

**Nigeria**

**Junior Secondary Maths**

**Form 1**

**Teacher's Guide for NGM JSS1**

**Pearson Education Limited**

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# Introduction

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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# JSS1 Scheme of Work and Curriculum matching chart

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.

Scheme of Work: JSS1, Term 1				Curriculum matching	
TERM 1	NGM Ch no	Chapter title	Work-sheet no.	NERDC JSS1 Themes and Topics	NERDC JSS1 Performance Objectives
<b>Week 1</b>	Pre	Basic operations and SI system		Basic Operations, p. 5 Topic 1: Addition and Subtraction	Add, subtract numbers correctly
<b>Week 2</b>	Ch 1	Development of number systems	1	Basic Operations, p. 5 Topic 1: Addition and Subtraction	State the place value of numbers
<b>Week 3</b>	Ch 2	Large and small numbers	2	Number & Numeration, p. 1 Topic 1: Whole Numbers	Count and write in millions, billions, trillions Count, write and read large quantities Develop QR with large numbers
<b>Week 4</b>	Ch 3	Factors and multiples	3	Number & Numeration, pp. 1–2 Topics 2 and 3: LCM, HCF	Find LCM and HCF of whole numbers Develop QR with LCM and HCF
<b>Week 5</b>	Ch 4	Fractions 1: Fractions and percentages	4	Number & Numeration, p. 4 Sub-theme Fractions  Basic Operations, p. 6 Topic 2: Addition and subtraction of fractions	Identify and use equivalent fractions Arrange fractions in ascending and descending order Convert fractions to percentages Add and subtract fractions
<b>Week 6</b>	Ch 5	Use of symbols 1: Letters for numbers	5	Algebraic Processes, p. 10 Topic 1: Use of symbols	Solve problems with open sentences Add, subtract, multiply, divide in open sentences Use letters to represent symbols in open sentences
<b>Week 7</b>	Ch 6	Solids 1: Properties	6	Geometry and Mensuration, p. 15 Topic 2 Three-dimensional figures	Identify the properties of cubes, cuboids, pyramids, cones, cylinders and spheres
<b>Week 8</b>	Ch 7	Algebraic simplification 1: Grouping	7	Algebraic Processes, p. 12 Topic 2: Simplification of algebraic expressions	Identify positive and negative coefficients of terms Add and subtract like terms Collect and simplify like terms
<b>Week 9</b>	Ch 8	Angles 1: Measurement	8	Geometry and Mensuration, p. 16 Topic 4: Angles	Measure and identify angles
<b>Week 10</b>	Revision Exercises and Tests, Ch 1–8			Use revision exercises and tests to consolidate Term 1 content	
End of Term 1					

Scheme of Work: JSS1, Term 2				Curriculum matching	
TERM 2	NGM Ch no	Chapter title	Work-sheet no.	NERDC JSS1 Themes and Topics	NERDC JSS1 Performance Objectives
<b>Week 1</b>	Ch 9	Fractions 2: Decimals and percentages	9	Number & Numeration, p. 4 Topic 2: Fractions  Basic Operations, p. 9 Topic 1: Addition and subtraction of fractions	Convert fractions to decimals Convert decimals to fractions Convert fractions to percentages Convert percentages to fractions Add and subtract decimal fractions Develop QR in problems with fractions
<b>Week 2</b>	Ch 10	Use of symbols 2: Word problems	10	Algebraic Processes, p. 11 Topic 1: Use of symbols  Algebraic Processes, p. 12 Topic 2: Simplification of algebraic expressions	Solve open sentences involving two arithmetic operations Solve word problems and QR involving use of symbols Write word problems in symbolic terms
<b>Week 3</b>	Ch 11	Plane shapes 1: Properties	11	Geometry and Mensuration, p. 14 Topic 1: Plane shapes	Identify various plane shapes by name and property
<b>Week 4</b>	Ch 12	Directed numbers: Addition and subtraction	12	Basic Operations, pp. 5–6 Topic 1: Addition and subtraction	Draw and use the number line to illustrate directed numbers Relate negative numbers to everyday activities Add and subtract positive and negative numbers
<b>Week 5</b>	Ch 13	Plane shapes 2: Perimeter	13	Geometry and Mensuration, p. 14 Topic 1: Plane shapes	Find the perimeter of regular polygons (square, rectangle, triangle, trapezium, parallelogram and circle)
<b>Week 6</b>	Ch 14	Plane shapes 3: Area	14	Geometry and Mensuration, p. 14 Topic 1: Plane shapes	Find the area of regular and irregular shapes (square, rectangle, triangle, trapezium, parallelogram and circle) Relate finding area to real-life situations
<b>Week 7</b>	Ch 15	Algebraic simplification 2: Brackets	15	Algebraic Processes, p. 12 Topic 2: Simplification of algebraic expressions	Insert/remove brackets Simplify algebraic expressions Write word problems in symbolic terms Develop QR in problems involving brackets
<b>Week 8</b>	Ch 16	Solids 2: Volume	16	Geometry and Mensuration, p. 15 Topic 2: Three-dimensional figures	Find the volume of cubes, cuboids
<b>Week 9</b>	Revision Exercises and Tests,			Use revision exercises and tests to consolidate Term 2 content	
<b>Week 10</b>	Ch 9–16				
End of Term 2					

Scheme of Work: JSS1, Term 3				Curriculum matching	
TERM 3	NGM Ch no	Chapter title	Work-sheet no.	NERDC JSS1 Themes and Topics	NERDC JSS1 Performance Objectives
<b>Week 1</b>	Ch 17	Statistics 1: Purpose and data collection	17	Everyday Statistics, p. 17 Topic 1: Need for statistics Topic 2: Data collection	List purposes of statistics Use statistics for planning, analysis and prediction Collect statistical data
<b>Week 2</b>	Ch 18	Statistics 2: Presentation of data	18	Everyday Statistics, p. 17 Topic 3: Data presentation	Present statistical data in lists, tables and graphs
<b>Week 3</b>	Ch 19	Simple equations	19	Algebraic Processes, pp. 11, 13 Topic 1: Use of symbols Topic 3: Simple equations	Solve open sentences involving two operations Translate word sentences into equations Solve simple equations and check the solution of an equation
<b>Week 4</b>	Ch 20	Angles 2: Angles between lines; angles in a triangle	20	Geometry and Mensuration, p. 16 Topic 4: Angles	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
<b>Week 5</b>	Ch 21	Geometrical constructions	21	Geometry and Mensuration, p. 16 Topic 3: Construction	Construct parallel and perpendicular lines Bisect a line segment Construct angles of $90^\circ$ and $60^\circ$
<b>Week 6</b>	Ch 22	Statistics 3: Averages	22	Everyday Statistics, p. 17 Topic: Averages	Determine the mean, median and mode of a set of data
<b>Week 7</b>	Ch 23	Estimation and approximation	23	Basic Operations pp. 7–8 Sub theme: Derived operations  Topic 1: Estimation Topic 2: Approximation	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
<b>Week 8</b>	Ch 24	Base two arithmetic	24	Number & 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	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
<b>Week 9</b>	Revision Exercises and Tests, Ch 17–24			Use revision exercises and tests to consolidate Term 3 content	
<b>Week 10</b>					
End of Term 3					

**Note:** QR means Quantitative Reasoning (ability to cope with numbers and calculation).



# Features of the Student's Book, Teacher's Guide and Workbook

## 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  $60^\circ$  and  $90^\circ$
- 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](http://www.pearsoneducation.com).

## Section 1: Additional material

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.

## 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.

- Allow 10 minutes to do each test.
- Try to do every item.
- Use the answers in the back of the book to correct the test.
- 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.

- 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.

### Addition

+	1	2	3	4	5	6	7	8	9	10
1	2	3	4	5	6	7	8	9	10	11
2	3	4	5	6	7	8	9	10	11	12
3	4	5	6	7	8	9	10	11	12	13
4	5	6	7	8	9	10	11	12	13	14
5	6	7	8	9	10	11	12	13	14	15
6	7	8	9	10	11	12	13	14	15	16
7	8	9	10	11	12	13	14	15	16	17
8	9	10	11	12	13	14	15	16	17	18
9	10	11	12	13	14	15	16	17	18	19
10	11	12	13	14	15	16	17	18	19	20

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

### Multiplication

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

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

### Fractions, decimals, percentages

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

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

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

## Addition: Revision and practice

Test A [QR]	Test B [QR]	Test C [QR]	Test D [QR]	Test E [QR]
① $5 + 3$	$2 + 7$	$5 + 4$	$3 + 4$	$3 + 2$
② $11 + 6$	$3 + 13$	$10 + 9$	$12 + 7$	$4 + 14$
③ $7 + 8$	$9 + 4$	$6 + 7$	$2 + 9$	$5 + 7$
④ $44 + 4$	$6 + 31$	$43 + 2$	$1 + 76$	$81 + 8$
⑤ $3 + 9 + 1$	$3 + 5 + 7$	$2 + 8 + 9$	$5 + 8 + 5$	$9 + 6 + 1$
⑥ $48 + 3$	$9 + 28$	$66 + 5$	$7 + 83$	$35 + 5$
⑦ $23 + 41$	$82 + 17$	$49 + 40$	$64 + 34$	$22 + 26$
⑧ $\begin{array}{r} 28 \\ + 26 \\ \hline \end{array}$	$\begin{array}{r} 53 \\ + 64 \\ \hline \end{array}$	$\begin{array}{r} 47 \\ + 33 \\ \hline \end{array}$	$\begin{array}{r} 36 \\ + 55 \\ \hline \end{array}$	$\begin{array}{r} 81 \\ + 65 \\ \hline \end{array}$
⑨ $\begin{array}{r} 75 \\ + 58 \\ \hline \end{array}$	$\begin{array}{r} 27 \\ + 93 \\ \hline \end{array}$	$\begin{array}{r} 45 \\ + 59 \\ \hline \end{array}$	$\begin{array}{r} 68 \\ + 68 \\ \hline \end{array}$	$\begin{array}{r} 82 \\ + 49 \\ \hline \end{array}$
⑩ $\begin{array}{r} 445 \\ + 386 \\ \hline \end{array}$	$\begin{array}{r} 383 \\ + 750 \\ \hline \end{array}$	$\begin{array}{r} 939 \\ + 859 \\ \hline \end{array}$	$\begin{array}{r} 637 \\ + 295 \\ \hline \end{array}$	$\begin{array}{r} 486 \\ + 485 \\ \hline \end{array}$
⑪ $\begin{array}{r} 423 \\ + 397 \\ \hline \end{array}$	$\begin{array}{r} 544 \\ + 961 \\ \hline \end{array}$	$\begin{array}{r} 246 \\ + 255 \\ \hline \end{array}$	$\begin{array}{r} 680 \\ + 361 \\ \hline \end{array}$	$\begin{array}{r} 874 \\ + 727 \\ \hline \end{array}$
⑫ $\begin{array}{r} 312 \\ 89 \\ + 651 \\ \hline \end{array}$	$\begin{array}{r} 629 \\ 502 \\ 143 \\ + 817 \\ \hline \end{array}$	$\begin{array}{r} 153 \\ 153 \\ 75 \\ + 9 \\ \hline \end{array}$	$\begin{array}{r} 374 \\ 1\ 280 \\ + 6\ 400 \\ \hline \end{array}$	$\begin{array}{r} 378 \\ 344 \\ + 1\ 206 \\ \hline \end{array}$

Test F [QR]	Test G [QR]	Test H [QR]	Test I [QR]	Test J [QR]
① $1 + 8$	$7 + 3$	$0 + 2$	$6 + 3$	$1 + 9$
② $15 + 2$	$4 + 12$	$7 + 11$	$18 + 2$	$3 + 16$
③ $8 + 6$	$8 + 9$	$8 + 3$	$4 + 7$	$4 + 8$
④ $6 + 90$	$75 + 4$	$5 + 62$	$50 + 9$	$7 + 22$
⑤ $7 + 5 + 5$	$7 + 8 + 3$	$6 + 4 + 6$	$8 + 9 + 2$	$4 + 5 + 6$
⑥ $4 + 59$	$46 + 6$	$7 + 74$	$55 + 8$	$6 + 39$
⑦ $55 + 23$	$34 + 43$	$53 + 36$	$23 + 71$	$30 + 28$
⑧ $\begin{array}{r} 34 \\ + 70 \\ \hline \end{array}$	$\begin{array}{r} 92 \\ + 76 \\ \hline \end{array}$	$\begin{array}{r} 39 \\ + 49 \\ \hline \end{array}$	$\begin{array}{r} 94 \\ + 25 \\ \hline \end{array}$	$\begin{array}{r} 36 \\ + 57 \\ \hline \end{array}$
⑨ $\begin{array}{r} 36 \\ + 64 \\ \hline \end{array}$	$\begin{array}{r} 79 \\ + 39 \\ \hline \end{array}$	$\begin{array}{r} 72 \\ + 68 \\ \hline \end{array}$	$\begin{array}{r} 83 \\ + 38 \\ \hline \end{array}$	$\begin{array}{r} 94 \\ + 97 \\ \hline \end{array}$
⑩ $\begin{array}{r} 471 \\ + 963 \\ \hline \end{array}$	$\begin{array}{r} 704 \\ + 727 \\ \hline \end{array}$	$\begin{array}{r} 491 \\ + 654 \\ \hline \end{array}$	$\begin{array}{r} 736 \\ + 819 \\ \hline \end{array}$	$\begin{array}{r} 356 \\ + 357 \\ \hline \end{array}$
⑪ $\begin{array}{r} 385 \\ + 315 \\ \hline \end{array}$	$\begin{array}{r} 608 \\ + 405 \\ \hline \end{array}$	$\begin{array}{r} 546 \\ + 556 \\ \hline \end{array}$	$\begin{array}{r} 435 \\ + 367 \\ \hline \end{array}$	$\begin{array}{r} 809 \\ + 195 \\ \hline \end{array}$
⑫ $\begin{array}{r} 961 \\ 86 \\ + 422 \\ \hline \end{array}$	$\begin{array}{r} 256 \\ 165 \\ 54 \\ + 32 \\ \hline \end{array}$	$\begin{array}{r} 434 \\ 504 \\ 614 \\ + 24 \\ \hline \end{array}$	$\begin{array}{r} 34 \\ 85 \\ 75 \\ + 26 \\ \hline \end{array}$	$\begin{array}{r} 693 \\ 631 \\ + 676 \\ \hline \end{array}$

## Subtraction: Revision and practice

	Test A [QR]	Test B [QR]	Test C [QR]	Test D [QR]	Test E [QR]
①	$6 - 2$	$7 - 4$	$9 - 5$	$8 - 0$	$3 - 1$
②	$18 - 5$	$14 - 11$	$15 - 3$	$19 - 15$	$16 - 6$
③	$10 - 3$	$20 - 5$	$10 - 8$	$20 - 11$	$10 - 5$
④	$14 - 6$	$11 - 7$	$18 - 9$	$13 - 5$	$12 - 3$
⑤	$28 - 4$	$99 - 8$	$35 - 1$	$47 - 3$	$65 - 2$
⑥	$49 - 23$	$56 - 42$	$28 - 17$	$85 - 32$	$78 - 15$
⑦	$62 - 58$	$73 - 65$	$36 - 28$	$95 - 87$	$28 - 19$
⑧	$33$ $\underline{-17}$	$85$ $\underline{-36}$	$72$ $\underline{-47}$	$96$ $\underline{-29}$	$64$ $\underline{-37}$
⑨	$271$ $\underline{-93}$	$314$ $\underline{-46}$	$850$ $\underline{-83}$	$426$ $\underline{-58}$	$537$ $\underline{-39}$
⑩	$523$ $\underline{-265}$	$635$ $\underline{-577}$	$748$ $\underline{-258}$	$571$ $\underline{-374}$	$854$ $\underline{-548}$
⑪	$204$ $\underline{-146}$	$402$ $\underline{-273}$	$500$ $\underline{-156}$	$603$ $\underline{-405}$	$307$ $\underline{-128}$
⑫	$2\ 037$ $\underline{-849}$	$3\ 503$ $\underline{-1\ 597}$	$5\ 662$ $\underline{-5\ 074}$	$4\ 080$ $\underline{-1\ 976}$	$2\ 005$ $\underline{-1\ 229}$

	Test F [QR]	Test G [QR]	Test H [QR]	Test I [QR]	Test J [QR]
①	$5 - 4$	$8 - 3$	$7 - 5$	$3 - 3$	$9 - 3$
②	$17 - 10$	$13 - 1$	$16 - 13$	$19 - 4$	$18 - 11$
③	$20 - 6$	$10 - 9$	$20 - 12$	$10 - 7$	$20 - 17$
④	$15 - 8$	$17 - 8$	$16 - 7$	$14 - 9$	$13 - 6$
⑤	$61 - 0$	$42 - 2$	$88 - 6$	$76 - 3$	$37 - 2$
⑥	$99 - 65$	$36 - 14$	$59 - 44$	$64 - 24$	$84 - 53$
⑦	$51 - 49$	$84 - 75$	$47 - 39$	$41 - 32$	$35 - 26$
⑧	$45$ $\underline{-29}$	$60$ $\underline{-26}$	$93$ $\underline{-68}$	$61$ $\underline{-46}$	$82$ $\underline{-59}$
⑨	$763$ $\underline{-76}$	$625$ $\underline{-86}$	$211$ $\underline{-72}$	$142$ $\underline{-57}$	$374$ $\underline{-95}$
⑩	$982$ $\underline{-298}$	$614$ $\underline{-219}$	$433$ $\underline{-224}$	$641$ $\underline{-368}$	$770$ $\underline{-482}$
⑪	$405$ $\underline{-198}$	$708$ $\underline{-539}$	$201$ $\underline{-165}$	$306$ $\underline{-287}$	$502$ $\underline{-396}$
⑫	$5\ 231$ $\underline{-506}$	$6\ 814$ $\underline{-5\ 807}$	$7\ 486$ $\underline{-2\ 979}$	$3\ 113$ $\underline{-2\ 066}$	$6\ 104$ $\underline{-825}$



## Multiplication: Revision and practice

Test A [QR]	Test B [QR]	Test C [QR]	Test D [QR]	Test E [QR]
① $6 \times 7$	$9 \times 8$	$6 \times 9$	$7 \times 4$	$7 \times 8$
② $2 \times 8 \times 2$	$5 \times 2 \times 6$	$2 \times 4 \times 8$	$2 \times 8 \times 5$	$9 \times 2 \times 2$
③ $4 \times 21$	$43 \times 2$	$5 \times 11$	$61 \times 1$	$3 \times 12$
④ $9 \times 13$	$6 \times 14$	$2 \times 17$	$8 \times 16$	$5 \times 18$
⑤ $39 \times 8$	$78 \times 4$	$63 \times 7$	$69 \times 5$	$26 \times 9$
⑥ $36 \times 100$	$1\ 000 \times 52$	$860 \times 10$	$100 \times 4$	$7 \times 1\ 000$
⑦ $428 \times 7$	$8\ 431 \times 5$	$325 \times 9$	$3\ 781 \times 3$	$472 \times 6$
⑧ $3\ 126 \times 4$	$335 \times 6$	$7\ 735 \times 3$	$172 \times 7$	$8\ 549 \times 2$
⑨ $5 \times 2 \times 34$	$4 \times 5 \times 19$	$26 \times 6 \times 5$	$8 \times 65 \times 5$	$5 \times 54 \times 12$
⑩ $80$	$57$	$70$	$78$	$90$
$\times 59$	$\times 30$	$\times 82$	$\times 40$	$\times 61$
⑪ $43$	$254$	$74$	$820$	$93$
$\times 52$	$\times 57$	$\times 61$	$\times 29$	$\times 17$
⑫ $562$	$425$	$257$	$621$	$542$
$\times 308$	$\times 409$	$\times 830$	$\times 341$	$\times 209$
Test F [QR]	Test G [QR]	Test H [QR]	Test I [QR]	Test J [QR]
① $9 \times 4$	$6 \times 8$	$9 \times 7$	$7 \times 7$	$9 \times 9$
② $3 \times 8 \times 2$	$3 \times 7 \times 3$	$4 \times 6 \times 2$	$3 \times 3 \times 5$	$2 \times 3 \times 7$
③ $53 \times 0$	$2 \times 23$	$30 \times 3$	$4 \times 22$	$3 \times 23$
④ $7 \times 16$	$4 \times 14$	$3 \times 15$	$6 \times 19$	$7 \times 13$
⑤ $48 \times 3$	$28 \times 7$	$83 \times 6$	$24 \times 9$	$37 \times 4$
⑥ $10 \times 60$	$508 \times 100$	$1\ 000 \times 90$	$10 \times 1\ 000$	$100 \times 300$
⑦ $8\ 307 \times 2$	$904 \times 8$	$3\ 941 \times 4$	$861 \times 8$	$6\ 275 \times 5$
⑧ $156 \times 9$	$2\ 369 \times 3$	$138 \times 8$	$6\ 141 \times 5$	$346 \times 8$
⑨ $5 \times 78 \times 6$	$25 \times 67 \times 2$	$3 \times 19 \times 10$	$5 \times 58 \times 8$	$15 \times 37 \times 4$
⑩ $30$	$29$	$50$	$87$	$20$
$\times 62$	$\times 80$	$\times 38$	$\times 60$	$\times 93$
⑪ $713$	$87$	$389$	$62$	$105$
$\times 35$	$\times 71$	$\times 17$	$\times 36$	$\times 47$
⑫ $485$	$647$	$705$	$470$	$452$
$\times 168$	$\times 392$	$\times 516$	$\times 288$	$\times 219$

## Division: Revision and practice

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

Test A [QR]	Test B [QR]	Test C [QR]	Test D [QR]	Test E [QR]
① $9 \div 3$	$\frac{1}{4}$ of 8	$\frac{8}{2}$	$3\overline{)6}$	$6 \div 2$
② $\frac{64}{8}$	$3\overline{)24}$	$42 \div 6$	$\frac{1}{8}$ of 72	$\frac{54}{9}$
③ $\frac{1}{2}$ of 72	$\frac{80}{2}$	$2\overline{)90}$	$52 \div 2$	$\frac{1}{2}$ of 86
④ $5\overline{)65}$	$56 \div 4$	$\frac{1}{6}$ of 72	$\frac{91}{7}$	$3\overline{)51}$
⑤ $196 \div 7$	$\frac{1}{6}$ of 150	$\frac{154}{7}$	$8\overline{)184}$	$162 \div 6$
⑥ $\frac{62\,000}{100}$	$\frac{1}{10}$ of 440	$\frac{50\,000}{1\,000}$	$600 \div 100$	$10\overline{)8\,000}$
⑦ $\frac{1}{6}$ of 258	$\frac{455}{7}$	$5\overline{)690}$	$3\,828 \div 4$	$\frac{1}{8}$ of 464
⑧ $8\overline{)1\,624}$	$3\overline{)927}$	$4\overline{)2\,032}$	$5\overline{)535}$	$4\overline{)2\,408}$
⑨ $1\,072 \div 8$	$5\overline{)6\,005}$	$5\,202 \div 9$	$4\overline{)4\,008}$	$7\,206 \div 2$
⑩ $31\overline{)3\,162}$	$25\overline{)7\,525}$	$44\overline{)9\,108}$	$30\overline{)1\,680}$	$45\overline{)9\,135}$
⑪ $43\overline{)1\,247}$	$59\overline{)18\,054}$	$32\overline{)2\,752}$	$92\overline{)10\,580}$	$57\overline{)3\,591}$
⑫ $49\overline{)15\,043}$	$37\overline{)30\,451}$	$90\overline{)26\,100}$	$33\overline{)25\,971}$	$69\overline{)57\,822}$
Test F [QR]	Test G [QR]	Test H [QR]	Test I [QR]	Test J [QR]
① $7 \div 7$	$5 \div 1$	$\frac{4}{2}$	$\frac{1}{3}$ of 3	$0 \div 2$
② $9\overline{)45}$	$63 \div 7$	$\frac{1}{7}$ of 49	$\frac{48}{8}$	$7\overline{)70}$
③ $\frac{58}{2}$	$2\overline{)98}$	$36 \div 2$	$\frac{1}{2}$ of 76	$\frac{34}{2}$
④ $84 \div 6$	$\frac{1}{8}$ of 96	$\frac{117}{9}$	$4\overline{)68}$	$128 \div 8$
⑤ $\frac{1}{8}$ of 192	$\frac{189}{9}$	$5\overline{)135}$	$234 \div 9$	$\frac{1}{4}$ of 116
⑥ $\frac{405\,000}{1\,000}$	$\frac{1}{100}$ of 1 000	$10\overline{)62\,000}$	$\frac{1\,000}{1\,000}$	$\frac{70\,000}{100}$
⑦ $\frac{2\,277}{3}$	$4\overline{)2\,268}$	$894 \div 6$	$\frac{1}{5}$ of 1 165	$\frac{4\,566}{6}$
⑧ $7\overline{)910}$	$6\overline{)6\,012}$	$3\overline{)618}$	$6\overline{)4\,224}$	$9\overline{)972}$
⑨ $1\,827 \div 9$	$6\overline{)1\,806}$	$4\,004 \div 7$	$5\overline{)7\,700}$	$8\,007 \div 3$
⑩ $76\overline{)8\,056}$	$80\overline{)24\,560}$	$55\overline{)16\,940}$	$41\overline{)12\,505}$	$66\overline{)6\,798}$
⑪ $54\overline{)11\,232}$	$35\overline{)7\,455}$	$48\overline{)41\,952}$	$37\overline{)3\,478}$	$23\overline{)11\,661}$
⑫ $21\overline{)20\,265}$	$72\overline{)58\,176}$	$57\overline{)52\,155}$	$45\overline{)32\,625}$	$18\overline{)16\,344}$

## Fractions and decimals: Revision and practice

	Test A [QR]	Test B [QR]	Test C [QR]	Test D [QR]	Test E [QR]
① Reduce to the lowest term.	$\frac{12}{24}$	$\frac{27}{36}$	$\frac{66}{99}$	$\frac{5}{20}$	$\frac{21}{28}$
② Which is bigger?	$\frac{1}{4}$ or $\frac{1}{5}$	$\frac{3}{4}$ or $\frac{7}{8}$	$\frac{1}{2}$ or $\frac{18}{38}$	$\frac{7}{12}$ or $\frac{2}{3}$	$\frac{1}{7}$ or $\frac{5}{28}$
③ Arrange in ascending order.	$\frac{9}{10}, \frac{19}{20}, \frac{4}{5}$	$\frac{4}{9}, \frac{2}{3}, \frac{7}{15}$	$\frac{5}{6}, \frac{6}{5}, \frac{4}{5}$	$\frac{3}{8}, \frac{5}{12}, \frac{1}{3}$	$\frac{13}{36}, \frac{11}{36}, \frac{1}{3}$
④ Change to a decimal.	$\frac{3}{4}$	$\frac{1}{5}$	$\frac{1}{10}$	$\frac{1}{2}$	$\frac{2}{5}$
⑤ Change to a fraction.	0.7	65%	0.18	40%	32%
⑥ Change to a percentage.	$\frac{1}{4}$	0.55	$\frac{9}{10}$	0.62	0.51
⑦ Add.	$\frac{1}{2} + \frac{1}{3}$	$0.29 + 0.37$	$\frac{1}{4} + \frac{1}{8}$	$33\% + 42\%$	$0.55 + 0.73$
⑧ Subtract.	$\frac{5}{8} - \frac{2}{4}$	$2.82 - 1.71$	$\frac{1}{2} - \frac{3}{10}$	$9.31 - 4.88$	$7.89 - 3.51$
⑨ Multiply.	$\frac{1}{5} \times \frac{2}{3}$	$0.4 \times 0.4$	$\frac{5}{9} \times \frac{3}{4}$	$0.21 \times 0.04$	$0.3 \times 0.8$
⑩ Divide.	$\frac{1}{8} \div \frac{1}{2}$	$0.9 \div 0.45$	$\frac{2}{3} \div \frac{4}{5}$	$2.7 \div 0.18$	$0.45 \div 0.5$
⑪ Simplify.	$\frac{3}{4}$ of 80%	$(1.1 + 0.3) \div 0.7$	$\frac{4}{5} \times \frac{1}{2} - \frac{1}{10}$	$0.2 \times 5.5 - 0.07$	25% of $(2.1 + 1.5)$
⑫ Simplify.	$\frac{9}{10} \div (\frac{3}{10} - \frac{1}{5})$	$0.8 \div (0.17 - 0.09)$	60% of $\frac{1}{4}$	$6.3 + 0.5 \times 4.8$	$0.64 \div (0.27 - 0.11)$
	Test F [QR]	Test G [QR]	Test H [QR]	Test I [QR]	Test J [QR]
① Reduce to the lowest term.	$\frac{6}{12}$	$\frac{3}{24}$	$\frac{17}{51}$	$\frac{7}{21}$	$\frac{63}{84}$
② Which is bigger?	$\frac{11}{12}$ or $\frac{2}{3}$	$\frac{11}{24}$ or $\frac{11}{25}$	$\frac{2}{3}$ or $\frac{3}{4}$	$\frac{1}{2}$ or $\frac{3}{7}$	$\frac{2}{9}$ or $\frac{1}{5}$
③ Arrange in ascending order.	$\frac{1}{2}, \frac{1}{4}, \frac{1}{3}$	$\frac{7}{11}, \frac{7}{10}, \frac{7}{12}$	$\frac{5}{2}, \frac{2}{5}, \frac{5}{4}$	$\frac{2}{5}, \frac{3}{10}, \frac{1}{3}$	$\frac{3}{2}, \frac{3}{4}, \frac{4}{3}$
④ Change to a decimal.	$\frac{1}{4}$	$\frac{3}{20}$	$\frac{3}{100}$	$\frac{4}{5}$	$\frac{17}{20}$
⑤ Change to a fraction.	0.44	15%	0.84	27%	0.25
⑥ Change to a percentage.	$\frac{1}{5}$	0.25	$\frac{1}{2}$	0.09	$\frac{3}{4}$
⑦ Add.	$\frac{1}{8} + \frac{1}{2}$	$68\% + 7\%$	$\frac{1}{10} + \frac{1}{2} + \frac{2}{5}$	$0.92 + 0.18$	$\frac{2}{3} + \frac{1}{9}$
⑧ Subtract.	$\frac{1}{2} - \frac{1}{4}$	$4.11 - 3.78$	$\frac{1}{3} - \frac{1}{4}$	$2.12 - 1.62$	$\frac{3}{4} - \frac{3}{8}$
⑨ Multiply.	$\frac{1}{10} \times \frac{5}{6}$	$0.09 \times 0.73$	$\frac{3}{4} \times \frac{3}{4}$	$0.1 \times 0.9$	$\frac{1}{2} \times \frac{3}{7}$
⑩ Divide.	$\frac{1}{10} \div \frac{1}{3}$	$5.1 \div 0.17$	$\frac{5}{8} \div \frac{15}{2}$	$6.3 \div 0.9$	$\frac{4}{5} \div \frac{1}{10}$
⑪ Simplify.	$\frac{3}{4} \times \frac{1}{2}$ of 40%	5% of $\frac{2}{3}$	70% of $(7.2 \div 0.8)$	$\frac{2}{3}$ of $(10.2 - 0.6)$	40% of $(\frac{5}{8} + \frac{1}{8})$
⑫ Simplify.	$\frac{5}{9} \div (\frac{2}{3} - \frac{1}{2})$	$\frac{7}{8} \times \frac{2}{3} - \frac{1}{4}$	$0.4 \times 0.6 - 0.13$	$(\frac{1}{7} \div \frac{4}{3}) \times \frac{7}{9}$	$0.11 \times (0.9 \div 0.1)$

## P.2 The SI system of units

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.

length	abbreviation	relationship to basic unit
1 kilometre	1 km	1 000 m
1 metre	1 m	1 m
1 centimetre	1 cm	0.01 m
1 millimetre	1 mm	0.001 m

Table P.1

### 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:

mass	abbreviation	relationship to basic unit
1 tonne	1 t	1 000 000 g = 1 000 kg
1 kilogram	1 kg	1 000 g
1 gram	1 g	1 g
1 milligram	1 mg	0.001 g

Table P.2

### 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).

capacity	abbreviation	relationship to basic unit
1 kilolitre	1 kl	1 000 ℓ
1 litre	1 ℓ	1 ℓ
1 millilitre	1 ml	0.001 ℓ

Table P.3

### Time

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

time	abbreviation	relationship to basic unit
1 second	1 s	1 s
1 minute	1 min	60 s
1 hour	1 h	3 600 s = 60 min

Table P.4

## Money

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 = 1 670 mm
- 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 108 m  
s 7 km and 8 m    t 1 km and 4 m
- ③ Express the following in kilometres.
- a 5 000 m    b 8 000 m    c 10 000 m  
d 1 500 m    e 2 400 m    f 9 500 m  
g 6 520 m    h 4 350 m    i 7 330 m  
j 3 748 m    k 1 375 m    l 5 822 m  
m 2 056 m    n 9 040 m    o 4 007 m  
p 3 km and 416 m    q 7 km and 502 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  $2\frac{1}{2}$  h    b  $1\frac{1}{4}$  h    c  $1\frac{2}{3}$  h  
d 180 s    e 150 s?
- ⑥ How many seconds in:
- a 5 min    b  $1\frac{1}{3}$  min    c  $\frac{1}{4}$  h  
d  $\frac{1}{2}$  h    e 3 h?

**Addition**

	Test A	Test B	Test C	Test D	Test E
①	8	9	9	7	5
②	17	16	19	19	18
③	15	13	13	11	12
④	48	37	45	77	89
⑤	13	15	19	18	16
⑥	51	37	71	90	40
⑦	64	99	89	98	48
⑧	54	117	80	91	146
⑨	133	120	104	136	131
⑩	831	1 133	1 798	932	971
⑪	820	1 505	501	1 041	1 601
⑫	1 052	2 091	390	8 054	1 928

	Test F	Test G	Test H	Test I	Test J
①	9	10	2	9	10
②	17	16	18	20	19
③	14	17	11	11	12
④	96	79	67	59	29
⑤	17	18	16	19	15
⑥	63	52	81	63	45
⑦	78	77	89	94	58
⑧	104	168	88	119	93
⑨	100	118	140	121	191
⑩	1 434	1 431	1 145	1 555	713
⑪	700	1 013	1 102	802	1 004
⑫	1 469	507	1 576	220	2 000

**Subtraction**

	Test A	Test B	Test C	Test D	Test E
①	4	3	4	8	2
②	13	3	12	4	10
③	7	15	2	9	5
④	8	4	9	8	9
⑤	24	91	34	44	63
⑥	26	14	11	53	63
⑦	4	8	8	8	9
⑧	16	49	25	67	27
⑨	178	268	767	368	498
⑩	258	58	490	197	306
⑪	58	129	344	198	179
⑫	1 188	1 906	588	2 104	776

	Test F	Test G	Test H	Test I	Test J
①	1	5	2	0	6

②	7	12	3	15	7
③	14	1	8	3	3
④	7	9	9	5	7
⑤	61	40	82	73	35
⑥	34	22	15	40	31
⑦	2	9	8	9	9
⑧	16	34	25	15	23
⑨	687	539	139	85	279
⑩	684	395	209	273	288
⑪	207	169	36	19	106
⑫	4 725	1 007	4 507	1 047	5 279

**Multiplication**

	Test A	Test B	Test C	Test D	Test E
①	42	72	54	28	56
②	32	60	64	80	36
③	84	86	55	61	36
④	117	84	34	128	90
⑤	312	312	441	345	234
⑥	3 600	52 000	8 600	400	7 000
⑦	2 996	42 155	2 925	11 343	2 832
⑧	12 504	2 010	23 205	1 204	17 098
⑨	340	380	780	2 600	3 240
⑩	4 720	1 710	5 740	3 120	5 490
⑪	2 236	14 478	4 514	23 780	1 581
⑫	173 096	173 825	213 310	211 761	113 278

	Test F	Test G	Test H	Test I	Test J
①	36	48	63	49	81
②	48	63	48	45	42
③	0	46	90	88	69
④	112	56	45	114	91
⑤	144	196	498	216	148
⑥	600	50 800	90 000	10 000	30 000
⑦	16 614	7 232	15 764	6 888	31 375
⑧	1 404	7 107	1 104	30 705	2 768
⑨	2 340	3 350	570	2 320	2 220
⑩	1 860	2 320	1 900	5 220	1 860
⑪	24 955	6 177	6 613	2 232	4 935
⑫	81 480	253 624	363 780	135 360	98 988

**Division**

	Test A	Test B	Test C	Test D	Test E
①	3	2	4	2	3
②	8	8	7	9	6
③	36	40	45	26	43

④	13	14	12	13	17
⑤	28	25	22	23	27
⑥	620	44	50	6	800
⑦	43	65	138	957	58
⑧	203	309	508	107	602
⑨	134	1 201	578	1 002	3 603
⑩	102	301	207	56	203
⑪	29	306	86	115	63
⑫	307	823	290	787	838

	Test F	Test G	Test H	Test I	Test J
①	1	5	2	1	0
②	5	9	7	6	10
③	29	49	18	38	17
④	14	12	13	17	16
⑤	24	21	27	26	29
⑥	405	10	6 200	1	700
⑦	759	567	149	233	761
⑧	130	1 002	206	704	108
⑨	203	301	572	1 540	2 669
⑩	106	307	308	305	103
⑪	208	213	874	94	507
⑫	965	808	915	725	908

### Fractions and decimals

	Test A	Test B	Test C	Test D	Test E
①	$\frac{1}{2}$	$\frac{3}{4}$	$\frac{2}{3}$	$\frac{1}{4}$	$\frac{3}{4}$
②	$\frac{1}{4}$	$\frac{7}{8}$	$\frac{1}{2}$	$\frac{2}{3}$	$\frac{5}{28}$
③	$\frac{4}{5}, \frac{9}{10}, \frac{19}{20}$	$\frac{4}{9}, \frac{7}{15}, \frac{2}{3}$	$\frac{4}{5}, \frac{5}{6}, \frac{6}{5}$	$\frac{1}{3}, \frac{3}{8}, \frac{5}{12}$	$\frac{11}{36}, \frac{1}{3}, \frac{13}{36}$
④	0.75	0.2	0.1	0.5	0.4
⑤	$\frac{7}{10}$	$\frac{13}{20}$	$\frac{9}{50}$	$\frac{2}{5}$	$\frac{8}{25}$
⑥	25%	55%	90%	62%	51%
⑦	$\frac{5}{6}$	0.66	$\frac{3}{8}$	75%	1.28
⑧	$\frac{1}{8}$	1.11	$\frac{1}{5}$	4.43	4.38
⑨	$\frac{2}{15}$	0.16	$\frac{5}{12}$	0.0084	0.24
⑩	$\frac{1}{4}$	2	$\frac{5}{6}$	15	0.9
⑪	60%	2	$\frac{3}{10}$	1.03	0.9
⑫	9	10	$\frac{3}{20}$	8.7	4

	Test F	Test G	Test H	Test I	Test J
①	$\frac{1}{2}$	$\frac{1}{8}$	$\frac{1}{3}$	$\frac{1}{3}$	$\frac{3}{4}$
②	$\frac{11}{12}$	$\frac{11}{24}$	$\frac{3}{4}$	$\frac{1}{2}$	$\frac{2}{9}$
③	$\frac{1}{4}, \frac{1}{3}, \frac{1}{2}$	$\frac{7}{12}, \frac{7}{11}, \frac{7}{10}$	$\frac{2}{5}, \frac{5}{4}, \frac{5}{2}$	$\frac{3}{10}, \frac{1}{3}, \frac{2}{5}$	$\frac{3}{4}, \frac{4}{3}, \frac{3}{2}$
④	0.25	0.15	0.03	0.8	0.85
⑤	$\frac{11}{25}$	$\frac{3}{20}$	$\frac{21}{25}$	$\frac{27}{100}$	$\frac{1}{4}$
⑥	20%	25%	50%	9%	75%

⑦	$\frac{5}{8}$	75%	1	1.1	$\frac{7}{9}$
⑧	$\frac{1}{4}$	0.33	$\frac{1}{12}$	0.5	$\frac{3}{8}$
⑨	$\frac{1}{12}$	0.0657	$\frac{9}{16}$	0.09	$\frac{3}{14}$
⑩	$\frac{3}{10}$	30	$\frac{1}{12}$	7	8
⑪	15%	$\frac{1}{30}$	6.3	6.4	$\frac{3}{10}$
⑫	$\frac{10}{3}$	$\frac{1}{3}$	0.11	$\frac{1}{12}$	0.99

### Exercise Pa

①	a	3 000	b	5 000	c	8 000	d	2 000
	e	6 000	f	10 000	g	9 000	h	13 000
	i	7 000	j	4 000	k	3 500	l	4 200
	m	6 800	n	8 100	o	5 900	p	10 400
	q	2 700	r	9 300				
②	a	3 850	b	2 440	c	8 390	d	6 050
	e	9 140	f	1 070	g	4 124	h	2 993
	i	7 625	j	5 704	k	3 009	l	2 058
	m	9 400	n	4 620	o	3 315	p	1 082
	q	5 050	r	6 108	s	7 008	t	1 004
③	a	5	b	8	c	10	d	1.5
	e	2.4	f	9.5	g	6.52	h	4.35
	i	7.33	j	3.748	k	1.375	l	5.822
	m	2.056	n	9.04	o	4.007	p	3.416
	q	7.502	r	6.847	s	10.5	t	8.42
	u	1.44	v	9.025	w	5.005	x	2.009
④	a	1.73	b	4.58	c	8.43	d	1.5
	e	1.05	f	2.8	g	1.01	h	1
	i	0.99	j	0.53	k	0.4	l	0.08
	m	0.19	n	0.05	o	0.5		
⑤	a	1	b	2	c	7	d	6.8
	e	4.1	f	1.4	g	3.726	h	9.504
	i	8.119	j	0.6	k	0.3	l	0.2
	m	0.051	n	0.06	o	0.003		

### Exercise Pb

①	a	10.2 kg	b	1.487 kg						
	c	2.885 kg	d	4 620 kg						
②	a	7.9 ℓ	b	1.28 ℓ						
	c	4.077 ℓ	d	5 150 ℓ						
③	a	<del>₹</del> 2 980	b	<del>₹</del> 3 175						
	c	<del>₹</del> 707	d	<del>₹</del> 875						
④	a	i \$1.39	ii	139c						
	b	i \$2.50	ii	250c						
	c	i \$19.53	ii	1 953c						
	d	i \$17.76	ii	1 776c						
⑤	a	150	b	75	c	100	d	3	e	$2\frac{1}{2}$
⑥	a	300	b	80	c	900	d	1 800	e	10 800

## Section 2: Suggested lesson plans

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.



**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  $32 \times 46 = 32 \times 2 \times 23 (= 1\ 472)$

and  $23 \times 64 = 23 \times 2 \times 32 = 32 \times 2 \times 23$   
(= 1 472)

Similarly  $43 \times 2 \times 34 = 43 \times 68 (= 2\ 924)$

and  $34 \times 2 \times 43 = 34 \times 86 (= 2\ 924)$

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.

**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  $S = \frac{1}{4} + \frac{1}{4^2} + \frac{1}{4^3} + \dots$  etc.

Then  $S = \frac{1}{4}(1 + \frac{1}{4} + \frac{1}{4^2} + \dots) \rightarrow S = \frac{1}{4}(1 + S)$

$\rightarrow 4S = (1 + S) \rightarrow 3S = 1$

$\rightarrow S = \frac{1}{3}$

**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.

**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 (% , 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  $1 \times 1$  square (2 ways), then a  $2 \times 2$  square (6 ways).

Using these results, there are 36 ways for a  $3 \times 3$  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

*edge:* 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  $4^{4-4} = 1$ .

## Worksheet 7

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

### 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,  $360^\circ = 1$  revolution

*acute angle:* an angle between  $0^\circ$  and  $90^\circ$

*right angle:* an angle of  $90^\circ$

*obtuse angle:* an angle between  $90^\circ$  and  $180^\circ$

*straight angle:* an angle of  $180^\circ$

*half turn:* a straight angle ( $180^\circ$ )

*reflex angle:* an angle between  $180^\circ$  and  $360^\circ$

*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*

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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.

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## 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.

**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.



**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

*chord:* straight line joining two points on the circumference of a circle

*diameter:* any chord through the centre of a circle

*sector:* region between two radii and the circumference

*semi-circle:* region between a diameter and the circumference

*segment:* region between a chord and the circumference

Note: on page 83 of the SB, parallel is incorrectly defined. Refer student's to the definition for parallel (lines), which is given below.

## 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?

Olanna (youngest)	Red dress	Teacher
Amina	Green dress	Lawyer
Chiamaka (oldest)	Yellow dress	Doctor

[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*

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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.

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## 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 13e.

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.

$$\text{Pages 1 to 9} = 1 \times 9 = 9 \text{ digits}$$

$$\text{Pages 10 to 99} = 2 \times 90 = 180 \text{ digits}$$

$$\text{Page 100} = 3 \text{ digits}$$

$$\text{Total: } 192 \text{ digits}$$

Now do the same for pages 101 to 200  
(=  $3 \times 100 = 300$  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 1 Area

*Student's Book page 111; Workbook page 35*

The focus of this lesson is basic area. Use this lesson to revise earlier chapters on plane shapes.

All students must complete the 'must do' questions of Exercise 14a.

Assign question 3 from Worksheet 14 as homework.

### 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  $h = 3$  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.

**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 ( $m^3$ ):* volume of a cube 1 m by 1 m by 1 m

*cubic centimetre ( $cm^3$ ):* 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  $cm^3$ )

*kilolitre:* 1 000  $\ell$

## 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.

Work through Examples 1–3 with the class.

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 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.

All students must complete the 'must do' questions of Exercise 16b.

Stronger students can complete the Shake hands puzzle on page 135 of the Student's Book.

Assign questions 6, 7, 8 and 10 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.

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.

**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:

	1	2	3	4	5	6
1						
2						
3						
4						
5						
6						

The shaded square shows the required outcomes.

$$= \frac{16}{36} \text{ or } \frac{4}{9} \text{ (four-ninths)}$$

**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.

# Chapter 18 Statistics 2: Presentation of data

## 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  $360^\circ$

## 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  $22 \times 200$  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.

**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*

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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.

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### 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  $90^\circ$  and  $60^\circ$ .

**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.

All students must complete the 'must do' questions of Exercise 21a.

Stronger students can complete question 9–10 of Exercise 21a.

Assign question 1a–b from Worksheet 21 as homework.

**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 Exercises 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 $90^\circ$

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

The focus of this lesson is constructing an angle of  $90^\circ$ .

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.

### Lesson 5 To construct an angle of $60^\circ$

*Student's Book page 176; Workbook page 56*

The focus of this lesson is constructing an angle of  $60^\circ$ .

Work through the text example with the class.

All students must complete the 'must do' questions of Exercise 21e.

Stronger students can complete the Consecutive products puzzle on page 177 of the Student's Book.

Assign question 3 from Worksheet 21 as homework.

### Answers

#### Puzzle: Five past five

At 5 o'clock the angle is  $\frac{5}{12}$  of  $360^\circ$  ( $= 150^\circ$ ).

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

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

Angle between the hands at five past five  
 $= 150^\circ - 30^\circ + 2\frac{1}{2}^\circ = 122\frac{1}{2}^\circ$ .

#### 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  $90^\circ$  and  $60^\circ$ .

# Chapter 22 Statistics 3: Averages

## 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.

Stronger students can complete questions 8–10 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.

# Chapter 23 Estimation and approximation

## 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.

Stronger students can complete Exercise 23c.

Assign questions 1 and 2 from Worksheet 23 as homework.

## 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.

Teacher's name: \_\_\_\_\_ Class name: \_\_\_\_\_  
Student's name: \_\_\_\_\_ Date: \_\_\_\_\_

### 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.

$\begin{array}{r} 634.7 \\ - 7.425 \\ \hline \end{array}$	
---	--

Teacher's name: \_\_\_\_\_ Class name: \_\_\_\_\_

Student's name: \_\_\_\_\_ Date: \_\_\_\_\_

## 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 ~~R~~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  $\frac{750}{1\,000\,000}$  \_\_\_\_\_

Teacher's name: \_\_\_\_\_ Class name: \_\_\_\_\_

Student's name: \_\_\_\_\_ Date: \_\_\_\_\_

### 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.

8	12	16

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.

\_\_\_\_\_

\_\_\_\_\_

Teacher's name: \_\_\_\_\_ Class name: \_\_\_\_\_

Student's name: \_\_\_\_\_ Date: \_\_\_\_\_

### Chapter 4 Revision test

1 Find the missing numbers.

a  $\frac{17}{6} = 2\frac{\square}{6}$  \_\_\_\_\_ b  $6\frac{7}{8} = \frac{\square}{8}$  \_\_\_\_\_

c  $\frac{4}{7} = \frac{\square}{56}$  \_\_\_\_\_

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  $5\frac{1}{3} \times 3\frac{1}{4}$  \_\_\_\_\_

6 Simplify.

a  $6\frac{3}{4} \div 9$  \_\_\_\_\_ b  $4\frac{2}{7} \div \frac{3}{14}$  \_\_\_\_\_

c  $5\frac{2}{5} \div 4\frac{2}{3}$  \_\_\_\_\_

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?

\_\_\_\_\_

Teacher's name: \_\_\_\_\_ Class name: \_\_\_\_\_

Student's name: \_\_\_\_\_ Date: \_\_\_\_\_

### 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  $w = 21 \div 3$  \_\_\_\_\_ b  $x = 3 \times 8$  \_\_\_\_\_

c  $39 = y \times 3$  \_\_\_\_\_ d  $9 = z \div 8$  \_\_\_\_\_

6 Each sentence is true. Find the numbers that the letters stand for.

a  $m + m = 20$  \_\_\_\_\_ b  $32 - n = n$  \_\_\_\_\_

c  $64 \div p = p$  \_\_\_\_\_ d  $q \times q = 1$  \_\_\_\_\_

7 Find the value of the following when  $y = 5$ .

a  $y + 9$  \_\_\_\_\_ b  $9 - y$  \_\_\_\_\_

c  $5 \div y$  \_\_\_\_\_ d  $y \times 8$  \_\_\_\_\_

8 Find the value of the following when  $z = 11$ .

a  $z + z$  \_\_\_\_\_ b  $z - z$  \_\_\_\_\_

c  $9 + (z \div z)$  \_\_\_\_\_ 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  $n$ ?  
\_\_\_\_\_

Teacher's name: \_\_\_\_\_ Class name: \_\_\_\_\_

Student's name: \_\_\_\_\_ Date: \_\_\_\_\_

### Chapter 6 Revision test

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

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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.

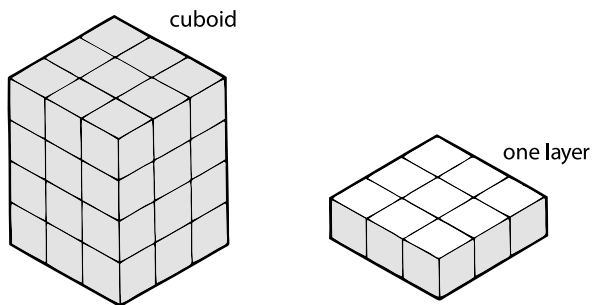


Fig. 1

- 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

Number of vertices, faces and edges that I can see in Fig. 2			Number of vertices, faces and edges altogether on a solid hexagonal prism		
Vertices	Faces	Edges	Vertices	Faces	Edges

Table 1

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

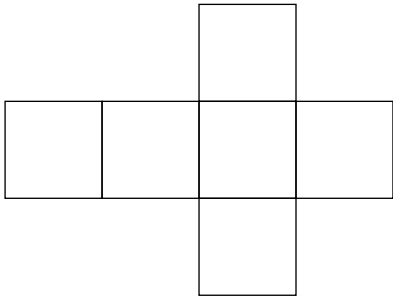


Fig. 3

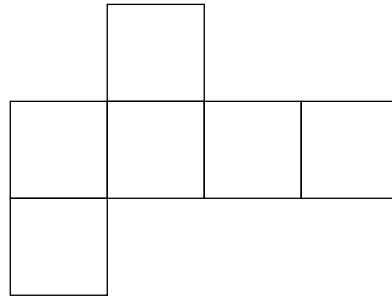


Fig. 4

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

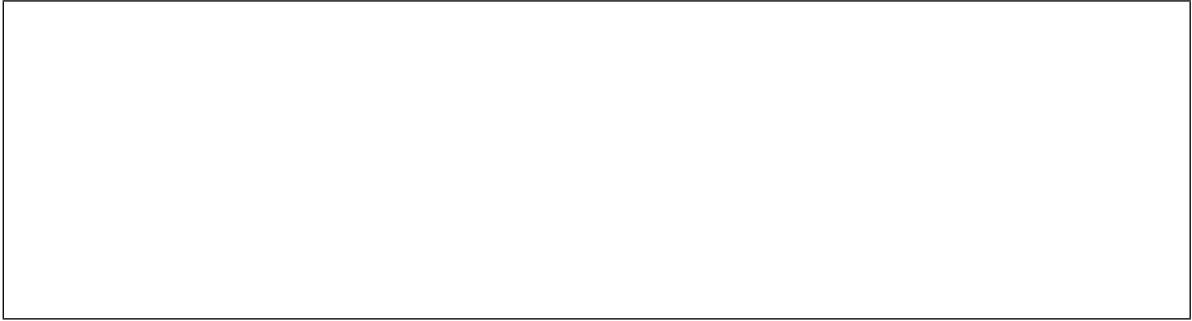
5 Use the method of Fig. 6.22 on page 43 of the Student's Book to draw a skeleton view of a triangular prism.

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:

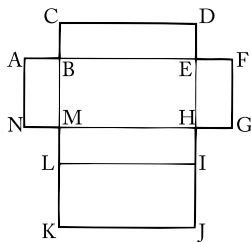


Fig. 5

a Which edge will join to IJ? \_\_\_\_\_

b Which points will join to point J? \_\_\_\_\_

9 Look at Fig. 6.

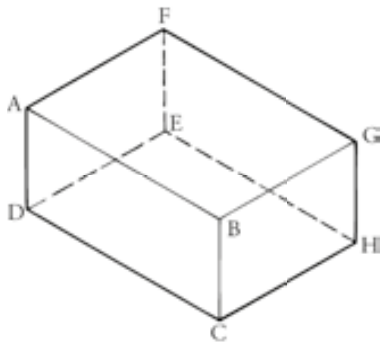


Fig. 6

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 \_\_\_\_\_

Teacher's name: \_\_\_\_\_

Class name: \_\_\_\_\_

Student's name: \_\_\_\_\_

Date: \_\_\_\_\_

### 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  $9b + 2 - 9 + b$  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?

\_\_\_\_\_

Teacher's name: \_\_\_\_\_ Class name: \_\_\_\_\_

Student's name: \_\_\_\_\_ Date: \_\_\_\_\_

### 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.

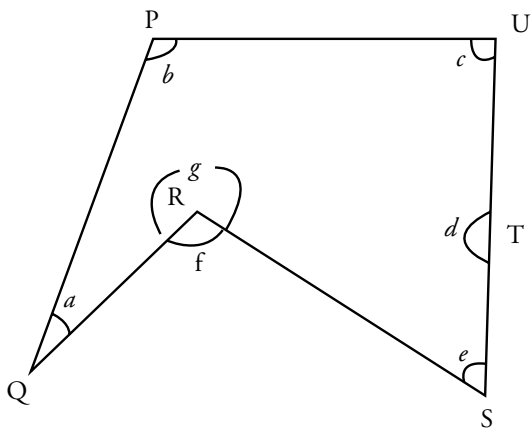


Fig. 7

angle	name of angle	type of angle
<i>a</i>	PQR or RQP	acute
<i>b</i>		
<i>c</i>		
<i>d</i>		
<i>e</i>		
<i>f</i>		
<i>g</i>		

Table 2

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

a \_\_\_\_\_ b \_\_\_\_\_

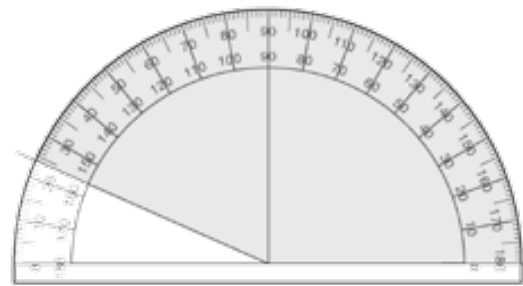
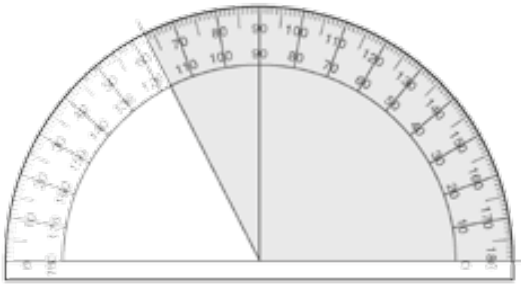


Fig. 8

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

\_\_\_\_\_

\_\_\_\_\_

7 Use a protractor to construct an angle of:

a  $55^\circ$                       b  $116^\circ$ .

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

a Use a protractor to measure the four angles of the quadrilateral.

b Find the sum of the four angles.

\_\_\_\_\_

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



---

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**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?



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Teacher's name: \_\_\_\_\_ Class name: \_\_\_\_\_

Student's name: \_\_\_\_\_ Date: \_\_\_\_\_

### 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  $5.93 \times 1\,000$  \_\_\_\_\_

b  $23.8 \div 100$  \_\_\_\_\_

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  $4\frac{7}{16}$  \_\_\_\_\_

7 Express the following as terminating decimals.

a  $\frac{5}{9}$  \_\_\_\_\_

b  $4\frac{1}{6}$  \_\_\_\_\_

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  $0.\dot{1}\dot{6}$  \_\_\_\_\_

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

\_\_\_\_\_

Teacher's name: \_\_\_\_\_ Class name: \_\_\_\_\_

Student's name: \_\_\_\_\_ Date: \_\_\_\_\_

### 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 ₦10 000 per chair?  
\_\_\_\_\_

b What is cost of  $m$  of the above chairs?  
\_\_\_\_\_

c What is the cost of 6 chairs at ₦ $y$  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 ₦5 000 is shared equally between  $x$  girls. One of the girls spends ₦360.  
How many naira does she have left?  
\_\_\_\_\_

Teacher's name: \_\_\_\_\_

Class name: \_\_\_\_\_

Student's name: \_\_\_\_\_

Date: \_\_\_\_\_

### Chapter 11 Revision test

In Fig. 9, ABCD is a rectangle with centre O.

Use Fig. 9 to answer Questions 1 to 3.

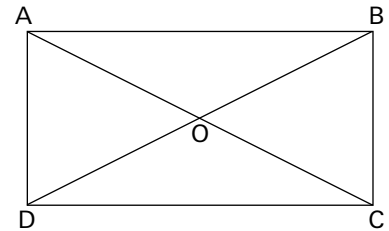


Fig. 9

- 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  $\hat{OAB}$ . \_\_\_\_\_

In Fig. 10, PQRS is a square with centre M.

Use Fig. 10 to answer Questions 4 and 5.

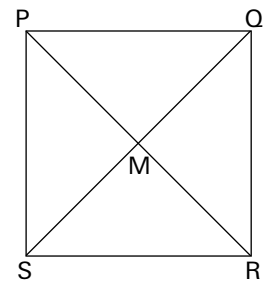


Fig. 10

4 Name as many isosceles triangles as you can.  
\_\_\_\_\_

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

In Fig. 11,  $\triangle XYZ$  is isosceles. MY is its line of symmetry.

Use Fig. 11 to answer Questions 6 and 7.

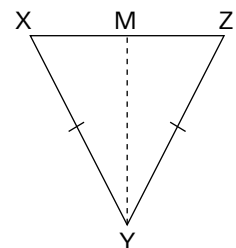


Fig. 11

6 If  $\hat{XYZ} = 34^\circ$ , 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  $\triangle XYZ$ ?  
\_\_\_\_\_

8 How many equilateral triangles can you see in each of the shapes in Fig. 12?  
\_\_\_\_\_

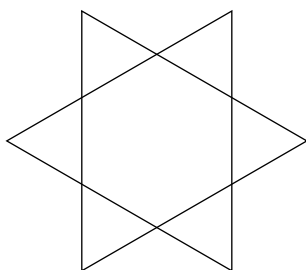
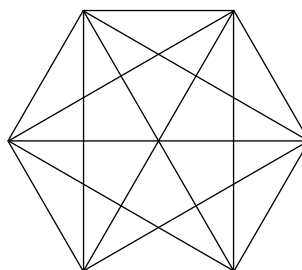


Fig. 12





9 a Are all the shapes in Fig. 13 quadrilaterals? \_\_\_\_\_

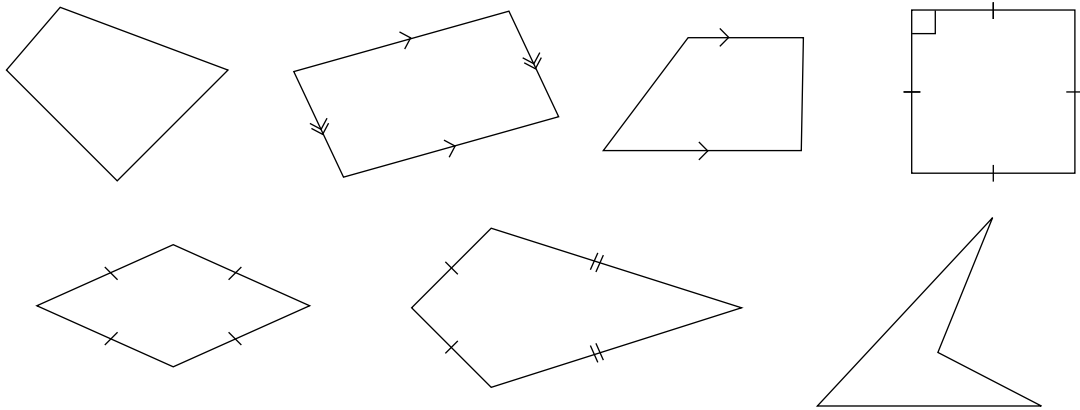


Fig. 13

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?

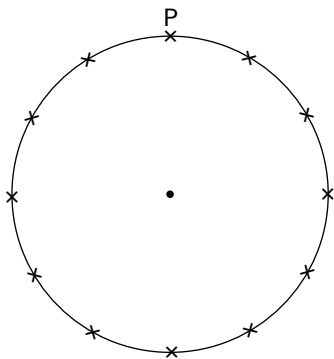
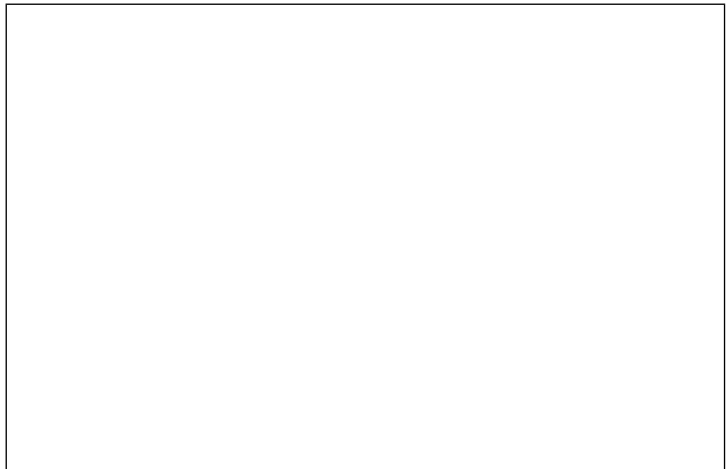


Fig. 14



Teacher's name: \_\_\_\_\_

Class name: \_\_\_\_\_

Student's name: \_\_\_\_\_

Date: \_\_\_\_\_

### 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  $9^{\circ}\text{C}$ . At night the temperature falls by  $13^{\circ}\text{C}$ . What is the night temperature?

\_\_\_\_\_

3 Abudu and Baba have no money, but Abudu owes  $\text{N}450$  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  $\text{N}23\,467$  in her bank account. She writes a cheque for  $\text{N}39\,500$ . 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.

**a**

		Second						
add		-3	-2	-1	0	+1	+2	+3
First	-3							
	-2							
	-1							+2
	0							
	+1							
	+2							
	+3							

**b**

		Second						
subtract		-3	-2	-1	0	+1	+2	+3
First	-3							
	-2							
	-1							-4
	0							
	+1							
	+2							
	+3							

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  $7.2\text{ }^\circ\text{C} - 9.6\text{ }^\circ\text{C}$

---

f  $-5.4\text{ }^\circ\text{C} + 8.6\text{ }^\circ\text{C}$

---

Teacher's name: \_\_\_\_\_ Class name: \_\_\_\_\_

Student's name: \_\_\_\_\_ Date: \_\_\_\_\_

### 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.

	length	breadth	perimeter
a	8 m	5 m	
b	9.3 m	7 m	
c	7 cm	7 cm	
d	5.1 km		15.4 km
e		4.4 cm	25 cm
f	12 cm		48 cm

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.

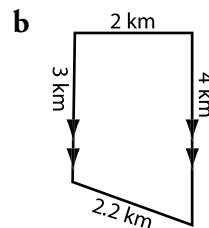
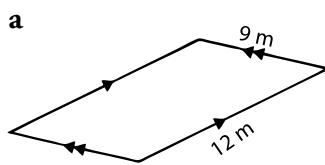


Fig. 16

\_\_\_\_\_

\_\_\_\_\_

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  $\pi$ .)

---

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  $\pi$  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  $\pi$ .

---

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

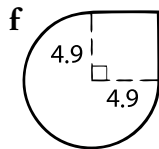
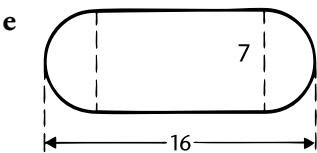
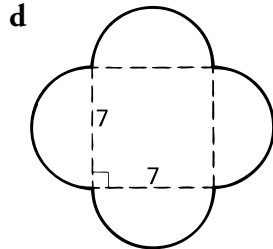
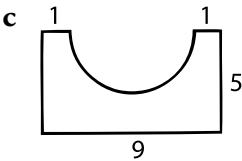
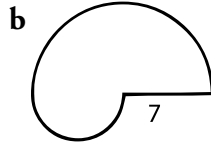
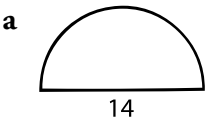


Fig. 17

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Teacher's name: \_\_\_\_\_

Class name: \_\_\_\_\_

Student's name: \_\_\_\_\_

Date: \_\_\_\_\_

### Chapter 14 Revision test

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

	length	breadth	area
<b>a</b>	8 m	5 m	
<b>b</b>	7 cm	7 cm	
<b>c</b>	9.3 m	7 m	
<b>d</b>	5.1 km		30.6 km <sup>2</sup>
<b>e</b>		3.2 cm	28 cm <sup>2</sup>
<b>f</b>	11 m		121 m <sup>2</sup>

Table 4

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

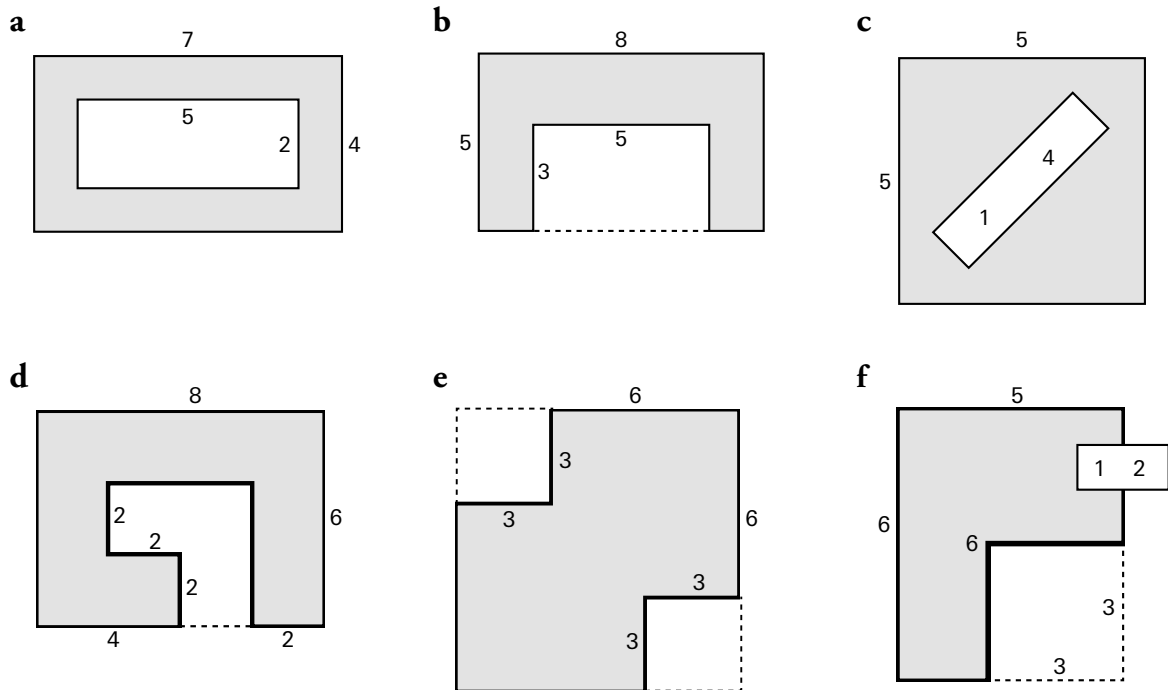


Fig. 18

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---

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  $\text{m}^2$ .

---

4 What is the area, in  $\text{m}^2$ , 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.

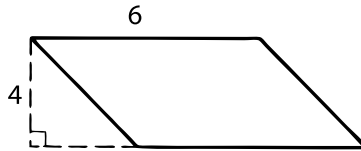
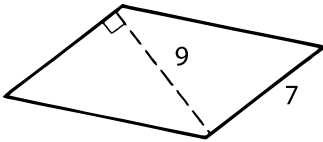


Fig. 19

---

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

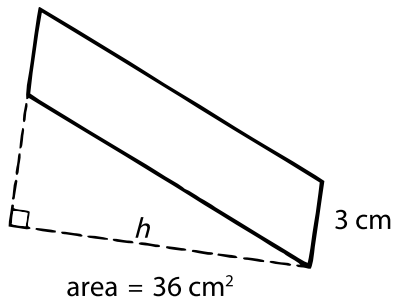


Fig. 20

---

8 Calculate the areas of the quadrilaterals in Fig. 21.

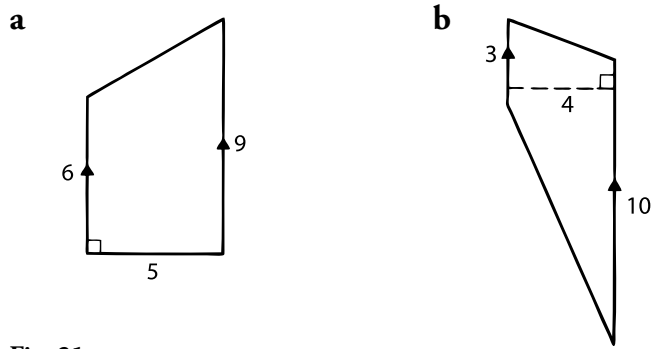


Fig. 21

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

	radius	diameter	area
<b>a</b>	35 cm		
<b>b</b>		8 m	
<b>c</b>			1 386 cm <sup>2</sup>

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.

\_\_\_\_\_



Teacher's name: \_\_\_\_\_ Class name: \_\_\_\_\_

Student's name: \_\_\_\_\_ Date: \_\_\_\_\_

### 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  $18n \div 6$  \_\_\_\_\_

b  $\frac{15m^2}{5}$  \_\_\_\_\_

c  $\frac{44xy^2}{4xy}$  \_\_\_\_\_

3 Simplify as far as possible.

a  $7x \times 3 - 13x$  \_\_\_\_\_

b  $8n + 18n \div 6$  \_\_\_\_\_

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  $28r \div 4 + 2r + 1 \times 5r - 5$  \_\_\_\_\_

b  $3s \times 2 + 8s \div 2 - 9s$  \_\_\_\_\_

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  $\text{N}p$  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?  
\_\_\_\_\_

Teacher's name: \_\_\_\_\_ Class name: \_\_\_\_\_

Student's name: \_\_\_\_\_ Date: \_\_\_\_\_

### Chapter 16 Revision test

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

Qu	length	breadth	height	volume
1	8 m	5 m	2 m	
2	9 cm	4 cm	$2\frac{1}{2}$ cm	
3	3 m	7 m		$84 \text{ m}^3$
4	4 cm		30 cm	$180 \text{ cm}^3$

Table 6

5 What is the difference in volume between a  $5 \text{ cm} \times 5 \text{ cm} \times 5 \text{ cm}$  cube and a  $2 \text{ cm} \times 4 \text{ cm} \times 16 \text{ cm}$  cuboid?

\_\_\_\_\_

\_\_\_\_\_

6 A classroom is 2.8 m high and has a volume of  $182 \text{ m}^3$ . 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  $8 \text{ m} \times 5 \text{ m} \times 3 \text{ m}$ .

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.

	height of prism	area of end face	volume of prism
9	35 cm	$4 \text{ cm}^2$	
10		$14 \text{ m}^2$	$140 \text{ m}^3$

Table 7

Teacher's name: \_\_\_\_\_ Class name: \_\_\_\_\_  
Student's name: \_\_\_\_\_ Date: \_\_\_\_\_

### 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.

Education institution	2003	2013
Nursery schools	34	340
Primary schools	2 143	2 696
Junior Secondary Schools (only)	0	157
Senior Secondary Schools (only)	0	49
Combined Secondary Schools (JSS + SSS)	212	439
Teacher Colleges	22	24
Universities	1	4

**Table 8**

- Which type of educational institution:
  - do you attend now \_\_\_\_\_
  - have you attended in the past? \_\_\_\_\_
- How many primary schools were there in the country in 2013?  
\_\_\_\_\_
- How many primary schools were built between 2003 and 2013?  
\_\_\_\_\_
- Which type of school showed the greatest rate of increase?  
\_\_\_\_\_
- Mention one possible reason for this increase.  
\_\_\_\_\_
- How many schools accepted Primary School leavers in 2003?  
\_\_\_\_\_
- How many schools altogether accepted Primary School leavers in 2013?  
\_\_\_\_\_
- 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?  
\_\_\_\_\_
- Name one reason for the introduction of JSS (only) schools during the period.  
\_\_\_\_\_
- Do you think that 24 Teacher Colleges will be enough after 2013? Give reasons.  
\_\_\_\_\_  
\_\_\_\_\_

Teacher's name: \_\_\_\_\_

Class name: \_\_\_\_\_

Student's name: \_\_\_\_\_

Date: \_\_\_\_\_

### 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.

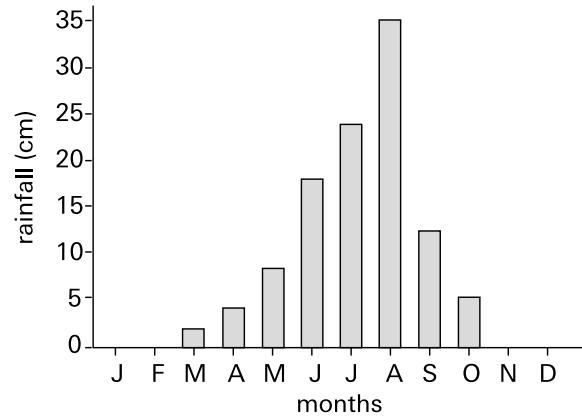


Fig. 22

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.

\_\_\_\_\_

Teacher's name: \_\_\_\_\_ Class name: \_\_\_\_\_

Student's name: \_\_\_\_\_ Date: \_\_\_\_\_

### Chapter 19 Revision test

1 Say whether the following are true or false.

a  $\square - 8 = 5$  when 13 goes in the box. \_\_\_\_\_

b  $11 + \square = 15$  when 26 goes in the box. \_\_\_\_\_

c  $\frac{\square}{8} = 4$  when 2 goes in the box. \_\_\_\_\_

d  $19 \times 2 = \square$  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  $10 = 8y - 52$  \_\_\_\_\_

Teacher's name: \_\_\_\_\_

Class name: \_\_\_\_\_

Student's name: \_\_\_\_\_

Date: \_\_\_\_\_

### Chapter 20 Revision test

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



Fig. 23

2 In Fig. 24,  $\hat{BXC} = 36^\circ$  and  $\hat{AXD} = 126^\circ$ .

a If  $\hat{BXD}$  is a right angle, calculate  $\hat{CXD}$  and  $\hat{AXB}$ .

\_\_\_\_\_

b Find the size of  $\hat{AXC}$ .

\_\_\_\_\_

c In what way could the drawing be improved?

\_\_\_\_\_

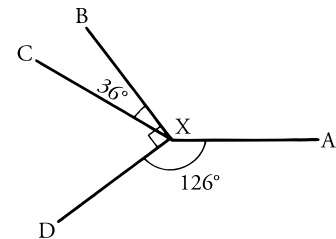


Fig. 24

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

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

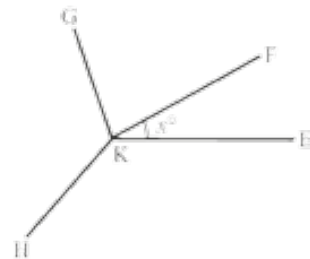


Fig. 25

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.

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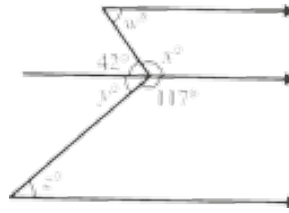


Fig. 26

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

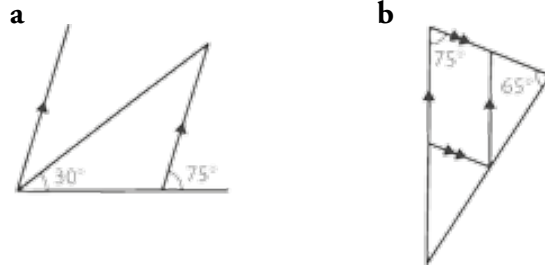


Fig. 27

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

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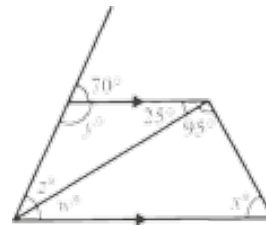


Fig. 28

8 Two angles of a triangle are  $45^\circ$  and  $76^\circ$ .  
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.

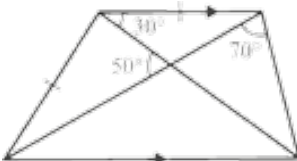


Fig. 29

Teacher's name: \_\_\_\_\_

Class name: \_\_\_\_\_

Student's name: \_\_\_\_\_

Date: \_\_\_\_\_

### 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  $50^\circ$  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,  $\hat{Q} = 70^\circ$  and  $\hat{R} = 80^\circ$ . Measure PR.
- 3 Look at Fig. 30. Measure the perpendicular distance of point E from the top edge of the page of this book.

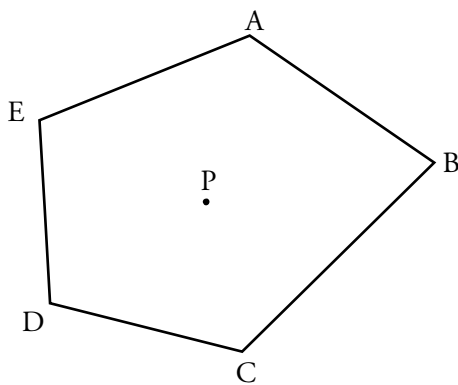
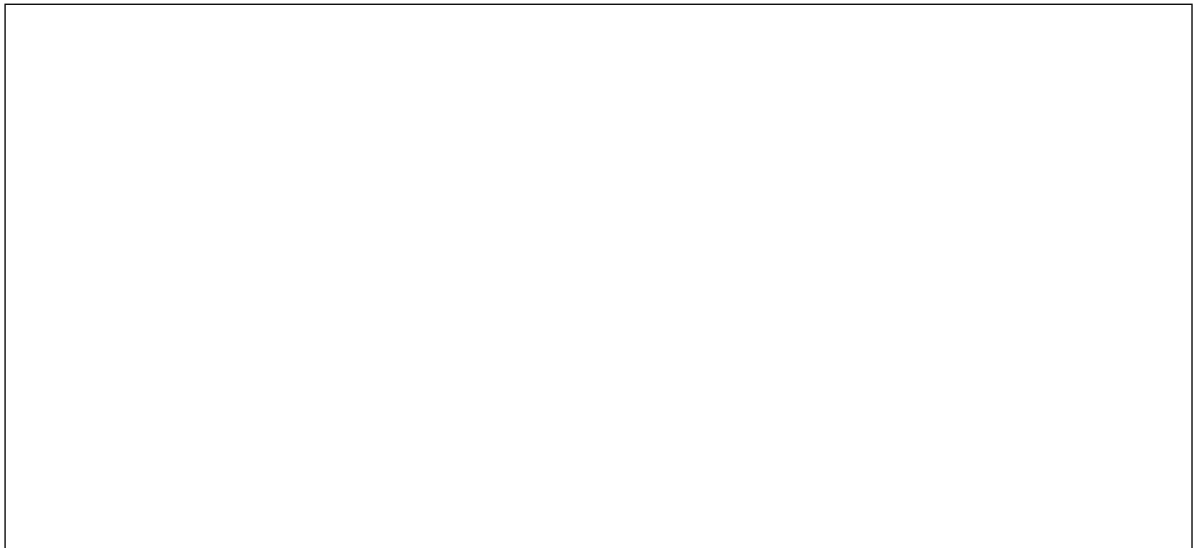


Fig. 30

- 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  $\triangle ABC$ , 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  $\hat{A}BC$ .

---

**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  $\triangle ABC$ .
  - 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  $\triangle PQR$ .
  - 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?
-

Teacher's name: \_\_\_\_\_

Class name: \_\_\_\_\_

Student's name: \_\_\_\_\_

Date: \_\_\_\_\_

## Chapter 22 Revision test

1 Calculate the mean of the following.

a 7, 5, 14, 12, 5, 11

\_\_\_\_\_

b ₦2 400, ₦1 800, ₦1 400, ₦1 400, ₦1 200

\_\_\_\_\_

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:

23 °C, 25 °C, 24 °C, 26 °C, 25 °C, 26 °C, 26 °C.

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 ₦280, ₦750, ₦320, ₦960, ₦990, ₦480

\_\_\_\_\_

6 State the modes of the following.

a 18, 18, 18, 26, 26, 36, 37 \_\_\_\_\_

b ₦200, ₦700, ₦700, ₦900, ₦900, ₦900, ₦900 \_\_\_\_\_

7 Find the mode (or modes) of the following.

a 9, 10, 8, 10, 5, 4, 4, 5, 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.

<b>mark</b>	5	6	7	8	9	10
<b>frequency</b>						

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.

<b>age (years)</b>	14	15	16	17
<b>frequency</b>	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.

\_\_\_\_\_

Teacher's name: \_\_\_\_\_ Class name: \_\_\_\_\_

Student's name: \_\_\_\_\_ Date: \_\_\_\_\_

### 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 \_\_\_\_\_      d 3.96 \_\_\_\_\_

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  $14.8 \times 3.3$

b  $1\frac{2}{3} + 9\frac{1}{2}$

\_\_\_\_\_

9 a Estimate the value of  $28 \times 0.745$  by rounding to 1 s.f.

\_\_\_\_\_

b Which of the following is likely to be the accurate value of  $28 \times 0.745$ :

- 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.

\_\_\_\_\_

Teacher's name: \_\_\_\_\_ Class name: \_\_\_\_\_

Student's name: \_\_\_\_\_ Date: \_\_\_\_\_

### 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 revision test answers

## 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 a  $\Lambda \cdot \Delta$       b 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 ~~£~~2 650 000 000 000
- 7 a 700 000 £      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  $140 = 2 \times 2 \times 5 \times 7 = 2^2 \times 5 \times 7$
- 5  $144 = 2^4 \times 3^2$
- 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  $2^3 \times 3^2 \times 5^2 \times 7$

## Chapter 4 Revision test

- 1 a 5      b 55      c 32
- 2 a  $\frac{3}{20}$       b  $\frac{5}{13}$       c  $\frac{7}{8}$
- 3 a  $\frac{19}{12}$  ( $1\frac{7}{12}$ )      b  $\frac{13}{24}$       c  $\frac{85}{12}$  ( $7\frac{1}{12}$ )
- 4  $\frac{7}{24}$
- 5 a 10      b  $5\frac{1}{3}$       c  $17\frac{1}{3}$
- 6 a  $\frac{3}{4}$       b 20      c  $\frac{81}{70}$  ( $1\frac{11}{70}$ )
- 7  $\frac{4}{15}$       8  $\frac{1}{18}$       9  $12\frac{1}{2}\%$       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 ~~₹~~90      b ~~₹~~150
- 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

Number of vertices, faces and edges seen			Number of vertices, faces and edges on a solid hexagonal prism		
vertices	faces	edges	vertices	faces	edges
10	4	13	12	8	18

4 Nets of a cube:

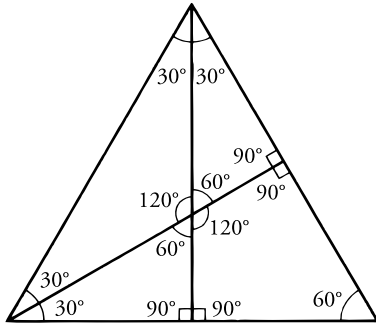


Fig. 31

- 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  $\frac{1}{4}$   
 2  $120^\circ$   
 3 a  $133^\circ$               b  $13^\circ$   
 4

angle	name of angle	type of angle
$a$	PR or RP	acute
$b$	QU or UQ	obtuse
$c$	PT or TP	right
$d$	US or SU	straight
$e$	TR or RT	acute
$f$	QS or SQ	obtuse
$g$	QS or SQ	reflex

Table 11

- 5 a  $117^\circ$               b  $161^\circ$

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

### 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 4.437 5  
 7 a  $0.\dot{5}$       b  $4.1\dot{6}$   
 8 a  $\frac{17}{20}$       b  $3\frac{17}{25}$   
 9 a 75%      b  $17\frac{1}{2}\%$       c 0.2%      d  $16\frac{2}{3}\%$   
 10 ₦27 090

### Chapter 10 Revision test

- 1 a ~~₦~~420                      b ~~₦~~( $n + 80$ )  
 2 a 1 m 58 cm              b ( $x - 7$ ) cm  
 c ( $8y + 7$ )  
 3 a 21                      b  $7w$                       c  $\frac{x}{7}$   
 4 a ~~₦~~40 000      b ~~₦~~10 000 $m$       c ~~₦~~6 $y$   
 5 1 000 $k$  g  
 6 a  $\frac{5}{n}$  m                      b  $\frac{500}{n}$  cm  
 7 a Team A      b  $\frac{n}{3}$  points  
 8  $9x$  m<sup>2</sup>  
 9 ( $7x - 13$ ) days  
 10 ~~₦~~( $\frac{5000}{x} - 360$ )

### Chapter 11 Revision test

- 1 a DC              b DB              c BC  
 d BO, CO, DO  
 2  $\hat{A}OB, \hat{C}OD$   
 3  $\hat{O}BA, \hat{O}CD, \hat{O}DC$   
 4 PQR, QRS, RSP, SPQ, PMQ, QMR, RMS, SMP  
 5  $45^\circ, 90^\circ, 45^\circ$   
 6  $\hat{X}YM = \hat{Z}YM = 17^\circ, \hat{Y}MX = \hat{Y}MZ = 90^\circ, \hat{M}XY = \hat{M}ZY = 73^\circ$   
 7 10 cm  
 8 8, 14  
 9 a yes

- b scalene quadrilateral, parallelogram, trapezium, square, rhombus, re-entrant quadrilateral, kite

10 A heart shape

### Chapter 12 Revision test

- 1 a 4      b -4      c 3  
d 0      e 2      f -7

2 4 °C

3 ₦900

- 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 ₦16 033

7 13 BC

8 a

+	-3	-2	-1	0	+1	+2	+3
-3	-6	-5	-4	-3	-2	-1	0
-2	-5	-4	-3	-2	-1	0	+1
-1	-4	-3	-2	-1	0	+1	+2
0	-3	-2	-1	0	+1	+2	+3
+1	-2	-1	0	+1	+2	+3	+4
+2	-1	0	+1	+2	+3	+4	+5
+3	0	+1	+2	+3	+4	+5	+6

b

-	-3	-2	-1	0	+1	+2	+3
-3	0	-1	-2	-3	-4	-5	-6
-2	+1	0	-1	-2	-3	-4	-5
-1	+2	+1	0	-1	-2	-3	-4
0	+3	+2	+1	0	-1	-2	-3
+1	+4	+3	+2	+1	0	-1	-2
+2	+5	+4	+3	+2	+1	0	-1
+3	+6	+5	+4	+3	+2	+1	0

- 9 a +6      b 0      c +450  
d -120      e +2x      f +46y

- 10 a  $-\frac{1}{2}$       b +3.5      c +8.7  
d  $-2\frac{1}{6}$       e  $-2.4$  °C      f  $+3.2$  °C

### Chapter 13 Revision test

- 1 Discuss with classmates  
2 Compare with classmates

3

	length	breadth	perimeter
a	8 m	5 m	26 m
b	9.3 m	7 m	32.6 m
c	7 cm	7 cm	28 cm
d	5.1 km	2.6 km	15.4 km
e	8.1 cm	4.4 cm	25 cm
f	12 cm	12 cm	48 cm

Table 12

4 2 600 m (or 2.6 km)

5 a 42 m      b 11.2 km

6 7.5 cm      7 65.94 cm      8 31.4 m

9 568

10 using  $\frac{22}{7}$  for pi:

a 36      b 40      c 32

d 44      e Please ask maths checker to provide answer

for e. Measurements have been corrected in question.

f 21.35

### Chapter 14 Revision test

1

	length	breadth	area
a	8 m	5 m	40 m <sup>2</sup>
b	7 cm	7 cm	49 cm <sup>2</sup>
c	9.3 m	7 m	65.1 m <sup>2</sup>
d	5.1 km	6 km	30.6 km <sup>2</sup>
e	8.75 cm	3.2 cm	28 cm <sup>2</sup>
f	11 m	11 m	121 m <sup>2</sup>

Table 13

2 a 18 m<sup>2</sup>      b 25 m<sup>2</sup>      c 21 m<sup>2</sup>

d 36 m<sup>2</sup>      e 63 m<sup>2</sup>      f 20 m<sup>2</sup>

3 a 14 m<sup>2</sup>      b ₦33 600

4 36 m<sup>2</sup>      5 720 g

6 a 63 cm<sup>2</sup>      b 24 cm<sup>2</sup>

7 12 cm

8 a 37.5 cm<sup>2</sup>      b 26 cm<sup>2</sup>

9

	radius	diameter	area
a	35 cm	70 cm	3 850 cm <sup>2</sup>
b	4 m	8 m	50 $\frac{2}{7}$ m <sup>2</sup>
c	21 cm	42 cm	1 386 cm <sup>2</sup>

Table 14

10 a 1.5 m      b 7 m<sup>2</sup> (actually 7.065 m<sup>2</sup>)



## 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  $\text{N}(p + 200)$       b  $\text{N}(4p + 200)$   
 10  $2n + 1$

## Chapter 16 Revision test

Qu.	length	breadth	height	volume
1	8 m	5 m	2 m	$80 \text{ m}^3$
2	9 cm	4 cm	$2\frac{1}{2} \text{ cm}$	$90 \text{ cm}^3$
3	3 m	7 m	4 m	$84 \text{ m}^3$
4	4 cm	1.5 cm	30 cm	$180 \text{ cm}^3$

Table 15

- 5  $3 \text{ cm}^3$       6  $65 \text{ m}^2$       7  $5 \ell$   
 8 a  $120 \text{ kl}$       b 8 days

Qu.	height of prism	area of end face	volume of prism
9	35 cm	$4 \text{ cm}^2$	$140 \text{ cm}^3$
10	10 m	$14 \text{ m}^2$	$140 \text{ m}^3$

Table 16

## Chapter 17 Revision test

- 1 Students' own answers  
 2 2 696  
 3 5 543  
 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  $x = 5$       7  $q = 7$       8  $x = 4\frac{1}{3}$   
 9  $m = 9$       10  $y = 7\frac{3}{4}$

## Chapter 20 Revision test

- 1 a  $t = 122^\circ$  (angles on a straight line)  
      $v = 23^\circ$  ( $v + 35^\circ$  vertically opposite to  $58^\circ$ )  
      $w = 122^\circ$  (vertically opposite to  $t$ )  
 b  $x = 90^\circ$  (angles on a straight line)  
      $y = 62^\circ$  ( $y + 28^\circ$  vertically opposite to right angle)  
      $z = 49^\circ$  ( $z + 41^\circ$  vertically opposite to  $x$ )  
 2 a  $\widehat{CXD} = 54^\circ$ ,  $\widehat{AXB} = 144^\circ$   
 b  $\widehat{AXC} = 180^\circ$   
 c  $AXC$  is a straight line.  
 3  $x + 2x + 3x + 4x = 360$ ,  $x = 36$ ;  $\widehat{EKF} = 36^\circ$ ,  
      $\widehat{FKG} = 72^\circ$ ,  $\widehat{GKH} = 108^\circ$ ,  $\widehat{HKE} = 144^\circ$   
 4 Acute angles are  $68^\circ$ ; obtuse angles are  $112^\circ$ .  
 5  $w = 42^\circ$  (alternate angles)  
      $x = 138^\circ$  (angles on a straight line)  
      $y = 63^\circ$  (angles on a straight line)  
      $z = 63^\circ$  (alternate angles)  
 6 a  $45^\circ, 45^\circ, 105^\circ$   
 b  $4 \times 75^\circ, 2 \times 105^\circ, 2 \times 65^\circ, 2 \times 40^\circ$

- 7  $w = 25^\circ$  (alternate angles)  
 $x = 60^\circ$  (sum of angles of triangle)  
 $y = 110^\circ$  (angles on a straight line)  
 $z = 45^\circ$  (sum of angles of triangle)

8  $59^\circ$

- 9 **a**  $x + 2x + 51^\circ = 180^\circ$       **b**  $x = 43^\circ$   
**c**  $43^\circ, 51^\circ, 86^\circ$

- 10  $3 \times 20^\circ, 2 \times 30^\circ, 2 \times 50^\circ, 2 \times 130^\circ, 1 \times 60^\circ,$   
 $1 \times 70^\circ, 1 \times 110^\circ$

### 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  $\square ABCD$   
**d** AB = 5 cm  
7 **a** Construction of  $\triangle ABC$     **b** AB = 7.6 cm  
**c**  $\hat{A}BC = 46.4^\circ$   
8 **a** Construction of  $\square$  with sides 5 cm  
**b** 7.6 cm  
9 **a–c** Any large  $\triangle ABC$   
**d** The circle passes through A, B and C.  
10 **a–c** Any large  $\triangle PQR$   
**d** The three lines meet at a single point.

### Chapter 22 Revision test

- 1 **a** 9                      **b**  $\text{N}1\ 640$   
2 36                        **3**  $25^\circ\text{C}$   
4 **a** 19                    **b** 50  
5 **a** 13                    **b**  $\text{N}615$   
6 **a** 18                    **b**  $\text{N}900$   
7 **a** 5 and 10 (bimodal)      **b** 0

8 **a**

mark	5	6	7	8	9	10
frequency	2	2	3	5	3	2

Table 17

**b** 8 marks

- 9 6, 7, 8, 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 =  $15\frac{8}{15}$  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  $\frac{1}{2}$  up)  
9 **a** 21    **b** 20.86  
10 5 400  $\ell$

### Chapter 24 Revision test

- 1  $7 \times 10^3 + 4 \times 10^2 + 0 \times 10^1 + 8 \times 1$   
2  $3 \times 5^2 + 1 \times 5^1 + 4 \times 1$   
3  $1 \times 2^4 + 1 \times 2^3 + 0 \times 2^2 + 1 \times 2^1 + 0 \times 1$   
4  $110111 (= 1 \times 2^5 + 1 \times 2^4 + 0 \times 2^3 + 1 \times 2^2 + 1 \times 2^1 + 1 \times 1)$   
5 30  
6  $11001_{\text{two}} = 25_{\text{ten}}$   
7  $1001_{\text{two}}$   
8  $11_{\text{two}}$   
9  $11010_{\text{two}}$   
10  $100010_{\text{two}}$

## Term revision test sheets

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.

Teacher's name: \_\_\_\_\_

Class name: \_\_\_\_\_

Student's name: \_\_\_\_\_

Date: \_\_\_\_\_

### 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.

\_\_\_\_\_

Teacher's name: \_\_\_\_\_ Class name: \_\_\_\_\_

Student's name: \_\_\_\_\_ Date: \_\_\_\_\_

### Term Revision test 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  $\frac{1}{2}$ ?

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  $6\frac{3}{4} \div 5\frac{5}{8}$ .

\_\_\_\_\_

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?

\_\_\_\_\_

Teacher's name: \_\_\_\_\_

Class name: \_\_\_\_\_

Student's name: \_\_\_\_\_

Date: \_\_\_\_\_

### 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 ₦ $n$ . She gives ₦180 to her brother and spends the other ₦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 ₦ $x$  each. He sells them all for ₦ $y$  each. What is his profit?

\_\_\_\_\_

Teacher's name: \_\_\_\_\_

Class name: \_\_\_\_\_

Student's name: \_\_\_\_\_

Date: \_\_\_\_\_

### 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

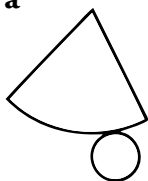
C square

D hexagon

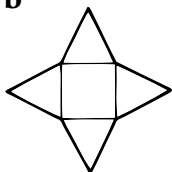
E circle.

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

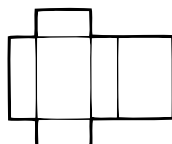
a



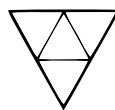
b



c



d



e

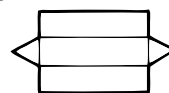


Fig. 32

3 The angle between the hands of a clock at 2 o'clock is:

A  $2^\circ$

B  $24^\circ$

C  $30^\circ$

D  $60^\circ$

E  $72^\circ$ .

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.

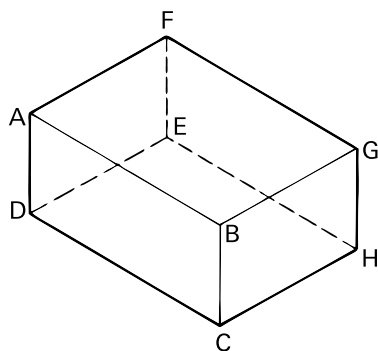


Fig. 33

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  $\hat{A}BC$  in the triangle in Fig. 34.

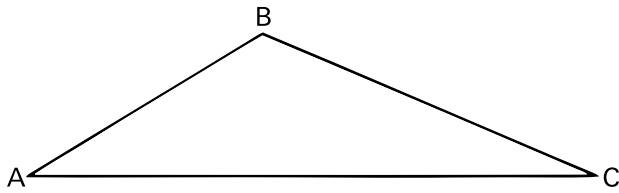
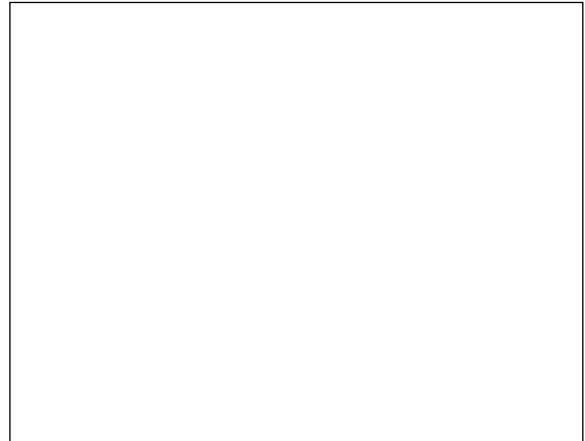


Fig. 34

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



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

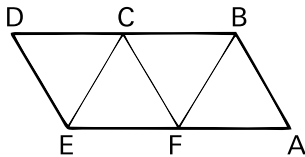


Fig. 35

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.

\_\_\_\_\_



Teacher's name: \_\_\_\_\_ Class name: \_\_\_\_\_

Student's name: \_\_\_\_\_ Date: \_\_\_\_\_

### 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  $20^\circ$       B  $40^\circ$       C  $60^\circ$       D  $90^\circ$       E  $120^\circ$

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  $1\frac{1}{20} + \frac{3}{5}$  \_\_\_\_\_

b  $5\frac{3}{8} - 4\frac{3}{4}$  \_\_\_\_\_

c  $3\frac{3}{4} \times 1\frac{1}{2}$  \_\_\_\_\_

d  $3\frac{1}{3} \div 2\frac{2}{9}$  \_\_\_\_\_

15 A woman gives  $\frac{1}{4}$  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 ₦ $x$  per metre. How much change will I get from ₦7 000?

\_\_\_\_\_

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

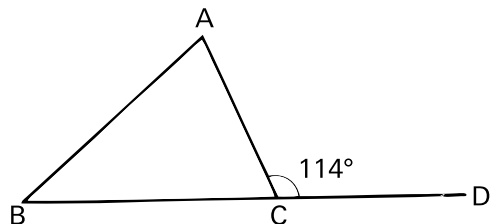


Fig. 36



Teacher's name: \_\_\_\_\_ Class name: \_\_\_\_\_

Student's name: \_\_\_\_\_ Date: \_\_\_\_\_

### 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 0.000 17                      B 0.001 7                      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 0.000 024                      B 0.000 24                      C 0.002 4  
D 0.024                          E 0.24

4 Select the correct answer to the following.  $1\,200 \div 0.04 =$

- A 30 000                          B 3 000                          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.

\_\_\_\_\_

Teacher's name: \_\_\_\_\_ Class name: \_\_\_\_\_

Student's name: \_\_\_\_\_ Date: \_\_\_\_\_

### 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 ₦5?

\_\_\_\_\_

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?

\_\_\_\_\_

Teacher's name: \_\_\_\_\_ Class name: \_\_\_\_\_

Student's name: \_\_\_\_\_ Date: \_\_\_\_\_

### 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 2 100      D 250      E 23

2 Select the correct answer to the following.  $-20 - (-70) =$

- A 290      B 250      C 150      D 190      E None of these

3 Select the correct answer to the following.  $13 - (-8) - 5 =$

- A 212      B 22      C 16      D 112      E 116

4 Select the correct answer to the following.  $9 \times 2 - 12 \div 2 + 2 =$

- A 243      B 218      C 5      D 14      E 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  $n - 2$       B  $n - 4$       C  $2n$       D  $2n - 2$       E  $2n - 4$

6 The temperature inside a refrigerator is  $2.4^\circ\text{C}$ . What will be the temperature if it falls by  $3.9^\circ\text{C}$ ?

\_\_\_\_\_

7 Simplify the following.

a  $3xy \times 9y$  \_\_\_\_\_

b  $2n \times 5an^2$  \_\_\_\_\_

c  $36a^2b \div 12ab$  \_\_\_\_\_

d  $\frac{5x^2}{x}$  \_\_\_\_\_

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  $n$ .

\_\_\_\_\_

Teacher's name: \_\_\_\_\_

Class name: \_\_\_\_\_

Student's name: \_\_\_\_\_

Date: \_\_\_\_\_

### 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  $\pi$  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  $3\text{ m}^2$       B  $6\text{ m}^2$       C  $9\text{ m}^2$       D  $300\text{ m}^2$       E  $90\,000\text{ m}^2$
- 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  $\text{cm}^3$  in  $1\text{ m}^3$ ?  
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  $\pi$  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.

\_\_\_\_\_

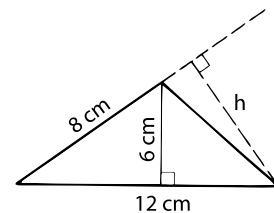


Fig. 37

- 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  $\pi$ .

\_\_\_\_\_

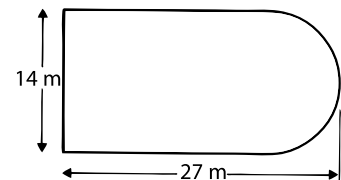


Fig. 38

Teacher's name: \_\_\_\_\_ Class name: \_\_\_\_\_

Student's name: \_\_\_\_\_ Date: \_\_\_\_\_

### Term General revision test B (Chapters 9–16)

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

- Select the correct answer to the following.  $3.2 \div 8\,000 =$   
A 0.0004    B 0.004    C 0.04    D 4    E 400
- Which of the following is 20% of 1 hour?  
A 5 min    B 6 min    C 12 min    D 20 min    E 30 min
- The difference, in grams, between  $x$  kg and  $50x$  g is:  
A  $x - 50x$     B  $49x$     C  $50x$     D  $950x$     E  $9.050x$
- 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
- 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 3 400
- Which of the following is the difference between temperatures of  $17^\circ\text{C}$  above zero and  $12^\circ\text{C}$  below zero?  
A  $5^\circ\text{C}$     B  $12^\circ\text{C}$     C  $17^\circ\text{C}$     D  $22^\circ\text{C}$     E  $29^\circ\text{C}$
- Select the correct answer to the following.  $3a - (9a - 5b) =$   
A  $a + 5b$     B  $6a - 5b$     C  $-6a - 5b$     D  $b - 6a$     E  $5b - 6a$
- Select the correct answer to the following.  $12x^2y \div 3x =$   
A  $4xy$     B  $8y$     C  $9xy$     D  $12xy$     E  $16y$
- A farmer buys  $n$  sheep at  $\text{N}a$  each and sells them at  $\text{N}b$  each. Which of the following is his profit in naira?  
A  $an - bn$     B  $bn - an$     C  $a - b$     D  $b - a$     E  $\frac{b-a}{n}$
- 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  $9\text{ cm}^2$     B  $25\text{ cm}^2$     C  $35\text{ cm}^2$     D  $36\text{ cm}^2$     E  $49\text{ cm}^2$

11 A thread is wound 100 times round a reel of diameter 3 cm. Calculate the length of the thread.  
(Use 3.14 for  $\pi$ .)

\_\_\_\_\_

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  $\pi$  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  $80 \text{ cm}^2$ .

\_\_\_\_\_



Teacher's name: \_\_\_\_\_ Class name: \_\_\_\_\_  
Student's name: \_\_\_\_\_ Date: \_\_\_\_\_

### 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:  
A 13      B 15      C 18      D 20      E 33
- 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:  
A 3      B 4      C 5      D 6      E 7

Use the following set of numbers in questions 3, 4 and 5.

2, 2, 2, 5, 5, 8, 9, 10, 11

- 3 The mode of the above set of numbers is:  
A 2      B 3      C 5      D 6      E 9
- 4 The median of the above set of numbers is:  
A 2      B 3      C 5      D 6      E 9
- 5 The mean of the above set of numbers is:  
A 2      B 3      C 5      D 6      E 9
- 6 100 people were asked their ages; the results are given in Table 18.

age	<15	15–29	30–44	45–59	>60
frequency	43	32	17	5	3

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.

\_\_\_\_\_

Teacher's name: \_\_\_\_\_

Class name: \_\_\_\_\_

Student's name: \_\_\_\_\_

Date: \_\_\_\_\_

### 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  $x$ .

\_\_\_\_\_

Teacher's name: \_\_\_\_\_ Class name: \_\_\_\_\_

Student's name: \_\_\_\_\_ Date: \_\_\_\_\_

### Term Revision test 11 (Chapters 20, 21)

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

- 1  $\widehat{XOY}$  and  $\widehat{YOZ}$  are adjacent on a straight line  $XOZ$ . If  $\widehat{XOY} = 58^\circ$ , then  $\widehat{YOZ} =$   
A  $32^\circ$       B  $122^\circ$       C  $132^\circ$       D  $238^\circ$       E  $302^\circ$
- 2 Complete the following sentence correctly. Vertically opposite angles ...  
A are alternate      B add up to  $180^\circ$       C are corresponding  
D are equal      E add up to  $360^\circ$ .
- 3 Three lines meet at a point. If the sum of two of the angles formed is  $163^\circ$ , the other angle is:  
A  $17^\circ$       B  $73^\circ$       C  $163^\circ$       D  $197^\circ$       E  $343^\circ$
- 4 Two angles of  $\triangle ABC$  are  $46^\circ$  and  $67^\circ$ . Calculate the third angle of  $\triangle ABC$ . 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  $\triangle XYZ$ ,  $XY = 5$  cm,  $\widehat{XYZ} = 40^\circ$  and  $\widehat{XZY} = 60^\circ$ . Which sketch in Fig. 39 shows this information correctly?

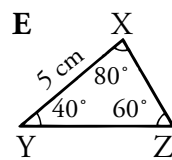
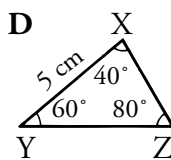
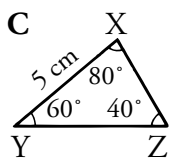
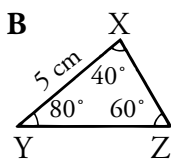
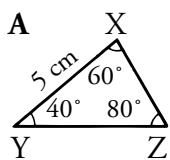
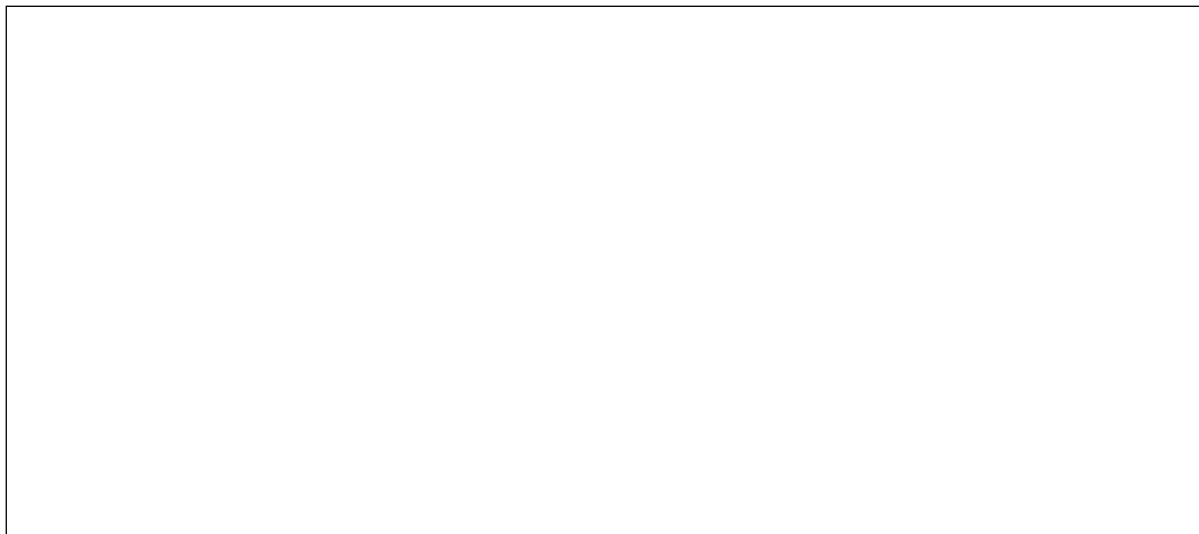


Fig. 39

- 6 Construct  $\triangle ABC$  in which  $BC = 4$  cm,  $\widehat{ABC} = 50^\circ$  and  $AB = 6$  cm.



7 In Fig. 40, find  $a$ ,  $b$ ,  $c$ .

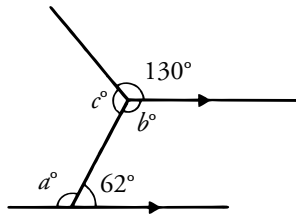


Fig. 40

8 In Fig. 41, find  $a$ ,  $b$ ,  $c$ ,  $d$ .

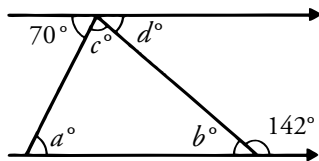


Fig. 41

9 Construct a parallelogram ABCD in which  $AB = 4$  cm,  $\hat{A}BC = 70^\circ$  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  $a$ ,  $b$ ,  $c$ .

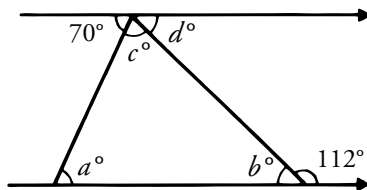


Fig. 42

Teacher's name: \_\_\_\_\_ Class name: \_\_\_\_\_

Student's name: \_\_\_\_\_ Date: \_\_\_\_\_

### 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 × 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  $110110_{\text{two}}$  to base ten \_\_\_\_\_

b  $25_{\text{ten}}$  to base two \_\_\_\_\_

7 Calculate the following, leaving your answer in base two.

a  $101 + 111$  \_\_\_\_\_

b  $111 - 10$  \_\_\_\_\_

c  $101 \times 11$  \_\_\_\_\_

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.

\_\_\_\_\_

Teacher's name: \_\_\_\_\_

Class name: \_\_\_\_\_

Student's name: \_\_\_\_\_

Date: \_\_\_\_\_

### 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  $7\frac{2}{3}$       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  $28^\circ$   
B  $31^\circ$   
C  $33^\circ$   
D  $56^\circ$   
E  $62^\circ$



Fig. 43

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

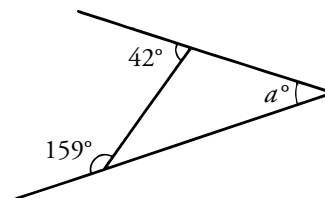


Fig. 44

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  $x = 23\frac{4}{5} \div 8\frac{1}{2}$ . 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.

vehicles	car	lorry	bus	bicycle
frequency	12	10	5	23

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  $a$ ,  $b$ ,  $c$ .

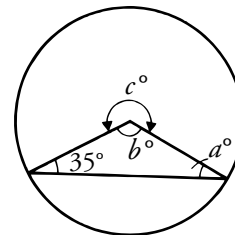


Fig. 45

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 ₦1 800. How much does each cost?

\_\_\_\_\_

19 On a separate sheet of paper, construct  $\triangle ABC$  in which  $BC = 6$  cm,  $\hat{A}BC = 30^\circ$  and  $\hat{B}AC = 100^\circ$ . 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  $101 \times 11$  \_\_\_\_\_

# Term revision tests answers

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  $60 = 2^2 \times 3 \times 5$     7 42  
 8 8    9  $3.713 \text{ t}$     10 113 cm

## Term Revision test 2 (Chapter 4)

- 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  $\frac{4d}{5} \text{ ml}$     10  $30y - 30x$ , 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  $125^\circ$     8 Discuss with students  
 9 a CD    b E  
 10  $15^\circ$

## 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  $5\frac{5}{8}$     d  $1\frac{1}{2}$   
 15  $\frac{1}{6}$     16  $\frac{2}{5}$     17  $70\frac{5}{6}\%$   
 18 a 5    b 7    c  $1\frac{1}{2}$     d 0  
 19 ~~₹~~7 000 – ~~₹~~5x or ~~₹~~(7 000 – 5x)  
 20  $114^\circ$

## 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 ~~₹~~33 800 000

## Term Revision test 6 (Chapters 10, 11)

- 1 D    2 E    3 B  
 4 E    5 B    6 10 sweets  
 7 a 1 000w    b  $10b$     c  $\frac{d}{100}$   
 8 square, rectangle, parallelogram, trapezium, rhombus  
 9  $45^\circ$     10  $(2c + d)$  years old

## Term Revision test 7 (Chapters 12, 15)

- 1 C    2 E    3 C    4 D    5 E  
 6  $-1.5^\circ\text{C}$   
 7 a  $27xy^2$     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  $33 \text{ cm}^2, 49 \text{ cm}^2$   
 7  $28.26 \text{ m}^2$   
 8  $36 \text{ cm}^2, b = 9 \text{ cm}$   
 9  $1 \text{ m}^3$   
 10  $357 \text{ m}^2$

## 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  $295x \text{ cm}$     16  $3y + 2z$   
 17 a  $-13$     b 17    c  $-5$     d 1  
 18 a  $16 - 7x$     b  $6a$     c  $13 - 7x$   
 19  $12.44 \text{ cm}^2$     20  $12\frac{1}{2} \text{ cm}$



**Term Revision test 9 (Chapters 17, 18, 22)**

- 1 C    2 B    3 A    4 C    5 D  
 6 a  $\frac{3}{4}$                   b 5%  
 7 Discuss with students  
 8 A pie chart with angles of  $120^\circ$  (drawings),  
 $72^\circ$  (photos),  $168^\circ$  (writing)  
 9 Discuss with students  
 10  $28^\circ\text{C}$

**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  $a = 118^\circ, b = 118^\circ, c = 112^\circ$   
 8  $a = 70^\circ, b = 38^\circ, c = 72^\circ, d = 38^\circ$   
 9 4.7 cm or 3.8 cm,  $18.8\text{ cm}^2$   
 10  $a = 70^\circ, b = 68^\circ, c = 42^\circ, d = 68^\circ$

**Term Revision test 12 (Chapters 13, 14, 16)**

- 1 D    2 C    3 E    4 D    5 B  
 6 a  $54_{\text{ten}}$                   b 11 001<sub>two</sub>  
 7 a 1 100                  b 101                  c 1 111  
 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  $x = 1\frac{2}{3}$                   b  $x = \frac{2}{5}$                   c  $x = \frac{1}{4}$   
 15  $a = 35^\circ, b = 110^\circ, c = 250^\circ$   
 16 340  
 17 mean =  $2\frac{3}{4}$  h, median =  $2\frac{1}{2}$  h, mode = 2 h  
 18 saucer: ~~180~~, plate: ~~360~~  
 19 area =  $7\text{ cm}^2$   
 20 a 1 000                  b 11                  c 1 111

## Section 4: Workbook answer sheets

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.

**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

h	min	Method in minutes column:
3	40	$40 + 25 + 28 + 35 = 128$ min
2	25	$= 2 \times 60$ min + 8 min
	28	$= 2$ h 8 min
1	35	write down 8 min and carry 2 h
<b>8</b>	<b>8</b>	<b>answer: 8 h 8 min</b>

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 = 1 000

D = 500

C = 100

L = 50

d Write the year in which you were born as Roman numerals. Students' own answer

③ a Complete the table.

	Thousands	Hundreds	Tens	Units	tenths	hundredths
67			6	7		
0.6					6	
23.9			2	3	9	
123		1	2	3		
0.08						8
6 666	6	6	6	6		
34.34			3	4	3	4
90.7			9	0	7	
677		6	7	7		
56.09			5	6	0	9

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.

a How many months in one year? 12

b How many weeks in one year? 52

c How many days in one year? 365 except in Leap Year, then 366

d How many days in one week? 7

e How many minutes in one hour? 60

⑥ Calculate.

a Add: 7 h 15 min, 12h 48 min and 3 h 12 min.

23 h 15 min

---

---

---

---

---

b Write 2 567 weeks as years and weeks.

49 years and 19 weeks

---

---

---

---

---

⑦ Which numbers have the same meaning as these?

a Penta = 5

b Tri = 3

c Quad = 4

d Hexa = 6

e Bi = 2

## Worked example

Express the following in a mixture of digits and words.

<b>a</b> ₦3 000 000	<b>b</b> 6 800 000 000	<b>c</b> 240 000 000	<b>d</b> 500 000 000 000
<b>a</b> ₦3 000 000 = ₦3 × 1 000 000 = ₦3 million	<b>b</b> 6 800 000 000 = 6.8 × 1 000 000 000 = 6.8 billion	<b>c</b> 240 000 000 = 240 × 1 000 000 = 240 million	<b>d</b> 500 000 000 000 = 0.5 × 1 000 000 000 000 = 0.5 trillion or 500 billion
or 240 000 000 = 0.24 × 1 000 000 000 = 0.24 billion (or 240 million)			

- 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.

Thousand million	Hundred million	Ten millions	Millions	Hundred thousands	Ten thousands	Thousands	Hundreds	Tens	Units
1 000 000 000	100 000 000	10 000 000	1 000 000	100 000	10 000	1 000	100	10	1

- b** Write the value of the underlined digit in each number.

879 70 \_\_\_\_\_

5 631 5 000 \_\_\_\_\_

27 694 20 000 \_\_\_\_\_

223 270 900 \_\_\_\_\_

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 04 567 876 = ten millions

- ③ **a** If  $0 \times 1 = 0$  and  $1 \times 0 = 0$ , write the answers to:

i)  $9\,567\,932 \times 0 = \underline{0}$

ii)  $0 \times 9\,567\,932 = \underline{0}$

- b** If  $0 + 1 = 1$  and  $1 + 0 = 1$ , write the answers to:

i)  $0 + 23\,765\,892 = \underline{23\,765\,892}$

ii)  $23\,765\,892 + 0 = \underline{23\,765\,892}$

- ④ A builder plans to build 10 houses. Each house will cost ₦7 500 000 to build. He wants to sell the houses for ₦15 000 000 each.

- a** How much will it cost to build 10 houses?

$$10 \times 7\,500\,000 = \text{N}75\,000\,000$$

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- b** How much will the builder receive if he sells all 10 houses?

$$15\,000\,000 \times 10 = \text{N}150\,000\,000$$

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- c** How much profit will the builder make?

$$150\,000\,000 - 75\,000\,000 = \text{N}75\,000\,000$$

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- 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?

$$222\,000\,000$$

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- b** What is the difference between the population of the country with the most people, and the country with the least?

$$170\,000\,000 - 13\,000\,000 = 157\,000\,000$$

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- c** What is the total population of Cameroon, Chad and Niger together?

$$52\,000\,000$$

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- d** Make up your own word problem with the populations. Swap with a classmate and work out the answer.

Students create own problems

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- ⑥ Calculate.

**a**  $7 + 6 = \underline{13}$

**b**  $77 + 49 = \underline{126}$

**c**  $398 + 821 = \underline{1\,249}$

**d**  $9 - 4 = \underline{5}$

**e**  $92 - 65 = \underline{27}$

**f**  $704 - 379 = \underline{325}$

- ⑦ Calculate.

**a** 
$$\begin{array}{r} 457 \\ + 198 \\ \hline 655 \end{array}$$

**b** 
$$\begin{array}{r} 7\,369 \\ + 778 \\ \hline 8\,147 \end{array}$$

**c** 
$$\begin{array}{r} 894 \\ - 456 \\ \hline 438 \end{array}$$

**d** 
$$\begin{array}{r} 92\,304 \\ - 74\,894 \\ \hline 17\,410 \end{array}$$

**e** 
$$\begin{array}{r} 523 \\ \times 317 \\ \hline 165\,791 \end{array}$$

**f** 
$$\begin{array}{r} 3\,575 \\ 250 \overline{)893\,750} \end{array}$$

**Worked example**

Express:

**a**  $9 \times 9 \times 9 \times 9$  in index form**b** 675 as a product of primes in index form.**a**  $9 \times 9 \times 9 \times 9 = 9^4$  (There are four 9s multiplied together.)**b**  $675 = 3 \times 3 \times 3 \times 5 \times 5$   
 $= 3^3 \times 5^2$ 

① Underline the correct answer.

**a** When you multiply a whole number by another whole number, the product is called a:factor                      multiple                      difference**b** When you divide a whole number by another whole number, the answer is called a:factor                      multiple                      difference

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; 22; 31; 33; 43; 44; 56; 66; 80)**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, 35, ...**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

⑥ A prime number has only two factors: 1 and itself.

Write the factors of each number. Tick if they are prime numbers.

Number	Factors	Prime number?
7	1, 7	yes
35	1, 5, 7, 35	
44	1, 2, 4, 11, 22, 44	
23	1, 23	yes
150	1, 2, 5, 10, 15, 25, 30, 50, 75, 150	

⑦ Choose the correct answer to complete the statement.

multiple                      composite                      counting

A number that is not a prime number is called a composite number.

⑧ a Colour all the prime numbers.

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

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.



## Worked example

**a** Express  $4\frac{5}{6}$  as an improper fraction.

**b** Express  $\frac{19}{8}$  as a mixed number.

$$\mathbf{a} \quad 4\frac{5}{6} = 4 + \frac{5}{6} = \frac{24}{6} + \frac{5}{6} = 24 + \frac{5}{6} = \frac{29}{6}$$

or, more quickly,

$$4\frac{5}{6} = 4 \times 6 + \frac{5}{6} = 24 + \frac{5}{6} = \frac{29}{6}$$

$$\mathbf{b} \quad \frac{19}{8} = 16 + \frac{3}{8} = \frac{16}{8} + \frac{3}{8} = 2 + \frac{3}{8} = 2\frac{3}{8}$$

or, more quickly,

$$\frac{19}{8} = 19 \div 8 = 2 \text{ with remainder } 3,$$

but the remainder is also divided by 8:

$$19 \div 8 = 2 + \frac{3}{8} = 2\frac{3}{8}$$

① Write the answers as common fractions.

$$\mathbf{a} \quad 12 \div 23 = \frac{12}{23}$$

$$\mathbf{b} \quad 31 \div 42 = \frac{31}{42}$$

$$\mathbf{c} \quad 101 \div 200 = \frac{101}{200}$$

$$\mathbf{d} \quad 7 \div 15 = \frac{7}{15}$$

$$\mathbf{e} \quad 1 \div 9 = \frac{1}{9}$$

② Write the answers as improper fractions and as mixed numbers.

$$\mathbf{a} \quad 120 \div 23 = \frac{120}{23} = \frac{5 \cdot 23}{23}$$

$$\mathbf{b} \quad 301 \div 42 = \frac{301}{42} = \frac{7 \cdot 42}{42}$$

$$\mathbf{c} \quad 507 \div 200 = \frac{507}{200} = \frac{2 \cdot 200}{200}$$

$$\mathbf{d} \quad 77 \div 15 = \frac{77}{15} = \frac{5 \cdot 15}{15}$$

③ Convert these fractions into their simplest form by dividing the numerator and denominator by the same number. Remember:  $\frac{2}{2} = \frac{3}{3} = \frac{4}{4} = \frac{67}{67} = 1$

$$\mathbf{a} \quad \frac{25}{30} = \frac{5}{6}$$

$$\mathbf{b} \quad \frac{49}{70} = \frac{7}{10}$$

$$\mathbf{c} \quad \frac{81}{180} = \frac{9}{20}$$

$$\mathbf{d} \quad \frac{150}{200} = \frac{3}{4}$$

④ Write these fractions as percentages.

$$\mathbf{a} \quad \frac{21}{100} = 21\%$$

$$\mathbf{b} \quad \frac{59}{100} = 59\%$$

⑤ Convert these fractions to equivalent fractions with a denominator of 100. Then write each answer as a percentage:

$$\mathbf{a} \quad \frac{9}{25} = \frac{36}{100} = 36\%$$

$$\mathbf{b} \quad \frac{17}{50} = \frac{34}{100} = 34\%$$

$$\mathbf{c} \quad \frac{98}{200} = \frac{49}{100} = 49\%$$

$$\mathbf{d} \quad \frac{150}{300} = \frac{50}{100} = 50\%$$

- ⑥ Express these fractions as percentages by multiplying them by  $\frac{100}{1}$ .
- a  $\frac{17}{20} = \frac{\times \frac{100}{1}}{1} = 85\%$       b  $\frac{49}{50} = \frac{\times \frac{100}{1}}{1} = 98\%$
- c  $\frac{14}{25} = \frac{\times \frac{100}{1}}{1} = 56\%$       d  $\frac{140}{200} = \frac{\times \frac{100}{1}}{1} = 70\%$

- ⑦ Write the first quantity as a fraction of the second quantity.
- a 15 min; 1 hour =  $\frac{1}{4}$  in its simplest form.  
This =  $\frac{25}{100}$ . Convert to a percentage = 25%.
- b 8 mm; 1 cm =  $\frac{4}{5}$  in its simplest form.  
This =  $\frac{80}{100}$ . Convert to a percentage = 80%.
- c 500 m; 2 km =  $\frac{1}{4}$  in its simplest form.  
This =  $\frac{25}{100}$ . Convert to a percentage = 25%.

- ⑧ 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  $31\frac{11}{12} = \frac{383}{12}$

- ⑨ Find the lowest common denominator of each pair of numbers. Then add.
- a  $\frac{3}{4} + \frac{7}{8} = \frac{13}{8} = 1\frac{5}{8}$
- b  $\frac{9}{10} + \frac{4}{5} = \frac{17}{10} = 1\frac{7}{10}$
- c  $\frac{6}{7} + \frac{3}{5} = \frac{51}{35} = 1\frac{16}{35}$
- d  $\frac{2}{9} + \frac{5}{12} = \frac{23}{36}$

- ⑩ 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% =  $\frac{150}{100} = 1\frac{1}{2}$

- ⑪ Colour 45% of the grid in red and  $\frac{21}{70}$  in blue.

			red					blue	

**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:**

<b>a</b> $\square = 15$	$(9 + 6 = 15)$	<b>b</b> $\square = 3$	$(9 - 6 = 3)$
<b>c</b> $\square = 8$	$(24 \div 3 = 8)$	<b>d</b> $\square = 42$	$(6 \times 7 = 42)$

- ① Fill in the numbers to make each open sentence true.
- a**  $0 + 9 = \underline{\quad 9 \quad}$       **b**  $2 + 7 = \underline{\quad 9 \quad}$   
**c**  $4 + 5 = \underline{\quad 9 \quad}$       **d**  $8 + 1 = \underline{\quad 9 \quad}$
- ② Replace the symbols with numbers to make each open sentence true.
- a** If  $y + 19 = 21$  then  $y = \underline{\quad 2 \quad}$ .  
**b** If  $z + 46 = 90$  then  $z = \underline{\quad 44 \quad}$ .  
**c** If  $a + 8 = 21$  then  $a = \underline{\quad 13 \quad}$ .  
**d** If  $b + 53 = 121$  then  $b = \underline{\quad 68 \quad}$ .  
**e** If  $c + 11 = 77$  then  $c = \underline{\quad 66 \quad}$ .
- ③ Replace the symbols with numbers to make each open sentence true.
- a** If  $y - 19 = 21$  then  $y = \underline{\quad 40 \quad}$ .  
**b** If  $z - 46 = 90$  then  $z = \underline{\quad 136 \quad}$ .  
**c** If  $a - 8 = 21$  then  $a = \underline{\quad 29 \quad}$ .  
**d** If  $b - 53 = 121$  then  $b = \underline{\quad 174 \quad}$ .  
**e** If  $c - 11 = 77$  then  $c = \underline{\quad 88 \quad}$ .
- ④ Replace the symbols with numbers that will make the sentences true.
- a** If  $2 \times y = 24$  then  $y = \underline{\quad 12 \quad}$ .  
**b** If  $3 \times z = 90$  then  $z = \underline{\quad 30 \quad}$ .  
**c** If  $9 \times a = 63$  then  $a = \underline{\quad 7 \quad}$ .  
**d** If  $b \times 7 = 140$  then  $b = \underline{\quad 20 \quad}$ .  
**e** If  $c \times 11 = 77$  then  $c = \underline{\quad 7 \quad}$ .
- 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  $y = 3$

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- ⑥ 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  $x = 14$

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- ⑦ If  $y = 40$  and  $z = 5$ , calculate the following.

**a**  $y + z = \frac{40 + 5 = 45}{}$

**b**  $y - z = \frac{40 - 5 = 35}{}$

**c**  $y \times z = \frac{40 \times 5 = 200}{}$

**d**  $y \div z = \frac{40}{5} = 8$

- 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  $12 + 25 = a$ .

$a = 37$

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- 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  $x = 5$

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- ⑩ Find the value of each letter if the following sentences are true.

**a** If  $2 \times y = 20$  then  $y = \frac{10}{}$

**b** If  $5 \times y = y + y + y + y + y = 45$  then  $y = \frac{9}{}$

**c** If  $34 - a = 7$  then  $a = \frac{27}{}$

**d** If  $81 \div b = 3 \times 3$  then  $b = \frac{27}{}$

- ⑪ **a** The highest monthly temperature in Nigeria is  $30^\circ\text{C}$  in April and the lowest monthly temperature is  $24^\circ\text{C}$  in January. Write a number sentence to show this. Then calculate the difference.

Example:

$30 - 24 = a$  so  $a = 6^\circ\text{C}$

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- 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.

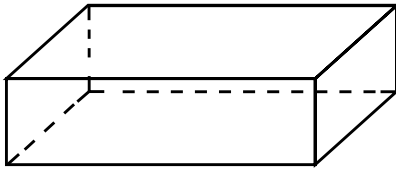
Example:

$4 \text{ mm} + b = 228 \text{ mm}$  so  $b = 224 \text{ mm}$

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① Name these three-dimensional objects.

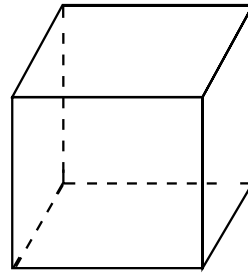
**a**



rectangular prism / cuboid

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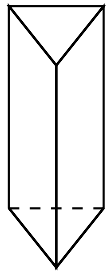
**b**



cube

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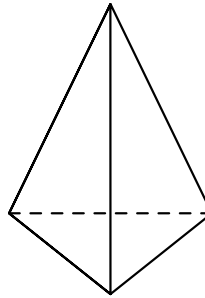
**c**



triangular prism

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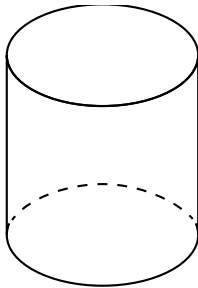
**d**



triangular-base pyramid

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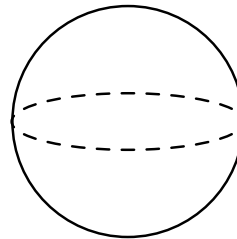
**e**



cylinder

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**f**

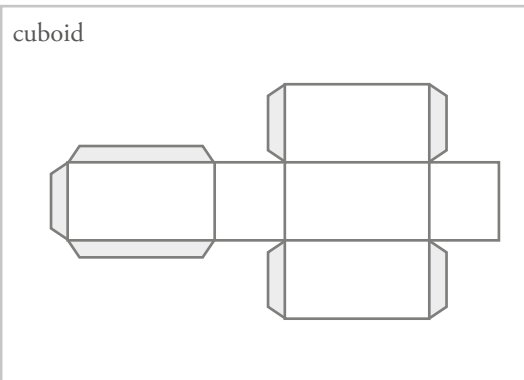


sphere

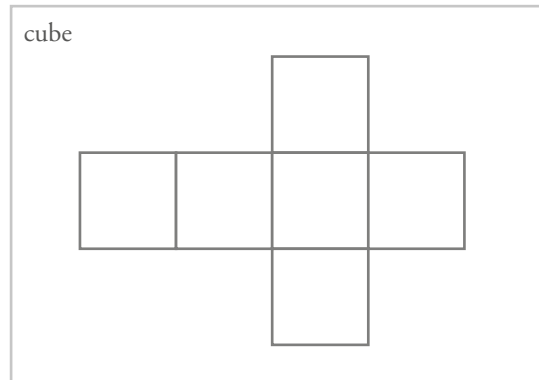
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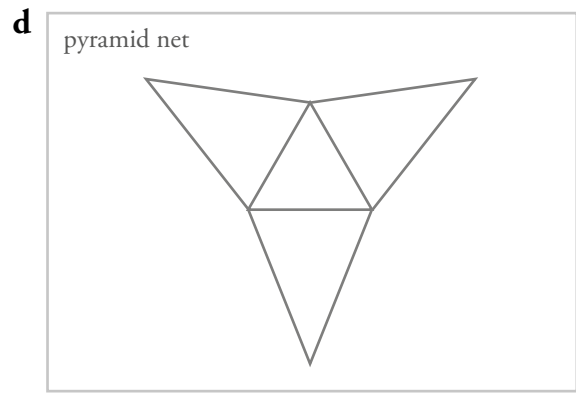
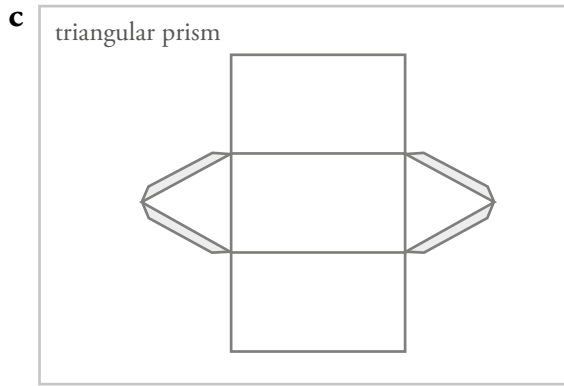
② Draw the nets for the objects in question 1 a, b, c and d.

**a**



**b**

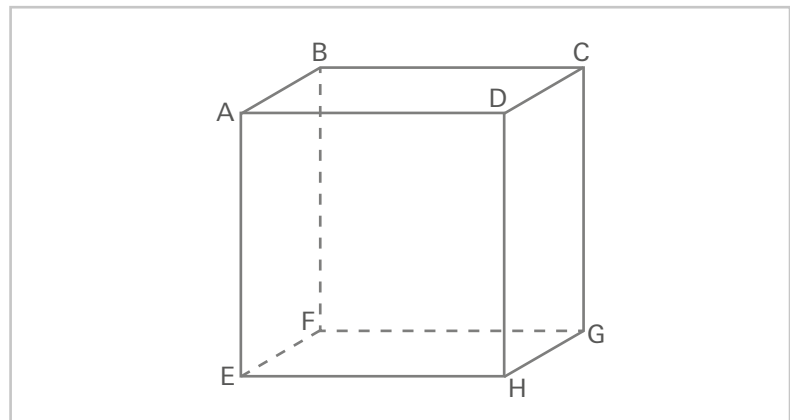




③ Complete the table about the objects in question 1.

	Name	Number of faces	Number of edges	Number of vertices
<b>a</b>	rectangular prism	6	12	8
<b>b</b>	cube	6	12	8
<b>c</b>	triangular prism	5	9	6
<b>d</b>	triangular-base pyramid	4	6	4
<b>e</b>	cylinder	2 flat, 1 curved	2	0
<b>f</b>	sphere	1 curved	0	0

④ **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

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**d** Name the faces of the cube.

ABCD, ADHE, EFGH, BCGF, ABFE, CDHG

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**e** Which edges meet at vertex A?

AB, AD, AE

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**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

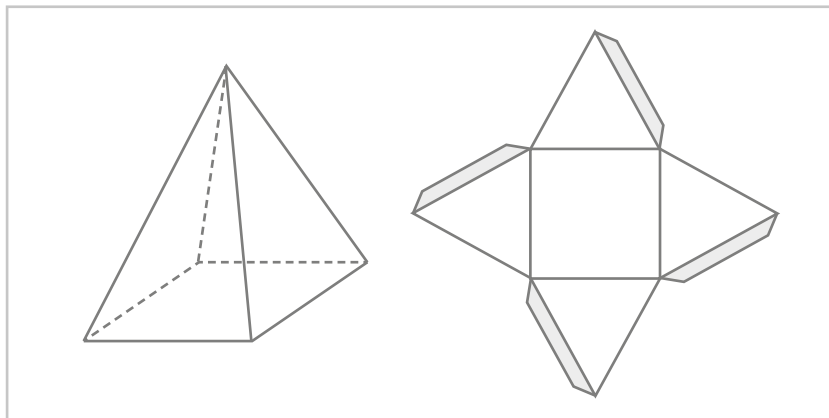
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⑤ Complete the table.

Objects	Number of faces	Number of vertices	Number of edges	Examples found in your town or classroom
Square-based pyramid	5	5	8	Roof of house
Cube	6	8	12	Dice
Cuboid	6	8	12	Book
Cylinder	3	0	2	Tin can
Triangular prism	5	6	9	Toblerone chocolate
Cone	2	1	1	Ice cream cone

⑥ Draw a skeleton view and a net of a square-based pyramid.



## Worked example

- a** In  $\frac{3}{4}x$ ,  $\frac{3}{4}$  is the coefficient of  $x$ .
- b** In  $2\frac{a}{3}$ ,  $\frac{2}{3}$  is the coefficient of  $a$  (since  $2\frac{a}{3} = \frac{2}{3}a$ ).
- 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?

**a**  $7y$   $\frac{7 \text{ of } y}{\quad}$

**b**  $23z$   $\frac{23 \text{ of } z}{\quad}$

**c**  $14a$   $\frac{14 \text{ of } a}{\quad}$

**d**  $\frac{1}{4}b$   $\frac{\frac{1}{4} \text{ of } b}{\quad}$

**e**  $\frac{c}{2}$   $\frac{\frac{1}{2} \text{ of } c}{\quad}$

**f**  $5\frac{d}{6}$   $\frac{5 \text{ of } d}{6}$

② Simplify.

**a**  $3x + 5x = \underline{\quad 8x \quad}$

**b**  $7a + 5a = \underline{\quad 12a \quad}$

**c**  $9b + 2b = \underline{\quad 11b \quad}$

**d** Can you simplify  $5c + 4d$ ? Explain:

no, because they have different terms ( $c$  and  $d$ )

---

③ Simplify.

**a**  $9e - 4e = \underline{\quad 5a \quad}$

**b**  $15f - 7f = \underline{\quad 8f \quad}$

**c**  $13g - 8g = \underline{\quad 5g \quad}$

④ Simplify.

**a**  $7a + 15a - 10a = \underline{\quad 12a \quad}$

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**b**  $12b + 13b - 4b = \underline{\quad 21b \quad}$

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**c**  $7c + c + c + 5c - 2c = \underline{\quad 12c \quad}$

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**d**  $8d - 4d + 3d = \underline{\quad 7d \quad}$

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**e**  $5e - 2e + 9e = \underline{\quad 12e \quad}$

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**f**  $f - 12f + 14f =$  3f

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**g**  $2g + 3g - 15g + 10g =$  0a

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**h**  $18h - 19h + 3h - h =$  h

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⑤ Simplify where possible.

**a**  $2b + 7 + 5c - 3 + 7b - 3c =$  9b + 4 + 2c

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---

**b**  $12h - 20g + 17 + 52g - 11 - 3h =$  9h + 32g - 6

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**c**  $3x - 5x - 7y + 9 - 2 + 3x + 10y =$  x + 3y + 7

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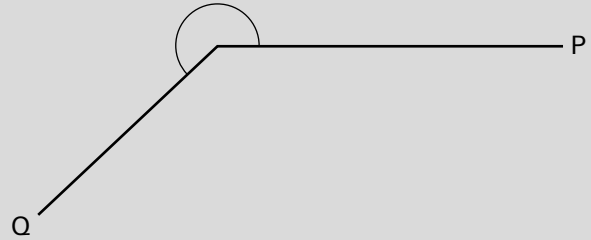
**d**  $24a + 19b + 36 - (12a + 17b + 10) =$  12a + 2b + 26

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**Worked example**

Measure the size of the obtuse angle  $\hat{P}OQ$  in the figure below.  
Calculate the size of reflex  $\hat{P}OQ$ .



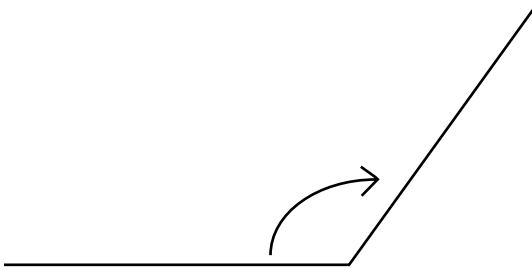
Place the protractor on the angle with its centre on O and its base line on OP or OQ.

obtuse  $\hat{P}OQ = 125^\circ$  (by measurement)

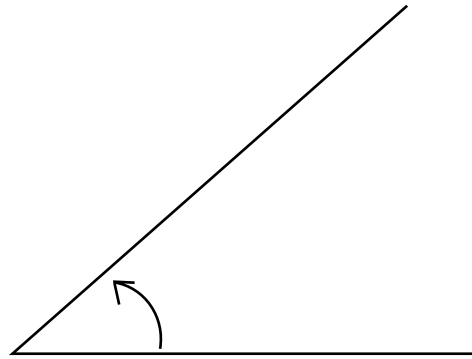
reflex  $\hat{P}OQ = 360^\circ - 125^\circ = 235^\circ$

① Estimate the size of each angle. Write your answers in the table in question 2.

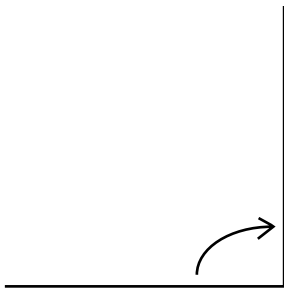
a



b



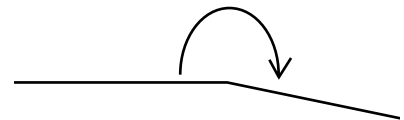
c



d



e

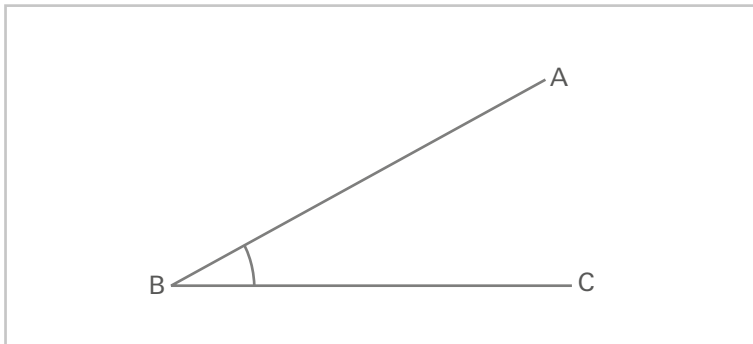


② Measure each angle in question 1. Complete the table.

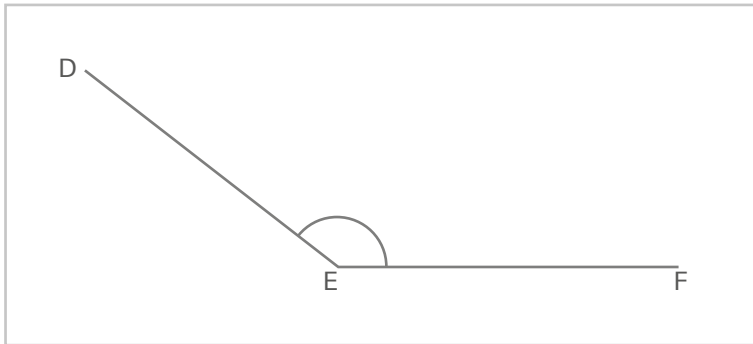
	Estimated size	Actual size	Type of angle
a	STUDENTS	$120^\circ$	obtuse
b	ESTIMATE	$41^\circ$	acute
c	ANSWERS	$90^\circ$	right
d	_____	$180^\circ$	straight
e	_____	$192^\circ$	reflex

③ Use a protractor and ruler to draw these angles.

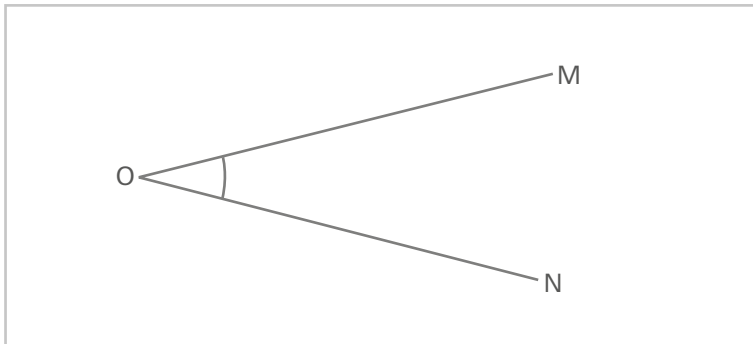
**a** An acute angle



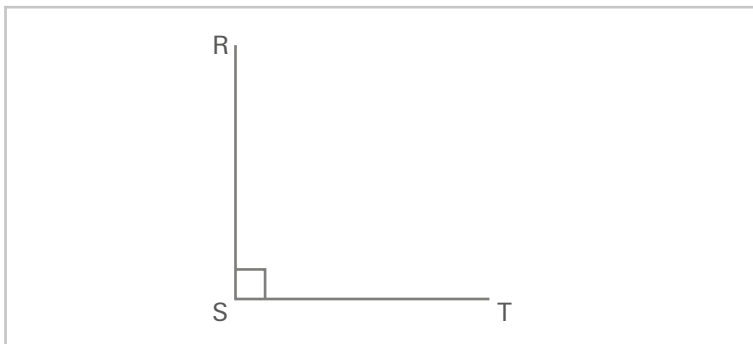
**b** An obtuse angle



**c** An acute angle



**d** A right angle



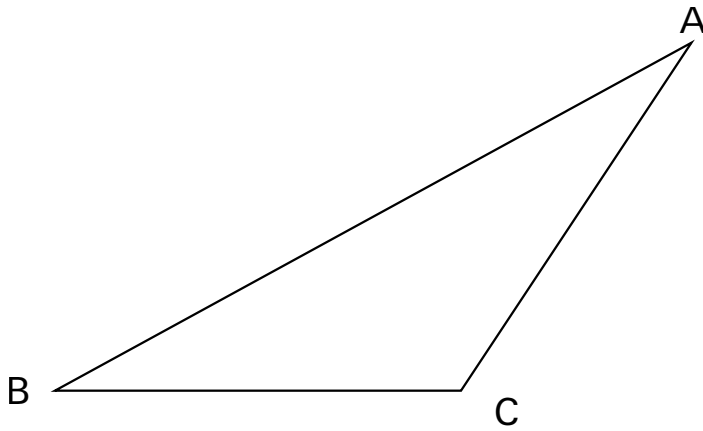
④ Label the angles you drew in question 3 using capital letters such as A, B, C, etc. Remember the angle is at the vertex.

⑤ Write the name of each angle you drew and labelled, for example DÊF:

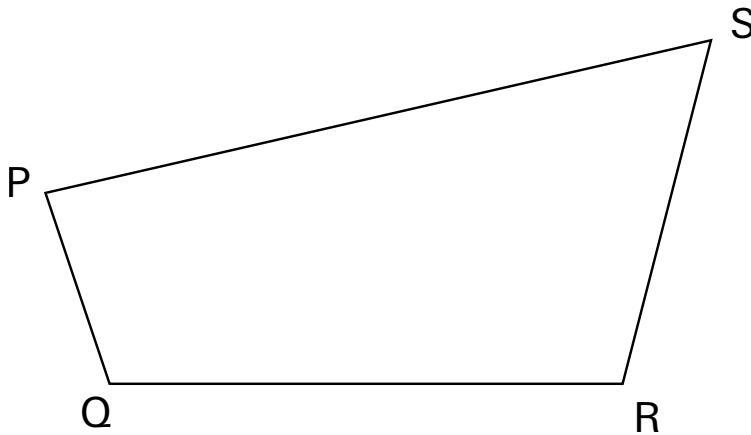
a           A<sup>^</sup>BC                                b           DÊF            
 c           MÔN                                d           R<sup>^</sup>ST          

⑥ Measure the angles in each triangle. Then complete the table.

a



b



Shape	Number of sides	Names of sides	Number of angles	Names of angles	Size of angles
Triangle	3	e.g. AB	3	e.g. C <sup>^</sup> AB	28°
ABC		BC		B <sup>^</sup> CA	124°
		AC		A <sup>^</sup> BC	28°
Rectangle	4	PS	4	P <sup>^</sup> QR	72°
PQRS		SR		P <sup>^</sup> SR	64°
		QR		S <sup>^</sup> PQ	119°
		PQ		S <sup>^</sup> RQ	105°

## Worked example

Write the following as decimal numbers.

**a**  $\frac{23}{1000}$

**b**  $120 \div 100\,000$

**a**  $\frac{23}{1000} = 23 \div 1\,000 = 23 \div 10^3 = 0.023$

**b**  $120 \div 100\,000 = 120 \div 10^5 = 0.00120$   
 $= 0.0012$

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.

Percentage	Fraction with denominator of 100	Decimal	Fraction with denominator > 100	Fraction with denominator < 100
75%	$\frac{75}{100}$	0.75	$\frac{150}{200}$	$\frac{3}{4}$
50%	$\frac{50}{100}$	0.5	$\frac{150}{300}$	$\frac{1}{2}$
25%	$\frac{25}{100}$	0.25	$\frac{50}{200}$	$\frac{1}{4}$
50%	$\frac{50}{100}$	0.5	$\frac{100}{200}$	$\frac{25}{50}$
35%	$\frac{35}{100}$	0.35	$\frac{70}{200}$	$\frac{7}{20}$

④ Convert these fractions to decimals. Write them in under the correct column:

		H	T	U	.	t	h
<b>a</b>	$\frac{4}{5}$	$\frac{8}{10}$	_____	_____	0	.	1
<b>b</b>	$\frac{18}{200}$	$\frac{9}{100}$	_____	_____	0	.	0 9
<b>c</b>	$\frac{9}{20}$	$\frac{45}{100}$	_____	_____	0	.	4 5
<b>d</b>	$\frac{12}{25}$	$\frac{48}{100}$	_____	_____	0	.	4 8

⑤ Change these fractions to percentages by multiplying them by 100.

<b>a</b>	$\frac{17}{25}$	$17 \times 4 = 68\%$	_____
<b>b</b>	$\frac{49}{50}$	$49 \times 2 = 98\%$	_____
<b>c</b>	$\frac{66}{150}$	$\frac{66}{3} \times 2 = 44\%$	_____

⑥ Calculate.

<b>a</b> $1.39 + 2.564$	<b>b</b> $7.05 - 3.879$
_____	_____
3.954	3.171
_____	_____
<b>c</b> $2.06 \times 17.3$	<b>d</b> $8.73 \div 0.9$
_____	_____
35.638	9.7
_____	_____

⑦ Write these fractions as recurring decimals.

<b>a</b> $\frac{1}{3}$	$0.33333\dots$	<b>b</b> $\frac{4}{9}$	$0.44444\dots$	<b>c</b> $\frac{7}{11}$	$0.636363\dots$
------------------------	----------------	------------------------	----------------	-------------------------	-----------------

⑧ Aisha and Cerena both got good marks for their Mathematics test.

**a** Work out their percentages if Aisha got  $\frac{24}{30}$  and Cerena got  $\frac{30}{40}$ .

Aisha got 80%.

Cerena got 75%.

**b** Find the difference in their percentages.

5%

⑨ Write these percentages as fractions and as decimals.

<b>a</b> 73%	$\frac{73}{100}$	=	0.73
<b>b</b> 99%	$\frac{99}{100}$	=	0.99
<b>c</b> 45%	$\frac{45}{100}$	=	0.45

**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**  $132 \div e = 11$       $e = 12$  \_\_\_\_\_

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** 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?

$$\underline{12m \text{ minutes}}$$

b How many hours are there in the school day?

$$\underline{\frac{12m}{60} \text{ hours}}$$

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?

$$\underline{3n \text{ years old}}$$

b How old is her mother?

$$\underline{2 \times 3n \text{ years old}}$$

⑥ A farmer has  $q$  hens. Each hen lays 1 egg a day.

a How many eggs will be laid in 10 days?

$$\underline{10q \text{ eggs}}$$

b If  $r$  eggs are broken, how many will be left?

$$\underline{10q - r \text{ eggs}}$$

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?

$$\underline{12 \text{ m} \times 15 \text{ m} = 180 \text{ sq.m}}$$

b What is the area of the veranda in centimetres?  $\underline{1\,200 \text{ cm} \times 1\,500 \text{ cm} = 1\,800\,000 \text{ sq.cm}}$

c What is the area of each tile?

$$\underline{v \times v \text{ sq.cm}}$$

d How many tiles will the man need to tile the veranda?

$$\underline{\frac{1\,800\,000}{v^2} \text{ tiles}}$$

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?  $\underline{130 + x \text{ cm}}$

b How tall is the sister?  $\underline{130 - y \text{ cm}}$

c What is the difference in height between the brother and sister of the boy?

$$\underline{(130 + x) - (130 - y)}$$

d If the boy grows 1 cm, what will the differences be then?

$\underline{\text{His brother will be } 131 + x \text{ cm tall. His sister will be } 131 - y \text{ cm tall.}}$

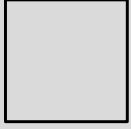
$\underline{\text{So, the difference is } (131 + x) - (131 - y)}$



**Worked example**

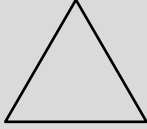
Name the shapes.

a)



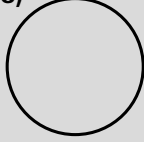
a square

b)



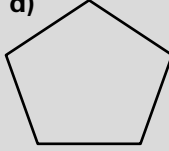
b triangle

c)



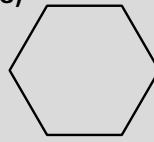
c circle

d)



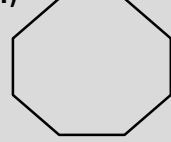
d pentagon

e)



e hexagon

f)



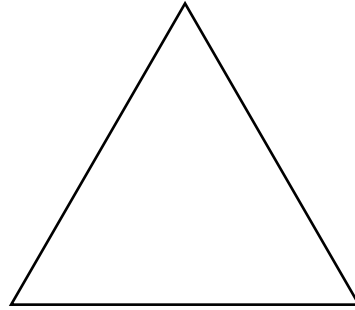
f octagon

① Study these plane shapes. Then complete the table.

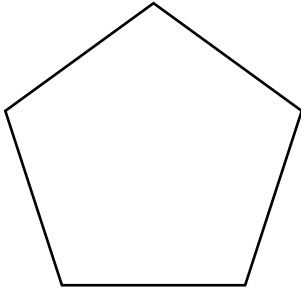
a



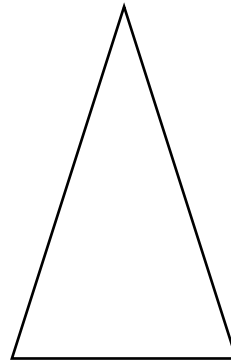
b



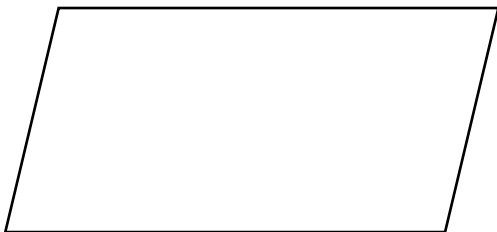
c



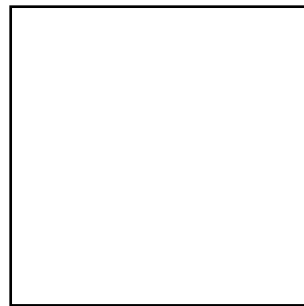
d



e



f



	Name of shape	Number of sides	Number of angles	Length of sides	Size of angles
<b>a</b>	rectangle	4	4	54 mm 31 mm	90°
<b>b</b>	equilateral triangle	3	3	41 mm	60°
<b>c</b>	pentagon	5	5	22 mm	108°
<b>d</b>	isosceles triangle	3	3	44 mm 22 mm	67°, 46°
<b>e</b>	parallelogram	4	4	52 mm 27 mm	103°, 77°
<b>f</b>	square	4	4	36 mm	90°

② Use the plane shapes in question 1 to complete this table.

	Name of shape	Sum of angles	Relationship of sides e.g. opposite sides are equal
<b>a</b>	rectangle	360°	opposite sides are equal
<b>b</b>	equilateral triangle	180°	all sides are equal
<b>c</b>	pentagon	540°	all sides are equal
<b>d</b>	isosceles triangle	180°	two sides are equal
<b>e</b>	parallelogram	360°	opposite sides are equal
<b>f</b>	square	360°	all sides are equal

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

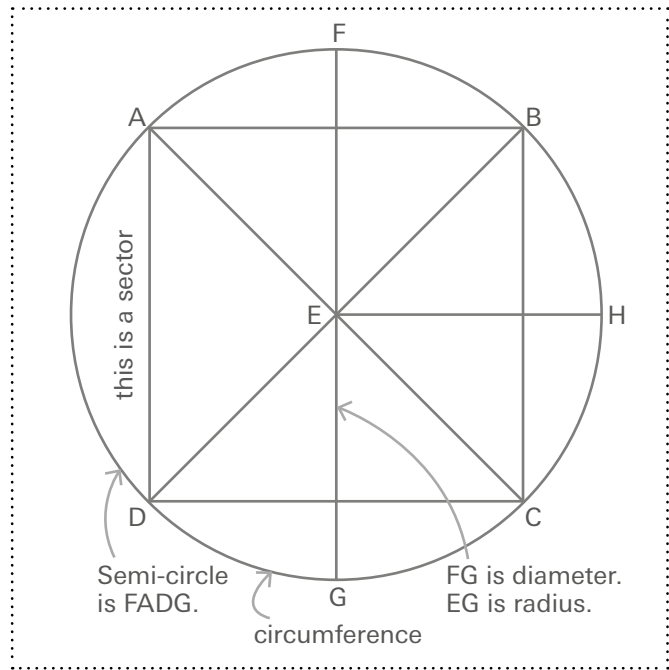
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**c** What do you call a closed shape with 8 straight and equal sides?

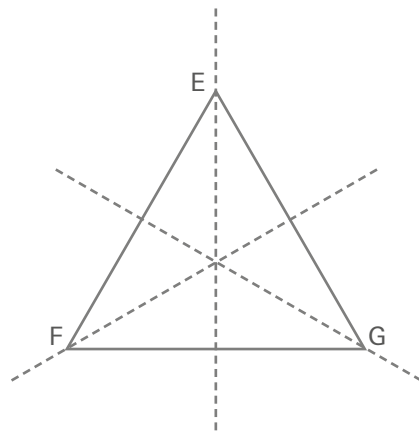
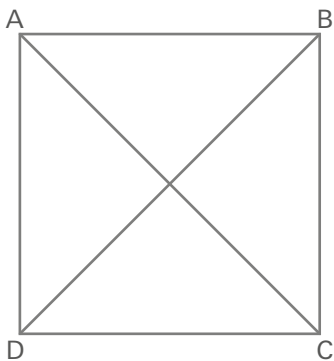
octagon

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- 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.



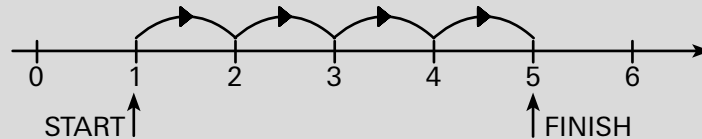
- ⑥ **a** Draw a square ABCD with sides 4 cm long.  
**b** Draw diagonals AC and BD on the square.  
**c** Draw an equilateral triangle EFG with sides 4 cm long.  
**d** Draw three lines of symmetry on the triangle.



## Worked example

- a Use a number line to complete  $1 + 4 = \square$ .  
 b Use a number line to complete  $6 - 2 = \square$ .

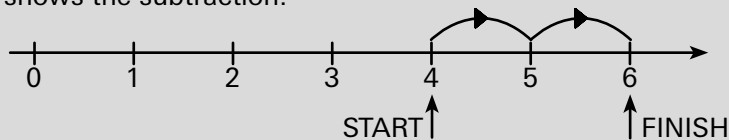
- a This number line shows the addition.



Follow the arrows. Start at 1. Move four places to the right. Finish at 5.

$$1 + 4 = 5$$

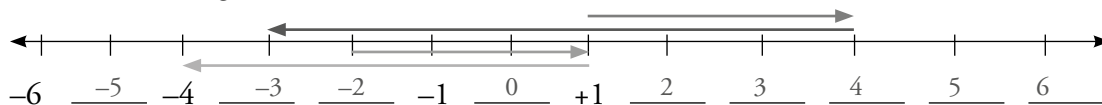
- b This number line shows the subtraction.



Follow the arrows. Start at 6. Move two places to the left. Finish at 4.

$$6 - 2 = 4$$

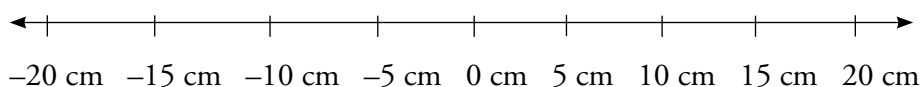
- ① a Fill in the missing numbers on the number line.



- b Use arrows on the number line to calculate the following.

i)  $1 + 3 - 7 = \underline{\quad -3 \quad}$       ii)  $-2 + 2 - 5 = \underline{\quad -5 \quad}$

- ② Use the number line to calculate the answer.

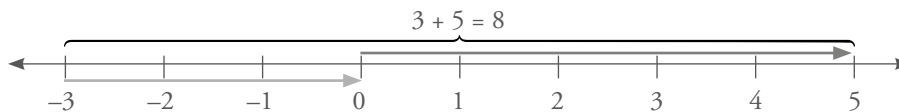


A boy and his sister are playing on the beach. He digs a hole 15 cm deep (negative number). She builds a castle 20 cm high. What is the measurement from the bottom of the hole to the top of the castle?

35 cm

- ③ Draw a number line to help you calculate.

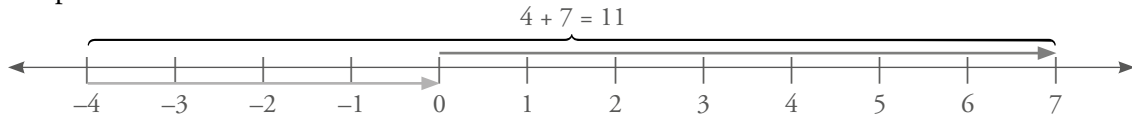
A kite is flying 5 m above the surface of the sea. A child is snorkeling 3 m below the surface. How far is the child from the kite?



8 m

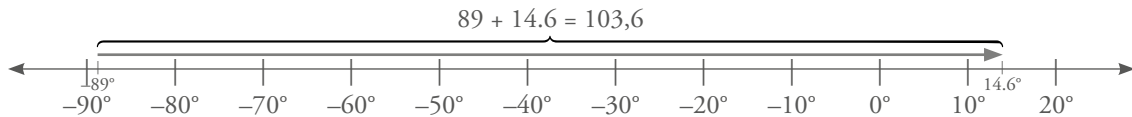
④ Draw number lines to help you calculate.

- 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?



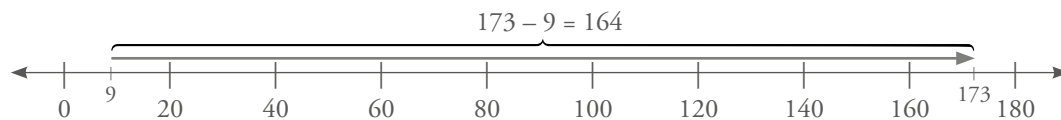
11 m

- b** The lowest temperature recorded in the Antarctic is  $-89^{\circ}\text{C}$  and the highest is  $14.6^{\circ}\text{C}$ . What is the difference between these temperatures?



$103.6^{\circ}\text{C}$

- 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?



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:  $8:15 + 5 \text{ min} = 8:20$

Watch:  $8:15 - 7 \text{ min} = 8:08$

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**  $27 - 50 = -23$

**d**  $-13 - 5 = -18$

**e**  $243 - 342 = -99$

**f**  $-77 + 42 = -35$

⑧ Simplify.

**a**  $34 + (-45) = -11$

**b**  $(-2) + (-5) = -7$

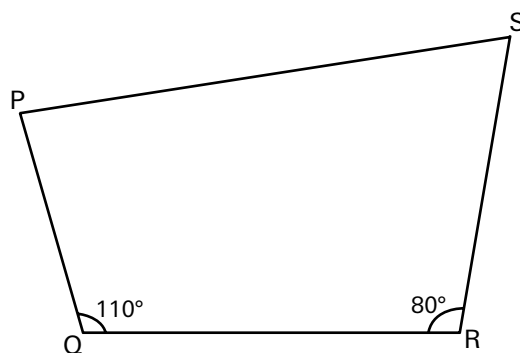
**c**  $(+7) - (-9) = +16$

**Worked example**

Calculate the perimeter of a football field that measures 80 m by 50 m.

$$\begin{aligned} \text{Perimeter of field} &= 2(l + b) \\ &= 2 \times (80 + 50) \text{ m} \\ &= 2 \times 130 \text{ m} \\ &= 260 \text{ m} \end{aligned}$$

- ① Use a ruler to measure the sides of the irregular shape PQRS. Fill in the measurements in the table.



Sides	Length in mm	Length in cm
PQ	22 mm	2.2 cm
QR	45 mm	4.5 cm
RS	35 mm	3.5 cm
SP	59 mm	5.9 cm
Add sides to find perimeter	161 mm	16.1 cm

- ② Use a ruler measure the perimeter of the following.

- a** The cover of your text book in mm.

Example: perimeter =  $2(l + b) = 2(250 + 200) \text{ mm} = 2(450) \text{ mm} = 900 \text{ mm}$

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- b** The top of your desk in cm.

Example: perimeter =  $2(l + b) = 2(60 + 50) \text{ cm} = 2(110) \text{ cm} = 220 \text{ cm}$

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- c** The door of your classroom in metres.

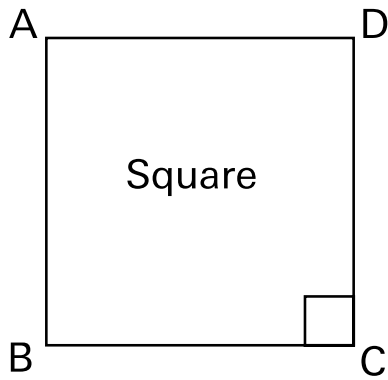
Example: perimeter =  $2(l + b) = 2(2 + 1) \text{ m} = 2(3) \text{ m} = 6 \text{ m}$

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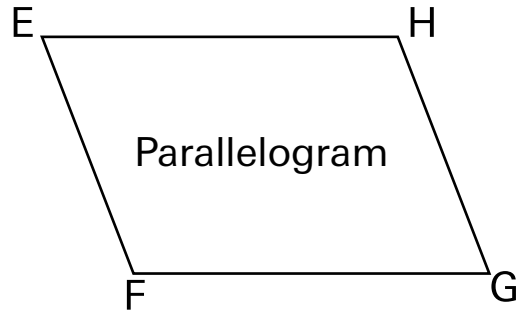
We don't need to measure all the sides to find the perimeter of a regular shape such as a square. For example, if a square has sides of 10 m, perimeter =  $4 \times 10 \text{ m} = 40 \text{ m}$ .

③ Find the perimeters of these regular shapes. Then complete the table.

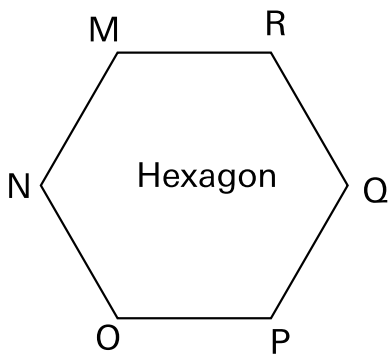
a Square ABCD



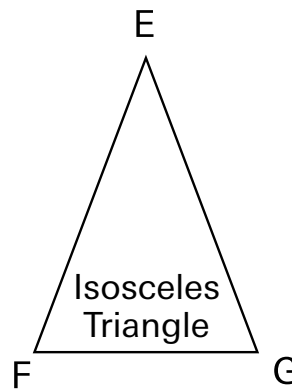
b Parallelogram EFGH



c Hexagon MNOPQR



d Isosceles triangle EFG

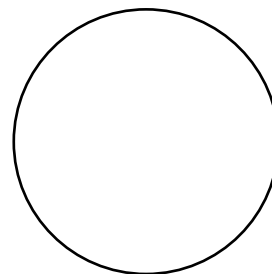


e

Shape	Sides	Calculate	Perimeter in mm	Perimeter in cm
square	4	$4s$	124 mm	12.4 cm
parallelogram	4	$2(l + b)$	144 mm	14.4 cm
hexagon	6	$6s$	102 mm	10.2 cm
isosceles triangle	3	$s + s + s$	101 mm	10.1 cm

④ Use string or wool to measure the perimeter (circumference) of the circle in cm.

Perimeter = 99 mm



To calculate the perimeter of a regular quadrilateral, we use the formula:  $P = 2(l + b)$ .

- ⑤ a Calculate the perimeter of your classroom in metres.  
Example: perimeter =  $2(l + b) = 2(12 + 12) \text{ m} = 2(24) \text{ m} = 48 \text{ m}$

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- b Calculate the perimeter of a soccer field.  
Example: perimeter =  $2(l + b) = 2(100 + 80) \text{ m} = 2(180) \text{ m} = 360 \text{ m}$

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- ⑥ a A rectangular carpet has a perimeter of 240 cm and a breadth of 50 cm. What is its length?  
 $240 - 50 \times 2 = \frac{140}{2} = 70 \text{ cm}$

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- b A square blanket has a perimeter of 6 m. What does each side measure?  
 $\frac{6 \text{ m}}{4} = 1.5 \text{ m}$

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- c A vegetable garden is 90 cm wide and 1.2 m long. What is the perimeter in cm and in m?  
 $P = 2(90 + 120) \text{ cm} = 2(210) \text{ cm} = 420 \text{ cm}$  or 4.2 m

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- ⑦ Find the perimeter (circumference) of these circles using the formula:  $2\pi r$ , where  $\pi = \frac{22}{7}$ .  
Complete the table.

	Radius	Diameter	Circumference
a	7 cm	14 cm	44 cm
b	7 cm	14 cm	44 cm
c	21 cm	42 cm	132 cm
d	14 cm	28 cm	88 cm
e	35 cm	70 cm	220 cm



**Worked example**

- a** Calculate the area of a rectangle 6 cm by 3.5 cm.  
**b** The area of a rectangle is  $224 \text{ cm}^2$ . If its length is 16 cm, calculate the breadth.

- a** area of rectangle =  $6 \text{ cm} \times 3.5 \text{ cm} = 21 \text{ cm}^2$   
**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:

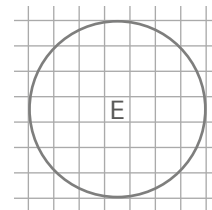
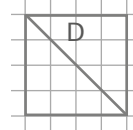
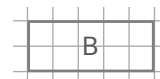
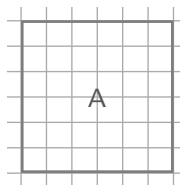
**i)** A square 6 blocks by 6 blocks; call it A.

**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 =  $1 \text{ cm}^2$ .  
 Add the blocks together to find how many there are in each shape.  
 Write the answers in the table.

Shapes	Length or base in cm	Breadth or height in cm	Estimated area in $\text{cm}^2$
A	6 cm	6 cm	$36 \text{ cm}^2$
B	5 cm	2 cm	$10 \text{ cm}^2$
C	3 cm	4 cm	about $\text{cm}^2$
D	4 cm	4 cm	$16 \text{ cm}^2$
$\frac{1}{2}$ of D	4 cm	4 cm	about $8 \text{ cm}^2$
E	Radius 3.5 cm	Radius 3.5 cm	about $38 \text{ cm}^2$

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  $\times$  height

Area of a circle =  $\pi r^2$  where  $\pi = \frac{22}{7}$

Use your calculations to complete the table.

Shapes	Length or base in cm	Breadth or height in cm	Formula	Calculated area in cm <sup>2</sup>
A	6 cm	6 cm	$l \times b$	36 cm <sup>2</sup>
B	5 cm	2 cm	$l \times b$	10 cm <sup>2</sup>
C	3 cm	4 cm	$\frac{1}{2}bh$	6 cm <sup>2</sup>
D	4 cm	4 cm	$l \times b$	16 cm <sup>2</sup>
$\frac{1}{2}$ of D	4 cm	4 cm	$\frac{1}{2}bh$	8 cm <sup>2</sup>
E	Radius 3.5 cm	Radius 3.5 cm	$\pi r^2$	38.5 cm <sup>2</sup>

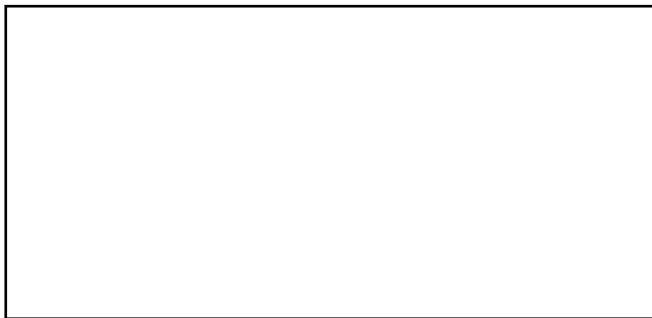
③ If  $l \times b = \text{area}$ , work out the following formulae:

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 m<sup>2</sup>. Find the length and the breadth of the square. Draw a sketch to help you calculate the answer.

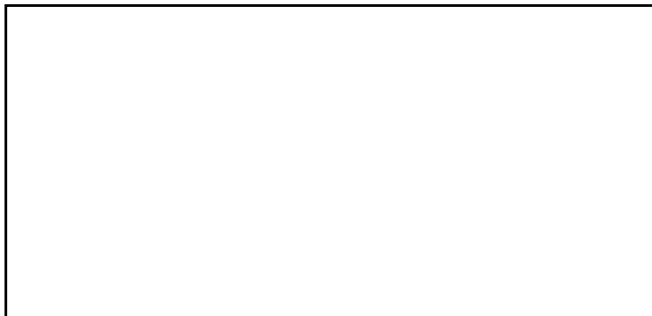


If  $l \times b = 16 \text{ m}^2$  and the shape is square,

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 m<sup>2</sup>. 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.

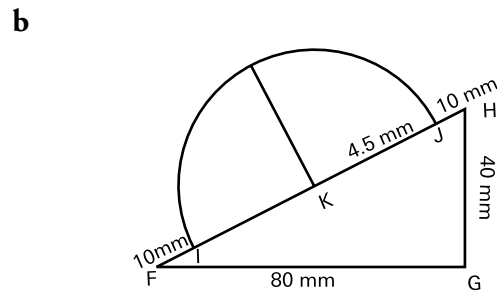
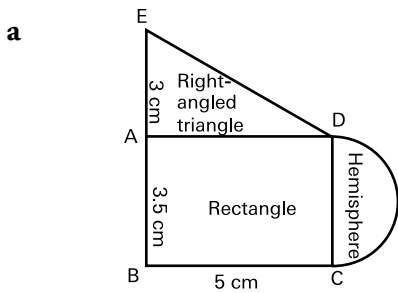
a) diameter of the circle = Diameter of a circle =  $2 \times \text{radius} = 2 \times 21 \text{ m} = 42 \text{ m}$

b) area of the circle = Area =  $\pi r^2 = \frac{22}{7} \times (21 \times 21) = 1\,386 \text{ m}^2$

⑥ Complete the table.

	Radius	Diameter	Formula and circumference	Formula and area
<b>a</b>	70 mm	140 mm	$2\pi r = 440$ mm	$\pi r^2 = 15\,400$ mm <sup>2</sup>
<b>b</b>	35 mm	70 mm	$2\pi r = 220$ mm	$\pi r^2 = 3\,850$ mm <sup>2</sup>
<b>c</b>	14 cm	28 cm	$2\pi r = 88$ cm	$\pi r^2 = 616$ cm <sup>2</sup>
<b>d</b>	70 mm	140 mm	$2\pi r = 440$ mm	$\pi r^2 = 15\,400$ mm <sup>2</sup>
<b>e</b>	21 m	42 m	$2\pi r = 132$ m	$\pi r^2 = 1\,386$ m <sup>2</sup>
<b>f</b>	21 mm	42 mm	$2\pi r = 132$ mm	$\pi r^2 = 1\,386$ mm <sup>2</sup>
<b>g</b>	2.8 m	5.6 m	$2\pi r = 17.6$ m	$\pi r^2 = 24.64$ m <sup>2</sup>
<b>h</b>	2.45 m	4.9 m	$2\pi r = 15.4$ m	$\pi r^2 = 18.865$ m <sup>2</sup>

⑦ Copy these shapes into your exercise book, using the exact measurements given.



**c** Complete the table based on your drawings.

Diagram a	Measurements of sides and radii	Diagram b	Measurements
	Rectangle ABCD		Triangle FGH
Side AB	3.5 cm	Side FG	80 mm
Side BC	5 cm	Side GH	40 mm
Side CD	3.5 cm	Side FH	90 mm
Side AD	5 cm	Lines KH and	KH = 4.5 mm
		JH	JH = 10 mm
Area	17.5 cm <sup>2</sup>	Area	1 600 mm <sup>2</sup>
	Triangle EAD		Hemisphere from I to J
Side AD	5 cm	Diameter	70 mm
Side ED	6 cm	Radius	35 mm
Side EA	3.5 cm	Area	$3\,850\text{ mm}^2 \div 2 = 1\,925\text{ mm}^2$
Area	8.75 cm <sup>2</sup>		
	Hemisphere C to D		
Diameter	3.5 cm		
Radius	1.75 cm		
Area	4.8125 cm <sup>2</sup>		
<b>Total area of diagram</b>	31.0625 cm <sup>2</sup>	<b>Total area of diagram</b>	1 600 mm <sup>2</sup>

## Worked example

Simplify	Working	Result	We know the following:
$2x \times 3$	$= 2 \times x \times 3 = 2 \times 3 \times x$ $= 6 \times x$	$= 6x$	$5 \times y = 5y$ $z + z + z = 3z$ $a - a = 0$ $6a \div 2 = 3a$
$5 \times 2y$	$= 5 \times 2 \times y = 10 \times y$	$= 10y$	$9ab \div b$ can be simplified as $\frac{9ab}{b}$ and solved.
$7a \times 3b$	$= 7 \times a \times 3 \times b$ $= 7 \times 3 \times a \times b = 21 \times ab$	$= 21ab$	
$6x \times 4x$	$= 6 \times x \times 4 \times x$ $= 6 \times 4 \times x \times x = 24 \times x^2$	$= 24x^2$	We can write $2 \times a$ as $2a$ or $2(a)$ .

① Simplify.

a  $7 \times 9 = \underline{63}$

b  $7 \times a = \underline{7a}$

c  $12a \times 4a = \underline{48a^2}$

d  $5ab \times 2a = \underline{10a^2b}$

e  $8b \div 2 = \underline{4b}$

f  $21b \div 3 = \underline{7b}$

g  $b^2 \div b = \underline{b}$

h  $9ab \div b = \underline{9a}$

② Simplify by writing these as fractions. Then solve.

a  $24ab \div 8a$   
 $= \underline{3b}$   
\_\_\_\_\_  
\_\_\_\_\_

b  $ab^2 \div b$   
 $= \underline{ab}$   
\_\_\_\_\_  
\_\_\_\_\_

c  $75a^2b^3 \div 25ab$   
 $= \underline{3ab^2}$   
\_\_\_\_\_  
\_\_\_\_\_

d  $18ab^3 \div 2ab$   
 $= \underline{9b^2}$   
\_\_\_\_\_  
\_\_\_\_\_

③ Group the like terms. Use BODMAS to simplify and solve.

a  $7a + 6b - 4 - 2a - 2b + 8 = \underline{5a + 4b + 4}$   
\_\_\_\_\_  
\_\_\_\_\_

b  $5ab + 2b - 2ab + b + 15 = \underline{3ab + 3b + 15}$   
\_\_\_\_\_  
\_\_\_\_\_

c  $7ab - 1 + 3ab + 2 - 8ab = \underline{2ab + 1}$   
\_\_\_\_\_  
\_\_\_\_\_

d  $9(a + b) - 3(a + b) = \underline{9a + 9b - 3a - 3b = 6a + 6a}$   
\_\_\_\_\_  
\_\_\_\_\_

④ Simplify.

a  $7(a + 4) = \underline{7a + 28}$

b  $5a(2a + 3a) = \underline{10a^2 + 15a^2 = 25a^2}$

c  $9a^2(a) - 8a^2(a) = \underline{9a^3 - 8a^3 = a^3}$

⑤ Write these without brackets.

a  $4a(2a + 2b + 3) = \underline{8a^2 + 8ab + 12a}$

b  $a(4a - 3b - 6) = \underline{4a^2 - 3ab - 6a}$

c  $3a(3a + 3a) = \underline{9a^2 + 9a^2}$

We can write  $2a + 4$  as  $2(a + 2)$ .

⑥ Write these expressions as a product of two expressions. Insert the brackets.

a  $6a + 3 = \underline{3(2a + 1)}$

b  $15ab + 5a + a = \underline{a(15b + 5 + 1)}$

c  $24b^3 + 6b^2 - 3b = \underline{3b(8b^2 + 2b - 1)}$

⑦ Write these without brackets. Then simplify.

a  $5a - (a + 5) = \underline{5a - a - 5 = 4a - 5}$

b  $5a + 5a(a - 5) = \underline{5a + 5a^2 - 25a}$

c  $(12a + 3b) + (2a + 2b) = \underline{14a + 5b}$

d  $(15a - 3b) - (2a - 2b) = \underline{13a - b}$

⑧ Complete the table.

	Expression	Write without brackets	Simplify
a	$15a - 3(a + 5)$	$15a - 3a + 15$	$12a - 15$
b	$36a + 4(a + 5)$	$36a + 4a + 20$	$40a + 20$
c	$5a(6a + 3a + 1)$	$30a^2 + 15a^2 + 5a$	$45a^2 + 5a$
d	$3a(4a + 5b + 2)$	$12a^2 + 15ab + 6a$	$12a^2 + 15ab + 6a$
e	$9a - 4(a - 5a)$	$9a - 4a + 20a$	$25a$

⑨ Write these as the product of two algebraic expressions.

a  $ab + ac = \underline{a(b + c)}$

b  $ab - ac = \underline{a(b - c)}$

c  $ab^2 + cb^2 = \underline{b^2(a + c)}$

d  $ab^2 - cb^2 = \underline{b^2(a - c)}$

### Worked example

- a** Calculate the volume of a rectangular box that measures 30 cm × 15 cm × 10 cm.  
**b** A rectangular room 4 m long by 3 m wide contains 30 m<sup>3</sup> of air.  
 Calculate the height of the room.

**a** Volume of box =  $(30 \times 15 \times 10) \text{ cm}^3 = 4\,500 \text{ cm}^3$

**b** volume of room = 30 m<sup>3</sup>  
 area of floor (base) = 4 m × 3 m = 12 m<sup>2</sup>  
 height of room =  $\frac{30}{12} \text{ m} = 2\frac{1}{2} \text{ m}$

- ① Follow these instructions to calculate the volume of a cuboid (rectangular prism).

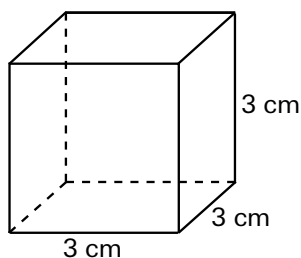
- a** Calculate the area of the base 5 cm long × 3 cm broad.

Area =  $l \times b =$  \_\_\_\_\_ Area = 5 cm × 3 cm = 15 cm<sup>2</sup>

- b** The height is 2 cm. Calculate the volume.

Volume = area ×  $h$ , which is  $l \times b \times h =$  \_\_\_\_\_ Volume = 5 cm × 3 cm × 2 cm = 30 cm<sup>3</sup>

- ② Calculate the volume of this cube.

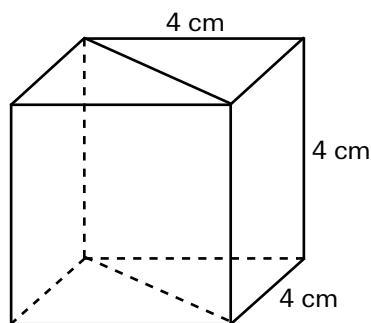


Volume =  $l \times b \times h = 3 \text{ cm} \times 3 \text{ cm} \times 3 \text{ cm} = 27 \text{ cm}^3$

- ③ **a** Calculate the volume of a cube measuring 4 m × 4 m × 4 m.

Volume =  $l \times b \times h = 4 \text{ m} \times 4 \text{ m} \times 4 \text{ m} = 64 \text{ m}^3$

- 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  $\frac{1}{2}(l \times b \times h)$  or  $\frac{1}{2}lbh$ .



$\frac{1}{2}lbh = \frac{1}{2}$  of  $64 \text{ cm}^3 = 32 \text{ cm}^3$

- ④ A building brick has a volume of  $1\,280\text{ cm}^3$ . The length of the brick is  $20\text{ cm}$  and the breadth is  $8\text{ cm}$ . What is the height of the brick?

If  $l \times b \times h = \text{volume}$  then  $h = \text{volume} \div (l \times b)$

$$\text{so } h = 1\,280\text{ cm}^3 \div (20\text{ cm} \times 8\text{ cm})$$

$$= 1\,280\text{ cm}^3 \div 160\text{ cm}^2 = 8\text{ cm}$$

Remember that  $1\text{ l} = 1\,000\text{ cm}^3$  and  $1\text{ kl} = 1\text{ m}^3$  or  $1\,000\,000\text{ cm}^3$ .

- ⑤ Complete the table.

	Length of side of a cube	Formula for finding volume	Volume	Capacity
<b>a</b>	10 cm	$l \times b \times h$	$1\,000\text{ cm}^3$	1 l
<b>b</b>	1 m	$l \times b \times h$	$1\text{ m}^3$	1 kl
<b>c</b>	100 cm	$l \times b \times h$	$1\,000\,000\text{ cm}^3$	1 kl

- ⑥ A boy has three containers of juice. Each container is  $10\text{ cm} \times 10\text{ cm} \times 10\text{ cm}$ .

- a** What is the volume of each container?

Each container has a volume of  $1\,000\text{ cm}^3$

- 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  $4\text{ m}$  long,  $3\text{ m}$  high and  $5\text{ m}$  wide. What is its volume?

$60\text{ cm}^3$

- ⑧ A rectangular container has a volume of  $720\text{ m}^3$ . If the length of the container is  $10\text{ m}$  and the height is  $9\text{ m}$ , what is its breadth?

$8\text{ m}$

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  $\text{cm}^3$  and  $\text{m}^3$ .

Volume of wall =  $0.15 \text{ m}^3$  or  $1\,500\,000 \text{ cm}^3$

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**b** What is the volume of each brick? Express the volume in  $\text{cm}^3$  and  $\text{m}^3$ .

Volume of brick =  $0.001 \text{ m}^3$  or  $1\,000 \text{ cm}^3$

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**c** How many bricks will he need to build the wall?

He will need 1 500 bricks

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⑩ A swimming pool is 7 m long, 5 m wide and 2.5 m deep.

**a** What is the volume of the pool?

$87.5 \text{ m}^3$

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**b** If the pool is filled with water 2 m deep, what is the volume of the water?

$70 \text{ m}^3$

---



---

**c** What is the difference in the volume of the water and the volume of the pool?

$87.5 \text{ m}^3 - 70 \text{ m}^3 = 17.5 \text{ m}^3$

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⑪ Complete the table.

Volume	Capacity
1 ml = $1 \text{ cm}^3$	1 ml = 0.001 litres
1 ℓ = $1\,000 \text{ cm}^3$	1 ℓ
1 kl = $1\,000\,000 \text{ cm}^3 = 1 \text{ m}^3$	1 kl = 1 000 ℓ

⑫ Convert from volume to capacity.

**a** 7 kl =  $\frac{7\,000\,000}{1\,000}$   $\text{cm}^3$

**b** 7 kl =  $\frac{7\,000}{1\,000}$  ℓ

**c** 19 ml =  $\frac{19}{1\,000}$   $\text{cm}^3$

**d** 999 ml =  $\frac{999}{1\,000}$  ℓ

**e** 15 ℓ =  $\frac{15\,000}{1\,000}$   $\text{cm}^3$



**Worked example**

The table below shows the leading causes of death by age group in a country in East Africa.

cause of death	Age group (years)			
	0–4	5–14	15–59	60+
Malaria/Fever	40%	61%	16%	26%
HIV & AIDS/TB	4%	13%	56%	17%
Heart disease	n/s	n/s	6%	23%
Injury/Accident	32%*	17%	5%	n/s

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.)

Club	Town or City	Home colours
Abia Warriors Football Club	Umuahia	Red
Akwa United	Uyo	Blue
Bayelsa United	Yenegoa	Yellow
Kano Pillars Football Club	Kano	Green and yellow
	STUDENTS' OWN ANSWERS	

- ② The table shows statistical data. Study the table carefully then answer the questions.

Data on education in Nigeria: 2012		
Institution	Gender	Enrolment
Pre-primary	Boys	14.8%
	Girls	13.8%
Primary	Boys	87.1%
	Girls	79.3%
Literacy rate: Young people aged 15 to 24 years	Boys	75.6%
	Girls	58%

- 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.

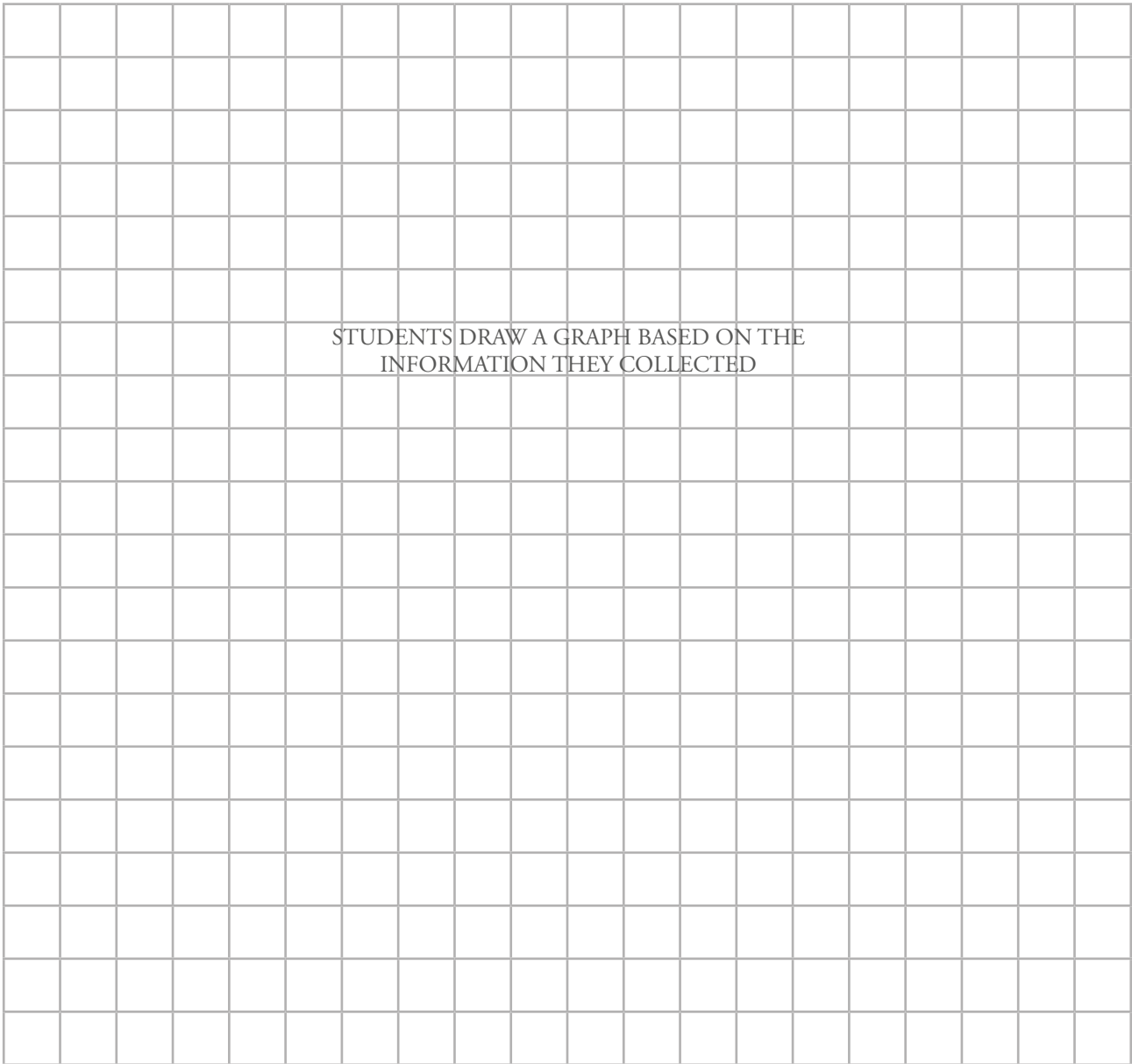
Place that interviews take place: Date:			
Names	Number of sisters (tally)	Number of brothers (tally)	Total
STUDENTS' OWN ANSWERS			

- 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. Students' own answers
- Consider which questions you will include in your questionnaire. Make notes of some possible questions.
  - Plan how many people you will interview.
  - Plan who you are going to question. Make a list of people you might interview.
  - How will you be sure the people you interview won't influence one another? Note people who live close together.
  - 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: Students' own answers
- Names of the people you interview.
  - Their responses, negative or positive. Mark these with tallies.
  - Allow a column to show the frequency ( $f$ ), which shows the total number of tallies recorded.

The plan should look a bit like this:

Response	Tally	Total
Positive		
Negative		
Other		

⑥ Complete the graph by filling in the bars (columns) and the information you have gained.



**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.

<b>Grade</b>	A	B	C	D	E	F
<b>Frequency</b>	3	5	3	1	2	1

She wanted to create a pie chart of the results so she created this table.

<b>Grade</b>	A	B	C	D	E	F	Total
<b>No. of students</b>	3	5	3	1	2	1	15
<b>Angle at centre</b>	72°	120°	72°	24°	48°	24°	360°

To calculate the angles, use the ratio of the frequency. For example:

$$\text{angle for grade A} = \frac{3}{15} \text{ of } 360^\circ = 72^\circ$$

$$\text{angle for grade B} = \frac{5}{15} \text{ of } 360^\circ = 120^\circ$$

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, 6, 7, 7, 7, 8, 8, 8, 9

- b Complete the table, using the marks.

<b>Marks out of ten</b>	2	3	4	5	6	7	8	9	10
<b>Number of pupils</b>	1	3	2	6	3	3	3	1	0

- 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

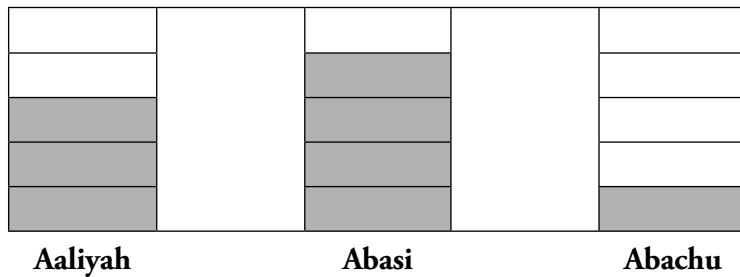
- h What is the frequency ( $f$ ) (number of times) of 4? 2

- ② Study the pictograph. Then answer the questions.

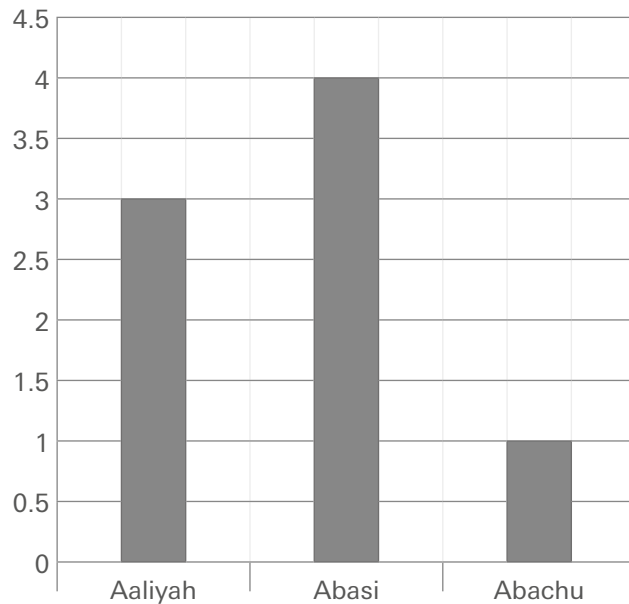
	Number of pets
Aaliyah	
Abasi	
Abachu	

- 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.  
 \_\_\_\_\_

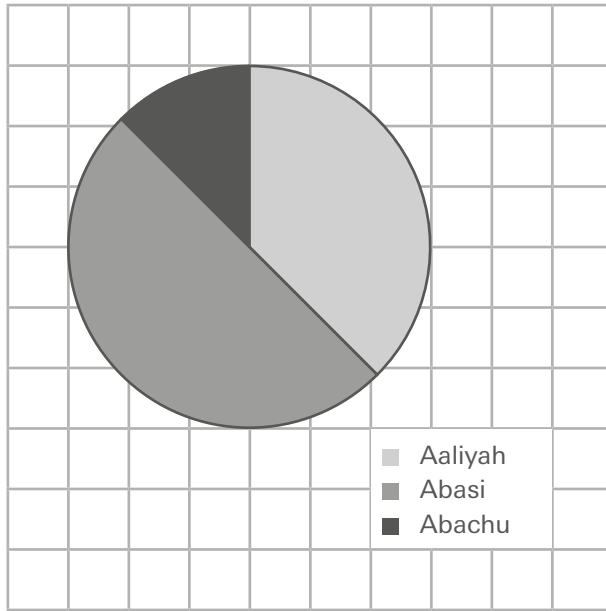
f Complete the diagram below to show the information on the pictograph.



g Draw a bar graph based on the same information.



**h** Draw a pie chart to show the same information. Use a pair of compasses to draw the circle.



③ Study the tally chart of sports meetings played and won by a local school's teams during one term. Then answer the questions.

Sports	Soccer	Hockey	Cricket	Netball
Frequency	////	///	//	////
Number	4	3	2	4

- 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



**Worked example**

Say whether the following are true or false.

**a**  $\square + 2 = 5$ ,  
when 3 goes in the box.

**b**  $3x + 1 = 10$ ,  
when  $x = 2$ .

**a** When 3 goes in the box:

$$\square + 2 \quad \square 3 + 2 \quad \square 5.$$

Thus

$\square + 2 = 5$  is true when 3 goes in the box.

**b** When  $x = 2$

$$3x + 1 = 3 \times 2 + 1$$

$$= 6 + 1$$

$$= 7$$

$$7 \neq 10, \text{ thus}$$

$$3x + 1 = 10 \text{ is false when } x = 2.$$

(The symbol  $\neq$  means: is not equal to.)

- ① 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:  $5 + \square = 7$  or  $5 + a = 7$ ) is called a(n) \_\_\_\_\_  
variable.

**b** The expression  $5 + \square = 7$  is called a(n) \_\_\_\_\_  
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

- ② Complete the table by writing true or false.

Open sentences	Value of unknown	True or False
$a + 15 = 19$ if	$a = 4$	true
$b - 7 = 26$ if	$b = 36$	false
$12c = 36$ if	$c = 3$	true
$5d + 4 = 24$ if	$d = 4$	true
$9e - 7 = 54$ if	$e = 7$	false
$\frac{25}{f} = 5$ if	$f = 5$	true
$4 = \frac{24}{g}$ if	$g = 4$	false



③ 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	RHS	Check: $4 + 5 = 9$
$a + 5$	$= 9$	
$a + 5 - 5$	$= 9 - 5$	
$a$	$= 4$	

④ Solve these equations. Then check your answers.

**a**  $2x + 9 = 27$        $2x + 9 - 9 = 27 - 9$   
 $2x = 18$   
 $\frac{2x}{2} = \frac{18}{2}$   
 $x = 9$

---



---

**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**  $\frac{b}{10} = 3$        $10 \times \frac{b}{10} = 3 \times 10$   
 $b = 30$

---



---

**f**  $\frac{7}{c} = 7$        $7 \times \frac{c}{c} = 7 \times c$   
 $7 \times 1 = 7c$   
 $7 = 7c$   
 $\frac{7}{7} = \frac{7c}{7}$

---



---

**g**  $12d = 96$   
 $\frac{12d}{12} = \frac{96}{12}$   
 $d = 8$

---



---

**h**  $39 = 13e$   
 $\frac{39}{13} = \frac{13e}{13}$   
 $3 = e$

---



---

**i**  $9f + 6 = 60$        $9f + 6 - 6 = 60 - 6$   
 $9f = 54$   
 $\frac{9f}{9} = \frac{54}{9}$   
 $f = 6$

---



---

**j**  $\frac{20}{g} + 4 = 8$        $\frac{20}{g} + 4 - 4 = 8 - 4$   
 $\frac{20}{g} = 4$   
 $20 \times \frac{g}{g} = 4 \times g$

---

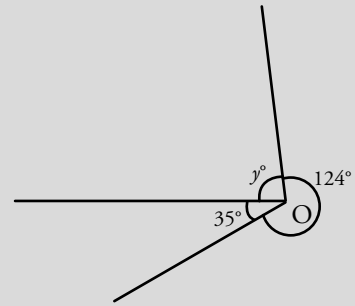
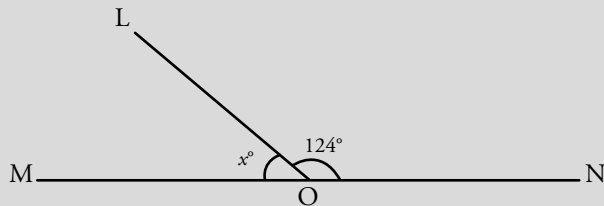


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$20 \times 1 = 4g$   
 $20 = 4g$   
 $\frac{20}{4} = \frac{4g}{4}$   
 $5 = g$

## Worked example

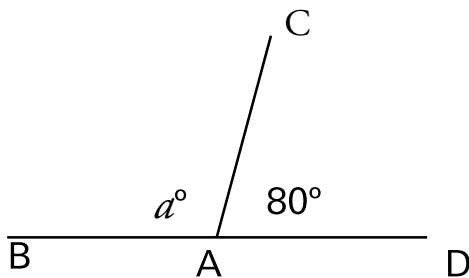
Calculate the sizes of the lettered angles



- a**  $x^\circ + 124^\circ = 180^\circ$  (adjacent angles on straight line MON)  
 $x^\circ = 180^\circ - 124^\circ$   
 $= 56^\circ$
- b**  $y^\circ + 35^\circ + 210^\circ = 360^\circ$  (sum of angles at point O)  
 $y^\circ + 245^\circ = 360^\circ$   
 $y^\circ = 360^\circ - 245^\circ$   
 $= 115^\circ$

① Measure these angles. Write your measurements below the angles.

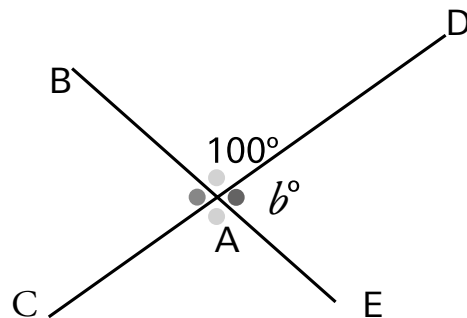
**a**



$$\hat{CAB} = \underline{100^\circ}$$

$$\hat{CAD} = \underline{80^\circ}$$

**b**



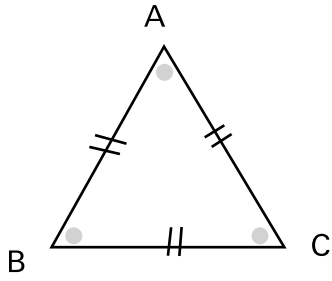
$$\hat{BAC} = \underline{80^\circ}$$

$$\hat{CAE} = \underline{100^\circ}$$

$$\hat{EAD} = \underline{80^\circ}$$

$$\hat{DAB} = \underline{100^\circ}$$

c

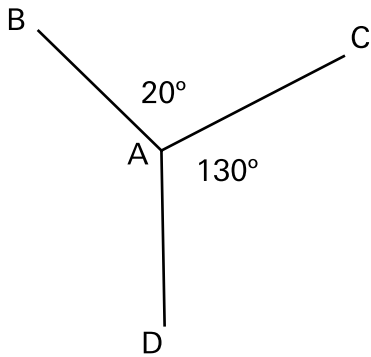


$\hat{A}BC = \underline{60^\circ}$

$\hat{B}CA = \underline{60^\circ}$

$\hat{C}AB = \underline{60^\circ}$

e

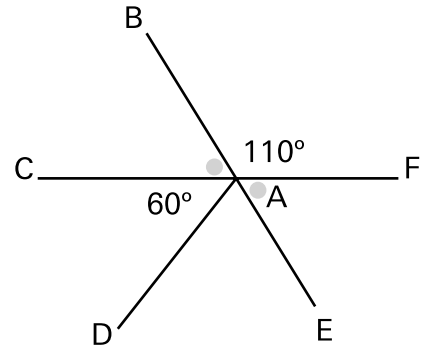


$\hat{B}AC = \underline{20^\circ}$

$\hat{D}AB = \underline{110^\circ}$

$\hat{C}AB = \underline{20^\circ}$

d



$\hat{B}AC = \underline{70^\circ}$

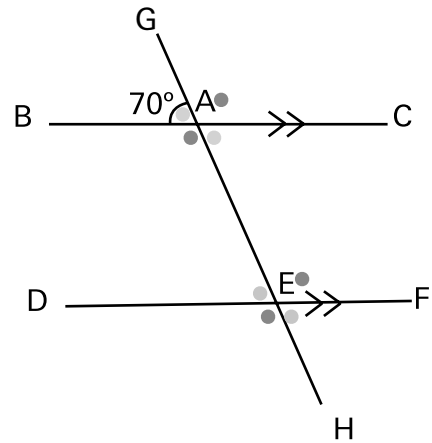
$\hat{E}AF = \underline{70^\circ}$

$\hat{C}AD = \underline{60^\circ}$

$\hat{D}AE = \underline{50^\circ}$

$\hat{F}AB = \underline{110^\circ}$

f



$\hat{B}AG = \underline{70^\circ}$

$\hat{C}AG = \underline{110^\circ}$

$\hat{B}AE = \underline{110^\circ}$

$\hat{D}EA = \underline{70^\circ}$

$\hat{F}EA = \underline{110^\circ}$

$\hat{D}EH = \underline{110^\circ}$

$\hat{F}EH = \underline{70^\circ}$

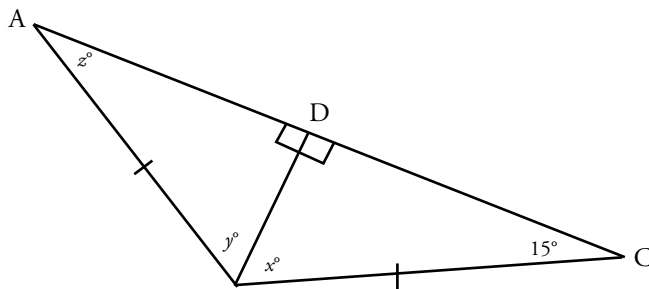


② Complete the table by filling in the spaces.

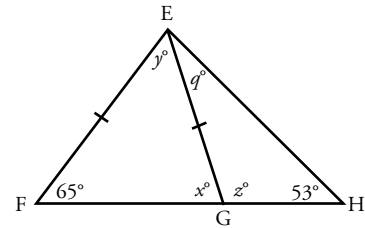
Triangle	1st angle	2nd angle	3rd angle	Sum of angles
ABC	60°	20°	80°	180°
DEF	113°	45°	22°	180°
GHI	69°	93°	18°	180°
JKL	54°	89°	37°	180°
MNO	93°	12°	75°	180°

③ Study the diagrams. Then answer the questions.

**a**



**b**



**c** Calculate the sizes of angles  $x$ ,  $y$  and  $z$  in  $\triangle ABC$ .

$$x = 75^\circ \quad y = 75^\circ \quad z = 15^\circ$$


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**d** Calculate the sizes of angles  $x$ ,  $y$ ,  $z$  and  $q$  in  $\triangle EFH$ .

$$x = 65^\circ \quad y = 50^\circ \quad z = 115^\circ \quad q = 12^\circ$$


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**e** In  $\triangle ABC$  does  $x^\circ = y^\circ$ ? 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  $15^\circ$ .

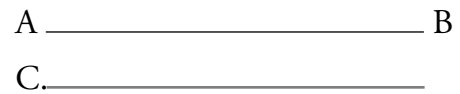
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This means the remaining angle in each triangle must be  $75^\circ$ .

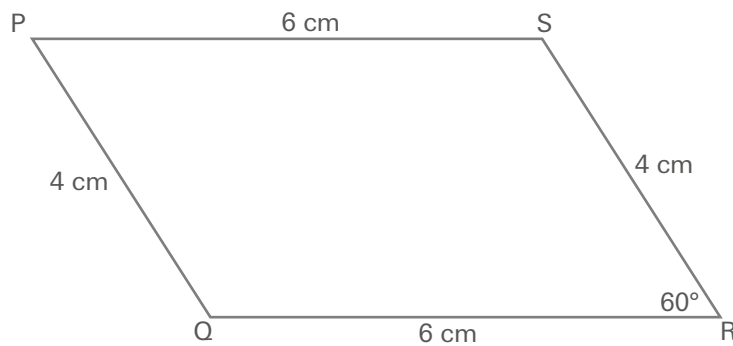
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① Construct these figures using a ruler, set square, protractor and pair of compasses.

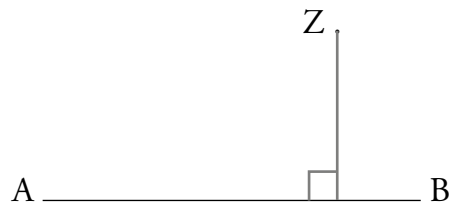
a Construct a line through C parallel to AB:



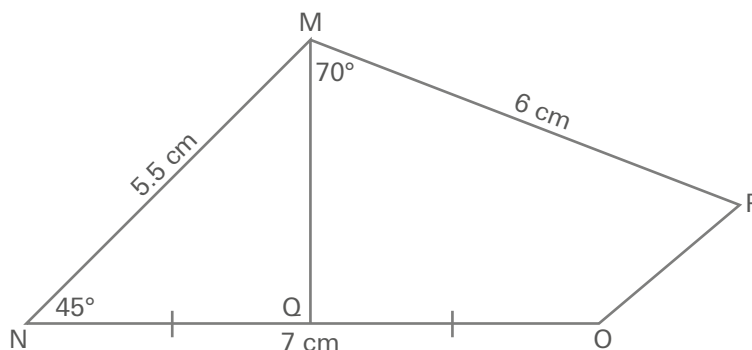
b Construct parallelogram PQRS so that the base,  $QR = 6$  cm,  $RS = 4$  cm and the angle at R =  $60^\circ$ .



c Construct a line through Z perpendicular to AB.



- d Construct quadrilateral MNOP so that the base,  $NO = 7\text{ cm}$ ,  $MN = 5.5\text{ cm}$  and the angle at  $N = 45^\circ$ . Draw  $MQ$  perpendicular to  $NO$ .  $MP = 6\text{ cm}$  and the angle at  $QMP = 70^\circ$ . Join  $PO$ .

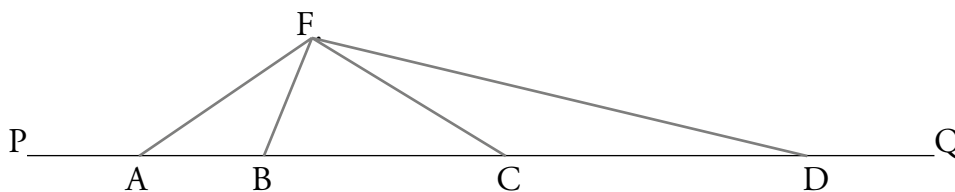


- e Answer these questions about the rectangle you have constructed above. Measure to confirm.

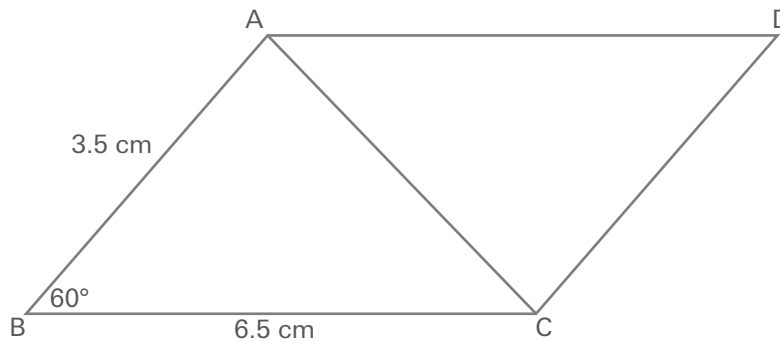
- i) What is the length of  $MQ$ ? 38 mm
- ii) What is the length of  $PO$ ? 30 mm
- iii) Find angle  $MNQ$ .  $45^\circ$
- iv) Find angle  $MQN$ .  $90^\circ$
- v) Find angle  $MQO$ .  $90^\circ$
- vi) Find angle  $QOP$ .  $149^\circ$
- vii) Find angle  $OPM$ .  $53^\circ$
- viii) What is the sum of the angles in triangle  $MNQ$ ?  $45^\circ + 90^\circ + 45^\circ = 180^\circ$
- ix) What is the sum of the angles in rectangle  $MNOP$ ?  $360^\circ$
- x) What is the sum of the angles in rectangle  $MQOP$ ?  $360^\circ$

- ② Join the points A, B, C and D to the point F.

Now draw a line from F perpendicular to the line  $PQ$ .



- ③ Construct parallelogram ABCD so that the base,  $BC = 6.5$  cm,  $AB = 3.5$  cm and the angle at  $B = 60^\circ$ .



Measure or calculate to find the following.

**a** Find the angle at D.  $60^\circ$  \_\_\_\_\_

**b** Find the angle at A.  $120^\circ$  \_\_\_\_\_

**c** Find the angle at C.  $120^\circ$  \_\_\_\_\_

**d** What is the sum of the four angles of the parallelogram?

$360^\circ$  \_\_\_\_\_

**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.

\_\_\_\_\_



**Worked example**

The **mean**, sometimes called the **arithmetic mean**, is the most common average. If there are  $n$  numbers in a set, then:  $\text{mean} = \left[ \frac{\text{sum of numbers in the set}}{n} \right]$

When a set of numbers is in order of size, the **median** is the middle number.

The **mode** is the number that appears most often.

- ① 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.

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
103	98	76	48	123	142	47

- a What is the average number of shoppers per day?

$$103 + 98 + 76 + 48 + 123 + 142 + 47 = 637$$

$$637 \div 7 = 91 \text{ is the average number of shoppers.}$$

- b What is another word for average? mean

- ② Calculate the mean of these sets of numbers.

a 5, 10, 15, 20, 25 5, 10, 15, 20, 25; the mean is 15

b 1, 9, 4, 5, 10 1, 9, 4, 5, 10; the mean is  $29 \div 5 = 5.8$

c 7, 8, 9, 10, 11, 15 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.

Subjects	English	Mathematics	History	Geography	Science	Art
Pupil 1	60	74	84	76	78	54
Pupil 2	70	78	38	54	84	66

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?  
 $49 \text{ kg} \times 3 = 147 \text{ kg}$   
 $147 \text{ kg} - (52 \text{ kg} + 46 \text{ kg}) = 49 \text{ kg}$

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?  
 $31 \div 2 = 15.5 \text{ years old}$

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

**Worked example**

Give 14 505 to the nearest:

**a** thousand      **b** hundred      **c** ten

- a** 14 505 = 15 000 to the nearest thousand  
(14 505 is a little nearer 15 000 than 14 000)
- b** 14 505 = 14 500 to the nearest hundred
- c** 14 505 = 14 510 to the nearest ten  
(the last digit of 14 505 is 5; round up)

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.

Numbers	Round off to the nearest 10	Round off to the nearest 100	Round off to the nearest 1 000
59	60	100	0
732	730	700	1 000
4 899	4 900	4 900	5 000
15 606	15 610	15 600	16 000
48 989	48 990	49 000	49 000

- ④ Complete the table by rounding off the numbers as required.

Numbers	Round off to the nearest 100	Round off to the nearest 10	Round off to the nearest whole number	Round off to the nearest tenth
83.45	100	80	83	83.5
3.45	0	0	3	3.5
183.43	200	180	183	183.4
18.05	0	20	18	18.1
83.01	100	80	83	83

Remember *estimated* and *approximated* have similar meanings. We show approximated results using the symbol  $\approx$ .

- 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.

Approximate number of shoes	Approximate number of slippers	Sum of approximate numbers	Calculation of actual numbers	Difference
789 $\approx$ 1 000	1 084 $\approx$ 1 000	2 000	1 873	127

- ⑥ 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.

Approximate mass of box	Approximate mass of packet	Sum of approximate masses	Calculation of actual masses	Difference
87 g $\approx$ 90 g	49 g $\approx$ 50 g	140 g	136 g	4 g

**Worked example**

Expand **a**  $25\ 024_{\text{six}}$ , **b**  $1\ 001_{\text{two}}$  in powers of their bases.

**a**  $25\ 024_{\text{six}}$   
 $= 2 \times 6^4 + 5 \times 6^3 + 0 \times 6^2 + 2 \times 6^1 + 4 \times 1$

**b**  $1\ 001_{\text{two}}$   
 $= 1 \times 2^3 + 0 \times 2^2 + 0 \times 2^1 + 1 \times 1$

- 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.

Decimal numbers	Binary numbers	Values of binary numbers
0	0	
1	1	
2	10	10 = 1 two and 0 ones
3	11	11 = 1 two and 1 one
4	100	100 = 1 four and 0 twos and 0 ones
5	101	101 = 1 four and 0 twos and 1 one
6	110	110 = 1 four 1 two and 0 ones
7	111	111 = 1 four 1 two 1 one
8	1000	1000 = 1 eight 0 fours 0 twos and 0 ones
9	1001	1001 = 1 eight 0 fours 0 twos and 1 one
10	1010	1010 = 1 eight 0 fours 1 two and 0 ones
11	1011	1011 = 1 eight 0 fours 1 twos and 1 ones
12	1100	1100 = 1 eight 1 fours 0 twos and 0 ones
13	1101	1101 = 1 eight 1 fours 0 twos and 1 one
14	1110	1110 = 1 eight 1 fours 1 two and 0 ones
15	1111	1111 = 1 eight 1 fours 1 twos and 1 ones
16	10000	10000 = 1 sixteen 0 eights 0 fours 0 twos and 0 ones

④ Add these binary numbers.

$$\begin{array}{r} \mathbf{a} \quad 1010 \\ + 1011 \\ \hline 10101 \end{array}$$

$$\begin{array}{r} \mathbf{b} \quad 110 \\ \quad 111 \\ + 101 \\ \hline 10010 \end{array}$$

⑤ Subtract these binary numbers.

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

$$\begin{array}{r} \mathbf{b} \quad 1011 \\ - 110 \\ \hline 101 \end{array}$$

⑥ Multiply these binary numbers.

$$\begin{array}{r} \mathbf{a} \quad 101 \\ \times 10 \\ \hline 1010 \end{array}$$

$$\begin{array}{r} \mathbf{b} \quad 1011 \\ \times 110 \\ \hline 100010 \end{array}$$

⑦ Calculate in base two. Then check your answers in base ten.

$$\begin{array}{r} \mathbf{a} \quad 1011 \\ + 1001 \\ \hline 10100 \end{array}$$

Check:  
 $10 + 9 = 20$

$$\begin{array}{r} \mathbf{b} \quad 10\ 011 \\ + 10\ 011 \\ \hline 100110 \end{array}$$

Check:  
 $19 + 19 = 38$

$$\begin{array}{r} \mathbf{c} \quad 10111 \\ - 1101 \\ \hline 1010 \end{array}$$

Check:  
 $23 - 13 = 10$

$$\begin{array}{r} \mathbf{d} \quad 10101 \\ - 1001 \\ \hline 1100 \end{array}$$

Check:  
 $21 - 9 = 12$

$$\begin{array}{r} \mathbf{e} \quad 1011 \\ \times 101 \\ \hline 110111 \end{array}$$

Check:  
 $11 \times 5 = 55$

$$\begin{array}{r} \mathbf{f} \quad 11011 \\ \times 111 \\ \hline 10111101 \end{array}$$

Check:  
 $27 \times 7 = 189$

# Index

- A**  
addition 2, 3, 10, 27, 32–33, 144–145  
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