calculate without using a number line.
   a. 7 + 5 = 12  b. –7 + 5 = –2  c. 27 – 50 = –23

8. Simplify.
   a. 34 + (–45) = –11  b. (–2) + (–5) = –7  c. (7) – (–9) = 16

Worksheet 12
Worksheet 13

Plane shapes 2: Perimeter

**Worked example**

Calculate the perimeter of a football field that measures 80 m by 50 m.

\[
\text{Perimeter of field} = 2(l + b) = 2 \times (80 + 50) \, \text{m} = 2 \times 130 \, \text{m} = 260 \, \text{m}
\]

1. Use a ruler to measure the sides of the irregular shape PQRS. Fill in the measurements in the table.

   ![Diagram of PQRS]

<table>
<thead>
<tr>
<th>Sides</th>
<th>Length in mm</th>
<th>Length in cm</th>
</tr>
</thead>
<tbody>
<tr>
<td>PQ</td>
<td>22 mm</td>
<td>2.2 cm</td>
</tr>
<tr>
<td>QR</td>
<td>45 mm</td>
<td>4.5 cm</td>
</tr>
<tr>
<td>RS</td>
<td>35 mm</td>
<td>3.5 cm</td>
</tr>
<tr>
<td>SP</td>
<td>59 mm</td>
<td>5.9 cm</td>
</tr>
<tr>
<td>Add sides to find perimeter</td>
<td>161 mm</td>
<td>16.1 cm</td>
</tr>
</tbody>
</table>

2. Use a ruler measure the perimeter of the following.

   a. The cover of your text book in mm.
      
      Example: perimeter = \(2(l + b) = 2(250 + 200) \, \text{mm} = 2(450) \, \text{mm} = 900 \, \text{mm}\)

   b. The top of your desk in cm.
      
      Example: perimeter = \(2(l + b) = 2(60 + 50) \, \text{cm} = 2(110) \, \text{cm} = 220 \, \text{cm}\)

   c. The door of your classroom in metres.
      
      Example: perimeter = \(2(l + b) = 2(2 + 1) \, \text{m} = 2(3) \, \text{m} = 6 \, \text{m}\)

We don’t need to measure all the sides to find the perimeter of a regular shape such as a square. For example, if a square has sides of 10 m, perimeter = \(4 \times 10 \, \text{m} = 40 \, \text{m}\).
3) Find the perimeters of these regular shapes. Then complete the table.

- **a** Square ABCD

- **b** Parallelogram EFGH

- **c** Hexagon MNOPQR

- **d** Isosceles triangle EFG

<table>
<thead>
<tr>
<th>Shape</th>
<th>Sides</th>
<th>Calculate</th>
<th>Perimeter in mm</th>
<th>Perimeter in cm</th>
</tr>
</thead>
<tbody>
<tr>
<td>square</td>
<td>4</td>
<td>$4s$</td>
<td>124 mm</td>
<td>12.4 cm</td>
</tr>
<tr>
<td>parallelogram</td>
<td>4</td>
<td>$2(l + b)$</td>
<td>144 mm</td>
<td>14.4 cm</td>
</tr>
<tr>
<td>hexagon</td>
<td>6</td>
<td>$6s$</td>
<td>102 mm</td>
<td>10.2 cm</td>
</tr>
<tr>
<td>isosceles triangle</td>
<td>3</td>
<td>$s + s + s$</td>
<td>101 mm</td>
<td>10.1 cm</td>
</tr>
</tbody>
</table>

4) Use string or wool to measure the perimeter (circumference) of the circle in cm.

Perimeter = $\frac{99 \text{ mm}}{2}$

To calculate the perimeter of a regular quadrilateral, we use the formula: $P = 2(l + b)$. 

Worksheet 13
5 a Calculate the perimeter of your classroom in metres.
Example: perimeter = $2(l + b) = 2(12 + 12) \text{ m} = 2(24) \text{ m} = 48 \text{ m}$

b Calculate the perimeter of a soccer field.
Example: perimeter = $2(l + b) = 2(100 + 80) \text{ m} = 2(180) \text{ m} = 360 \text{ m}$

6 a A rectangular carpet has a perimeter of 240 cm and a breadth of 50 cm. What is its length?
$240 - 50 \times 2) = \frac{140}{2} = 70 \text{ cm}$

b A square blanket has a perimeter of 6 m. What does each side measure?
$6 \text{ m} \div 4 = 1.5 \text{ m}$

c A vegetable garden is 90 cm wide and 1.2 m long. What is the perimeter in cm and in m?
$P = 2(90 + 120) \text{ cm} = 2(210) \text{ cm} = 420 \text{ cm} \text{ or } 4.2 \text{ m}$

7 Find the perimeter (circumference) of these circles using the formula: $2\pi r$, where $\pi = \frac{22}{7}$.
Complete the table.

<table>
<thead>
<tr>
<th>Radius</th>
<th>Diameter</th>
<th>Circumference</th>
</tr>
</thead>
<tbody>
<tr>
<td>a 7 cm</td>
<td>14 cm</td>
<td>44 cm</td>
</tr>
<tr>
<td>b 7 cm</td>
<td>14 cm</td>
<td>44 cm</td>
</tr>
<tr>
<td>c 21 cm</td>
<td>42 cm</td>
<td>132 cm</td>
</tr>
<tr>
<td>d 14 cm</td>
<td>28 cm</td>
<td>88 cm</td>
</tr>
<tr>
<td>e 35 cm</td>
<td>70 cm</td>
<td>220 cm</td>
</tr>
</tbody>
</table>
Worked example

a Calculate the area of a rectangle 6 cm by 3.5 cm.

b The area of a rectangle is 224 cm². If its length is 16 cm, calculate the breadth.

| a area of rectangle = 6 cm × 3.5 cm = 21 cm² |
| b breadth = \( \frac{224 \text{ cm}^2}{16 \text{ cm}} = 14 \text{ cm} \) |

1. Use a sheet of squared paper.

a Draw the following shapes on the paper:

i) A square 6 blocks by 6 blocks; call it A.

ii) A rectangle 2 blocks by 5 blocks; call it B.

iii) A right-angled triangle with base 3 blocks and perpendicular 4 blocks; call it C.

iv) A square 4 blocks by 4 blocks; draw a diagonal line across this square. Call it D.

v) A circle with radius of \( 3\frac{1}{2} \) blocks; Call it E.

b Suppose each block represents 1 cm, so 1 block = 1 cm². Add the blocks together to find how many there are in each shape. Write the answers in the table.

<table>
<thead>
<tr>
<th>Shapes</th>
<th>Length or base in cm</th>
<th>Breadth or height in cm</th>
<th>Estimated area in cm²</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>6 cm</td>
<td>6 cm</td>
<td>36 cm²</td>
</tr>
<tr>
<td>B</td>
<td>5 cm</td>
<td>2 cm</td>
<td>10 cm²</td>
</tr>
<tr>
<td>C</td>
<td>3 cm</td>
<td>4 cm</td>
<td>about cm²</td>
</tr>
<tr>
<td>D</td>
<td>4 cm</td>
<td>4 cm</td>
<td>16 cm²</td>
</tr>
<tr>
<td>½ of D</td>
<td>4 cm</td>
<td>4 cm</td>
<td>about 8 cm²</td>
</tr>
<tr>
<td>E</td>
<td>Radius 3.5 cm</td>
<td>Radius 3.5 cm</td>
<td>about 38 cm²</td>
</tr>
</tbody>
</table>

2. Calculate the area of each shape in question 1 using the correct formula:

Area of regular rectangle = \( l \times b \)

Area of a right-angled triangle = \( \frac{1}{2} \) base × height

Area of a circle = \( \pi r^2 \) where \( \pi = \frac{22}{7} \)
Use your calculations to complete the table.

<table>
<thead>
<tr>
<th>Shapes</th>
<th>Length or base in cm</th>
<th>Breadth or height in cm</th>
<th>Formula</th>
<th>Calculated area in cm²</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>6 cm</td>
<td>6 cm</td>
<td>$l \times b$</td>
<td>36 cm²</td>
</tr>
<tr>
<td>B</td>
<td>5 cm</td>
<td>2 cm</td>
<td>$l \times b$</td>
<td>10 cm²</td>
</tr>
<tr>
<td>C</td>
<td>3 cm</td>
<td>4 cm</td>
<td>$\frac{1}{2}bh$</td>
<td>6 cm²</td>
</tr>
<tr>
<td>D</td>
<td>4 cm</td>
<td>4 cm</td>
<td>$l \times b$</td>
<td>16 cm²</td>
</tr>
<tr>
<td>$\frac{1}{2}$ of D</td>
<td>4 cm</td>
<td>4 cm</td>
<td>$\frac{1}{2}bh$</td>
<td>8 cm²</td>
</tr>
<tr>
<td>E</td>
<td>Radius 3.5 cm</td>
<td>Radius 3.5 cm</td>
<td>$\pi r^2$</td>
<td>38.5 cm²</td>
</tr>
</tbody>
</table>

3 If $l \times b = \text{area}$, work out the following formulae:
   a breadth = \(\frac{\text{area}}{\text{length}}\)
   b length = \(\frac{\text{area}}{\text{breadth}}\)

4 Use the formulae you calculated in question 3 to find the following.
   a A square has an area of 16 m². Find the length and the breadth of the square. Draw a sketch to help you calculate the answer.

   If $l \times b = 16 \text{ m}^2$ and the shape is square, then $l = b$ so,
   
   \[ l = \sqrt{16} = 4 \text{ m and } b = \sqrt{16} = 4 \text{ m} \]

   b A rectangle has an area of 15 m². Find the length and the breadth of the rectangle. Draw a sketch to help you calculate the answer.

   If $l \times b = 15 \text{ m}^2$ and the shape is a rectangle, then $l \neq b$ so, $5 \times 3 = 15 \text{ m}^2$.
   
   Length = 5 m and breadth = 3 m

5 If the radius of a circle = 21 m, find the following.
   a) Diameter of the circle = $2 \times \text{radius} = 2 \times 21 \text{ m} = 42 \text{ m}$
   b) Area of the circle = $\pi r^2 = \frac{22}{7} \times (21 \times 21) = 1386 \text{ m}^2$
6. Complete the table.

<table>
<thead>
<tr>
<th>Radius</th>
<th>Diameter</th>
<th>Formula and circumference</th>
<th>Formula and area</th>
</tr>
</thead>
<tbody>
<tr>
<td>a 70 mm</td>
<td>140 mm</td>
<td>$2\pi r = 440 mm$</td>
<td>$\pi r^2 = 15 400 mm^2$</td>
</tr>
<tr>
<td>b 35 mm</td>
<td>70 mm</td>
<td>$2\pi r = 220 mm$</td>
<td>$\pi r^2 = 3 850 mm^2$</td>
</tr>
<tr>
<td>c 14 cm</td>
<td>28 cm</td>
<td>$2\pi r = 88 cm$</td>
<td>$\pi r^2 = 616 cm^2$</td>
</tr>
<tr>
<td>d 70 mm</td>
<td>140 mm</td>
<td>$2\pi r = 440 mm$</td>
<td>$\pi r^2 = 15 400 mm^2$</td>
</tr>
<tr>
<td>e 21 m</td>
<td>42 m</td>
<td>$2\pi r = 132 m$</td>
<td>$\pi r^2 = 1 386 m^2$</td>
</tr>
<tr>
<td>f 21 mm</td>
<td>42 mm</td>
<td>$2\pi r = 132 mm$</td>
<td>$\pi r^2 = 1 386 mm^2$</td>
</tr>
<tr>
<td>g 2.8 m</td>
<td>5.6 m</td>
<td>$2\pi r = 17.6 m$</td>
<td>$\pi r^2 = 24.64 m^2$</td>
</tr>
<tr>
<td>h 2.45 m</td>
<td>4.9 m</td>
<td>$2\pi r = 15.4 m$</td>
<td>$\pi r^2 = 18.865 m^2$</td>
</tr>
</tbody>
</table>

7. Copy these shapes into your exercise book, using the exact measurements given.

a

[Diagram of a right-angled triangle, a rectangle, and a hemisphere]

c. Complete the table based on your drawings.

<table>
<thead>
<tr>
<th>Diagram a</th>
<th>Measurements of sides and radii</th>
<th>Diagram b</th>
<th>Measurements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rectangle ABCD</td>
<td>Side AB 3.5 cm</td>
<td>Side FG 80 mm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Side BC 5 cm</td>
<td>Side GH 40 mm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Side CD 3.5 cm</td>
<td>Side FH 90 mm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Side AD 5 cm</td>
<td>Lines KH and KH = 4.5 mm</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>JH JH = 10 mm</td>
<td></td>
</tr>
<tr>
<td>Area 17.5 cm²</td>
<td></td>
<td>Area 1 600 mm²</td>
<td></td>
</tr>
<tr>
<td>Triangle EAD</td>
<td></td>
<td>Hemisphere from I to J</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Side AD 5 cm</td>
<td>Diameter 70 mm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Side ED 6 cm</td>
<td>Radius 35 mm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Side EA 3.5 cm</td>
<td>Area $3 850 mm^2 + 2 = 1 925 mm^2$</td>
<td></td>
</tr>
<tr>
<td>Area 8.75 cm²</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hemisphere C to D</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diameter 3.5 cm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Radius 1.75 cm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Area 4.8125 cm²</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total area of diagram 31.0625 cm²</td>
<td>Total area of diagram 1 600 mm²</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Algebraic simplification 2: Brackets

#### Worked example

<table>
<thead>
<tr>
<th>Simplify</th>
<th>Working</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>(2x \times 3)</td>
<td>(2 \times x \times 3 = 2 \times 3 \times x)</td>
<td>(6x)</td>
</tr>
<tr>
<td>(5 \times 2y)</td>
<td>(5 \times 2 \times y = 10 \times y)</td>
<td>(10y)</td>
</tr>
<tr>
<td>(7a \times 3b)</td>
<td>(7 \times a \times 3 \times b)</td>
<td>(21ab)</td>
</tr>
<tr>
<td>(6x \times 4x)</td>
<td>(6 \times x \times 4 \times x)</td>
<td>(24x^2)</td>
</tr>
</tbody>
</table>

We know the following:

- \(5 \times y = 5y\)
- \(z + z + z = 3z\)
- \(a - a = 0\)
- \(6a + 2 = 3a\)

- \(9ab + b\) can be simplified as \(\frac{9ab}{b}\) and solved.

#### (1) Simplify.

- **a** \(7 \times 9 = 63\)
- **b** \(7 \times a = 7a\)
- **c** \(12a \times 4a = 48a^2\)
- **d** \(5ab \times 2a = 10a^2b\)
- **e** \(8b + 2 = 4b\)
- **f** \(21b + 3 = 7b\)
- **g** \(b^2 + b = b\)
- **h** \(9ab + b = 9a\)

#### (2) Simplify by writing these as fractions. Then solve.

- **a** \(\frac{24ab + 8a}{3b}\)
- **b** \(\frac{ab^2 + b}{ab}\)
- **c** \(\frac{75a^2b^3 + 25ab}{3ab^2}\)
- **d** \(\frac{18ab^3 + 2ab}{9b^2}\)

#### (3) Group the like terms. Use BODMAS to simplify and solve.

- **a** \(7a + 6b - 4 - 2a - 2b + 8 = 5a + 4b + 4\)
- **b** \(5ab + 2b - 2ab + b + 15 = 3ab + 3b + 15\)
- **c** \(7ab - 1 + 3ab + 2 - 8ab = 2ab + 1\)
- **d** \(9(a + b) - 3(a + b) = 6a + 6a\)
4. Simplify.
   a. \(7(a + 4) = \frac{7a + 28}{10a^2 + 15a^2 = 25a^2}\)
   b. \(5a(2a + 3a) = \frac{10a^2 + 15a^2 = 25a^2}{9a^3 - 8a^3 = a^3}\)
   c. \(9a^2(a) - 8a^2(a) = \frac{9a^2 - 8a^2 = a^2}{25a^2 - 7a^2 = 18a^2}\)

5. Write these without brackets.
   a. \(4a(2a + 2b + 3) = \frac{8a^2 + 8ab + 12a}{4a^2 - 3ab - 6a}\)
   b. \(3a(3a + 3a) = \frac{9a^2 + 9a^2}{4a^2 + 5a^2 - 25a}\)
   c. \(24b^3 + 6b^2 - 3b = \frac{3b(8b^2 + 2b - 1)}{3(2a + 1)}\)

6. Write these expressions as a product of two expressions. Insert the brackets.
   a. \(6a + 3 = \frac{3(2a + 1)}{a(15b + 3 + 1)}\)
   b. \(15ab + 5a + a = \frac{a(15b + 5 + 1)}{24b^3 + 6b^2 - 3b}\)
   c. \(24b^3 + 6b^2 - 3b = \frac{3b(8b^2 + 2b - 1)}{3(2a + 1)}\)

7. Write these without brackets. Then simplify.
   a. \(5a - (a + 5) = \frac{5a - a - 5 = 4a - 5}{a(15b + 3 + 1)}\)
   b. \(5a + 3a(3a + 3a) = \frac{5a + 5a^2 - 25a}{14a + 5b}\)
   c. \((12a + 3b) + (2a + 2b) = \frac{14a + 5b}{13a - b}\)

8. Complete the table.

<table>
<thead>
<tr>
<th>Expression</th>
<th>Write without brackets</th>
<th>Simplify</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. (15a - 3(a + 5))</td>
<td>(15a - 3a + 15)</td>
<td>(12a - 15)</td>
</tr>
<tr>
<td>b. (36a + 4(a + 5))</td>
<td>(36a + 4a + 20)</td>
<td>(40a + 20)</td>
</tr>
<tr>
<td>c. (5a(6a + 3a + 1))</td>
<td>(30a^2 + 15a^2 + 5a)</td>
<td>(45a^2 + 5a)</td>
</tr>
<tr>
<td>d. (3a(4a + 5b + 2))</td>
<td>(12a^2 + 15ab + 6a)</td>
<td>(12a^2 + 15ab + 6a)</td>
</tr>
<tr>
<td>e. (9a - 4(a - 5a))</td>
<td>(9a - 4a + 20a)</td>
<td>(25a)</td>
</tr>
</tbody>
</table>

9. Write these as the product of two algebraic expressions.
   a. \(ab + ac = \frac{a(b + c)}{a(b - c)}\)
   b. \(ab - ac = \frac{b^2(a + c)}{b^2(a - c)}\)
   c. \(ab^2 + cb^2 = \frac{b^2(a + c)}{b^2(a - c)}\)
Follow these instructions to calculate the volume of a cuboid (rectangular prism).

1. Calculate the area of the base 5 cm long × 3 cm broad.
   \[ \text{Area} = l \times b = 5 \times 3 = 15 \text{ cm}^2 \]

2. The height is 2 cm. Calculate the volume.
   \[ \text{Volume} = \text{area} \times h = 15 \times 2 = 30 \text{ cm}^3 \]

3. Calculate the volume of a cube measuring 4 m × 4 m × 4 m.
   \[ \text{Volume} = l \times b \times h = 4 \times 4 \times 4 = 64 \text{ m}^3 \]

   b. Calculate the volume of half of the cube in question 3a if you cut it into two equal right-angled prisms as in the diagram. Use the formula \( \frac{1}{2} \left( l \times b \times h \right) \) or \( \frac{1}{2} lbh \).
   \[ \frac{1}{2} lbh = \frac{1}{2} \times 64 = 32 \text{ cm}^3 \]
4 A building brick has a volume of 1 280 cm³. The length of the brick is 20 cm and the breadth is 8 cm. What is the height of the brick?

If \( l \times b \times h = \text{volume} \) then \( h = \text{volume} + (l \times b) \)

so \( h = 1 280 \text{ cm}^3 ÷ (20 \text{ cm} \times 8 \text{ cm}) \)

\[ = 1 280 \text{ cm}^3 ÷ 160 \text{ cm}^2 = 8 \text{ cm} \]

Remember that 1 ℓ = 1 000 cm³ and 1 kl = 1 m³ or 1 000 000 cm³.

5 Complete the table.

<table>
<thead>
<tr>
<th>Length of side of a cube</th>
<th>Formula for finding volume</th>
<th>Volume</th>
<th>Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>a 10 cm</td>
<td>( l \times b \times h )</td>
<td>1 000 cm³</td>
<td>1 ℓ</td>
</tr>
<tr>
<td>b 1 m</td>
<td>( l \times b \times h )</td>
<td>1 m³</td>
<td>1 kl</td>
</tr>
<tr>
<td>c 100 cm</td>
<td>( l \times b \times h )</td>
<td>1 000 000 cm³</td>
<td>1 kl</td>
</tr>
</tbody>
</table>

6 A boy has three containers of juice. Each container is 10 cm × 10 cm × 10 cm.

a What is the volume of each container?

Each container has a volume of 1 000 cm³


b What is the capacity of each container?

Each container has a capacity of 1 ℓ


c How many litres of juice does the boy have?

He has 3 litres


7 A room is 4 m long, 3 m high and 5 m wide. What is its volume?

60 m³


8 A rectangular container has a volume of 720 m³. If the length of the container is 10 m and the height is 9 m, what is its breadth?

8 m
9 A builder builds a brick wall 3 m high, 5 m long and 10 cm wide. (Remember: 100 cm = 1 m and 1 cm = 0.01 m.) He uses bricks 10 cm wide, 5 cm high and 20 cm long.
   a What is the volume of the wall? Express the volume in cm³ and m³.
      Volume of wall = 0.15 m³ or 1 500 000 cm³
   b What is the volume of each brick? Express the volume in cm³ and m³.
      Volume of brick = 0.001 m³ or 1 000 cm³
   c How many bricks will he need to build the wall?
      He will need 1 500 bricks

10 A swimming pool is 7 m long, 5 m wide and 2.5 m deep.
   a What is the volume of the pool?
      87.5 m³
   b If the pool is filled with water 2 m deep, what is the volume of the water?
      70 m³
   c What is the difference in the volume of the water and the volume of the pool?
      87.5 m³ – 70 m³ = 15 m³

11 Complete the table.

<table>
<thead>
<tr>
<th>Volume</th>
<th>Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 ml = 1 cm³</td>
<td>1 ml = 0.001 litres</td>
</tr>
<tr>
<td>1 ℓ = 1 000 cm³</td>
<td>1 ℓ</td>
</tr>
<tr>
<td>1 kl = 1 000 000 cm³ = 1 m³</td>
<td>1 kl = 1 000 ℓ</td>
</tr>
</tbody>
</table>

12 Convert from volume to capacity.
   a 7 kl = \( \frac{7 000 000}{\text{cm}^3} \)
   b 7 kl = \( \frac{7 000}{\text{ℓ}} \)
   c 19 ml = \( \frac{19}{\text{cm}^3} \)
   d 999 ml = \( \frac{999}{\text{ℓ}} \)
   e 15 ℓ = \( \frac{15 000}{\text{cm}^3} \)
The table below shows the leading causes of death by age group in a country in East Africa.

<table>
<thead>
<tr>
<th>Age group (years)</th>
<th>0–4</th>
<th>5–14</th>
<th>15–59</th>
<th>60+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cause of death</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Malaria/Fever</td>
<td>40%</td>
<td>61%</td>
<td>16%</td>
<td>26%</td>
</tr>
<tr>
<td>HIV &amp; AIDS/TB</td>
<td>4%</td>
<td>13%</td>
<td>56%</td>
<td>17%</td>
</tr>
<tr>
<td>Heart disease</td>
<td>n/s</td>
<td>n/s</td>
<td>6%</td>
<td>23%</td>
</tr>
<tr>
<td>Injury/Accident</td>
<td>32%*</td>
<td>17%</td>
<td>5%</td>
<td>n/s</td>
</tr>
</tbody>
</table>

n/s means not significant
*Most of these deaths are linked to childbirth.

Data like this might tell a Health Minister that more needs to be done about malaria for young people aged 0 to 14 years and that HIV & AIDS and TB need to be reduced in the 15–59 age range.

1. The table shows data related to several Premier League Football Clubs in Nigeria. Collect information from newspaper, radio, television or friends to fill in data about at least three more football clubs. (You may use your school clubs or village clubs.)

<table>
<thead>
<tr>
<th>Club</th>
<th>Town or City</th>
<th>Home colours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abia Warriors Football Club</td>
<td>Umuahia</td>
<td>Red</td>
</tr>
<tr>
<td>Akwa United</td>
<td>Uyo</td>
<td>Blue</td>
</tr>
<tr>
<td>Bayelsa United</td>
<td>Yenegoa</td>
<td>Yellow</td>
</tr>
<tr>
<td>Kano Pillars Football Club</td>
<td>Kano</td>
<td>Green and yellow</td>
</tr>
</tbody>
</table>

2. The table shows statistical data. Study the table carefully then answer the questions.

<table>
<thead>
<tr>
<th>Institution</th>
<th>Gender</th>
<th>Enrolment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-primary</td>
<td>Boys</td>
<td>14.8%</td>
</tr>
<tr>
<td></td>
<td>Girls</td>
<td>13.8%</td>
</tr>
<tr>
<td>Primary</td>
<td>Boys</td>
<td>87.1%</td>
</tr>
<tr>
<td></td>
<td>Girls</td>
<td>79.3%</td>
</tr>
<tr>
<td>Literacy rate: Young people aged 15 to 24 years</td>
<td>Boys</td>
<td>75.6%</td>
</tr>
<tr>
<td></td>
<td>Girls</td>
<td>58%</td>
</tr>
</tbody>
</table>

a. What is the total percentage of boys and girls enrolled at pre-primary school?
   28.6%

b. What is the total percentage of boys and girls enrolled at primary school?
   Ave 82.3%
c What total percentage of Nigerian youth were literate (could read) in 2012?
133.6%

d What was the difference between the number of girls and boys who enrolled at pre-primary school?
14.8% – 13.8% = 1%

e What was the difference between the number of girls and boys who enrolled at primary school?
87.1% – 79.3% = 7.8%

f What was the difference between the number of girls and boys who were literate?
75.6% – 58% = 17.6%

③ Interview at least five pupils in your class. Use the data collected to complete the table.

<table>
<thead>
<tr>
<th>Place that interviews take place: Date:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Names</strong></td>
</tr>
<tr>
<td>STUDENTS’ OWN ANSWERS</td>
</tr>
</tbody>
</table>

④ Many people believe that the number 7 is lucky and the number 13 is unlucky. Design a questionnaire based on these beliefs in your exercise book.

a Consider which questions you will include in your questionnaire. Make notes of some possible questions.

b Plan how many people you will interview.

c Plan who you are going to question. Make a list of people you might interview.

d How will you be sure the people you interview won’t influence one another? Note people who live close together.

e What if someone you interview answers, 'I don’t know.'? Prepare an alternative question, for example: 'Do you believe any numbers are lucky/unlucky?'

⑤ In your exercise book, draw up a questionnaire based on what you have worked on. Your questionnaire should allow for the following:

a Names of the people you interview.

b Their responses, negative or positive. Mark these with tallies.

c Allow a column to show the frequency (f), which shows the total number of tallies recorded.

The plan should look a bit like this:

<table>
<thead>
<tr>
<th>Response</th>
<th>Tally</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Negative</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
6. Complete the graph by filling in the bars (columns) and the information you have gained.
Worksheet 18

**Worked example**

An English teacher gave an essay to 15 students. She graded the essays from A (very good), through B, C, D, E to F (very poor). The grades of the students were:

B, C, A, B, A, D, F, E, C, C, A, B, B, E, B.

A frequency table gives the frequency of each grade.

<table>
<thead>
<tr>
<th>Grade</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>3</td>
<td>5</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

She wanted to create a pie chart of the results so she created this table.

<table>
<thead>
<tr>
<th>Grade</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of students</td>
<td>3</td>
<td>5</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>15</td>
</tr>
<tr>
<td>Angle at centre</td>
<td>72°</td>
<td>120°</td>
<td>72°</td>
<td>24°</td>
<td>48°</td>
<td>24°</td>
<td>360°</td>
</tr>
</tbody>
</table>

To calculate the angles, use the ratio of the frequency. For example:

\[
\text{angle for grade A} = \frac{3}{15} \times 360° = 72°
\]

\[
\text{angle for grade B} = \frac{5}{15} \times 360° = 120°
\]

Then use the angles to draw the pie chart. Usually there are no numbers on a pie chart. The sizes of the sectors give a quick comparison between the numbers of students getting each grade.

1. **a** A teacher gave his class marks out of ten for a test. Arrange them in rank order.

5, 7, 3, 5, 6, 9, 5, 7, 3, 4, 8, 5, 2, 8, 6, 6, 5, 8, 4, 5, 7, 3

2, 3, 3, 3, 4, 4, 5, 5, 5, 5, 5, 5, 5, 6, 6, 7, 7, 7, 8, 8, 8, 9

2. **b** Complete the table, using the marks.

<table>
<thead>
<tr>
<th>Marks out of ten</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of pupils</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>6</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

c What was the lowest mark? 2 out of 10

d What was the highest mark? 9 out of 10

e What was the most common mark? 5 out of 10

f How many students got the highest mark? 1

g How many students got the lowest mark? 1

h What is the frequency (f) (number of times) of 4? 2

2. **c** Study the pictograph. Then answer the questions.

<table>
<thead>
<tr>
<th>Number of pets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aaliyah</td>
</tr>
<tr>
<td>Abasi</td>
</tr>
<tr>
<td>Abachu</td>
</tr>
</tbody>
</table>
a How many pets does Aaliyah have? 3
b How many pets does Abasi have? 4
c How many pets does Abachu have? 1
d How many pets do they have altogether? 8
e Write one other question you can ask using the pictograph.
   Example: Who has the most pets?
   How many more is this than the one who has the least pets? etc.

f Complete the diagram below to show the information on the pictogram.

```
Aaliyah Abasi Abachu
```

```
<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
```

g Draw a bar graph based on the same information.

```
<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
```

```
<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
```

```
<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
```

```
<table>
<thead>
<tr>
<th>0</th>
<th>0.5</th>
<th>1</th>
<th>1.5</th>
<th>2</th>
<th>2.5</th>
<th>3</th>
<th>3.5</th>
<th>4</th>
<th>4.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aaliyah</td>
<td>Abasi</td>
<td>Abachu</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
```
h Draw a pie chart to show the same information. Use a pair of compasses to draw the circle.

Study the tally chart of sports meetings played and won by a local school’s teams during one term. Then answer the questions.

<table>
<thead>
<tr>
<th>Sports</th>
<th>Soccer</th>
<th>Hockey</th>
<th>Cricket</th>
<th>Netball</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>/////</td>
<td>///</td>
<td>//</td>
<td>////</td>
</tr>
<tr>
<td>Number</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>4</td>
</tr>
</tbody>
</table>

a Complete the table by writing in the number of tallies.

b Which sports team played the most matches? Soccer and netball

c Which sports team played the fewest matches? Cricket

d How many matches were played altogether? $13$
4. Interview 15 people. Ask which of the following Nigerian dishes they prefer. (You can substitute other dishes for these.)

<table>
<thead>
<tr>
<th>People asked</th>
<th>Jollof rice</th>
<th>Dodo or fried</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plantain</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>STUDENTS’ OWN ANSWERS</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. Fill in the results on the frequency table.

<table>
<thead>
<tr>
<th>Dishes</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jollof rice</td>
<td>STUDENTS COMPLETE TABLE BASED ON THEIR INFORMATION COLLECTED.</td>
</tr>
<tr>
<td>Dodo or fried plantain</td>
<td></td>
</tr>
</tbody>
</table>

b. Draw a pictogram, a bar graph and a pie chart to show your results.

STUDENTS’ GRAPHS BASED ON INFORMATION COLLECTED
Choose a term from the box to complete these sentences.

unknown algebraic sentence  equation  equal sign  open sentence

a A letter or empty box in a number sentence (for example: 5 + □ = 7 or 5 + a = 7) is called a(n) variable.

b The expression 5 + □ = 7 is called a(n) equation or formula.

c A sentence that may be true or false is called a(n) algebraic expression.

d In order for an algebraic sentence to be an equation, it must have a(n) variable or unknown value.

Complete the table by writing true or false.

<table>
<thead>
<tr>
<th>Open sentences</th>
<th>Value of unknown</th>
<th>True or False</th>
</tr>
</thead>
<tbody>
<tr>
<td>a + 15 = 19 if</td>
<td>a = 4</td>
<td>true</td>
</tr>
<tr>
<td>b − 7 = 26 if</td>
<td>b = 36</td>
<td>false</td>
</tr>
<tr>
<td>12c = 36 if</td>
<td>c = 3</td>
<td>true</td>
</tr>
<tr>
<td>5d + 4 = 24 if</td>
<td>d = 4</td>
<td>true</td>
</tr>
<tr>
<td>9e − 7 = 54 if</td>
<td>e = 7</td>
<td>false</td>
</tr>
<tr>
<td>( \frac{25}{f} = 5 ) if</td>
<td>f = 5</td>
<td>true</td>
</tr>
<tr>
<td>4 = ( \frac{24}{g} ) if</td>
<td>g = 4</td>
<td>false</td>
</tr>
</tbody>
</table>
Solve these equations.

\(a\) \(x + 15 = 17\)
\[x = 2\]

\(b\) \(y - 12 = 23\)
\[y = 35\]

\(c\) \(34 + z = 42\)
\[z = 8\]

\(d\) \(31 - a = 19\)
\[a = 12\]

\(e\) \(\frac{b}{8} = 9\)
\[b = 72\]

\(f\) \(\frac{27}{c} = 9\)
\[c = 3\]

\(g\) \(11d = 121\)
\[d = 11\]

\(h\) \(35 = 7e\)
\[e = 5\]

Remember the balance method of solving equations. What you do to the LHS you must do to the RHS.

Check your answers. For example: LHS \(\frac{a + 5}{a} + 5 - 5 = \frac{9 - 5}{4}\) Check: \(4 + 5 = 9\)

Solve these equations. Then check your answers.

\(a\) \(2x + 9 = 27\)
\[2x + 9 - 9 = 27 - 9\]
\[2x = 18\]
\[x = 9\]

\(b\) \(5y - 15 = 10\)
\[5y - 15 + 15 = 10 + 15\]
\[5y = 25\]
\[\frac{5y}{5} = \frac{25}{5}\]
\[y = 5\]

\(c\) \(24 + 2z = 30\)
\[24 - 24 + 2z = 30 - 24\]
\[2z = 6\]
\[\frac{2z}{2} = \frac{6}{2}\]
\[z = 3\]

\(d\) \(40 - 11a = 18\)
\[40 - 40 - 11a = 18 - 40\]
\[11a = 22\]
\[\frac{11a}{11} = \frac{22}{11}\]
\[a = 2\]

\(e\) \(\frac{7}{c} = 7\)
\[\frac{7}{c} \times c = 7 \times c\]
\[7 = 7c\]
\[\frac{7}{7} = \frac{7c}{7}\]
\[1 = c\]

\(f\) \(\frac{39}{13} = 13e\)
\[\frac{39}{13} = \frac{13e}{13}\]
\[3 = e\]

\(g\) \(\frac{20}{g} + 4 = 8\)
\[\frac{20}{g} + 4 - 4 = 8 - 4\]
\[\frac{20}{g} = 4\]
\[\frac{20 \times 1}{g} = \frac{4g}{g}\]
\[20 = 4g\]
\[\frac{20}{4} = \frac{4g}{4}\]
\[5 = g\]
Angles 2: Angles between lines; angles in a triangle

**Worked example**

Calculate the sizes of the lettered angles

\[ \text{a} \quad x^\circ + 124^\circ = 180^\circ \quad \text{(adjacent angles on straight line MON)} \]
\[ x^\circ = 180^\circ - 124^\circ \]
\[ = 56^\circ \]

\[ \text{b} \quad y^\circ + 35^\circ + 210^\circ = 360^\circ \quad \text{(sum of angles at point O)} \]
\[ y^\circ + 245^\circ = 360^\circ \]
\[ y^\circ = 360^\circ - 245^\circ \]
\[ = 115^\circ \]

\( \text{\underline{\hspace{1.3cm}}} \) Measure these angles. Write your measurements below the angles.

\[ \text{a} \quad \text{b} \]

\[ \text{C} \quad \text{D} \]

\[ \text{B} \quad \text{A} \quad \text{D} \]

\[ \text{C} \quad \text{D} \]

\[ \text{B} \quad \text{A} \quad \text{D} \]

\[ \text{C} \quad \text{D} \]

\[ \text{B} \quad \text{A} \quad \text{D} \]

\[ \text{C} \quad \text{D} \]

\[ \text{B} \quad \text{A} \quad \text{D} \]

\[ \text{C} \quad \text{D} \]

\[ \text{B} \quad \text{A} \quad \text{D} \]

\[ \text{C} \quad \text{D} \]

\[ \text{B} \quad \text{A} \quad \text{D} \]

\[ \text{C} \quad \text{D} \]

\[ \text{B} \quad \text{A} \quad \text{D} \]

\[ \text{C} \quad \text{D} \]

\[ \text{B} \quad \text{A} \quad \text{D} \]

\[ \text{C} \quad \text{D} \]

\[ \text{B} \quad \text{A} \quad \text{D} \]

\[ \text{C} \quad \text{D} \]

\[ \text{B} \quad \text{A} \quad \text{D} \]
c

\[ \angle ABC = 60^\circ \]
\[ \angle BCA = 60^\circ \]
\[ \angle CAB = 60^\circ \]

\[ \angle BAC = 70^\circ \]
\[ \angle EAF = 70^\circ \]
\[ \angle CAD = 60^\circ \]
\[ \angle DAE = 50^\circ \]
\[ \angle FAB = 110^\circ \]

e

\[ \angle BAC = 20^\circ \]
\[ \angle DAB = 110^\circ \]
\[ \angle CAB = 20^\circ \]

\[ \angle BAG = 70^\circ \]
\[ \angle CAG = 110^\circ \]
\[ \angle BAE = 110^\circ \]
\[ \angle DAE = 70^\circ \]
\[ \angle FEA = 110^\circ \]
\[ \angle DEH = 110^\circ \]
\[ \angle FEH = 70^\circ \]
g  Colour the angles in each diagram that are equal. For example, in question b, make a red dot in the angles $\angle BAC$ and $\angle EAD$. Then mark the other two angles in another colour if they are equal. If angles are not equal, don’t mark them.  These markers show angles of same size.

h  Say which angles are equal in each question and why. For example, are they opposite angles, corresponding angles? If they are not equal, say so.

<table>
<thead>
<tr>
<th>Question</th>
<th>Angles</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>No equal angles</td>
</tr>
<tr>
<td>b</td>
<td>$\angle BAC = \angle EAD$ and $\angle DAB = \angle CAE$ vertically opposite angles</td>
</tr>
<tr>
<td>c</td>
<td>Three angles of an equilateral triangle</td>
</tr>
<tr>
<td>d</td>
<td>$\angle BAF = \angle CAE$ and $\angle BAC = \angle EAF$ opposite angles</td>
</tr>
<tr>
<td>e</td>
<td>No equal angle</td>
</tr>
<tr>
<td>f</td>
<td>$\angle BAG = \angle DEA = \angle CAE = \angle FEH$ corresponding angles</td>
</tr>
<tr>
<td></td>
<td>$\angle GAC = \angle AEF = \angle BAE = \angle DEH = \angle AED = \angle FEH$ vertically opposite</td>
</tr>
<tr>
<td></td>
<td>$\angle GAC = \angle BAE = \angle AEF = \angle DEH = \angle AED = \angle FEH$ vertically opposite</td>
</tr>
<tr>
<td></td>
<td>$\angle GAC = \angle BAE = \angle AEF = \angle DEH = \angle AED = \angle FEH$ vertically opposite</td>
</tr>
</tbody>
</table>
2. Complete the table by filling in the spaces.

<table>
<thead>
<tr>
<th>Triangle</th>
<th>1st angle</th>
<th>2nd angle</th>
<th>3rd angle</th>
<th>Sum of angles</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABC</td>
<td>60°</td>
<td>20°</td>
<td>80°</td>
<td>180°</td>
</tr>
<tr>
<td>DEF</td>
<td>113°</td>
<td>45°</td>
<td>22°</td>
<td>180°</td>
</tr>
<tr>
<td>GHI</td>
<td>69°</td>
<td>93°</td>
<td>18°</td>
<td>180°</td>
</tr>
<tr>
<td>JKL</td>
<td>54°</td>
<td>89°</td>
<td>37°</td>
<td>180°</td>
</tr>
<tr>
<td>MNO</td>
<td>93°</td>
<td>12°</td>
<td>75°</td>
<td>180°</td>
</tr>
</tbody>
</table>

3. Study the diagrams. Then answer the questions.

a. 

b. 

c. Calculate the sizes of angles $x$, $y$ and $z$ in $\triangle ABC$.

$$x = 75° \quad y = 75° \quad z = 15°$$


d. Calculate the sizes of angles $x$, $y$, $z$ and $q$ in $\triangle EFH$.

$$x = 65° \quad y = 50° \quad z = 115° \quad q = 12°$$


e. In $\triangle ABC$ does $x° = y°$? Explain your answer.

In triangle $ABC$, $x = y$.

$\triangle ABD$ and $\triangle DBC$ share a common line $BD$ and have lines $AB$ and $BC$ equal.

They each have a right angle and an angle of $15°$.

This means the remaining angle in each triangle must be $75°$. 


① Construct these figures using a ruler, set square, protractor and pair of compasses.

a  Construct a line through C parallel to AB:

```
A ______________________ B
C ______________________
```

b  Construct parallelogram PQRS so that the base, QR = 6 cm, RS = 4 cm and the angle at R = 60°.

```
P Q
  |    6 cm
  |    S
  |    4 cm
  |    |
  |    |
  |    |
  |    |
  |    |
  |    |
  |    | R
  60°
```

c  Construct a line through Z perpendicular to AB.

```
A ______________________ B
    Z
```

Geometric constructions
**d** Construct quadrilateral MNOP so that the base, NO = 7 cm, MN = 5.5 cm and the angle at N = 45°. Draw MQ perpendicular to NO. MP = 6 cm and the angle at QMP = 70°. Join PO.

![Diagram of MNOP with MQ and PO drawn](image)

**e** Answer these questions about the rectangle you have constructed above. Measure to confirm.

- **i)** What is the length of MQ? 38 mm
- **ii)** What is the length of PO? 30 mm
- **iii)** Find angle MNQ. 45°
- **iv)** Find angle MQN. 90°
- **v)** Find angle MQO. 90°
- **vi)** Find angle QOP. 149°
- **vii)** Find angle OPM. 53°
- **viii)** What is the sum of the angles in triangle MNQ? 45° + 90° + 45° = 180°
- **ix)** What is the sum of the angles in rectangle MNOP? 360°
- **x)** What is the sum of the angles in rectangle MQOP? 360°

2. Join the points A, B, C and D to the point F.

   Now draw a line from F perpendicular to the line PQ.
Construct parallelogram ABCD so that the base, BC = 6.5 cm, AB = 3.5 cm and the angle at B = 60°.

Measure or calculate to find the following.

a. Find the angle at D. \[ 60° \]
b. Find the angle at A. \[ 120° \]
c. Find the angle at C. \[ 120° \]
d. What is the sum of the four angles of the parallelogram? \[ 360° \]
e. Join AC.
f. Which angle does the angle at BCA equal? \[ BCA = CAD \]
g. Which angle does the angle at BAC equal? \[ BAC = ACD \]
h. Give a reason for your answers to questions f and g.

The angles in questions f and g are alternate angles, which are equal.
Study the table that shows how many people from a village went to the café on seven days of the week. Then answer the questions.

<table>
<thead>
<tr>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
<th>Saturday</th>
<th>Sunday</th>
</tr>
</thead>
<tbody>
<tr>
<td>103</td>
<td>98</td>
<td>76</td>
<td>48</td>
<td>123</td>
<td>142</td>
<td>47</td>
</tr>
</tbody>
</table>

a. What is the average number of shoppers per day?

\[
\text{Average} = \frac{103 + 98 + 76 + 48 + 123 + 142 + 47}{7} = \frac{637}{7} = 91
\]

b. What is another word for average? mean

2. Calculate the mean of these sets of numbers.

a. 5, 10, 15, 20, 25; the mean is 15

b. 1, 9, 4, 5, 10; the mean is \( \frac{29}{5} = 5.8 \)

c. 7, 8, 9, 10, 11, 15; the mean is 12

3. Two pupils got these percentage results in six tests. Study the table. Then answer the questions.

<table>
<thead>
<tr>
<th>Subjects</th>
<th>English</th>
<th>Mathematics</th>
<th>History</th>
<th>Geography</th>
<th>Science</th>
<th>Art</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pupil 1</td>
<td>60</td>
<td>74</td>
<td>84</td>
<td>76</td>
<td>78</td>
<td>54</td>
</tr>
<tr>
<td>Pupil 2</td>
<td>70</td>
<td>78</td>
<td>38</td>
<td>54</td>
<td>84</td>
<td>66</td>
</tr>
</tbody>
</table>

a. What was the highest mark obtained? 84

b. What was the lowest mark obtained? 38

c. What is the difference between the highest and the lowest marks? 46

d. What is the mean mark obtained by pupil 1? 71

e. What is the mean mark obtained by pupil 2? 65

f. What is the mode for pupil 1? There is no mode.
g What is the mode for pupil 2? There is no mode.

h What is the mode for both pupils? 54, 74, 84

i What is the range of all the marks obtained by both pupils in increasing size?
38, 54, 54, 60, 66, 70, 74, 76, 78, 78, 84, 84

j What is the mean mark obtained for all the marks?
68

k What is the mode obtained for all the marks?
54, 74, 84

l What is the median for all the marks?
72

4 The average mass of three children is 49 kg. The first child has a mass of 46 kg and the second a mass of 52 kg. What is the mass of the third child?

$49 \times 3 = 147$ kg

$147$ kg – $(52$ kg + $46$ kg) = $49$ kg

5 The average age of all the pupils in Grade 7 is 13 years. There are 22 pupils in the class and 5 are 12 years old while 15 are 13 years old. How old are the last 2 pupils?

$31 \div 2 = 15.5$ years old

6 Arrange these numbers in ascending order:

a 45, 99, 9, 81, 27, 63, 18, 36, 90, 54, 72
9, 18, 27, 36, 45, 54, 63, 72, 81, 90, 99

b Name the median.
54
Estimation and approximation

Worked example

Give 14 505 to the nearest:

<table>
<thead>
<tr>
<th>a</th>
<th>thousand</th>
<th>b</th>
<th>hundred</th>
<th>c</th>
<th>ten</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>14 505 = 15 000 to the nearest thousand</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b</td>
<td>(14 505 is a little nearer 15 000 than 14 000)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c</td>
<td>14 505 = 14 500 to the nearest hundred</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d</td>
<td>14 505 = 14 510 to the nearest ten</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e</td>
<td>(the last digit of 14 505 is 5; round up)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(1) What units (mass, distance or length, capacity) would you use to estimate these?

a  The amount of juice in a bottle ________
   capacity – litres

b  The distance from your home to school ________
   distance – kilometres

c  Your mass ________
   mass – kilograms

d  The radius of a small coin ________
   length – millimetres

e  The length of a soccer field ________
   length – metres

f  The distance to the Moon ________
   distance – kilometres

g  The water in a swimming pool ________
   capacity – litres

(2) Estimate these quantities.

a  Water in a cup ________
   250 ml

b  The distance from your home to your nearest shop ________
   Students’ own answers

c  The mass of your friend ________
   Students’ own answers

d  The radius of a dinner plate ________
   approx. 1.5 m

e  The length of a school desk ________
   approx. 12 cm

f  The distance to Lagos from your home ________
   mass – kilograms

g  The water in a bath ________
   Students’ own answers

(3) Complete the table by rounding off the numbers as required.

<table>
<thead>
<tr>
<th>Numbers</th>
<th>Round off to the nearest 10</th>
<th>Round off to the nearest 100</th>
<th>Round off to the nearest 1 000</th>
</tr>
</thead>
<tbody>
<tr>
<td>59</td>
<td>60</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>732</td>
<td>730</td>
<td>700</td>
<td>1 000</td>
</tr>
<tr>
<td>4 899</td>
<td>4 900</td>
<td>4 900</td>
<td>5 000</td>
</tr>
<tr>
<td>15 606</td>
<td>15 610</td>
<td>15 600</td>
<td>16 000</td>
</tr>
<tr>
<td>48 989</td>
<td>48 990</td>
<td>49 000</td>
<td>49 000</td>
</tr>
</tbody>
</table>
4. Complete the table by rounding off the numbers as required.

<table>
<thead>
<tr>
<th>Numbers</th>
<th>Round off to the nearest 100</th>
<th>Round off to the nearest 10</th>
<th>Round off to the nearest whole number</th>
<th>Round off to the nearest tenth</th>
</tr>
</thead>
<tbody>
<tr>
<td>83.45</td>
<td>100</td>
<td>80</td>
<td>83</td>
<td>83.5</td>
</tr>
<tr>
<td>3.45</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>3.5</td>
</tr>
<tr>
<td>183.43</td>
<td>200</td>
<td>180</td>
<td>183</td>
<td>183.4</td>
</tr>
<tr>
<td>18.05</td>
<td>0</td>
<td>20</td>
<td>18</td>
<td>18.1</td>
</tr>
<tr>
<td>83.01</td>
<td>100</td>
<td>80</td>
<td>83</td>
<td>83</td>
</tr>
</tbody>
</table>

Remember estimated and approximated have similar meanings. We show approximated results using the symbol ≈.

5. A factory makes 789 pairs of shoes in a week and 1 084 pairs of slippers. Complete the table showing your approximated and calculated results.

<table>
<thead>
<tr>
<th>Approximate number of shoes</th>
<th>Approximate number of slippers</th>
<th>Sum of approximate numbers</th>
<th>Calculation of actual numbers</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>789 ≈ 1 000</td>
<td>1 084 ≈ 1 000</td>
<td>2 000</td>
<td>1 873</td>
<td>127</td>
</tr>
</tbody>
</table>

5. A box has a mass of 87 g and a packet has a mass of 49 g. Complete the table showing your approximated and calculated results.

<table>
<thead>
<tr>
<th>Approximate mass of box</th>
<th>Approximate mass of packet</th>
<th>Sum of approximate masses</th>
<th>Calculation of actual masses</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>87 g ≈ 90 g</td>
<td>49 g ≈ 50 g</td>
<td>140 g</td>
<td>136 g</td>
<td>4 g</td>
</tr>
</tbody>
</table>
1. **a** Base ten numbers are decimal numbers based on ten digits. List the ten digits in the base ten system.

   0, 1, 2, 3, 4, 5, 6, 7, 8, 9

   **b** Base two numbers are binary numbers based on two digits. List the two digits in the base two system.

   0, 1

2. **a** Complete the list of place values of the digits in the decimal system.
   
   Th, H, T, U, tenths, hundredths

   **b** Complete the list of place values of the digits in the binary system.

   Eights, fours, twos, units

3. Complete the table.

<table>
<thead>
<tr>
<th>Decimal numbers</th>
<th>Binary numbers</th>
<th>Values of binary numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>10</td>
<td>10 = 1 two and 0 ones</td>
</tr>
<tr>
<td>3</td>
<td>11</td>
<td>11 = 1 two and 1 one</td>
</tr>
<tr>
<td>4</td>
<td>100</td>
<td>100 = 1 four and 0 twos and 0 ones</td>
</tr>
<tr>
<td>5</td>
<td>101</td>
<td>101 = 1 four and 0 twos and 10 ones</td>
</tr>
<tr>
<td>6</td>
<td>110</td>
<td>110 = 1 four 1 two and 0 ones</td>
</tr>
<tr>
<td>7</td>
<td>111</td>
<td>111 = 1 four 1 two 1 one</td>
</tr>
<tr>
<td>8</td>
<td>1000</td>
<td>1000 = 1 eight 0 fours 0 twos and 0 ones</td>
</tr>
<tr>
<td>9</td>
<td>1001</td>
<td>1001 = 1 eight 0 fours 0 twos and 1 one</td>
</tr>
<tr>
<td>10</td>
<td>1010</td>
<td>1010 = 1 eight 0 fours 1 two and 0 ones</td>
</tr>
<tr>
<td>11</td>
<td>1011</td>
<td>1011 = 1 eight 0 fours 1 two and 1 one</td>
</tr>
<tr>
<td>12</td>
<td>1100</td>
<td>1100 = 1 eight 1 fours 0 twos and 0 ones</td>
</tr>
<tr>
<td>13</td>
<td>1101</td>
<td>1101 = 1 eight 1 fours 0 twos and 1 one</td>
</tr>
<tr>
<td>14</td>
<td>1110</td>
<td>1110 = 1 eight 1 fours 1 two and 0 ones</td>
</tr>
<tr>
<td>15</td>
<td>1111</td>
<td>1111 = 1 eight 1 fours 1 two and 1 ones</td>
</tr>
<tr>
<td>16</td>
<td>10000</td>
<td>10000 = 1 sixteen 0 eights 0 fours 0 twos and 0 ones</td>
</tr>
</tbody>
</table>
4. Add these binary numbers.
   a  1010
   + 1011
   ________
   10101

   b  110
   + 111
   ________
   10010

5. Subtract these binary numbers.
   a  1101
   –  11
   ________
   1010

   b  1011
   – 110
   ________
   101

6. Multiply these binary numbers.
   a  101
   ×  10
   ________
   1010

   b  1011
   × 110
   ________
   100010

7. Calculate in base two. Then check your answers in base ten.
   a  1011
   + 1001
   ________
   10100

   Check: 10 + 9 = 20

   b  10 011
   + 10 011
   ________
   100 010

   Check: 19 + 19 = 38

   c  10111
   – 1101
   ________
   1010

   Check: 23 – 13 = 10

   d  10101
   – 1001
   ________
   1100

   Check: 21 – 9 = 12

   e  1011
   ×  101
   ________
   110111

   Check: 11 × 5 = 55

   f  11011
   ×  111
   ________
   10111101

   Check: 27 × 7 = 189
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