

**Nguzu Nguzu Mathematics**

# **Teacher's Guide Book 1**



**Standard 5**

First Edition 2005



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P.O. Box G27

Honiara

Solomon Islands

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# Standard 5

## Mathematics Teacher's Guide



## Foreword

This Standard 5 Mathematics Teacher's Guide has been developed to make Mathematics teaching and learning more relevant to the needs of Solomon Islands pupils and teachers.

This Teacher's Guide and the related Pupil's Resource Books have been developed locally by Solomon Islands' teachers and curriculum developers. They place mathematics in a local context, using examples and situations which are familiar to Solomon Islands' children. I regard the development of these teaching and learning approaches as another important step in our efforts to provide high quality, meaningful learning experiences for our primary pupils.

All the Nguzu Nguzu Standard 5 Maths materials build on the ideas and methodologies which have been used in Standard 1 through to Standard 4 Nguzu Nguzu Mathematics. The underlying principle is that learning takes place when pupils are involved in practical activities. This Teacher's Guide therefore includes teacher led activities and child centred practical activities which consolidate new skills and knowledge.

In order for pupils to achieve 'numeracy' they need to be able to think flexibly and apply their knowledge to new situations. This includes solving practical problems, experimenting with mathematics and developing the ability to reason mathematically and to communicate their ideas to others. A child is not 'functionally numerate' if they can only answer theoretical maths questions. They also need to be able to abstract and generalise from specific situations to demonstrate their mathematical thinking.

As Permanent Secretary responsible for education services in Solomon Islands I endorse this Standard 5 Mathematics Teacher's Guide for use in primary schools throughout the country. I recommend it to teachers and encourage you all to implement this curriculum in your classrooms.



**Dr. Derek Sikua**  
**Permanent Secretary**  
**Ministry of Education and Human Resource Development**  
**April 2005**

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## Important Note

**This Teacher's Guide, the Pupil's Resource Books and all supporting materials for the Nguzu Nguzu curriculum are the property of the school. They have been freely donated to the school. They must not be sold or removed from the school. Teachers who are transferred to other schools must not take books with them when they move.**

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## The Mathematics Units

Term 1	<b>Unit 1</b>	<b>Number</b>	39
	Topic 1	Whole Numbers up to 1,000,000	
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	Topic 20	Volume	
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	Topic 21	Area	

## The Mathematics Syllabus

The Mathematics Syllabus is the Ministry of Education approved syllabus for Primary Mathematics teaching from Standards 1 – 6. The Teacher's Guides and pupils' resources in the Nguzu Nguzu materials are all designed to assist teachers to cover the syllabus objectives for each Standard. Copies of this syllabus have been distributed to all education offices and should be available in all schools.

### Rationale for the Inclusion of Mathematics in the Primary Curriculum

Knowledge of mathematics is essential for all Solomon Islands' children if they are to fully participate in life, both at the present time and in the future.

Mathematics is not just something to be learned by children for later use in adult life. Mathematics is part of everyday life for children today. All children continually make judgments which are based upon their mathematical skills and understanding, such as judgments about quantity, distance, size, time and shape. Many children's games, activities and pastimes involve the use of mathematical skills and concepts.

As children grow into adults, the level of mathematical skills they require increases in range and sophistication. We do not know what the future holds for children currently in primary schools, but we do know that the world is changing at a rapid rate. In order to cope with these changes, children must be able to adapt their skills to suit different situations and they must be able to solve problems using many different strategies.

Throughout this Teacher's Guide, at the beginning of each unit, an explanation is given to the teacher to explain the importance of each of the objectives and to help to justify the inclusion of the various topics. Teachers should always try to keep this rationale in mind when teaching, when providing learning experiences and when making assessments of pupils' progress in their understanding of the concepts and their ability to carry out practical skills involved.

### Aims of Mathematics Education

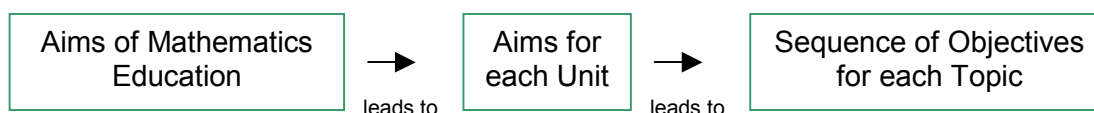
The Mathematics Syllabus has been developed in accordance with the following aims:

1. to introduce mathematical concepts through relevant first-hand experience in real situations, working from the real to the abstract;
2. to make mathematics relevant to the local environment and culture;
3. to involve the children in practical activities and games which are most relevant to their age and experience;
4. to encourage the planning and presentation of lively, varied and interesting lessons;
5. to encourage the children to use their mathematical skills in practical and problem solving situations;
6. to encourage children to appreciate the aesthetic nature of mathematics;
7. to encourage exploration and investigation;
8. to encourage children to talk about their mathematical activities, describing what they do and why they do it, so as to deepen their understanding of mathematical concepts.

At the beginning of each unit in the Teacher's Guide, these aims are made more specific to help teachers understand what pupils are expected to know and do.

Together with these specific aims, sequences of objectives are stated and these form the basis of the teaching methodology throughout the Teacher's Guide.

In other words,





The body of mathematical concepts, skills and knowledge contained in the Mathematics Syllabus is divided into a number of **themes**. These are:

- |           |                |
|-----------|----------------|
| 1. Number | 4. Measurement |
| 2. Shape  | 5. Time        |
| 3. Graphs | 6. Money       |

### Mathematical Themes and Topics

Within each theme there are a number of topics, which are numbered and arranged in sequence. For example in Standard 5 the **Number** theme contains nine topics:

- |         |                               |
|---------|-------------------------------|
| Topic 1 | Whole Numbers up to 1,000,000 |
| Topic 2 | Number Sequences              |
| Topic 3 | Addition                      |
| Topic 4 | Subtraction                   |
| Topic 5 | Multiplication                |
| Topic 6 | Division                      |
| Topic 7 | Mixed Computation             |
| Topic 8 | Fractions and Decimals        |
| Topic 9 | Percentages                   |

A clear understanding of topic 1 is needed before progression to topic 2 and so on.

Theme scope and sequence objective tables for Standard Four, Five and Six are included here on pages 10 - 12. These show the knowledge children should have, the skills they should possess and their attitudes for each theme. By including all three standards here, the Standard 5 teacher has a record of what the pupils should have covered in Standard 4, as well as what they will go on to cover in Standard 6.

On pages 13 - 14 there is a list of the sequence of objectives for each topic in the Standard 5 syllabus.

**NB** In the published Primary Mathematics Syllabus Standards 1 to 6 2001, Topic 17 has been erroneously omitted from the Standard 5 syllabus. The Measurement theme therefore begins with Topic 18.

Standard Four Syllabus Objectives			
	Knowledge	Skills	Attitudes
Themes	Pupils should have knowledge of..	Pupils should be skilled in..	Pupil's attitudes should include..
<b>Number</b>	<ul style="list-style-type: none"> <li>the nature and structure of the place value number system 0 - 99,999</li> <li>the concept of addition and subtraction of 3 and 4-digit numbers with and without regrouping and trading</li> <li>the concept of rounding whole numbers to the nearest ten, hundred and thousand</li> <li>the concept of even and odd numbers</li> <li>multiplying and dividing 2 and 3-digit numbers by 1-digit numbers</li> <li>the concept of mixed number fractions, decimal fractions and fractional notations</li> <li>the meaning of the decimal points in money and measurement notation</li> </ul>	<ul style="list-style-type: none"> <li>reading, writing and ordering numbers up to 99,999</li> <li>adding and subtracting numbers including regrouping and trading</li> <li>multiplying 2 and 3-digit numbers by a single digit using multiplication tables from 6 - 10</li> <li>division by a single digit number using the standard notation</li> <li>developing mental addition and subtraction strategies</li> <li>recognising odd and even numbers</li> <li>rounding to the nearest ten, hundred and thousand</li> <li>recognising, comparing and ordering mixed number fractions, decimal fractions for money and measurement and the correct notation</li> </ul>	<ul style="list-style-type: none"> <li>the recognition that mathematics is relevant to their daily lives</li> <li>an appreciation of mathematics as a useful tool</li> <li>an appreciation of the structure and patterns of the odd and even number system</li> <li>the willingness to solve addition, subtraction, multiplication and division problems</li> </ul>
<b>Shape</b>	<ul style="list-style-type: none"> <li>5 to 8 sided regular two- dimensional shapes and their properties</li> <li>how certain two-dimensional shapes can fit together and make patterns</li> <li>the properties of three-dimensional solids folded and unfolded</li> <li>the appropriate words for angles as the measurement of a turn</li> <li>the concept of co-ordinates to describe a location in a map</li> </ul>	<ul style="list-style-type: none"> <li>recognising and naming regular shapes in the environment</li> <li>investigating properties and making simple patterns of regular shapes</li> <li>recognising, formulating and constructing nets of three-dimensional solids</li> <li>recognising and describing the relationship between shapes and angles</li> <li>finding a location on a map using two co-ordinates, a letter and a number</li> </ul>	<ul style="list-style-type: none"> <li>an appreciation of the nature of regular shapes in the environment</li> <li>the recognition and appreciation of the properties and patterns in regular shapes</li> <li>a willingness to construct three-dimensional solids from nets</li> <li>an appreciation of different angles in regular shapes and how they fit together</li> </ul>
<b>Graphs</b>	<ul style="list-style-type: none"> <li>the use of vertical and horizontal graphs for illustrating and interpreting information</li> </ul>	<ul style="list-style-type: none"> <li>collecting data from tally charts and tables of information.</li> <li>representing and reading data from bar graphs</li> </ul>	<ul style="list-style-type: none"> <li>an appreciation that information can be collected, represented and readily retrieved and interpreted from graphs</li> </ul>
<b>Measurement</b>	<ul style="list-style-type: none"> <li>estimating lengths, weights and capacity in measurement</li> <li>the standard units of measurement for lengths, areas, weight and capacity</li> <li>the concept of kilometre</li> <li>calculating areas using the standard notation in measurement</li> <li>the concept of probability</li> </ul>	<ul style="list-style-type: none"> <li>making accurate estimates in cm and m when measuring</li> <li>making accurate estimates in kg, g, and l, ml</li> <li>the use of standard units of measurement using measuring devices such as rulers, metres, sticks, containers and scales</li> <li>the use of the formula <math>a = l \times w</math> to measure areas of squares and shapes made up of squares and rectangles</li> <li>using appropriate words such as, likely, unlikely and impossible to describe events</li> </ul>	<ul style="list-style-type: none"> <li>an appreciation that an estimate is relevant prior to accurate measurement</li> <li>the recognition that there is a need for standard units to measure lengths, weights and capacity</li> <li>an appreciation that a special formula <math>a = l \times w</math> can be used to measure areas of shapes made up of squares and rectangles</li> </ul>
<b>Time</b>	<ul style="list-style-type: none"> <li>the concept of units of time in hours, minutes and seconds</li> <li>passage of time such as in hours and minutes, a.m. and p.m.</li> <li>the 12 hour clock</li> <li>estimating, calculating, converting and recording events within the units of time</li> </ul>	<ul style="list-style-type: none"> <li>recognising and reading a.m. and p.m. time</li> <li>recognising, saying and reading 12 hour clock in time tables and schedules</li> <li>recognising the relationship between units of time</li> <li>estimating, calculating, and recording events using standard units of time</li> </ul>	<ul style="list-style-type: none"> <li>an appreciation that time is relevant to their daily lives</li> <li>an appreciation that measuring, recording and saying time intervals in seconds, minutes and hours is relevant in their daily lives</li> </ul>
<b>Money</b>	<ul style="list-style-type: none"> <li>the concept of decimal notation of money</li> <li>the way in which money is used in computation</li> </ul>	<ul style="list-style-type: none"> <li>recognising and recording the standard notation of money</li> <li>computing amounts and change</li> <li>developing mental strategies to solve money problems</li> </ul>	<ul style="list-style-type: none"> <li>the recognition that money is important in their daily lives</li> <li>an appreciation that problem solving with money is a useful tool in every day life</li> </ul>

## Standard Five Syllabus Objectives

	Knowledge	Skills	Attitudes
Themes	Pupils should have knowledge of..	Pupils should be skilled in..	Pupil's attitudes should include..
<b>Number</b>	<ul style="list-style-type: none"> <li>the nature and structure of the number system 0 - 1,000,000</li> <li>the concept and properties of whole numbers and their place value</li> <li>addition and subtraction of 5 and 6-digit numbers</li> <li>multiplying 2 and 3-digit numbers by 2-digit numbers</li> <li>dividing by a single digit number with remainder</li> <li>the concept of equivalence in fractions and decimal fractions</li> <li>the concept of percentages</li> </ul>	<ul style="list-style-type: none"> <li>reading, writing and ordering numbers up to one million</li> <li>exploring, recognising and sequencing negative and square numbers</li> <li>adding and subtracting 5 and 6-digit numbers</li> <li>multiplying 2 and 3-digit numbers by 2-digit numbers</li> <li>developing mental strategies in addition, subtraction and multiplication</li> <li>the use of division algorithm</li> <li>adding and subtracting fractions with the same denominator</li> <li>recognising, and investigating equivalence and decimal fractions</li> <li>investigating relationships between fractions and percentage equivalence</li> </ul>	<ul style="list-style-type: none"> <li>the recognition that mathematics is relevant to their daily lives</li> <li>an appreciation of mathematics as a useful tool</li> <li>an appreciation of the structure and patterns of negative and square numbers</li> <li>the recognition that algorithms are necessary in addition, subtraction, multiplication and division</li> <li>the willingness to solve addition, subtraction, multiplication and division problems</li> <li>the recognition that fractions, decimals and percentages are relevant in their daily lives</li> </ul>
<b>Shape</b>	<ul style="list-style-type: none"> <li>constructing circles and circle patterns</li> <li>the properties of a circle and irregular shapes</li> <li>the concept of reflection of irregular shapes in square grids</li> <li>pyramids and prisms</li> <li>the nature and structure of two-dimensional irregular shapes</li> <li>the nature and structure of three-dimensional solids</li> <li>the concept of angles: acute, obtuse, reflex, etc.</li> <li>the concept of degrees as the standard unit of measurement of angles</li> <li>the concept of locating points on a map using 'x' and 'y' axes and co-ordinates</li> </ul>	<ul style="list-style-type: none"> <li>drawing circles and circle patterns using devices such as, tins and coins</li> <li>identifying properties of two-dimensional shapes including symmetry and angle properties</li> <li>identifying, measuring and estimating, diameter, radius and circumference of a circle</li> <li>constructing pyramids and prisms from nets</li> <li>strengthening simple two and three-dimensional structures</li> <li>classifying angles as obtuse, acute and right angles</li> <li>using a protractor to measure angles</li> <li>finding and locating points on a map using number co-ordinates and x and y axes</li> </ul>	<ul style="list-style-type: none"> <li>an appreciation of the presence of circles and circle patterns in their local environment</li> <li>the recognition of the properties of circles</li> <li>the appreciation of irregular shapes in the local environment</li> <li>an appreciation that reflection is a way of constructing irregular shapes</li> <li>an appreciation of the nature and the structure of two-dimensional shapes</li> <li>a willingness to construct pyramids and prisms from nets</li> <li>a recognition of pyramids and prisms seen around them</li> <li>the recognition of angles in the local environment</li> <li>an appreciation that angle measurement and location are relevant in their daily lives</li> </ul>
<b>Graphs</b>	<ul style="list-style-type: none"> <li>of the concept of line graph as a method of representing data</li> </ul>	<ul style="list-style-type: none"> <li>distinguishing line graphs from horizontal and vertical bar graphs</li> <li>reading and interpreting information in line graphs</li> <li>constructing line graphs from tables of information</li> <li>constructing line graphs using co-ordinates.</li> </ul>	<ul style="list-style-type: none"> <li>an appreciation that information can be collected, represented and readily retrieved and interpreted from line graphs</li> <li>the recognition that a line graph is another way of representing data collected from tables of information</li> </ul>
<b>Measurement</b>	<ul style="list-style-type: none"> <li>the appropriate units in measuring lengths and weights</li> <li>the concept of scale drawings and plans</li> <li>decimal notation as it relates to <math>0.5 = \frac{1}{2}</math></li> <li>the relationship between units of weight: g/ kg, kg/ tonnes</li> <li>the concept of weight and volume and their appropriate units of measurement</li> <li>calculating areas of squares, rectangles and triangles</li> <li>the use of degree Celsius as a measure of temperature</li> <li>using fractions to describe the probability of events</li> <li>the probability of <math>\frac{1}{2}</math> as the representation of 'even chance'</li> </ul>	<ul style="list-style-type: none"> <li>calculating lengths including cm, mm and m and weights in grams and kilograms including 2.5m, 3.5kg</li> <li>calculating distance on a map using a scale</li> <li>constructing scale drawings and plans</li> <li>using the appropriate formula for calculating volumes of boxes (<math>v = l \times b \times h</math>) in <math>m^3</math> and <math>cm^3</math></li> <li>the use of formula <math>a = l \times w</math> to calculate areas of squares and rectangles and composite shapes in <math>cm^2</math> and <math>m^2</math></li> <li>the use of formula <math>area = \frac{1}{2} \text{ base} \times \text{height}</math> to calculate areas of a triangle</li> <li>the use of thermometer to measure temperature and keeping a record of air temperatures</li> <li>using fractions to describe the probability of an event</li> </ul>	<ul style="list-style-type: none"> <li>the recognition that standard units are necessary in measuring and calculating lengths, weights and volumes</li> <li>an appreciation that a special formula is used to measure and calculate areas of triangles and volumes of boxes</li> <li>the recognition that there is a relationship between units of measurement in length, weight and volume</li> <li>an appreciation that scale drawings, plans, thermometers and probability are relevant in our daily lives</li> </ul>
<b>Time</b>	<ul style="list-style-type: none"> <li>the concept of the standard notation of the 24 hour clock</li> <li>the 24 hour clock schedules and timetables</li> <li>measuring time using non standard units of measurement</li> </ul>	<ul style="list-style-type: none"> <li>interpreting and recording 24 hour clock using the standard notation of time</li> <li>reading, 24 hour timetables and schedules</li> <li>calculating time intervals in the 24 hour clock</li> <li>devising non standard ways of measuring time</li> </ul>	<ul style="list-style-type: none"> <li>an appreciation that 24 hour time is relevant to their daily lives</li> <li>an appreciation that measuring, recording and saying 24 hour time intervals in seconds, minutes and hours is relevant in their daily lives.</li> <li>the recognition that devising non standard ways to measure time is useful in their daily lives</li> </ul>
<b>Money</b>	<ul style="list-style-type: none"> <li>money computation</li> </ul>	<ul style="list-style-type: none"> <li>solving problems involving computation of money</li> </ul>	<ul style="list-style-type: none"> <li>the recognition that computation is relevant in solving money problems in their daily lives</li> </ul>

Standard 6 Syllabus Objectives			
	Knowledge	Skills	Attitudes
Themes	Pupils should have knowledge of .	Pupils should be skilled in..	Pupil's attitudes should include..
<b>Number</b>	<ul style="list-style-type: none"> <li>the nature and structure of a number system up to 5 and 6-digits</li> <li>adding and subtracting large numbers up to 5 and 6-digits</li> <li>the concept of estimates in addition and subtraction</li> <li>multiplying and dividing 3 and 4-digit numbers by 2-digit numbers</li> <li>calculating and solving problems involving more than one operation</li> <li>the concept of a negative answer calculation</li> <li>simplifying a fraction to its lowest form</li> <li>calculating fractions with like and unlike denominators</li> <li>the concept of rounding decimal fractions and their place value</li> <li>calculating percentages</li> <li>the concept of number ratio</li> </ul>	<ul style="list-style-type: none"> <li>reading, writing and ordering numbers up to 5 and 6-digits and decimal fractions</li> <li>adding and subtracting 5 and 6-digit numbers</li> <li>making accurate estimates in addition and subtraction</li> <li>division and multiplication of 3 and 4-digit numbers by 2-digit numbers</li> <li>making calculations and solving problems using more than one operation</li> <li>making calculations which give negative answers</li> <li>reducing fractions to their simplest form</li> <li>adding and subtracting fractions with like and unlike denominators</li> <li>rounding, adding and subtracting decimal fractions and multiplying and dividing simple decimal fractions</li> <li>making simple calculations and solving problems involving percentages</li> <li>calculating increases and decreases involving percentages</li> <li>comparing values and expressing quantities using number ratio</li> </ul>	<ul style="list-style-type: none"> <li>the recognition that mathematics is relevant to their daily lives</li> <li>an appreciation of mathematics as a useful tool</li> <li>the recognition that algorithms are useful in addition, subtraction, multiplication and division</li> <li>a willingness to use more than one operation in calculating and solving mathematical problems</li> <li>the recognition and appreciation of negative answers in subtraction</li> <li>the recognition of equal fractions and an appreciation for simplifying fractions to their simplest form</li> <li>an appreciation that percentages and ratios are useful in their daily lives</li> </ul>
<b>Shape</b>	<ul style="list-style-type: none"> <li>using a protractor for measuring and comparing angles</li> <li>angles in triangles and quadrilaterals</li> <li>the concept of right angled, equilateral, isosceles and scalene triangles</li> <li>how to draw certain triangles from given instructions</li> <li>the concept of plotting using bearings</li> <li>the concept of tessellation using two-dimensional shapes</li> <li>creating three-dimensional solids from nets of two-dimensional drawings</li> </ul>	<ul style="list-style-type: none"> <li>measuring and comparing angles using a protractor</li> <li>investigating the sum of angles in triangles and quadrilaterals</li> <li>classifying and naming triangles: right angled, equilateral, isosceles, scalene, etc</li> <li>drawing triangles from given instructions</li> <li>plotting a course with bearings</li> <li>creating tessellation patterns using one or more two-dimensional shapes</li> <li>using nets from two-dimensional shapes to make three-dimensional solids</li> </ul>	<ul style="list-style-type: none"> <li>the recognition that a protractor is a useful tool for measuring angles</li> <li>the recognition and appreciation of the different angles in triangles and quadrilaterals</li> <li>the recognition and appreciation of the properties and patterns in regular shapes</li> <li>a willingness to construct solids from nets</li> <li>an appreciation that plotting courses is a useful life skill</li> <li>the recognition and appreciation of tessellating patterns around them</li> </ul>
<b>Graphs</b>	<ul style="list-style-type: none"> <li>the concept of pie charts as a method of representing data</li> <li>organising information on bar and line graphs</li> </ul>	<ul style="list-style-type: none"> <li>reading information from pie charts</li> <li>drawing simple pie charts to display information</li> <li>reading, collecting and showing data on bar and line graphs</li> <li>calculating totals and averages from graphs</li> <li>representing information such as population and weather on bar and line graphs</li> </ul>	<ul style="list-style-type: none"> <li>an appreciation that a pie chart is a useful tool for representing and organising information</li> <li>an appreciation that information can be collected, represented and readily retrieved from pie charts and bar and line graphs</li> </ul>

<b>Measurement</b>	<ul style="list-style-type: none"> <li>the concept of speed, distance and time</li> <li>the commonly used weights, capacity and volumes for containers and drums</li> <li>decimal notation as it relates to <math>0.58 = 58/100</math></li> <li>the probability of events</li> </ul>	<ul style="list-style-type: none"> <li>using the appropriate formula to calculate distance, speed and time travelled; i.e. distance = speed x time</li> <li>recognising commonly used containers and their weights and capacities</li> <li>calculating and comparing volumes and solving problems involving capacity and weights</li> <li>using decimal notation, e.g. <math>2.53\text{m} = 2\text{m } 53\text{cm}</math></li> <li>investigating the chances in an event</li> </ul>	<ul style="list-style-type: none"> <li>an appreciation that the calculation of time, speed and, distance travelled is a useful tool in their daily lives</li> <li>the recognition that there is a need for a standard formula to calculate time, speed and distance travelled</li> <li>the recognition and appreciation of commonly used containers for weight and capacity</li> <li>an appreciation that solving problems involving capacity and volume is useful in daily life</li> <li>a willingness to investigate, observe and predict chances of events using probability</li> </ul>
<b>Time</b>	<ul style="list-style-type: none"> <li>time and its use in the calendar and different part of the world</li> </ul>	<ul style="list-style-type: none"> <li>using the calendar to express the date</li> <li>explaining and differentiating time: years, decades and centuries</li> <li>investigating time zones</li> </ul>	<ul style="list-style-type: none"> <li>the recognition of different terms in the units of time</li> <li>an appreciation that time is relevant to their daily lives</li> <li>an appreciation that time zones are relevant to an understanding of where they live</li> </ul>
<b>Money</b>	<ul style="list-style-type: none"> <li>money calculations</li> </ul>	<ul style="list-style-type: none"> <li>adding, subtracting, multiplying and dividing sums of money</li> </ul>	<ul style="list-style-type: none"> <li>the recognition that calculating money is necessary and useful in their daily lives</li> </ul>

## Syllabus Objectives Table Standard 5

Standard Five Syllabus Objectives	
Theme: Number	
Topics	Objectives
1. Whole Numbers up to 1,000,000	<ol style="list-style-type: none"> <li>1. Recognising and identifying place value in numbers up to one million.</li> <li>2. Reading and writing numbers up to one million.</li> </ol>
2. Number Sequences	<ol style="list-style-type: none"> <li>1. Extending the number line to include negative numbers.</li> <li>2. Recognising and continuing number sequences, including some that have negative numbers, e.g. 5, 10, 15, 20 . . . or -7, -3, 1, 5, 9. . .</li> <li>3. Recognising square numbers.</li> <li>4. Using words to describe number sequences and patterns, e.g. 'add four each time'.</li> </ol>
3. Addition	<ol style="list-style-type: none"> <li>1. Developing and practising strategies for mental addition.</li> <li>2. Adding 5 and 6-digit numbers.</li> <li>3. Making estimates in addition, e.g. knowing that <math>108 + 189</math> is close to 300.</li> <li>4. Solving addition problems and puzzles.</li> </ol>
4. Subtraction	<ol style="list-style-type: none"> <li>1. Developing and practising strategies for mental subtraction.</li> <li>2. Subtracting 5 and 6-digit numbers.</li> <li>3. Making estimates in subtraction, e.g. knowing that <math>347 - 150</math> is close to 200.</li> <li>4. Solving subtraction problems and puzzles.</li> </ol>
5. Multiplication	<ol style="list-style-type: none"> <li>1. Revising multiplication of 2 and 3-digit numbers by 1-digit numbers.</li> <li>2. Multiplying 2 and 3-digit numbers by 2-digit numbers.</li> <li>3. Revising multiplication tables and using multiplication facts in calculations.</li> <li>4. Solving multiplication problems and puzzles.</li> </ol>
6. Division	<ol style="list-style-type: none"> <li>1. Dividing 2-digit numbers with remainders, e.g. <math>33 \div 4</math></li> <li>2. Dividing 2 and 3-digit numbers by 1-digit numbers.</li> <li>3. Dividing 3 and 4-digit numbers by 1-digit numbers.</li> <li>4. Finding the average of a set of numbers.</li> <li>5. Solving problems involving calculation of average.</li> </ol>
7. Mixed Computation	<ol style="list-style-type: none"> <li>1. Making calculations involving more than one operation, e.g. <math>27 + 36 - 15 =</math></li> <li>2. Making calculations involving more than one operation where brackets indicate the order of operations, e.g. <math>(13 + 35) \times 3 =</math></li> </ol>
8. Fractions and Decimals	<ol style="list-style-type: none"> <li>1. Recognising equivalent fractions, e.g. <math>\frac{1}{2} = \frac{2}{4} = \frac{4}{8}</math></li> <li>2. Adding and subtracting fractions with the same denominator.</li> <li>3. Exploring fraction and decimal equivalence, e.g. <math>\frac{1}{10} = 0.1</math>, <math>\frac{2}{5} = 0.4</math></li> <li>4. Ordering a set of decimal numbers.</li> <li>5. Adding and subtracting decimal numbers.</li> </ol>
9. Percentages	<ol style="list-style-type: none"> <li>1. Introducing percentages.</li> <li>2. Investigating fraction and percentage equivalence, e.g. <math>\frac{1}{2} = \frac{50}{100} = 50\%</math>.</li> </ol>
Theme: Shape	
Topics	Objectives
10. Circles	<ol style="list-style-type: none"> <li>1. Drawing circles and circle patterns, e.g. by using tins and coins.</li> <li>2. Identifying properties of a circle: radius, diameter and circumference.</li> <li>3. Measuring the diameter and radius of circles.</li> <li>4. Estimating and measuring the circumference of circles.</li> </ol>

11.	Two-Dimensional Shapes	<ol style="list-style-type: none"> <li>Investigating irregular shapes.</li> <li>Identifying properties of irregular shapes, e.g. sides, angles, symmetry.</li> <li>Drawing reflections of irregular shapes using square grids.</li> </ol>
12.	Three-Dimensional Shapes	<ol style="list-style-type: none"> <li>Unfolding cartons and boxes to revise nets of cuboids.</li> <li>Investigating pyramids and prisms.</li> <li>Making pyramids and prisms from nets.</li> </ol>
13.	Structures	<ol style="list-style-type: none"> <li>Understanding that some two-dimensional shapes are more rigid than others, e.g. that for construction, a triangle is stronger than a square.</li> <li>Knowing how to strengthen simple two-dimensional and three-dimensional structures, e.g. by adding diagonals.</li> </ol>
14.	Angles	<ol style="list-style-type: none"> <li>Introducing degrees (<math>^{\circ}</math>) as the standard unit of measurement for angles, e.g. a right-angle = <math>90^{\circ}</math>, there are <math>360^{\circ}</math> in a circle.</li> <li>Using a protractor to measure angles.</li> <li>Classifying angles: acute, obtuse, reflex, etc.</li> </ol>
15.	Location	<ol style="list-style-type: none"> <li>Locating points on a map using number co-ordinates.</li> <li>Finding points using 'x' and 'y' axes.</li> </ol>
<b>Theme: Graphs</b>		
<b>Topics</b>		<b>Objectives</b>
16.	Line graphs	<ol style="list-style-type: none"> <li>Reading and interpreting line graphs.</li> <li>Constructing line graphs from tables of information.</li> <li>Constructing line graphs using co-ordinates.</li> </ol>
<b>Theme: Measurement</b>		
<b>Topics</b>		<b>Objectives</b>
17.	Length	<ol style="list-style-type: none"> <li>Choosing appropriate units when measuring length.</li> <li>Calculating length, including cm, m, mm and km.</li> <li>Calculating distance on a map using a scale, e.g. 1:20, 1:100.</li> <li>Constructing scale drawings and plans.</li> </ol>
18.	Mass / Weight	<ol style="list-style-type: none"> <li>Choosing appropriate units when measuring weight.</li> <li>Understanding the relationship between units: g/kg, kg/t.</li> <li>Completing practical activities and problem solving using grams and kilograms.</li> </ol>
19.	Volume	<ol style="list-style-type: none"> <li>Introducing the concept of volume.</li> <li>Measuring volume using <math>1\text{cm}^3</math> units.</li> <li>Using the formula for calculating the volume of boxes and containers, volume = length x breadth x height.</li> </ol>
20.	Area	<ol style="list-style-type: none"> <li>Calculating the area of squares and rectangles in <math>\text{cm}^2</math> and <math>\text{m}^2</math> using the formula <math>a = l \times w</math> (area = length x width).</li> <li>Calculating the area of a triangle by halving the area of a rectangle.</li> <li>Introducing the formula for finding the area of triangles, (area = <math>\frac{1}{2}</math> base x height) and parallelograms (area = base x height).</li> <li>Calculating the area of shapes made up of rectangles and squares and rectangles and triangles.</li> </ol>
21.	Temperature	<ol style="list-style-type: none"> <li>Using degrees Celsius (<math>^{\circ}\text{C}</math>) to measure temperature.</li> <li>Using a thermometer to measure and record of air temperature.</li> </ol>
22.	Probability	<ol style="list-style-type: none"> <li>Using fractions to describe the probability of events, e.g. when throwing a dice, know that the probability of scoring a six is 1 in 6 or <math>\frac{1}{6}</math>.</li> <li>Understanding that a probability of <math>\frac{1}{2}</math> represents an 'even chance'.</li> </ol>



<b>Theme: Time</b>	
<b>Topics</b>	<b>Objectives</b>
11. The Twenty-Four Hour Clock	1. Using 24-hour notation, e.g. knowing that 8:15 a.m. is written as 0815 and 3:30 p.m. is written as 1530 in 24-hour notation.. 2. Understanding and using 24-hour timetables and schedules. 3. Calculating time intervals, e.g. knowing that if a canoe journey begins at 0945 and ends at 1315, it has taken $3\frac{1}{2}$ hours.
12. Measuring Time	1. Devising non-standard ways of measuring time, e.g. making a water clock.
<b>Theme: Money</b>	
<b>Topics</b>	<b>Objectives</b>
13. Computation of Money	1. Solving problems involving computation of money (+, -, x, ÷) e.g. if items cost \$1.20 each, working out how many can be bought with \$20.00 and calculating the change.

### Four-Term Arrangement of Units and Topics

The revised mathematics syllabus takes into account the fact that children learn at different rates and in different ways. For this reason, lessons are not pre-written and the four-term arrangement gives the teacher enough flexibility to respond to the needs of the children and the circumstances of the class and school.

Here is a suggested four-term arrangement plan for Standard 5. This covers all the topics in the syllabus. A period of about two weeks is appropriate for each topic or pair of topics. However this does vary. For example Unit 18 Topic 25 should only take a week to complete. This plan below is a suggestion only. It is not meant to be rigidly followed by every school or every class. It is quite acceptable for teachers to plan their own schedule of work. However, as stressed before, sequence within certain themes is essential. The themes are mixed each term to give the pupils a wide variety of mathematical experiences.

<b>Term 1</b>	<b>Term 2</b>	<b>Term 3</b>	<b>Term 4</b>
<b>Unit 1 Number</b> Topic 1 Whole Numbers up to 1,000,000 Topic 2 Number Sequences	<b>Unit 6 Number</b> Topic 5 Multiplication	<b>Unit 11 Time</b> Topic 24 The 24 hour Clock	<b>Unit 16 Number</b> Topic 9 Percentages
<b>Unit 2 Shape</b> Topic 10 Circles Topic 11 Two-dimensional Shapes	<b>Unit 7 Number</b> Topic 6 Division	<b>Unit 12 Number</b> Topic 7 Mixed Computation	<b>Unit 17 Measurement</b> Topic 23 Probability
<b>Unit 3 Number</b> Topic 3 Addition Topic 4 Subtraction	<b>Unit 8 Measurement</b> Topic 19 Mass Topic 29 Volume	<b>Unit 13 Shape</b> Topic 14 Angles	<b>Unit 18 Time</b> Topic 25 Measuring Time
<b>Unit 4 Number</b> Topic 8 Fractions and Decimals	<b>Unit 9 Shape</b> Topic 12 Three-dimensional Shapes Topic 13 Structures	<b>Unit 14 Graphs</b> Topic 16 Line Graphs	<b>Unit 19 Money</b> Topic 26 Computation of Money
<b>Unit 5 Measurement</b> Topic 18 Length	<b>Unit 10 Measurement</b> Topic 21 Area	<b>Unit 15 Measurement</b> Topic 22 Temperature	<b>Unit 20 Shape</b> Topic 15 Location

Note: There is no Topic 17



## The Standard 5 Mathematics Materials

### Teacher's Guide

#### Teacher Led Activities

At the beginning of each lesson there are **T** activities labelled as shown on the right. These activities are led by the teacher and form the introduction to each lesson. After the **T** there is a number which tells you activity this objective covers and then a lower case letter which tells you which lesson it is. Thus the box in the example refers to the first (**a**) teacher led activity (**T**) for objective one (**1**).

**T<sub>1a</sub>**

The **purpose** of these teacher led activities is to teach new concepts, new vocabulary and notation, and to explain how these concepts are applied. This may include:

- an introduction to the topic;
- teaching or explaining new skills, strategies or rules;
- demonstrating new methods or rules.

The **focus** of the teacher led or **T** activities is usually on whole class activities.

#### Child Centred Activities

In the Teacher's Guide the teacher led activities are always followed by **C** activities. They are labelled as shown on the right. The **C** refers to the fact that it is a child centred activity and in this example, **3** tells you that it supports objective 3 and the **b** tells you that it is the second lesson for this objective.

**C<sub>3b</sub>**

**C** activities are **child centred** activities. They are usually done in groups, sometimes in pairs or sometimes individually.

Learning is through doing, activity and exploration, and is led by the pupils themselves. The teacher takes a supervisory role in these activities.

The **purpose** of these child centred activities is as follows:

- to consolidate what the teacher has taught in the teacher led activity;
- to give the children time to practice and understand new concepts in a practical way;
- to encourage children to talk about their mathematics, with each other and their teacher;
- to encourage group work, cooperation, working together, following rules.

**C** activities **may** or indeed **may not** be followed by further activities in the Pupil's Resource Book. Activities in the Pupil's Resource Book are referenced to the Teacher's Guide as shown by the box on the right.

**1a**

This example shows that the activity follows activities **T1a** and **C1a** in the Teacher's Guide. It supports objective 1 (**1**) and is part of the first lesson on that objective (**a**).

Pupil's Resource Book activities are usually provided to give the pupils more practice in applying and using the skills they have learned in the **T** and **C** activities.

Here is a summary of the difference between teacher led activities and child centred activities. These tables may help you when you are planning your lessons.

Teacher's Activity	Purpose	Comments
<ul style="list-style-type: none"> <li>Led by the teacher</li> <li>The teacher leads the pupils through a new skill, method or concept</li> <li>Probably a whole class activity – (though not always)</li> </ul>	<ul style="list-style-type: none"> <li>To introduce the topic</li> <li>To teach new skills</li> <li>To explain new ideas, mathematical language or concepts</li> <li>To do demonstrations</li> </ul>	<p>The teacher must be sure that the pupils have understood the mathematical concepts which they will go on to practice in the children's activity.</p> <p>Pupils should participate by discussion and asking questions.</p> <p>Child centred / exploratory activities will <b>not</b> work effectively to reinforce children's learning if they do not understand the concepts involved.</p>

Children's Activity	Purpose	Comments
<ul style="list-style-type: none"> <li>Pupil focussed</li> <li>Learning is through activity and exploration, and is led by the children themselves.</li> <li>The teacher takes a supervisory role.</li> <li>Probably done in groups, pairs or sometimes individually.</li> </ul>	<ul style="list-style-type: none"> <li>To consolidate what the teacher has taught in the teachers activity</li> <li>To give the children time to practice and understand new concepts in a practical way.</li> <li>To encourage enquiry, extension and conceptual thinking.</li> <li>To encourage group work, cooperation, working together, following rules</li> </ul>	<p>Pupil's activities should be motivating. Children should enjoy doing them and find them rewarding.</p> <p>They include games, puzzles and practical tasks.</p> <p>Pupils will not always have the teacher with them when they do the children's activity. The teacher must give clear instructions so the pupils can get on by themselves.</p>

## Materials

At the beginning of each **T** activity there is a box with the heading **Materials** as shown on the right. This lists all the things the teacher will need for the lesson as described in the Teacher's Guide.

**Materials**  
board compass  
circular shaped objects  
rulers

It is a checklist of everything extra the teacher needs to prepare before teaching the lesson. If you have other activities which you have added to your lesson you may need to add to this list when you do your lesson preparation.

The list does not include materials such as pupils' exercise books, Pupils' Resource Books or blackboard and chalk as it is assumed that these will be at hand.

## Extension and Support Activities

At the end of most units in the Teacher's Guide there are ideas for extension and support activities. These are **not just more of the same** activities which have already been covered in the lesson. They are different activities with a different purpose. They are included to help you differentiate your teaching to meet the different needs of pupils in your class. They do this by extending the skills of the most able and supporting the learning of the least able.

Extension and support activities may be used at any time during the unit to help the pupils grasp and apply the concepts. They are not intended always to be left until the end, even though they appear at the end in the Teacher's Guide.

### Extension Activities

The purpose of extension activities is to allow pupils to apply and extend the concepts taught. Usually these activities involve independent investigations. These may take the pupils beyond the syllabus objectives.

Pupils with a firm grasp of the concepts taught in a particular topic and who have achieved the objectives are encouraged to work independently.

#### Type of Activities

- Activities which only need the teacher to introduce them and then allow pupils to work independently. They do not contain large amounts of work for the teacher (e.g. writing things up on the board).
- Activities which may take pupils beyond the syllabus objectives or link the topic with other topics.
- Activities which rely heavily on pupils asking their own questions, finding things out for themselves and exploring mathematics concepts independently.

A range of suggestions and examples of activities, relating to the different objectives are included.

### Support Activities

The purpose of support activities is to revise and practice concepts taught in the unit again, to make them easier to understand or to provide more practice. These support activities are aimed at pupils who are having trouble grasping the concepts and achieving the objectives. They are for pupils who need more practice, or more time to fully understand all the objectives in a particular unit.

#### Type of Activities

- Activities which require teacher input. The teacher can use them to work with small groups who need extra help.
- Activities that teach the same idea in a different way.
- Activities that give more practice, such as practical activities and games.

A range of suggestions and examples for the teacher to choose from are included.

## Answers

The answers to all the exercises in the Pupil's Resource Book are found in the Teacher's Guide. They have been formatted as near as possible to the layout in which they appear in the Pupil's Resource Book activity. It has not been practical to reprint the pages of the Pupil's Resource Book as was done in the Standard Four Teacher's Guide.

When marking pupil's work, however it is very important to note that the right answer is not always the most important aspect, especially in problem solving activities. Check pupil's working as well as their answers as this tells you a lot about whether they have understood the lesson or not.

## Teacher's Assessment Reminders

At the end of each set of activities, **assessment reminders** are provided for the teacher to use to evaluate whether the children are ready to move on to the next step.

These focus the teacher back to the syllabus objectives and are used as a reminder to the teacher to assess pupil's progress continuously. The assessment reminders ask the teacher to make a judgment as to whether the pupils have achieved the objective. If they have not, you may choose to use some of the support activities to review the concepts before moving on.

## The Pupil's Resource Book

The **purpose** of Pupil's Resource Books is to provide activities which the teacher can use to give the pupils more practice with the concepts taught in the maths lesson. It includes a range of activities from straightforward practice of new skills through to application of skills to real life situations and problem solving.

The Pupil's Resource Book supports the Teacher's Guide but can **never** be used in isolation. Pupils will not learn maths by working independently through the Pupil's Resource Book. All the teaching of new concepts and skills comes in the teacher led activities (**T** activities) and child centred activities (**C** activities). Pupil's Resource Book activities are for further practice and application of what has been taught.

## Graded Activities

In the Pupil's Resource Book the activities are differentiated or graded. This means that they are set at three different levels. By matching the level of the activities to each pupil's ability, teachers can ensure that all pupils make progress, whatever level they are at. In the Standard 5 Pupil's Resource Book the activities are differentiated as follows:

- Activity A** Straightforward practice of what has been taught in the lesson. These activities give pupils repeated examples of using a method or rule until the pupils are confident with it.
- Activity B** At this level, pupils are asked to demonstrate a higher level of understanding. These activities ask pupils to apply new concepts to different situations or vary the method that they have learned in some way. They also sometimes provide extra practice, as in Activity A, but at level B more difficult figures, or more difficult examples are used.
- Activity C** Activities at this level focus on using and applying the concept, method or skill to real, practical problems. These activities require a higher level of conceptual thinking and problem solving and may ask pupils to complete a number of different operations, including what has been taught in the lesson.

The teacher must decide which of the activities in the Pupil's Resource Book to use and when to use them as well as with which pupils. This will vary between topics. This will also vary according to individual pupil needs.

All pupils are **not** expected to do all the activities in the Pupil's Resource Book. You may choose to miss out Activity A for some pupils and have them do only Activities B and C, or you may have some pupils who only do Activity A, for example. It is important for teachers to use their knowledge of each pupil to make these decisions.

The Teacher's Guide gives advice about how and when to use Pupil's Resource Book activities. You should follow this, as there are some examples where Activities A, B and C need to be done in sequence.

## Speech Bubbles

In the Pupil's Resource Book there are **speech bubbles** like this, containing tips and reminders for the pupils. The purpose of these is to remind the pupils of important aspects, or key points of the lesson. Things that they will need to remember in order to complete the activities.

**Remember!**  
The area of a rectangle is  
length x breadth.  
 $a = l \times b.$



The **focus** of these is on the key information from the lesson.

They often start with a heading such as:

Be Careful! Remember! Watch Out! Don't Forget! Think! Tip!

Teachers should encourage their pupils to get into the habit of reading these before they start their activities, as they will help them as they work.

## Check Up Pages

At the end of every unit there is a **Check Up Page**. This is a tool which teachers can use to check that the pupils have mastered the skills they have taught.

The **purpose** of these pages is to help teachers with an ongoing assessment. The questions are designed to allow pupils to demonstrate their understanding and apply their skills.

Each Check Up Page contains at least one question assessing each objective in each topic covered in the unit. Sometimes more than one question per objective is included. In this case the questions allow pupils to demonstrate different levels of achievement. One might be for a basic use of the concept, and the second might be for a higher application of that concept.

All the answers to the check up pages are included in the Teacher's Guide.

These Check Up Pages serve as a very good continuous assessment tool. They can be used at the end of each unit to review progress. This will inform the teacher as to whether each pupil has understood the maths concepts taught.

Teachers should record the pupils' performance in the Check Up Pages at the end of each unit as one continuous assessment activity. A way of recording pupils' scores in these Check Up Pages is suggested on page 37.

Other methods of assessment are discussed further on page 31 in the chapter on Assessment in Mathematics.

## Additional Materials

Together with the Teacher's Guide and the Pupil's Resource Book there is a set of other resources. These include posters, games and resource cards. They are referred to in the Teacher's Guide in the materials boxes, so that they can be used at the appropriate time.

Teachers need to prepare these ready for the lesson in which they will be used. Sometimes they need to be cut up and pasted onto card to make them last longer. They should be stored carefully so that they can be used again the following year.

## Teaching Methodology

### Learning Through Doing

In the Nguzu Nguzu Mathematics materials, learning is based on **practical activity**. Pupils learn best by doing things, by experimenting, by playing games, by exploring and finding out for themselves. Learning is active not passive.

This approach should make learning **enjoyable** for pupils.

Teachers need to create an atmosphere in the classroom where pupils are used to working in this way, doing things for themselves and actively exploring maths concepts with confidence. Pupils must learn that **making mistakes is OK!** It is acceptable to get things wrong and to try again, this is how pupils learn with confidence.

Above all **they must feel free to talk about their maths**, both with each other and with their teacher. Teachers should constantly be asking pupils to explain the concepts they are learning, encouraging them to discuss their ideas and to ask questions about the lesson. This kind of active participation supports sound understanding.

The active approach to teaching and learning maths is reflected in the whole of the Primary Mathematics Syllabus. Learning is achieved through developing three different aspects of children's ability - **skills**, **awareness** and **knowledge**. This approach integrates learning with doing.

Pupils who have been studying Nguzu Nguzu Mathematics and English in Standards 1 to 4 will have learnt to study and learn in a certain way. For example:

- They will be used to working in small groups as well as, as a whole class;
- They should be used to getting on with some work by themselves, while the teacher works with another group;
- They will be used to practical activities and will expect to do these as part of most lessons;
- They will understand that the teacher expects them to talk in class and to discuss their work with each other;
- They will be developing their confidence in speaking up in class to ask questions or to contribute to discussions;
- They will enjoy playing games to reinforce their learning and they will be able to follow the rules of simple games;
- They will know that it is OK to make mistakes and that they learn a lot from getting things wrong and trying again!

During Standard 5 they will be developing further. They will be:

- becoming more independent in their learning and taking responsibility for their own learning. This may mean doing research to find things out and thinking things through for themselves;
- developing their own ideas and mathematical strategies and learning how to explain these to other people with confidence;
- developing their mathematical thinking so that they can apply it to decision making and problem solving;
- growing in confidence and self assurance.

Teachers are therefore encouraged to **teach** first, and then let the pupils **consolidate** what has been taught through pupil-focussed activities, then allow the pupil's to **practice** what they have learnt.

Nguzu Nguzu materials combine both **teacher led** and **child centred** learning approaches according to which are best suited to the topic or activity. Lessons should always have a balance between listening to the teacher and doing practical activities.

When pupils become familiar with this way of learning they will not be afraid to make mistakes. This will help them learn with confidence in other subjects too. In this way pupils learn through exploration, investigation and discovery.

### **What does this Active Learning Approach Mean in Practice?**

Under the guidance of the teacher, the pupils **work out rules and patterns for themselves** instead of the teacher telling them what they are. It means they experiment, get things wrong and find the right way in the end. It means they suggest their own ideas for how to solve problems and try them out to see if they work.

In mathematics we teach pupils formulae and algorithms, such as:

The volume of a rectangular prism is length x breadth x height ( $v = l \times b \times h$ ).

The area of a triangle is half the base x the height ( $a = \frac{1}{2} b \times h$ )

These formulae are useful tools, but pupils remember and use them properly, only if they have worked them out for themselves. It is in the process of working them out, that they come to understand the idea behind the formula. They are then able to adapt the formula and apply it to other situations and problems.



As well as teaching children how to do things, the good mathematics' teacher teaches the pupils to work out **how** to do things for themselves and to ask **why**? This encourages pupils to question, explain and talk about what they do. We know as adults that if we try something for ourselves we are more likely to understand and remember it than if we watch someone else do it or listen to someone talk about how it is done.

Our pupils are no different. To learn with confidence, they need to **do things themselves**, not watch the teacher do them or listen while the teacher talks about doing them.

## Working in Groups

In the Teacher's Guide it is often suggested that teachers organise the pupils to work in small groups, or in pairs, as well working together as a whole class. If your pupils have used Nguzu Mathematics materials before they will be familiar with this.

There are many reasons for group work:

- It allows pupils to learn at different levels according to their ability.
- It trains them to cooperate with each other, help each other and work together.
- It helps them to talk about their work and discuss and explain what they are doing.
- It gives them the chance to practice skills they have learnt in class until they are confident with them. In a group of five, pupils have more 'turns' than in a class of 20.
- It frees up the teacher to concentrate on those pupils who need extra help.
- It encourages independent learning.
- It can overcome the problem of scarce resources, by rotating activities between groups.

It can sometimes be more difficult to organise and manage the class when they work in groups. Organising the groups carefully and planning the work they will do thoroughly helps to make it successful.

Here are some suggestions for successful group work.

Organising Groups
Grouping children by <b>ability</b> can be useful for teaching skills at different levels, but it may be discouraging for pupils to always be grouped by ability if they feel they are put in the 'worst group'.
<b>Mixed ability</b> groups can also be useful where more able pupils can help less able ones. This is a good way of approaching practical tasks.
Different activities may be suited to different ways of grouping children. <b>Vary</b> your groups to suit the activity.
Children should know what groups they work in, so they can quickly get into their groups. Do not mix the groups around too often as it will waste too much time.
Give groups <b>names</b> such as islands, birds or colours not numbers or letters as this encourages them not to see one group as 'top' or 'bottom'.
You could, for example, have two different groupings for your class. The <b>colour groups</b> which are formed by ability, Red for the most able pupils, Green for the mid level group and Blue for the less able pupils; and <b>the fish groups</b> for mixed ability work, the Marlin group, the Bonito group and the Yellow Fin group, for example. Then when you are ready for the class to work in groups all you need to say is, 'Work in your colour groups today, or work in your fish groups.'

Managing Groups
Give <b>clear instructions</b> . Pupils in each group must understand what to do before they start the task.
<b>Monitor</b> the groups. The teacher must be aware of what all the groups are doing, even if he or she is working more closely with one of the groups. Make sure they are all concentrating on their work.
Don't worry about the noise! Group work may be noisy. Pupils should be talking to each other and discussing their work, this shows that they are learning.
Plan some strategies to manage a working noisy classroom This may be by giving an agreed signal such as clapping your hands three times for pupils to stop work and pay attention, when needed.
Teach pupils to take responsibility for their own learning. Training them to get out and put away equipment, to tidy their group area and so on, will make it easier for you to manage group work.

Teachers are sometimes reluctant to group their pupils. However if pupils have been using the Nguzu Nguzu materials they will already be familiar to working co-operatively in groups. As long as groups are well organised and managed by you as the teacher they are a very useful way to promote learning in the classroom.

## Using Games as a Learning Tool

In Nguzu Nguzu Mathematics games are often used in the pupils focused activities or suggested as support activities. They are helpful because:

- they allow pupils to learn as they play.
- pupils enjoy themselves.
- games hold pupils' attention so they can concentrate for longer.
- playing games encourages children to talk to each other and discussing mathematical concepts helps them to understand them better.
- through games children also learn other skills like following rules, cooperating with each other and taking turns.
- playing games helps children to develop a strategy or plan. This actively develops their strategic thinking skills.

When games are suggested in the Teacher's Guide they may involve some teacher time to prepare before the lesson.

When you have taken the time to make a game (or any other teaching aids) make sure that you store it carefully after you have used it, carefully labeled by unit, so that you can use it again the following year. Games are very valuable teaching aids, especially in the teaching and learning of mathematics.



## Lesson Planning

Careful planning is the key to success for all teachers. Here is a summary of four stages of planning:

<b>Stage 1</b>	<b>Yearly Planning</b>	The teacher must study the syllabus to become familiar with the material that is to be covered in the year. The four term arrangement in the Teacher's Guide on page 15 helps you to plan how to cover the syllabus.
<b>Stage 2</b>	<b>Termly Planning</b>	The teacher must plan which topics he/she will teach in each term. Discuss this with other teachers. If you are sharing equipment you may need to rearrange some units. The four-term arrangement will help again.
<b>Stage 3</b>	<b>Weekly Planning</b>	The teacher must decide what will be covered in each lesson for the week. Objectives for each lesson should be written down as well as the activities planned. The Teacher's Guide helps here, but teachers must plan additional activities too, to meet the needs of their class.
<b>Stage 4</b>	<b>Lesson Preparation</b>	In this final stage the teacher must make sure that all the work, materials and teaching aids are ready for each lesson. This should be done every day.

A suggested format for a lesson plan is shown on the next page. Teachers all plan their lessons in different ways, which is fine. Teachers should use the lesson plan format which is most suited to their own way of working. The suggested format can be used as a guide as to what should be included.

In order to plan a lesson successfully a teacher must be familiar with the objectives of the topic to be taught. In other words the teacher must know exactly **what** he/she is trying to teach.

A teacher must think about how long each activity within a lesson will take. This is determined by how long the pupils can concentrate for, the type of activity and the need to balance listening and participation in a lesson. Timing is very important.

A good teacher responds to the pupils, if things go well and they are motivated an activity can be extended. If an activity is not going well then the teacher must be flexible and change that activity.

In planning lessons, teachers should use a variety of teaching methods to keep the pupil's attention and make sure they understand and practice the new skills you want them to learn.

<b>Title of Lesson</b>	
<b>Objective (s)</b>	<p>Select these from the Teachers' Guide. The box at the beginning of each unit outlines the objectives. There may be only one objective, or more than one for each lesson. There may also be more than one lesson on the same objective.</p> <p>Sometimes teachers will plan extra lessons for revision or extension of an objective in the Teachers' Guide.</p> <p>Remember to think about <b>Knowledge, Skills</b> and <b>Attitudes</b></p> <p><b>What are the pupils going to learn in this lesson?</b></p>
<b>Materials</b>	<p>Use the materials' boxes in the Teacher's Guide to help. List teaching aids, charts, equipment and books you will need to have prepared or made before the lesson.</p> <p><b>What do I need to teach the lesson effectively?</b></p>
<b>Introduction</b>	<p>An introductory activity led by the teacher.</p> <p>This may include revision of previous work on this topic, finding out what pupils already know. This may be in the form of a game, a brainstorm, or a discussion.</p> <p>This is a good time for the teacher to talk about the rationale for learning the skills included in this lesson.</p> <p><b>Why are we learning about this?</b></p>
<b>Activities</b>  Teacher Activities:  Pupil's Activities:	<p>Some will be selected from the Teacher's Guide; some will be planned by the teacher to reinforce learning.</p> <p>Remember:</p> <ul style="list-style-type: none"> <li>• to balance listening and doing</li> <li>• to follow the sequence of teaching, consolidation and practice of new skills.</li> </ul> <p><b>What will we do in the lesson?</b></p>
<b>Organisation</b>	<p>How will pupils be grouped for each activity?</p> <p>How will the teacher's time be divided up? How will the teacher supervise and monitor the pupils as they work?</p> <p>What teaching methods will be used?</p> <p>How long will each part of the lesson take?</p> <p>What will early finishers do?</p>
<b>Conclusion</b>	<p>It is helpful to bring the class back together for the end of the lesson.</p> <p>A good concluding activity might be a game, an opportunity to show/share work completed or a class discussion.</p>
<b>Evaluation</b>	<p>After teaching the lesson the teacher should note down how it went. This may include ideas for the next lesson. This is a record, which the teacher can refer to for ideas to improve their teaching.</p>

## Making Teaching Aids

Using teaching aids helps pupils to explore and understand Mathematics better. Nguzu Nguzu mathematics cannot be taught properly unless the teacher makes teaching aids and uses locally available materials to provide practical activities. Nguzu Nguzu Mathematics cannot be successfully taught with only a blackboard and chalk!

At first it may seem as if there is a lot of work involved in making teaching aids for Nguzu Nguzu Mathematics lessons. However, if the teaching aids are looked after they can be used for many different lessons and should last for the whole year.

There are different kinds of teaching aids:

1. **Aids provided by the Nguzu Nguzu programme.** This includes cards and games, posters and pictures. These are printed by the Curriculum Development Centre and will be distributed along with the Teacher's Guides and Pupil's Resource Books.
2. **Things which can be collected** by teachers, pupils and parents from around the school community and environment. These things are mostly freely available.
3. **Things which teachers need to make.** These, too, can be made from locally available resources but they require time and effort to put them together. If teachers do not know how to make things there is usually someone in the community who can be asked to help.

Some teaching aids require special tools, skills or equipment to make them e.g. a balance scale. Teachers will need to be resourceful and maybe ask the local Community High School or a Rural Training Centre to make equipment in their workshop. Teachers may be able to borrow tools from Community High School or a Rural Training Centre or from a local carpenter. Teachers may be able to borrow resources from the local clinic e.g. a thermometer or scales when investigating measurement.

Pages 14 – 17 of **Ideas into Practice** give some useful suggestions of how teachers can begin their collection or teaching aids. This book should be available in your school.

A list of the teaching aids, games and posters needed for each unit is included on pages 27 and 28. Use these tables as you plan your teaching in each unit to make sure that you have everything that you need.

## Teaching Aids and Resources Required for Standard 5 Maths

	Nguzu Nguzu Cards and Games Provided		Things the Teacher Should Collect or Borrow from the Environment or Community	Things the Teacher Should Make
	Charts and Posters	Group Teaching Aids and Games		
<b>Unit 1</b>	Place Value Poster (T1a, T1b) <i>Use also for Unit 3</i>	<b>Topic 1</b> Place Value Charts (T1a&b) Number Expanders and Numeral Cards (T1a&b) Number Cards 0 – 9 (T1c)	<b>Topic 2</b> Plastic water bottles (T1c) Counters shells or stones (T4a)	<b>Topic 1</b> 6-digit numbers cards (T1c) Rounding off chart (T2b) <b>Topic 2</b> Number lines including negative numbers - (T2b) Geoboards, 12 x 12 made from timber and nails (T4b&c) See also Units 6 & 10 Counting Frame (Support Activity)
<b>Unit 2</b>	<b>Topic 11</b> Circle Parts Poster (T2b) <b>Topic 12</b> Regular Shapes Poster (T1a) Irregular Shapes Poster (T1a) Symmetry Poster (T2b)	<b>Topic 12</b> Symmetry Pairs Game (T2c)	<b>Topic 11</b> Cylindrical items such as milk or Milo tins, cups, glasses, buckets and paint tins (T1a) String or bush rope (T2a, T4a&b) Fabric, clothing or objects containing circle designs (T1b) <b>Topic 12</b> Symmetrical found objects such as citrus fruits, seeds, flowers (T2b) Mirrors and reflective objects such as spoons, metal tins, glass louvers. (T3a) Pins (T3a)	
<b>Unit 3</b>	Place Value Chart (T2b T1a) <i>Use the one from unit 1</i>	Number Dice Nets (Support Activity)		Wooden Number Dice (Support Activity)
<b>Unit 4</b>	Fraction Chart 1 (T1a) Fraction Chart 2 (T1b)	Fraction Puzzles (Support Activity) Circle Fraction Cakes (Support Activity)	Pawpaw or other fruit to divide up (T1a) Knife (T1a) Bundles of sticks and elastic bands or local string (T4a) A pack of cards (Extension Activity)	Place Value Charts (T3b) Circular cakes (Support Activity)
<b>Unit 5</b>	Units of Measurement Poster <i>Also use for Unit 8</i>		20c coins (T1a) Various everyday objects to measure (T1a) Maps with scales (T4b) Tape measures, builders tape, trundle wheel (Extension and Support Activities)	Metre sticks or meter rulers Centimetre rulers (if you do not have enough for the class to use)
<b>Unit 6</b>	Multiplication Square (T2b)	Multiplication Bingo Game Cards (Support Activity) Set 1 Tables $\times 2 - \times 5$ Set 2 Tables $\times 6 - \times 10$	Small stones and shells (200 plus) (T1a) Elastic bands or fine string (T3b)	Geoboards (T3b) Number blocks, tens and units (T1a) Dice numbered 1 – 6 and 7 – 12 (Support Activity) Spinners 1- 6 and 7 – 12 (Support Activity)
<b>Unit 7</b>			Stones shells or seeds to use for counters (T1a, T4b) Bundles of sticks (T2a) A non transparent cloth bag or basket (T3a)	Digit Cards for the division race (T3a)
<b>Unit 8</b>		<b>Topic 19</b> Decimal Weight Game Cards (T3a) <b>Topic 20</b> Building Instructions Cards (T2b)	<b>Topic 19</b> Groceries and grocery boxes/tins that show the weight of each item clearly (T1a, T2a) Spring balance, kitchen scales (T2a, T4a) <b>Topic 20</b> Matchboxes or other similar shaped boxes (T1a) Stones or other irregular shaped objects that will sink (T2c) Plastic containers or cut off bottles (T2c)	Spring balance (T2a) Balance scales (T2a) Unit of Weight Chart (T3b) Standard weights made from bags of sand as follows: 50g 100g 200g 250g 500g 1kg. (T2a, T4a) <b>Topic 20</b> Centimeter cubes made from timber or card (T1a, T2b)

<b>Unit 9</b>	Three Dimensional Shapes Poster (Topic 12 T2b)	<b>Topic 12</b> Card Nets: Prisms and Cuboids (T2a) Card Nets: Pyramids (T2b)	<b>Topic 12</b> A range of cardboard boxes and cases (T1a, T1b) Scissors / cutting knives (T1a, T1b) Cloth for blindfolds and to cover objects (T2a) <b>Topic 13</b> Paper fasteners or split pins (T1a) Sticks, old drinking straws, coconut midribs (T1b) Putty, clay or green pawpaw pieces	Wooden cut out prisms, cubes cuboids and pyramids (T2a) <b>Topic 13</b> Geostrips cut from card (T1b) Two dimensional shapes made from geo strips or local materials (T1c)
<b>Unit 10</b>	Area Formulae Poster (T3a)	Composite Shape Cards (T4a) Shape Cards for making composite shapes (T4a)	Elastic Bands (T1a)	Geoboards (T1a) Card rectangles, different sizes. (T1a, T2b, T3a) Large Cardboard Shapes (T4b)
<b>Unit 11</b>	24 Hour Clock Poster (T1b) School Timetable Poster (T2a)	a.m. / p.m. dice (C1a) 24 hour clock model (C1b) Analog Clock Face (T2b) Race Against Time Cards (C2b) Time Snap Cards (Support)	Scissors and cutting knives (C1b) Nguzu Nguzu Standard 4 a.m./ p.m. chart (T1a)	Card strips to make digital clocks (C1b) Time Facts Chart (T1b)
<b>Unit 12</b>		Four Operations Matching Game (C1a)		
<b>Unit 13</b>	Angles Poster (T3a)	Angles Matching Game (C3a) Angle Bingo Game (C3b)	String (4m lengths) (T1a) Rulers Protractors Stones and counters	Cardboard Shape Templates (C1a) Clock faces
<b>Unit 14</b>	Line / Bar Graphs Poster	Line Graph Samples (C2a)		Buried Treasure Game (C4a)
<b>Unit 15</b>	Thermometer Diagram Poster (T1a) Different Types of Thermometer Poster (T1a)	Units of Measurement Matching Game (C1a)	Thermometers Cups and water Cloth for blindfold Counters or stones for temperature bingo	Temperature Order Game (C1b)
<b>Unit 16</b>			Stones and shells to use as counters (T1a)	Cardboard Circles
<b>Unit 17</b>		Probability Shape Cards	Twenty cent coins A cloth bag (T1b) A selection of coloured stones (T1b&c)	Probability Scale Chart (T2a)
<b>Unit 18</b>			A clock Empty plastic bottles, candles, sand, water, matches, (T1b) Sticks (T1c) String, compass A Standard 3 Nguzu Nguzu story book	Plumb lines / fishing weights of different lengths
<b>Unit 19</b>		Shop Cards x6 sets (T1a&b) Paper coins and notes Special offer cards (T1f)		
<b>Unit 20</b>	Location Grid Poster (T1a)	Shape cards to stick on grid (T1a) Noughts and Crosses Dice Nets (C1a)	Grid Paper, cm <sup>2</sup> paper Maps (Extension)	Noughts and Crosses Game

## Storage and Display Ideas

The way the teacher organises resources is important. There are many different ways of organising a classroom, just as there are many different classrooms and teachers must adapt or change to suit the circumstances they find themselves in.

Often the resources that teachers have are poor. Not enough books, no cupboards, not enough space, few teaching aids and poorly maintained classrooms. It would be very easy, faced with these problems, to just give up and not bother with how the classroom looks. But if teachers do not look after their classrooms, they give the pupils the impression that school doesn't matter and learning isn't important.

Storage is a real problem in many classrooms especially in rural schools. Often classrooms are not secure so that materials can be stolen, cupboards and shelves are not available for materials to be stored neatly and where classrooms are not well maintained equipment can be spoiled by the rain and wind, this can be especially damaging for books.

There is a lot that teachers can do however, with a little help from the community, to improve the storage facilities in their classrooms to help them make the most of the books they do have and look after the teaching aids they have spent time making.

**Ideas into Practice** (pages 18 - 19) has some good ideas on how to store equipment. All these storage ideas are easy to make. They can be made from locally available materials most of which are cheaply or even freely available. They all look attractive and will help pupils to take a pride in their classroom environment.

It is especially important to store books so that they last a long time. **Ideas into Practice** (pages 6 – 11) gives some good ideas on how to store books. The pupils must be taught to look after books as well as having them readily accessible so that the pupils can use them for research or choose to read when they have free time.

## Displaying Pupil's Work in the Classroom

There are many reasons for displaying pupil's work in the classroom, for example:

- it makes the classroom look attractive;
- it reminds pupils of what they have learned;
- it encourages pupils to talk about their work;
- it helps pupils to take a pride in their work;
- it reinforces and supports learning.

Every classroom should have some display areas where pupil's work as well as posters and other learning aids are neatly and attractively displayed.

Displays should be changed regularly to keep them interesting and in good condition.

Displays can be used to reinforce learning of new topics. For example the equipment used for teaching measurement and capacity in Mathematics can be displayed on a table during the teaching of that unit to allow pupils to experiment with it.

Pupils should be encouraged to look at and talk about displays with their teachers and with each other and to ask their parents and family members to come in and see their work too.

Teachers should be careful, however, that their classrooms are not too crowded or cluttered. One or two interesting displays that are changed regularly are probably better than 20 displays that remain the same all year round. Teachers should use display to support the work they are **currently** doing with their class.

## Mathematical Language

Teachers often use informal, everyday language in maths lessons alongside technical mathematical vocabulary. Although this is a good way to help pupils to grasp the meaning of different words and phrases, a structured approach to teaching mathematical vocabulary is essential if pupils are to use the correct terminology with confidence.

Teachers first need to teach new mathematical terms in a suitable context, for example, with relevant real objects, mathematical apparatus, pictures and/or diagrams.

Teachers should then use correct mathematical language with the class all the time to reinforce what they have taught.

Then they must encourage the pupils to use the technical terms they have learnt when working in groups, in pairs and individually. Careful questioning can encourage pupils to use these terms. They should use them orally first, and, when they are confident with the meaning, they can begin to read and write this new vocabulary.

This process of learning mathematical vocabulary through a cycle of oral work, reading and writing is outlined below.

<b>Start by using the terms orally during practical work</b>	Pupils develop a practical understanding of what mathematical words mean in a variety of contexts, using real materials.
<b>Develop their understanding through more oral and discussion work, and during practical tasks.</b>	<p>This might include opportunities to:</p> <ul style="list-style-type: none"> <li>▪ listen to adults and other pupils using the words correctly;</li> <li>▪ participate in discussions where they are required to use technical vocabulary;</li> <li>▪ describe, define and compare mathematical properties, positions, methods, patterns, relationships, rules;</li> <li>▪ discuss how to tackle a problem, collect data, and organise their work;</li> <li>▪ hypothesise or make predictions about possible results;</li> <li>▪ present, explain and justify their methods, results, solutions or reasoning, to the whole class or to a group or a partner.</li> </ul>
<b>Introduce them to reading technical terms</b>	<p>This may include reading:</p> <ul style="list-style-type: none"> <li>▪ numbers, signs and symbols, expressions and equations from the board;</li> <li>▪ instructions and explanations in the Pupil's Resource Books;</li> <li>▪ labels and captions on displays, in diagrams, graphs, charts and tables;</li> <li>▪ definitions in dictionaries in order to discover meanings, origins of words; and words with similar roots (such as triangle, triplet, tricycle, trisect).</li> </ul>
<b>Teach pupils to use mathematical vocabulary in a variety of ways in their writing.</b>	<p>This may include:</p> <ul style="list-style-type: none"> <li>▪ labeling diagrams;</li> <li>▪ writing sentences to describe, compare, predict, interpret, explain or justify their maths work;</li> <li>▪ writing formulae, first using words, then symbols;</li> <li>▪ drawing and labeling graphs, charts or tables, and interpreting and making predictions from the data in them.</li> </ul>



## Problem Solving

Problem solving promotes reasoning and logical thought. It tests the pupil's ability to apply their knowledge of algorithms and transfer theoretical knowledge into practice.

Problem solving is an essential part of Nguzu Nguzu mathematics. It reinforces learning by helping pupils to apply it to real life situations. It promotes real understanding of rules and methods and, by using real-life relevant problems, shows pupils the relevance and importance of maths.

Nguzu Nguzu mathematics uses a problem solving approach to ensure that each new mathematical concept taught is applied to real-life problems. These allow pupils to demonstrate their understanding of concepts by tackling problems and finding the solutions.

Problem solving is a process or a series of processes. The process is usually just as important as arriving at the right answer. It involves the following common steps:

- Identifying the problem to be solved;
- Selecting a suitable strategy (or strategies);
- Choosing which mathematical operations are needed;
- Working through the problem to find an answer;
- Checking the answer against reasonable estimates.

All of these can be thought through individually or done through discussion. There are no clear rules. Problems can be solved in many different ways using more than one strategy.

Teaching problem solving therefore, means teaching pupils to think broadly and flexibly about different approaches. It means developing their confidence to try different strategies and encouraging them to see the problem through when faced with difficulties. It also requires plenty of time, sometimes pupils will need to work on problems over several lessons, before they find a solution.

Teachers have to specifically teach pupils skills that will help them to solve problems. This will include teaching the following skills:

1. Reading the problem carefully two or three times until pupils are sure that they know what it is about.
2. Deciding what the problem is asking them to discover.
3. Identifying and writing down any useful information that is given in the problem.
4. Identifying any information that is given that is not useful.
5. Thinking about which method or strategy to use.
6. Choosing an alternative strategy if the first one doesn't work.
7. Using a range of problem solving tools such as estimating, drawing pictures, making tables, making lists, working backwards, drawing graphs, estimating and checking and trial and error.
8. Showing their working out and using this to work through the problem.
9. Presenting their final answer clearly.
10. Checking to see if their answer is a sensible one.

When pupils are familiar with problem solving approaches to mathematics they learn not to be afraid of new problems. When they meet a problem they have never encountered before they can have a go at solving it using a variety of strategies that they have learned in mathematics.



## Assessment in Mathematics

Assessment involves collecting information about pupils' mathematical skills and making judgments about their strengths, weaknesses and progress.

The assessment advice given in this Teacher's Guide is **assessment for learning**. It is **not** designed to help teachers compare pupils or rank them in relation to the rest of the class. It simply asks teachers to make judgments about each individual's attainment in order to help them improve and to make accurate progress reports.

Assessment is an ongoing process. The teacher should constantly observe and evaluate the pupils' achievements, collecting data on areas of improvement and new skills acquired. This data will then be used for planning appropriate new teaching activities.

Assessment serves a number of purposes as follows:

- **identifying pupil's strengths and weaknesses.** The teacher can then plan more effectively to address these and give more help where needed;
- **grouping.** It can help teachers to identifying pupils general ability level so that they can be placed in the right group for more effective teaching and learning;
- **reporting.** This includes providing feedback information for pupils, parents, the next class teacher, curriculum developers, overall class standard, overall school standard, Ministry of Education, etc.

Assessment may also be used for selection purposes to determine which pupils move on to the next school or class.

Assessment for learning is part of the ongoing cycle of teaching and learning. It is important that teachers remember to build assessment into their daily cycle of planning, teaching and evaluation. The Standard 5 Nguzu Nguzu Mathematics Teacher's Guide helps teachers to do this by:

- a. setting out the **Sequence of Objectives** clearly at the start of each unit to help the teacher be clear about what to teach.
- b. providing **assessment reminders** at the end the activities for each objective which link the work completed to the syllabus objectives and remind the teacher to check on pupils grasp of the concepts taught.
- c. providing a **Check Up Page** at the end of each unit of work. These are a tool to help the teacher monitor each pupil's progress against the objectives taught.
- d. providing **extension and support activities** to feed into lessons when assessment activities show that pupils need more support.

Assessment for learning is a type of **formative assessment**. This means that it informs the teacher as well as the pupil and leads to the most appropriate strategies being chosen for future teaching and learning. This type of assessment is used to plan and direct teaching. Formative assessment happens all the time in the classroom.

**Summative assessment**, on the other hand, is designed to look at overall progress over a longer period of time such as a term or a year. The results from summative assessments can be used for grading and reporting on individual pupils as well as on overall class achievement. Summative assessment is a good tool for evaluating teacher effectiveness.

An example of summative assessment is when the teacher gives the pupils a written or oral test on a topic that has been taught. This is usually done individually and the pupil does not get help from the teacher to answer the questions. The teacher can therefore find out whether the pupil can answer the questions in the test. However understanding mathematics goes deeper than the ability to answer test questions.

There is a place for tests as one form of assessment and the Check Up pages at the end of each unit can be used in this way.

For more information on constructing summative tests refer to the test blue-print information, which is included as an Appendix in Standard Four Teacher's Guide.

A **test blue-print** is a tool designed to help teachers plan and construct balanced tests. It takes the form of a grid into which teacher places the questions they want to include in their test and assesses the level at which these are testing mathematical knowledge. The grid can also be used to decide what mark will be allocated to each question in order to properly weight the marking schedule. The Test Blue Print Appendix provides guidelines for teachers on how to prepare mathematics' tests at the end of a unit, a term or a year to supplement the judgments they make on children's progress through continuous assessment. Suggestions for recording test results are also given.

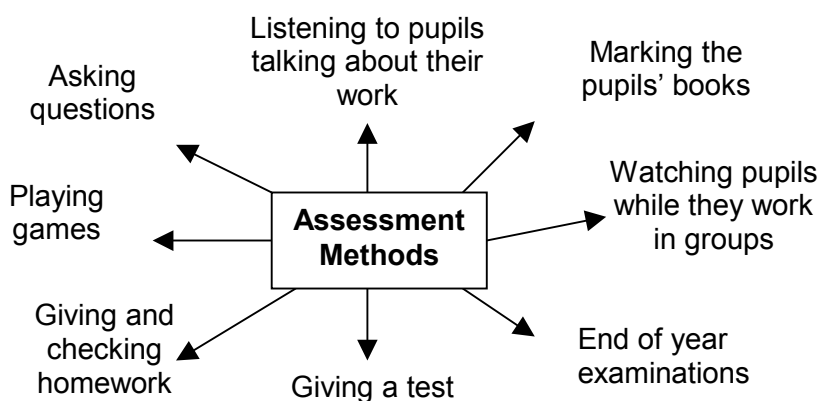
However, there are some serious problems, with using tests as the **only** method of assessment. Here are some, which many teachers will recognise:

- The language may be too difficult. The pupil may not understand what is being asked even if he does know the correct answer.
- The pupil may get the correct answer by guessing. The teacher cannot tell whether this has happened or not. This is especially a problem with true or false questions and multiple choice type questions.
- The pupil may have copied the correct answer from a friend.
- The pupil may be unwell on the day of the test.
- The pupil may know a lot of things that are not included in the test, but the test results will not reflect this.
- Tests often only show whether a pupil has got the answer right or wrong, not **where** he/she has gone wrong so they do not help the teacher to plan more effectively or to help the pupil to correct their own mistakes.

All these issues affect the accuracy and the fairness of tests.

The Check Up pages should always, therefore, be used along with other continuous assessment techniques.

Different methods of assessment are shown in the diagram below.



### The Skill of Questioning

Using well thought out questions is an important assessment technique for teachers as well as an important teaching tool. The right questions, asked in the right way can help teachers both to teach new ideas and to check that pupils have learnt and understood them.

Different types of questions assess different levels of mathematical thinking, from simply recalling facts, to the ability to apply these facts and use them in for reasoning, hypothesising and problem solving. The table on the next page explains the different types of questions by giving examples.

Question Type	Examples
<b>Recalling facts</b>	What is 3 add 7? How many days are there in a week? How many centimetres are there in a metre? Is 31 a prime number?
<b>Applying or using facts</b>	Tell me two numbers that have a difference of 12. What unit would you choose to measure the width of the table? What are the factors of 42?
<b>Hypothesising or predicting</b>	Estimate the number of stones in this jar. If we did our survey again on Friday, how likely is it that our graph would be the same? Roughly what is 51 times 47?
<b>Designing and comparing procedures</b>	How might we count this pile of sticks? How could you subtract 37 from 82? How could we test a number to see if it is divisible by 6? How could we find the 20 <sup>th</sup> triangular number? Are there other ways of doing this?
<b>Interpreting results</b>	So what does that tell us about numbers which end in 5 or 0? What does the graph tell us about the most common foot size? So what can we say about the sum of the angles in a triangle?
<b>Applying reasoning</b>	The seven coins in my hand total \$1. What could they be? In how many different ways can four pupils sit round a table? Why is the sum of two odd numbers always even?

### Supporting and Monitoring Group Work

As part of their ongoing assessment for learning activities teachers can use the time while pupils work in groups to go around and discuss their work with them.

Careful questioning can be used both to extend children's thinking and assess their understanding while they work on their maths in small groups. The table on the following page includes some suggestions for the type of questions that might be asked at different stages in the lesson.

<b>Ask pupils who are just getting started with a piece of work:</b>	<b>Ask pupils who are stuck and do not know what to do next:</b>
<p>How are you going to tackle this?</p> <p>What information do you have? What do you need to find out or do?</p> <p>What operation/s are you going to use?</p> <p>Will you do it mentally, with a pencil and paper, using a number line, with a calculator ....? Why?</p> <p>What method are you going to use? Why?</p> <p>What equipment will you need?</p> <p>What questions will you need to ask?</p> <p>How are you going to record what you are doing?</p> <p>What do you think the answer or result will be? Can you estimate or predict?</p>	<p>Can you describe the problem in your own words?</p> <p>Can you talk me through what you have done so far?</p> <p>What did you do last time? What is different this time?</p> <p>Is there something that you already know that might help?</p> <p>Could you try it with simpler numbers... using a number line...?</p> <p>What about putting things in order?</p> <p>Would a table help, or a picture/diagram/graph?</p> <p>Why not make a guess and check if it works?</p> <p>Have you compared your work with anyone else's?</p>
<b>Check progress while pupils are working by asking:</b>	<b>At the end of the lesson ask:</b>
<p>Can you explain what you have done so far? What else is there to do?</p> <p>Why did you decide to use this method or do it this way?</p> <p>Can you think of another method which might have worked?</p> <p>Could there be a quicker way of doing this?</p> <p>What do you mean by ....?</p> <p>What do you notice when....?</p> <p>Why did you decide to organise your results like that?</p> <p>Are you beginning to see a pattern or a rule?</p> <p>Do you think that this would work with other numbers?</p> <p>Have you thought of all the possibilities?</p> <p>How can you be sure?</p>	<p>How did you get your answer?</p> <p>Can you describe your method/pattern/rule to us all? Can you explain why it works?</p> <p>What could you try next?</p> <p>Would it work with different numbers?</p> <p>What if you had started with ... rather than....?</p> <p>What if you could only use ...?</p> <p>Is it a reasonable answer/result? What makes you say so?</p> <p>How did you check it?</p> <p>What have you learnt or found out today?</p> <p>If you were doing it again, what would you do differently?</p> <p>Having done this, when could you use this method/information/idea again?</p> <p>Did you use any new words today? What do they mean?</p> <p>What are the key points/ideas you need to remember for the next lesson?</p>

## Marking

Marking pupil's work is an important part of assessment. When you look at a pupil's work you can identify success, progress, mistakes and areas needing further teaching.

The following marking guidelines can help the teacher to approach marking with a focus on assessment for learning. They help the teacher to use marking to collect evidence of pupils' progress and attainment.

- Where possible mark work **with the pupil** there, so that you can talk through it with them. This will help you identify what mistakes the pupil is making as well as what he / she got wrong.
- Indicate which answers are wrong and which are right clearly. Make sure the pupil understands how you have marked their work.
- If a pupil has got a whole exercise wrong, they clearly have not understood the concept. Do **not** mark the whole page wrong. Instead make time to talk to the pupil individually and discuss the work. Give them the chance to try the exercise again.
- If you **write comments** for the pupils make sure that pupils can read them. Avoid writing 'good' or 'well done' on their own. Write **why** a piece of work is good.
- Add comments which give you and others information about the amount of help a pupil needed to complete a task. e.g. 'John worked with Martha on this problem' or 'Selwyn needed some help with the long division to work out this problem'.
- If you are not sure what a pupil has done when you look at his / her work, do not mark it. Set aside some time to talk to the pupil individually.
- Do not only mark work at the end of the lesson or when the work is finished. Sometimes going around the class and marking pupils' work when they are halfway through an exercise is a good way to check for, and correct, mistakes before they become a habit.
- If possible try to use a pen or pencil for your marking which is a different colour to the pupils' work.

## Recording Check Up Page Scores

Every unit has a **Check Up Page** as the last activity. This checks pupil's understanding of each objective that has been taught. If two topics have been taught in the unit both sets of objectives are assessed in the Check Up Page.

Each Check Up Page is made up of a different number of questions. When you have marked these, you could change each pupil's score into a percentage. This will make it easier to compare pupils' progress in different units.

### For example:

Unit 1 has two topics; Topic 1 Whole Numbers up to 1,000,000 and Topic 2, Number Sequences. The Check Up Page which can be found in the Pupil's Resource Book page 12 has 13 questions. Some have a. b. c. parts in them so there are 40 answers altogether. If a pupil scores 24 out of 40 then 24 is the raw score. To change this raw score into a percentage, multiply it by 100 as shown:

$$\frac{24}{40} \times 100 = 60\%$$

Below is an example of how you could record these percentages. This sheet is designed for the first two terms. The unit numbers are written across the top. The names of the pupils in your class are listed down the left hand side. You will have to make another record sheet for term 3 and 4. It would be a very helpful to pass these record sheets on to the Standard 6 teacher at the end of the year.





## Tips for Managing Composite Classes

The way in which Nguzu Nguzu mathematics is arranged around six repeated themes, helps teachers to manage their composite classes. Teachers can organise the four-term arrangement so that the different groups that they teach study the same themes and topics at the same time. This will allow whole class work to introduce the topics and group work at the appropriate level for groups within the class.

A number of basic principles make managing composite classes easier:

The composite class teacher **must be well organised** and well prepared.

As far as possible the class should be treated as **one group**. For example, for registration in the morning, for sports and games and art activities they can all do the same activity.

For learning new skills such as in mathematics, pupils should be grouped for teaching, but the groups need not always follow year groups, they may be **ability groups**.

The teacher must share his/her time fairly between all the pupils, and not focus on exam groups or ignore the less able members of the class.

An alternative is to teach **two different lessons** by year or ability groups. One year/ability group working independently on a set activity, while the teacher teaches the first lesson to the other group. Once this lesson is underway and the pupils have been set an independent task, the teacher then teaches the second lesson to the other group.

If you have some input into how composite classes are organised in your school below are some guidelines which should be considered carefully.

## Guidelines for Organising Composite Classes

- The composite class should not be too big.
- Year groups that are combined should be close in age – e.g. Standard 1 and 2 not Standard 1 and 5.
- Composite classes should, as far as possible, be taught as one class not as two separate classes.
- More experienced teachers should be allocated to composite classes, not probationers.
- It is helpful if a composite class teacher has had experience of teaching both year groups in his/her class before.
- The largest classroom should be allocated and the furniture should be suitable to be moved around for flexibility.
- If one teacher takes responsibility for the composite class other teachers should assist by teaching certain lessons or taking groups at certain times in the week.
- It is important that parents understand how these decisions have been made and why their child has been placed in the class they are in.

Teaching a composite class is hard work. All members of staff should share the responsibility by offering additional support to the composite class teacher, by taking the composite class for certain lessons to allow the teacher additional preparation time and so on.

It is the principals' responsibility to ensure that the composite class is organised in the best possible way for the school and that the teacher of that class (or classes) gets the support they need.

## References

Two books, which should be available in all schools, offer a lot of ideas to support composite class teachers:

**Ideas into Practice** (Nguzu Nguzu Guide to Whole School Development) and **Multiclass Teaching in Primary Schools**, (Ian Collingwood, published by UNESCO).

Teachers should refer to these for a wide range of practical ideas to help them to teach composite classes more effectively.

# Unit 1

## Number Topic 1: Numbers up to 1,000,000 Topic 2: Number Sequences

### Aim:

To further develop an understanding of the formation, order and sequence of numbers up to one million.

### Topic 1, Sequence of objectives: To

1. recognise and identify place value in numbers up to one million.
2. read and write numbers up to one million.

### Topic 2, Sequence of objectives: To

1. extend the number line to include negative numbers.
2. recognise and continue number sequences, including some that have negative numbers e.g. 5, 10, 15, 20, 25, - - - - -  
-7, -3, 1, 5, 9, 13, - - - - -
3. use words to describe number sequences and patterns e.g. "add four each time".
4. recognise square numbers.

### Rationale:

Mathematical operations used in every day life require a sound understanding of number.

In this unit, the pupils work on number place and value up to one million in Topic 1.

In Topic 2 they extend their knowledge and skill of number sequences, including negative and square numbers as well as using and identifying number patterns.

### T<sub>1a</sub>

Revise the place value of numbers up to 99,999. Write a five digit number on the board, for example: 36,421.

Ask the pupils,

'What does the digit 4 represent?' (**4 hundreds**)

'What does the digit 6 represent?' (**6 thousands**)

Check if the pupils can recognise totals by asking them these questions,

- a) How many thousands are there in 36,421? (**36**)
- b) How many hundreds are there in this number 36,421? (**364**)
- c) How many ones? (**36, 421**)

Remind the pupils of the use of the comma.

Point to the places in the chart as you explain this. The first place value is the units of one (ones place). The second place is formed from the units of 10 ones (the tens place). The third place is formed from the units of 10 tens (hundreds place). The fourth place is formed from the units of 10 hundreds (thousands place).

### Materials

place value charts,  
number expanders

Draw a place value chart  
on the board as shown.

ten thousands	thousands	hundreds	tens	ones
3	6	4	2	1

What does the digit 2 represent?  
What does the digit 3 represent?



## Unit 1: Number

The fifth place is formed from units of 10 thousands (ten thousands place).

Write the five digit number 25,469 on the place value chart. Point to each digit starting from the ones. Emphasise each place value and each digit value.

ten thousands	thousands	hundreds	tens	ones
2	5	4	6	9

Help the pupils to recognise and identify the numbers in the place value chart and state their total value.

For example, use your place value chart to recognise and identify the place value of:

**2 ten thousands, 5 thousands, 4 hundreds, 6 tens, 9 ones.**

Pupils say: twenty-five thousand, four hundred and sixty-nine.

Repeat this with other five digit numbers for the pupils to identify and say.

Emphasise how to say the numbers correctly in groups of thousands and then hundreds, tens and ones.

Revise the totals. 25 thousands, 254 hundreds, 2,546 tens, 25,469 ones.

Write these numbers on the board and ask the pupils to read and say the numbers.

**five thousand two hundred and twelve**

**5,212**

**thirty thousand six hundred and twenty-seven**

**30,627**

**forty thousand seven hundred and eighteen**

**40,718**

Draw a place value chart on the board.

Read the numbers below and ask the pupils to write them on the chart.

36 thousand four hundred and sixteen

81 thousand seven hundred and thirty-five

46 thousand one hundred and forty-four

eg.

ten thousands	thousands	hundreds	tens	ones
2	5	4	1	6



Ask the pupils to complete the activities in their Pupil's Resource Book on pages 4 and 5.

# Topic 1: Numbers up to 1,000,000

## Answers

### Activity A

1. 9,426
2. 99,711
3. 72,158
4. 43,333
5. 71,659
6. five thousand, one hundred and twenty-three.
7. forty-five thousand, seven hundred and fifty-one.
8. fifty-five thousand eight hundred and seventy-nine.
9. twenty-three thousand five hundred and ninety-two.
10. ninety-nine thousand six hundred and seventy-six.

### Activity B

1. 81,431
2. 30,724
3. 61,003
4. 13,030
5. 99,040
6. Sixty-two thousand and nineteen.
7. Seventy-four thousand, one hundred.
8. Ninety thousand and forty.
9. Fifty thousand, seven hundred and seven.
10. Eighty thousand and eight.

### Activity C

1.

	ten thousands	thousands	hundreds	tens	ones
a	9	2	3	4	6
b	5	1	2	0	6
c	9	0	0	1	7
d	2	2	9	3	7
e	8	0	0	0	1

2. a. 923
- b. 5,120
- c. 90,017
- d. 2
- e. 800

**T<sub>1b</sub>**

Before introducing the seventh place value digit, draw the place value chart on the board for a six digit number as shown below.

**Materials**  
place value chart,  
number expanders

hundred thousands	ten thousands	thousands	hundreds	tens	ones
2	5	4	6	9	0

# Unit 1: Number

Use base 10 materials to show that 10 ones form 1 ten, 10 tens form 1 hundred, 10 hundreds form 1 thousand, 10 thousands form 1 ten thousand, 10 ten thousands form 1 hundred thousand, extending the place value chart to the left.

Explain that we count by grouping in tens and use ten digits, which is why we call our number system the **base ten system** or **decimal system**.

Write these numbers on the board and ask the pupils to name the number of tens, hundreds, thousands and so on.

62,345  
327,585  
456,248  
717,819

Demonstrate the number expander for the pupils to see and read, for example.

**540,607** can be expanded into

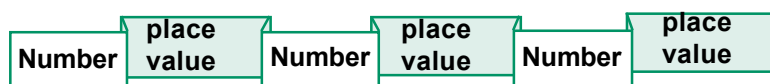


Ask some pupils to suggest numbers for use in the number expanders.

e.g. **717,819** can be expanded to give



Show the pupils how to make different expanders using strips of card.



Write these numbers on the board.

70,305	270,005
36,256	691,056
120,743	270,356

Ask the pupils to say each number in different ways. For example: **70,305** could be said:

**Seven ten thousands, three hundreds and five ones**  
**or seventy thousands, three hundreds and five ones.**

**C<sub>1b</sub>**

Put the pupils in pairs.

Write these numbers on the board. Tell the pupils to work with a partner and take turns in making place value expanders that show the following:

- |                                 |                                 |
|---------------------------------|---------------------------------|
| 1. 150 thousands                | 2. 619 thousands                |
| 3. 563 thousands and 4          | 3. 325 thousands and 25         |
| 5. 910 thousands and 3          | 6. 10 thousands and 1           |
| 7. four hundred thousand and 10 | 8. nine hundred thousand and 16 |

# Topic 1: Numbers up to 1,000,000

Some pupils will need extra help. Go round the class while they are doing this activity. Make sure the pupils are reading aloud the numbers they are showing on their expanders.

This activity will make the pupils more confident in understanding what the digits represent in larger numbers.

At the end of the lesson go through the exercise as a class. Choose different pupils to show and read their expanders for each of the eight questions. You could have prepared correct examples before the lesson.

**T<sub>1c</sub>**

**Materials**  
numeral cards  
0 - 9

Display the ten numeral cards on the board 1 2 3 4 5 6 7 8 9 and 0. Point out to pupils that in our number system, we make use of these ten symbols. We can use the same numerals for big or small numbers. For example 54,628, 29,486, 234,690. Use the cards to make up each of these numbers.

This is because the same digits have different values depending on where they are placed in the number.

Write these numbers on the board. Use them to show the pupils the different values of each digit in expanded notation. For example:

**42,683** means **40,000 + 2,000 + 600 + 80 + 3**

**365,563** means **300,000 + 60,000 + 5,000 + 500 + 60 + 3**

**796,579** means **700,000 + 90,000 + 6,000 + 500 + 70 + 9**

**420,462** means **400,000 + 20,000 + 400 + 60 + 2**

Start with number 999,995 and ask the pupils to count on. When they reach 999,999 stop and ask the pupils to predict the next number.

Explain to the pupils that the digit placed in the column before the hundred thousands represents 10 hundred thousands. This place has the a value of 1 million (1,000,000).

Point out to the pupils, the use of the comma after every 3 digits to separate the thousands from the hundreds, and the millions from the hundred thousands.

Now show the pupils how to place **1,000,000** in the place value chart.

Do more examples to practise recognising and identifying place value up to 1 million. Write some six-digit numbers in words on cardboard or paper and read them out to pupils. For example:

two hundred and nineteen thousand, five  
hundred and seventy-three

seven hundred and four thousand, nine  
hundred and forty

nine hundred thousand and six

eight hundred thousand and sixteen

# Unit 1: Number

Ask the pupils to write the numbers in their exercise books, as you read them out.

Ask the pupils to suggest situations in which large numbers might be used.

For example:

- a) The population of Solomon Islands in 2001 was about 409,500.
- b) The number of people watching the 2000 Olympic Games on televisions around the world would be more than two hundred million.

**C<sub>1c</sub>**

Have the pupils draw a place value chart in their exercise book as shown below.

millions	hundred thousands	ten thousands	thousands	hundreds	tens	ones

Read out the following numbers in words.

**219,573**

**704,940**

**1,000,000**

Ask the pupils to write the numbers in digits in their place value chart.

Now write some six digit numbers on the board in words. Ask different pupils to write each number in digits on the board.

Let the other pupils decide if the number is correct.

Here are some you could use

- 1. eight hundred thousand. **(800,000)**
- 2. nine hundred thousand and six **(900,006)**
- 3. five hundred thousand, one hundred and one **(500,101)**

When pupils have had enough practice, have them complete the activities in the Pupil's Resource Book pages 5 and 6.

## Answers

### Activity A

- 1. 974,321
- 2. nine hundred and seventy-four thousand, three hundred and twenty-one.
- 3. 123,479
- 4. one hundred and twenty-three thousand, four hundred and seventy-nine.

### Activity B

- 1. 124,598
- 2. 985,421
- 3. 518,249
- 4. 129,854
- 5. 412,589
- 6. 900,006
- 7. 9,000
- 8. 90
- 9. 90,000
- 10. 0

# Topic 1: Numbers up to 1,000,000

## Activity C

1. 103,789
2. 883,521
3. 12,690
4. 396,211
5. 750
6. 49,124
7. 500,876



Can all the pupils recognise and identify place value in numbers up to one million?

**T<sub>2a</sub>**

Begin the lesson by drawing a place value chart on the board.

millions	hundred thousands	ten thousands	thousands	hundreds	tens	ones

Write the number 999,900 on the board. Ask one pupil to the board and ask them to put each digit in the correct place in the place value chart. Ask the class if the digits are in the right places. Ask the pupils to read the number out aloud.

Ask 'How many more must be added to this number to make one million?' (100)

Now repeat this activity with other numbers. The numbers should not be too difficult if this is to be done mentally. Make sure the pupils can recognise the correct place value for each digit and be able to say each number correctly.

Use these examples

- a) 900,000      b) 990,000      c) 999,000      d) 999,990      e) 999,090

Write these numbers on the board.

**324,000    342,000**

Ask the pupils to say these numbers.

**three hundred and twenty-four thousand**

**three hundred and forty-two thousand**

Ask the pupils 'Which number is bigger?' (**342,000**)

Draw a sign to show this between the two numbers

324,000 < 342,000

This means 324,000 **is less than** 342,000

342,000 > 324,000

This means 342,000 **is greater than** 324,000

Explain the use of the two signs < and >.

# Unit 1: Number

C<sub>2a</sub>

Go through some examples. Ask the pupils to tell you what each one means.

Make sure all the pupils have a turn at reading the numbers aloud.

Ask them to complete the activities on pages 6 and 7 in the Pupil's Resource Book.

Some extra practise is given in Activity A in reading out and identifying numbers.

1.  $234,987 > 198,700$

2.  $877,543 < 877,800$

3.  $999,500 < 999,550$

4.  $432,011 > 432,001$

## Answers

### Activity A

- |              |            |                                     |
|--------------|------------|-------------------------------------|
| 1. 300       | 6. 126     | 11. five hundred and fifty          |
| 2. 3,000     | 7. 126,000 | 12. fifty-five thousand             |
| 3. 30,000    | 8. 815     | 13. five hundred and fifty thousand |
| 4. 300,000   | 9. 815,000 | 14. five million                    |
| 5. 1,000,000 | 10. 81,500 | 15. seventy-five thousand           |
16. four hundred and thirty-two thousand, four hundred.  
17. two hundred and twenty-seven thousand, one hundred and fifty.  
18. three hundred and forty thousand, one hundred and twenty-two.

### Activity B

- |                        |                         |
|------------------------|-------------------------|
| 1. $125,000 < 376,000$ | 7. $423,789 > 423,719$  |
| 2. $225,009 > 225,000$ | 8. $70,486 < 74,486$    |
| 3. $100,999 > 99,999$  | 9. $899,111 > 879,000$  |
| 4. $876,234 < 876,243$ | 10. $17,004 < 17,014$   |
| 5. $325,089 < 325,809$ | 11. $655,099 > 605,099$ |
| 6. $709,322 > 209,099$ | 12. $360,012 < 603,120$ |

### Activity C

- 700,000
- 867,894
- 2,001
- 444,445
- No ( $225 \text{ litres} \times 365 \text{ days} = 82,125 \text{ litres}$ )



# Topic 1: Numbers up to 1,000,000

**T<sub>2b</sub>**

**Materials**  
rounding off chart

Revise numbers containing six digits with the pupils. For example: 328,538

Say: **three hundred and twenty-eight thousand, five hundred and thirty-eight.**

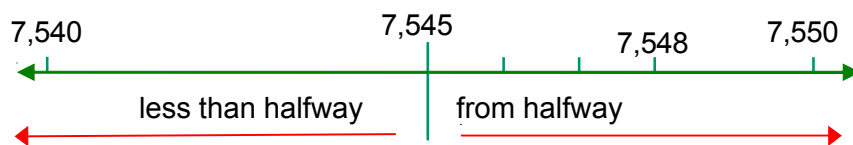
Remind the pupils that, rounded to the nearest

**ten:** 328,538 is 328,540

**hundred:** 328,538 is 328,500

**thousand:** 328,538 is 329,000

Use a number line to explain how to round off numbers to the nearest ten, hundred and thousand. For example: Round off **7,548** to the **nearest ten**?



Ask the pupils,

The number 7,548 is between which tens? **(7,540 and 7,550).**

Which number is halfway between 7,540 and 7,550? **(7,545)**

Which ten is closer to the number 7,548? **(7,550)**

Continue to talk about the same number (7,548) but round it to the nearest hundred and then to the thousand.

Explain to the pupils that any number from halfway and onward, is rounded off to the next ten, hundred or thousand.

Write these numbers on a number line and use them as examples:

- a. 3,735    b. 765    c. 762  
d. 23,406    e. 7,372    f. 18,785

**C<sub>2b</sub>**

Ask the pupils to complete the activities in the Pupil's Resource Book on page 8.

## Answers

### Activity A

- |            |             |             |
|------------|-------------|-------------|
| 1. 130     | 6. 100      | 11. 0       |
| 2. 3,650   | 7. 3,600    | 12. 4,000   |
| 3. 23,230  | 8. 23,200   | 13. 23,000  |
| 4. 700,880 | 9. 700,900  | 14. 701,000 |
| 5. 654,560 | 10. 654,600 | 15. 655,000 |

### Activity B

- |              |
|--------------|
| 1. 350,500   |
| 2. 822,500   |
| 3. 100,800   |
| 4. 531,000   |
| 5. 1,000,000 |

# Unit 1: Number

## Activity C

- |             |         |         |               |           |           |
|-------------|---------|---------|---------------|-----------|-----------|
| 1. 766,810  | 766,800 | 767,000 | 6. 110,220    | 110,200   | 110,000   |
| 2. 101,410  | 101,400 | 101,000 | 7. 232,790    | 232,800   | 233,000   |
| 3. 99,590   | 99,600  | 100,000 | 8. 999,670    | 999,700   | 1,000,000 |
| 4. 667,320  | 667,300 | 667,000 | 9. 900,350    | 900,300   | 900,000   |
| 5. 356,500  | 356,500 | 357,000 | 10. 1,000,500 | 1,000,500 | 1,001,000 |
|             |         |         |               |           |           |
| 11. 26,510  | 26,500  | 27,000  |               |           |           |
| 12. 19,870  | 19,900  | 20,000  |               |           |           |
| 13. 90,350  | 90,400  | 90,000  |               |           |           |
| 14. 777,000 | 777,000 | 777,000 |               |           |           |
| 15. 25,000  | 25,000  | 25,000  |               |           |           |

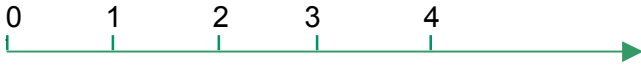


Can all the pupils read and write numbers up to one million?

# Topic 1: Numbers up to 1,000,000

## T<sub>1a</sub>

Draw a number line on the board. Mark the points for numbers 0, 1, 2, 3, 4 and so on. Explain that this number line runs horizontally from zero to the right.



Tell the pupils that this number line can be extended to the left from zero to include -1, -2, -3 and so on. Extend the number line to the left and mark -1, -2, -3.



Ask: What do we call numbers from zero to the right? (**positive numbers**)

What do we call numbers from zero to the left? (**negative numbers**)

Explain to the pupils that **positive numbers are greater than zero** and **negative numbers are less than zero**.

On the board, practise drawing number lines from the negative side to the positive side beginning with any number.

Show the pupils that all negative numbers are written with a 'minus' sign to the left of the number e.g. -6.

We say 'negative' six or 'minus' six. If the number is positive, we usually do not need to say positive six or plus six but it is not wrong to do so for example -6, +6.

## C<sub>1a</sub>

Ask pupils to draw a number line and mark it negative 4 (-4) to positive four (+4)

Give more practice in drawing number lines and writing the correct number in each of the places.

Ask the pupils to draw a number line from -10 to +10.

Then tell them to extend the line to -20.

Do this again with other numbers. For example:

Draw a number line from -1 to +5.

Extend this number line to +7.

Draw a number line from -3 to +12.

Extend this number line to -5.

# Unit 1: Number

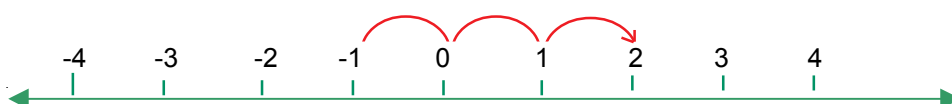
T<sub>1b</sub>

Draw a number line on the board. Use it to demonstrate:

- a) 2 more than 0      b) 2 less than -1      c) 2 less than 1

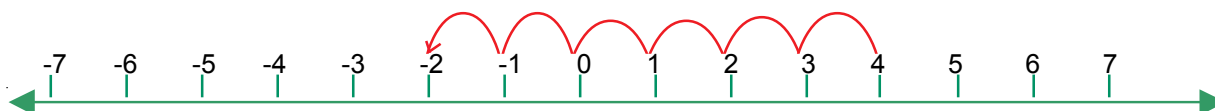
Tell the pupils that negative and positive numbers can be **added** by counting to the left for negative numbers and to the right for positive numbers.

Example: To add  $-1 + 3$  begin at -1 and take three steps to the right so  $-1 + 3 = +2$



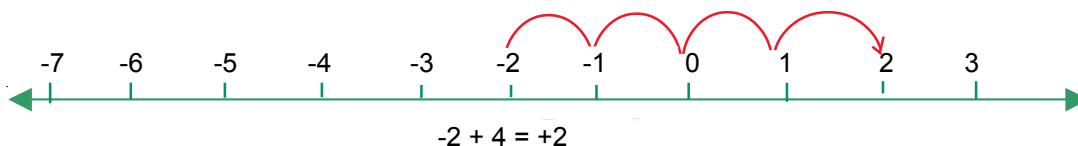
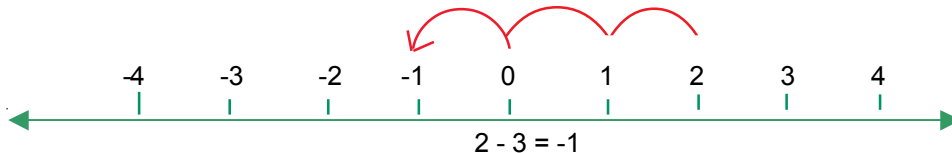
To add  $4 + -6$ .

You begin at +4 and take six steps to the left so  $4 + -6 = -2$



Numbers can be **subtracted** by counting to the left for positive numbers and to the right for negative numbers.

Ask the pupils to draw these number lines and draw arrow steps to show the number facts.



Give the pupils many more examples of adding and subtracting using arrows or steps.

C<sub>1b</sub>

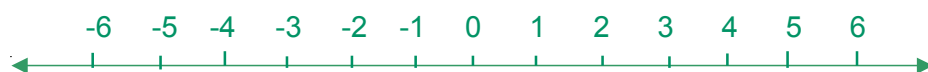
Ask the pupils to do the activities in the Pupil's Resource Book on pages 9 and 10 in their exercise books.

Check that the pupils have drawn their number lines correctly as well as that they have the correct answers.

## Topic 2: Number Sequences

### Answers

#### Activity A



- |       |       |       |        |
|-------|-------|-------|--------|
| 1. -3 | 4. 3  | 7. -5 | 10. -6 |
| 2. -2 | 5. -3 | 8. -4 | 11. 3  |
| 3. 0  | 6. -5 | 9. 5  | 12. 0  |

#### Activity B

- |        |        |
|--------|--------|
| 1. 10  | 6. 0   |
| 2. -3  | 7. -4  |
| 3. -3  | 8. -40 |
| 4. -10 | 9. 1   |
| 5. 1   | 10. -2 |

-9	-10	-5
-4	-8	-12
-11	-6	-7

-1	4	-3
-2	0	2
3	-4	1

#### Activity C

- No. He lost a total of 5,780 grams, or 5.78kg. He did not reach his target of 6kg.
- Sets of cards which total zero. Note: these are possible answers, pupils may also find different combinations.

- |          |        |       |        |
|----------|--------|-------|--------|
| a) -1000 | b) -12 | c) 88 | d) 199 |
| 500      | 22     | -42   | -298   |
| 500      | -10    | -46   | 99     |
| e) 22    | f) -42 | g) 56 | h) 3   |
| 3        | 4      | -46   | 5      |
| -25      | 38     | -10   | -8     |

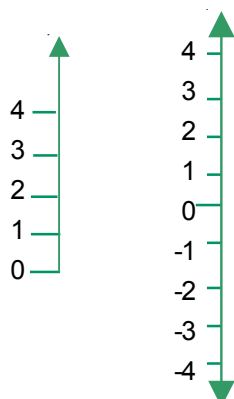
**T<sub>1c</sub>**

#### Materials

plastic water bottle,  
30cm ruler, glue,  
strips of paper

Draw a vertical number line on the board. Mark it with equally spaced points from 0, 1, 2, 3, 4.

Explain that this number line runs vertically from zero (0) up to 4.



Tell the pupils that this number line can also be extended downwards to include -1, -2, -3, -4 and so on.

Explain that this diagram could represent the tide measured in metres. 0 (zero) could represent normal sea level. This is half way between high and low tide.

Ask:

Where will the sea level reach if the high tide rises 3m from normal sea level?

**(3 above normal sea level, or +3)**

Where would the sea level be if the low tide dropped 2m?

**(2 below normal, or -2)**

What numbers are below normal sea level? **(negative numbers).**

What numbers are above normal sea level? **(positive numbers).**

# Unit 1: Number

C<sub>1c</sub>

Have the class work in groups of three or four pupils.

Give each group a plastic bottle and a marked strip of paper with positive and negative numbers.

Explain that zero (0) represents normal sea level and that the positive numbers represent metres above normal sea level and the negative numbers represent metres below normal sea level.

Glue the strip to the outer part of the bottle.

Allow the pupils to experiment adding and removing different amounts of water.

Ask each group to pour water into their bottle. Use zero (0) as normal sea level.

Add some water for high tide, empty some water for low tide.

For example: 1cm on the strip represents 1m in the tide.

Ask: What happens when water is added? (**water rises to give a positive number**)

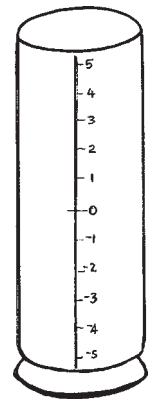
How many centimetres? (**2cm**) - High tide is 2m above normal sea level.

(+2cm on the scale.)

Ask: What happens when some water is removed? (**water level drops**)

How many centimetres drop? (**4cm**) - Low tide is 4m below normal sea level.

(-4cm on the scale.)



Can all the pupils understand and use a number line extended to include negative numbers?

T<sub>2a</sub>

Draw this number line on the board.

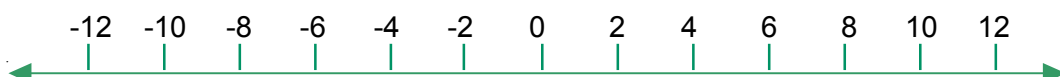


Ask the pupils to read the numbers on the number line.

Ask: How many numbers are represented by each space?

What counting sequence does this number line represent? (**counting in ones**)

Draw a second number line to include negative numbers. This time count in 2s.



Explain that from zero (0) to the right, numbers increase by 2 and from zero (0) to the left, numbers decrease by 2.

Give the pupils more examples of number sequences for example:

-9, -6, -3, 0, 3, 6, 9 (**counting in threes**). Draw number lines to illustrate these.

## Topic 2: Number Sequences

A sequence is a pattern. There is a repeated pattern along the number line.

Write some number sequences on the board.

1 (+1) 2 (+2) 4 (+1) 5 (+2) 7 (+1) 8, ,  (Answer 10, 11)

1 (+5) 6 (-3) 3 (+5) 8 (-3) 5 (+5) 10, ,  (Answer 7, 12)

Ask the pupils to work out the next two numbers. They must look for a pattern.

The pattern will be repeated to make a sequence. Tell the pupils that in a sequence the first number is called **1st term**, the second number is the **2nd term** and so on.

Write the sequence and with the pupils work out the rule for these examples:

1, 2, 4, 5, 7, 8, 10, 11, (Rule: +1, +2)

1, 6, 3, 8, 5, 10, (Rule: +5, -3)



Ask the pupils to complete the activities in the Pupil's Resource Book on pages 10 and 11.

### Answers

#### Activity A

1. 1, 4, 7, 10, 13,
2. 2, 5, 8, 11, 14,
3. 1, 2, 4, 8, 16,
4. 3, 6, 12, 24, 48,
5. 5, 10, 20, 40, 80,
6. a. 3, 8, 13, 18, 23,  
b. 3, 6, 12, 24, 48,  
c. 3, 5, 7, 9, 11,  
d. 3, 13, 23, 33, 43,

#### Activity B

1. 8, 10, add two.
2. 12, 15, add three.
3. 1,000 10,000 multiply by ten.
4. 6, 9, add three
5. 6, 11, add five.
6. 7, 11, add one more each time (+1, +2, +3, +4)
7. 250, 1,250, multiply by five.
8. 21, 28, add seven.
9. 1, 4, 7, 10 Rule: +3 or 1, 4, 16, 64 Rule:  $\times 4$

Note the following are some suggested possible answers, pupils may find different sequences.

10. 3, 7, 11, 15, add four  
3, 7, 15, 31, multiply by two and add one.
11. 2, 6, 10, 14, add four.  
2, 6, 18, 54, multiply by three.
12. 4, 8, 12, 16, 20, add four.  
4, 8, 16, 32, 64, multiply by two.
13. 5, 15, 25, 35, 45, add ten.  
5, 15, 35, 75, 155, multiply by two and add five.
14. 62 multiply by two then add two
15. 6 multiply by two, subtract one
16. 12 first add five then take away two.

#### Activity C

1. 16
2. 31
3. Plus 3.



# Unit 1: Number

**T<sub>2b</sub>**

**Materials**  
number lines

Write some number sequences on the board. For example:

4, 8, 12, 16, 20, 24,

Ask different pupils to read out the numbers.

Ask: Who can identify the sequence?

What is the number pattern or rule used? **(+4)**

Repeat with the following sequence of numbers using the number line:

-10, -7, -4, -1, 2, 5, 8,



Ask:

What is the number pattern used? **(+3)**

Go through some more examples with the pupils. For example

-8, -6, -4, -2, 0, 2, 4, 6, 8 **(+2)**

-20, -15, -10, -5, 0, 5, 10, 15, 20 **(+5)**

2, 4, 7, 9, 12, 14, **(+2, +3)**

Make up some more examples of your own.

**C<sub>2b</sub>**

On the board write these sequence starters. Ask the pupils to work out the rule then write four more terms.

	Rule	
a) -9, -6, -3, 0, 3,	<b>(+3)</b>	<b>Answer: 6, 9, 12, 15</b>
b) 5, 9, 7, 11, 9, 13,	<b>(+4, -2)</b>	<b>Answer: 11, 15, 13, 17</b>
c) 2, 4, 3, 6, 5, 10, 9,	<b>(x2, -1)</b>	<b>Answer: 18, 17, 34, 33</b>
d) 3, 8, 5, 10, 7, 12,	<b>(+5, -3)</b>	<b>Answer: 9, 14, 11, 16</b>

Ask the pupils to work in pairs. Tell them to write two sequences each. Let them give their sequences to their partner. Their partner must work out the rule they have used and add two more terms to each sequence.

Have pupils complete the activities on page 12 of the Pupil's Resource Book.

## Topic 2: Number Sequences

### Answers

#### Activity A

1. 1, 4, 7, 10, 13,
2. 10, 8, 6, 4, 2,
3. 2, 4, 8, 16, 32,
4. 32, 16, 8, 4, 2
5. 1, 2.5, 4, 5.5, 7,
6. -4, -2, 0, 2, 4,
7. 33, 31, 29, 27, 25,
8. 2, 6, 18, 54, 162,

#### Activity C

1. 1, 8, 43, 218, 1,093, 5,468,
2. 1, 10, 28, 64, 136, 280,
3. \$5, \$8, \$11, \$14, \$17, \$20,
4. 1,000g, 540g, 310g, 195g, 137.5g, 108.75g,
5. 1, 2, 5, 10, 17, 26,
6. Double the first term to get the second term then add three to the result to get the third term, and so on.
7. Multiply each number by itself.
8. Multiply by 2 then add 2.
9. Add four then multiply by 2.
10. Multiply by 2 then subtract 2.

#### Activity B

1. 1, 5, 13, 29, 61,
2. 1, 8, 22, 50, 106,
3. 0.5, 5, 14, 32, 68,
4. 1, 2, 4, 7, 11,
5. 25, 125, 525, 2,125, 8,525,



Can all the pupils recognise, identify and continue number sequences including negative numbers?

T<sub>3a</sub>

#### Materials

Number sequence cards

Write a sequence of numbers on the board

5, 10, 15, 20, 25, 30.....

Ask different pupils to identify the rule in this sequence and then work with the class to find the next three terms.

The rule is '**add five each time**', and the next terms would be **35, 40, 45**.

Do this again with another example.

3, 4, 6, 9, 13, 18,

The rule is: '**add one more each time**', and the next three terms would be **24, 31, 39**.

Now start with a rule and the first term and build up a sequence of five terms on the board with the class. For example:

The rule is: **take away two each time and the first term is 20**.

The sequence you will build up will be **20, 18, 16, 14, 12**.

Introduce some more interesting rules.

For example: **add even numbers each time in order and the first term is 1**.

#### Number sequence

Complete the number sequence.

a) 5, 10, 15, 20, 25, 30, .....,...

b) 3, 5, 7, 9, ....., ....., 15, 17, .....

c) 1, 4, 9, 16, ....., 36, 49, ....., .....

## Unit 1: Number

The sequence you will build up will be: **1, (+2) 3, (+4) 7, (+6) 13, (+8) 21.**

Ask the pupils to think of some rules. Choose some of these and build up the sequences as a class activity on the board. Remember to use the correct mathematical language. Try and use all these terms

<b>add on</b>	<b>take away</b>	<b>multiply</b>	<b>divide</b>	<b>even</b>
<b>odd</b>	<b>square</b>	<b>subtract</b>	<b>more</b>	<b>less</b>



To help pupils strengthen their skills in describing number sequences, have them play a the **Sequence Rules Race Game**.

Play as a whole class first until they understand what to do, then play in pairs or small groups.

Prepare some cards with number sequences on them, some should be easy, and others more difficult so that everyone has a chance to succeed. Write the rules for the sequences down separately.

For example:

<b>2</b>	<b>4</b>	<b>6</b>	<b>8</b>	<b>10</b>
----------	----------	----------	----------	-----------

<b>15</b>	<b>10</b>	<b>5</b>	<b>0</b>	<b>-5</b>
-----------	-----------	----------	----------	-----------

<b>8</b>	<b>9</b>	<b>11</b>	<b>15</b>	<b>18</b>
----------	----------	-----------	-----------	-----------

<b>1</b>	<b>3</b>	<b>9</b>	<b>27</b>	<b>81</b>
----------	----------	----------	-----------	-----------

<b>4</b>	<b>11</b>	<b>25</b>	<b>53</b>	<b>109</b>
----------	-----------	-----------	-----------	------------

Rules:

1. Add two
2. Subtract 5
3. Add one more each time
4. Multiply by three
5. Multiply by two and add three

Split the class into two teams. Hold up one card for the class to see and see who can be quickest to work out the rule. The first pupil to put up his or her hand should explain the rule, if they are correct their team gets a point.

When they understand the game you could play in groups, or in pairs. If playing in pairs ask the pupils to make up their own sequences and rules and swap with their partner. The first to find and correctly explain the other persons' rule, gets a point.



Can all the pupils use words to describe number sequences?

## Topic 2: Number Sequences

T4a

**Materials**  
counters, shells,  
stones

Tell the pupils that numbers can have shapes. Draw 9 circles on the board.

Arrange them in 3 rows and 3 columns to make a square shape as shown.

Explain that 9 is called a square number.

Each row and column has 3 circles so we call 9 the **square** of 3 or **3 squared**.

Draw some more square numbers.

Draw some that are not squares too to show the difference.

Tell the pupils that **a square number can be written as the product of 2 equal factors**.

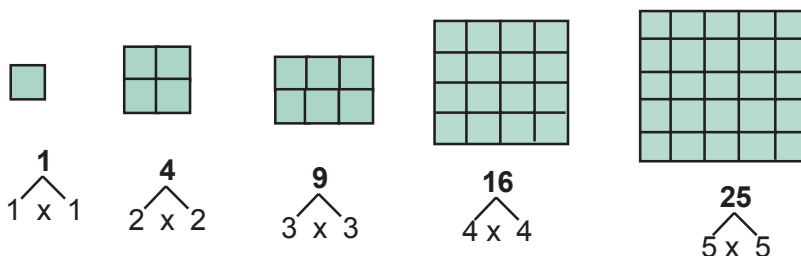
For example:  $1 = 1 \times 1$  ← This is 'one' squared.

$$4 = 2 \times 2$$

$$9 = 3 \times 3$$

$$16 = 4 \times 4$$

$$25 = 5 \times 5$$



Sometimes square numbers are written like this:

$1 \times 1 = 1$  we say **one to the power of two or one squared**.

$2 \times 2 = 4$  we say **two to the power of two or two squared** and so on.

Remind the pupils that the **product** is the answer obtained when two numbers are multiplied together.

C4a

Ask pupils to complete the activities in the Pupil's Resource Book on page 13.

### Answers

#### Activity A

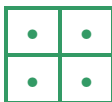
- 1 is a square number because  $1 \times 1 = 1$   
4 is a square number because  $2 \times 2 = 4$   
9 is a square number because  $3 \times 3 = 9$   
16 is a square number because  $4 \times 4 = 16$

## Unit 1: Number

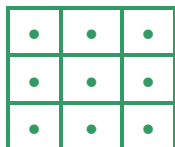
2.



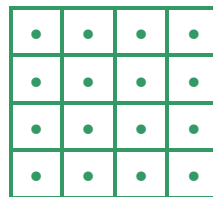
1



4



9



16

### Activity B

	factor	square number	product	to the power
1.	1	1	$1 \times 1 = 1$	$1^2$
2.	7	49	$7 \times 7 = 49$	$7^2$
3.	3	9	$3 \times 3 = 9$	$3^2$
4.	2	4	$2 \times 2 = 4$	$2^2$
5.	10	100	$10 \times 10 = 100$	$10^2$
6.	5	25	$5 \times 5 = 25$	$5^2$
7.	6	36	$6 \times 6 = 36$	$6^2$

**T<sub>4b</sub>**

**Materials**  
geo-boards,  
dotted paper

Draw a 10 x 10 grid on the board. Use it to show the following square numbers.

4 circles in each row and column.

8 circles in each row and column.

6 circles in each row and column.

10 circles in each row and column.

Ask different pupils to name the square numbers.

Explain that, we get a square number by multiplying the number by itself. For example:

$$4 \times 4 = 16$$

$$8 \times 8 = 64$$

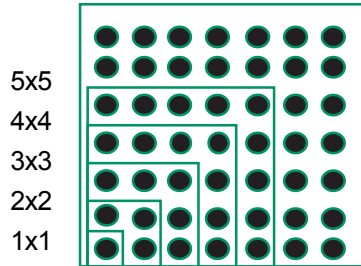
$$6 \times 6 = 36$$

$$10 \times 10 = 100$$

Ask: What is the square number for 9 units in each row and column? **(81)**

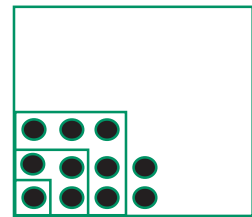
Draw a picture of a geoboard to show how square numbers grow as shown below.

## Topic 2: Number Sequences



A number like 11 is not a square number because the rows and columns are not the same.

11 circles cannot be arranged so that there are the same number circles in each row and in each column.

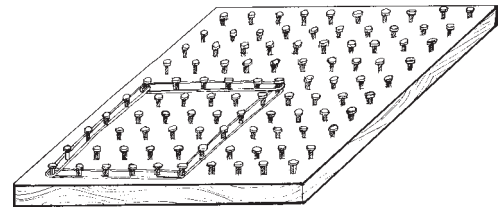


**C<sub>4b</sub>**

Show the pupils a geoboard. Explain how to make one and how to use one.

Get the pupils to explore which of the following are square numbers using geoboards. Tell the pupils to explore each number on the geoboards.

1. 14      2. 18      3. 25      4. 40
5. 49      6. 81      7. 64      8. 121



Ask the pupils to draw what they make on the geo-board using dotted paper. They can mark out a piece of paper with dots. They can use the examples you have drawn on the board as a guide.



Can all the pupils recognise and identify square numbers?

# Unit 1: Number

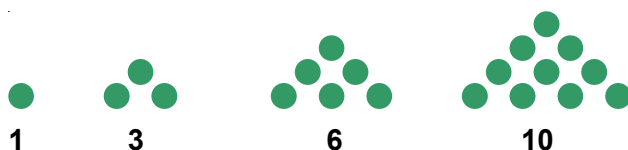
## Extension Activities

For pupils who understand the concepts taught in this unit well and need to extend their skills you should provide extension activities which encourage them to work independently and think for themselves. Leave them to work on their own once you have explained the activities. You could also use these activities for homework.

The following are examples of activities you might give to more able pupils to extend their understanding of the topics in this unit.

### Triangular Numbers

Just as square numbers can be shown as a series of dots that make up a square – a triangular number is one that is made up of a series of dots forming a triangle. For example:



Challenge pupils to find all the triangular numbers up to 100. Ask them to look for any patterns that they can see in the numbers they identify.

### Number Sequences and Patterns

Ask pupils to copy and continue a number pattern and see what they find out. They should discuss their work with a partner. For example

1.  $1 + 2 + 1 = 4$   $4 = 2 \times 2$
2.  $1 + 2 + 3 + 2 + 1 = 9$   $9 = 3 \times 3$
3.  $1 + 2 + 3 + 4 + 3 + 2 + 1 = 16$   $16 = 4 \times 4$

Ask pupils to work out the rules for the following sequences:

1. 4   12   8   24   20   60   54
2. 5   25   27   135   137   685   687
3. 3   10   31   94   283   850   2,551

Write down the next 5 terms in the following sequence:

4. 1   1   2   3   5   8   13   21   34

Ask them to work with a partner to devise their own sequences and try to work them out.

### Problem Solving with Larger Numbers

Try some of these and make up some more of your own for pupils to try.

1. There were 6,220,531 people living in London in 2000. In the following year the population increased by 259,601 and in 2002 it increased again by 205,439.  
How many people were living in London in 2002?
2. The population of Solomon Islands is 485,205. 21,260 are aged 60 and above and 102,318 are below 18 years of age. What is the total population aged between 18 and 59?
3. If one gallon of petrol costs \$34 dollars it takes 8 gallons to go to Gizo and back. How many gallons will be needed to travel to Gizo once a week for a year. How much will this cost?



## Support Activities

For pupils who need more practice with the concepts they have learned in this unit, you should provide extra activities that give them plenty of practice working with numbers.

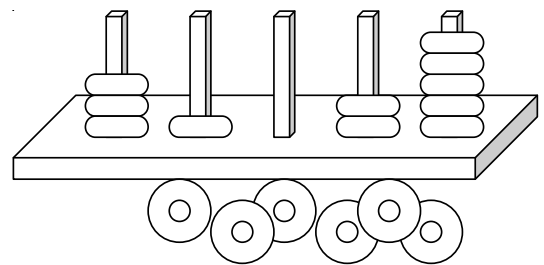
The concept of place value is a critical foundation for all number work so work closely with the pupils still having difficulty with this. You might try some of the following activities:

### Place Value Game

Pupils will be familiar with this game from Standard 3 and Standard 4. Use a set of number cards 0 – 9 for each player. Each child also needs a grid on which to place their numbers, with 4 spaces for a 4 -digit number, 5 spaces for a 5-digit number and so on. Place the cards face down on the table. Have pupils take turns to pick a number and place it on their grid. The aim is to make the highest possible number with the cards picked.

### Counting Frame Games

A counting frame has one stick to represent each place value as shown. You could make these out of scrap timber. Use beads, shells or seeds to show different numbers on the counting frame.



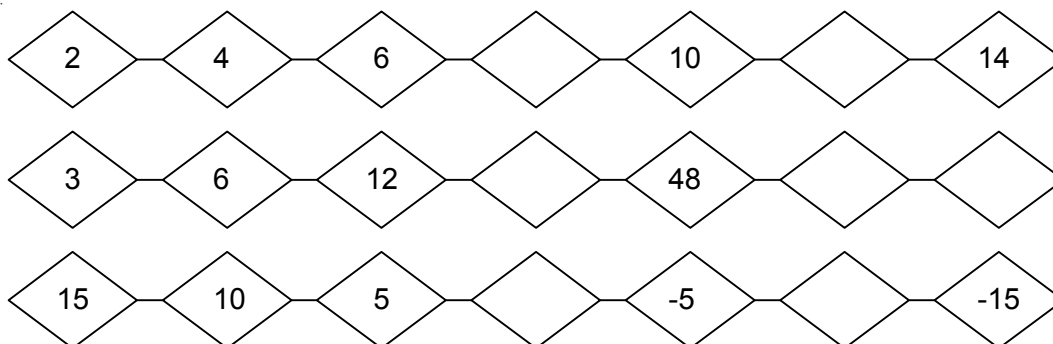
Start by asking pupils simply to show given numbers on the frame, 304, 1,236, 25,002 and so on.

Encourage them to talk about the numbers as they work.

Next try having them read and write down a number from the frame (31,025 as shown, for example) Make sure that they recognise the place value of each set of beads.

### Missing Numbers

Help pupils to understand simple number sequences by filling in the missing numbers. You can start with familiar sequences and move on to more difficult ones. For example:



You could prepare sequences like these on strips of card.

# Unit 1: Number

## Check Up Page: Answers

1. 37,648
2. 70,011
3. Sixty-nine thousand, three hundred and fifty-four
4. Twenty thousand and eighteen
5. a) seven thousands    b) nine ten thousands    c) 9,704    d) 970
6. a) 852    b) 8    c) 8,520    d) 85
7. Smallest, 100,389. Largest, 983,100
8. a) 1,530            1,500            2,000  
b) 176,560           176,600           177,000  
c) 88,970            89,000            89,000  
d) 673,540           673,500           674,000  
e) 934,220           934,200           934,000
9. a) false            b) true            c) true            d) false
10. a) -4            -2    0    2    4    6  
b) -5            -2    1    4    7    10  
c) 3            6    12    24    48  
d) 3            7    11    15    18    23  
e) 1            4    6    9    11    14    16  
f) -2            2    -1    3    0    4    1    5
11. a) 5            7    9    11    13    15  
b) 2            6    4    8    6    10  
c) -3            2    0    5    3    8  
d) 100            95    90    85    80    75  
e) 6            12    7    14    9    18
12. a) 6            13    20    27    34    41    48  
b) 36            31    26    21    16    11    6  
c) 121            131    141    151    161    171    181  
d) 346            342    338    334    330    326    322

13.            16                            25                            36                            49  
              4 x 4                            5 x 5                            6 x 6                            7 x 7

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### Aim:

To develop pupils' understanding of the properties of circles and improve their skills in drawing and measuring circles and circle patterns.

To recognise and investigate the properties of irregular shapes, including a revision of line symmetry. To introduce reflective symmetry by drawing reflections of irregular shapes.

### Topic 10, Sequence of objectives: To

1. draw circles and circle patterns. e.g. by using tins and coins.
2. identify the properties of circles including radius, diameter and circumference.
3. measure the radius and diameter of a circle.
4. estimate and measure the circumference of a circle.

### Topic 11, Sequence of objectives: To

1. investigate irregular shapes.
2. identify the properties of irregular shapes including number of sides, angles and symmetry.
3. draw reflections of irregular shapes using square grids.

### Rationale:

In this unit the pupils learn about circles and irregular shapes through investigative and practical approaches. Through these approaches pupils will gain understanding of the properties of shapes and develop skills in drawing shapes. They will also appreciate circle patterns and reflections of irregular shapes.

### T1a

#### Materials

board compass,  
clindrical items,  
pencils, rulers, strips  
of card, compasses  
chart paper



Bring a collection of circular items such as tins, coins, round lids, etc. into the classroom.

Show a cylindrical item (eg. a tin can) to the class and ask what shape the two ends are.

Repeat with as many cylindrical items as possible and ask the same question.

Draw a circle on the blackboard using one of the cylindrical items. Ask the pupils to watch carefully.

Let two or three pupils come to the board and draw a small circle, a big circle and a very big circle each using the cylindrical objects.

Demonstrate how to draw circles, using a board compass, a strip of card or a piece of string.

Demonstrate the use of each item to draw circles on the board. Let the pupils practise drawing a small circle, a big circle and the biggest circle they can using their instruments.



## Unit 2: Shape

### C1a

Provide the pupils with chart paper, pencils, strips of card and compasses.

In pairs, ask the pupils to draw some circles using the different methods they have learned using strips of card, objects and a compass.

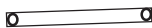
Drawing circles using a card strip or compass will be quite difficult for pupils who are using them for the first time. Help them with these skills and allow plenty of time for practise.

#### Using a strip of card and a pencil to draw a circle.

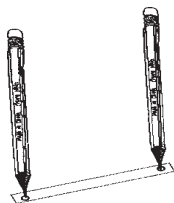
Take a strip of paper.  
Choose a length of about 7 cm.



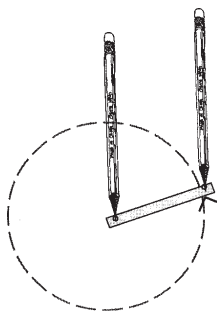
Put a hole in each end of the strip.



Place one sharp object such as a pencil firmly at one end and a pencil in the hole at the other end.



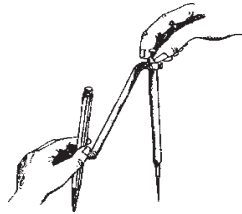
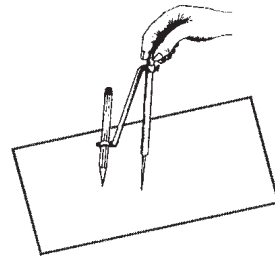
Slowly move one end of the card strip with the pencil to draw the circle.



Remember to always keep the card strip straight so that the distance between the two ends remains the same.

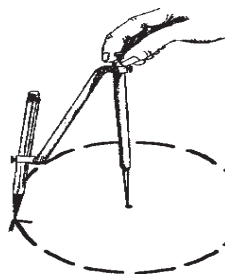
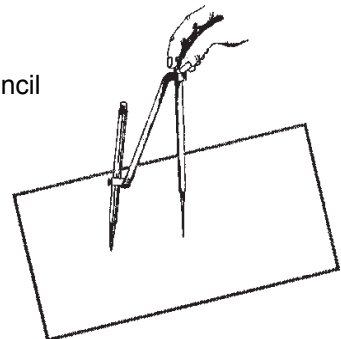
#### Using a compass and pencil to draw a circle.

Place the sharp end of your compass firmly on the paper.



Move the part of the compass with the pencil to determine how big your circle will be.

Place the end with the pencil on the paper.



Slowly twist the top end of your compass to draw the circle.

Once the pupils can handle the compass properly they will be able to draw good circles using card strips.

Display the pupils circles on the classroom wall.



## Topic 10: Circles

### T<sub>1b</sub>

#### Materials

collection of circle designs, compass, designs, pencils, coloured pencils

Bring a collection of items which have circle patterns on them such as, clothes, material and pictures.

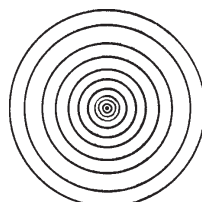
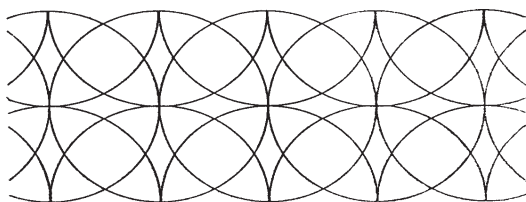
Display the items in front of the class and describe the patterns.

Involve the pupils in your discussion. Talk about the shapes and how the patterns are formed.

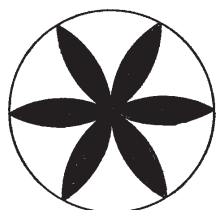
Encourage the pupils to explain what shapes these patterns are made up of.

For example:

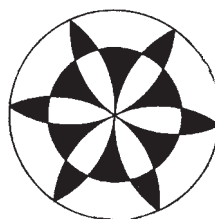
This pattern is made up of whole circles and semi circles.



This pattern is made up of concentric circles. Explain that concentric circles have the same centre.



This pattern is made up of whole circles and arcs.



This pattern is made up of two concentric circles and arcs through the centre of the circles.

Continue this with other patterns. Think of a different pattern. Draw the circles on the blackboard. Make different designs and patterns on them. Allow the pupils to identify the shapes that form the pattern. Is it made up of concentric circles, whole circles or arcs?

### C<sub>1b</sub>

Put the pupils in working groups of three and four. Give out sheets of blank paper, compasses or strips of paper and pencils to each group.

Tell the pupils to make at least four designs or patterns with a combination of circles and circle parts.

Let the pupils colour their designs and patterns.

Go around the groups. Assist pupils who are finding it difficult to draw circles using compasses or paper strips. Display the pupils' work in the classroom.

Ask the pupils to open their Pupil's Resource Book on page 16 and complete the activities about circles. These give them more practice drawing circles.



Can all the pupils draw circles and circle patterns using objects and compasses?

## Unit 2: Shape

T<sub>2a</sub>

**Materials**  
compass, string

Draw a big circle on the board using a board compass or a string attached to a piece of chalk.

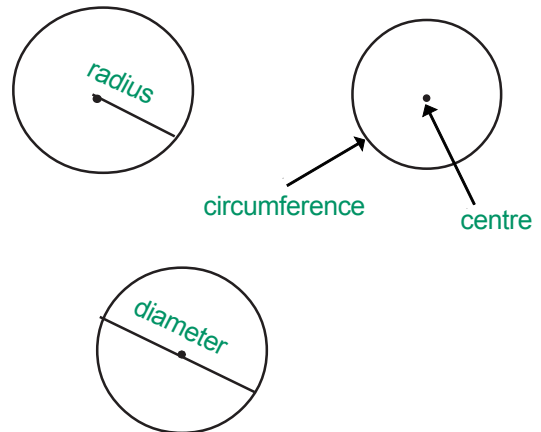
Mark its centre clearly and show this to the pupils. Explain that the point is the **centre** of the circle.

Show pupils the line outside of the circle and explain that it is called the **circumference**.

Label these parts so that the pupils can see.

Draw a straight line from the centre to the circumference. Explain that this is called the **radius**.

Draw a straight line from one side of the circle to the other side. Make sure that the line passes through the centre. Explain that this line is called the **diameter**. A diameter is two times the length of the radius.



Emphasise the following as you draw the diagram:

a **radius** is a line from the centre of the circle to the **circumference**;

the plural of radius is **radii**;

all radii of a circle have the same length;

when two radii join together to make a straight line, this forms a **diameter**.

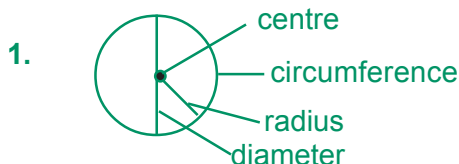
Ask the pupils to draw some circles using compasses or card strips and label the different parts.

C<sub>2a</sub>

Ask the pupils to open their Pupil's Resource Books on page 17 and complete activity A.

Activity B on page 17, 18 and 19, suggests some art and craft activities which can be done using circles. You will need paper, scissors and glue to complete these activities. Allow plenty of time for pupils to work on them and make a display of their finished work in the classroom.

### Answers



- 2.
- a. circumference
  - b. side
  - c. radius
  - d. radii
  - e. diameter
  - f. diameter

## Topic 10: Circles

T<sub>2b</sub>

Teach the pupils more about parts of a circle.

Display the **Circle Parts Poster** in front of the class.

Before introducing other circle parts, you may want to revise the circle parts pupils learned in the last lesson.

Remind the pupils of these parts. Ask if anyone in the class can recognise any of the circle parts on the poster.

Ask them to come to the front and point to the parts they know.

Encourage the pupils to name the parts if they can.

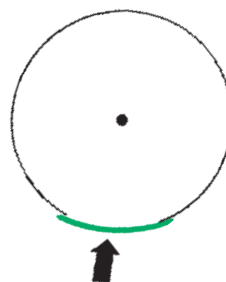
Introduce the new parts. Go through the different circles, one by one. Point to each part and ask the pupils if they can read the names.

Read the explanation after each word together. Let the pupils define each term in their own words.

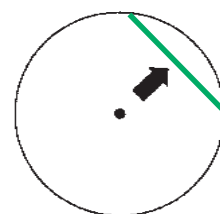
Repeat this with other circle parts. Display the poster in the classroom and encourage the pupils to read the poster in their own time.

### Materials

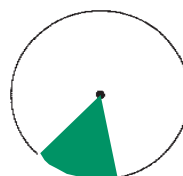
Circle Parts Poster, chalk, coloured pencils, crayons



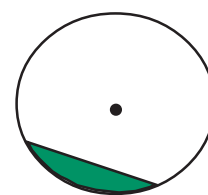
**Arc:**  
Part of the **circumference** of a circle.



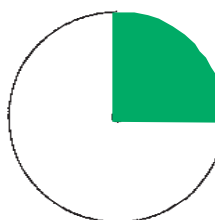
**Chord:**  
A straight line joining the end points of an **arc**.



**Sector:**  
The area enclosed by two **radii** and an **arc**.



**Segment:**  
The area enclosed by an **arc** and a **chord**.



**Quadrant:**  
A quarter of a circle enclosed by two **radii** and an **arc** and containing a right angle.

C<sub>2b</sub>

Ask the pupils to complete the activities about circle parts in the Pupil's Resource Book pages 19, 20 and 21.

Go around the class and assist the pupils who have difficulty reading the instructions.

Display the pupils' work.

### Answers

Check each pupils work individually.



Can all the pupils identify the following parts of a circle: radius, diameter and circumference?



## Unit 2: Shape

T<sub>3a</sub>

### Materials

board compass,  
board ruler  
collection of circular  
objects

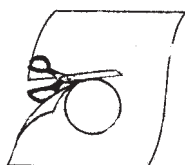
Bring a collection of circular objects such as milk tins, 20 cent coins and pots to the lesson.

Teach the pupils how to find the centre of a circle and how to calculate its diameter.

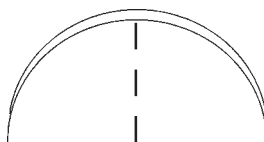
Show the pupils how to do this using these instructions.



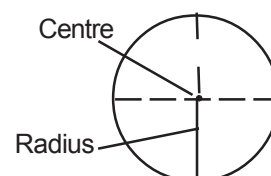
Draw around the rim or base of the cup



Cut out the circle.



Fold the circle in half and then in half again. Unfold it. The part where the creases meet is the centre.



Mark the centre and the radius of the circle.

Work with the class to measure the radius of a circle, for example, 6 cm. Record this on the board.

Repeat this with the diameter. This will be 12 cm.

Talk about the measurement with the pupils.

Encourage the pupils to identify the relationship between the radius and the diameter. Work with the pupils to come up with a general rule. For example:

The diameter of the cup is 2 times the radius.

or The radius of the cup is  $\frac{1}{2}$  the diameter.

Explain to the pupils that the diameter is 2 times the length of the radius.

Write this simple rule on the blackboard.

**$d = r \times 2$**  where d = diameter, r = radius.

Therefore,  $d = 6 \text{ cm} \times 2 = 12 \text{ cm}$ .

Continue this with one or two more objects. Draw around their circumferences. Fold to identify their centre and radius. Measure the radius and calculate to find the diameter.

Circle	Radius	Diameter
Rim of cup	6 cm	12 cm

Diameter = Radius  $\times$  2 ( $D = R \times 2$ )

C<sub>3a</sub>

Have pupils work in pairs.

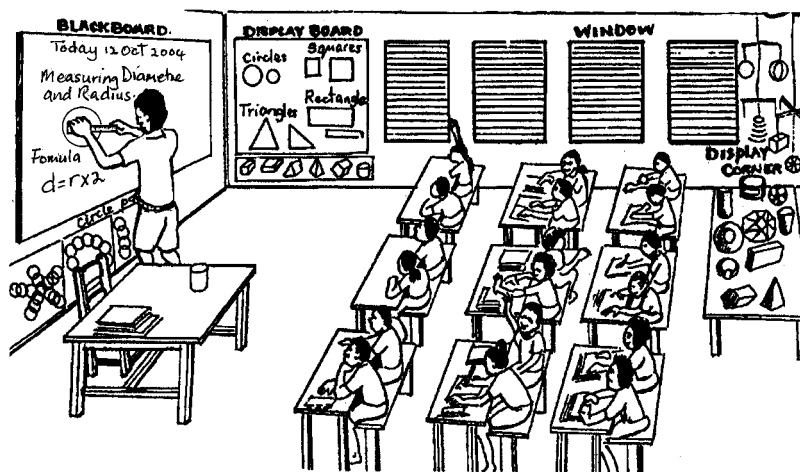
Ask them to calculate the length of the radius of each object by using the rule they have just discovered. To do this they must first measure the diameter and then calculate the radius by dividing by 2.

Draw the following table on the board and ask them to copy it into their exercise books. Then let them work with their partner to measure objects and complete the table.

## Topic 10: Circles

Item	Diameter in cm	Radius
Coin		
Rim of tin		
Rim of plate		
Rim of cup	6 cm	12 cm
Rim of bottle cap		
Rim of milk tin		

Work with any pairs having difficulty. As you move around the class encourage pupils to revise and use the vocabulary they have learned.



Ask the pupils to open their Pupil's Resource Books on page 22 and complete the activities.

### Answers

#### Activity A

	Item	Radius	Diameter
1.	milo tin	4 cm	8 cm
2.	bucket	12 cm	24 cm
3.	pot	11 cm	22 cm
4.	plate	8 cm	16 cm
5.	thermos	6 cm	12 cm
6.	cup	4 cm	8 cm
7.	teapot	7 cm	14 cm
8.	bottle	3 cm	6 cm

#### Activity B

1. Radius 1 cm Diameter 2 cm
2. Radius 3 cm Diameter 6 cm
3. Radius 2 cm Diameter 4 cm
4. Radius 2.5 cm Diameter 5 cm
5. Radius 3.5 cm Diameter 7 cm
6. Radius 1.5 cm Diameter 3 cm

## Unit 2: Shape

**T<sub>4a</sub>**

### Materials

tins - assorted sizes,  
string, tape measure,  
rulers, circular items  
such as tins, pots,  
buckets

Bring a collection of round items such as tins, plastic containers and bottles to the lesson.

Show the pupils how they can measure the **circumference** of a tin.

Explain that the rim forms a circle. The circumference is the perimeter or the measurement all around the edge of the circle.

Ask the pupils to estimate the circumference of different objects.

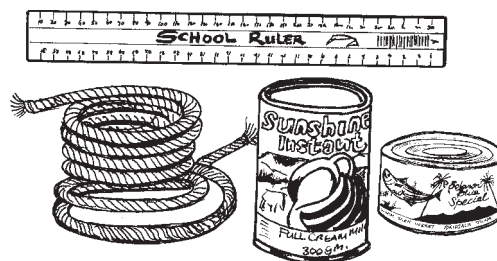
Write each pupil's estimate on the board.

Show the pupils how to measure the rim using a tape or a piece of string.

Record the actual measurement and let them compare this with their estimates.

Find out the differences between the pupils' estimates and the actual measurement of the circumference. For example:

estimate	<b>8 cm</b>	8 cm
actual measurement	<b>7 m</b>	- <u>7 cm</u>
difference		1 cm



Repeat this with other items. Emphasise the skills necessary for precise measurement.

Encourage the pupils to participate in measuring the circumferences of a variety of objects.

**C<sub>4a</sub>**

Let the pupils work in pairs or in small groups of not more than four. They will need string or strips of paper and rulers to measure.

Pupils measure the circumference of each item collected and record their measurements in their exercise book. Encourage them to estimate first before measuring the circumference.

Ask them to prepare a table like the one below to record their results.

Object	Estimate	Actual Measurement
bucket		
777 tin		
Milo tin		
cup		
plate		

Ask the pupils to compare their estimates and measurements.

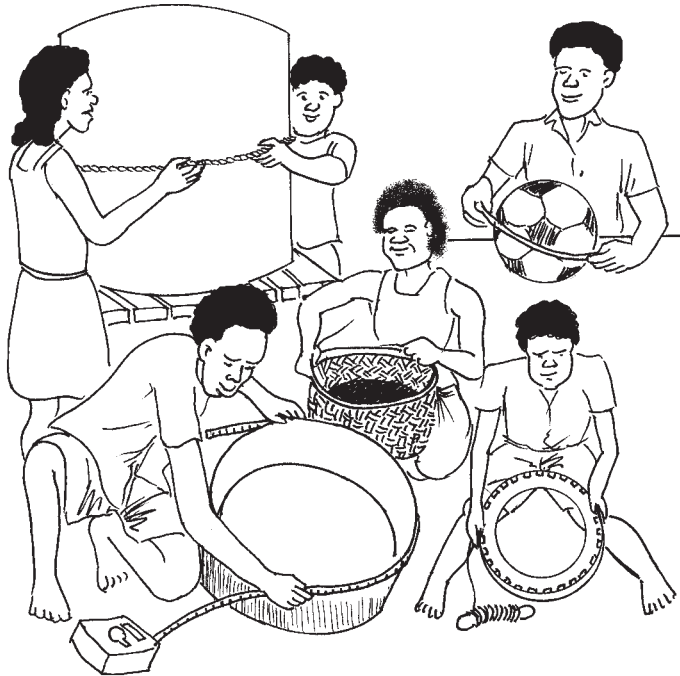
Let them talk about the differences and find out who made the closest estimates.

## Topic 10: Circles

T<sub>4b</sub>

### Materials

various cylindrical containers, string, glasses, tape measure.



Discuss the estimating skills the pupils used in the previous activity.

Emphasise that estimating is not blind guessing but calculated guessing.

It gives an informed answer. This means that it can be used to check that their actual answer is a sensible one.

Ask the pupils to estimate the measurement of two rims of different objects.

Then measure them. Calculate the difference.

Ask the pupils to explain what a good estimate means, in their own words.

C<sub>4b</sub>

In pairs or small groups have the pupils estimate, measure and calculate the difference between the estimated length and the actual length of the circumference of various objects.

The pupils can use a table like the one below to record their work.

Item	Estimated measurement	Actual measurement	Difference	Degree of accuracy
Milk tin (900 g)	45 cm	42 cm	3 cm	good

Explain what degree of accuracy means.

If the measurements are nearly the same then the degree of accuracy is good. If they are close you could say the degree of accuracy was fair. If they were very different you could say the degree of accuracy was poor. If it was poor have the pupils check their actual reading again. Is it correct? If it is correct then their estimate must have not been very accurate.



Can all the pupils estimate and measure the circumference of a circular object?

## Unit 2: Shape

### T<sub>1a</sub>

Revise what we mean by **regular shapes** using the poster given.

Remind pupils that a regular shape is one in which all the sides are the same length and all the internal angles are the same size. Revise the names of the regular shapes used at Standard 4.

Next show the pupils the **Irregular Shapes Chart**.

Explain that these shapes have sides of different lengths and that the angles are different.

Ask pupils to choose a shape from the chart and describe it to the class. The class must guess which one they are describing.

Their description might include the following:

How many sides the shape has.

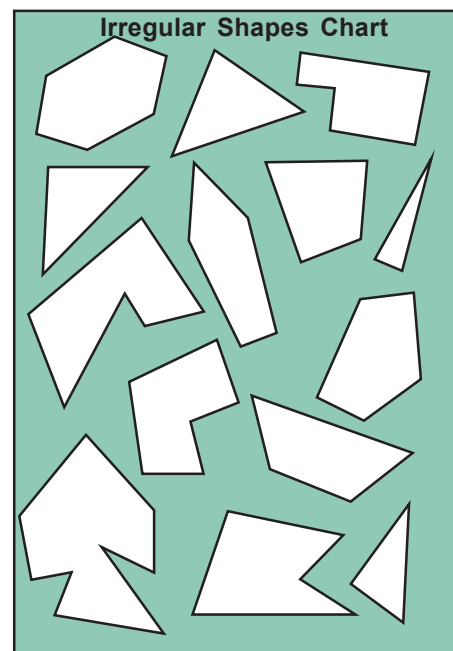
How many corners or angles.

Whether the angles are jutting out or sticking into the shape.

Whether the shape looks like anything (e.g. a canoe, an arrow).

#### Materials

Regular Shapes Chart,  
Irregular Shapes Chart,  
regular and irregular  
shapes cut from card,  
12 x 12 geo-boards,  
elastic bands



Continue talking about the shapes until you are sure that the pupils know the difference between **regular** and **irregular** shapes.

### C<sub>1a</sub>

Show the pupils the shapes you have cut out from cardboard. Ask them to select first a regular shape, then an irregular shape from the pile.

If pupils need more practice, have them work in groups to sort out the regular shapes and the irregular shapes into two piles. Check that they are correct and encourage them to talk about the sides and angles of the shapes as they work.

When pupils have understood the difference between regular and irregular shapes divide them into groups of four and give each group a geo-board. Show them how to use the geo-boards and elastic bands to make irregular shapes.

Write the following instructions on the board and have the pupils work in their groups to complete the activity.

1. Make four different regular shapes and four different irregular shapes on your geo-board.
2. Copy each shape into your exercise book and write a sentence to describe the shape you have drawn.

Now ask the pupils to complete the exercises in the Pupil's Resource Book on pages 23 and 24.

These exercises make sure that they have understood the difference between regular and irregular shapes and help them to use appropriate language to describe two-dimensional shapes.

# Topic 11: Two Dimensional Shapes

## Answers

### Activity A

1. Regular
2. Irregular
3. Regular
4. Regular
5. Regular
6. Irregular
7. Irregular
8. Regular
9. Irregular
10. Irregular

### Activity B

1. Irregular hexagon
2. Regular triangle
3. Regular octagon
4. Irregular heptagon
5. Regular pentagon
6. Irregular hexagon
7. Regular quadrilateral
8. Regular hexagon
9. Irregular triangle
10. Irregular quadrilateral
11. Irregular pentagon
12. Irregular quadrilateral

### Activity C

1 - 4 Check each pupils work individually.

5. a. An irregular pentagon
- b. A regular octagon
- c. An irregular octagon
- d. An irregular hexagon
- f. A regular pentagon
- e. An irregular hexagon



Can all the pupils identify and explore the properties of irregular shapes?

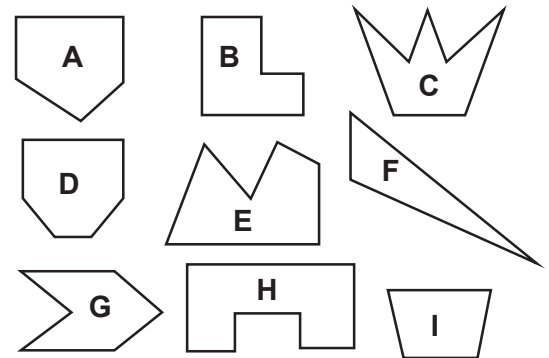
T<sub>2a</sub>

Draw the following irregular shapes on the board.

Ask the pupils to tell you what sort of shapes they are. **Irregular shapes.**

Ask the pupils to describe and name each shape using some of the following terms: **irregular hexagon, quadrilateral, triangle, irregular pentagon, irregular heptagon** etc.

Talk about the different properties of the shapes to revise the vocabulary pupils will have learned at Standard 4, as follows:



Properties	Vocabulary
1. the number of sides	triangle, quadrilateral, pentagon, hexagon, heptagon, octagon, nonagon, decagon
2. the number of angles	
3. the size of the angles	acute angles, right angles, obtuse angles
4. the length of the sides	long, longer, longest, short, shorter, shortest, equal
5. whether the shape has any parallel sides	parallel
6. whether the shape has line symmetry	symmetrical, asymmetrical, the same, different

## Unit 2: Shape

C<sub>2a</sub>

Draw a table on the blackboard like the one shown below and complete for each of the shapes A - I, on the previous page. Discuss the first examples with the class then ask the pupils to complete the table in their exercise books.

Shape	Number of sides	Number of angles	Parallel sides	Symmetry lines	Name of shape
A	5	5	yes 2	none	irregular pentagon
B	6	6	yes 4	none	irregular hexagon
C					
D					







Now ask the pupils to complete the activities in the Pupil's Resource Book on pages 24 and 25. These activities help them to use appropriate language to describe two-dimensional shapes.

### Answers

#### Activity A

	Number of sides	Number of angles or corners	Symmetrical or asymmetrical?	Name of the shape
1.	6	6	symmetrical	irregular hexagon
2.	3	3	asymmetrical	irregular triangle
3.	5	5	asymmetrical	irregular pentagon
4.	8	8	symmetrical	irregular octagon
5.	10	10	symmetrical	irregular decagon

#### Activity B

1. D  An irregular quadrilateral with two parallel sides.
2. E  An irregular hexagon containing two right angles.
3. B  An irregular octagon with one line of symmetry.
4. F  A regular pentagon in which all the internal angles are the same.
5. A  An irregular triangle with one obtuse angle.
6. C  An irregular triangle with one right angle.

## Topic 11: Two Dimensional Shapes

### Activity C (Suggested Answers)



7. a. 5. Irregular pentagon containing one right angle.  
b. 3. Irregular octagon in which all the angles are right angles.  
c. 6. Irregular pentagon with two parallel sides.  
d. 1. Irregular quadrilateral with two parallel sides.  
e. 2. Irregular hexagon containing two right angles.  
f. 4. Irregular triangle in which one angle is larger than a right angle.



Can all the pupils explore, investigate and describe irregular shapes?

T<sub>2b</sub>

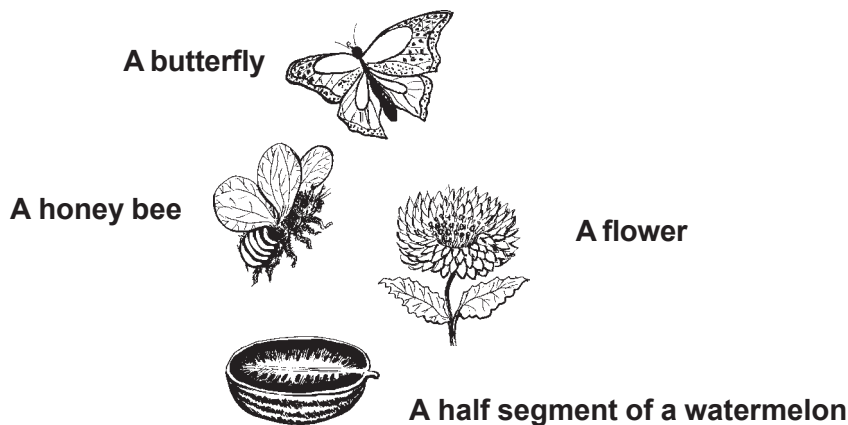
**Materials**  
symmetrical objects

In this activity pupils look for symmetrical patterns in their environment to improve their ability to recognise and explain symmetry.

Revise the meaning of the word **symmetry**. Ask the pupils to explain it to you to make sure that they have understood it properly.

Ask the pupils to think about symmetrical patterns that they might see around them.

Start them off with the following examples:



You could bring the objects into the classroom or draw them on the blackboard.

Ask the pupils to go for a walk around the school compound to find objects which are symmetrical. These may be either made or natural objects.

C<sub>2b</sub>

Have the pupils sketch the objects they saw on their walk and draw in the lines of symmetry.

They could either do this individually in their exercise books or, if you have chart paper, they could work in groups to make a display poster for the classroom.



## Unit 2: Shape

T<sub>2c</sub>

Revise **Line Symmetry** with the class. They covered this topic in Unit 3 Standard 4 (see pages 71 – 72 of the Standard 4 Teacher's Guide).

Draw a face like the one shown, on the board, while the pupils watch.

As you draw explain that the face is **symmetrical**, or has **line symmetry**. Explain that this means that each half is the same when a line is drawn down the centre of the face.

Now draw half a face on the board as shown. Draw in a central line of symmetry. Ask one of the pupils to come up and complete the face to make a **symmetrical** face.

Draw some more half faces on the board and ask other pupils to complete them. Then ask them to work in pairs. Each one should draw half a face in their exercise book then swap books and allow their partner to complete the face.

Next introduce the term **asymmetrical**. Explain that this is the opposite of symmetrical. A shape which is asymmetrical has no lines of symmetry. When divided in half the two sides are different.

Illustrate this by changing one of the faces on the board to make it asymmetrical. Ask the pupils to do the same with the other faces and then ask them to draw asymmetrical faces in their exercise books.

**Materials**  
symmetry pairs  
game cards



C<sub>2c</sub>

Play the **Symmetry Pairs** game in groups of about 6.

Place all the cards face down on the table.

Each pupil takes it in turn to select two cards.

If they make a symmetrical face, they can keep the pair and have another turn. If the face is not symmetrical they should turn them over again. The next player then picks two cards. The winner is the player with the most pairs when all the cards have been used up.

Move around the groups as they play and check that they have understood the game. Encourage them to use the appropriate language as they play including words like **symmetry**, **symmetrical**, **asymmetrical** and **line of symmetry**. Also encourage them to use comparing words such as **the same** and **different**.

Now complete the activities in the Pupil's Resource Book on page 26 and 27.

These activities help the pupils to use the skills they have learned about symmetry.

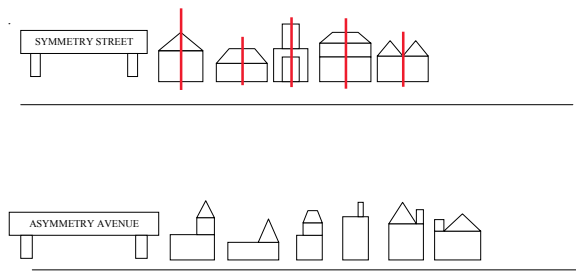
### Answers

#### Activity A

Check each pupil's work individually.

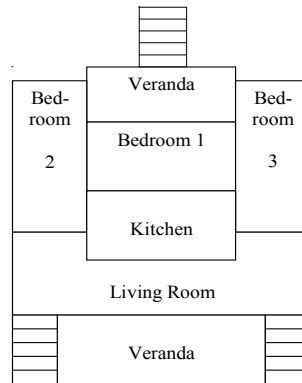
# Topic 11: Two Dimensional Shapes

## Activity B



Asymmetry Avenue has the most buildings.

## Activity C



House A is symmetrical. Suggested plan for own symmetrical design.

Mark each pupil's work individually.



Can all the pupils identify lines of symmetry in irregular shapes?

### T<sub>3a</sub>

In this activity you will introduce the pupils to the idea of reflective symmetry.

**Reflective symmetry** is the mirror image or reflection of a shape or form. Start by discussing reflections with the pupils.

Draw a picture on the board like the one on the right, showing reflections in a lake or lagoon.

Notice how the reflected image is the same as the real image but is seen in reverse, or back to front.

Help pupils to experience this by having them draw a similar picture in their exercise book and then turn it upside down to see that objects on the left in the picture appear on the right in the reflection when you turn it upside down.

Demonstrate this further using a mirror.

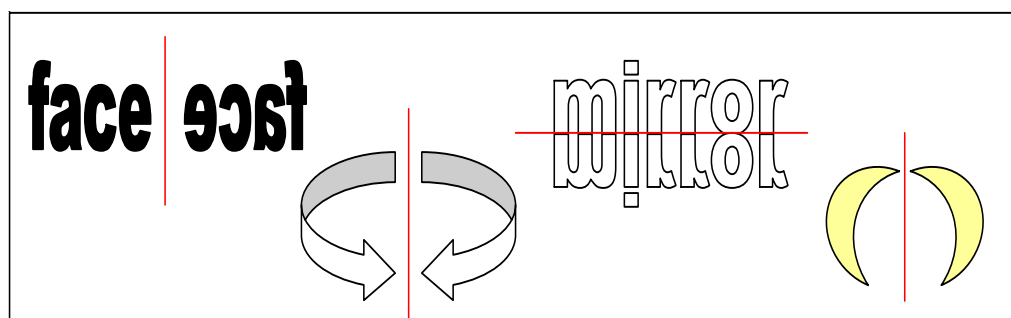
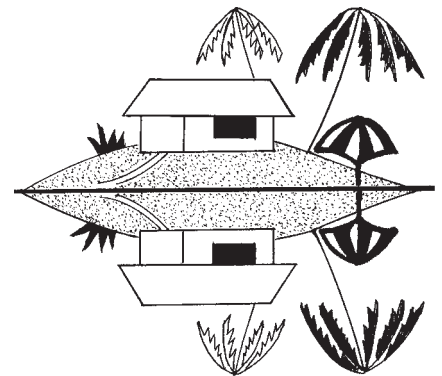
Draw some shapes and write some words on the blackboard as in the examples below.

Hold a mirror up to each image and help pupils to see how the images are reversed.

The red line shows the **mirror line**.

### Materials

Mirror, reflective objects eg. tins, spoons, glass



Discuss reflections with the class. Ask them where they have seen reflections such as in glass windows, in lagoons or lakes, in metal bowls or spoons. You could bring some of these objects into the class to look at reflections.

## Unit 2: Shape

C<sub>3a</sub>

Now ask the pupils to work individually to write their name in their exercise book and then write the mirror image of it either underneath, as in example A, or to the side, as in example B.

Example A

Joseph  
—————  
J026bN

Example B

Maria | 6ir6M

Check their work and ask the pupils to show you where the mirror line is in their drawing to make sure that they have understood.

T<sub>3b</sub>

In this activity you will demonstrate how to draw the mirror image of an irregular shape as follows:

### Materials

mirrors,  
squared paper, sharp  
objects, eg. pins or  
compasses.

- Using a mirror and squared paper to visualise the mirror image.
- Using folded paper with a pin to mark the vertices.



Demonstrate each of these as follows:

Draw an irregular shape, such as a triangle, on one side of a large piece of squared paper and label the vertices as shown on the left: A, B C.

Put the paper flat on the table so that pupils can see it and place a mirror along the mirror line.

Allow pupils to look at the mirror image and talk about it.

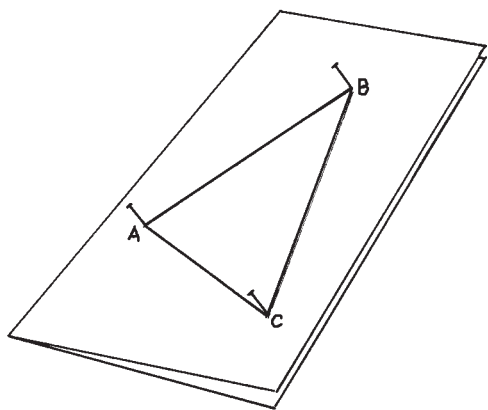
Help them to see and explain the fact that **the image is back to front in the mirror**, the labelled vertices will help them with this.

Now draw the reflected image as seen behind the mirror. Draw each vertex and then join them to make the shape. Use the squared paper to help you.

Take the mirror away and draw in the **mirror line**. The pupils should now be able to tell you that the second shape is the **reflected image** of the first shape.

Repeat with different shapes.

## Topic 11: Two Dimensional Shapes



Now demonstrate how to draw a mirror image using the **folded paper method**.

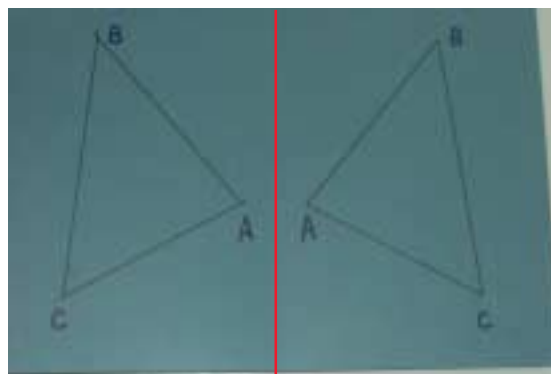
Draw another irregular shape on one side of a piece of squared paper and label the vertices as shown.

Fold the paper in half and make a crease. The crease is the mirror line.

Use a pin or sharp object such as a compass point to mark each of the vertices of the shape through the paper.

Open out the paper and join the pinpoints with lines to make the mirror image of the shape. The crease becomes the mirror line.

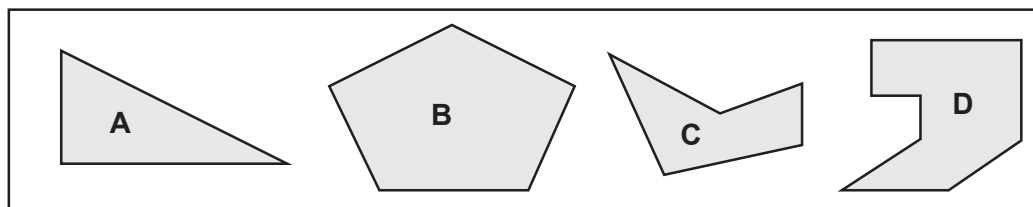
Repeat this with some more shapes until you are sure that the pupils understand and can use the method.



C3b

Have the children work in pairs to make their own mirror images of shapes using the folded paper method.

You could give them different shapes to copy from the board. Ask the pupils who are confident with the method to copy more complicated shapes such as example D below and those who are not so sure to copy simple shapes such as example A.



Walk around the pairs as they are working. Encourage them to talk to each other about what they are doing and ask them to explain the method. Encourage them to use the vocabulary you have taught them using words such as **mirror line**, **reflection**, **reverse**, **back to front** and **mirror image**.

Ask early finishers to use the same method to plot the mirror image of their name.

Now ask the pupils to complete the activities in the Pupil's Resource Book on pages 27 and 28.

These activities give them more practice using the idea of reflective symmetry.

## Unit 2: Shape

### Answers

#### Activity A

Check each pupil's work individually.

#### Activity B

- |            |            |            |            |
|------------|------------|------------|------------|
| 1. j and a | 3. o and q | 5. g and t | 7. k and s |
| 2. b and l | 4. f and n | 6. c and e | 8. d and m |

#### Activity C

- |               |            |           |
|---------------|------------|-----------|
| 1. a. A and G | e. V and K | 2. d. run |
| b. C and E    | f. J and P |           |
| c. B and F    | g. M and S |           |
| d. Q and Y    | h. I and W |           |

### Support Activities

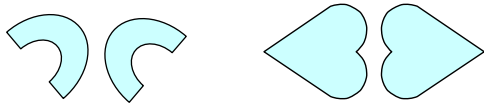
For pupils who need more help understanding the properties of circles and irregular shapes, you should provide practice in handling and using these shapes in a variety of games and activities. Work with them and encourage them to talk about the shapes and use the vocabulary you have taught them.

Some suggested activities:

#### Art and Craft

Use compasses and objects to draw circles of different sizes on coloured paper and cut these out to make designs and patterns.

The same activity could be done for irregular shapes. Encourage pupils to include both line symmetry and reflective symmetry in their patterns by cutting out two similar shapes and reversing one.



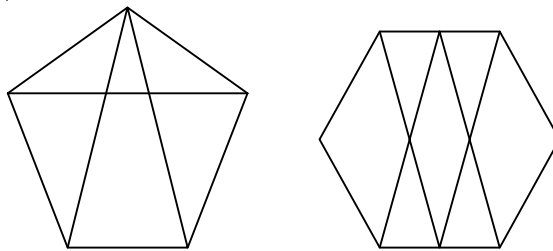
#### Card Games

Make sets of regular and irregular shape cards to use for games such as snap and pairs to give pupils more practice recognising the different shapes.

#### Puzzles

For example, have pupils study shape diagrams like the ones shown and identify and describe as many regular and irregular shapes as they can find.

They could also draw their own diagrams to try on their partners.



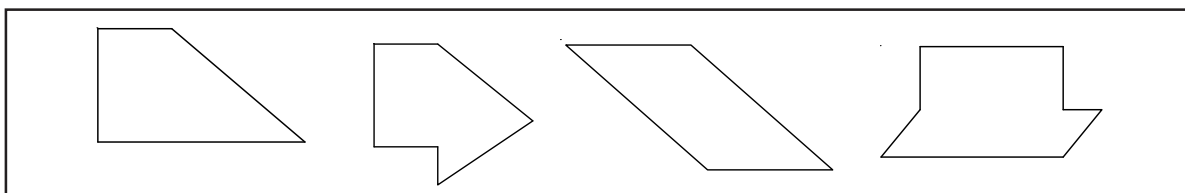
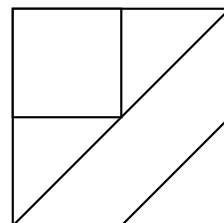
### Extension Activities

For pupils who understand the concepts in this unit well and need to extend their skills you should provide exploratory activities which encourage them to work independently and think for themselves. Leave them to work on their own once you have explained the activities. you could also use these activities for homework.

Some suggested activities are:

#### Tangrams

Pupils can explore irregular shapes further using a tangram. Have them cut out a square tangram in five parts as shown and try to rearrange the shapes to make the shapes shown.



## Unit 2: Shape

### Symmetrical Spelling.

Ask pupils to think up as many words that are spelt symmetrically as they can. Start them off with some examples such as:

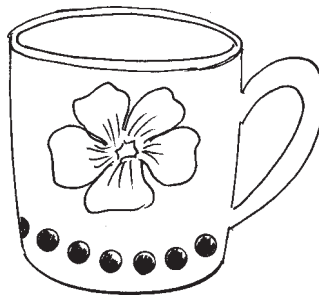
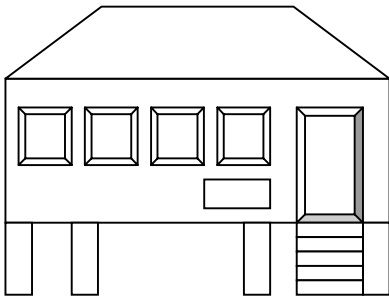
mum omo

Have them write the words they think of in their exercise books.

### Drawing reflection.

Give the pupils a detailed line drawing of a face, an object or a building and ask them to sketch the mirror image of that drawing.

For example:

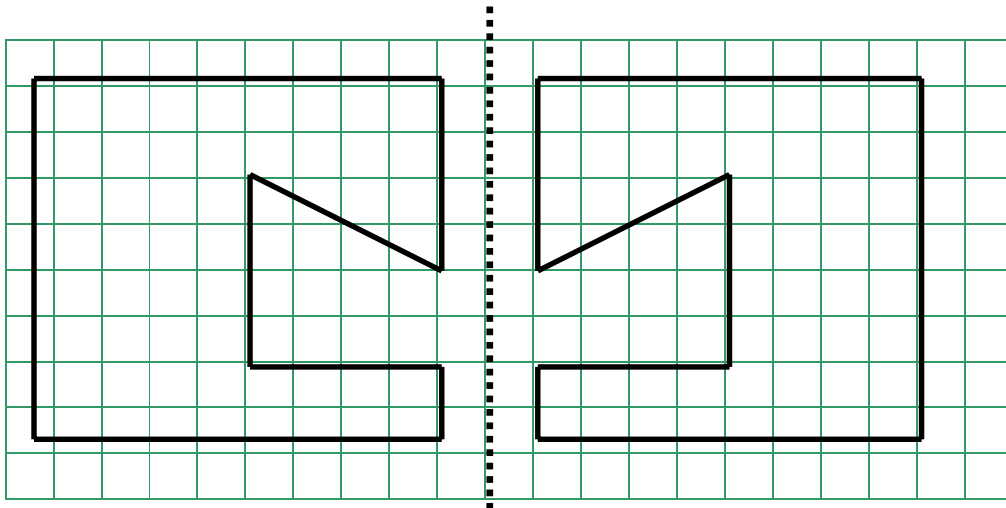


### Check Up Page: Answers

1.
  - a) The diameter of a circle is a straight line that joins both sides of the circle and passes through the centre.
  - b) The circumference of a circle is the distance all the way around the outside.
  - c) The radius of a circle is a straight line that joins the centre with the outside.
2.
  - a) radius
  - b) diameter
  - c) centre
  - d) circumference
  - e) chord
3. 

a) regular octagon	b) irregular octagon	c) irregular quadrilateral
d) irregular triangle	e) regular hexagon	f) irregular octagon
g) regular pentagon	h) irregular quadrilateral	

Check the shading in pupil's books too.
4. Check each pupil's work individually.
5. Suggested answer. The pupil's drawing will depend on where they have placed the mirror line. There are four possible correct answers.



6. pig, run, boy, bog, sit, hat.
7.
  - a) vertices : the points at which two lines meet to form an angle.
  - b) hexagon: a six sided two dimensional shape
  - c) irregular shape: a shape with different length sides and different size angles.
  - d) symmetrical: having a line of symmetry. A shape is symmetrical if it has two halves that are the same when folded along a line.
  - e) reflection: a mirror image
  - f) quadrilateral: a four sided two dimensional shape.
  - g) pentagon: a five sided two dimensional shape



## Number Topic 3: Addition

### Topic 4: Subtraction

**Aim:**

To develop the skills of adding and subtracting mentally as well as by written calculation.

**Topic 3, Sequence of objectives:** To

1. develop and practise strategies for mental addition.
2. add 5 and 6-digit numbers.
3. make estimates in addition.
4. solve addition problems and puzzles.

**Topic 4, Sequence of objectives:** To

1. develop and practise strategies for mental subtraction.
2. subtract 5 and 6-digit numbers.
3. make estimates in subtraction.
4. solve subtraction problems and puzzles.

**Rationale:**

In this topic pupils learn how to add and subtract larger whole numbers while making calculations and solving problems. They also continue to practise skills such as estimating and calculating mentally. These skills will enable pupils to be more confident with numbers, which are the foundation of other mathematical operations.

**T<sub>1a</sub>**

Revise with the pupils different strategies which we use to work out answers to addition sums mentally. Do these examples on the board. Make sure you clearly explain and demonstrate the steps involved.

<b>Strategy 1: Counting in 5's</b> $27 + 5 =$ <b>step 1:</b> $25 + 5 = 30$ <b>step 2:</b> $30 + 2 = 32$	<b>Strategy 2: Counting in 10's</b> $27 + 5 =$ <b>step 1:</b> $30 + 5 = 35$ <b>step 2:</b> $35 - 3 = 32$	<b>Strategy 3: Using doubles</b> $25 + 27 =$ <b>step 1:</b> $25 + 25 = 50$ <b>step 2:</b> $50 + 2 = 52$
--	---	--

Encourage the pupils to practise the strategies you have shown.

Write  $15 + 7 =$  on the board.

Ask, 'Which strategy would be most sensible to use?'

Some pupils will suggest the **counting in 5's** strategy:

$$15 + 5 = 20$$

$$20 + 2 = 22$$

Other pupils may use the **counting in 10's** strategy:

$$15 + 10 = 25$$

$$25 - 3 = 22$$

## Topic 3: Addition

Both are good strategies. Let the pupils decide which one they find easiest to use.

Write some of these sums on the board and ask the pupils to work out the answers mentally. Have them explain to the whole class how they worked out their answers. Let them talk through their strategies and write them up on the board.

1.  $15 + 7 =$

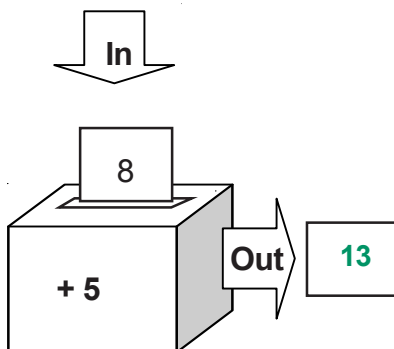
2.  $16 + 20 =$

3.  $20 + 13 =$

4.  $30 + 12 =$

**C<sub>1a</sub>**

Sketch this example on the board and explain that this machine adds 3 to any number that is put into it. Practice working out the answers and complete the table together.



In	15	27	30	21	44	53	76
Out							

Go through the instructions for Activity A in the Pupil's Resource Book on page 31. Do a few examples to demonstrate the activity. Give the pupils time to copy the tables 1 and 2 into their exercise books. When everyone is ready, set a starting time. You have to time how fast the pupils can mentally work out their answers. You can give a time of 5 to 10 minutes, depending on the ability of your class.

Orally mark the answers together and encourage the pupils to talk about the strategies they used.

Have the pupils complete the other activities in the Pupil's Resource Book on page 31.

### Answers

#### Activity A

1. 20, 32, 35, 26, 49, 58,

2. 23, 37, 41, 48, 50, 85,

#### Activity B

1. 17    2. 26    3. 33    4. 52    5. 52

6. 78    7. 42    8. 25    9. 82    10. 83

#### Activity C

1. 66, 40, 77, 112, 18, 78,

2. 18, 13, 24, 47, 40, 47,

3. 34, 36, 30, 36, 4, 83,

## Unit 3: Number

### T<sub>1b</sub>

Extend the strategies used in the previous lesson to 2 and 3-digit addition using the counting in 10's and 100's strategies. Do these examples on the board and clearly demonstrate the steps involved.

#### Strategy 1: Counting in 10's

$$53 + 44 =$$

**step 1:**  $50 + 40 = 90$

**step 2:**  $90 + 7 = 97$

$$64 + 25 =$$

**step 1:**  $60 + 20 = 80$

**step 2:**  $80 + 9 = 89$

#### Strategy 2: Counting in 100's

$$100 + 112 =$$

**step 1:**  $100 + 100 = 200$

**step 2:**  $200 + 12 = 212$

$$203 + 606 =$$

**step 1:**  $200 + 600 = 800$

**step 2:**  $800 + 9 = 809$

Work through each strategy orally with the class. Before they are asked to work out the answer to an addition question mentally, ask pupils to explain which strategy would be the most sensible to use and why? This will help the pupils to actually practice using the strategies they have learned. They will look at the sum and decide which is the best strategy.

Do some more examples with the class as follows:

1.  $32 + 47 =$

2.  $47 + 51 =$

3.  $105 + 203 =$

4.  $74 + 36 =$

5.  $323 + 417 =$

6.  $440 + 209 =$

### C<sub>1b</sub>

Go through the instructions for the activities in the Pupil's Resource Book on page 32.

Explain that the number grids in Activity A are to give them practice in using the counting in 10's and 100's strategies. Do a few examples together.

Remind the pupils that they must mentally work out all their answers to practice mental calculations. This means they do all the working out in their heads. They only write down the answers.

### Answers

1.

+	43	25	32	54
23	66	48	55	77
31	74	56	63	85
44	87	69	76	98
52	95	77	84	106

2.

+	100	110	302	420
200	300	310	502	620
330	430	440	632	750
450	550	560	752	870
540	640	650	842	960

3.

	231	609	362	481
210	441	819	572	691
360	591	969	722	841
400	631	1,009	762	881
517	748	1,126	879	998

## Topic 3: Addition

### Activity B

1. 79
2. 77
3. 290
4. 409
5. 590
6. 1,156
7. 95
8. 650
9. 59
10. 444

### Activity C

1. 136
2. 10
3. 23
4. 204
5. 302
6. 24
7. 260
8. 90
9. 200
10. 300



Can all the pupils use a range of strategies for mental addition up to 3 digits?

**T<sub>2a</sub>**

**Materials**  
cardboard,  
chart paper

Prepare a place value chart on the board, on cardboard or on chart paper for 6-digit numbers.

Write this question in the place value chart.

$$257,083 + 342,715 =$$

H.th	T.th	Th	H	T	O
2	5	7	0	8	3
3	4	2	7	1	5
					8

Go through the digits and the value of each column from the ones to the hundred thousands column. Remind the pupils about placing each digit in the correct column.

Explain that addition of numbers in each column gives a result of not more than 10 in this example, so there will be no need to regroup any figures.

For example: In the ones column the 3 is added to the 5 to give 8, and in the tens column the 1 is added to the 8 to give 9. etc. All this can be done mentally.

Use these as examples to give the pupils some mental practice:

- |            |            |            |
|------------|------------|------------|
| a) 145,816 | b) 324,572 | c) 123,456 |
| + 623,071  | + 575,427  | + 876,023  |
| <hr/>      | <hr/>      | <hr/>      |
| <hr/>      | <hr/>      | <hr/>      |

You can make up other examples with two or three numbers added together to give an answer in each column of not more than ten.

Help the pupils to use the correct mathematical language, to explain their strategy and their answers.

**C<sub>2a</sub>**

Ask the pupils to complete the activities in the Pupil's Resource Book on pages 33.

### Answers

#### Activity A

- |           |           |            |
|-----------|-----------|------------|
| 1. 25,683 | 3. 96,291 | 5. 99,861  |
| 2. 57,248 | 4. 37,464 | 6. 107,909 |

# Unit 3: Number

## Activity B

1. 80,266
2. 389,534
3. 666,999
4. 998,789
5. 400,099
6. 416,769
7. 99,799
8. 699,877
9. 999,999

## Activity C

1. 7,792
2. 37,988
3. 22,568

**T<sub>2b</sub>**

**Materials**  
place value chart

Prepare a place value chart on the board for 6-digit numbers as shown here. Explain the symbol and value for each column from ones (O) to hundred thousands (H.Th).

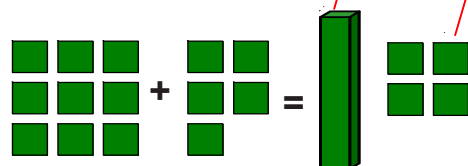
Remind the pupils about placing each digit in the correct column of the chart.

Show them that when an addition gives more than 10 in a column then regrouping has to take place.

Explain to the pupils that when the 9 and 5 are added it gives 14 ones. Record the 4 ones under the ones column then regroup the ten ones for 1 ten in the tens column.

Do some more examples together on the board.  
Make sure all the pupils are confident with regrouping.

H.Th	T.Th	Th	H	T	O
			1 h	1 ten	
2	5	7	0	8	9
+ 3	5	4	7	2	5
			8	1	4



**C<sub>2b</sub>**

The pupils should now complete the exercises in their Pupil's Resource Book on pages 34 and 35.

## Answers

### Activity A

1. 31,129
2. 122,910
3. 118,010
4. 142,081

### Activity B

1. 68,997
2. 578,595
3. 603,584
4. 888,788
5. 1,649,699
6. 692,539
7. 664,772
8. 1,441,879
9. 1,864,154
10. 1,547,162
11. 1,312,755
12. 1,309,886

### Activity C

1. 6
2. 2,0
3. 0,0
4. 16,687
5. 33,264
6. 7,898



Can all the pupils add five and six digit numbers using regrouping where necessary?

## T<sub>3a</sub>

Explain to the pupils what is meant by '**estimate**.' Pupils should understand that to estimate means that they are making a rough calculation. It is not simply a guess. Ask the pupils to make some estimates in around the classroom and the school.

For example:

- estimate how many pupils there are in the next class
- estimate how many dogs live in their village
- estimate the population of their village
- estimate the population in the next village

An estimate gives the pupils a good idea as to what the answer is before they actually calculate or find out the answer. For example: They could go and count the pupils in the next class. They could find out the population of their village and the next village. They could count the dogs in the village.

Ask the pupils to look at the sum of  $389 + 513$ .

Ask them how they could estimate an answer. Try to encourage them to come up with the idea of rounding up the numbers and then adding them to give an estimated answer, as follows:

389 is close to 400. 513 is close to 500.

Therefore  $400 + 500 = 900$ .

Work out the actual answer with the class. This is 902. Compare the estimate of 900 and the actual answer of 902.

Remind the pupils that when making any calculation it is important first to make an **estimate** to give a good idea of what the answer is. When the actual answer is then calculated the pupils can compare it with the estimate and see if their answer is a sensible one.

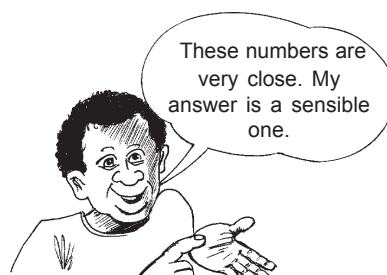
Give pupils lots of practice in estimating numbers. Ask them to estimate some of the things that they are familiar with in and around their environment. For example:

How many people?   How many houses?                      How many churches?  
How many shops?   How many boats or canoes?   How many families?

Revise rounding numbers to the nearest ten, hundred and thousand. Pupils should have done this in Standard 4 and Unit 1 Standard 5.

On the board, work through this example to show how an estimate and then a calculation are worked out and compared.

Estimate	Calculate	Compare
<b>1.</b> 1807 round to the nearest hundred = <b>1800</b> + 5330 round to the nearest hundred = + <b>5300</b> <div style="text-align: right;"><b>7100</b></div>	<b>2.</b> 1807 + 5330 <div style="text-align: right;"><b>7137</b></div>	<b>3. Estimate   = 7,100</b> <b>Calculation = 7,137</b>



## Unit 3: Number

Emphasise to the pupils that the estimate of 7,100 gives a good idea that the correct answer will be close to that number. The actual answer is 7,137. When we compare the two, the numbers are very close. The estimate gave us a good idea of what the answer would be. The three steps are **Estimate, Calculate, Compare**.

Write some more addition sums on the board. Ask the pupils to estimate and then calculate the actual answer. Let them check their answers by comparing the two.

For example:

a)  $382 + 745$

Estimate:  $400 + 700 = 1,100$

Calculate: Answer = 1,127

Compare: Estimate close to calculated answer.

b)  $622 + 319$

Estimate:  $600 + 300 = 900$

Calculate: Answer = 941

Compare: Estimate close to calculated answer.

Give the pupils plenty of practice in estimating, calculating and then comparing their answers in addition.

Reinforce that it is important for the pupils to check that their calculated answer is nearly the same as the estimate, therefore acceptable.

C<sub>3a</sub>

The pupils should now complete the activities in their Pupil's Resource Book on pages 35 and 36.

### Answers

#### Activity A

- |          |          |          |
|----------|----------|----------|
| 1. a. 70 | f. 300   | k. 260   |
| b. 60    | g. 400   | l. 370   |
| c. 20    | h. 6,500 | m. 6,510 |
| d. 30    | i. 4,100 | n. 4,070 |
| e. 60    | j. 700   | o. 740   |

- | 2. Estimate        | Actual |
|--------------------|--------|
| a. $30 + 30 = 60$  | 61     |
| b. $40 + 50 = 90$  | 84     |
| c. $20 + 50 = 70$  | 67     |
| d. $30 + 30 = 60$  | 54     |
| e. $40 + 40 = 80$  | 80     |
|                    |        |
| f. $50 + 20 = 70$  | 72     |
| g. $30 + 30 = 60$  | 55     |
| h. $50 + 10 = 60$  | 57     |
| i. $60 + 40 = 100$ | 101    |
| j. $10 + 80 = 90$  | 97     |

#### Activity B

- |     | Estimate | Answer |
|-----|----------|--------|
| 1.  | 170      | 162    |
| 2.  | 430      | 429    |
| 3.  | 450      | 457    |
| 4.  | 160      | 153    |
| 5.  | 230      | 226    |
| 6.  | 480      | 485    |
| 7.  | 820      | 812    |
| 8.  | 610      | 607    |
| 9.  | 730      | 722    |
| 10. | 910      | 910    |

## Activity C

Estimate	Answer
1. 6,000	5,931
2. 7,100	7,037
3. 5,100	5,147
4. 8,800	8,755
5. 8,200	8,195
6. 9,200	9,140
7. 9,400	9,400
8. 9,000	8,994
9. 270	267 eggs
10. 5,000	5,119 L
11. 480	478 passengers
12. 330	335 coconuts



Can all the pupils make estimates to help check the accuracy of their addition?

### T<sub>4a</sub>

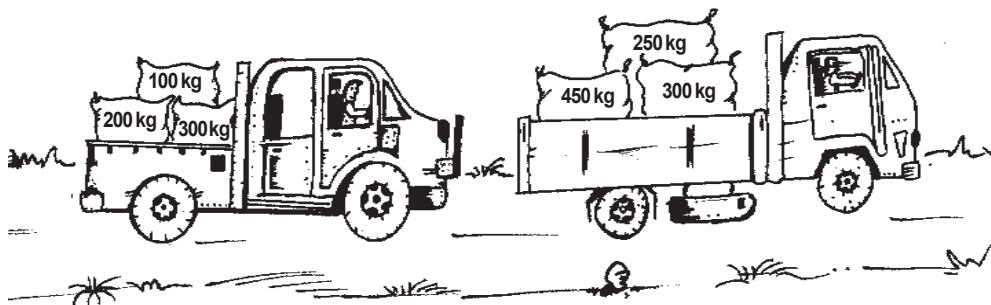
Help the pupils to practise solving problems involving addition. The object of these activities is to help pupils to think of their own strategies and skills for solving addition problems.

Lead the pupils through these examples. Encourage and help them to talk about the problems and think of a strategy to solve them.

1. A school has 340 boys and 219 girls.

What is the total number of pupils in the school? **(559 pupils)**

2. Mary has invited six friends to her birthday party. She needs to give them 100 mL of soft drink each. How many millilitres of drink does she need altogether? **(600 mL)**
3. Two trucks loaded cocoa bags to sell in Honiara.



- a. What is the total mass of cocoa carried by each truck? **(600 kg and 1,000 kg or lt)**
- b. Which truck is heavier? **(the first truck)**



## Unit 3: Number

There are different stages in problem solving:

First identifying what information has been given;

Then identifying what we still need to know;

Deciding what operation is required;

Then solving the problem.

The pupils need to develop all of these skills. Pupils must also learn to look for words like, total, altogether, sum, which are used in the problem. These give clues of how to solve the problem.

Work through each of the examples with the class. Encourage the pupils to read the sentences and solve the problem by thinking through the above process. Remind pupils to include the unit for each answer. Think of other simple examples to use.

C4a

On the board, write the following examples and ask the pupils to solve the problem.

1.

Name	Henry	Apuri	Votu
Race 1	11.45 s	9.45 s	12.50 s
Race 2	10.01 s	10.00 s	11.05 s

- What was the total time clocked by each runner in the two races? (**Henry 21.4 s, Apuri 19.45 s, Votu 23.5 s**)
- How many seconds altogether did the three athletes clock? (**65.26 s**)
- Who clocked the shortest time? (**Apuri**)

2. Joe bought some cabbage at \$3.50 and a pumpkin at \$1.00. How much did he spend altogether? (**\$4.50**)

After going through the examples, ask the pupils to do the activities in the Pupil's Resource Book on page 37.

### Answers

#### Activity A

- 500 pupils
- 42 pupils
- \$93.30
- 2001
  - 10,200 mL
  - 3,200 mL, 7,000 mL

#### Activity B

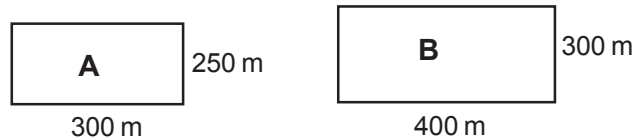
- a chinese cabbage a mango and a pineapple
  - a chinese cabbage some bananas and a coconut
- Basket one is the heaviest.
  - Take the 100 g bananas out of basket one.

## Topic 3: Addition

**T<sub>4b</sub>**

Help the pupils to solve problems involving addition as well as other operations. Write the following problems on the board.

- Jane needs 250 g of rice for each of her 3 friends. She has only 150 g in her bag. How much more does she need?
- Joan planned two fences for her piggery project as shown.



- How much piggery wire will be needed for each fence? (**A = 1,100 m, B = 1,400 m**)
  - How many metres shorter is fence A? (**300 m**)
- Martha lives 1,250 metres from Muria who lives 750 metres from school. If the two girls walk to school together, how far does Martha walk? (**2 km**)

Explain to the pupils that in these examples, both addition and subtraction are required to solve the problems.

For example 1, Jane needs to find out the total grams of rice her friends need and subtract that from what she has already in order to find out how much more she needs.

step 1 (adding)	step 2 (subtracting)
250	750
250	-150
+ 250	<b>600 g</b>
<b>750 g</b>	

Work with the pupils to solve the other problems. Encourage the pupils to solve the problems themselves, do not just do the calculations on the board for them.

**C<sub>4b</sub>**

Ask the pupils to complete the activities in the Pupil's Resource Book on pages 38 and 39. Go around the class and assist pupils who are having difficulty with their work.

### Answers

#### Activity A

- 250 metres
- a. more  
b. 90 more shells
- 930 metres

#### Activity B

- a. 48 eggs  
b. 16 eggs
- 154 cm or 1 m 54 cm

#### Activity C

- Honiara to Gizo + Honiara to Kira Kira
- a. Honiara to Brisbane and Honiara to Port Moresby.  
b. Suva.



Can all the pupils use their addition and subtraction skills to solve problems and puzzles?

## Unit 3: Number

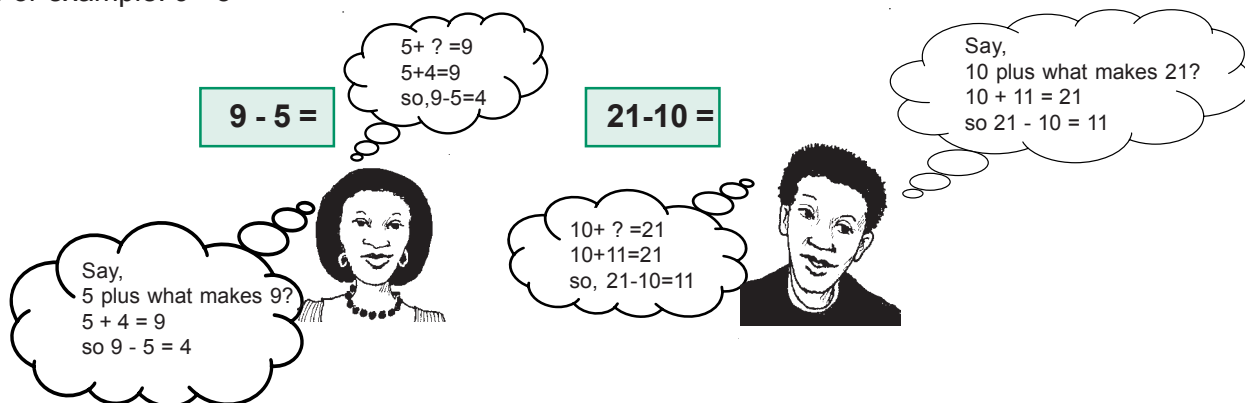
**T<sub>1a</sub>**

**Materials**  
place value chart

Pupils can mentally calculate one and two digit number subtraction sums easily using their knowledge of basic addition facts by using an '**inversion**' strategy.

The inversion strategy involves calculating a subtraction question in reverse.

For example:  $9 - 5 =$



Write some subtraction statements on the board. Ask the pupils to try the inversion strategy. See how quickly the pupils can work out the answers using this strategy.

Do some more examples together until the pupils are confident with the inversion strategy.

**C<sub>1a</sub>**

Do the activities in the Pupil's Resource Book on pages 39 and 40.

It is very important that pupils do not use counting materials or rewrite the subtraction questions and do their calculations on paper.

Ensure that pupils are using the inversion strategy. Mark the work orally with the class and encourage the pupils to explain in words how they did each mental calculation.

### Answers

#### Activity A

1. 7      4. 16      7. 25      10. 21
2. 8      5. 8      8. 6      11. 20
3. 10      6. 7      9. 19      12. 11

#### Activity B

1. 10      4. 29      7. 9      10. 31
2. 21      5. 14      8. 23      11. 46
3. 12      6. 23      9. 69      12. 71

#### Activity C

1.

-	15	29	14	24
7	8	22	7	17
5	10	24	9	19
8	7	21	6	16
11	4	18	3	13

3.

6	1	8
7	5	3
2	9	4

2.

-	65	79	84	53
27	38	52	57	26
35	30	44	49	18
18	47	61	66	35
48	17	31	36	5

4.

16	11	18
17	15	13
12	19	14

## Topic 4: Subtraction

### T<sub>1b</sub>

Subtractions that do not involve regrouping can be calculated mentally using the inversion strategy. Some subtraction questions are more complicated and are not suitable for the inversion strategy.

For subtraction questions requiring regrouping, another strategy is used. This is the **rounding off to the nearest ten** strategy.

#### Example 1:

$$27 - 8$$

$$27 - 10 = 17 \text{ (round off 8 to the nearest ten)}$$

$$17 + 2 = 19 \text{ (there was 2 added the 8 when rounding to ten, so we add the 2 with 17 to give the answer 19)}$$

#### Example 2:

$$52 - 13 =$$

$$52 - 10 = 42 \text{ (round 13 off to the nearest 10)}$$

$$42 - 3 = 39 \text{ (we subtracted 10 and need to take away 3 more)}$$

#### Example 3:

$$45 - 17 =$$

$$45 - 20 = 25 \text{ (round 17 off to the nearest ten)}$$

$$25 + 3 = 28 \text{ (we took away 3 extra and need to give them back)}$$

After explaining this strategy to the pupils, write these questions on the board and ask the pupils to apply the strategy to mentally work out the answers.

$$42 - 19 = \quad 35 - 18 = \quad 23 - 8 = \quad 34 - 16 =$$

Encourage the pupils to practise using the rounding off strategy. Ask them to explain the process they go through in their heads to the rest of the class.

### C<sub>1b</sub>

Write the examples below on the board. Time the pupils and see how quickly they can write the answers.

1.  $32 - 17 =$

6.  $21 - 15 =$

2.  $27 - 19 =$

7.  $33 - 26 =$

3.  $26 - 18 =$

8.  $30 - 13 =$

4.  $25 - 16 =$

9.  $22 - 14 =$

5.  $31 - 24 =$

10.  $37 - 10 =$

Go through the answers orally with the class.

Make sure they can use the **rounding off to the nearest ten** strategy.

## Unit 3: Number

### T<sub>1c</sub>

Revise different strategies for mental subtraction with 1 and 2-digit numbers.

#### Strategy 1.

The '**inversion method**'

Example:  $34 - 9$  which is the same as  $9 + ? = 34$ .

Add a 20 to give 29.

Count on to find what must be added to reach 34 (**5**).

So altogether  $20 + 5$  or 25 must be added, therefore  $34 - 9 = 25$ .

#### Strategy 2.

The '**nearest ten**' strategy.

$34 - 9$ .

Take away 4 to get 30.

Take the 4 away from 9 to give 5.

Now take 5 away from 30.

$30 - 5 = 25$ .

so  $34 - 9 = 25$ .

#### Strategy 3.

Revise '**counting on**' strategy.

$34 - 9$ .

Count on from 9 up to 34 to find how many numbers there are between 9 and 34. The answer is 25.

### C<sub>1c</sub>

Ask the pupils to complete activities in the Pupil's Resource Book on pages 40 and 41

#### Answers

##### Activity A

- |       |        |        |
|-------|--------|--------|
| 1. 16 | 6. 12  | 11. 20 |
| 2. 9  | 7. 23  | 12. 13 |
| 3. 2  | 8. 9   | 13. 19 |
| 4. 11 | 9. 9   | 14. 9  |
| 5. 10 | 10. 13 | 15. 8  |

##### Activity C

- |       |        |        |
|-------|--------|--------|
| 1. 12 | 6. 54  | 11. 58 |
| 2. 12 | 7. 31  | 12. 39 |
| 3. 30 | 8. 34  | 13. 15 |
| 4. 43 | 9. 25  | 14. 82 |
| 5. 41 | 10. 26 | 15. 21 |

##### Activity B

- |       |       |        |
|-------|-------|--------|
| 1. 12 | 6. 17 | 11. 22 |
| 2. 25 | 7. 10 | 12. 13 |
| 3. 32 | 8. 27 | 13. 14 |
| 4. 3  | 9. 20 | 14. 23 |
| 5. 18 | 10. 7 | 15. 22 |



Can all pupils use a range of strategies for mental subtraction?

## Topic 4: Subtraction

**T<sub>2a</sub>**

**Materials**  
place value chart

Prepare a place value chart on the board for 5 and 6 digit numbers as shown.

Remind pupils of the symbols and value for each column from ones (O) to hundred thousands (H.Th). Then demonstrate using the place value chart how to subtract two numbers.

Write this question in the value chart.  $863,294 - 327,506$

Remind the pupils about placing the numbers in the correct column of the chart. Show them when regrouping has to take place.

For example, in the ones column, 6 cannot be subtracted from 4 so the 9 tens have to be regrouped to 8 tens and 1 ten.

The 1 ten is traded for 10 ones which are placed in the ones column. The 4 is added making it 14 as shown in the example.

6 now can be subtracted from 14 giving 8 in the ones column. Remember each number has a place and value. The place is sometimes called a place holder.

Work through some more examples with the whole class. Revise the language and subtraction method. You can use these examples to find whether your pupils' understand the regrouping concept when subtracting.

Ask:

'What do we take away first?' (the numbers in the ones column)

'Can we take 7 ones from 3 ones?' (No)

'What are we going to do then?' ... and so on.

Explain to the pupils that 'The method for subtracting ones, tens, hundreds and thousands is the same. In the example, 8 ten thousands take away 5 ten thousands the answer is 3 ten thousands.

Use these and other examples to give the pupils more practice.

$$\begin{array}{r} 62,484 \\ - 36,849 \\ \hline \end{array} \quad \begin{array}{r} 42,562 \\ - 18,583 \\ \hline \end{array}$$

H. Th	T.Th	Th	H	T	O
8	<del>6</del>	<del>3</del>	<del>2</del>	<del>9</del>	<del>4</del>
- 3	2	7	5	0	6
5	3	5	7	8	8

H.Th	T. Th	Th	H	T	O
		6	12	7	13
	8	7	2	8	3
-	5	4	5	2	7
	3	2	7	5	6

**C<sub>2a</sub>**

When you have given the pupils enough practice tell them to work through the activities in the Pupil's Resource Book on pages 41 and 42.

### Activity A

- |          |            |            |             |
|----------|------------|------------|-------------|
| 1. 4,223 | 4. 334,315 | 7. 617,352 | 10. 133,352 |
| 2. 4,221 | 5. 100,652 | 8. 333,121 | 11. 442,316 |
| 3. 2,333 | 6. 117,347 | 9. 401,943 | 12. 2,485   |

## Unit 3: Number

### Activity B

- |           |            |            |                  |
|-----------|------------|------------|------------------|
| 1. 33,587 | 4. 10,186  | 7. 179,093 | 10. 564,774      |
| 2. 36,577 | 5. 355,967 | 8. 47,699  | 11. 539,847      |
| 3. 44,205 | 6. 47,699  | 9. 401,943 | 12. 10,588 males |

### Activity C

- |              |                     |         |            |             |
|--------------|---------------------|---------|------------|-------------|
| 1. 324 seats | 2. 354,055 more men | 3. 63cm | 4. \$28.95 | 5. \$221.90 |
|--------------|---------------------|---------|------------|-------------|



Can all the pupils subtract five and six digit numbers using regrouping?

### T<sub>3a</sub>

Revise what is meant by **estimation** in mathematics. Pupils should understand that to estimate means to make a rough calculation. It is not a guess.

Estimation gives the pupils a good idea as to what the answer is before they actually calculate their answer.

For example they could estimate the difference in the number of pupils in two classes in their school. They could then do an actual calculation, to check the accuracy of their estimate.

Try making some other estimations involving subtraction.

Estimate  $729 - 513$ .

First make an approximation for each number.

729 is close to 700 and 513 is close to 500

$700 - 500 = 200$  is an easy mental calculation.

Next calculate the answer. Show how the estimate 200, is close to the actual answer, which is 216.

Remind the pupils that when making a calculation they should estimate first to give a good idea of what the answer will be. Then calculate the actual answer. The two answers should be compared, to check that the calculated answer is a sensible one.

### C<sub>3a</sub>

Let the pupils look at the activities in the Pupil's Resource Book on pages 43 and 44.

Tell them to estimate an answer first. When they have done an actual calculation encourage them to compare their answers with their estimate.

Make sure they set out all their working out in their exercise book.

### Answers

#### Activity A

Estimate	Actual	Estimate	Actual
1. 10	8	6. 10	12
2. 10	12	7. 20	16
3. 10	10	8. 20	21
4. 10	11	9. 10	12
5. 0	2	10. 20	15

## Topic 4: Subtraction

### Activity B

	Estimate	Actual		Estimate	Actual
1.	90	90	6.	200	206
2.	90	95	7.	100	89
3.	140	147	8.	200	168
4.	150	130	9.	200	175
5.	10	9	10.	300	274

### Activity C

1. Joe \$74.80, Anne \$50.50, Mary \$30.70
2. Joe \$25.20, Anne \$49.50, Mary \$69.30



Can all the pupils make reasonable estimates before doing subtraction calculations?

### T<sub>4a</sub>

In this objective pupils will use and apply the subtraction strategies they have been learning. The activities help them to think through a range of problems, decide how to approach them and use their subtraction strategies to find an answer.

#### What is the Problem?

Explain the following example to the class:

The M.V. Iuminao left Honiara with 925 people on board and travelled to Western Province. 60 people got off at Gasini, 151 got off at Seghe and 205 got off at Munda. How many people were left on the ship when it arrived at Gizo?

Help them to understand the problem by asking the following questions. Try to allow the pupils to explain their ideas rather than telling them the answers:

#### 1. What is the question to be answered?

How many people were on the ship when it arrived at Gizo?

#### 2. What information does it tell you?

How many started the journey and how many got off at Gasini, Seghe and Munda.

#### 3. What do you need to do?

Start with the number of people on board and **subtract** the number that get off at each port.

#### 4. How will you do this?

This could be using a mental strategy or by writing down the figures. Allow pupils to suggest different ways of doing it and discuss which way is best.

#### 5. What is the answer?

509.



## Unit 3: Number

You could ask some more questions such as:

How many people were on the ship between Seghe and Munda?

What was the total number of people who got off the ship before it arrived at Gizo?

Revise the process by giving the pupils the same problem again with different figures and see if they can get the right answer. You could split them into groups and give each group different figures to work with.

Now use the problem solving questions to analyse the following example and help the pupils to solve it together. Remember they must talk about what they are doing.

The principal took \$12,000 out of the bank. He paid \$1,000 each to the 6 teachers in the school and spent \$1,250 on petrol for the school canoe. He gave the rest of the money to the school burser who spent \$2,120 on supplies for the school canteen.

a) How much money was left over?

b) How much did the principal give the burser?

**Answers a) \$2,630, b) \$4,750**

### C4a

Remind the pupils of the skills they have learned in this topic including mental subtraction strategies, estimation and subtracting 5 and 6-digit numbers. Tell them that they are going to work in pairs to think up more problems using subtraction skills.

There are some ideas for them to use in the box. Write these on the board.

Working in pairs, have them make up a subtraction problem and then swap with their partner to try to solve each other's problems.

You could make up a subtraction problem about:

- money;
- people travelling on ships;
- children in a school;
- bags of copra;
- fruits sold at the market;
- or any other ideas you might have.

Check their work and help those who may have difficulties. Remind them to work out the answers to their own problems too.

You could read out or write up some of the pupils problems on the board for the whole class to try.

### T4b

In this activity you will introduce the pupils to problems that involve more than one operation. These are more complex because they combine subtraction with addition, multiplication or division.

Explain the following example to the class using the different stages of the process of solving the problem that should help them to analyse the problem.

## Topic 4: Subtraction

When a large tree fell down near his house, Ben decided to cut it up for firewood.

He made 256 bundles in total and stored them in his canoe shed. Ben's wife used 4 bundles of firewood every week for a whole year.

- a) How many bundles are left in the shed?
- b) For how many weeks will the remaining firewood last?

**Answers** a) 48 bundles b) 12 weeks

Explain to the pupils that you need to combine skills and knowledge to find the answer as well as using a number of different operations as follows:

- **First you have to know that there are 52 weeks in a year.**
- **Next you have to multiply 4 x 52 (bundles per week).**
- **Next you have to subtract this from 256 (total number of bundles).**
- **Then you have to divide the remaining bundles by 4 to find out how many weeks they will last for.**

When the pupils have understood, give them the same problem again with a different number of bundles of firewood and see if they can follow the procedure you have shown them.

Next try the example on the right: Make sure the pupils talk about the ideas they have for solving the problem. Work through it together.

James works from Monday to Friday. He is allowed to take 25 days leave each year and does not have to work on 8 public holidays.

How many days does he have to go into the office in a whole year?

- **First pupils must know that there are 365 days and 52 weeks in a year.**
- **Next they must multiply 52 by 2 to find out how many Saturdays and Sundays there are in a year. (James does not work on weekends).**
- **Next they must subtract this figure, 8 bank holidays and 25 days leave from 365.**
- **They could also add up all the days that James does not work (104 + 8 + 25) and subtract this total from 365.**

Answer 228

**C<sub>4b</sub>**

Now ask the pupils to work through the problems in the Pupil's Resource Book on pages 44, 45 and 46.

They can do activity A, B or C.

Work with them to make sure that they can correctly interpret what information they are asked for in each question.

Help them to talk about their ideas and explain their strategies with their partners as they work.

### Answers

#### Activity A

1. 307 2. 195 3. 445 4. 17

#### Activity C

1. a. 430 m b. 1,910 m c. 4,300 m d. 2,580 m e. Jimmy  
2. a. 3,435 b. 14,012  
3. a. 267 b. 1,010 c. 749 d. 476

#### Activity B

1. a. 17.5 kg 2. Either Henry and Sera or Bule and Mali or Kimo and Lency  
b. 8 weeks 3. a. 4, b. yes, 4, c. 3

## Unit 3: Number

### Extension Activities

For pupils who understand the strategies taught in this unit well, and need to extend their skills you should provide exploratory activities which encourage them to work independently and think for themselves. Leave them to work on their own once you have explained the activities. You could also use these activities for homework.

Some suggested activities are as follows:

#### Think of a Number Games.

Write these sets of instructions on the board and let pupils work with a partner to explore the results.

##### Think of any number

Add it to the number which follow it  
Add 5  
Divide by 2  
Subtract the original number  
What do you find?  
Try it with different numbers  
What do you find?

##### Think of a number larger than 3

Write down the numbers that are two less than and two more than your number.  
Find the product of these two  
Add 4  
Find the square root of the answer.  
What do you find?  
Try this with other numbers too. What do you find?

#### Problem Solving

Give the pupils some more difficult problems to try for themselves. For example:

1. A palindromic number is a number that reads the same both backwards and forwards such as 747 or 636. List all the palindromic numbers:

- between 500 and 600
- between 2,000 and 2,100
- between 35,000 and 35,100

2. Find three consecutive numbers whose product is 46,620.

3. Find four consecutive numbers whose product is 3,024.

#### Magic Squares

In a magic square all the rows and columns must add up to the same number. The pupils can use their mental arithmetic skills to complete these.

They can also devise their own magic squares to test a partner.

In example 1, use all the numbers from 1 – 16 so that each column and each row adds up to 34.

In example 2 use only the numbers 4, 5 and 6 so

that all the rows, columns and diagonals add up to 15. Use each number three times.

16			13
	15	14	

Example 1


Example 2

## Support Activities

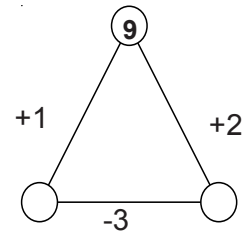
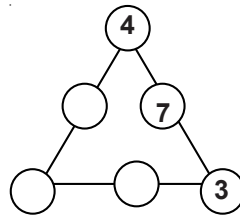
For pupils who need more practice with the number operations and mental arithmetic strategies they have learned in this unit, you should provide extra activities that give them plenty of practice working with numbers.

Work closely with these pupils and encourage them to talk about the strategies they use for making calculations and solving problems. They should use the correct mathematical vocabulary.

Some suggested activities:

### Missing Numbers

Draw some addition and subtraction triangles like those on the right and ask pupils to find the missing numbers so that the sum of the numbers on each side of the triangle is the same.

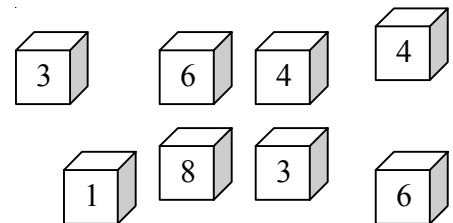


### Dice Games

There are many simple dice games that can be used for mental addition practice. Try simply taking it in turns to roll three dice and add up the score on all three. Record the score and add up the total score as you go along. The first player to reach 100 is the winner.

To include subtraction in the activity, choose one number on the dice as the 'joker' (say 1) if a player throws a 1 they have to subtract their last score from their total instead of adding it.

For practice with larger numbers throw three or four dice, arrange the figures on them to make a three or four digit number and then throw again and add or subtract the second number from the first.



Ask pupils to make up rules for their own simple games using dice.

### Guess the Number

Play in small groups. Have one person think of a number. They should write it on a piece of paper but keep it hidden from the other members of the group. The players then have to take turns to ask questions about the number, but they can only ask questions that can be answered with yes or no. For example:

- Is it larger than 100?      Is it an even number?
- Does it have 4 digits?      Does it start with a 4?
- ...and so on until they guess the number.

### Check Up Page: Answers

- |           |           |                                    |
|-----------|-----------|------------------------------------|
| 1. 304    | 6. 33,587 | 11. a. The three singles (\$11.25) |
| 2. 9,980  | 7. 36,577 | b. 25c                             |
| 3. 72,924 | 8. 44,205 | 12. 20 metres                      |
| 4. 7,035  | 9. 10,186 | 13. \$12.40                        |
| 5. 1,805  | 10. 130   |                                    |

## Number Topic 8: Fractions and Decimals

**Aim:**

To introduce pupils to addition and subtraction of common fractions through equivalence and to explore the decimal equivalence of numbers, as well as ordering and using them in calculations.

**Sequence of Objectives:** To

1. recognise equivalent fractions, eg;  $= \frac{1}{2} = \frac{2}{4} = \frac{4}{8}$
2. add and subtract fractions with the same denominator.
3. explore fraction and decimal equivalence, eg;  $\frac{1}{10} = 0.1$ ,  $\frac{2}{5} = 0.4$ ,  $2\frac{1}{2} \text{ m} = 2.5 \text{ m}$ .
4. order a set of decimal numbers.
5. add and subtract decimal numbers.

**Rationale:**

Our system of money and measurement is totally dependent on an understanding of decimals, their place value and their links to common fractions. Pupils therefore need a thorough grounding in the use of decimals and their application to problems and practical activities.

**T<sub>1a</sub>**

**Materials**  
fraction chart,  
paper strips, knife

Before the lesson you need to

1. find a pawpaw or other fruit that is easy to cut.
2. prepare strips of paper about 8 cm x 20 cm. (five strips per child or pair).
3. prepare a fraction chart as shown on the next page.

Introduce this lesson by cutting up the pawpaw to revise common fractions such as halves, quarters, eighths and sixteenths.

Share out the paper strips. Give four to each pupil. Ask the pupils to fold one into two equal parts, another one into four equal parts, then eight equal parts and 16 equal parts. Ask the pupils to say what fraction each folded part of each strip of paper represents.

Have the pupils write the fractions on the folded parts.

Example:

$\frac{1}{2}$	$\frac{1}{2}$
---------------	---------------

$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$
---------------	---------------	---------------	---------------

Ask the pupils to put their strips in order from the biggest fraction to the smallest.

Ask questions such as:

How many quarters is equal to one half? **(2)**

How many eighths would fit into two quarters? **(4)**

How many eighths would make one half? **(4)**

How many sixteenths would equal to one whole? **(16)**

How many quarters is the same as eight sixteenths? **(2)**

## Topic 8: Fractions and Decimals

Ask the pupils more questions until they understand fractions which are equal. Use your fractions chart.

**Fraction Chart**

One whole															
$\frac{1}{2}$								$\frac{1}{2}$							
$\frac{1}{4}$				$\frac{1}{4}$				$\frac{1}{4}$				$\frac{1}{4}$			
$\frac{1}{8}$		$\frac{1}{8}$		$\frac{1}{8}$		$\frac{1}{8}$		$\frac{1}{8}$		$\frac{1}{8}$		$\frac{1}{8}$		$\frac{1}{8}$	
$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$

Ask questions such as:

How many quarters is equivalent to  $\frac{1}{2}$  ? **(2)**

How many eighths is equivalent to  $\frac{2}{4}$  ? **(4)**

How many sixteenths is equivalent to  $\frac{4}{8}$  ? **(8)**

Help pupils understand that these fractions are **equivalent** or the same.

$$\frac{1}{2} = \frac{2}{4} = \frac{4}{8} = \frac{8}{16}$$

Use other examples from the chart to help the pupils understand the relationship between the fractions. Let them give you some examples of equivalent fractions.

**C<sub>1a</sub>**

Ask the pupils to complete the exercise in the Pupil's Resource Book on page 48.

You could get your class to work through all the activities A, B and C or you could give the less able pupils Activity A, the average pupils Activity B and the more able pupils Activity C.

### Answers

#### Activity A

1.  $\frac{2}{4}$       2.  $\frac{4}{8}$       3.  $\frac{6}{8}$       4.  $\frac{6}{16}$       5.  $\frac{1}{4}$       6.  $\frac{16}{16}$

#### Activity B

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

#### Activity C

1. c) 1 eighth      2. b) 2 eighths      3. a) 6 eighths  
4. b) 10 sixteenths      5. c) 1 half      6. c) 6 sixteenths

## Unit 4: Number

**T<sub>1b</sub>**

**Materials**  
grid papers,

Introduce other fractions emphasising their fraction equivalence.

Using the appropriate language together with the fraction symbols will help pupils to understand the concept properly.

You could draw up this table on the board.

This shows more fractions which are equivalent. For example;

$$\frac{1}{3} \text{ is equivalent to } \frac{2}{6}$$

$$\frac{1}{3} \text{ is the same as } \frac{2}{6}$$

In symbols we write it as

$$\frac{1}{3} = \frac{2}{6} \text{ or } \frac{1}{3} \Leftrightarrow \frac{2}{6}$$

Use other examples to go over the equivalent fractions concept.

Example:

$$\text{a. } \frac{1}{3} \Leftrightarrow \frac{2}{6} \quad \text{b. } \frac{4}{12} \Leftrightarrow \frac{1}{3} \quad \text{c. } \frac{2}{3} \Leftrightarrow \frac{8}{12} \quad \text{d. } \frac{4}{12} \Leftrightarrow \frac{1}{3}$$

One whole											
$\frac{1}{3}$				$\frac{1}{3}$				$\frac{1}{3}$			
$\frac{1}{6}$		$\frac{1}{6}$		$\frac{1}{6}$		$\frac{1}{6}$		$\frac{1}{6}$		$\frac{1}{6}$	
$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{9}$
$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$

**C<sub>1b</sub>**

Encourage the pupils to use the appropriate mathematical language in their discussions.

When you have gone through some examples let the pupils complete the activities on pages 49 and 50 of the Pupil's Resource Book.

### Answers

#### Activity A

$$1. \frac{4}{12} \quad 2. \frac{8}{12} \quad 3. \frac{1}{3} \quad 4. \frac{3}{3} \quad 5. \frac{2}{3} \quad 6. \frac{8}{12} \quad 7. \frac{6}{6} \quad 8. \frac{4}{6}$$

#### Activity B

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

#### Activity C

$$1. \text{ a. } \frac{6}{15} \quad \text{b. } \frac{12}{15} \quad \text{c. } \frac{1}{5} \quad \text{d. } \frac{3}{5} \quad \text{e. } \frac{3}{15} \quad \text{f. } \frac{15}{15}$$

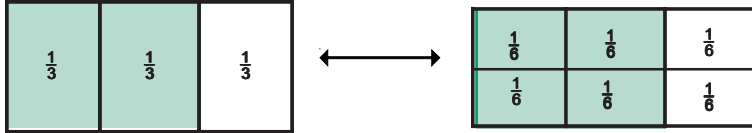
**Suggested answers. Pupils may have different answers that are also correct.**

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

## Topic 8: Fractions and Decimals

**T<sub>1c</sub>**

Equivalent fractions can be calculated without using a fractions chart by multiplying or dividing the denominator and numerator by the same number.



Example:  $\frac{2}{3}$  is the same as  $\frac{4}{6} \rightarrow \frac{2 \times 2}{3 \times 2} = \frac{4}{6}$

$\frac{2}{3}$  is the same as  $\frac{6}{9} \rightarrow \frac{2 \times 3}{3 \times 3} = \frac{6}{9}$

Simplifying fractions using this method is only possible when the denominator and numerator are factors of the number you multiply them with. In the examples, 2 is a factor of both 4 and 6. 3 is a factor of 6 and 9.

The fraction is **equivalent** if you multiply or divide the denominator and the numerator by the **same** number.

Explain to the pupils that the denominator and the numerator are multiplied or divided by the same number to get an equivalent fraction.

Write  $\frac{2}{3}$  on the board.

Ask the pupils to find out what will happen if the numerator and the denominator are multiplied by 2? Now do the same for 3.

Emphasise the mathematical language for the fraction such as thirds, sixths, equivalent, denominator, numerator, factors, etc.

$\frac{2}{3}$	$\leftarrow$ Numerator
	$\leftarrow$ Denominator
$\frac{2}{3} = \frac{2 \times 2}{3 \times 2} = \frac{4}{6}$	
$\frac{2}{3} = \frac{2 \times 3}{3 \times 3} = \frac{6}{9}$	

Explain to pupils that an **equivalent fraction** looks different and has a different name but it has the **same value**.

For example:  $\frac{2}{3} = \frac{2 \times 2}{3 \times 2} = \frac{4}{6}$        $\frac{2}{3} = \frac{2 \times 3}{3 \times 3} = \frac{6}{9}$

2 thirds is renamed as 4 sixths and 6 ninths.

Write other examples on the board. Ask the pupils to multiply the numerator and denominator by the same number.

For example:  $\frac{2}{5}$  multiply  $\frac{2 \times 2}{5 \times 2} = \frac{4}{10}$        $\frac{2 \times 3}{5 \times 3} = \frac{6}{15}$        $\frac{2 \times 4}{5 \times 4} = \frac{8}{20}$

**C<sub>1c</sub>**

When all the pupils are confident with the examples, ask them to do the activities in the Pupil's Resource Book on pages 50, 51 and 52.

Tell the pupils that to do these activities they must know their multiplication tables well.

### Answers

#### Activity A

1.  $\frac{2}{6}$
2.  $\frac{4}{12}$
3.  $\frac{20}{24}$
4.  $\frac{6}{18}$
5.  $\frac{1}{3}$
6.  $\frac{14}{18}$
7.  $\frac{6}{6}$
8.  $\frac{3}{18}$
9.  $\frac{1}{1}$
10.  $\frac{4}{10}$
11.  $\frac{9}{12}$



## Unit 4: Number

### Activity B

1.  $\frac{2}{5}$   $\frac{4}{10}$   $\frac{6}{15}$   $\frac{8}{20}$

2.  $\frac{1}{6}$   $\frac{2}{12}$   $\frac{3}{18}$   $\frac{4}{24}$

3.  $\frac{3}{5}$   $\frac{6}{10}$   $\frac{9}{15}$   $\frac{12}{20}$

4.  $\frac{2}{9}$   $\frac{4}{18}$   $\frac{6}{27}$   $\frac{8}{36}$

5.  $\frac{1}{2}$   $\frac{2}{4}$   $\frac{3}{6}$   $\frac{4}{8}$

6.  $\frac{3}{4}$   $\frac{6}{8}$   $\frac{9}{12}$   $\frac{12}{16}$

### Activity C

1.  $\frac{2}{3}$   $\frac{4}{6}$   $\frac{6}{9}$   $\frac{8}{12}$   $\frac{10}{15}$   $\frac{12}{18}$   $\frac{14}{21}$

2.  $\frac{1}{6}$   $\frac{2}{12}$   $\frac{3}{18}$   $\frac{4}{24}$   $\frac{5}{30}$   $\frac{6}{36}$   $\frac{7}{42}$

3.  $\frac{1}{8}$   $\frac{2}{16}$   $\frac{3}{24}$   $\frac{4}{32}$   $\frac{5}{40}$   $\frac{6}{48}$   $\frac{7}{56}$

4.  $\frac{3}{4}$   $\frac{6}{8}$   $\frac{9}{12}$   $\frac{12}{16}$   $\frac{15}{20}$   $\frac{18}{24}$   $\frac{21}{28}$

5.  $\frac{2}{4}$   $\frac{4}{8}$   $\frac{6}{12}$   $\frac{8}{16}$   $\frac{10}{20}$   $\frac{12}{24}$   $\frac{14}{28}$

6.  $\frac{2}{6}$   $\frac{4}{12}$   $\frac{6}{18}$   $\frac{8}{24}$   $\frac{10}{30}$   $\frac{12}{36}$   $\frac{14}{42}$

**T<sub>1d</sub>**

We can find equivalent fractions by multiplying the numerator and the denominator by the same number. We can also make equivalent fractions by dividing the numerator and denominator by the same number. This will give us a fraction in its simplest form.

**Example 1:**  $\frac{6}{12} \div \frac{2}{2} = \frac{3}{3} \div \frac{3}{3} = \frac{1}{2}$

So,  $\frac{6}{12}$  in its simplest form is  $\frac{1}{2}$ .

Do more examples on the board with the class. Show how fractions can be simplified to their simplest forms.

Explain to the pupils that the divider has to be a factor of the numerator and denominator. If the numerator and denominator cannot be divided by the same number, it means that you need to find another divider.

**Example 2.**  $\frac{8}{10} \div \frac{2}{2} = \frac{4}{5}$  yes

$\frac{8}{10} \div \frac{3}{3} = \frac{2 \text{ r } 2}{3 \text{ r } 1}$  no

$\frac{8}{10} \div \frac{4}{4} = \frac{2}{2 \text{ r } 2}$  no

So,  $\frac{8}{10}$  is  $\frac{4}{5}$  in its simplest form.

There is more than one way to get this answer.

Can the pupils think of other ways?

Go through some more examples on the board, such as:

$\frac{18}{24}$   $\frac{10}{15}$   $\frac{40}{60}$   $\frac{14}{49}$

### Example 3.

$\frac{12 \div 2}{24 \div 2} = \frac{6 \div 2}{12 \div 2} = \frac{3 \div 3}{6 \div 3} = \frac{1}{2}$

So,  $\frac{12}{24}$  in its simplest form, is  $\frac{1}{2}$

## Topic 8: Fractions and Decimals

Remind the pupils that when they understand this process they can show their working out and how they arrived at their answer like this.

$$\frac{\cancel{15}}{\cancel{25}} = \frac{3}{5} \qquad \frac{\cancel{12}}{\cancel{48}} \frac{\cancel{3}}{\cancel{12}} = \frac{1}{4}$$

C<sub>1d</sub>

Make sure that the pupils understand the relationship between the divider and the numerator and denominator.

Go through the instructions again.

Do one or two more examples if necessary before setting the pupils on to their task.

Ask the pupils to complete the activities in the Pupil's Resource Book on pages 52 and 53.

### Answers

#### Activity A

1.  $\frac{5}{15} = \frac{1}{3}$

2.  $\frac{6}{10} = \frac{3}{5}$

3.  $\frac{4}{8} = \frac{1}{2}$

4.  $\frac{4}{12} = \frac{1}{3}$

5.  $\frac{3}{15} = \frac{1}{5}$

6.  $\frac{4}{10} = \frac{2}{5}$

7.  $\frac{6}{9} = \frac{2}{3}$

8.  $\frac{4}{16} = \frac{1}{4}$

#### Activity B

1.  $\frac{8}{12} = \frac{2}{3}$

2.  $\frac{12}{16} = \frac{6}{8} = \frac{3}{4}$

3.  $\frac{6}{18} = \frac{1}{3}$

4.  $\frac{16}{20} = \frac{8}{10} = \frac{4}{5}$

5.  $\frac{12}{18} = \frac{4}{6} = \frac{2}{3}$

6.  $\frac{8}{16} = \frac{1}{2}$

7.  $\frac{12}{20} = \frac{6}{10} = \frac{3}{5}$

8.  $\frac{6}{12} = \frac{1}{2}$

9.  $\frac{10}{16} = \frac{5}{8}$

10.  $\frac{8}{20} = \frac{2}{5}$

11.  $\frac{15}{30} = \frac{1}{2}$

12.  $\frac{16}{28} = \frac{4}{7}$



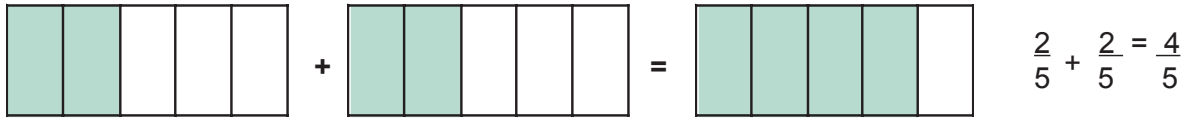
Can all the pupils identify and name a range of equivalent fractions?

## Unit 4: Number

**T<sub>2a</sub>**

Copy these diagrams onto the board. Mark each rectangle in fifths.

Read the sum out aloud. Two fifths and two fifths equals four fifths.



Explain to pupils that, for the addition of fractions with the same denominator, you only add the numerators or the top numbers.

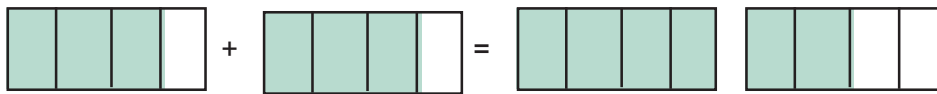
Write these fraction additions on the board and ask the pupils to show each sum and answer by drawing it out as a diagram like the example above.

a.  $\frac{3}{6} + \frac{2}{6} = \frac{5}{6}$     b.  $\frac{3}{8} + \frac{2}{8} = \frac{5}{8}$     c.  $\frac{4}{9} + \frac{3}{9} = \frac{7}{9}$

Use other examples to give extra practice in adding fractions that have the same denominator.

d.  $\frac{3}{4} + \frac{3}{4} = \frac{6}{4}$  Ask the pupils what they notice about  $\frac{6}{4}$ .

The diagram for this would look like this



They should be able to tell you that it is more than one whole number. So  $\frac{4}{4} = 1$  whole.  $\frac{6}{4}$  can be changed to 1 whole +  $\frac{2}{4}$ . This can be simplified to  $1\frac{1}{2}$ .

Try some more examples, such as:

$\frac{5}{8} + \frac{5}{8} =$      $\frac{6}{9} + \frac{4}{9} =$

**C<sub>2a</sub>**

When the pupils have practised adding fractions with the same denominator ask them to complete the activities in the Pupil's Resource Book on pages 53 and 54.

### Answers

#### Activity A

1.  $\frac{1}{5} + \frac{3}{5} = \frac{4}{5}$     2.  $\frac{2}{5} + \frac{1}{5} = \frac{3}{5}$     3.  $\frac{1}{3} + \frac{1}{3} = \frac{2}{3}$     4.  $\frac{4}{8} + \frac{2}{8} = \frac{6}{8}$   
 5.  $\frac{10}{10} + \frac{10}{10} = \frac{20}{10}$     6.  $\frac{9}{15} + \frac{12}{15} = \frac{21}{15}$     7.  $\frac{3}{7} + \frac{3}{7} = \frac{6}{7}$

#### Activity B

1.  $\frac{5}{6}$     2.  $\frac{6}{9} = \frac{2}{3}$     3.  $\frac{4}{5}$     4.  $\frac{3}{4}$     5.  $\frac{9}{12} = \frac{3}{4}$     6.  $\frac{7}{8}$     7.  $\frac{6}{10} = \frac{3}{5}$

## Topic 8: Fractions and Decimals

8.  $\frac{4}{7}$

9.  $\frac{3}{3} = 1$

10.  $\frac{6}{9} = \frac{2}{3}$

11.  $\frac{9}{11}$

12.  $\frac{4}{6} = \frac{2}{3}$

### Activity C

1.  $\frac{1}{3} + \frac{2}{3} = \frac{3}{3} = 1$  whole - All of it.

2.  $\frac{1}{4} + \frac{1}{4} = \frac{2}{4}$  or  $\frac{1}{2}$  of an hour

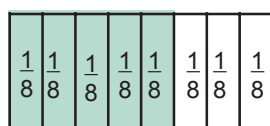
5.  $\frac{2}{5} + \frac{1}{5} = \frac{3}{5}$ .  $\frac{2}{5}$  left still to plant.

3.  $\frac{2}{6} + \frac{1}{6} = \frac{3}{6}$  or half. Half was left.

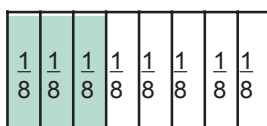
4.  $\frac{2}{5} + \frac{2}{5} = \frac{4}{5}$ .  $\frac{1}{5}$  is still empty

**T<sub>2b</sub>**

Write this fraction on the board.



take away



5 eighths take away 3 eighths ?

$$\frac{5}{8} - \frac{3}{8} = \frac{5-3}{8} = \frac{2}{8}$$

Work through this example with the pupils on the board.

Explain to pupils that to subtract fractions with the same denominator you only subtract the numerators or the top numbers. The denominator stays the same.

Use these questions to give the pupils practise.

a.  $\frac{4}{5} - \frac{3}{5} = \frac{1}{5}$

b.  $\frac{5}{6} - \frac{2}{6} = \frac{3}{6}$

c.  $\frac{5}{7} - \frac{1}{7} = \frac{4}{7}$

d.  $\frac{5}{6} - \frac{3}{6} = \frac{2}{6}$

e.  $\frac{8}{9} - \frac{5}{9} = \frac{3}{9}$

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

In example (f) explain that  $1\frac{1}{3}$  must be changed to  $\frac{4}{3} - \frac{2}{3}$  before the answer is worked out.

Remind pupils that  $\frac{3}{3}$  is one whole.

Do some more examples where whole numbers need to be changed before the answer can be worked out. For example:

g.  $1\frac{2}{5} - \frac{3}{5} = \frac{7}{5} - \frac{3}{5} = \frac{4}{5}$

h.  $1\frac{1}{4} - \frac{3}{4} = \frac{5}{4} - \frac{3}{4} = \frac{2}{4}$

Remind the pupils about how to simplify fractions to their lowest terms. Look at the all the answers of the examples on the board.

Ask the pupils if any of the answers can be simplified.

Answers b)  $\frac{1}{2}$  d)  $\frac{1}{3}$  e)  $\frac{1}{3}$  h)  $\frac{1}{2}$

**C<sub>2b</sub>**

Give the pupils enough examples to make sure they understand subtracting fractions which have the same denominator.

Give pupils enough practice before they are asked to do activities A and B in the Pupil's Resource Book on pages 54 and 55.

### Answers

#### Activity A

1.  $\frac{1}{4}$

2.  $\frac{2}{8} = \frac{1}{4}$

3.  $\frac{3}{9} = \frac{1}{3}$

4.  $\frac{3}{9} = \frac{1}{3}$

5.  $\frac{8}{12} = \frac{2}{3}$

6.  $\frac{1}{5}$

## Unit 4: Number

7.  $\frac{3}{7}$

8.  $\frac{5}{10} = \frac{1}{2}$

9.  $\frac{5}{6}$

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

11.  $\frac{7}{16}$

12.  $\frac{1}{10}$

### Activity B

1.  $\frac{3}{9} = \frac{1}{3}$

2.  $\frac{4}{12} = \frac{1}{3}$

3.  $\frac{5}{15} = \frac{1}{3}$

4.  $\frac{8}{16} = \frac{1}{2}$

5.  $\frac{12}{20} = \frac{3}{5}$

6.  $\frac{10}{15} = \frac{2}{3}$

7.  $\frac{4}{8} = \frac{1}{2}$

8.  $\frac{3}{15} = \frac{1}{5}$

9.  $\frac{6}{18} = \frac{1}{3}$

10.  $\frac{10}{20} = \frac{1}{2}$


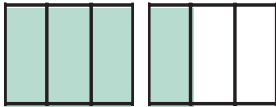
11.  $\frac{4}{16} = \frac{1}{4}$

12.  $\frac{7}{14} = \frac{1}{2}$

**T<sub>2c</sub>**

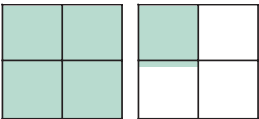
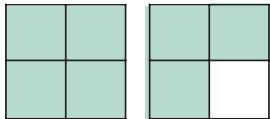
Write up these examples on the board to show pupils how to do addition of mixed fractions. Explain that mixed fractions mean that the number is a mixture of a fraction and a whole number. Make sure you teach the pupils how to do the additions horizontally and vertically.

When doing the addition vertically, explain that the rules are the same as in normal addition. That is, add the smallest units first before the larger units. The rule for regrouping is the same as in normal addition.

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

Ones	Thirds
2	$\frac{2}{3}$
+	$1\frac{1}{3}$
<hr/>	
3	$\frac{2}{3}$

**Answer = 3  $\frac{2}{3}$**

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

Ones	Quarters
1	$\frac{3}{4}$
+	$1\frac{3}{4}$
<hr/>	
2	$\frac{6}{4}$ (regroup as 1 one.)

**Answer = 3**

Work through some more examples, such as:

c.  $2\frac{2}{5} + \frac{4}{5} =$

d.  $\frac{5}{6} + 1\frac{3}{6} =$

e.  $1\frac{3}{7} + 2\frac{2}{7} =$

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

g.  $1\frac{2}{3} + 2\frac{2}{3} =$

h.  $1\frac{3}{5} + \frac{3}{5} =$

**Answers:** c.  $3\frac{1}{5}$

d.  $2\frac{1}{3}$

e.  $3\frac{5}{7}$

f. 4

g.  $4\frac{1}{2}$

h.  $2\frac{1}{5}$

**C<sub>2c</sub>**

Do a few more examples until the pupils are clear how to add mixed fractions before asking them to complete the tasks in the Pupil's Resource Book on pages 55, 56 and 57.

### Answers

#### Activity A

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

2.  $4\frac{1}{2} + \frac{1}{2} = 5$

3.  $5\frac{5}{9}$

4.  $7\frac{4}{7}$

5.  $6\frac{9}{10}$

6.  $10\frac{10}{15} = 10\frac{2}{3}$

7.  $11\frac{4}{5}$

8.  $8\frac{18}{20} = 8\frac{9}{10}$

9.  $13\frac{9}{12} = 13\frac{3}{4}$

## Topic 8: Fractions and Decimals

10.  $17\frac{12}{15} = 17\frac{4}{5}$

11.  $11\frac{8}{9}$

12.  $2\frac{7}{8}$

13.  $10\frac{6}{7}$

14.  $26\frac{4}{6} = 26\frac{2}{3}$

### Activity B

1.  $4\frac{4}{10}$  or  $4\frac{2}{5}$

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

3.  $11\frac{2}{7}$

4.  $5\frac{1}{6}$

5.  $7$

6.  $3\frac{2}{4}$  or  $3\frac{1}{2}$

7.  $1\frac{2}{8}$  or  $1\frac{1}{4}$

8.  $8\frac{1}{7}$

9.  $12\frac{1}{9}$

10.  $4\frac{1}{3}$

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

12.  $3\frac{3}{6}$  or  $3\frac{1}{2}$

### Activity C

1.  $6\frac{1}{2}$

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

3.  $12\frac{3}{6}$  or  $12\frac{1}{2}$

4.  $4\frac{2}{9}$

5.  $6\frac{4}{7}$

6.  $4\frac{6}{10}$  or  $4\frac{3}{5}$

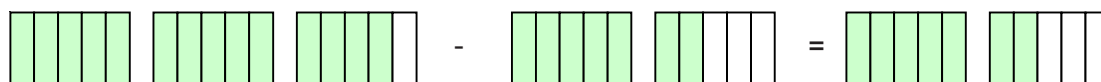
7.  $8$

8.  $8$



Use this example to introduce the pupils to the concept of subtracting mixed fractions. Write it up on the board. Use the diagram to help you explain the sum to the pupils.

$$2\frac{4}{5} - 1\frac{2}{5} = 1\frac{2}{5}$$



Next arrange the same example vertically, using a place value chart as shown.

ones	fifths
2	$\frac{4}{5}$
- 1	$\frac{2}{5}$
1	$\frac{2}{5}$

Explain that, in this example, no regrouping is required. We simply subtract as we would for whole numbers, starting with the fifths place column,  $\frac{4}{5} - \frac{2}{5} = \frac{2}{5}$

Then moving on to the ones column  $2 - 1 = 1$   
Giving an answer of  $1\frac{2}{5}$

Do some more examples without regrouping to be sure that the pupils have understood.

Such as:  $5\frac{6}{3} - 3\frac{3}{8} =$        $4\frac{2}{3} - 3\frac{1}{3} =$        $9\frac{4}{5} - 6\frac{1}{5} =$

Now work through some examples in which regrouping is required. Set these out vertically on the board using a place value chart as shown

ones	quarters
<del>3</del> 2	<del>1</del> $\frac{5}{4}$
- 1	$\frac{3}{4}$
1	$\frac{2}{4}$

Explain that we cannot take  $\frac{3}{4}$  away from  $\frac{1}{4}$ , so we have to use trading.

We regroup one whole from the ones column to give us  $\frac{5}{4}$  (five quarters) then subtract  $\frac{3}{4}$  from  $\frac{5}{4}$  giving us the answer  $\frac{2}{4}$

Then we go to the ones column and subtract.  $2 - 1 = 1$ .

The answer is  $1\frac{2}{4}$ .

Pupils may be able to tell you that this can be simplified to  $1\frac{1}{2}$ .

## Unit 4: Number

Ask different pupils to come to the front of the class and work through some examples to explain what they are doing as they go along. Here are some examples you could work through.

ones	fifths	ones	eighths	ones	sixths	ones	tenths
3	$\frac{2}{5}$	2	$\frac{3}{8}$	3	$\frac{3}{6}$	6	$\frac{3}{10}$
- 1	$\frac{4}{5}$	- 1	$\frac{5}{8}$	- 2	$\frac{4}{6}$	- 4	$\frac{5}{10}$

**C<sub>2d</sub>**

Use other examples for the pupils to practice this concept before going on to the activities in the Pupil's Resource Book on pages 57 and 58.

### Answers

#### Activity A

- $6\frac{5}{9}$
- $9\frac{2}{7}$
- 4
- $4\frac{4}{15}$
- $\frac{2}{5}$
- $6\frac{6}{20}$  or  $6\frac{3}{10}$
- $3\frac{6}{9}$  or  $3\frac{1}{3}$
- $2\frac{2}{8}$  or  $2\frac{1}{4}$
- $1\frac{4}{7}$
- $6\frac{1}{6}$
- $8\frac{4}{8}$  or  $8\frac{1}{2}$
- $5\frac{4}{8}$  or  $5\frac{1}{2}$

#### Activity B

- $$\begin{array}{r} 9\ 11 \\ 10\ 2 \\ \frac{2}{9} \\ - 4\ \frac{7}{9} \\ \hline 5\ \frac{4}{9} \end{array}$$
- $$\begin{array}{r} 12\ 8 \\ 13\ 2 \\ \frac{2}{7} \\ - 4\ \frac{3}{7} \\ \hline 8\ \frac{5}{7} \end{array}$$
- $$\begin{array}{r} 11\ 1 \\ 12\ 4 \\ \frac{4}{10} \\ - 8\ \frac{5}{10} \\ \hline 3\ \frac{9}{10} \end{array}$$
- $$\begin{array}{r} 6\ 18 \\ 7\ 3 \\ \frac{3}{15} \\ - 3\ \frac{7}{15} \\ \hline 3\ \frac{11}{15} \end{array}$$
- $$\begin{array}{r} 7\ 11 \\ 8\ 11 \\ \frac{11}{10} \\ - 7\ \frac{5}{10} \\ \hline 6\ \frac{6}{10} \text{ or } \frac{3}{5} \end{array}$$
- $$\begin{array}{r} 11\ 24 \\ 12\ 8 \\ \frac{8}{16} \\ - 6\ \frac{9}{16} \\ \hline 5\ \frac{15}{16} \end{array}$$
- $2\frac{3}{9}$  or  $2\frac{1}{3}$
- $1\frac{6}{8}$  or  $1\frac{3}{4}$
- $\frac{3}{7}$
- $5\frac{5}{6}$
- $7\frac{5}{8}$
- $7\frac{5}{8}$
- $\frac{7}{9}$
- $\frac{4}{5}$

#### Activity C

- $\frac{2}{4}$  or  $\frac{1}{2}$
- 30
- 76
- $\frac{1}{3}$
- a  $\frac{2}{3}$
- b 2 km



Can all the pupils add and subtract fractions with the same denominator?

## Topic 8: Fractions and Decimals

**T<sub>3a</sub>**

Introduce decimal fractions to the pupils. Draw a rectangular shape on the board. Divide the shape into ten equal parts as shown.



Explain that the shape shows one whole.

Ask: How many parts has this shape been divided into? **(10)**

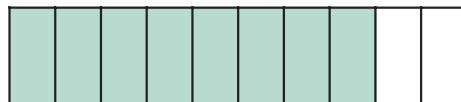
What are the parts called? **(tenths)**

How many tenths are shaded? **(3 tenths)**

Explain that 3 tenths are shaded. This is 3 out of the 10 equal parts or 3 tenths.

Use different fractions to explain this concept again, such as 2 tenths, 8 tenths and so on.

Emphasise the use of mathematical language such as tenths, equal parts etc.



Ask the pupils to draw rectangular shapes and divide them into ten equal parts, then shade them to show other fractions such as 6 tenths, 4 tenths, 1 tenth.

**C<sub>3a</sub>**

After introducing the pupils to tenths, ask them to do the activity in the Pupil's Resource Book on page 59.

Ask the pupils to copy and complete activity A in their exercise books.

### Answers

#### Activity A

- 1.
- 2.
- 3.
- 4.
- 5.



## Unit 4: Number

6.  $3\frac{2}{10}$

7.  $5\frac{8}{10}$

8.  $\frac{3}{10}$

9.  $3\frac{4}{10}$

10.  $\frac{9}{10}$

11.  $2\frac{1}{10}$

12.  $1\frac{8}{10}$

**T<sub>3b</sub>**

**Materials**  
place value chart

Introduce the term **decimal fractions** to the pupils.

Remind the class that our number system uses a base ten.

Draw this place value chart on the board.

In the place value chart ask a pupil to put in the number 3,152.

Th	H	T	O

Revise with the class that 10 ones make one ten and ten tens make one hundred and so on.

Now explain that one whole can be divided into ten tenths. The place value chart can be extended to the right to show tenths like this.

Th	H	T	O	tenths

Explain to the pupils that a **decimal point** is used to separate the fraction part of the number from the whole number.

Ask the pupils to write 29 and 3 tenths in a place value chart on the board.

Tell the pupils that now they can write 29 and 3 tenths in two different ways. As a fraction =  $29\frac{3}{10}$  and as a **decimal fraction** 29.3

T	O	tenths
2	9	3

**Decimal point**

Write up some more examples on the board and ask the pupils to write them as decimal fractions.  $3\frac{6}{10}$  (**3.6**)  $2\frac{2}{10}$  (**2.2**)  $4\frac{7}{10}$  (**4.7**)

Explain to the pupils that if there are no whole ones then a zero (0) must be written in the ones place so  $\frac{2}{10}$  as a decimal fraction is written as 0.2,  $\frac{8}{10}$  is written as 0.8 and  $\frac{9}{10}$  is written as 0.9

**C<sub>3b</sub>**

When the pupils have had enough practice with these examples tell them to complete the activities in the Pupil's Resource Book on page 60.

### Answers

#### Activity A

1.  $\frac{2}{10}$  or 0.2

5.  $\frac{9}{10}$  or 0.9

2.  $\frac{7}{10}$  or 0.7

6.  $\frac{8}{10}$  or 0.8

3.  $\frac{6}{10}$  or 0.6

7.  $\frac{4}{10}$  or 0.4

4.  $\frac{2}{10}$  or 1.2

8.  $\frac{5}{10}$  or 0.5

#### Activity B

1.  $\frac{2}{10} = 0.2$

6.  $\frac{4}{10} = 0.4$

2.  $\frac{5}{10} = 0.5$

7.  $\frac{8}{10} = 0.8$

3.  $\frac{6}{10} = 0.6$

8.  $\frac{7}{10} = 0.7$

4.  $\frac{3}{10} = 0.3$

9.  $\frac{3}{10} = 0.3$

5.  $\frac{9}{10} = 0.9$

10.  $\frac{5}{10} = 0.5$

## Topic 8: Fractions and Decimals

### T<sub>3c</sub>

Explain that, when a fraction is written as a decimal fraction, it represents tenths of a whole.

So to write  $\frac{1}{2}$  as a decimal fraction this must be first be written in tenths.

To change the denominator 2 to tenths we must multiply by 5.

To make the fraction equivalent we must also multiply the numerator by 5.

so  $\frac{1}{2} \times \frac{5}{5} = 0.5$  as a decimal fraction.  $\frac{1}{2} = 0.5$  as a decimal fraction.

Go through some more examples.

a.  $\frac{2}{5} \times \frac{2}{2} = \frac{4}{10} = 0.4$     b.  $2\frac{1}{2} = 2\frac{1}{2} \times \frac{5}{5} = 2\frac{5}{10} = 2.5$     c.  $3\frac{3}{5} = 3\frac{3}{5} \times \frac{2}{2} = 3\frac{6}{10} = 3.6$

### C<sub>3c</sub>

When the pupils understand this concept ask them to complete the activities in the Pupil's Resource Book on pages 61 and 62.

You may need to give some pupils extra practise with examples before they are ready to work through the activities on their own.

### Answers

#### Activity A

1. 0.3    2. 0.2    3. 0.9    4. 0.7    5. 0.4    6. 0.1    7. 0.2    8. 0.8

#### Activity B

1. 4.2    2. 2.5    3. 3.3    4. 1.2    5. 5.7    6. 6.4    7. 9.9    8. 16.6  
9. 0.5    10. 0.7    11. 0.3    12. 0.4    13. 0.1    14. 0.4

#### Activity C

1. 0.7    2. 0.4    3. 0.2    4. 0.6    5. 0.5    6. 0.9  
7.  $\frac{9}{10}$     8.  $\frac{1}{5}$     9.  $\frac{4}{5}$     10.  $\frac{1}{2}$     11.  $\frac{2}{5}$     12.  $\frac{1}{10}$   
13. 2.7    14.  $5\frac{3}{10}$     15.  $10\frac{9}{10}$     16. 4.5    17. 8.2  
18.  $3\frac{1}{10}$     19. 7.4    20.  $1\frac{1}{2}$     21. 6.6    22.  $10\frac{4}{5}$



Do all the pupils understand the relationship between fractions and decimals?

## Unit 4: Number

**T<sub>4a</sub>**

**Materials**  
bundles of sticks

Revise the value of decimal numbers with the pupils.

Draw a place value chart on the board. Revise place value of whole numbers then extend it to show a decimal fraction which is based on tenths.

hundreds	tens	ones	decimal point	tenths
	1	4	.	3

We read this number as **fourteen point three**. In figures it is written as 14.3 which means  $14\frac{3}{10}$ .

Use a bundle of sticks to demonstrate this fraction idea. Explain that when 10 sticks are tied together they form 1 whole which is the same as  $\frac{10}{10}$ .

If one stick is taken out from the bundle, the one taken out is 1 tenth of the total. It is one out of the total number of sticks in the bundle which is 10. In symbols, it is written as  $\frac{1}{10}$  and in decimals as 0. 1.

Teach the pupils that

$\frac{1}{10}$  is called a **common fraction** and 0.1 is called a **decimal fraction**.

Use other numbers to demonstrate the relationship between a common fraction and a decimal fraction.

Encourage the pupils to compare their values and put the fractions in order accordingly. For example:

Re-arrange these fractions from the biggest fraction to the smallest fraction.

a. 0.5, 0.1, 0.3 = (**0.5, 0.3, 0.1**)

b. 0.2, 0.6, 0.8 = (**0.8, 0.6, 0.2**)

c. 0.3, 0.9, 0.1 = (**0.9, 0.3, 0.1**)

Do other examples until the pupils understand the concept of sequencing. Include some mixed examples as follows:

d.  $0.1, \frac{1}{2}, 0.7 = \mathbf{0.7, \frac{1}{2}, 0.1}$       e.  $\frac{3}{5}, \frac{1}{2}, 0.4 = \mathbf{0.4, \frac{1}{2}, \frac{3}{5}}$

Introduce mixed fractions too.

Write some examples on the board and work with the pupils to put them in order. Start with the smallest.

$1\frac{3}{10}, 1.1, 1\frac{1}{2}, 1.7 = (\mathbf{1.1, 1\frac{1}{2}, 1\frac{3}{10}, 1.7})$

$3\frac{1}{2}, 3\frac{3}{4}, 3, 3\frac{6}{10} = (\mathbf{3, 3\frac{1}{2}, 3\frac{3}{4}, 3\frac{6}{10}})$

Show the pupils how to convert the fractions to a common denominator so that their value can be compared.

Then order them according to values from biggest to smallest or the other way round. Encourage the pupils to talk about each fraction and to compare their values using > and <. Also encourage the pupils to think of the fraction equivalence.

## Topic 8: Fractions and Decimals

**C<sub>4a</sub>**

Revise the symbols < (less than) and > (greater than) with the class before they go on to the activities in the Pupil's Resource Book on pages 63 and 64.

### Answers

#### Activity A

1. 0.5    2. 0.4    3. 0.9    4. 0.5    5. 0.8  
 6. 0.1    7. 0.2    8. 0.5    9. 0.6    10. 0.1  
 11. 0.3, 0.7, 0.9    12. 0.1, 0.5, 0.8    13. 0.4, 0.5, 0.6    14. 0.9, 1.1, 1.3  
 15. 1.4, 1.7, 1.9    16. 2.6, 2.8, 3.1    17. 0.5, 5.0, 5.8    18. 0.5, 0.8, 1.8

#### Activity B

1.  $0.1 < 0.8$     2.  $0.3 < 0.7$     3.  $0.9 > 0.8$     4.  $0.6 > 0.5$     5.  $0.7 > 0.2$   
 6.  $1.3 < 1.5$     7.  $1.8 > 1.5$     8.  $1.9 > 1.7$     9.  $2.3 > 1.8$   
 10. 0.6, 0.5, 0.4, 0.1    11. 1.6, 0.9, 0.8, 0.3    12. 1.9, 1.1, 1.0, 0.1

#### Activity C

1. 0.2, 0.3,  $\frac{4}{10}$ , 0.9    6.  $1\frac{1}{2}$ , 1.3, 0.9, 0.7  
 2.  $\frac{3}{10}$ , 0.5,  $\frac{8}{10}$ , 0.9    7.  $1\frac{9}{10}$ ,  $1\frac{3}{5}$ , 1.5, 1.4  
 3. 0.4, 0.5,  $\frac{6}{10}$ , 0.9    8. 1.9,  $1\frac{4}{5}$ , 1.5, 0.5  
 4. 2.1, 2.2,  $2\frac{3}{10}$ , 2.4    9.  $2\frac{2}{5}$ , 2.3, 1.8,  $1\frac{3}{5}$   
 5.  $\frac{9}{10}$ , 2.1, 2.4, 2.5    10. 0.9, 0.8,  $\frac{7}{10}$ ,  $\frac{3}{5}$ ,  $\frac{2}{5}$ , 0.1



Can all the pupils recognise the value of decimals and put them in the correct order?

**T<sub>5a</sub>**

Explain how to add decimal fractions. Use this example to show pupils how to add decimal fractions.

	tens	ones	decimal point	tenths
	1	4	.	0
+	1	6	.	3
	2	0	.	3

Start with the tenths column.

$0 + 3 = 3$ . Write in the answer.

Put in the decimal point.

4 ones and 6 ones = 10 ones. So write the 0 in the ones column and carry the 1 ten.

1 ten and 1 ten is equal to two tens. Answer = **20.3**

## Unit 4: Number

Emphasise to the pupils that they must always remember the place value of the whole numbers and the decimals. Use further examples to give the pupils practise, such as:

	<b>tens</b>	<b>ones</b>	<b>point</b>	<b>tenths</b>			<b>tens</b>	<b>ones</b>	<b>point</b>	<b>tenths</b>
		2	.	5			1	9 <sup>1</sup>	.	3
+		3	.	3		+		3	.	8
		5	.	8			1	3	.	1

Remind the pupils that they must always begin their calculation with the smallest value.

In these examples they must start with the tenths, then add the ones, then add the tens and so on.

The decimal point must be put in the answer too.

Here are some more examples to work through to give the pupils more practice.

$$10.6 + 5.8 = (16.4)$$

$$11.8 + 0.9 = (12.7)$$

$$8.3 + 2.3 = (10.6)$$



When the pupils have worked through some examples on the board ask them to complete the activities in the Pupil's Resource Book on pages 64 and 65.

### Answers

#### Activity A

- |                                   |                                   |                                   |                                   |
|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| 1. 16.5                           | 2. 16.6                           | 3. 19.8                           | 4. 28.1                           |
| 5. 39.2                           | 6. 19.3                           | 7. 18.1                           | 8. 48.3                           |
| 9. 15.6<br>+ 13.7<br><u>29.3</u>  | 10. 14.8<br>+ 14.6<br><u>29.4</u> | 11. 13.5<br>+ 11.9<br><u>25.4</u> | 12. 12.8<br>+ 24.8<br><u>37.6</u> |
| 13. 37.0<br>+ 12.7<br><u>49.7</u> | 14. 55.5<br>+ 33.3<br><u>88.8</u> | 15. 30.9<br>+ 17.4<br><u>48.3</u> | 16. 17.9<br>+ 29.8<br><u>47.7</u> |

#### Activity B

- |           |             |                   |
|-----------|-------------|-------------------|
| 1. 49.6   | 2. 40.6     | 3. 48             |
| 4. 42.3   | 5. 57.3     | 6. 162.3          |
| 7. 182.4  | 8. 120.2    | 9. 113.6          |
| 10. 170.5 | 11. 278.3   | 12. 173.7         |
| 13. 103.6 | 14. 1,032.1 | 15. 19.9 and 18.7 |

## Topic 8: Fractions and Decimals

### Activity C

+	12.5	13.6	11.4	10.3
34.4	46.9	48	45.8	44.7
19.7	32.2	33.3	31.1	30
23.6	36.1	37.2	35	33.9
21.5	34	35.1	32.9	31.8

+	42.5	23.6	16.4	14.2
54.4	96.9	78	70.8	68.6
29.7	72.2	53.3	46.1	43.9
26.6	69.1	50.2	43	40.8
71.5	114	95.1	87.9	85.7

**T<sub>5b</sub>**

Introduce the subtraction of numbers which include decimal fractions. Write these examples on the board.

$$\begin{array}{r} 6 \text{ } 13 \\ 5 \text{ } 7 \text{ } 3 \text{ } . \text{ } 5 \\ - 3 \text{ } 2 \text{ } 6 \text{ } . \text{ } 4 \\ \hline 2 \text{ } 4 \text{ } 7 \text{ } . \text{ } 1 \end{array}$$

Begin with the tenths. Remember the decimal point. Trade as necessary. This should be revision for your pupils.

Go through these examples on the board with the class.

a).  $416.8$

$- 315.7$

\_\_\_\_\_

b).  $225.3$

$- 104.8$

\_\_\_\_\_

c).  $217.2$

$- 109.6$

\_\_\_\_\_

d).  $100.3$

$- 51.5$

\_\_\_\_\_

**C<sub>5b</sub>**

Ask the pupils to complete the activities in the Pupil's Resource Book on pages 65 and 66.

### Answers

#### Activity A

1.  $141.7$

2.  $113.3$

3.  $135.3$

4.  $134.3$

5.  $253.1$

6.  $211.1$

7.  $212.2$

8.  $111.1$

9.  $120.1$

10.  $231.2$

11.  $213.1$

12.  $233.2$

#### Activity B

1.  $136.5$

2.  $20.8$

3.  $239.2$

4.  $45$

5.  $109.1$

6.  $106.3$

7.  $321.8 - 127.9$

8.  $7$

9.  $9$

10.  $2$

#### Activity C

1.  $17.2$

$- 9.8$

$7.4$

2.  $213.0$

$- 47.2$

$165.8$

3.  $164.5$

$- 76.8$

$87.7$

4.  $101.0$

$- 69.7$

$31.3$

5.  $223.4$

$- 94.0$

$129.4$

6.  $312.0$

$- 198.3$

$113.7$

7.  $144.5$

8.  $21.5$

9.  $54.4$

10.  $163$

11.  $490.1$

12.  $2.3$



Can all pupils add and subtract numbers up to the first decimal place?

## Unit 4: Number

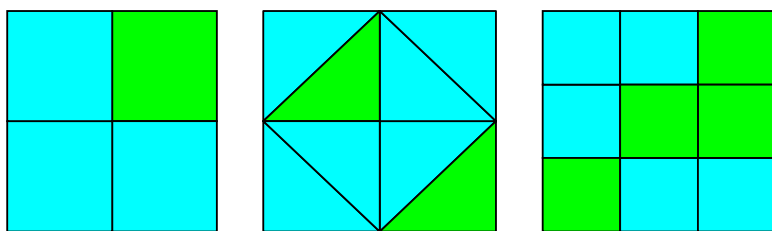
### Support Activities

For pupils who still have difficulties working with fractions and decimals, you should provide practical activities to help them understand. Work with these pupils and encourage them to talk about their work to reinforce the vocabulary you have taught them.

Some suggested activities:

#### Fraction Puzzles

To practice recognising and naming fractions, make some square puzzles. These should be coloured differently on each side, say blue on one side and green on the other. Cut the squares into different patterns as shown.



Pupils can use the shapes to make up and name a range of fractions by turning different parts of the square to blue.

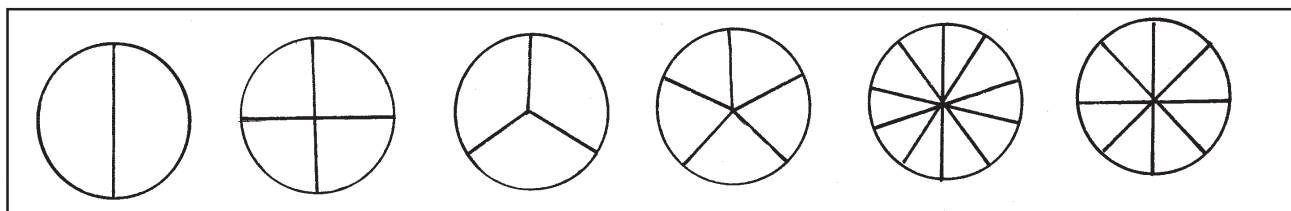
Pupils could also make up their own fraction puzzles.

#### Folding Paper

You can also use sheets of paper folded in different ways and a different number of times to illustrate different fractions.

#### Addition and Subtraction

Make some sets of circular cut out “cakes” to illustrate halves, quarters, thirds, fifths, eighths and tenths as shown.



Use these to demonstrate and practice the addition and subtraction of fractions in a more concrete way.

Allow pupils to count out three quarters plus three quarters for example and see that they can then make up one and a half ‘cakes’.

Give pupils two whole cakes and ask them to take away  $\frac{9}{8}$ . How many cakes are left? Using shapes in this way will help pupils to see the value of the different parts.

You could also use these cut outs to reinforce their understanding of the equivalence of fractions.

#### Fraction Problems

Encourage pupils to apply the skills they have learned about fractions to real life problems. This will help them to do addition and subtraction with more confidence. You will have to work through the problems with the children and make sure that they understand the processes. Show them how

## Extension and Support

drawing diagrams can help them to work out the problem. You could try some of the following:

- If John bought a 10 kilo bag of rice on Monday and his family ate one fifth of the rice every day, on which day would he need to buy another bag?
- Jenny has made some cakes to sell at the market. She sells her cakes for one dollar a slice. If she cuts her cakes into sixths she will make \$24 but if she cuts them into eighths she will make \$32. How many cakes has she made?
- Keri earns \$200 dollars each week. Each week she gives half her wages to her Mum, saves one quarter of her wages in the bank and spends the rest. How much does she give to her Mum? How much does she spend each week? What fraction of her money does she spend?

## Extension Activities

For pupils who understand the concepts in this unit well and need to extend their skills you should provide exploratory activities which encourage them to work independently and think for themselves. Leave them to work on their own once you have explained the activities. You could also use these activities for homework.

Some suggested activities are:

### Fraction Challenges

Give the pupils some problems that they can go away and work on on their own, such as:

How many times can  $\frac{3}{4}$  be subtracted from 12?

How many times can  $\frac{5}{8}$  be taken away from 40?

If Joanne was paid \$800 on Monday and spent half of her salary on Tuesday, half of what was left on Wednesday and so on. How much would be left after she has finished shopping on Saturday?

### Fraction Wheels

Place the following fractions in the circles so that each row of three fractions adds up to the same number.

$\frac{1}{8}, \frac{1}{4}, \frac{3}{8}, \frac{1}{2}, \frac{5}{8}, \frac{3}{4}, \frac{1}{8}$

You could also ask pupils to make up their own fraction wheels and try them on a partner.

### Card Fractions

Give pupils a deck of cards and have them work out the following fractions:

What fraction of the cards are red?

What fraction of the cards are hearts?

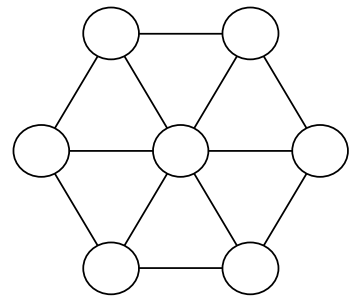
What fraction of the cards are jacks?

What fraction of the cards is the ace of spades?

What fraction of the cards are picture cards?

What fraction of the cards are black picture cards?

And so on. See if they can add some more fractions to the list you give them.





# Unit 4: Number

## Check Up Page: Answers

1. a.  $\frac{3}{5}$       b.  $\frac{1}{4}$       c.  $\frac{1}{2}$       d.  $\frac{1}{2}$       e.  $\frac{1}{3}$       f.  $\frac{1}{4}$

2. a. 0.3      b. 0.2      c. 0.9      d. 0.7      e. 0.5      f. 0.6  
g. 0.8      h. 0.2      i. 2.5      j. 4.2      k. 3.3      l. 6.8

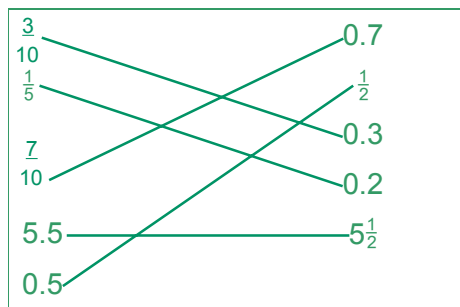
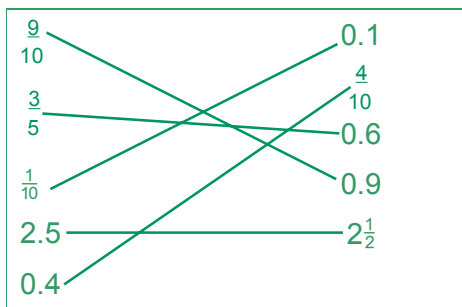
3. a.  $\frac{6}{9}$       b.  $\frac{6}{10}$       c.  $\frac{2}{6}$       d.  $\frac{4}{8}$       e.  $\frac{4}{16}$       f.  $\frac{2}{10}$       g.  $\frac{1}{3}$       h.  $\frac{2}{3}$

4. a.  $\frac{7}{3}$       b.  $\frac{32}{10}$       c.  $\frac{11}{8}$       d.  $\frac{23}{4}$       e.  $\frac{16}{7}$   
f.  $\frac{19}{4}$       g.  $\frac{16}{5}$       h.  $\frac{9}{4}$       i.  $\frac{7}{4}$       j.  $\frac{11}{2}$

5. a. 2      b. 3      c.  $2\frac{1}{3}$       d.  $1\frac{3}{5}$       e.  $1\frac{1}{2}$

6. a.  $2\frac{2}{3}$       b.  $5\frac{5}{6}$       c. 7      d.  $3\frac{5}{8}$       e.  $\frac{1}{6}$       f.  $1\frac{4}{7}$       g.  $7\frac{4}{5}$

7.



8. a. 0.8, 0.5, 0.4, 0.3,  
b. 1.7, 1.4, 0.9, 0.6,  
c. 1.8, 1.7, 1.0, 0.8,

9. a.  $\begin{array}{r} 31.8 \\ - 20.6 \\ \hline 11.2 \end{array}$       b.  $\begin{array}{r} 37.2 \\ - 16.5 \\ \hline 20.7 \end{array}$       c.  $\begin{array}{r} 21.6 \\ + 63.8 \\ \hline 85.4 \end{array}$       d.  $\begin{array}{r} 124.8 \\ - 79.3 \\ \hline 45.5 \end{array}$       e.  $\begin{array}{r} 159.6 \\ + 47.7 \\ \hline 207.3 \end{array}$

10. a.  $5\frac{4}{9}$       b.  $7\frac{5}{7}$       c.  $3\frac{3}{5}$       d.  $13\frac{5}{9}$

e.  $\frac{10}{12}$  or  $\frac{5}{6}$       f.  $16\frac{1}{2}$       g.  $3\frac{2}{6}$  or  $3\frac{1}{3}$       h.  $8\frac{5}{7}$

**Aim:**

To further develop the pupils' knowledge, skills and understanding of measurement. To select appropriate units of measurement and to use these to make calculations.

**Sequence of objectives:** To

1. choose appropriate units when measuring length.
2. calculate length, including cm, m, mm and km.
3. use decimal notation, e.g.  $2.5\text{ m} = 2\frac{1}{2}\text{ m}$ .
4. calculate distance on a map using a scale, eg. 1:20, 1:100.
5. construct scale drawings and plans.

**Rationale:**

This unit enables pupils to develop practical measuring skills and allows them to make calculations based on measurement.

Measurement is a useful skill for many real life activities such as construction, carpentry and shopping. Pupils who can calculate using standard units of measurement accurately, will be able to apply this skill to these activities.

**T<sub>1a</sub>****Materials**

rulers, 20 cent coins, shapes and objects to measure

Remind pupils of the standard units of length they have used in Standard 3 and 4. Write them on the board. Talk about them with the class.

1. The **centimetre** is used for small measurements. For example, the length of an exercise book is about 28 cm and the width is about 18 cm. Have the pupils check by measuring the length and width of their exercise book.
2. The **millimetre** is used to measure very small lengths.  
For example; a) the thickness of a 20 cent coin is 2 mm  
b) the width of a 20 cent coin is 28 mm or 2 cm 8 mm  
c) the thickness of an exercise book is about 5 mm

Have the pupils check these measurements.

3. The **metre** is used to measure longer lengths. For example, the length of a desk is about 1m and its width is about  $\frac{1}{2}\text{ m}$  (50 cm). Check by measuring a desk in the classroom. Write up the measurements on the board.
4. The **kilometre** is used to measure long distances. For example, the distance from the school to the river or the next village.  
Draw the table on the right on the board. Ask the pupils to name more objects. Ask them to identify the unit of measurement, estimate the measurement and then measure the object.

Object	Unit of Measurement	Estimate	Measurement
stamp (length)			
thumb (width)			
exercise book (length)			
board (width)			
door (height)			
classroom (width)			

You can use objects which you have available in the classroom.

## Unit 5: Measurement

### C<sub>1a</sub>

Ask the pupils to measure and explore different lengths for themselves. Let them find appropriate things to measure in millimetres, centimetres and metres.

Ask the pupils to do the activity in the Pupil's Resource Book on page 70.

### Answers

#### Activity A

The answers to 1-8 will vary.

You will need to check these measurements for yourself. You could do this before the lesson, or ask pupils to work with a partner to check each others measurements.

#### Activity B

1. 4 cm      40 mm
2. 5 cm      50 mm
3. 3 cm      30 mm
4. 8 cm      80 mm
5. 2 cm      20 mm

Questions 6 to 12. You will need to check all the pupils line drawings.

### T<sub>1b</sub>

Materials  
card  
scissors

Discuss the different units of measurement with the pupils. Ask them to talk about the different units they have used and what they used them for. For example: **I used centimetres when measuring the width of my exercise book.**

Ask questions like these to check that they can use appropriate measuring units.

- a) What units would you use to measure the length of your forearm? (**cm**)



- b) What units would you use to measure the height of a house? (**m**)



- c) What units would you use to measure your handspan? (**cm and mm**)



- d) What units would you use to measure the distance around an island? (**km and m**)



Talk about the different units and what they are used for with the pupils.

## Topic 17: Length

Explain to the pupils the relationship between the units.

The table below will help them to understand these.

Unit	Written as	Relationship to other units
millimetre	mm	10 mm = 1 cm
centimetre	cm	100 cm = 1 m
metre	m	1,000 m = 1 km
kilometre	km	

You could make a chart and put it on your classroom wall or write the information on the board.

Revise the short form or abbreviations for writing standard measurement units and the relationship between the units.

### C<sub>1b</sub>

Let the pupils work in pairs. Tell them to make a set of cards like the ones below to play a matching game.

200 mm	2 cm	centimetre	cm
200 cm	2 m	millimetre	mm
50 cm	$\frac{1}{2}$ m	metre	m
2000 m	2 km	kilometre	km
35 mm	$3\frac{1}{2}$ cm	500 cm	5 m

Tell them to cut up the cards and place them face down on the table. Each player in turn picks up 2 cards. If they match they have won that pair and they have another go. If they do not match they must turn them over again and leave them in exactly the same place. Then it is the next players turn. The winner is the player who has won most pairs when all the cards are used up.

Ask the pupils to complete the activity in the Pupil's Resource Book on page 71.

### Answers

#### Activity A

1. km
2. mm
3. m
4. m
5. cm
6. m and cm
7. km and m
8. km and m
9. mm
10. m

#### Activity B

1. 27 cm, 16 cm
2. 9 m, 8 m, 60 cm, 15 cm, 5 mm
3. 3 km, 12 m

#### Activity C

1. 2 km
2. 30 cm
3. 4.5 m
4. 18 m
5. 500 m



Can all pupils choose appropriate units to measure length?

## Unit 5: Measurement

### T2a

#### Materials

rulers, metre sticks,  
card strips,  
sellotape

In this activity pupils practice using rulers and metre sticks to measure in centimetres, millimetres and metres. They also practice to draw lines of a given length.

Show pupils how to use rulers to get accurate measurements in centimetres and millimetres. Emphasise the following:



- Show them the units on the ruler and check that they can identify the millimetre and centimetre marks.
- Ask them to explain what the numbers on the ruler mean.
- Remind them to align the start of the line with the zero on the ruler.

Give the pupils some practice using rulers to measure lines and objects.

Ask them to use their rulers to draw lines of a given length, such as 4 cm, 9 mm or 21.5 cm.

Next show them a metre stick and demonstrate how to use this for measuring longer lengths. If you do not have enough metre sticks have the pupils make them using strips of card and let them measure the correct length with their rulers.

### C2a

Have the pupils work in groups of four to measure their height using metres and centimetres.

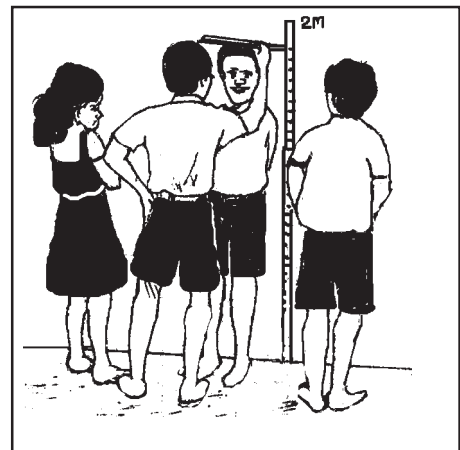
Show them first how to paste two metre strips to the wall.

Then allow each pupil to measure and record their height in metres and centimetres.

Have them compare their heights and decide who is tallest, shortest, and so on. They could also compare their heights with pupils from another group.

When they have finished have them complete the activities in the Pupil's Resource Book on pages 72 and 73.

For Activity C the pupils should work outside in groups of 4 or 5.



## Answers

### Activity A

Check each pupil's work individually.

### Activity B

- |           |            |
|-----------|------------|
| 1. 15 cm  | 4. 15.5 cm |
| 2. 9.5 cm | 5. 8.5 cm  |
| 3. 12 cm  | 6. 18 cm   |

### Activity C

Check each pupil's work individually.

## Topic 18: Length

### T<sub>2b</sub>

Revise the relationship between the metric units of measurement using the chart you prepared in the last lesson.

Ask the pupils:

- How many millimetres are there in 1 cm?
- How many centimetres in 1 metre?
- How many metres in 1 kilometre?

<b>10 millimetres (mm)</b>	<b>= 1 centimetre (cm)</b>
<b>100 centimetres (cm)</b>	<b>= 1 metre (m)</b>
<b>1,000 metres (m)</b>	<b>= 1 kilometre (km)</b>

Show them how to change or convert one unit of measurement into another.

Use this as an example:

How many centimetres are there in 120mm? (**12cm**)

Work with the pupils to find a solution to the question.

Ask the pupils to explain what they did to change millimetres to centimetres. Discuss this with the pupils before showing them how to do it mathematically.

Let the pupils try and come up with the answer. Write their ideas on the board.

$$10 \overline{) 120 \text{ mm}}$$

Explain to them why we divide 120 mm by 10.

Refer to your chart during the explanation.

Go on to explain and use examples to show them the following.

- To change centimetres to metres divide by 100.
- To change metres to kilometres divide by 1,000.

Ask the pupils to explain how to change millimetres to metres.

**(Divide first by 10 to change millimetres to centimetres.  
Then divide by 100 to change centimetres to metres.)**

<b>centimetres</b>	<b>= <u>millimetres</u></b>
	<b>10</b>
<b>metres</b>	<b>= <u>centimetres</u></b>
	<b>100</b>
<b>kilometres</b>	<b>= <u>metres</u></b>
	<b>1,000</b>

Give the pupils some more examples to try.

- Change 500 cm to m. (**5 m**)
- Change 700 cm to m. (**7 m**)
- Change 1000 mm to m. (**1 m**)
- Change 10,000 mm to m (**10 m**)

Ask the pupils to change:

- 2 m 55 cm into cm.

Tell them to change 2 m first = 200 cm then add on 55 cm.

Answer = **255 cm**.

Give them some more examples. Work through them with the whole class.

Example:

- 1 m 10 cm 10 mm = \_\_\_\_\_ mm

Answer = 1000 + 100 + 10 = **1,110 mm**.

- 258 cm = \_\_\_\_\_ m \_\_\_\_\_ cm

Answer = **2 m 58 cm**

## Unit 5: Measurement

**C<sub>2b</sub>**

You can think of other examples before you ask the pupils to copy and complete the activities in the Pupil's Resource Book on pages 73 and 74.

### Answers

#### Activity A

- |                 |                              |
|-----------------|------------------------------|
| 1. 1 m = 100 cm | 5. 1.5 m = 150 cm            |
| 2. 2 m = 200 cm | 6. 3.5 m = 350 cm            |
| 3. 4 m = 400 cm | 7. $2\frac{1}{2}$ m = 250 cm |
| 4. 3 m = 300 cm | 8. 6.5 m = 650 cm            |

#### Activity B

- |          |          |            |
|----------|----------|------------|
| 1. 5 m   | 5. 15 cm | 9. 2 km    |
| 2. 3.5 m | 6. 27 cm | 10. 3.5 km |
| 3. 7 m   | 7. 19 cm | 11. 6 km   |
| 4. 8.5 m | 8. 35 cm | 12. 9.5 km |

#### Activity C

1. 21 m 59 cm
2. 37 m 50 cm
3. 3 m 75 cm
4. 14 km 225 cm
5. 150 km 693 m
6. 236 km 100 m
7. 2,500 m
8. 327 cm
9. 2,250 cm
10. 159 mm
11. 2,280 mm
12. 150,000 cm

**T<sub>3a</sub>**

Revise lengths that include fractions. Example:  $1\frac{1}{2}$  metres = 150 cm.  $2\frac{1}{5}$  cm = 22 millimetres. Explain to the pupils how 22 millimetres is equal to  $2\frac{1}{5}$  cm.

$$\frac{22 \text{ mm}}{10} = 2\frac{2}{10}$$

Then  $\frac{2}{10}$  can be simplified to  $\frac{1}{5}$  by dividing the numerator and denominator by 2, so  $\frac{2}{10} = \frac{1}{5}$  so 22 mm =  $2\frac{1}{5}$  cm.

Make up other examples and use them to consolidate this concept.

Go on to introduce lengths with decimal fractions.

For example: **150 cm =  $1\frac{1}{2}$  m**

**then convert the  $\frac{1}{2}$  to a decimal.**

Remind the pupils that decimal fractions are tenths.

so  $\frac{1}{2}$  m =  =  $\frac{5}{10} = 0.5$  so  **$1\frac{1}{2}$  m = 1.5 m**

## Topic 18: Length

Help the pupils to understand this mathematical concept by giving them more practice.

Do these examples together on the board.

$$4 \text{ m } 25 \text{ cm} = 4 \frac{25}{100} \text{ m} = 4 \text{ m} = 4.5 \text{ m}$$

$$23 \text{ m } 50 \text{ cm} = 23 \frac{50}{100} \text{ m} = 23 \frac{1}{2} \text{ m} = 23.5 \text{ m}$$

$$2 \text{ km } 500 \text{ m} = 2 \frac{500}{1000} \text{ km} = 2 \frac{1}{2} \text{ km} = 2.5 \text{ km}$$

Ask the pupils:

1. If we change metres to kilometres why do we have to divide by 1,000?

**Because there are 1,000 metres in 1 kilometre.**

2. If we change millimetres to centimetres why do we have to divide by 10?

**Because there are 10 millimetres in 1 centimetre.**

3. If we change centimetres to metres why do we have to divide by 100?

**Because there are 100 centimetres in 1 metre.**



Ask the pupils to complete the activities in the Pupil's Resource Book on pages 74 and 75.

### Answers

#### Activity A

- |                               |                               |                    |                      |
|-------------------------------|-------------------------------|--------------------|----------------------|
| 1. 20 mm                      | 2. 200 cm                     | 3. 5 cm            | 4. 4 m               |
| 5. 50 cm                      | 6. 500 mm                     | 7. 1,500 m         | 8. 2.5 km            |
| 9. 50 cm = 500 mm             | 10. 4 cm = 40 mm              | 11. 25 cm = 250 mm | 12. 45 cm = 450 mm   |
| 13. $1\frac{1}{2}$ m = 150 cm | 14. $4\frac{1}{2}$ m = 400 cm | 15. 2.5 m = 250 cm | 16. 7.5 m = 750 m    |
| 17. 1 km = 1,000 m            | 18. 8 km = 8,000 m            | 19. 2 km = 2,000 m | 20. 9.5 km = 9,500 m |

#### Activity B

- |            |              |
|------------|--------------|
| 1. 13.9 cm | 9. 4.5 km    |
| 2. 31.5 cm | 10. 18.5 km  |
| 3. 95.5 cm | 11. 25.5 km  |
| 4. 86.1 cm | 12. 200.5 km |
| 5. 14.5 m  | 13. 5.5 km   |
| 6. 3.5 m   | 14. 218.5 km |
| 7. 55.5 m  | 15. 215.5 km |
| 8. 100.5 m | 16. 22.5 km  |

#### Activity C

- |   |  |
|---|--|
| 1. 400 m                                      | 3. $2\frac{1}{2}$ km or 2.5 km or 2 km 500 m |
| 2. $1\frac{3}{4}$ km or 1.75 km or 1 km 750 m | 4. 2.8 m or 2 m 80 cm                        |

- |          |      |      |      |
|----------|------|------|------|
| +5. a. = | b. < | c. > | d. > |
| e. <     | f. = | g. > | h. = |



## Unit 5: Measurement

### T<sub>4a</sub>

Introduce the pupils to the concept of map reading using a **scale** and how to interpret information using a scale.

Help the pupils to understand statements such as 1 cm = 10 km, 0.5 cm = 12 cm, and so on. It is important to define the meaning of such statements.

Use these questions to discuss with the pupils the concept of scale drawing.

- What is a scale drawing?
- Why do we need to use a scale?
- What happens if the picture or plan is not drawn to a scale?

Explain that before a house is built, the plan of the house is sketched on paper using a scale. Maps are also drawn using scale. They give accurate information about distance or size. Explain to the pupils that they can use their rulers to find the distance between villages, towns, islands etc. on a map using a given a scale. It is important to help the pupils to be able to interpret information on a map using a scale.

Draw 2 dots 20 centimetres (cm) apart on the board. Draw a line to join the dots. Explain to the pupils that the distance shown between the dots can be changed using a scale.

For example:

If the scale is 1 cm = 5 cm, what distance does the 20 cm line on the board represent?

**(100 cm)**

Use different scales for the pupils to see how the same distance on the board (20 cm) can represent a different length using a given scale.

For example:

1 cm = 1 m	20 cm line = 20 m
1 cm = 5 km	20 cm line = 100 km
1 cm = 2 km	20 cm line = 40 km and so on.

### C<sub>4a</sub>

Give the pupils a scale and ask them to draw a line to represent a 20 centimetres distance. For example: **1 cm = 4 cm**

Then ask them,

'What is the length of the line you have drawn?' **(5 cm)**

Explain to them that every 1 cm represent 4 cm.

Ask the pupils to suggest another scale to use.

For example:

**1 cm = 10 cm, 2 cm = 5 cm** etc.

## Topic 18: Length

Help the pupils to understand how the same distance can be changed according to the different scale used.

Ask the pupils to draw these lines.

Write this up on the board.

- a) Draw a line to show 5 km when 1 cm = 1 km.
- b) Draw a line to show 10 km when 1 cm = 2 km.
- c) Draw a line to show 10 km when 1 cm = 5 km.

Check the pupils answers. Then make up more examples of your own. The pupils could work in pairs and check each other's work.

**T<sub>4b</sub>**

**Materials**  
maps, rulers

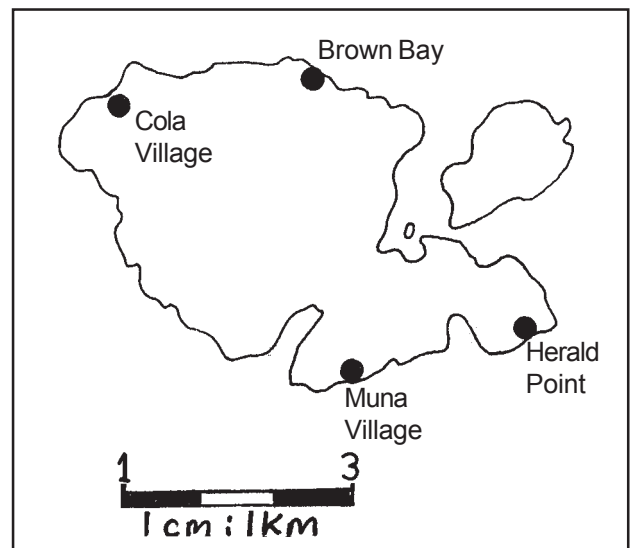
Introduce the pupils to the concept of using scale when drawing real objects and maps.

Explain this to the pupils. A house is always bigger and taller than a sheet of paper therefore, if we want to draw a house we have to scale it down. By accurate measurements we can work to an accurate scale.

For example: we could draw a plan of a desk top by drawing a plan were 1 cm represents 1 metre.

Another example is a map. A map of the world has been reduced so it can fit onto a small piece of paper but it still represents the actual size of the world.

Look at a map with the class. Can they find a scale on the map? Discuss the scale with the class.



**C<sub>4b</sub>**

If you have other maps look at them with the pupils. Let them find the scale on each map.

How is the scale written on the map?

Give the pupils some examples of how scales can be recorded, for example,

a. 1 cm = 5 km

b.   
10 km

c. 1 : 20

Explain how each scale can be read.

Ask the pupils to do the activities in the Pupil's Resource Book pages 76 and 77.

### Answers

#### Activity A

- 1. 2.5 km
- 2. 1.5 km
- 3. 3.5 km
- 4.  $2\frac{1}{2}$  km or 2.5 km
- 5. 5km

# Unit 5: Measurement

## Activity B

- |                 |                            |                  |
|-----------------|----------------------------|------------------|
| 1. 1 cm = 10 km | 2. 1 cm = 100 km           | 3. 1 cm = 100 m  |
| 4. 1 cm = 2 cm  | 5. 1 cm = $\frac{1}{2}$ km | 6. 1 cm = 100 km |

## Activity C

- |          |                 |                                     |
|----------|-----------------|-------------------------------------|
| 1. 50 km | 2. 50 km        | 3. Accept between 325 km and 400 km |
| 4. 50 km | 5. About 275 km | 6. About 150 km                     |

**T5a**

**Materials**  
rulers  
plan of house

Give the pupils some practise using scales. For example, a scale of **1 cm = 20 cm**.

Ask them to: a) draw a line that represent 80 cm?

b) draw a line that represents 40 cm?

You could add some more examples until the pupils understand and can do this accurately.

Ask the pupils what could be a sensible scale for drawing a plan of a house.

A plan of a house could be drawn where 1 centimetre represents 5 metres.

Pupils will be able to read and understand a plan if an example is used. Draw a plan of a house and show the pupils how to read the scale to get the right measurements.

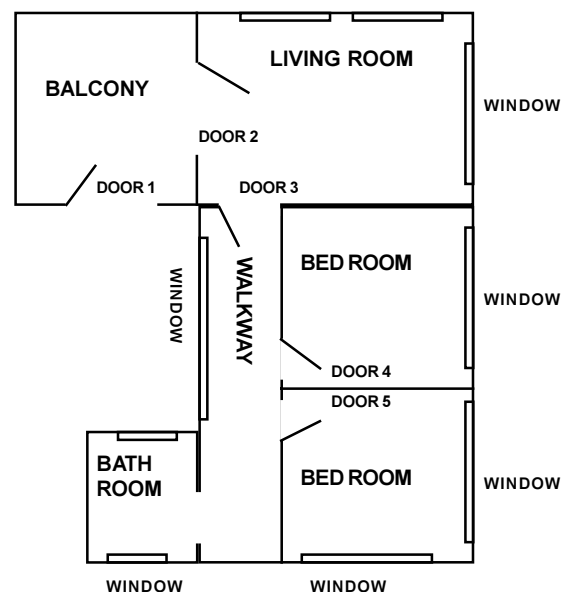
You could have this prepared before the lesson.

Here is an example of a plan you could use.

You may need to adjust the scale when you draw your plan so that the whole class can see the plan.

Choose a scale that is appropriate for the size of your chart paper.

Explain to the pupils how to read and link the scale to the plan. Measure each line in centimetres to find the length on the plan then times by 2 to get the actual measurement in metres. Do this as a whole class activity.



SCALE 1 cm:2 m

**C5a**

Divide the class into groups.

In their groups, ask them to make a sketch of their classroom.

Ask them to actually measure the length and the width of the room or building.

Use their measurements to sketch the room or building on paper using an appropriate scale.

### T5b

Revise the use of scale when drawing plans. Talk about who would need to be able to use this skill in everyday life.

Ask the pupils to come up with ideas. Build up their ideas on the board.

Use words such as architect, builder, carpenter, surveyor, geographer, traveller, motorist, shipbuilder, pilot. You will be able to think of many more.

### C5b

Tell the pupils that they are going to do practical activities using scale. Ask them to work in pairs. Choose appropriate activities from the Pupil's Resource Book on pages 77 and 78.

### Answers

Each pairs answers will vary.

You will need to check all the pupils work.



Can all the pupils draw a plan using an appropriate scale?

## Unit 5: Measurement

### Support Activities

For pupils who need more practice with the measurement skills taught in this unit, you should provide a wide range of practical measurement activities. The best way for pupils to develop confidence with measuring length and using standard units of measurement is to practise.

Work with these pupils and encourage them to discuss the tasks you give them using the measurement vocabulary you have taught them.

Some suggested activities are as follows:

1. Have pupils work in pairs. Let each pupil draw a shape or line on a piece of paper and measure its length or perimeter with a ruler. These could be solid 2D shapes or lines with angles and corners. Have them write down their measurement and then swap their papers with their partner. They then estimate the length and measure each other's lines and compare their results.
2. Introduce pupils to other measuring tools. They are already familiar with a ruler and a meter stick, teach them how to use a tape measure, a builders tape, a trundle wheel or any other measuring tool you can find. Practice using these to measure a wide variety of familiar objects.
3. Work as a group to measure and draw a scale plan of something familiar like the classroom or the school.


### Extension Activities

For pupils who understand the concepts in this unit well and need to extend their skills, you should provide extra activities which encourage them to work independently and think for themselves. Leave them to work on their own once you have explained the task. You could also use these activities for homework.

Some suggested activities are:

1. Have pupils draw a scale plan of a football field, a rugby pitch or a netball court. To do this they will need to measure the pitch, decide on a scale and construct their diagram to scale. It can be done using metre sticks, but if you have a trundle wheel you could show them how to use this for this task.
2. Have pupils draw a scale plan of their house.
3. Have pupils suggest some non-standard units of measurement that could be used to make approximate measurements such as a pace (a single step or stride). Have them use these to construct a scale plan of the school or village.
4. Give the pupils a scale diagram of an island or a building and ask them to redraw it using a different scale.
5. Give the pupils some real maps of the Pacific, your area or any other maps you have available. Ask them to study the map and the scale to find distances between given places. They could work in pairs and make up questions to ask their partners about the maps and the scales.

## Check Up Page: Answers

1.
  - a. metres
  - b. cm or mm
  - c. km
  - d. mm
  - e. cm
  - f. cm and m
  - g. m
  - h. mm
2.
  - a. 1 m 45 cm or 1.45 m
  - b. 1 m 24 cm or 1.24 m
  - c. 10 cm
  - d. 5 km
3.
  - a.  $2\frac{1}{2}$  m
  - b. 3.5 km
  - c. 89 mm
  - d. 5.5 m
  - e. 50 cm
4.
  - a. 2 km
  - b. 8 km
  - c. 8 km
  - d. 
  - e. Check each pupils drawings.
5. Check each pupil's plan. Check the scale is correct for the drawing. There are many possible right answers.

## Number Topic 5: Multiplication

**Aim:**

To extend and develop multiplication skills to be able to multiply 2 and 3 digit numbers by 2 digit numbers.

**Sequence of objectives:** To

1. revise multiplication tables and use multiplication facts in calculations.
2. revise multiplication of 2 and 3 digits numbers by 1 digit numbers.
3. teach the pupils to multiply 2 and 3 digit numbers by 2 digit numbers.
4. solve multiplication problems and puzzles

**Rationale:**

Pupils use place value charts, counters, shells or stones in practical activities. This will help them to pupils consolidate the concept of regrouping the ones, tens and hundreds and the multiplication algorithm. Through this pupils will become more familiar with multiplication facts and their use in problem solving. These problems will be related to real life situations.

**T<sub>1a</sub>**

**Materials**  
Multiplication square

Make a multiplication square to help revise multiplication tables.

You could draw a chart like this on a large piece of paper and put it up in your classroom. You could draw it out on the board.

Use the square to recall multiplication facts with the class. Show them how to read along the rows and down the columns to find the product of the two numbers at the start of each row and column.

Practise calculations by referring to the multiplication square.

e.g.  $34 \times 75$  involves knowing the following facts:

$5 \times 4$ ,  $5 \times 3$ ,  $7 \times 4$  and  $7 \times 3$ .

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

**C<sub>1a</sub>**

The pupils could draw a multiplication square in their exercise books.

Puzzles and games which provide multiplication practice can be found in the the Pupil's Resource Book on pages 80, 81 and 82.

Ask the pupils to use their multiplication squares to complete these activities.

## Topic 5: Multiplication

### Answers

#### Activity A

##### Race Against the Clock

**Set 1** 12 12 21 18 10 9 18 20 24 27

**Set 2** 16 28 42 32 24 36 12 36 40 20

**Set 3** 14 49 64 0 42 28 24 48 72 63

#### Use Your Tables

1. 32 pupils      2. 28 shells      3. \$45      4. \$1 or 100 cents

#### Activity B

1. Jo 20 Rebecca 28 Marc 27 Adrian 25 Ray 24

2. 77 7. 80 12. 300 17. 300

3. 70 8. 20 13. 86 18. 48

4. 24 9. 88 14. 40 19. 24

5. 69 10. 68 15. 64 20. 30

6. 88 11. 120 16. 32

#### Activity C

##### Find a Home

1.  $4 \times 8 = 32$

2.  $5 \times 9 = 45$

3.  $7 \times 10 = 70$

4.  $3 \times 6 = 18$

##### Fruit Stall

- a. melon
- b. lime
- c. pineapple
- d. lemon
- e. orange

### T1b

#### Materials

geo board, rubber bands or string

Explain to the pupils that any whole number which can be multiplied by another to make a given number is known as a **factor**.

Write the number 12 on the board.

Explain that factors of 12 are 1, 2, 3, 4, 6 and 12.

These are the factors because:

$1 \times 12 = 12$        $3 \times 4 = 12$        $6 \times 2 = 12$

$2 \times 6 = 12$        $4 \times 3 = 12$        $12 \times 1 = 12$

Write these numbers on the board 10, 15, 24.

With the pupils work out what the factors are.

Factors of 10 are 1, 2, 5 and 10.

Factors of 15 are 1, 3, 5 and 15.

Factors of 24 are 1, 2, 3, 4, 6, 8, 12, and 24.

Factors of 10	Factors of 15
$1 \times 10 = 10$	$1 \times 15 = 15$
$2 \times 5 = 10$	$3 \times 5 = 15$
$5 \times 2 = 10$	$5 \times 3 = 15$
$10 \times 1 = 10$	$15 \times 1 = 15$
The common factor of 10 and 15 is 5	



## Unit 6: Number

Let the pupils give you the multiplication sums to explain why each number is a factor.

Ask the pupils to look at the factors of 10 and 15 that are written up on the board.

Ask them to point out the **greatest common factor** of 10 and 15.

Explain that **common** means **the same**. The greatest common factor of 10 and 15 is 5.

Remind the pupils of the relationship between multiplication and division. Tell them that another way of explaining a factor is that factors of a number are those numbers that divide exactly into it, leaving no remainder.

For example 1, 2, 3 and 6 are factors of 6.

$1 \times 6 = 6$  so 6 divided by 1 = 6

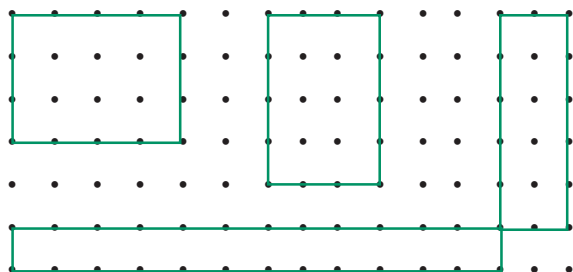
$2 \times 3 = 6$  so 6 divided by 2 = 3

$6 \times 1 = 6$  so 6 divided by 6 = 1

A factor is always a whole number.

### C1b

The pupils should work in small groups. Show the pupils how to use a geo board to show factors. Work through this example with them. You could write up the multiplication facts on the blackboard. How many ways can they make a square or a rectangle on the geo board which covers 12 small squares? They can count the small squares along the side of each shape to find the **factors** of 12.



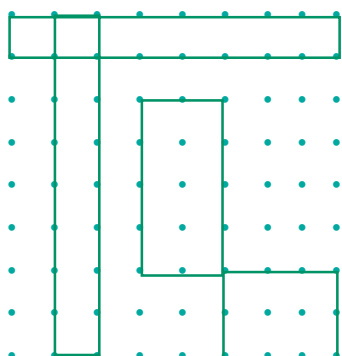
Now ask the pupils to experiment with other numbers e.g. 8, 10, 9 and 20.

Ask the pupils to complete the activities in the Pupil's Resource Book on page 83.

### Answers

#### Activity A

**Factors of 8 are 1, 2, 4, 8**



$1 \times 8$   
 $8 \times 1$   
 $2 \times 4$   
 $4 \times 2$

#### Activity B

1. Factors of 24 are 1, 2, 3, 4, 6, 8, 12, 24

Factors of 32 are 1, 2, 4, 8, 16, 32

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

Factors of 54 are 1, 2, 3, 6, 9, 18, 27, 54

2. Jason 4    Sophie 6/4 or 3,    Ruchi 7    Tom 3

- |         |      |
|---------|------|
| 3. a. T | g. F |
| b. T    | h. T |
| c. F    | i. T |
| d. T    | j. T |
| e. T    | k. T |
| f. F    | l. T |

## Topic 5: Multiplication

### T<sub>1c</sub>

Explain to the pupils that any number which can be divided equally by another number is called a **multiple** of that number.

For example 24 is a **multiple** of 4 because 24 divided by 4 equals 6. Other multiples of 4 are 4, 8, 12, 16, 20, 24, 28 and so on.

Another way of explaining multiples is to say that a multiple of a given number is the product of that number and any other whole number.

Ask the pupils what they notice about this pattern of numbers.

They should be able to recognise the 4 x table here.

Build up multiples of 10 on the board.

Multiples of 10 are 10, 20, 30, 40, 50, 60, 70, 80

Use other numbers to reinforce this concept. If the pupils know their times tables they will find this activity simple.

Here are some more examples you could use.

Multiples of 6 are 6, 12, 18, 24, 30, 36, 42, 48, 54, 60

Multiples of 15 are 15, 30, 45, 60, 75, 90, 105

### C<sub>1c</sub>

Let the pupils look at their multiplication table chart. Revise the multiples of 7, 8 and 9.

Can the pupils count in 7s, 8s and 9s? Play a counting game with the class. Begin with the number 7 and ask the pupils to take turns to call out the next multiple of 7.

They should be able to say 7, 14, 21, 28, 35, 42, 49, 56, 63 and 70. When someone calls a wrong answer, start this again. Make sure everyone in the class has a turn. Do this with 8 and 9 too.

Tell the pupils they must not look at their multiplication square.

They should be able to do this if they know their multiplication tables.

Spend some time revising their tables before asking the pupils to complete the activities in the Pupil's Resource Book on pages 84 and 85.

### Answers

#### Activity A

1. 15, 27, 12, 30      2. 12, 30      3. 16, 24, 12      4. 15, 45, 30      5. 18, 24, 12, 30

#### Branching Out

- A. 5, 25      B. 27, 21      C. 49, 7, 21      D. 16, 28      E. 18, 42      F. 70, 50

#### Activity B

Multiples of 3	9, 12, 15, 18, 21, 24, 27, 30
Multiples of 5	10, 15, 20, 25, 30, 35, 40, 45
Multiples of 7	7, 14, 21, 28, 35, 42, 49, 56
Multiples of 8	24, 32, 40, 48, 56, 64, 72, 80
Multiples of 9	9, 18, 27, 36, 45, 54, 63, 72

# Unit 6: Number

## Activity C

1. 7

2. 4

3. 5

4. 6

5. 1

6. 50

7. 7

8. 4

9. 10

10. 3

11. 3

12. 11

13. 2

14. 6

15. 2

16. 24

17. 24

18. 32

19. 14

20. 42

## Coded Message - Factors and Multiples









T<sub>2a</sub>

**Materials**  
 place value chart,  
 stones, shells or  
 counters, number  
 blocks

Revise 2-digit by 1-digit number multiplication without regrouping. For example; 12 x 4, 24 x 2, 31 x 3

Begin with the multiplication concept. Write 12 x 4 on the board and show this on a place value chart. Put 4 rows of 12 stones on the place value chart. ie. 4 rows of 1 ten and 2 ones.

For example:

Tens	Ones
	
	
	
	
4 tens	8 ones = 48

Talk about the rows of ones and tens in the place value. Start with the ones. Ask:

How many rows of ones are there in the ones place? (4)

How many ones in each row? (2)

How many ones altogether in ones place? (8)

**So 4 rows of 2 ones are 8 ones. (4 twos are 8).**

Continue with the tens. Ask:

How many rows of tens in tens place? (4)

How many tens in each row? (1)

How many tens altogether in tens place? (4)

**So 4 rows of 1 ten are 4 tens. (4 tens are 40).**

**Therefore 40 tens, add 8 ones equals 48.**

Write the totals under each column and remind the pupils that:

**12 multiplied by 4 is 48** which is the same as: **12 x 4 = 48.**

Explain that **12 x 4 = 48** can be written vertically as shown:

Do some more examples on the place value chart such as 24 x 2 and 31 x 3.

12  
x 4  
48

## Topic 5: Multiplication

**C<sub>2a</sub>**

Ask the pupils to work in groups of three or four. Give each group some stones, shells or counters and a place value chart.

Write these multiplication sentences on the board.

$41 \times 2 =$	$21 \times 4 =$	$20 \times 4 =$
$32 \times 3 =$	$33 \times 3 =$	$44 \times 2 =$
$14 \times 2 =$	$22 \times 3 =$	

Ask each group to show the array for each multiplication sentence on the place value chart using stones or counters. Encourage the pupils to talk about the total and let them write out each multiplication sentence in their exercise book.

Tell the pupils to do one multiplication at a time. Check to see that each group gets the work correct before moving on to the next multiplication sentence.

Ask the pupils to complete the activities in the Pupil's Resource Book pages 86. Before they begin, remind them of how to set out the multiplication algorithm.

e.g.  $41 \times 2$  can be written as

$$\begin{array}{r} 41 \\ \times 2 \\ \hline \end{array}$$

$21 \times 4$  is written as

$$\begin{array}{r} 21 \\ \times 4 \\ \hline \end{array}$$

### Answers

#### Activity A

- |       |       |        |        |        |        |        |
|-------|-------|--------|--------|--------|--------|--------|
| 1. 48 | 2. 96 | 3. 88  | 4. 60  | 5. 48  | 6. 84  | 7. 39  |
| 8. 82 | 9. 44 | 10. 66 | 11. 68 | 12. 62 | 13. 99 | 14. 60 |

#### Activity B

- |                  |                  |       |       |       |
|------------------|------------------|-------|-------|-------|
| 1. 11            | 2. 32            | 3. 12 | 4. 33 | 5. 6  |
| 6. $10 \times 3$ | 7. $10 \times 5$ | 8. 14 | 9. 31 | 10. 2 |

## Unit 6: Number

**T<sub>2b</sub>**

Revise 3-digit by 1-digit number multiplication.

Write this multiplication story on the board.

4 canoes transported copra from Gella to Honiara.

The boats loaded 221 bags of copra each.

How many bags of copra did they load altogether?

Solve the problem with the pupils. Find out the number of canoes and the number of copra bags each canoe loaded. **i.e. 4 canoes, each carrying 221 bags of copra.**

Ask the pupils to suggest ways of finding the answer to the question.

Explain that we can do this in two ways.

By multiplying the number of canoes by the number of copra bags each canoe carried like this:	or by repeated addition, like this.
$\begin{array}{r} 221 \\ \times 4 \\ \hline 884 \end{array}$	$\begin{array}{r} 221 \\ 221 \\ 221 \\ + 221 \\ \hline 884 \end{array}$

Repeat this example with some other multiplication stories.

- Three water tanks were filled with water. Each tank held 1,500 litres. How much water was there altogether? **(4,500 litres)**
- Five baskets were filled with eggs to take to the market. If each basket had 28 eggs in it how many eggs were taken to market? **(140)**

**C<sub>2b</sub>**

Ask the pupils to work in pairs.

Write these multiplication sums on the board.

- $\begin{array}{r} 31 \\ \times 4 \\ \hline \end{array}$
- $\begin{array}{r} 227 \\ \times 2 \\ \hline \end{array}$
- $\begin{array}{r} 420 \\ \times 4 \\ \hline \end{array}$
- $\begin{array}{r} 365 \\ \times 3 \\ \hline \end{array}$

Tell the pupils to make up multiplication stories to fit each sum. For example, I planted 4 rows of cabbages. Each row had 31 plants in it. How many cabbages were there altogether?

Encourage the pupils to exchange their multiplication stories and see if they can work out the answers.

Ask the pupils to complete the activities in their Pupil's Resource Book, page 86 and 87.

You may need to talk through the problems with some pupils. Make sure the pupils understand the what they have to do.

## Topic 5: Multiplication

### Activity A

1. 75 bottles
2. 140 days
3. 66 buns
4. 60 people
5. 98 people

### Activity B

1. 252 pupils
2. \$90
3. 52
4. \$404.80
5. \$3,994.20

**T<sub>3a</sub>**

Introduce 2-digit by 2-digit number multiplication. Such as  $24 \times 13$ .

$$\begin{array}{r} 24 \\ \times 13 \\ \hline 72 \\ 240 \\ \hline 312 \end{array}$$

**Say:**

First we multiply **24** by **3**

Next we multiply **24** by **10**

Finally we add the two answers.

Pupils have to learn that when multiplying by a 2-digit number, you multiply by the 'ones' digit first and then the 'tens' digit.

The two answers are placed underneath one another and are added to give the final answer. This is the **product**. The product is the answer obtained by multiplying two numbers together.

Here is another example. Talk through it slowly making sure the pupils follow.

$$\begin{array}{r} 36 \\ \times 15 \\ \hline 180 \text{ (5 x 36)} \\ 360 \text{ (10 x 36)} \\ \hline 540 \end{array}$$

**Say:** First multiply **36 x 5**

**5 times 6 = 30.** Put down the zero and carry the **3 10s**

**5 times 3 = 15 (150),** add the **3 = 18**      So **36 x 5 = 180**

Next multiply **36 x 10**

**10 x 6 = 60.** Put down zero and carry the **6 10s.**

**10 x 3 (30) = 30 (300) + 6 (60) = 360**

Add the two answers to give the final answer.

**180 + 360 = 540**

The **product** of 36 and 15 is **540**.

Do more examples with the class. Ask pupils to come out to the board and talk through some examples too.

## Unit 6: Number

C<sub>3a</sub>

Give pupils more practice. Write these multiplication examples on the board and ask the pupils to copy and complete them in their exercise book. They could check each others' answers to see if they have the correct answer. Encourage the pupils to talk about how they arrived at their answer. Let them tell each other what they did.

a. 38	b. 46	c. 53
$\begin{array}{r} \times 14 \\ \hline \end{array}$	$\begin{array}{r} \times 17 \\ \hline \end{array}$	$\begin{array}{r} \times 18 \\ \hline \end{array}$

Answers: a. **532**  
b. **782**  
c. **954**

Ask the pupils to complete the activities in their Pupil's Resource Book, on pages 87, 88 and 89. Some pupils may need extra help to understand the multiplication stories in Activities B and C.

### Answers

#### Activity A

- |           |           |           |           |           |
|-----------|-----------|-----------|-----------|-----------|
| 1. 1,095  | 2. 540    | 3. 812    | 4. 1,449  | 5. 720    |
| 6. 420    | 7. 1,157  | 8. 1,430  | 9. 1,280  | 10. 1,748 |
| 11. 2,225 | 12. 880   | 13. 966   | 14. 561   | 15. 649   |
| 16. 1,160 | 17. 1,560 | 18. 1,080 | 19. 3,990 | 20. 1,150 |

#### Activity B

- |               |               |          |            |
|---------------|---------------|----------|------------|
| 1. 288 pupils | 2. 238 shells | 3. \$285 | 4. \$31.20 |
|---------------|---------------|----------|------------|

#### Activity C

- |               |                    |           |
|---------------|--------------------|-----------|
| 1. 224 plants | 2. 1,260 mangoes   | 3. \$72   |
| 4. \$59.50    | 5. a. 1,692 lemons | b. \$423  |
| 6. 3,400 kg   | 7. \$40            | 8. 476 kg |

T<sub>3b</sub>

The method used in multiplying a 3-digit number by 2-digit numbers is a new concept for the pupils. Go through another example on the board. Encourage the pupils to tell you what to do next after each step.

For example:  $126 \times 16$ .

We say:

$$\begin{array}{r} 126 \\ \times 16 \\ \hline 756 \\ + 1260 \\ \hline 2016 \end{array}$$

**First multiply the ones column  $126 \times 6$**

**6 times 6 ones = 36.** Put down the **6** and trade the **3** to tens column.

**6 times 2 tens = 12,** add the **3** (tens) = **15.** Put **5** down and regroup **1.**

**6 times 1 hundreds = 6** add the **1** = **7** So  $126 \times 6 = 756$

Next multiply the tens.

**10 times 6 ones = 60**

Write down the **0** trade the **6**

**10 times 2 is 20** add **6** = **26**

write down the **6** trade the **2**

**10 times 1 is 10** add the two = **12**

So  **$126 \times 10 = 1,260$**

Now add the two answers to get the **product 2,016**

## Topic 5: Multiplication

Go through some more examples with the whole class. You could call pupils to the board to do each step of the calculation. Here are some examples you could use.

- a.  $112 \times 14$       b.  $231 \times 13$       c.  $146 \times 17$

**Answers: a. 1,568      b. 3,003      c. 2,482**

**C<sub>3b</sub>**

Write the following multiplication sentences on the board and ask the pupils to practise them in pairs. Let them check each others' work to see if they have set them out correctly.

- d.  $156 \times 17 =$                       e.  $153 \times 18 =$                       f.  $138 \times 14 =$

**Answers: d. 2,6652      e. 2,754      f. 1,932**

Ask the pupils to complete the activities in the Pupil's Resource Book, pages 89 and 90.

## Answers

## Activity A

1. 1,080      2. 3,243      3. 2,016      4. 6,192      5. 6,072      6. 12,408  
7. 5,628      8. 35,490      9. 3,838      10. 21,390      11. 24,941      12. 13,260

## Activity B

- |    |       |    |       |    |       |
|----|-------|----|-------|----|-------|
| 1. | 162   | 2. | 768   | 3. | 560   |
|    | 972   |    | 96    |    | 1,040 |
|    | 216   |    | 816   |    | 1,760 |
|    | 3,024 |    | 288   |    | 800   |
|    | 378   |    | 576   |    | 480   |
|    | 1,080 |    | 384   |    | 2,800 |
|    | 486   |    | 1,152 |    | 1,600 |
|    | 1,458 |    | 240   |    | 160   |
| 4. | 1,728 | 5. | 432   | 6. | 910   |
|    | 384   |    | 1,152 |    | 1,540 |
|    | 5,376 |    | 216   |    | 980   |
|    | 672   |    | 864   |    | 630   |
|    | 1,920 |    | 360   |    | 2,450 |
|    | 864   |    | 792   |    | 2,800 |
|    | 2,592 |    | 576   |    | 560   |
|    | 288   |    | 1,728 |    | 490   |

## Activity C

## Brain Teaser

- a.  $\begin{array}{r} 459 \\ \times 30 \\ \hline \end{array}$       b. 13,770      c.  $\begin{array}{r} 430 \\ \times 95 \\ \hline \end{array}$
- d. 40,850

## Multiplication Puzzle

### Across

## Down

[illegible]



## Unit 6: Number

### T<sub>4a</sub>

Here is a problem which can be solved using multiplication. Write it up on the board.

The School bought 15 cartons of books. The books were packed in boxes of 18 and the boxes were packed into cartons. 36 boxes fitted into each carton. How many books did the school buy?

Ask the pupils to think carefully about the problem. Talk through the process of solving the problem with them, asking them to suggest what has to be done at every stage and to explain their suggestions carefully. You could use the following questions as a guide.

- **What is the problem asking you to find out?** (The total number of **books** the school bought.
- **What information does it tell you?** (How many cartons the school bought (**15**), how many boxes were in each carton (**36**) how many books in each box (**18**).
- **What operation can you use to find out the answer to the problem?** (multiplication)

- **How will you approach it?** Multiply the number of books by the number of boxes (18 x 36) to find out how many books were in each carton and then multiply this number by the number of cartons.
- **Is there more than one way of doing it?** Can pupils suggest another way? (Multiply the number of boxes by the number of cartons first, then multiply the total by 18 to find the number of books)

18 books x 36 boxes	36
	x 18
	360
	<u>288</u>
books per carton	<u>648</u>
648 books x 15 cartons	648
	x 15
	6,480
	<u>3,240</u>
books in 15 cartons	<u>9,720</u>

When you have finished talking through how to solve the problem, solve it with the class. Set the sums out as shown, and work out the answer. Have the pupils try both methods and see if they get the same answer.

### C<sub>4a</sub>

Remind the pupils that when they read a problem they must think about these points.

- What is to be found out?
- What is given?
- What can be assumed?
- What needs to be done first?
- What happens next?
- How many steps?

Let the pupils work in pairs to solve the problems in the Pupil's Resource Book pages 91, 92, 93 and 94 together.

Encourage them to talk through each problem before they work out the answers.

## Answers

### Activity A

1. 112 coconuts
2. 78 people
3. 48 pieces of cake
4. 210
5. 35 km

### Guess the Number

- |      |      |
|------|------|
| A 18 | C 45 |
| B 6  | D 15 |

### Football Puzzle

108 studs

## Topic 5: Multiplication

6. a. 63 players  
b. 63 players

### Activity B

1. Orange 1,080  
Mango 312  
Pineapple 950  
Banana 1,216

### 5. Brain Teaser

63 or 72  
x 72      x 63  
both give 4,536

2. Pawpaw 1,148  
Mandarin 560  
Avacado 340  
Lemon 484

3. 2,250 eggs

4. 768 pens

### Activity C

1. a. \$1,920  
b. No - because  $\$240 \times 5$  and then  $\$180 \times 5 = \$2,100$  which is more than \$1,920
2. a. \$27      b. \$13.50      c. \$50      d. \$63
3. 84 mins or 1 hour 24 mins      4. a. \$280      b. \$560      c. \$1,120      d. \$14,560
5. \$5,500      6. \$280

Puzzle 1 10 pieces

Puzzle 2 20 km



Can all the pupils solve multiplication problems and puzzles?

## Support Activities

For pupils who need more practice with multiplication skills, you should provide activities, which approach the same operations in a different way. Work with these pupils to provide support and help and encourage them to talk about the activities as they go along. Discussing the processes they use helps them to understand them better and develops their confidence.

### Some Suggested Activities

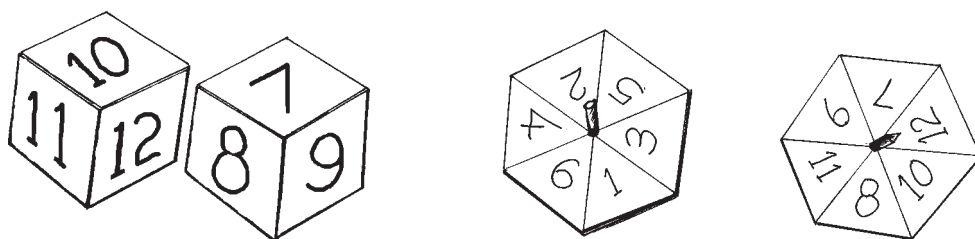
#### Multiplication Tables

The key to success in multiplication is knowing your tables. If pupils know their multiplication facts and can recall these easily, then multiplication problems will be easy for them. Any activity that encourages pupils to learn their tables will be valuable for those needing support. Try not to simply teach pupils to recite their tables. Not only is this boring, it is also not very meaningful. There are plenty of other ways to make learning your tables interesting and fun, such as:

**Dice games** are good for practicing tables up to 6

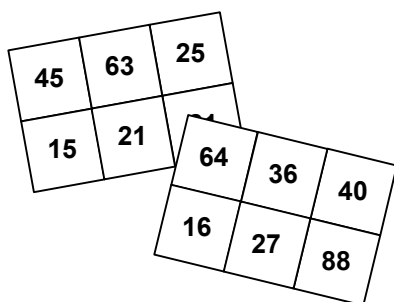
Play in pairs, take turns to throw two dice and calculate the product of the two numbers thrown. Write this down as your score, the first person to reach 100 wins.

Play in groups throw two dice and see who can calculate the product quickest, the first to give the right answer gets a point, the first to 6 points wins.



These can be extended to practice tables up to 12 if you make your own dice showing numbers 7 – 12 or if you make simple spinners, to spin and show the numbers.

#### Multiplication Bingo

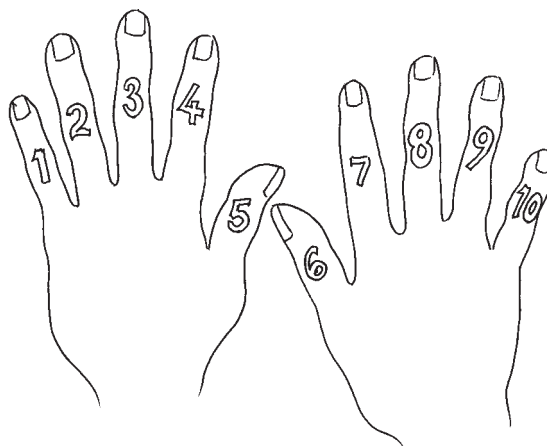


This is another game which is easy to make and gives lots of practice with multiplication facts. Prepare bingo cards with multiples on them like these on the left.

Call out multiplication sums, such as 'five times nine', or 'eleven multiplied by eight' and have pupils cover the answer if it appears on their card. The first to cover all six spaces on their card shouts Bingo – they are the winner.

#### Tricks with tables

Here's a useful trick you can teach pupils to help them remember their nine times table. Tell them to put up the fingers of both hands and imagine that they are numbered as in the picture.



## Extension and Support

To find a multiple of 9, say  $4 \times 9$ , they have to put down finger number 4 and then count how many fingers are left standing before it (3) and how many are left standing after it (6). Put these together (36) and they give you're your answer. Try it again with other multiples of 9. For example to find  $9 \times 9$  put down finger number 9. there are 8 fingers left standing before it and only one after it. Put these together to get the answer:  $9 \times 9 = 81$

### Problem Solving

To help pupils who are struggling with problem solving try setting problems that start with one straightforward multiplication operation, but grow more complicated as you work through them. Here is a suggested example:

1. James sold 15 mangoes for 3 dollars each how much did he make? (\$45)
2. James' dad had promised that he would **double** the money James made in the market, how much did his dad give him? (\$45), How much did he have then? (\$90)
3. James saved all of his money. The following week he sold 22 mangoes in the market for \$3 each how much did he make? (\$66) How much did he have after his dad had doubled his money? (\$132)
4. James spent some of this money and saved the same amount as last week. What were his total savings? (\$180)
5. If James saved \$90 a week for 6 weeks how much would he have? (\$540)

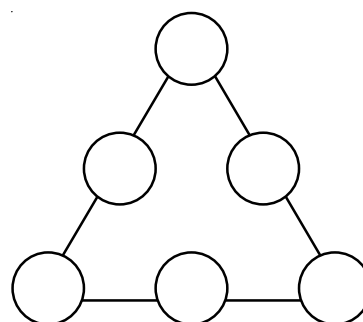
### Extra Activities Extension

For pupils whose multiplication skills are strong, you must provide activities to help them extend and apply these skills. Multiplication is a great subject for exploratory activities, which encourage the pupils to experiment with multiplication and find out patterns and sequences. Once you have explained the activities leave the pupils to work alone. You could also use these activities for homework.

#### Some Suggested Activities

**Triangle Multiplication** – give the pupils some of the following triangle puzzles to work out. You could prepare these on pieces of card before the lesson so that you don't have to spend time writing them on the board.

1. Place the numbers 4, 5, 6, 8, 10 and 12 in the circles so that each side of the triangle comes to 240 when multiplied.
2. Place the numbers 4, 5, 6, 8, 10, and 12 in the circles so that each side of the triangle comes to 480 when multiplied.



They could also make up your own triangle puzzles and try them out on their friends.

**Looking for Patterns.** Set the pupils the following task and have them work through it and see what they can find out. Write it on a card before the lesson.

Complete the multiplication pairs below then explain the patterns you have found:

$7 \times 7 =$
$5 \times 9 =$

$9 \times 9 =$
$7 \times 11 =$

$4 \times 4 =$
$2 \times 6 =$

$8 \times 8 =$
$6 \times 10 =$

## Unit 6: Number

Next use the pattern you have discovered to write down the answers to these problems without working them out. You can do the calculation afterwards to check your answers if you wish.

- |                              |      |                  |
|------------------------------|------|------------------|
| 1. If $18 \times 18 = 324$   | then | $16 \times 20 =$ |
| 2. If $33 \times 33 = 1,089$ | then | $31 \times 35 =$ |
| 3. If $88 \times 88 = 7,744$ | then | $86 \times 90 =$ |
| 4. If $69 \times 69 = 4,761$ | then | $67 \times 71 =$ |

Can you use the same pattern to find an easy way to work out the following?

1.  $18 \times 22$
2.  $38 \times 42$
3.  $68 \times 72$
4.  $28 \times 32$
5.  $48 \times 62$
6.  $88 \times 92$

### Check Up Page: Answers

- |                 |                    |                       |            |
|-----------------|--------------------|-----------------------|------------|
| 1. 369          | 2. 64              | 3. 72                 | 4. 435     |
| 5. 216          | 6. 1,200           | 7. 1,035              | 8. 117     |
| 9. 336          | 10. 576            | 11. 3,268             | 12. 1,750  |
| 13. 2,717       | 14. 5,304          | 15. 10,296            | 16. 19,754 |
| 17. 5720 people | 18. a. 336 minutes | b. 5 hours 36 minutes |            |
| 19. 540 loaves  | 20. 6,642 kg       | 21. 1,824 plants      |            |

**Aim:**

To extend and develop division skills from 2 to 4-digit numbers divided by one digit numbers.

**Sequence of objectives:** To

1. divide 2-digit numbers giving answers with remainders.
2. divide 2 and 3-digit numbers by 1-digit numbers.
3. divide 3 and 4-digit numbers by 1-digit numbers.
4. find the average of a set of numbers.
5. solve problems involving calculations of average.

**Rationale:**

In this topic, the pupils extend division skills from 2 to 4-digit numbers being divided by 1-digit numbers. Pupils will develop their understanding of the link between multiplication and division. They will learn how division can be useful when finding averages. People in their daily life should know how to interpret an average.

T1a

**Materials**

counters, stones,  
shells, seeds

Revise the standard notation for division. Remind the pupils of a simple division problem.

**How many circles are there in 4 rows of 5?**

This is a multiplication problem.  $4 \times 5 = 20$ .

The problem can be changed into a simple division problem.

**How many rows of 5 can be made from 20 circles?**

This can be written as  $5 \overline{)20}$  which is the same as  $20 \div 5 = 4$

Explain, that the division facts are built on a recall of the corresponding multiplication facts.

This kind of division is often known as **exact division**. It has no remainder.

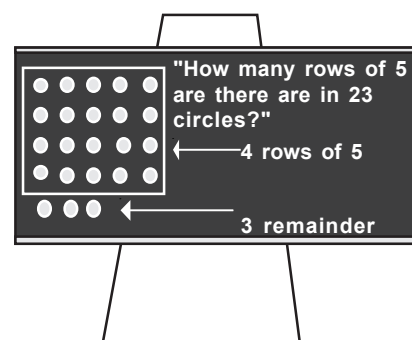
Give enough examples of this kind of division to ensure that pupils remember how to write standard notation for division. Then introduce a division problem that is not exact. This kind of division has a **remainder**.

**How many rows of 5 are there in 23 circles?**

Show the pupils that the answer is 4 rows of 5 and 3 left over.

Now introduce the pupils to the language of remainders.

**Twenty three divided by five is equal to four remainder three**



Show the pupils how to write this in standard notation.

Provide enough examples of division with remainders to ensure that pupils learn the language of division and how to write it in standard notation.

Use simple examples.

$$24 \div 5 \quad 31 \div 3 \quad 14 \div 4 \quad 16 \div 3$$

standard notation

$$\begin{array}{r} 4 \text{ r } 3 \\ 5 \overline{)23} \\ \underline{20} \\ 3 \end{array}$$

## Unit 7: Number

C<sub>1a</sub>

Get the pupils to practise the concept of division with remainders using real objects.

Give each pupil 20 stones to share.

Ask them to share the stones into groups of 7.

Ask how many groups of 7 can you make out of the 20 stones?

Get the pupils to put their stones into groups of 7 then count to find out the number of groups with how many are left over.

Emphasise to them that they should use the language of division.

**20 stones divided by 7 is 2 remainder 6.**

Repeat with a different example. Ask **what is twenty five stones divided by four pupils?**

Pupils use their stones to work out that each gets 6 with one left over.

This is written as: **6r1** 25 divided by 4 is 6 remainder 1.

$$\begin{array}{r} 4 \overline{)25} \\ \underline{24} \\ 1 \end{array}$$

Show pupils that a number line can also be used to help them work out a division problem.

For example  $14 \div 4$ .

Draw a number line on the board. Tell pupils to start at 14 and count back in 4s until they can go no further. How many jumps?

How many left over?



So  $14 \div 4 = 3 \text{ r } 2$

Repeat using a number line with other examples. Get pupils to come to the board and demonstrate the use of a number line.

When they have had some more practice, ask the pupils to copy and complete activities from the Pupil's Resource Book on pages 96, 97 and 98 in their exercise book.

### Answers

#### Activity A

- |           |           |            |
|-----------|-----------|------------|
| 1. 2 r 3  | 6. 2 r 2  | 11. 1 r 4  |
| 2. 4 r 2  | 7. 6 r 1  | 12. 3 r 1  |
| 3. 3 r 2  | 8. 2 r 2  | 13. 4 r 2  |
| 4. 2 r 1  | 9. 7 r 1  | 14. 3 r 1  |
| 5. 8 r 1  | 10. 3 r 4 | 15. 6 r 1  |
| 16. 3 r 4 | 21. 2 r 4 | 26. 3 r 1  |
| 17. 5 r 1 | 22. 4 r 1 | 27. 2 r 4  |
| 18. 3 r 2 | 23. 2 r 3 | 28. 3      |
| 19. 9 r 1 | 24. 3 r 1 | 29. 4 r 1  |
| 20. 6 r 1 | 25. 3 r 2 | 30. 12 r 1 |

## Topic 6: Division

### Activity B

1. a.  $22 \div 6 = 3 \text{ r } 4$
- b.  $25 \div 4 = 6 \text{ r } 1$
- c.  $3 \text{ r } 1$
- d.  $7 \text{ r } 1$
- e.  $5 \text{ r } 2$

- f.  $4 \text{ r } 2$
- g.  $3 \text{ r } 2$
- h.  $4 \text{ r } 1$
- i.  $5 \text{ r } 3$
- j.  $6 \text{ r } 3$

2.  $(3) \ 6 \ 8 \ (9) \ 12 \ (11) \ (15) \ 18 \ (17)$
3.  $(7) \ 1 \ 3 \ (12) \ (17) \ 20 \ (22) \ 23 \ (37) \ 41$

4. 

4	5	6
15	16	17

7	8	9
18	19	20

10	11	12
21	22	23

13	14
24	25

A regular pattern of  $\square$   $\triangle$   $\bigcirc$  repeated.

### Activity C

1. 9 pieces, with 2cm left over.
2. 9 with \$2 left over.
3. 3
4. 13
5. 14 bags and 2 buns left over.
6. 10 canoe trips
7. a. 12 exercise books.  
b. not enough money left for any pencils - only \$1

### Quick Practise

1.  $11 \text{ r } 5$
2.  $10 \text{ r } 8$
3.  $12 \text{ r } 3$
4.  $14 \text{ r } 1$
5.  $25 \text{ r } 1$
6.  $15 \text{ r } 2$
7.  $19 \text{ r } 3$
8.  $13 \text{ r } 3$
9.  $11 \text{ r } 5$
10.  $15 \text{ r } 2$

### T<sub>2a</sub>

**Materials**  
bundles of sticks.

Introduce the pupils to division of larger, 2-digit numbers. For example:

Work through the problem demonstrating with sticks as follows:

Ask, **how many bundles of 3 sticks can be made from a total of 38 sticks?**

Pupils should be able to tell you that **there are 12 bundles, with 2 sticks left over.**

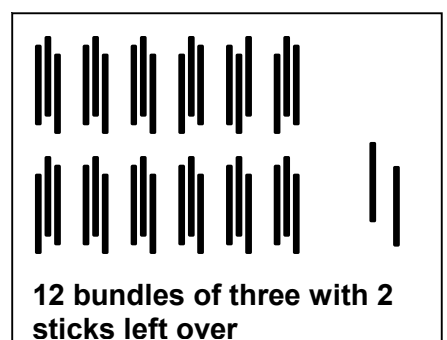
Emphasise the language that can be used to present this same problem, and the answer, in different ways, as follows:

#### Problem

- How many threes in 38?
- How many groups of 3 can be made from 38
- 38 divided by three?
- $38 \div 3$

#### Answer

- Twelve remainder two
- Twelve with two left over
- 12 remainder 2
- $12 \text{ r } 2$



Show the pupils how to set out the correct notation for each stage in the calculation and talk through the sum to find the answer.



## Unit 7: Number

The notation is →

$$\begin{array}{r} 12r2 \\ 3 \overline{) 38} \\ \underline{- 30} \\ 8 \\ \underline{- 6} \\ 2 \end{array}$$

Share the tens

Can you share 3 tens among 3?

Yes 1 ten each.

Then share the ones.

Can you share the 8 ones among 3?

Yes, 2 and 2 remain.

You could explain to the pupils that the division is done in two steps. 38 is made up of 30 + 8. First, share the tens (3 tens which is 30).

The answer is 10 because  $3 \times 10 = 30$ . So write 1 (for ten) in the tens column. Then subtract 30 to give 8.

Then share the ones (8 ones) into 3s. The answer is 2 threes = 6 and 2 left over (remainder). Write 2 in the ones column and 6 underneath the 8. Subtract the 6 to give a remainder of 2.

Emphasise the place value position of the answer.

Introduce the pupils to the names of the numbers.

Go through some more examples with the class.

$$2 \overline{) 27} \quad 5 \overline{) 53} \quad 3 \overline{) 41}$$

$$\begin{array}{r} 12 \leftarrow \text{quotient} \\ 3 \overline{) 38} \leftarrow \text{dividend} \\ \underline{30} \\ 8 \\ \underline{6} \\ 2 \leftarrow \text{remainder} \end{array}$$

divisor

Emphasise to the pupils that to be able to work out these division sums they must know their multiplication facts well.

**C<sub>2a</sub>**

Give the pupils plenty of practise in sharing using concrete materials such as stones, shells etc. Get the pupils to share large dividends by single digit divisors.

Give the pupils dividends larger than numbers used in the multiplication tables and then ask them to share them into single number groupings.

Example: Share (divide) 54 shells by 4.

Practise sharing the tens (10s) first then the ones.

Encourage the pupils to talk to each other about their division.

Encourage them to use correct division language and write the correct notation.

Ask the pupils to turn to the Pupil's Resource Book on pages 98 and 99.

Activity A gives the pupils extra practice in using their multiplication facts. It is a good activity for all the pupils to do since it reinforces the relationship between multiplication and division.

### Answers

#### Activity A

- |       |      |      |       |        |
|-------|------|------|-------|--------|
| 1. 8  | 2. 7 | 3. 6 | 4. 9  | 5. 6   |
| 6. 14 | 7. 6 | 8. 8 | 9. 12 | 10. 12 |

#### Activity B

- |              |                 |              |       |       |
|--------------|-----------------|--------------|-------|-------|
| 1. 13        | 2. 26           | 3. 14        | 4. 16 | 5. 12 |
| 6. 14        | 7. 13           | 8. 14        | 9. 17 | 10. 9 |
| 11. 8 shells | 12. 24 coconuts | 13. 19 cents |       |       |

## Activity C

1. 3 buns
2. 5 mangoes
3. 8 boxes
4. 3 lollies
5. \$12

**T<sub>2b</sub>**

**Materials**  
counters, stones,  
shells, sticks

In this activity you extend the pupil's skills to divide larger numbers by introducing a 3-digit dividend.

Use division stories to make the division problems more meaningful to the pupils.

Encouraging pupils to think of these operations in relation to real life situations, helps them to understand the purpose of learning division skills and makes the calculations more meaningful.

Using the example, ask the pupils to tell you what calculation they need to do in order to find the answer. Another way of saying this is, 'What needs to be divided by what?' **134 shells need to be divided between (or by) 4 boys.**

Show the pupils how to set out this sum correctly as shown.

The dividend is 134, and the divisor is 4.

Share the tens first. There are 13 tens. 13 divided by 4 is 3 with one remainder.

Explain that we write down the tens we have used (12) underneath the total number of tens (13) and subtract to find this remainder.

We add the ones to this left over 10 to give 14. We do this by bringing down the 4 from the dividend and placing it next to the one ten.

Now share the 14 ones, 14 divided by 4 is 3 with two remainder.

Write this as 3 r 2, making the answer 33 r 2.

It is important to teach the pupils to line up their division algorithms correctly, so that they bring down the right number each time. You can help them to do this by referring to the place value of each digit as you talk through the problem.

Give the pupils more division stories and work through them in the same way, for example.

1. Mary and Joanna picked 234 mangoes to sell in the market. How many did they each have when they shared them out? **(117)**
2. There are 125 pupils in Patukae School. There are five classes. How many pupils are in each class? **(25)**
3. When 378 oranges are packed into three boxes, how many will there be in each box? **(126)**

### Division Story

4 boys collected 134 shells and shared them out between themselves. How many shells did each boy get?

### Notation

$$\begin{array}{r} 33\text{r}2 \\ 4 \overline{) 134} \\ \underline{- 12} \phantom{0} \\ 14 \\ \underline{- 12} \\ 2 \end{array}$$

## Unit 7: Number

C<sub>2b</sub>

Have the pupils work with a partner. First tell them each to think up and write down a division story like the examples they have been working on. Then have them calculate the answer, but keep this hidden from their partner.

Next have them swap their problems over and see who can be first to find the right answer to their partner's problem.

When they have had enough practice, have them complete the activities on pages 100 and 101 of the Pupil's Resource Book. Ask them to work with the same partner and discuss their work as they go along.

### Answers

#### Activity A

- |        |        |        |        |         |
|--------|--------|--------|--------|---------|
| 1. 107 | 2. 210 | 3. 101 | 4. 105 | 5. 207  |
| 6. 107 | 7. 175 | 8. 202 | 9. 61  | 10. 309 |

#### Activity B

- |          |       |       |        |
|----------|-------|-------|--------|
| 1. \$120 | 2. 25 | 3. 30 | 4. 214 |
|----------|-------|-------|--------|

#### Activity C

- |                                       |          |          |                         |
|---------------------------------------|----------|----------|-------------------------|
| 1. \$87, \$2 leftover or \$87.50 each | 2. 16, 1 | 3. 65, 3 | 4. a. 5    b. 5    c. 4 |
|---------------------------------------|----------|----------|-------------------------|



Can all the pupils divide 2 and 3-digit numbers by one digit number?

T<sub>3a</sub>

**Materials**  
digit cards and a  
bag for the division  
race

Now extend the activity further by introducing a 4-digit dividend.

Explain that the process is exactly the same for a 3-digit number as for a 4-digit number. Talk the pupils carefully through the process using the following example.

Ask the pupils to tell you what is to be divided by what? **4,324 is to be divided by 4.**

Ask them where they think they will start the division process? **With the 4**, which represents 4,000 because it is in the thousands place value.

Show them that 4,000 divided by 4 is 1,000 and show them where to place the 1, directly above the 4.

$$\begin{array}{r}
 1,081 \\
 4 \overline{) 4,324} \\
 \underline{4} \phantom{00} \\
 32 \phantom{0} \\
 \underline{32} \phantom{0} \\
 4 \phantom{0} \\
 \underline{4} \phantom{0} \\
 0
 \end{array}$$

Move on to share the hundreds. 3 cannot be shared between 4 so show the pupils how we put a 0 in the hundreds column to show that it was not used. Then move on to the tens.

We change the hundreds to tens to make 32 tens and ask, what is 32 divided by four? **(8)**. Write the 8 above the 2 and move on to the unit's column, what is 4 divided by 4? **(1)**

To give the answer 1,081.

## Topic 6: Division

Now work through some more examples.

$$5,285 \div 5.$$

$$\begin{array}{r} 1,057 \\ 5 \overline{) 5,285} \\ \underline{-5} \phantom{00} \\ 28 \phantom{0} \\ \underline{-25} \phantom{0} \\ 35 \\ \underline{35} \\ 0 \end{array}$$

Begin with the thousands, 5 thousand shared between 5 is 1 thousand, put the 1 above the 5 and move on to the hundreds.

2 (hundreds) cannot be divided between 5. We **put a zero above the 2 to show that the hundreds were not shared** and move on to the tens column. We now have 28 (tens) to share between 5.  **$28 \div 5$  is  $5 \text{ r } 3$** .

Place the 5 above the 8 in the tens place.

**Say  $5 \times 5$  is 25** and write the 25 underneath the 28 tens. We do this to see how many of the tens we have used up, and find out how many are still left to be shared.

Subtract the 25 from the 28 to show the remainder of 3. This figure means that there are three tens left over, still to be shared out.

Bring down the remaining units (5) and add them to the tens to make 25. Divide 35 by 5 to get 7. Write the 7 in the units place.

This is a complicated process and pupils can make mistakes at any stage of the process that will give them the wrong answer. It is important therefore that they understand what to do at each stage and that they have plenty of practice until they are confident and able to set out and calculate the sums accurately.

Here are some more examples you can try. Work through some as above leading the class through each step, then ask pupils to come to the board one at a time and lead the class through some more examples. They will understand the process better if they have to explain it themselves.

Some of these examples also have remainders.

$$\begin{array}{r} 330 \\ 5 \overline{) 1650} \\ \underline{-15} \phantom{00} \\ 15 \phantom{0} \\ \underline{15} \phantom{0} \\ 0 \end{array}$$

$$\begin{array}{r} 546 \text{ r } 4 \\ 6 \overline{) 3280} \\ \underline{-30} \phantom{00} \\ 28 \phantom{0} \\ \underline{-24} \phantom{0} \\ 40 \\ \underline{-36} \\ 4 \end{array}$$

$$\begin{array}{r} 2454 \\ 3 \overline{) 7362} \\ \underline{-6} \phantom{00} \\ 13 \phantom{00} \\ \underline{12} \phantom{00} \\ 16 \phantom{00} \\ \underline{-15} \phantom{00} \\ 12 \phantom{00} \\ \underline{12} \phantom{00} \\ 0 \end{array}$$

$$\begin{array}{r} 1097 \text{ r } 2 \\ 7 \overline{) 7681} \\ \underline{-7} \phantom{00} \\ 68 \phantom{00} \\ \underline{-63} \phantom{00} \\ 51 \phantom{00} \\ \underline{-49} \phantom{00} \\ 2 \end{array}$$

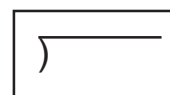


### Division Race

This is a game you could play to provide more practice. Pupils will need their note books and pencils as they will have to write down the sums to work them out.

In a paper or cloth bag, put the digits 1 - 9 on a small pieces of card.

Draw an empty division algorithm on the board.



Ask 4 pupils to pick one digit each and call out the number. Write these on the algorithm in the order that they are called to make the dividend.

When the 4-digit dividend is complete. Choose a suitable divisor, write this on the board and say 'Go'

The first pupil to come up with the correct answer gets a point.

The activities in the Pupil's Resource Book on pages 101, 102 and 103 will provide more practice and develop pupil's confidence with this method of division.

# Unit 7: Number

## Answers

### Activity A

- |           |           |           |           |
|-----------|-----------|-----------|-----------|
| 1. 33     | 2. 53     | 3. 24     | 4. 126    |
| 5. 623    | 6. 37     | 7. 107    | 8. 1,908  |
| 9. 138    | 10. 122   | 11. 125   | 12. 1,225 |
| 13. 1,520 | 14. 2,060 | 15. 1,210 | 16. 1,713 |

### Activity B

- 1 a. 10    b. 29    c. 31    d. 43  
e. 138    f. 70    g. 90    h. 59

2.

÷	125	130	135
5	25	26	27
6	20r5	21r4	22r3
7	17r6	18r4	19r2

3.

÷	110	120	130
2	55	60	65
5	22	24	26
10	11	12	13

### Activity C

1. 122 plants                      2. 320 shells                      3. \$2,240  
4. January \$96, February \$272, March \$168, April \$384, May \$488, June \$64  
5. a. 4, 347                      b. \$8,694                      c. \$2,898                      d. 207



Can all the pupils divide 3 and 4-digit numbers by 1 digit numbers?

## T4a

Introduce the pupils to the idea of averages.

Explain to the pupils that the **average** of a set of numbers is somewhere in the middle. The number that is called the **average** represents all the numbers in the set.

Use these numbers to illustrate the concept.

1, 2, 3, 4, **5**, 6, 7, 8, 9

Ask the pupils    How many numbers are in the list? **(9)**.

What is the middle number? **(5)**.

Explain that, in this case, 5 is the average number. It is the number in the middle of the list.

Ask the pupils to add all the numbers together.

What is the sum (total) of the numbers? **(45)**

How many numbers are on the list? **(9)**

Ask the pupils to think of a relationship between these two numbers. Can the pupils come up with a rule to work out the **average** of a set of numbers?

Now ask the pupils to divide the total **(45)** by how many numbers **(9)**.

The result is **5**. The **average** of the numbers is 5.

$$\begin{array}{r} 5 \\ 9 \overline{) (1+2+3+4+5+6+7+8+9)} \end{array}$$

## Topic 6: Division

Explain that the average can be found by adding a set numbers and dividing by the number of numbers in the set. Here is another example:

Find the average of **8, 9, 11, 12**

To find the average first add them together.  $8 + 9 + 11 + 12 = 40$

Then divide the total by the number of numbers.  $40 \div 4 = 10$ . The average is **10**.

Give the pupils some other examples. Let them work out the average of these themselves.

a. 2, 7, 12, 10, 14 (**9**)

b. 8, 21, 16, 15 (**15**)

c. 16, 9, 13, 2 (**10**)

Make up other examples of your own and use them to go through this again.

C4a

**Maths Test Results. Marks out of 20**

John	8	Mary	12
William	9	Anna	12
Pita	11	Juliette	11
Samani	12	Mali	12
James	11	Hannah	15
Pattison	15	Maria	16

Write this example on the board and work through it with the class.

Explain that the table shows the results of a maths test for 12 pupils. Maria got the highest score.  $\frac{16}{20}$  and John the lowest,  $\frac{8}{20}$ .

Ask pupils to explain how they would calculate the average score for the whole class.

Work through the process together as follows, making sure you allow the pupils to explain each step:

First find the total of all the scores by adding them together (**144**)

Next count how many pupils took the test altogether (**12**)

Then divide the total by the number of pupils to find the average ( **$144 \div 12 = 12$** )

Next, ask the pupils to work with a partner to find the average score for boys, and for the girls. This allows them to practice the process again.

Check their answers as a class and work through the process again if necessary.

Answers: girls **13**, boys **11**.

Give the pupils more problems involving calculating averages if they need more practice. Use only simple division sums at this stage.

When they are ready, have them move on to the Pupil's Resource Book activities on pages 103 and 104.

# Unit 7: Number

## Answers

### Activity A

- |            |             |       |
|------------|-------------|-------|
| 1. 5       | 5. 3        | 9. 5  |
| 2. 3       | 6. 2        | 10. 2 |
| 3. 3       | 7. 3        | 11. 2 |
| 4. 4       | 8. 3        | 12. 5 |
| 13. 6 fish | 14. 10 eggs |       |

### Activity B

- |       |       |        |
|-------|-------|--------|
| 1. 8  | 5. 10 | 9. 28  |
| 2. 6  | 6. 7  | 10. 31 |
| 3. 15 | 7. 50 | 11. 26 |
| 4. 11 | 8. 36 | 12. 40 |

### Activity C

- |          |               |
|----------|---------------|
| 1. 70    | 5. 11 seconds |
| 2. 885   | 6. a. 14      |
| 3. 104   | b. 17         |
| 4. \$239 | 7. \$219      |



**Materials**  
shells, stones

Reinforce the last lesson with some concrete activities.

Show the pupils that finding the average is similar to sharing things equally.

Use examples to explain this, such as:

A group of 5 students collected shells.

The first child collected 2, the second collected 5, the third collected 7, the fourth collected 1 and the fifth collected 10.

They put all their shells together and shared them equally among themselves.

$$\text{Average} = \frac{\text{Sum (total) of all the shells}}{\text{Number of pupils}}$$

$$\begin{array}{r} 5 \overline{) 25 \text{ shells}} \\ 5 \end{array}$$

← average

↑ number of pupils

↖ total number of shells

Help the pupils to see the relationship between division, sharing equally and finding average.

## Topic 6: Division

C<sub>4b</sub>

Do a class tally of how many brothers and sisters each pupil has.

Write the figures up on the board and ask the pupils to work with a partner to find the average number of brothers and sisters per family for the class. Make sure they discuss their work with their partner, then check and discuss their answers as a whole class activity.

Work through another example based on another real life situation. Copy the temperature chart onto the board and ask the pupils to work through the following questions with their partner.

Find the average temperature for the following:

- a. Monday, Tuesday and Wednesday (**30°C**)
- b. Monday and Tuesday (**29°C**)
- c. Tuesday to Friday (**32°C**)
- d. The weekend (**30.5°C**)
- e. The whole week (**31°C**)

<b>Lata Weather Station</b>	
<b>Maximum Temperature</b>	
Monday	28°C
Tuesday	30°C
Wednesday	32°C
Thursday	35°C
Friday	31°C
Saturday	28°C
Sunday	33°C

Give the pupils more examples to work through with their partners if you think they need more practice.



Can all the pupils find the average of a set of numbers?

T<sub>5a</sub>

Introduce the pupils to problem solving involving finding averages.

Write this problem on the board as an example.

Draw this table, showing how much rain fell in Kira Kira during the week beginning Monday 3 February 2003, on the board.

	Mon	Tue	Wed	Thur	Fri	Sat	Sun
rainfall in mm	31	22	0	12	120	16	44

Discuss what the table shows with the class before introducing the problem.

Then ask: **Was the average rainfall at the weekend more or less than the average for the whole week?**

Remind the pupils that before they try to do the calculation they should think about how they are going to work out their answer.

Ask the pupils to work in pairs and talk about the problem. Tell them not to work it out yet but to discuss what they would do. Bring the whole class together and ask them to explain how they will tackle this problem.



## Unit 7: Number

Lead the discussion by asking questions like these.

**What are you asked to find out?**

The pupils should be able to tell you that they are asked to find out the difference between two averages.

**What do you need before you can do that?**

Answer: You need to calculate the two averages.

**What can you start with?**

Answer: Start with working out the weekly average rainfall.

**How do you do that?**

Answer: Add together the rainfall for everyday and divide that answer by the number of days which is 7. This will give the average weekly rainfall.

**What is the next step?**

Answer: Next you need to calculate the average rainfall at the weekend?

**How do you do that?**

Answer: Add together the rainfall amounts for Saturday and Sunday and divide the total by 2. This will give the average rainfall at the weekend.

**Is the problem solved?**

Answer: No, you must look at the two averages and compare them. Which one is more and which one is less. Then you can solve the problem.

**Have I been given too much information?**

Answer: No, you have to use all the information which is given.

Now work through the actual calculations on the blackboard with the class.

The weekly rainfall was 31 mm + 22 mm + 0 mm + 12 mm + 120 mm + 16 mm + 44 mm.

The total is **245 mm**.

**The average rainfall for the week** is  $245 \text{ mm} \div 7$  (number of days in a week) = **35 mm**.

Point out that to get the average we must still divide by 7 even though there was no rainfall on Thursday.

The rainfall at the weekend was 16 mm + 44 mm.

The total is **60 mm**.

**The average rainfall at the weekend was**  $60 \text{ mm} \div 2$  (number of days at the weekend) = **30 mm**.

Now we can solve this problem.

Was the average rainfall at the weekend more or less than the average for the whole week?

Solution:

**The average rainfall at the weekend was less than the average for the whole week.**

C5a

Ask them to solve the problems in the Pupil's Resource Book on pages 105 and 106.

Allow the pupils to talk about each problem either in small groups or with a partner.

Remind the pupils that when they solve problems they should set out their answers carefully in their exercise book. They should set out all the steps in their calculation. Remind them that the way they work out the problem is important.

### Answers

#### Activity A

1. 3 pawpaw
2. Average age is 9
3. 4 fish
4. 15 eggs
5. 17 cm
6. You will need to check each pupil's sentences.

#### Activity B

1. 21 mm
2. 55
3. 28 coconuts
4. 29 shells
5. \$15

**Activity C** - includes some problems for which pupils need to find out information. Split the class into groups and give each group one of the problems to research and solve.

Answers will be different for each class.



Can all the pupils solve problems including calculating averages?

## Unit 7: Number

### Support Activities

For pupils who need more practice with division skills, you should provide activities, which approach the same operations in a different way. Work with these pupils to provide support and help and encourage them to talk about their work as they go along. Discussing the processes they use helps them to understand them better and develops their confidence with calculating division problems.

#### Some Suggested Activities

##### 1. Division Practice

Provide practice of the division method using easy figures, so that the method is well established before moving on to more difficult calculations. For example:

$$2 \overline{)48} \quad 3 \overline{)369} \quad 5 \overline{)1,055} \quad 4 \overline{)800} \quad 10 \overline{)110} \quad 5 \overline{)5,050}$$

$$4 \overline{)904} \quad 3 \overline{)738} \quad 5 \overline{)2,055} \quad 5 \overline{)240} \quad 6 \overline{)8,412} \quad 4 \overline{)6,016}$$

##### 2. Finding Dividends

Have the pupils work together using concrete materials (stones or shells) to find dividends. For example:

- Write 5 numbers between 10 and 30 that can be divided by 3.
- Write 5 numbers between 46 and 110 that can be divided by 9.
- Write 5 numbers between 250 and 290 that can be divided by 5

##### 3. Problem Solving with Division and Averages

To help pupils who are struggling with problem solving, try setting problems that start with one straightforward division operation, and then add more information as you work through the problem together. Here is a suggested example:

- Two brothers wanted to buy a TV and video, at a cost of \$2,400. How much would each brother have to pay? **(\$1,200)**
- They didn't think they could raise this much money, so they decided to ask their cousin if he wanted to come in with them too. If they split the cost between three of them, how much would they have to pay each? **(\$800)**
- This was still too much so they asked their sister to help too. How much would they have to pay if she also shared the cost? **(\$600)**
- One of the brothers found the same TV and video on sale in a different store for \$2,100. Work out what they would have to pay each if they shared the cost between two, three and four of them. **(\$1,050, \$700, \$525)**
- They decided to buy the cheaper set with their cousin, but their sister decided not to join. If each of the three boys can save \$140 a month, how long will it take them to save enough money to buy the TV and video? **(5 months).**

## Extension Activities

For pupils who understand division and are confident in problem solving, you must provide activities to help them extend and apply these skills. Choose activities, which encourage the pupils to experiment with division and explore numbers for themselves. Once you have explained the activities leave the pupils to work alone. You could also use these activities for homework.

### Some Suggested Activities

#### 1. Tests of Divisibility

Explain that we can apply simple rules to show whether larger whole numbers are divisible by other whole numbers or not. We call this a **test of divisibility**.

For example:

We can check whether a number is divisible by 2 simply by looking at the digit in the one's column. If the last digit is 0, 2, 4, 6 or 8, then the number is divisible by 2.

Have pupils check the rule using some examples such as, 1,235, 12,980, 1,464 and 13,667.

Then set them the challenge to devise simple rules to show whether a number is divisible by the following numbers:

Number	Rules to Test for Divisibility
2	If a whole number ends in 0, 2, 4, 6, or 8, then it can be divided by 2.
5	
10	
100	
4	
3	
9	

#### 2. Palindromic Numbers

Explain that a palindromic number is a number that reads the same backwards as it does forwards such as 3,443 or 345,543.

Set the pupils the following challenge.

Both of the following palindromic numbers can be divided by 11. 7,447 1,441

Try dividing other palindromic numbers by 11 and see what you can find out.

Write down what you find out and try to explain why.

#### 3. Challenges with Averages.

Ask the pupils to find the average of the following:

- The first five consecutive numbers (1, 2, 3, 4, 5)
- The first seven consecutive numbers
- The first nine consecutive numbers

## Unit 7: Number

Next ask them to use these calculations to find a rule for finding averages of consecutive numbers. They should then be able to do the following without calculations:

- a. Find the average of the first fifteen consecutive numbers.
- b. Find the average of consecutive numbers from 26 - 30.
- c. Find the average of consecutive numbers from 245 to 251.

### Problem Solving with Averages.

Have the pupils work with a partner to try some more difficult problems, such as:

- a. The average age of a group of five children is 12 years. If they include their teacher, (aged 24) in the group, what will the new average age be?
- b. The average age of a group of cousins is 6. If four of them are aged 7, 6, 4 and 5, what is the age of the other cousin?
- c. In maths tests for terms 1 - 3, Jemima scored 72, 78 and 80. What mark will she have to get in the term 4 test to get an average of 80 for the year?
- d. The average weight of 8 sacks of Copra is 72 kg. When a 9<sup>th</sup> sack is added the average weight changes to 70 kg. What is the weight of the ninth sack?

### Check Up Page: Answers

- |          |                                  |                 |
|----------|----------------------------------|-----------------|
| 1. 5 r 1 | 9. 6 and 1 left over             | 17. 1,329       |
| 2. 4 r 1 | 10. 7 and 3 pineapples left over | 18. a. December |
| 3. 4 r 1 | 11. 4                            | b. June         |
| 4. 2 r 3 | 12. 12                           | c. 12           |
| 5. 3     | 13. 19                           | d. less         |
| 6. 5     | 14. 82 r 1                       |                 |
| 7. 26    | 15. 132 r 1                      |                 |
| 8. 3     | 16. 262 r 3                      |                 |

## Measurement Topic 19: Mass

## Topic 20: Volume

### Aim:

To reinforce pupils' use of standard units of mass and to introduce the concept of volume.  
To calculate and solve problems using mass and volume units.

### Topic 19, Sequence of objectives: To

1. choose appropriate units when measuring mass.
2. understand the relationship between units: grams/ kilograms/ tonnes.
3. use decimal notation, e.g.  $53.5 \text{ kg} = 53\frac{1}{2} \text{ kg}$ .
4. complete practical activities and problem solving using grams and kilograms.

### Topic 20, Sequence of objectives: To

1. introduce the concept of volume.
2. measure volume using  $1\text{cm}^3$  units.
3. use the formula for calculating the volume of boxes and containers i.e.  
volume = length x breadth x height.

### Rationale:

The standard units for volume are cubic centimetres and cubic metres. The standard units for mass are grams, kilograms and tonnes. In this unit pupils will become familiar with these metric units as they are used in most countries in the world.

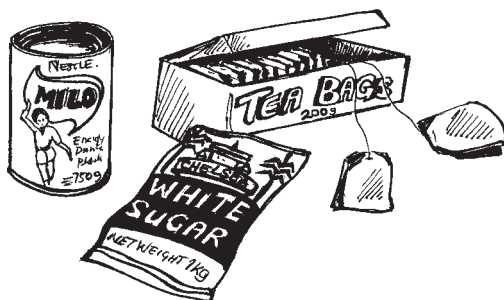
These topics will be taught through a lot of practical activities. The pupils will be given plenty of opportunity to practise using standard units of mass and volume. Teachers need to collect and prepare standard units of mass such as 50 g, 100 g, 250 g, 500 g, 1 kg. Empty cans, bottles, packets, stones, blocks, will also be useful.

### T1a

Revise the standard units of weight. 1,000 grams = 1 kilogram (kilo means 1,000). Show the pupils some familiar items with their weights displayed or labelled.

### Materials

grocery packages  
with weights  
displayed



Explain to pupils the use of the terms **weight** and **mass**. Weight is the effect of gravity (a force) on a mass and it can change according to the gravitational force. Mass is the amount of substance in an object.

So on earth, an astronaut will weigh more than he does on the moon, even though his mass is the same. This is because the force of gravity is greater on Earth than it is on the moon.

In everyday use, the terms weight and mass mean the same thing but in real terms they are different.

Mass is the measurement of quantity and the units used are milligrams, grams, kilograms and tonnes.

## Unit 8: Measurement

Revise the units used with the pupils. Ask the pupils

### Why do you think there are 3 units of mass?

Talk about the appropriateness of each of the units. For example, look at what is measured in grams (g) and what is measured in kilograms (kg).

Explain to the pupils why different units of measurement are used for each of the different items.

Items that are weigh less than a kilogram (1,000 g) are measured in grams.

Things which are light are measured in grams. Things which are heavier are measured in kilograms. Things which are very heavy are measured in tonnes.

Give these examples to the pupils. What units would they use to measure the mass of the following:

- |                                |                               |
|--------------------------------|-------------------------------|
| a) their father (kilograms)    | d) a pile of feathers (grams) |
| b) 2 spoons of tea (grams)     | e) a truck (tonnes)           |
| c) a sack of copra (kilograms) | f) a boat (tonnes)            |

C1a

Remind the pupils that in Standard Four, units of measurement used to measure mass are **grams** and **kilograms**. Talk about the relationship between the units. Revise with the pupils that 1,000 g is equal to 1 kilogram.

Tell the pupils that objects with a much bigger mass are measured in tonnes. For example, trucks, a large quantity of copra, a large catch of fish, all can be measured in tonnes.

Write this table on the board and use it to talk about the different units used to measure mass.

1,000 g = 1 kilogram  
1,000 kg = 1 tonne

Write this list of items on the board. Ask the pupils to discuss which unit of measurement they would use to find the mass of each item:

Objects	Units
a) classroom board	<b>kilograms</b>
b) a piece of chalk	<b>grams</b>
c) table	<b>kilograms</b>
d) a spoon of sugar	<b>grams</b>
e) a plate of cooked rice	<b>grams</b>
f) teacher	<b>kilograms</b>
g) bus	<b>tones</b>
h) a bag of rice	<b>kilograms</b>

In their pairs, ask the pupils to come up with another list of objects. Let them exchange lists with other pairs and see if they can decide which units to use. Let the pupils discuss this with each other and use the vocabulary you have taught them.

Ask the pupils to complete the activities in the Pupil's Resource Book on page 108.

## Topic 19: Mass

### Answers

#### Activity A

- |              |              |
|--------------|--------------|
| a. kilograms | g. kilograms |
| b. kilograms | h. grams     |
| c. tonnes    | i. kilograms |
| d. tonnes    | j. tonnes    |
| e. grams     | k. grams     |
| f. grams     | l. tonnes    |

#### Activity B

1. Doesn't make sense. Mother weighed out 750 g of flour for the birthday cake.
2. Makes sense.
3. Doesn't make sense. When we got the chicken ready to roast it weighed 3 kg.
4. Doesn't make sense. My grandfather has put on a lot of weight. He now weighs 85 kg.
5. Makes sense.
6. Doesn't make sense. The pumpkin we grew weighed  $2\frac{1}{2}$  kg.



Can all the pupils identify appropriate units for measuring mass?

**T<sub>2a</sub>**

Revise the standard units of mass, which are **grams**, **kilograms** and **tonnes**. Remind pupils that the **gram** is used when weighing a small quantity. Larger objects are measured in **kilograms** and very heavy objects in **tonnes**. Explain to the pupils that 'tonne' is the biggest unit of measurement used in measuring mass. Remind the pupils that **kilo** means 1,000. It is then easy to remember that 1 kilogram = 1,000 grams.

Write this on the blackboard and explain their equivalence:

$$\begin{array}{lcl} 1 \text{ kilogram} & = & 1000 \text{ grams} \quad (1 \text{ kg} = 1000 \text{ g}) \\ 1 \text{ tonne} & = & 1000 \text{ kilograms} \quad (1 \text{ t} = 1000 \text{ kg}) \end{array}$$

Revise the abbreviation for each unit : tonne (**t**), kilogram (**kg**) and gram (**g**).

Explain to the pupils that when weighing objects we use grams, kilograms or tonnes depending on the size of the object.

If possible, show the pupils some different kinds of scales and look at the units they weigh in.

**C<sub>2a</sub>**

Let the pupils work in small groups. Make sure that each group has a balance as well as a selection of different objects. Tell them to choose three objects, weigh them and then add together the weights. How many different groups of three can they weigh?

Tell them to write their total as kilograms and grams. For example:  $750 \text{ g} + 250 \text{ g} + 500 \text{ g} = 1,500 \text{ g}$  or  $1.5 \text{ kg}$ .

Let them talk about this activity in their group. Make sure that all pupils actually weigh, record and know how to change grams to kilograms to get the totals.

Let the pupils complete the activities in the Pupil's Resource book on pages 109, 110 and 111.

#### Materials

spring balance,  
kitchen scale, cans,  
packets of different  
weights  
standard weights



## Unit 8: Measurement

### Answers

#### Activity A

There are many possible answers here. You could check pupils answers as a class activity.

#### Activity B

1. 2 kg 500 g
2. Corned Beef (340 g) + sunshine milk (300 g) + Omo, or salt or sugar (all weigh 500 g each)
3. 1 kg 550 g
4. 1 kg 590 g
5. 4
6. 1 kg
7. 2 kg 250 g
8. 3 kg 150 g
9. 5 kg 40 g
10. 4 kg 8 g
11. 1 t
12. 2 t 400 kg
13. 12 t 200 kg
14. 23 kg 500 g
15. 17 kg 750 g

#### Activity C

1. Truck A 2 tonnes 765 kg  
Truck B 3 tonnes 970 kg
2. 721 kg
3. 3 kg 500 g
4. a. \$1.00  
b. \$3.50  
c. \$2.00



Do all the pupils understand the relationship between units of mass, including grams, kilograms and tonnes?

### T3a

**Materials**  
decimal weight  
game cards

Write 2,500 g on the board. Ask the pupils if they can change this into kilograms and grams. They will be able to tell you that 2,500 g is the same as 2kg 500 g. This is the same as 2 kg. Ask the pupils if they can think of another way to express  $\frac{1}{2}$  kg.

$\frac{1}{2}$  can be expressed as a **decimal** = 0.5

$$2,500 \text{ g} = 2\text{k g } 500 \text{ g} = 2\frac{1}{2} \text{ kg} = 2.5 \text{ kg}$$

Use some more examples.

$$4 \text{ kg } 500 \text{ g} = 4.5 \text{ kg} \quad 3\frac{1}{2} \text{ kg} = 3 \text{ kg } 500 \text{ g} = 3.5 \text{ kg} \quad 1\frac{1}{2} \text{ kg} = 1 \text{ kg } 500 \text{ g} = 1.5 \text{ kg}$$

$$5.5 \text{ kg} = 5 \text{ kg } 500 \text{ g} = 5\frac{1}{2} \text{ kg} \quad 500 \text{ g} = \frac{1}{2} \text{ kg} = 0.5 \text{ kg}$$

Ask the pupils to tell you how many grams there are in  $\frac{1}{4}$  kg,  $\frac{3}{4}$  kg,  $\frac{1}{5}$  kg using decimals.

They should be able to come up with 0.25 kg, 0.75 kg and 0.2 kg.

Use examples like these to reinforce the decimal form of each weight.

$$5\frac{1}{4} \text{ kg} = 5.25 \text{ kg} \quad 2\frac{3}{4} \text{ kg} = 2.75 \text{ kg} \quad 1\frac{1}{5} \text{ kg} = 1.2 \text{ kg} \quad 1\frac{1}{2} \text{ tonnes} = 1.5 \text{ tonnes}$$

$$3\frac{3}{4} \text{ kg} = 3.75 \text{ kg} = 3 \text{ kg } 750 \text{ g} \quad 4\frac{1}{5} \text{ kg} = 4.2 \text{ kg} = 4 \text{ kg } 200 \text{ g} \quad 2\frac{3}{4} \text{ t} = 2.7 \text{ t}$$

Make sure that all the pupils know that 1,000 g = 1 kg and 1,000 kg = 1 tonne.

## C<sub>3a</sub>

### Decimal Weight Game

Prepare five sets of cards as shown below. Put the pupils into five groups. Tell them to place all the cards face down. Each pupil takes a turn to pick two cards. If the cards are equivalent they win that pair. They then have another turn.

$2\frac{1}{2}$ kg	0.5 kg	$1\frac{1}{2}$ kg	1 kg	3 kg 250 g	2 kg 750 g
2.5 kg	$\frac{1}{2}$ kg	1.5 kg	1,000 g	3.25 kg	2.75 kg
$2\frac{1}{4}$ kg	250 g	$1\frac{1}{5}$ kg	1,200 g	2,250 g	2,750 g
2.25 kg	$\frac{1}{4}$ kg	1.2 kg	1 kg 200 g	$3\frac{1}{4}$ kg	$2\frac{3}{4}$ g

If the cards are not equivalent they must turn the cards over and leave them in the same place ready for the next pupil. The winner is the person who has the most pairs when all the cards have been used up.

Ask the pupils to complete the activities in the Pupil's Resource Book, on pages 111 and 112.

### Answers

#### Activity A

- 1,000 g
- 2,500 g
- 1,200 g
- 500 g
- 1,250 g
- 750 g
- 1,750 g
- 2,000 g
- 1,500 g

#### Activity B

- 3 kg
- 7 kg
- 2 kg
- 1.5 or  $1\frac{1}{2}$  kg
- 6.5 kg or  $6\frac{1}{2}$  kg
- 3,500 g
- 4,000 g
- 8,500 g
- 4.5 kg or  $4\frac{1}{2}$  kg
- 3.5 kg or  $3\frac{1}{2}$  kg
- 4.25 kg or  $4\frac{1}{4}$  kg.
- 1.75 kg or  $1\frac{3}{4}$  kg.
- 0.5 kg or  $\frac{1}{2}$  kg.
- 500 g
- 2,250 g
- 3,750 g

## Unit 8: Measurement

T<sub>3b</sub>

**Materials**  
chart showing the  
relationship  
between the units

Prepare a chart showing the relationship between the different units of mass you have discussed as shown below. Display this in the class for pupils to refer to.

<b>1,000 grams</b>	<b>= 1 kilogram</b>	<b>1,000 g</b>	<b>= 1 kg</b>
<b>1,000 kilograms</b>	<b>= 1 tonne</b>	<b>1,000 kg</b>	<b>= 1 t</b>

Ask the pupils to study these relationships and then suggest how we might change grams into kilograms and kilograms into tonnes.

Ask questions to help them, such as:

How many grams are there in a kilogram? (**1,000**)

If we reverse this, what part of a kilogram is a gram (**one thousandth**)

Try to help them come up with the idea that **we can change grams to kilograms by dividing by 1,000**, and **we can change kilograms to grams by multiplying by 1,000**.

Use these examples to show how this is done:

To change 2,500 grams into kilograms  $2,500 \div 1,000 = 2.5$  kg

To change 7,800 grams into kilograms  $7,800 \div 1,000 = 7.8$  kg

To change 3.5 kilograms into grams  $3.5 \times 1,000 = 3,500$  g

To change 2.75 kilograms into grams  $2.75 \times 1,000 = 2,750$  g

Based on this, ask the pupils to work out for themselves how to change kilograms into tonnes and tonnes into kilograms.

Have them discuss it with a partner and write the rules they decide on in their exercise books before discussing it as a class and writing the rules up on the board as follows:

**We can change kilograms into tonnes by dividing by 1,000**, and

**We can change tonnes into kilograms by multiplying by 1,000**.

Since pupils have not yet learnt how to divide by a four digit number you can teach them the shorthand way of doing this, which is simply to move the decimal point three places to the left. The opposite short cut can be used to multiply by 1,000, move the decimal point three places to the right.

C<sub>3b</sub>

Write some more examples on the board to give the pupils some practice before you ask them to complete the activities in the Pupil's Resource Book on pages 112 and 113.

Change the unit of mass in each of the following:

- |                                |                               |
|--------------------------------|-------------------------------|
| a. Change 5,345 g to kilograms | e. Change 2,450 kg to tonnes  |
| b. Change 1,750 g to kilograms | f. Change 5.32 kg to grams    |
| c. Change 2.5 kg to grams      | g. Change 5.65 t to kilograms |
| d. Change 2.5 t to kilograms   | h. Change 34k g to grams      |

## Topic 19: Mass

### Answers

#### Activity A

1. Joyce, Tom, Ewa, Michael, Francis, Margie

2.

Name	Weight in grams	Weight in kilograms
Joyce	3,750 g	3.75 kg
Ewa	3,450 g	3.45 kg
Francis	2,260 g	2.26 kg
Tom	3,500 g	3.5 kg
Michael	2,500 g	2.5 kg
Margie	2,000 g	2 kg

#### Activity B

- |            |              |              |               |
|------------|--------------|--------------|---------------|
| 1. 3.45 kg | 7. 1.03 kg   | 13. 5,000 g  | 17. 32,000 g  |
| 2. 3.26 kg | 8. 6.026 kg  | 14. 6,756 g  | 18. 3,450 g   |
| 3. 2.98 kg | 9. 2.983 kg  | 15. 20,000 g | 19. 100,000 g |
| 4. 2.72 kg | 10. 1.032 kg | 16. 15,650 g | 20. 1,330 g   |
| 5. 2.38 kg | 11. 2.018 kg |              |               |
| 6. 3.28 kg | 12. 3.02 kg  |              |               |



Can all the pupils use decimal notation to record mass?

T<sub>4a</sub>

#### Materials

collection of objects, scales, gram and kilogram weights

In this lesson pupils will use scales to accurately weigh objects. They will then use their knowledge from the last lesson to convert total weights to kg and express their total as a decimal.

Prepare a display of objects before the lesson. Put the pupils into groups. Tell each group to estimate the weight of four objects and record each estimate in their exercise book. Then tell them to weigh each object accurately and record this reading.

Encourage the pupils to discuss their estimates and their actual readings. How accurate were their estimates? If they now choose different objects can they estimate more accurately?

Tell the pupils to add their weights and convert these to kg. You could show an example on the board. You could use actual readings from a demonstration.

Object	Estimate	Reading
stone	200 g	350 g
book	100 g	450 g
cup	100 g	300 g
basket	50 g	100 g
Total	450 g	2,100 g

My estimate was 0.45 kg but the actual weight of all four items was 2.1 kg.

## Unit 8: Measurement

C<sub>4a</sub>

Allow the pupils enough time to estimate, weigh and total their results. Make sure that all pupils in each group use a balance and take a reading. Encourage the pupils to discuss their practical work and compare results with other groups.

T<sub>4b</sub>

In this lesson pupils will use their knowledge of weight to solve problems.

Remind the pupils that they should read through the problem first. They should then ask themselves

- What is the problem?
- What do I have to find out?
- Do I have enough information?
- Do I need all the information I have been given? Is there too much?
- Do I need to solve this problem in steps?
- What must I do first?

Remind the pupils that they have followed this process before. Today's problems are all to do with weight.

C<sub>4b</sub>

Have the pupils work through the problems on pages 113, 114 and 115 of the Pupil's Resource Book.

Pupils could work in pairs. This would encourage discussion about each problem. They should talk about the problem and how they are going to tackle it. They could then work independently to do the actual working out and then discuss their answers. Are their answers the same? How have they arrived at them.

### Answers

#### Activity A

1. 4 kg 250 g
2. 23 kg 500 g or  $23\frac{1}{2}$  kg or 23.5 kg
3. 15 t 500 g or  $15\frac{1}{2}$  t or 15.5 t
4. 45 kg
5. 3,750 g or  $3\frac{3}{4}$  kg or 3.75 kg

#### Activity B

1. 1 t 336 kg or 1,336 kg
2. 2.98 t
3. 23.75 kg
4. 6.925 kg or 6 kg 925 g
5. 1.725 kg
6. 65 kg

## Topic 19: Mass

### Activity C

1. 6.75 t
2. 39 kg flour, 7.8 kg sugar, 3.9 kg butter
3. Weigh out 780 g. From that weigh out 300 g, this leaves you with 480 g. Use the 480 g as a weight and weigh out the same again. This gives 960 g
4. 19.6 t
5. 210 kg
6. 65 kg



Can all the pupils solve practical problems involving mass?

## Unit 8: Measurement

T<sub>1a</sub>

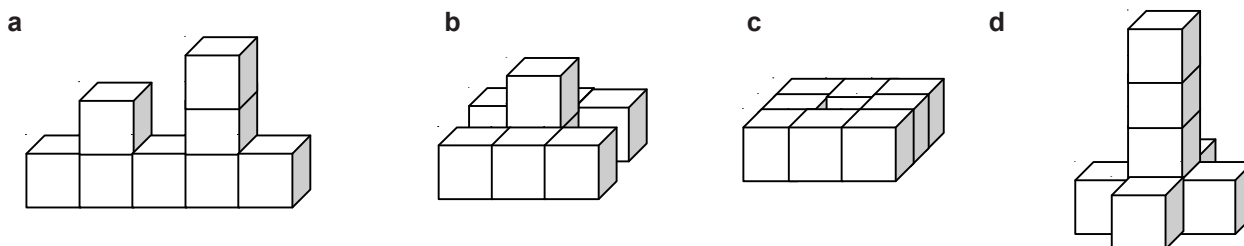
### Materials

blocks, centimetre  
cubes, boxes

Explain to pupils that the amount of space something takes up is called its **volume**.

Use some cubes or boxes and build a shape. Ask a pupil to come to the front of the class and build another shape using exactly the same cubes or boxes. Ask the pupils if the first and second shape take up the same amount of space. Do they have the same volume? Emphasise the idea by building other models with the same number of blocks.

For example use 8 blocks and build these 4 structures.



Ask the pupils to compare the models. Talk about the space each of them takes up.

Ask, **Which model looks bigger?**

**Do they take up the same space?**

**Do they have the same volume?**

**Why?**

Explain to the pupils that the models occupy the same amount of space. Explain to the pupils that the different models were built with the same number of cubes so that they have the same volume. They all occupy the same amount of space.

The **volume** of a shape or object is the amount of space it occupies.

C<sub>1a</sub>

Let the pupils work in pairs or small groups. Give each group some cubes or boxes to work with. Let them experiment by building different shapes with the same number of cubes. Tell them to record their models by carefully drawing each shape.

Tell the pupils to complete the activities in the Pupil's Resource Book on pages 115 and 116.

### Answers

#### Activity A

1. Either is correct. This is an opinion.
2. Yes, they take up the same amount of space.
3. Both models have the same volume.

#### Activity B

1. 5 cubes
2. 4 cubes
3. 6 cubes
4. 9 cubes
5. 12 cubes
6. 12 cubes
7. 9 cubes
8. 7 cubes
9. 8 cubes
10. 5 + 6 and 4 + 7



Do all the pupils understand that volume is a measure of the amount of space occupied by an object?

## Topic 20: Volume

### T<sub>2a</sub>

Introduce the standard units of volume. Explain to the pupils that space or volume is measured using the standard units of **cubic centimetres** and **cubic metres**.

Ask the pupils to draw a centimetre cube using their ruler. Explain to them that this is one of the standard units used in measuring volume.

Ask the pupils to tell you what its length is (1 cm). What is its height? (1 cm). What is its breadth? (1 cm).

Therefore a **centimetre cube has a volume of one centimetre cubed** or **one cubic centimetre**.

Show pupils the correct notation for this, which is **1 cm<sup>3</sup>**.

Draw a prism on the board or on a chart using cm<sup>3</sup>. You could use the example shown here.

Ask the pupils to find the amount of space taken up by the prism.

Discuss with the pupils the different ways of finding the amount of space occupied by the shape by asking;

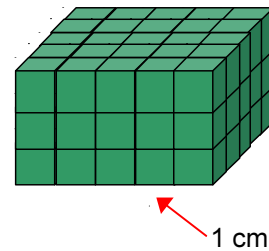
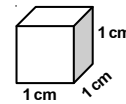
**How much space is occupied by the prism?**

**How can we find the amount of space?**

Allow the pupils to give suggestions of how to find the answer, such as by counting the number of cubes.

Tell them to use the correct unit of volume to give an answer in cubic centimetres or cm<sup>3</sup>. The volume of the shape drawn here is 75 cm<sup>3</sup>.

a cubic centimetre



### C<sub>2a</sub>

Let the pupils build prisms using centimetre cubes. Tell them to work in pairs. Let them build a prism, draw it and find out its volume. Tell them to check each others work. Remind them they must write the volume under their diagrams. Emphasise that they must use the correct unit of volume which is **cubic centimetres** or **cm<sup>3</sup>**.

Tell the pupils to complete the activity in the Pupil's Resource Book on pages 116 and 117.

### Answers

#### Activity A

1. 12 cubic centimetres or 12 cm<sup>3</sup>
2. 20 cubic centimetres or 20 cm<sup>3</sup>
3. 8 cubic centimetres or 8 cm<sup>3</sup>
4. 25 cubic centimetres or 15 cm<sup>3</sup>
5. 10 cubic centimetres or 10 cm<sup>3</sup>
6. 8 cubic centimetres or 8 cm<sup>3</sup>
7. 36 cubic centimetres or 18 cm<sup>3</sup>
8. 10 cubic centimetres or 10 cm<sup>3</sup>
9. 64 cubic centimetres or 64 cm<sup>3</sup>
10. 12 cubic centimetres or 12 cm<sup>3</sup>
11. 24 cubic centimetres or 24 cm<sup>3</sup>
12. 36 cubic centimetres or 35 cm<sup>3</sup>



## Unit 8: Measurement

**T<sub>2b</sub>**

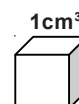
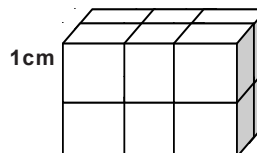
### Materials

cubes, boxes,  
building cards

Draw this figure on the board or on a chart.

Use it to revise the concept and how volume is measured using cubic centimetres.

Explain to the pupils that the prism shown here has the volume of 12 cubic centimetres. This means that it occupies a space measured 12 cubic centimetres. Revise the language used. Tell the pupils that 12 cubic centimetres can be written as  $12 \text{ cm}^3$ .



Build another shape using centimetre cubes. Ask the pupils to tell you the volume of the shape you have built. Can they write the volume in two different ways? Let them use the correct mathematical language. Choose pupils to write the answers on the board. Let the other pupils check these answers.

**C<sub>2b</sub>**

Let the pupils work in pairs.

Give each pair 4 cards with building instructions on them. You will need to have prepared these before the lesson.

Build a regular prism with a volume of 24 cubic centimetres	Build a regular prism with a volume of 4 cubic centimetres
Build a regular prism with a volume of 27 cubic centimetres	Build a regular prism with a volume of 9 cubic centimetres
Build a regular prism with a volume of 36 cubic centimetres	Build a regular prism with a volume of 8 cubic centimetres
Build a regular prism with a volume of 32 cubic centimetres	Build a regular prism with a volume of 16 cubic centimetres
Build a regular prism with a volume of 28 cubic centimetres	Build a regular prism with a volume of 20 cubic centimetres
Build a regular prism with a volume of 18 cubic centimetres	Build a regular prism with a volume of 15 cubic centimetres
Build a regular prism with a volume of 48 cubic centimetres	Build a regular prism with a volume of 30 cubic centimetres
Build a regular prism with a volume of 10 cubic centimetres	Build a regular prism with a volume of 12 cubic centimetres

Tell the pupils they must build each shape. Check that it is correct and then draw it in their exercise book when they are sure it is right.

Under each shape they must write its volume in  $\text{cm}^3$ .

Make sure that you check all the pupils' work. There are a range of correct answers.

## Topic 20: Volume

T<sub>2c</sub>

### Materials

water, stones and other irregular objects  
plastic bottles

Demonstrate to the pupils that a 1 cm<sup>3</sup> can hold 1 mL (millilitre) of water.

1 mL of water, therefore, has a volume of 1 cm<sup>3</sup>.

Discuss with the pupils how they could find the volume or the amount of space taken up by irregular shapes such as a stone.

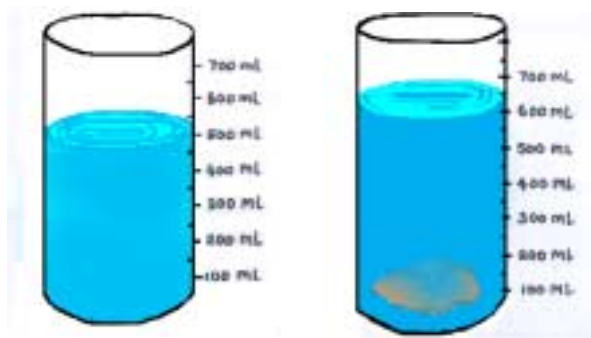
### How could you find the amount of space taken up by the stone?

Let the pupils work in small groups to discuss this problem.

Talk about the pupil's suggestions and decide on a good way to find out the volume of the stone.

You could use a plastic bottle and cut off the top. Now carefully measure in  $\frac{1}{2}$  L of water. Remind the pupils that 1,000 mL = 1 litre so  $\frac{1}{2}$  L = 500 mL.

Now carefully mark a scale down the side of your bottle.



Scale marked on a paper strip  
or stand a ruler behind the  
bottle.

Take your stone and carefully put it in the bottle.

### What happens to the water?

Answer - the water level rises.

### What is the new reading in ml? (650 mL)

If 1 mL is equal to 1 cm<sup>3</sup> what is the volume of the stone which you put in?  
(650 mL - 500 mL = 150 mL or 150 cm<sup>3</sup>)

Do this experiment several times using different irregular shaped objects. The object takes up some of the space which the water took up before. We say the water has been **displaced**.

The water moves up because the stone takes its place.

The amount of space something takes up is called its **volume**.

C<sub>2c</sub>

Let the pupils work in small groups. Give them a plastic bottle a stone, some water, and a measuring cylinder or bottle marked in litres and millilitres. Tell them to find out the volume of their stone.

Tell them to write a few sentences explaining exactly what they did and what they found out. Tell them to draw diagrams to help explain their experiment.



Can all the pupils measure volume using cubic centimetres?

## Unit 8: Measurement

T<sub>3a</sub>

The pupils have measured volume by counting cubic centimetres. Draw a prism on the board or build a prism as a class demonstration. Make it 3 cm x 2 cm x 2 cm.

Talk about the length, breadth and the height of the shape. Another word for breadth is width.

Explain to the pupils that the shape has a length of 3 centimetres.

The breadth is 2 centimetres and its height is 2 centimetres.

Refer the pupils back to the discussion they have had about how to find the volume of the prism.

Talk through the suggestions they made again, such as:

### By counting the total number of centimetre cubes in the prism

This gives us the right answer but it takes a lot of time, especially for larger objects.

### By counting how many centimetre cubes in each layer and then multiplying that by the number of layers

This is a good way of cutting down the number of cubes that we have to count.

... and so on.

Tell the pupils that there is a way to work out the volume of the shape without counting cubes at all. Ask them to discuss this with a partner for a few minutes and see if they can tell you what it is.

If they need help, give them a clue as follows: Think about the length of the shape (3 cm), the breadth of the shape (2 cm) and the width of the shape (2 cm).

Can they think of a rule that would link these three measurements?

If they can ask them to use to calculate the volume of the shape and check their answer by counting the number of centimetre cubes.

Ask pupils to explain their rules to the class before clearly explaining the rule for any pairs who have not found it, as follows:

The volume of a rectangular prism is **the length x the breadth x the height**

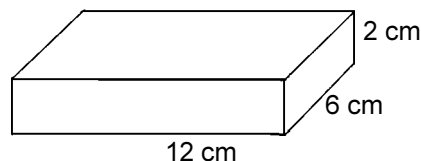
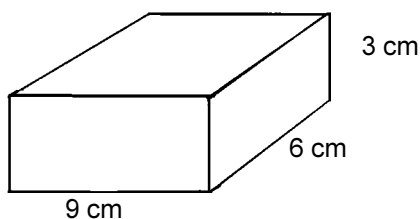
We can write this formula as follows:  **$v = l \times b \times h$**

We can use it to calculate the volume **length = 3 cm, breadth = 2 cm, height = 2 cm**

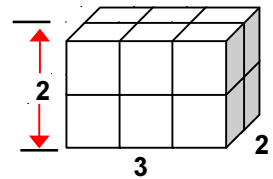
of the above shape as follows:  **$3 \text{ cm} \times 2 \text{ cm} \times 2 \text{ cm} = 12 \text{ cm}^3$**

we can write this in two ways:  **$12 \text{ cm}^3$ , or 12 cubic centimetres.**

Draw some shapes on the board and ask the pupils to practise using the formula to calculate their volume. Remind the pupils that the volume is always measured in **cubic units**.



**Materials**  
ruler, pencil,  
rubber  
centimetre cube  
out from wood



Use 1 cm<sup>3</sup> cubes to build the same models and then ask the pupils to count the cubes to check if the number of blocks used for each shape matches their answers.

## Topic 20: Volume

C<sub>3a</sub>

In small groups let the pupils build some shapes of their own and find the volume in two different ways. Ask them to count the cubes and then tell them to check the answer by using the formula

**$l \times b \times h = \text{volume}$ .**

Are their answers the same?

When the pupils are confident in using the formula ask them to complete the activities in the Pupil's Resource Book on pages 117, 118 and 119.

### Answers

#### Activity A

- |                      |                      |                      |                      |
|----------------------|----------------------|----------------------|----------------------|
| 1. $16 \text{ cm}^3$ | 2. $32 \text{ cm}^3$ | 3. $8 \text{ cm}^3$  | 4. $48 \text{ cm}^3$ |
| 5. $64 \text{ cm}^3$ | 6. $24 \text{ cm}^3$ | 7. $30 \text{ cm}^3$ | 8. $18 \text{ cm}^3$ |

#### Activity B

- |                       |                       |                       |
|-----------------------|-----------------------|-----------------------|
| 1. $324 \text{ cm}^3$ | 2. $144 \text{ cm}^3$ | 3. $250 \text{ cm}^3$ |
| 4. $162 \text{ cm}^3$ | 5. $128 \text{ cm}^3$ | 6. $216 \text{ cm}^3$ |

#### Activity C

- |         |         |         |
|---------|---------|---------|
| 1. 6 cm | 4. 3 cm | 7. 4 cm |
| 2. 4 cm | 5. 4 cm | 8. 3 cm |
| 3. 5 cm | 6. 4 cm | 9. 6 cm |

T<sub>3b</sub>

**Materials**  
metre rulers, sticks,  
string, cartons,  
boxes

Remind the pupils that the **volume** of a prism is the amount of **space** that it takes up.

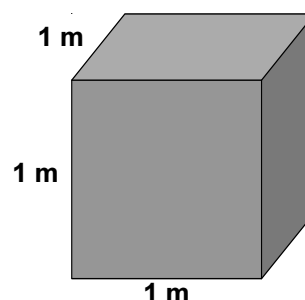
**Volume** is a measure of **three dimensional space** just as **length** is a measure of **distance**, and **area** is a measure of **two dimensional space**.

Revise the units used to measure volume. They should by now be familiar with the cubic centimetre, they should be able to tell you that this is a cubic space measuring  $1 \text{ cm} \times 1 \text{ cm} \times 1 \text{ cm}$ .

Explain that there is also a larger cubic measurement called the cubic metre. Have pupils apply what they already know about cubic centimetres to define a cubic metre as follows:

**A cubic metre is a cubic shape which measures  $1 \text{ m} \times 1 \text{ m} \times 1 \text{ m}$ .**

It has a volume of one cubic metre which is written as  $1 \text{ m}^3$ .



Discuss the kind of measurements for which you would use a cubic metre rather than a cubic centimetre. For example: the volume of freight space on a large ship; the volume of the inside of a container used for packing freight, or the volume of a storage cupboard.

Ask pupils to tell you why the cubic centimetre would not be suitable for measuring these volumes.

### Challenge!

Ask the pupils if that can work out the relationship between one cubic centimetre and one cubic metre. How many cubic centimetres are there in a cubic metre?

## Unit 8: Measurement

They can use the formula  $v = l \times b \times h$  to do this, you can help them if necessary by reminding them that there are 100cm in 1 m.

$$1 \text{ m} \times 1 \text{ m} \times 1 \text{ m} = 1 \text{ m}^3$$

which is the same as  $100 \text{ cm} \times 100 \text{ cm} \times 100 \text{ cm} = 1,000,000 \text{ cm}^3$

so there are 1,000,000 (one million) cubic centimetres in a cubic metre.

C3b

Get the pupils to work in groups. Using sticks or pieces of bamboo and string ask them to construct a cube which has a volume of  $1 \text{ m}^3$ .

By making this shape the pupils will have a visual awareness of the space a  $1 \text{ m}^3$  occupies.

Give the pupils more practice at using the formula for finding volume by working through the examples in the Pupil's Resource Book on pages 119, 120 and 121. These examples include measurements in m and cm.

### Answers

#### Activity A

- |                      |                        |                       |
|----------------------|------------------------|-----------------------|
| 1. $2 \text{ m}^3$   | 2. $36 \text{ m}^3$    | 3. $24 \text{ m}^3$   |
| 4. $8 \text{ m}^3$   | 5. $42 \text{ m}^3$    | 6. $27 \text{ m}^3$   |
| 7. $150 \text{ m}^3$ | 8. $30 \text{ cm}^3$   | 9. $125 \text{ m}^3$  |
| 10. $64 \text{ m}^3$ | 11. $300 \text{ cm}^3$ | 12. $12 \text{ cm}^3$ |

#### Activity B

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



Can all the pupils use the formula  $l \times b \times h$  to calculate volume?

## Support Activities

The best way to reinforce pupils understanding of mass and volume as taught in this unit is to provide plenty of practice through practical activities. Work with these pupils on practical measuring and weighing tasks. Provide support and encourage them to talk about their work as they go along. They will come to understand the concepts best through applying them to real practical problems.

### Some Suggested Activities

#### 1. Class Shop

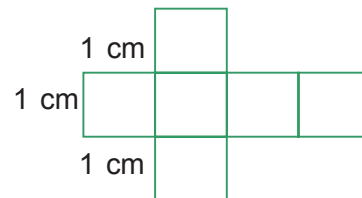
Bring in market produce, choose fruit and vegetables that will not easily spoil when the pupils handle them, such as kumara or limes. Prepare some standard weights in grams and kilograms. Set up a class shop and practice weighing out given amounts of each item on request.

#### 2. Comparing Known Mass

Bring in a selection of grocery items that have the weights marked on the packets in grams and kilograms. Have pupils compare the weight and then arrange them in order of weight.

#### 3. Construct a Cubic Centimetre

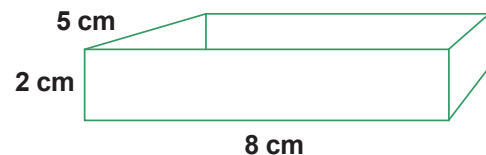
Work with the group to draw a net and construct a cubic centimetre model – you will need card and sellotape, rulers and scissors to do this. Emphasise the measurements as you work so that pupils understand the relationship between the 2 dimensional measurements and their finished cube.



#### 4. Using Cubes to Calculate Volume

Pupils who are struggling with the idea of volume need to do plenty of practical tasks using centimetre cubes. If you have made centimetre cubes out of wood, use these.

Prepare some cardboard prism shapes with different volumes – leave one side of each shape open as shown.



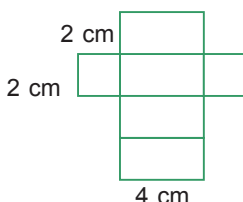
The nets below will help you.

Have the pupils pack the shapes with 1 cm cubes and find the volume by counting the cubes.

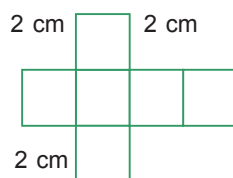
Next, lead them through the calculation using the formula, showing them how each measurement relates to the number of cubes in the box.

You could also encourage them to make their own solids of a given volume using the nets below and use these to reinforce the formula.

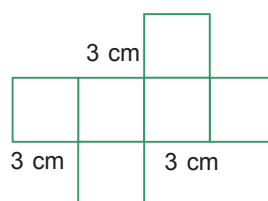
Volume  $16 \text{ cm}^3$



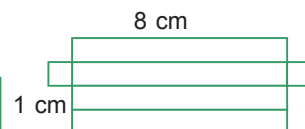
Volume  $8 \text{ cm}^3$



Volume  $27 \text{ cm}^3$



Volume  $8 \text{ cm}^3$



## Unit 8: Measurement

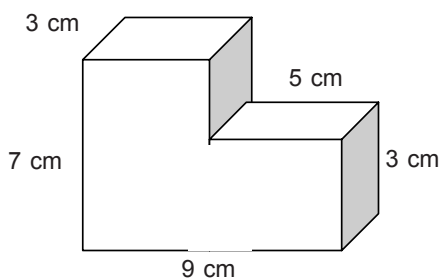
### Extension Activities

For pupils who understand how to weigh and measure using the standard units you have taught in this unit, provide activities to help them extend and apply these skills. Choose activities, which encourage the pupils to go beyond the objectives of the unit and think for themselves. Once you have explained the activities leave the pupils to work alone. You could also use these activities for homework.

#### Some Suggested Activities

##### 1. Calculating the Volume of Composite Shapes

This is an extension of the work pupils have mastered on calculating volume. Draw a composite shape on the board and challenge the pupils to find a way to find the volume.



They should be able to do this by splitting the shape into two rectangular prisms and calculating the volume of each part then adding the two together.

Once they have worked out how to do it, have them work with a partner to design and draw other composite shapes and calculate the volume.

The volume of this shape is  $81 \text{ cm}^3 + 48 \text{ cm}^3 = 129 \text{ cm}^3$  or  $84 \text{ cm}^3 + 45 \text{ cm}^3 = 129 \text{ cm}^3$ .

##### 2. Painted cubes

Give the pupils the following problem to sort out.

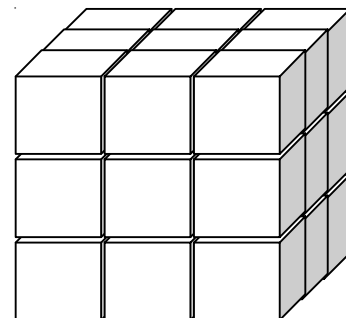
This object is made from 27 1 cm cubes glued together. Its volume is  $27 \text{ cm}^3$ .

If the object was painted all blue all over, how many of the 1 cm cubes used will have the following?

- a. 3 sides painted
- b. 2 sides painted
- c. 1 side painted
- d. no sides painted

Answers a. 8, b. 12, c. 6, d. 1.

When they have finished they could design their own similar problems and try them out on a partner.



#### Check Up Page: Answers

- 1. a. kg      b. g      c. t      d. kg
- 2. a. 1 kg 324 g      3. a. 3,500 g      4. a. 2 t 250 kg      5. a. 3,000 g      e. 4,200 g  
b. 2 kg 578 g      b. 1,353 g      b. 1 t 607 kg      b. 2,500 g      f. 2,323 g  
c. 2 kg 75 g      c. 2,050 g      c. 3 t 50 kg      c. 1,250 g      g. 1,250 g  
d. 750 g      h. 1,500 g
- 6.  $54\frac{1}{4}$  kg or 54 kg 250 g or 54.25 kg
- 7. a. 3 kg 250 g or  $3\frac{1}{4}$  kg      b. 3 kg 925 g
- 8.  $2\frac{1}{2}$  kg or 2 kg 500 g or 2.5 kg
- 9. a.  $6 \text{ cm}^3$       b.  $32 \text{ cm}^3$       c.  $16 \text{ cm}^3$       10. a.  $30 \text{ cm}^3$       b.  $600 \text{ m}^3$       c.  $128 \text{ cm}^3$
- 11. breadth = 2 cm
- 12. 2 m and 3 m      or 1 m and 6 m  
  
 $1 \times b = 6$        $1 \times b = 6$

## Shape Topic 12: Three-dimensional Shapes

### Topic 13: Structures

#### Aim:

To extend the pupils knowledge and understanding of prisms and pyramids and to investigate properties of two and three-dimensional structures.

#### Topic 12, Sequence of objectives: To

1. unfold cartons and boxes to revise nets of cuboids.
2. investigate prisms and pyramids.
3. make pyramids and prisms.

#### Topic 13, Sequence of objectives: To

1. teach that some shapes are more rigid than others.
2. teach pupils how to strengthen simple two-dimensional and three-dimensional structures.

#### Rationale:

In these topics, the pupils learn about pyramids and prisms and two-dimensional and three-dimensional structures. They will investigate the nets of pyramids and prisms, and the properties of these structures. Pupils will make pyramids and prisms and learn how to strengthen (make rigid) two and three-dimensional structures. Pupils will appreciate the use of triangular structures when erecting buildings, in particular the roofs of buildings.

#### T1a

#### Materials

a selection of  
cardboard cases  
scissors  
cutting knives

This activity is a revision of what the pupils learned in Standard 4, Unit 3.

Revise nets of cuboids in a practical way using a collection of cartons and boxes. Show the pupils various cartons and discuss their properties. For example:

- the number of **faces**
- the number of **edges**
- the number of **vertices**
- any faces which are **congruent** (the same)
- any edges which have the same length
- the name of shapes.

Make sure the pupils are confident with these terms.

Draw a heavy line along the edges of each box or carton. Then carefully cut along the edges. This will open up the carton or box. Show the net to the pupils. The heavy lines drawn will show the net clearly.

Repeat with other boxes or cartons making sure that you cut different edges to give a different net for the same shape.

Sketch the nets on the board.





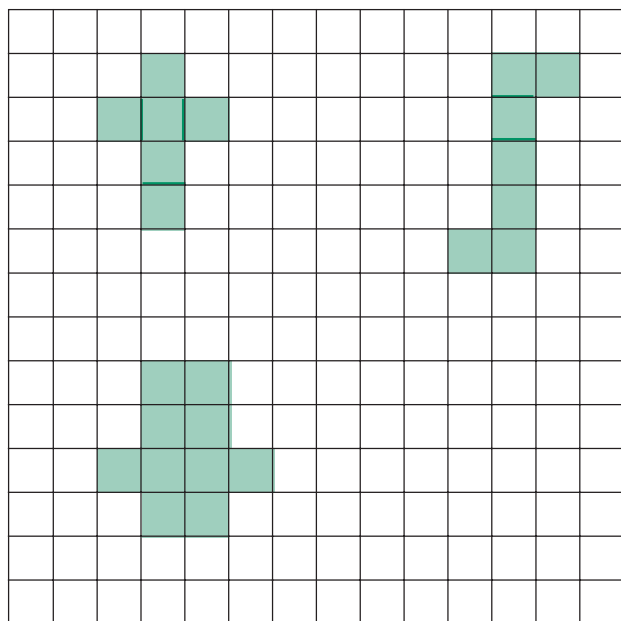
# Unit 9: Shape

## C<sub>1a</sub>

Pupils work in groups of 4 to 6. Give each group a cardboard case.

Ask the pupils to unfold the box using the method you demonstrated. Encourage the pupils to make different nets for the same shape.

Ask the pupils to draw their nets on grid paper, if possible. Display the pupils work.



As they work encourage the pupils to talk about the shapes using the vocabulary they have revised in this lesson.

Ask the pupil's to complete the activities in the Pupil's Resource Book on page 124.

## Answers

### Activity A

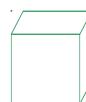
1. Shape A: Cube
  - a) vertex
  - b) face or square face
  - c) edge
  - d) face or square face
2. Shape B: Cuboid
  - a) vertex
  - b) square face
  - c) rectangular face
  - d) edge

### Activity C

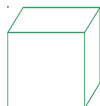
1. cuboid



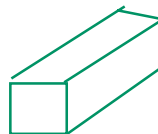
2. cube



3. cube



4. cuboid



5. Cube



### Activity B (Suggested Answers)

1. A cuboid with six faces, twelve edges and eight vertices.  
Two faces are square and four are rectangular.  
The length of the short edge is half as long as the longer edge.
2. A cube. All six faces are squares of exactly the same size.  
There are twelve edges and eight vertices.

## Topic12: Three-dimensional shapes

**T<sub>1b</sub>**

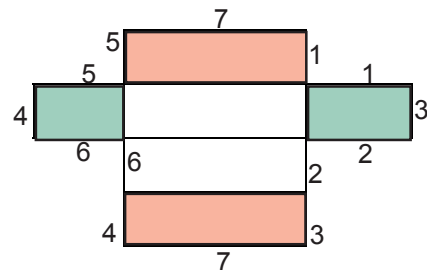
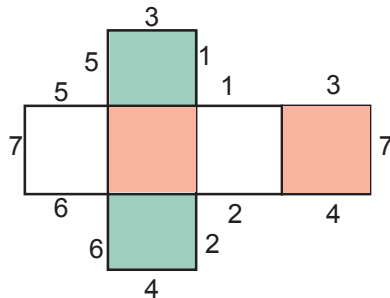
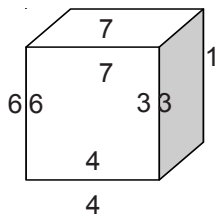
**Materials**

empty cartons of different sizes

Show the pupils a carton. Ask them what shape it is. Cut and unfold the carton to revise the previous activity.

Ask the pupils to identify the pair of faces which are **congruent**. Then shade or colour them. Make sure there are three pairs of faces. Also identify each pair of sides which come from a common edge and mark them. There should be seven pairs of sides.

Repeat with one or two cartons to give different nets.



**C<sub>1b</sub>**

Working in groups, ask each group to label the edges of the case they cut up in yesterday's lesson in the same way.

Then ask them to shade three pairs of congruent faces.

They can reassemble their case to check that they have labelled the edges correctly.

Ask the pupils to do the activities in the Pupil's Resource Book on page 125.

### Answer

#### Activity A

1. cuboid



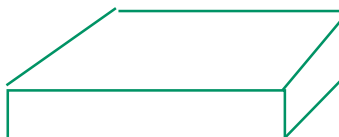
2. cube



3. cuboid



4. cuboid

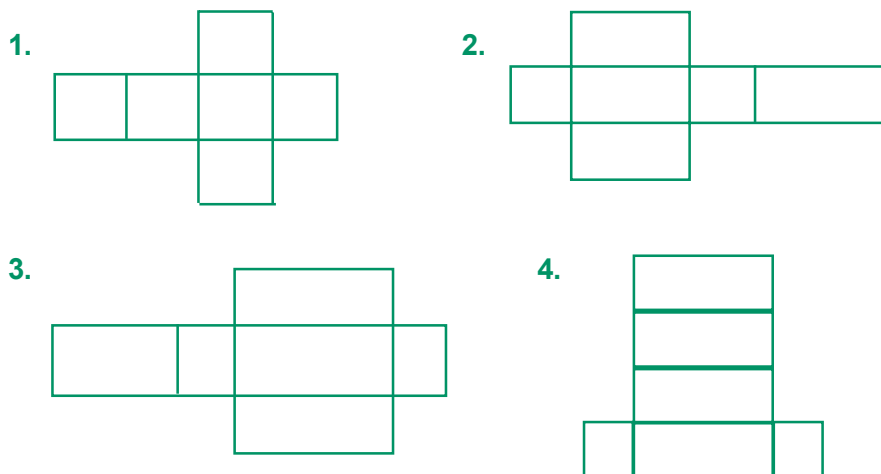


# Unit 9: Shape

## Activity B

1. C cuboid
2. E cube
3. A cuboid
4. B cuboid
5. D cube

## Activity C (Suggested Answers)



Can all the pupils understand the relationship between cuboids and their nets?

T<sub>2a</sub>

Bring a collection of prisms into the classroom. If you can make these out of wood they will last longer than cardboard ones. You can also collect prism shaped objects.

You need enough objects for all the children to be able to handle them.

Pass the prisms around the class and allow all the pupils to **touch and handle** the different prism shapes.

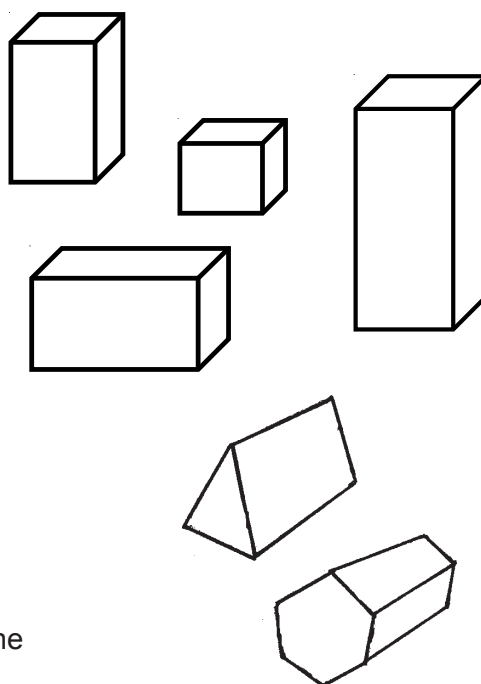
Ask pupils to **describe** each shape. They should now be confident with using the vocabulary they have already learned including words such as the names of **shapes**, **faces**, **vertices**, and **edges**. Encourage them also to use comparative words to describe length and shape, such as **long / longer**, **short / shorter**, **parallel / not**

When they have had plenty of time to investigate and describe the shapes introduce and explain the following terms:

- prism** A solid shape with two bases that are the same joined by rectangular sides
- base** the bottom of a shape (a prism has two bases – one at either end)

### Materials

strips of cloth for blindfolds,  
collection of prisms  
cut from wood or made  
from card, rulers,  
scissors glue or  
sellotape



## Topic 12 : Three-dimensional shapes

Explain that a **prism is named according to the shape of its base**. For example a prism with a hexagonal base is called a hexagonal prism, a prism with a triangular base is called a triangular prism and so on. A cuboid is a rectangular prism.

Practice using the names. Show pupils examples of different prisms. Help them to identify which face is the base and count the number of sides, then name the prism correctly.

Ask the pupils to look at the other faces of the prisms. What do they notice? **All other faces of a prism are rectangles.**

Ask them how many bases there are. Explain that **a prism always has two bases** and that all the other faces are rectangles.

Look at the edges of the prism. Ask the pupils what they notice about these. Help them to see that **all the edges that join the 2 bases of a prism are parallel**. Can any of the pupils explain why this is? (because they are joining two bases of the same shape).

All the time you should be encouraging the pupils to **talk** about what they see and **describe** the solids using the correct mathematical terms that they have learned.

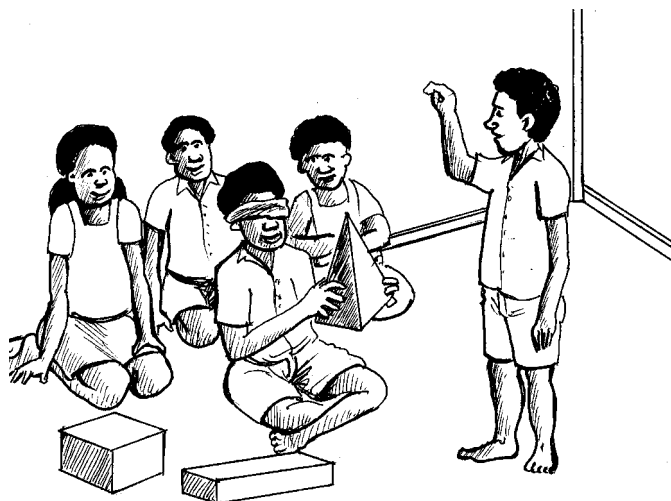
C2a

There are three games suggested for this activity. Demonstrate each one first and then allow the pupils to play the games in groups of about 6 pupils.

### Blind Man's Prism - How to Play.

One pupil is blindfolded. Another player gives the blindfolded player a prism to hold. Without looking he/she has to feel the shape and describe it, (number of faces, number of sides etc.) and then has to name the prism.

Continue until every player in the group has had a turn.



### Guess My Name - How to Play.

One pupil has to think of a shape and write the name of the shape down on a piece of paper, for example **triangular prism**. The other players must not see the paper.

The other players then take it in turns to ask questions about the shape. The questions can only be answered **yes** or **no**.

For example:

**Does the shape have five faces?** Is OK because the answer is yes or no.

**How many faces has the shape got?** Is not OK because the answer would be 5.

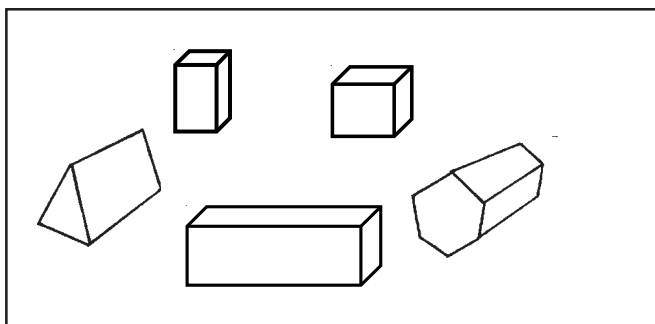
They go on asking questions until someone can guess the shape. Then the person who guesses is the next person to think of a shape.

## Unit 9: Shape

### Memory Game - How to Play.

Put a collection of 6 to 8 cuboids and prisms of different shapes on the table and tell the pupils to look carefully at them.

Then, cover them with a cloth and take away one of the shapes without the pupils seeing which one it is.



Remove the cloth and have the children try to remember which shape has been removed. They should put up their hands to make a guess, the first one to guess correctly can be the next player to take a shape away.



#### Materials

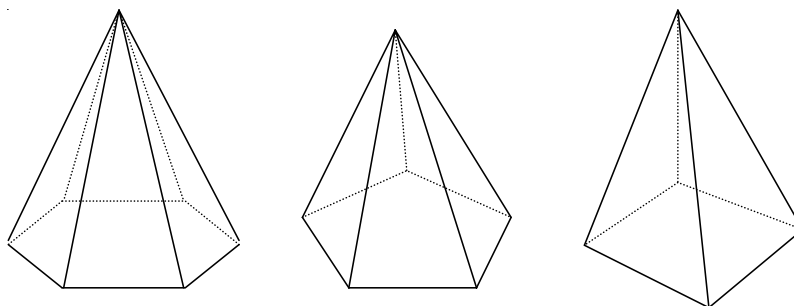
Pyramid nets which have been cut and folded, one for each group.  
a collection of pyramids  
Three-dimensional Shapes poster

Display a collection of pyramids on a table in front of the pupils.

Show a pentagonal pyramid and talk about the faces. Point out that the base is a pentagon. Discuss with the pupils the shape of other faces.

Repeat with other pyramids. Point to the shape of the base. Ask the pupils to name the shape.

- triangular pyramid
- pentagonal pyramid
- hexagonal pyramid
- rectangular pyramid



Talk about the number of vertices. Point out that, apart from the base, all the other faces are triangles. The triangles meet at the apex.

Ask the pupils which shape has a triangle for all its faces.

(Answer: **a triangular prism**)

Use the Three-dimensional Shape poster to revise the properties of pyramids and prisms before moving on. You could display this in the classroom.

## Topic 12: Three-dimensional Shapes

C<sub>2b</sub>

Have pupils work in groups of three or four.

Give each group a different pyramid net which has been cut and folded but not stuck together.

They are to open out their net and look at the properties of the pyramid. They could record their observations on a table in their exercise books or on a chart, as follows:






<b>Number of faces</b>	
<b>Number of edges</b>	
<b>Number of vertices</b>	
<b>Shape of the base</b>	
<b>Name of the shape</b>	

Ask the pupils to complete the activities in the Pupil's Resource Book on pages 126 and 127.

Each group will need a selection of pyramid shapes to work with.

### Answers

#### Activity A

	Faces	Edges	Vertices	Base
1. Triangular Pyramid	4	6	4	
2. Rectangular Pyramid	5	8	5	
3. Pentagonal Pyramid	6	10	6	
4. Hexagonal Pyramid	7	12	7	
5. Octagonal Pyramid	9	16	9	

#### Activity B

1. Done in the Pupil's Resource Book.

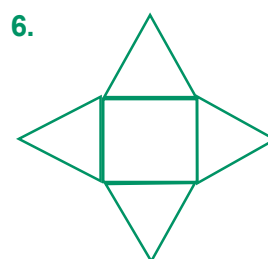


#### Activity C



3. 16

4. 4



## Unit 9: Shape

### T<sub>2c</sub>

In the environment there are many prisms and pyramids. Walk around the school campus with the pupils and look for prism or pyramid shapes in buildings or other man-made objects. Ask the pupils to sketch any that they find and write brief descriptions of where they are found. Talk about the shapes as you find them. Encourage the pupils to use the correct mathematical language.



### C<sub>2c</sub>

Have the pupils work in groups of three. Give each group a mixed collection of pyramids and prisms and ask them to complete the following activities. You could write these instructions on the board.

- Work together to sort out your shapes into two piles, pyramids in one pile and prisms in the other.
- Mix up the shapes again. Take turns to pick one shape from the pile and describe it to the rest of the group. In your description you should use the terms you have learned such as, face, edge, apex, vertex and the name of each shape.
- Take turns to pick a shape from the pile and tell your group whether it is a pyramid or a prism. Give a reason for your answer.

When they have finished their group work have pupils turn to the Pupil's Resource Book and complete the activities on pages 127, 128 and 129. These help the pupils to differentiate between pyramids and prisms.

## Answers

### Activity A

- |                           |                          |
|---------------------------|--------------------------|
| 1. C. Hexagonal prism     | 6. A. Triangular prism   |
| 2. E. Pentagonal pyramid  | 7. I. Pentagonal prism   |
| 3. H. Hexagonal pyramid   | 8. G. Triangular pyramid |
| 4. F. Octagonal prism     | 9. B. Rectangular prism  |
| 5. D. Rectangular pyramid |                          |

### Activity B

	Shape of the base or ends	Name	Number of		
			faces	vertices	edges
1.	square	rectangular pyramid	5	5	8
2.	pentagon	pentagonal pyramid	6	6	10
3.	pentagon	pentagonal pyramid	7	10	15
4.	octagon	octagonal prism	10	16	24
5.	hexagon	hexagonal prism	8	12	18
6.	hexagon	hexagonal pyramid	7	7	12
7.	triangle	triangular prism	5	6	6
8.	triangle	triangular pyramid	4	4	6

## Topic 12: Three-dimensional Shapes

### Activity C

#### (Suggested Answers)

1. Because it has two congruent ends, each of which is a hexagon.
2. Shape 7 has two triangular ends while shape 8 only has one triangular base. The edges of shape 8 meet at an apex.
3. Both shapes are pyramids but shape 2 has a pentagonal base and shape 6 has a hexagonal base.
4. Both are prisms, both have 2 congruent ends and 2 sets of parallel sides.
5. Shapes 1, 2, 6 and 8.
6. A pyramid has one base with edges which meet to form an apex, but a prism has 2 bases and parallel sides.



Do all pupils know the properties of pyramids and prisms?

**T<sub>3a</sub>**

#### Materials

card or squared  
paper  
scissors  
glue or sellotape  
rulers

Have pupils work in mixed ability groups of two or three for this activity so that they can help each other. If you do not have enough materials for all the groups to work at once, have some pupils do this activity while others work with the solid shapes, or do the Pupil's Resource Book activities or play the shape games they learnt in T2a.

Ask pupils to tell you the difference between pyramids and prisms in their own words.

Explain that this lesson consists of a practical activity in which they will draw nets and construct solid shapes.

Show pupils how to construct a solid shape from a net.

If they are using glue their net will need to include tabs for the glue. If they are using sellotape they can make nets without tabs.

Demonstrate the construction method that they will use. Pupils will need plenty of time to complete these activities.

Each group should try to make three different pyramids and prisms.

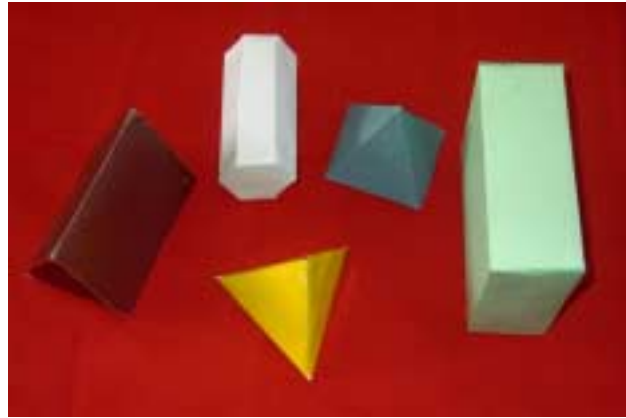
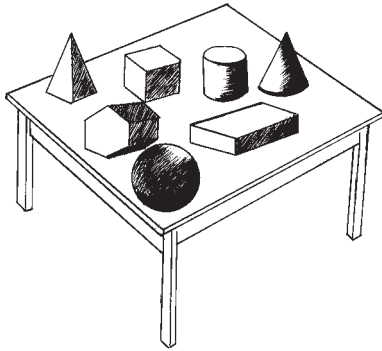
The nets are provided on pages 129 and 130 of the Pupil's Resource Book for pupils to copy.



## Unit 9: Shape

C<sub>3a</sub>

Display the pupils' finished solids. You could set up a table in the classroom to display them or make mobiles to hang.



Can all the pupils construct pyramids and prisms from nets?

## Topic 13: Structures

T<sub>1a</sub>

**Materials**  
plain shapes  
geo-strips  
split pin fasteners

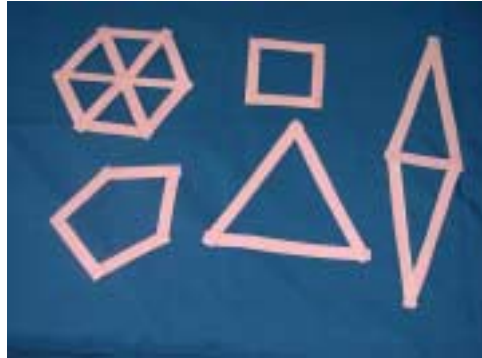
Revise the names and properties of some common two-dimensional shapes, such as:

1. **triangles**
2. **quadrilaterals** - square, rectangle, parallelogram
3. **other polygons** - pentagon, hexagon, octagon

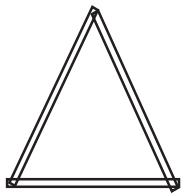
Ask pupils to describe the properties of each shape

Explain to the pupils that structures are made using these two-dimensional shapes. Use geo-strips to make some two-dimensional shapes including a triangle, a rectangle and a hexagon.

Allow pupils to handle the shapes and explore which ones are easy to move and which ones are firmer.



Introduce the term **rigid** and explain what it means. Ask them to tell you which of the shapes you have made is most rigid (**the triangle**) and least rigid (**the hexagon**).



Ask the pupils why they think the triangular structure is more rigid than the rectangular structure. Listen to their explanations.

Explain that a triangle is a very strong shape often used in construction. Sometimes triangular braces are added to rectangular shapes to make them more rigid, or to strengthen them.

Ask the pupils to look around the building and see if they can find examples of triangular shapes in the structures. These could be in the roof construction.

C<sub>1a</sub>

Ask the pupils to look around the school buildings. Ask them to look for different shapes. Tell them to look for triangular, rectangular and circular structures. Are there any other shapes they can find?

Ask the pupils to take particular attention as to which parts they think are rigid and which parts are less rigid.

Let the pupils record their findings.

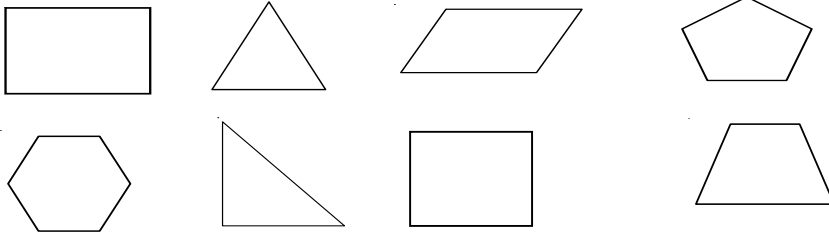
Ask the pupils to talk about why they think there are so many triangles used in buildings.

## Unit 9: Shape

**T<sub>1b</sub>**

**Materials**  
geo-strips, soft putty  
or clay, sago palm,  
midribs

Revise your first lesson on rigidity.

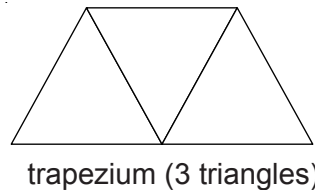
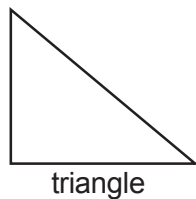
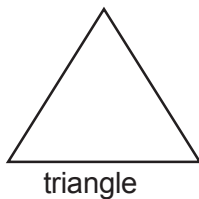


Draw some shapes on the board. Explain that they represent two dimensional structures.

Discuss why some are rigid and others are not. Talk about each shape of why it may or may not be rigid.

Explain that triangles and trapeziums have a very high chance of rigidity because they have **a triangular structure**. On the other hand, other shapes such as a squares, rectangles and pentagons have lower rigidity because they have **no triangular structure**.

Show how these shapes are rigid and what makes them rigid.

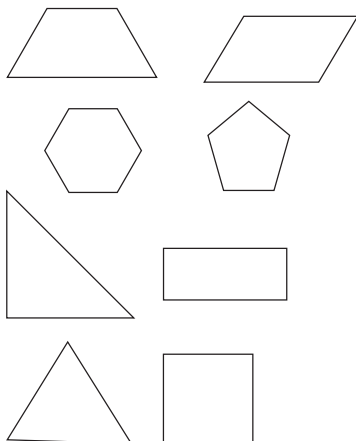


**C<sub>1b</sub>**

Ask the pupils to make polygons (two-dimensional shapes) from geo-strips. These shapes will also be used in the next activity.

Give geo-strips to the pupils. If you do not have geo-strips, then local materials such as, leaf, midribs joined with clay, soil or soft putty from fruit could be used instead.

In groups of three, ask the pupils to make these two-dimensional shapes from geo-strips or local materials.



Once they have finished making their two-dimensional shapes, the pupils can then investigate and discuss among themselves the rigidity of the shapes they have made. For example:

**Which shapes are most rigid and which ones are less rigid?**

**What makes them rigid?**

**Can they add to the shapes to make them more shapes rigid? If so how?**

**What properties must the shapes have to become rigid?**

Encourage the pupils to discuss this with the other groups and find out what others think about the rigidity of shapes.

Display and store the shapes for the next activity.

## Topic 13: Structures

T<sub>1c</sub>

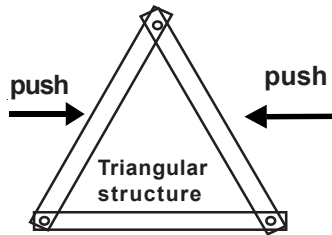
### Materials

two-dimensional  
shape structures  
made from geo-strips  
or local materials

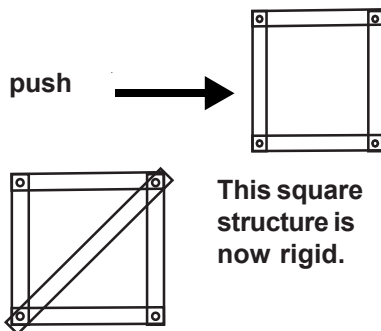
Use the two-dimensional structures prepared in the last lesson.

Show pupils how two-dimensional structures such as a square, parallelogram, trapezium and a pentagon can be strengthened to become more rigid.

Begin with a triangular structure. While holding one side, give it a push on one side and then on the other side. The structure is rigid, it cannot be collapsed by pushing.



Show a square structure. Let the pupils observe you give it a push on one side and then on the other. Ask if the structure is rigid. The answer is obvious. The structure collapses easily. It is not rigid.



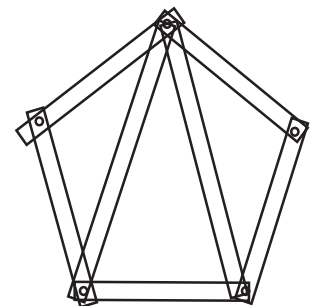
Ask the pupils to suggest ways to strengthen the square structure to make it more rigid. Ask the children what property it must have. Emphasise it must have a **triangular structure** to make it rigid. Add a diagonal strut to make it rigid.

Sketch it on the board using a square to represent the shape. The square is **rigid** if a diagonal **strut** is added, dividing the not rigid square into two rigid triangles.

Explain to the pupils that the square needs only one diagonal strut to strengthen it.

Point out the diagonal has created two triangles.

Repeat this with a pentagonal structure. Add two struts to the structure as shown. Show that adding two struts creates three triangles.



C<sub>1c</sub>

Have pupils work with a partner to explore other two-dimensional structures. Encourage them to find out the patterns between the shapes, the number of struts and triangles as they add diagonal struts to the shapes. Explain that the struts used to strengthen each shape must not cross over each other.

You may prepare a table like the one here to record the results.

## Unit 9: Shape

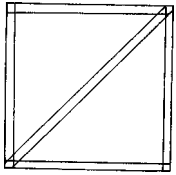
Talk about the results with the pupils.

For example:

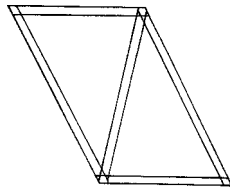
A triangle does not need a diagonal to strengthen it.

A square and a rectangle need one diagonal to strengthen them. The diagonal creates two triangles and so on.

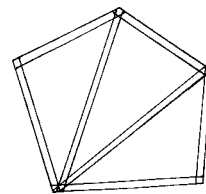
shape	number of sides	diagonal (struts)	triangles
triangle	3	0	1
parallelogram	4	1	2
square	4	1	2
rectangle	4	1	2
pentagon	5	2	3
hexagon	6	3	4
octagon	8	5	6



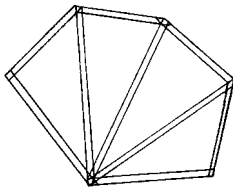
Square  
1 strut  
x 2 triangles



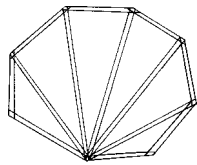
Parallelogram  
x 1 strut  
x 2 triangles



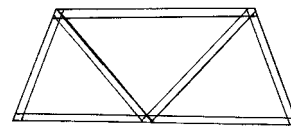
Pentagon  
x 2 struts  
x 3 triangles



hexagon  
x 3 struts  
x 4 triangles



octagon  
x 5 struts  
x 6 triangles



trapezium  
2 struts  
3 triangles

When the pupils have completed the practical activity have them turn to pages 131 and 132 of the Pupil's Resource Book and complete the activities.

### Answers

#### Activity A

1. rigid
2. less rigid
3. rigid
4. less rigid
5. rigid
6. less rigid
7. rigid
8. rigid.

#### Activity B

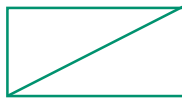
1.



2.



3.



4.



5.



6.



#### Activity C

	sides	struts	triangles
triangle	3	0	1
rhombus	4	1	2
trapezium	4	2	3
pentagon	5	2	3
hexagon	6	3	4
heptagon	7	4	5
octagon	8	5	6



Do all the pupils understand the meaning of the term rigidity, and can they all identify more and less rigid shapes?

## Topic 13: Structures

### T<sub>2a</sub>

Prepare the following three-dimensional shapes using reeds, coconut midribs and fruit putty, clay or soil.

Show each structure to the pupils. Discuss:

- The name of the structure
- The number of sticks used to make it
- The rigidity of each structure
- Which faces are not rigid
- How could the faces which are not rigid be strengthened?
- How could diagonals be used to strengthen the shape as a whole?

Pay particular attention to the parts of the structure which are not triangular in shape.

Note that in a triangular pyramid all the faces are triangles. Therefore it is very rigid.

The other pyramids however does not have a triangular base. All the other faces are triangular. Explain that the face that needs strengthening is the base. Refer to the previous lesson on how to strengthen it.

If you have made other pyramids use these in your lesson too.

#### Materials

reeds  
coconut midribs,  
clay, putty, string



### C<sub>2a</sub>

Ask the pupils to work in small groups and use sticks and clay to explore how to strengthen 3D structures.

Move among them as they work and encourage them to think about strengthening both the faces and the structure as whole. Make sure they are discussing their work and ask them to explain why they choose to add struts to each shape.

## Unit 9: Shape

T<sub>2b</sub>

### Materials

sticks, coconut midribs, straws, putty, clay

Explain that there are two different ways of strengthening three-dimensional structures. Ask the pupils to discuss this and see if they can suggest what they are. Hopefully they will identify the following:

- by strengthening the faces and
- by strengthening the structure as a whole.

Explain the difference between these using a model of a rectangular prism made from sticks and putty.

Show that without any braces the structure is weak and easy to move. It has little rigidity, and would therefore be weak as a structure to use in building construction.

Ask pupils to come and use more sticks or midribs to strengthen the faces of the shape as shown.

When we strengthen the faces only, we can improve the rigidity as shown.

Explain that, to make the structure stronger again we need to add braces that cut through the centre of the structure. These are three-dimensional braces.

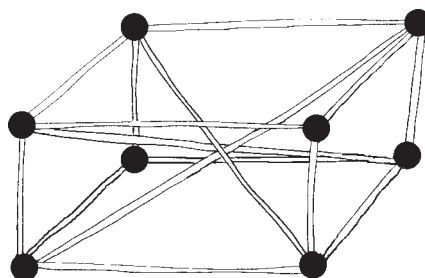
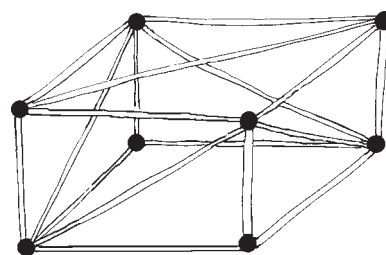
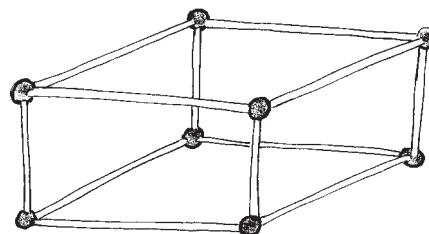
Ask pupils to suggest where these braces could be added.

The diagram shows some suggestions.

Tell pupils to look up and study the structure of the roof of your classroom (which is probably a triangular prism). Ask them to identify the following:

- Any braces added to two dimensional shapes or faces.
- Any braces which cut through the shape as a whole.

Discuss why the braces have been placed as they have and discuss the design of the roof in terms of rigidity and strength. If possible you could also take the class to look at different roof structures and compare different designs.



C<sub>2a</sub>

Divide the pupils into groups of three for this practical activity. Give each group some sticks or straws and putty.

Challenge them to design and make a strong triangular prism shape, which uses both forms of strengthening.

Allow them plenty of time to talk about their design as well as to make it. Encourage trial and error, where they test different structures to see which is strongest and encourage them explain why they choose the ones they do.

When all the groups have finished their models, display them at the front of the class and discuss them.

Compare the different designs, discuss which is strongest and why and allow each group to explain why they chose to strengthen their model in the way that they did.

### Support Activities

For pupils who need more help understanding the properties of three dimensional shapes and structures, you should reinforce their learning through practical activities. Work with them and encourage them to talk about the shapes and use the vocabulary you have taught them.

Some suggested activities:

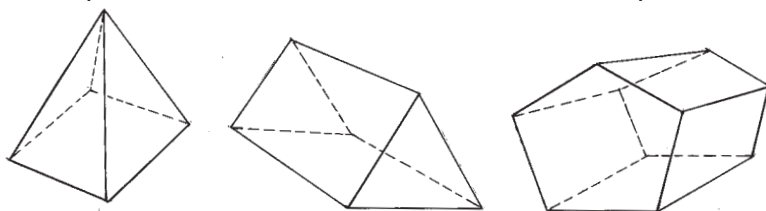
#### 1. Sort it Out

Give the pupils a mixed pile of shapes and ask them to sort them out by a number of different criteria, for example:

- Put all the pyramids in one pile and all the prisms in another.
- Put all the shapes with triangular faces in one pile all the shapes with rectangular faces in another pile, and all the shapes with both in a third pile.
- Sort out the shapes according to the number of vertices they have starting with the least.
- Sort out the shapes with parallel edges and those without parallel edges.
- Sort out the shapes with square faces and those without square faces.

#### 2. What Am I?

Describe a shape in terms of the number of faces, edges and vertices it has and have pupils pick the shape from a choice of two or three. For example show them the following shapes:



I am a shape with two bases 15 edges and five rectangular faces.

**What am I?**

Repeat this to give the pupils lots of practice defining the solids in terms of their properties.

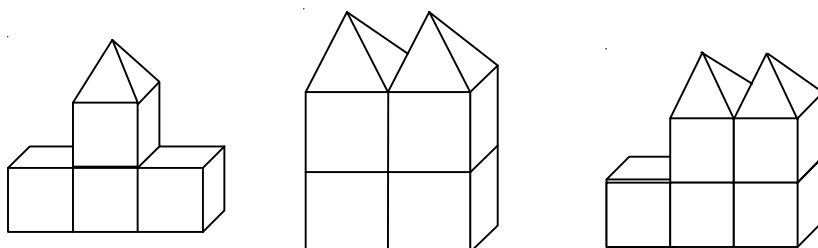
When they are more confident with the terms, ask them to work with a partner, to make up the descriptions themselves and see if their partner can guess the shape they are describing.

#### 3. Design your House

Tell the pupils to imagine that they are designing their own house. They can use up to 5 cubes and up to 3 square based pyramids fitted together in any way they like. Tell them to think of three different designs for their house and sketch them in their exercise books.

Then they should choose the design they like the best and write a few sentences to explain why they have chosen it.

Some suggested designs are shown below to get the pupils started.





## Unit 9: Shape

### Extension Activities

For pupils who are confident with the three-dimensional shapes and structures they have studied extend their skills with some more practical tasks. Leave them to work on their own once you have explained the activities. You could also use these activities for homework.

Some suggested activities are:

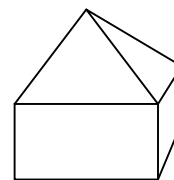
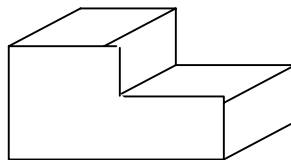
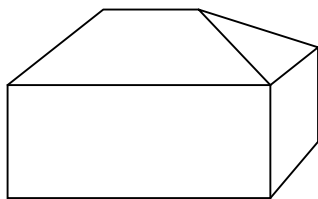
#### 4. Become an Architect

Working in pairs, ask the pupils to design and build a three-dimensional model of a building. They could choose to make a house, a wharf, a canoe shed or a warehouse.

They should decide what materials to use to make their model and collect these themselves, they might use sticks or midribs with putty as you have already shown them, or they might use other locally available materials. They could also use cardboard boxes with sticks added for strengthening.

When their models are completed they should display them in the classroom and label them with a short explanation about their design which describes the three-dimensional shapes it incorporates and their reasoning for strengthening it in the way that they have.

#### 5. Designing Nets



#### 6. Investigating Euler's law

Explain the following formula that was discovered by a man called Leonard Euler, a mathematician from Switzerland. It is called Euler's Law.

$$v + f - e = 2$$

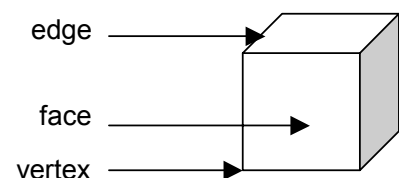
Euler says that if you add the number of vertices and the number of faces of solid shape, and then take away the number of edges, the answer will always be 2.

Show the pupils how the formula works for a cube as follows:

$$8 \text{ vertices} + 6 \text{ faces} = 14 - 12 \text{ edges} = 2$$

Then challenge them to try out Euler's law on other solid shapes including the following:

- a rectangular prism
- a square prism
- a triangular pyramid
- a triangular prism
- a hexagonal prism a square pyramid



## Check Up Page: Answers

1. a. apex      c. face      e. vertex  
b. edge      d. base      pentagonal pyramid
2. a. pentagonal pyramid      d. triangular pyramid      g. octagonal pyramid  
b. cube      e. hexagonal pyramid      h. hexagonal prism  
c. rectangular prism      f. pentagonal prism      i. triangular prism

3.

shape	number of		
	faces	edges	vertices
hexagonal prism	8	18	12
pentagonal pyramid	6	10	6
square based pyramid	5	8	5
triangular prism	5	9	6

4. a. pyramid - a solid shape with one base and triangular sides which meet at an apex.  
b. prism - a solid shape with two congruent ends and parallel edges which join the ends.  
c. apex - the part at which sides of a pyramid meet. The highest part of a solid shape.  
d. base - the bottom of a shape  
e. face - one flat side of a solid shape.  
f. vertex - the part of which three or more edges of a solid shape join.  
g. edge - the line between two faces of a solid shape.
5. a prism has two congruent bases joined by parallel faces while a pyramid only has one base and the faces meet at an apex.

6. a.



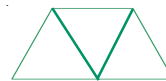
b.



c.



d.



7. a. i      b. i      c. ii      d. i      e. i      f. i

8. Check each pupil's work individually.

**Aim:**

To develop the pupils' understanding of area so that they can calculate the area of a variety of shapes.

**Sequence of objectives:** To

1. calculate the area of squares and rectangles in  $\text{cm}^2$  and  $\text{m}^2$  using the formula  $a = l \times w$  (area = length x width).
2. calculate the area of a triangle by halving the area of a rectangle.
3. introduce the formula for finding the area of triangles (area =  $\frac{1}{2}$  base x height) and parallelograms (area = base x height).
4. calculate the area of shapes made up of rectangles and squares and rectangles and triangles.

**Rationale:**

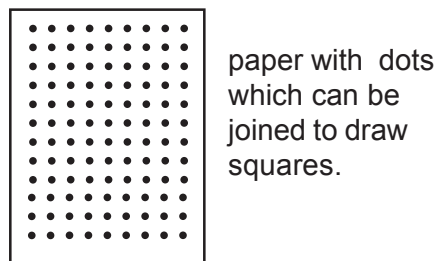
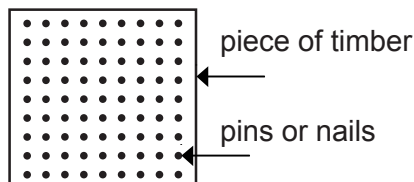
Understanding and being able to calculate the area of shapes is essential knowledge for pupils. In their future lives they will be able to apply these skills in real situations such as in carpentry, farming, building and mechanics.

**T1a****Materials**

geo boards,  
dot paper,  
rectangular cut out  
shapes

Prepare 9-pin geo boards and square dotted paper.

Divide the class into groups. Give each group a geo board and dotted paper.



Give each group at least 5 elastic rubber bands.

Ask them to make different shapes of the same area on the geo board. Then draw the shapes on the squared dotted paper.

For example:

Ask the pupils to make a rectangle that has 12 squares. Ask them,

'How many different ways can you make it have 12 squares?' ( $1 \times 12$ ,  $6 \times 2$ ,  $2 \times 6$ ,  $12 \times 1$ ,  $3 \times 4$ ,  $4 \times 3$ )

Ask them to record their findings by drawing the shapes on squared or dotted paper.

Prepare different sized rectangles and squares cut out from cardboard.

Pick up a rectangle from the cut out shapes and show it to the pupils. Ask them to talk about some of the things they know about the shape, such as the name of the shape, the number of sides and so on.

Ask the pupils, to describe what is meant by the **area of the shape**.

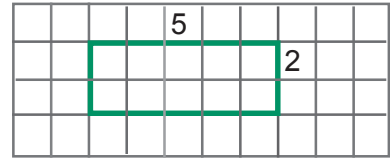
## Topic 21: Area

Show them a cardboard rectangle and explain the different properties of the rectangle. Show them the area. Explain to the pupils that the area of a shape is the size of the surface covered.

Ask the pupils,

'How can we find the space covered by the surface of the shape?'

Talk about different ways of finding the area of a 4 sided shape. Then demonstrate it on the board using grids.



Draw a grid on the board. Tell the pupils to assume that each square is 1 square centimetre.

Draw a rectangle measuring 5 cm long x 2 cm wide.

Ask 'What is the length of the rectangle?' (**5 cm**)

'What is the width?' (**2 cm**)

'How much space is taken up by the surface of the rectangle?' (**10 square cm**)

'How do we find area of the rectangle?' (**count the squares**)

Can the pupils think of a rule? Can they come up with the formula? Give them sometime to talk about it with a partner.

Area = length x width

$$5 \times 2 = 10 \text{ cm}^2$$

Explain to the pupils that area is measured in squared units such as cm squared or m squared, or km squared.

Explain that cm squared is written like this **cm<sup>2</sup>**, m square is **m<sup>2</sup>** and km squared is **km<sup>2</sup>**.

**C<sub>1a</sub>**

Have the pupils work in groups. Give each group a set of cut out rectangular shapes. Ask them to estimate the area of each shape before they actually measure it to calculate the area. They should write their estimate and their measurement in their exercise book.

Guide the pupils to measure the shapes using their rulers. Remind them of the starting point on the ruler.



Ask the pupils to do the activities in the Pupil's Resource Book on pages 135 and 136.

### Answers

#### Activity A

- |                                     |                                     |                      |                       |
|-------------------------------------|-------------------------------------|----------------------|-----------------------|
| 1. 18 squares or 18 cm <sup>2</sup> | 2. 16 squares or 16 cm <sup>2</sup> | 5. 9 cm <sup>2</sup> | 6. 4 cm <sup>2</sup>  |
| 3. 24 squares or 24 cm <sup>2</sup> | 4. 9 squares or 9 cm <sup>2</sup>   | 7. 2 cm <sup>2</sup> | 8. 12 cm <sup>2</sup> |
|                                     |                                     | 9. 8 cm <sup>2</sup> | 10. 5 cm <sup>2</sup> |

#### Activity B

- |                         |                        |                        |                        |
|-------------------------|------------------------|------------------------|------------------------|
| 1. 150 cm <sup>2</sup>  | 2. 42 cm <sup>2</sup>  | 3. 240 m <sup>2</sup>  | 4. 840 mm <sup>2</sup> |
| 5. 1,050 m <sup>2</sup> | 6. 540 cm <sup>2</sup> | 7. 676 km <sup>2</sup> |                        |

# Unit 10: Measurement

## Activity C

1. a.  $340 \text{ m}^2$       b. \$680      c. 74 m
2. a. 6      b. Yes 1 m      c.  $2 \text{ m}^2$       d.  $13 \text{ m}^2$
3. a. house 1  $160 \text{ m}^2$  house 2  $144 \text{ m}^2$       b.  $2,696 \text{ m}^2$       c.  $3,000 \text{ m}^2$



Can all the pupils calculate the area of a rectangle using the formula  $a = l \times w$ ?

**T<sub>2a</sub>**

**Materials**  
dotted paper,  
geo boards, rubber  
bands

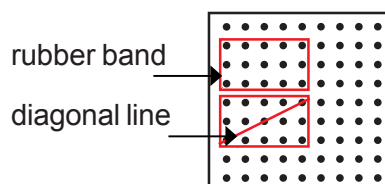
Prepare 9-pin square geo boards and dotted paper.

Divide the class into small groups. Give each group a geo board, dotted squared paper and elastic rubber bands.

Ask the pupils to make a rectangle on the geo board that has the area of 8 squares.

Ask them to check the area of the rectangle by counting the squares.

Ask them to place another rubber band diagonally. Then compare the area of the triangle with the area of the rectangle.



Ask them to draw other shapes of the same area on the dotted paper. Divide the shapes into halves by drawing a diagonal line. Ask them to compare the areas of the shapes.

Bring the class together and discuss their findings. Can the pupils think of a rule or formula to find the area of a triangle?

Pupils should come up with the following:

**The area of the triangle is the area of the rectangle divided by 2 or the area of the triangle is half the area of rectangle.**

Use rectangles of different sizes so that the pupils can check if their rule is true.

**C<sub>2a</sub>**

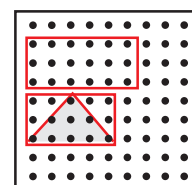
Ask the pupils to make some rectangles on the geo board or dotted squared paper, such as a 12 squared rectangle, 14 squared rectangle.

Then make or draw different triangles on each of the rectangles of the same length base and height.

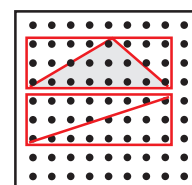
Ask them to compare the areas, by counting the squares and by using the formula.

Ask the pupils to complete the activity in the Pupil's Resource Book on pages 136 and 137.

10 squared  
rectangle



14 squared  
rectangle



# Topic 21: Area

## Answers

### Activity A

1. 14 squares      2. 10.5 squares      3. 22.5 squares      4. 17.5 squares

### Activity B

1.  $2 \text{ cm}^2$       2.  $5 \text{ cm}^2$       3.  $3 \text{ cm}^2$       4.  $2 \text{ cm}^2$   
5.  $7.5 \text{ cm}^2$       6.  $6 \text{ cm}^2$       7.  $4.5 \text{ cm}^2$       8.  $21 \text{ cm}^2$

### Activity C

Check each pupil's exercise book carefully.

**T<sub>2b</sub>**

**Materials**  
card rectangles

Prepare some rectangles of different sizes cut out of cardboard.

Place the shapes on grid paper. Ask the pupils to find the area of each of the shapes by counting the number of squares covered by each shape.

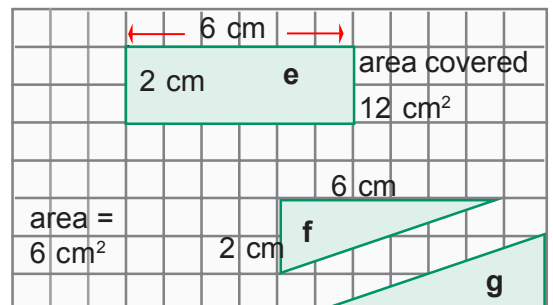
Draw a diagonal line to cut the rectangle in half.

When the rectangle **e** is cut in half, it gives two equal triangles **f** and **g**.

Place one of the triangles on to the grid paper and ask the pupils to find its area by counting the number of squares covered by triangle **f**. Repeat with other rectangles.

Ask the pupils to compare the area of the rectangle **e** with the area of the triangle **f**.

Revise the relationship between the shapes using the results.



area of rectangle e = area of triangle f

2

$$\frac{12 \text{ cm}^2}{2} = 6 \text{ cm}^2$$

2

**C<sub>2b</sub>**

Give the pupils grid paper. Ask them to draw these rectangles on the grid paper.

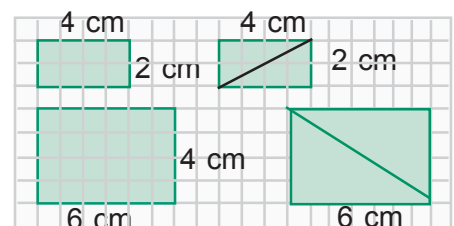
4 cm x 2 cm, 6 cm x 4 cm.

Ask them to count the squares to give the area of each of the shapes.

Ask the pupil to draw diagonal lines on each of the shapes.

Ask the pupils to count the squares to give the area of each of the triangles and compare them with the area of the rectangle.

Tell the pupils to record their results in their exercise book.



Can all the pupils calculate the area of a triangle by halving the area of a rectangle?

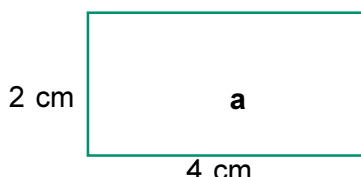
# Unit 10: Measurement

T<sub>3a</sub>

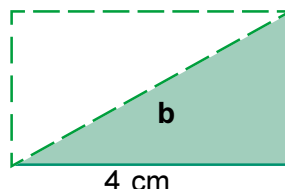
**Materials**  
cut out 4-sided  
shapes  
Area Poster

Revise with the pupils the relationship between the area of a rectangle and the area of the two triangles made by drawing a diagonal line. The area of each triangle is equal to half of the area of the rectangle.

Draw some rectangles on the board and use them to remind the pupils how the shapes are related. For example:



The area of this rectangle is  $2 \times 4 = 8 \text{ cm}^2$



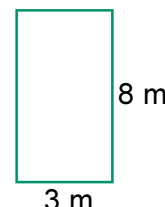
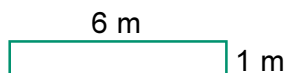
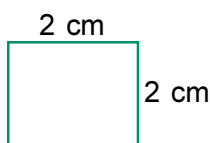
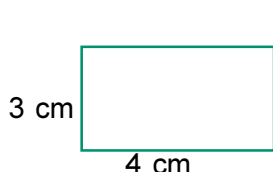
The area of this triangle can be calculated

$\frac{1}{2}$  of  $4 \times 2 = 4 \text{ cm}^2$

Introduce the terms **base** and **height**. The **base** of the triangle is 4 cm.

The height of the triangle is 2 cm.

Draw some more shapes on the board. For example:



Ask the pupils to come up to the board and draw diagonal lines in each shape and then calculate the area of each triangle by dividing the total area of each rectangle by 2.

Now ask the pupils if they can come up with a rule that shows a relationship between the base and the height of a triangle and its area.

The pupils know that the area of a triangle is half that of the rectangle. So if the area of the rectangle is  $12 \text{ cm}^2$  the area of each triangle is half of  $12 \text{ cm}^2$  or  $6 \text{ cm}^2$ .

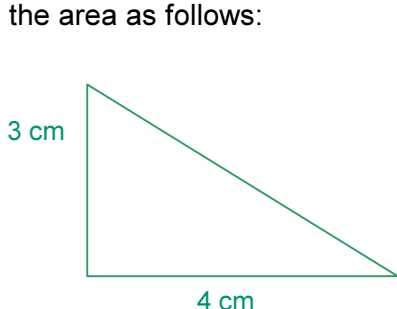
The pupils should be able to come up with the formula as follows:

**The area of a triangle is  $\frac{1}{2}$  base x height**

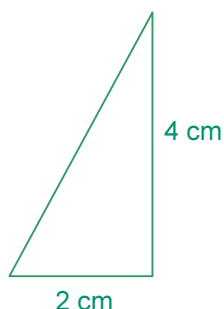
Show them that this can be written in two ways as follows:

$$a = \frac{1}{2} b \times h \quad \text{or} \quad a = \frac{b \times h}{2}$$

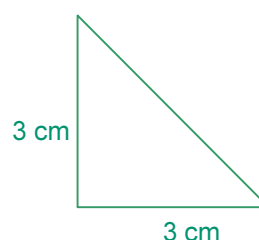
Put some examples on the board and demonstrate different ways of using the formula to calculate the area as follows:



$$\text{area} = (4 \div 2) \times 3 = 6 \text{ cm}^2$$



$$\text{area} = (2 \div 2) \times 4 = 4 \text{ cm}^2$$



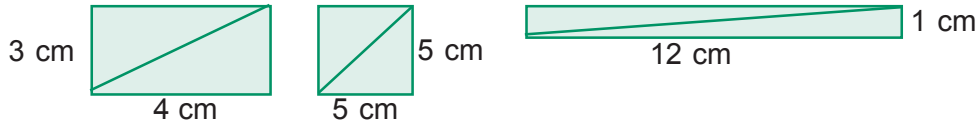
$$\text{area} = \frac{1}{2} \text{ of } 3 \times 3 = 4.5 \text{ cm}^2$$

You can use the **Area Poster** to remind pupils of the formulae they have learnt.

# Topic 21: Area

**C<sub>3a</sub>**

Draw these shapes on the board.



Ask the pupils to find the area of the shapes then divide by 2 to find the area of each triangle. Then tell them to use the formula and check if the answers are the same.

After the pupils have had enough practice ask them to do the activity in the Pupil's Resource Book on page 138.

## Answers

### Activity A

- |                       |                       |                        |                      |                        |
|-----------------------|-----------------------|------------------------|----------------------|------------------------|
| 1. 12 cm <sup>2</sup> | 2. 64 cm <sup>2</sup> | 3. 60 cm <sup>2</sup>  | 4. 9 m <sup>2</sup>  | 5. 56 m <sup>2</sup>   |
| 6. 45 m <sup>2</sup>  | 7. 48 m <sup>2</sup>  | 8. 180 cm <sup>2</sup> | 9. 60 m <sup>2</sup> | 10. 320 m <sup>2</sup> |

### Activity B

- |                     |                      |                     |
|---------------------|----------------------|---------------------|
| 1. 5 m <sup>2</sup> | 2. 10 m <sup>2</sup> | 3. 7 m <sup>2</sup> |
|---------------------|----------------------|---------------------|

### Activity C

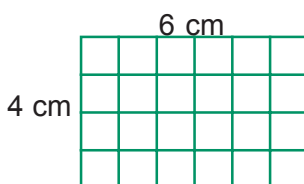
- |                       |                       |                      |                        |
|-----------------------|-----------------------|----------------------|------------------------|
| 1. 36 cm <sup>2</sup> | 2. 18 cm <sup>2</sup> | 3. 9 cm <sup>2</sup> | 4. 4.5 cm <sup>2</sup> |
|-----------------------|-----------------------|----------------------|------------------------|

**T<sub>3b</sub>**

**Materials**  
chart paper,  
coloured pens,  
paper glue  
Area Poster

Extend the idea of using the formula to find the area of a triangle which does not have a right angle.

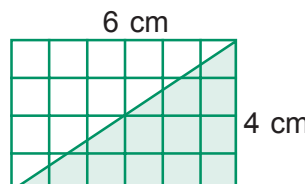
Draw these grids and diagrams on the board. Use them first to **revise** how to find the area of rectangles and right angled triangles. For example:



**figure A**

#### Area of rectangle

$$\begin{aligned}
 &= \text{length} \times \text{width} \\
 &= 6 \text{ cm} \times 4 \text{ cm} \\
 &= 24 \text{ cm}^2
 \end{aligned}$$



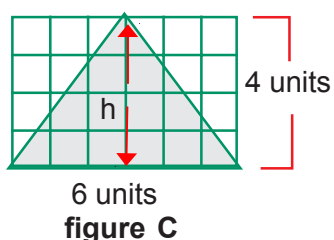
**figure B**

#### Area of triangle

$$\begin{aligned}
 &= \text{length} \times \text{width} \div \text{by } 2 \text{ of rectangle} \\
 &= 6 \text{ cm} \times 4 \text{ cm} \div 2 \\
 &= 24 \text{ cm}^2 \div 2 \\
 &= 12 \text{ cm}^2 \\
 &\text{or } \frac{1}{2} b \times h = 3 \text{ cm} \times 4 \text{ cm} \\
 &= 12 \text{ cm}^2
 \end{aligned}$$

Now draw figure **C** on the board.

The area of the rectangle =  $6 \times 4 = 24 \text{ units}^2$ .



**figure C**

The base is 6 units therefore  $\frac{1}{2}$  base = 3 units

The height is 4 units

Therefore, area =  $\frac{1}{2}$  base  $\times$  height

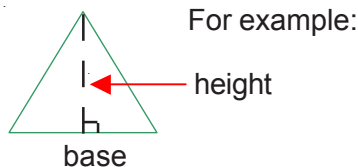
3 units  $\times$  4 units = 12 square units.



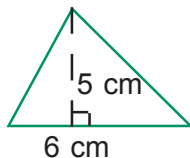
## Unit 10: Measurement

Explain to the pupils that the formula, **area =  $\frac{1}{2}$  base x height**, can be applied to calculate the area of any triangle provided that the height and base lengths are known.

Draw some triangles on the board and use them to explain how to mark the height with a dotted line that is perpendicular to the base. Perpendicular means it forms a right angle with the base.



For example:



$$\text{Area} = \frac{1}{2} \text{ base} \times \text{height}$$

$$\frac{1}{2} \text{ of } 6 \text{ cm} \times 5 \text{ cm}$$

$$3 \text{ cm} \times 5 \text{ cm}$$

$$= 15 \text{ cm}^2$$

Do some more examples to allow pupils to practice applying the formula to calculate the area of each triangle. You could display the Area Poster and use it as a teaching aid.

C3b

Give the pupils sheets of paper and ask them to work in pairs to make a poster. Their poster must explain and illustrate one of the two formulae they have learned so far in this unit:

either the area of a rectangle

$$a = l \times w$$

or the area of a triangle

$$a = \frac{b \times h}{2} \text{ or } a = \frac{1}{2} b \times h$$

Make sure that all the pupils are not making the same poster.

Display their finished posters on the wall.

If pupils need more practice with the formula, ask them to complete the activities on pages 139 and 140 of the Pupil's Resource Book.



### Answers

#### Activity A

1.  $20 \text{ cm}^2$

2.  $2,100 \text{ cm}^2$

3.  $120 \text{ cm}^2$

4.  $363 \text{ m}^2$

5.  $400 \text{ m}^2$

6.  $247 \text{ m}^2$

7.  $30 \text{ cm}^2$

8.  $375 \text{ m}^2$

9.  $2,880 \text{ m}^2$

#### Activity B

1.  $75 \text{ cm}^2$

2.  $180 \text{ m}^2$

3. a.  $12 \text{ m}^2$

b.  $32 \text{ m}^2$

c.  $5 \text{ m}^2$

d.  $1.5 \text{ m}^2$

e.  $10 \text{ m}^2$

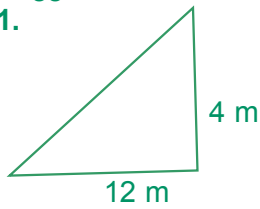
f.  $9 \text{ m}^2$

## Topic 21: Area

### Activity C

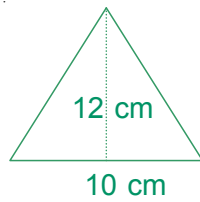
Suggested answers, check each pupils diagrams in their exercise book.

1.



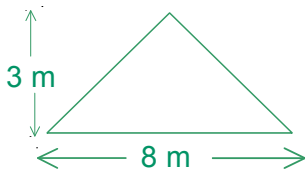
$$\text{area} = \frac{12 \times 4}{2} = 24 \text{ m}^2$$

2.



$$\text{area} = \frac{10 \times 12}{2} = 60 \text{ cm}^2$$

3.



$$\text{area} = \frac{8 \times 3}{2} = 12 \text{ m}^2$$



Can all the pupils use formulae to find the area of triangles and parallelograms?

T3c

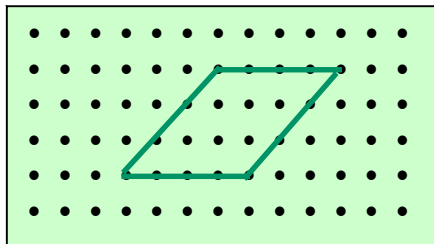
#### Materials

scissors, geo boards  
elastic bands or  
string, dotted paper  
or squared paper

In this lesson pupils are going to investigate parallelograms. They are going to try and come up with a formula to work out the area of a parallelogram.

Divide the class into small groups. Pairs or groups of three would be best. These group sizes depend on how many geo boards you have available.

Give each group a geo board, some elastic rubber bands and dotted paper. Have the pupils make a parallelogram on the geo board that has a base of 4 squared units and a height of 3 squared units.



Let the pupils draw this parallelogram onto dotted paper. Tell them to count how many squares their shape covers. What is its area? (12 squares).

Have the pupils try to make another parallelogram that has an area of 12 squares. (base 3, height 4 or base 6, height 2, or base 2, height 6 or base 12, height 1 or base 1, height 12).

Ask the pupils what they notice about their areas compared to the dimensions of their parallelogram. They should be able to tell you that base x height of a parallelogram is equal to its area.

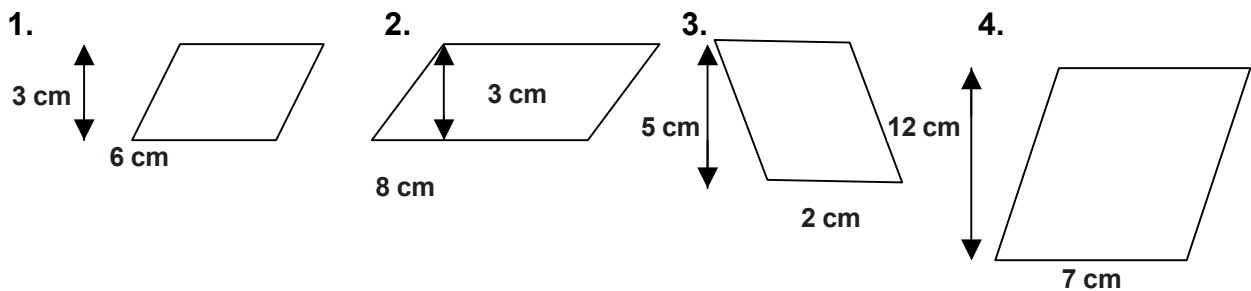
## Unit 10: Measurement

C<sub>3c</sub>

Ask the pupils to work in groups. Let them use the materials they had in the first part of this lesson.

Ask the pupils to practice making parallelograms of the same area but different base and height measurements. Ask them to draw their parallelograms on dotted or squared paper and count the area in each one.

You could draw the parallelograms below for the pupils to have a starting point. Go around the groups and help any pupils who are having difficulties.



T<sub>3d</sub>

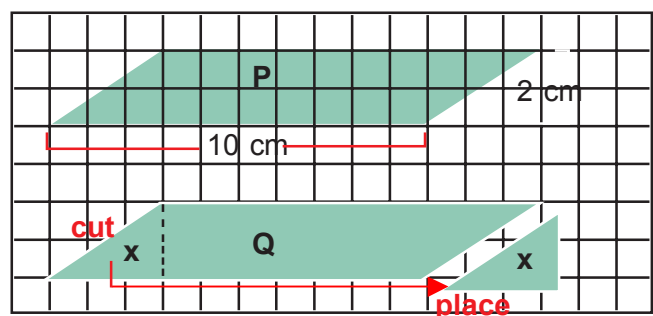
### Materials

grid paper, cut out shapes, scissors, ruler

Prepare some cut out cardboard shapes of parallelograms. Place them on to grid paper. You could draw the diagram below on the board. Look at the parallelogram **P**. The base is 10 cm and the height is 2 cm. Ask the pupils to find the area of the shape by counting the number of squares covered by shape **P**.

Explain to the pupils that if we cut out one end of the parallelogram (see diagram **Q**) and place it to the other end of the shape, it will form a rectangle that has these measurements.

The length is 10 cm and a width of 2 cm.



Then ask the pupils to find the area of the rectangle using the formula,

area = length x width

$$10 \text{ cm} \times 2 \text{ cm}$$

Ask the pupils to compare the area of the rectangle with the area of the parallelogram.

They should have the same answer of 20 cm<sup>2</sup>.

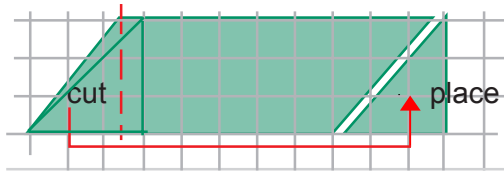
Emphasise that it is best to select and cut the part of the shape that would give a regular shape for simple calculation. Explain that the formula for finding the area of a parallelogram is **base x height**.

In this example, 10 cm x 2 cm = 20 cm<sup>2</sup>.

## Topic 21: Area

C<sub>3d</sub>

Give the pupils grid paper or square paper. Ask the pupils to draw parallelograms. Ask them to draw a perpendicular line at one end of the diagram (see the example).



Cut off the end of the shape marked with the dotted line and place it onto the other end of the parallelogram to form a rectangle. Then ask the pupils to find the area by counting the squared units to check the area of the shape. They can do the calculation to check the area too.

Tell the pupils to draw some different parallelograms on their grid paper. They can repeat the above activity.

Ask the pupils to complete the activity in the Pupil's Resource Book on pages 140 and 141.

### Answers

#### Activity A

- |                       |                       |                       |
|-----------------------|-----------------------|-----------------------|
| 1. 18 cm <sup>2</sup> | 2. 12 cm <sup>2</sup> | 3. 40 cm <sup>2</sup> |
| 4. 12 cm <sup>2</sup> | 5. 12 cm <sup>2</sup> | 6. 24 cm <sup>2</sup> |
| 7. 30 cm <sup>2</sup> | 8. 24 cm <sup>2</sup> | 9. 8 cm <sup>2</sup>  |

#### Activity B

- |                      |                        |                       |                      |
|----------------------|------------------------|-----------------------|----------------------|
| 1. 6 cm <sup>2</sup> | 2. 19½ cm <sup>2</sup> | 3. 15 cm <sup>2</sup> | 4. 6 cm <sup>2</sup> |
|----------------------|------------------------|-----------------------|----------------------|

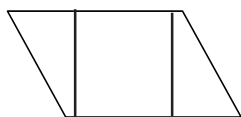
T<sub>4a</sub>

**Materials**  
selection of  
cardboard cut out  
shapes

Now that pupils know how to find the area of rectangles and triangles, they can apply their skills to find the area of composite shapes made up of rectangles and triangles.

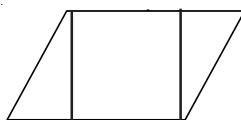
Prepare a selection of shapes cut out from cardboard including squares, triangles and rectangles. You will need enough for about ten shapes for each group of three pupils. The shapes should be carefully prepared so that they fit together to form composite shapes.

Revise the names of the following shapes and show pupils how to put the card pieces together to make each shape:



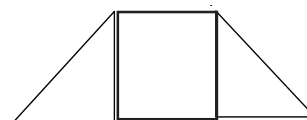
**Rhombus**

made from a  
rectangle and two  
triangles



**Parallelogram**

made up of a  
rectangle and two  
triangles

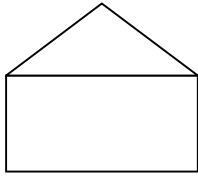


**Trapezium**

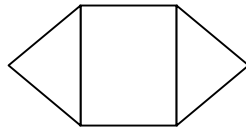
made from a square  
and two triangles

## Unit 10: Measurement

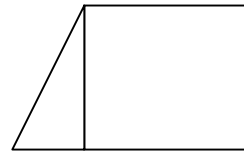
Ask pupils to come to the front of the class and make each shape themselves. Revise the names of the shapes. Can they also make other shapes? For example:



**Pentagon**  
made from a rectangle  
and one triangle



**Hexagon**  
made up of a rectangle  
and two triangles



**Irregular Quadrilateral**  
made from a square a  
triangle

### C4a

Play a race game to practice making up composite shapes. Split the class into teams of three and give each team a set of about 10 shapes.

Call out the name of a shape, and see which group can be the first to make the shape correctly. Give a point to the team who are first and continue until they have revised the names of all of the shapes in T4a, and can make them from triangles and rectangles.

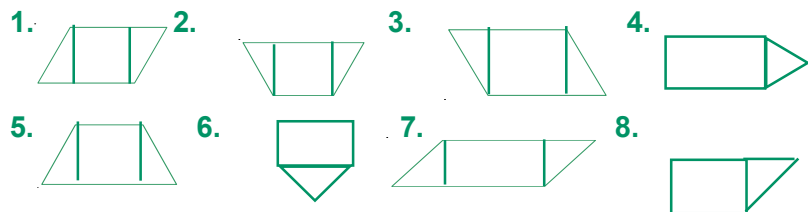
When they are all confident with this have them complete the activities on pages 141 and 142 of the Pupil's Resource Book.

### Answers

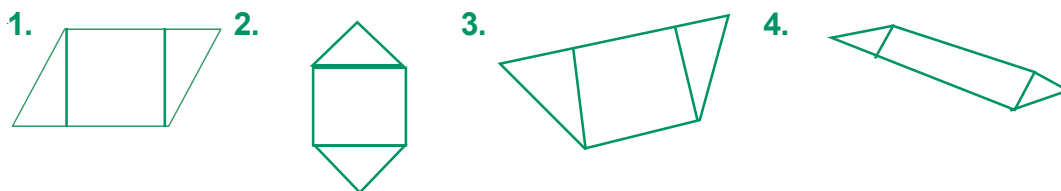
#### Activity A

1. d, parallelogram
2. a, pentagon
3. c, rhombus
4. e, trapezium
5. b, hexagon

#### Activity B



#### Activity C (Suggested Answers)



## T<sub>4b</sub>

### Materials

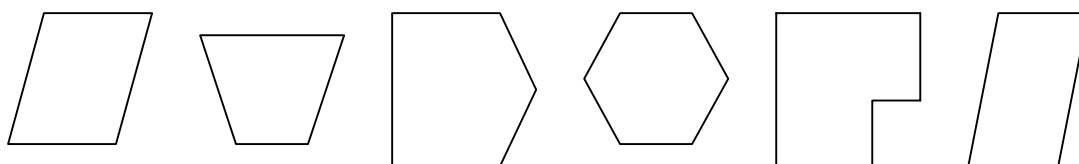
large cardboard  
shapes  
rulers  
marker pens

The aim of this activity is for pupils to work out for themselves how to calculate the area of a composite shape.

Prepare some card shapes. These should be carefully cut so that the length of each side is easy to measure in full centimetres, but do not mark them with any measurements.

You will need enough for each group of three children to have one or two shapes.

Include trapezia, rhombi, pentagons and hexagons. Also include some shapes made up of more than one rectangle. For example:



Tell the pupils that you want to find out the area of each shape. Ask them for their ideas on how this could be done.

Do not tell the pupils how to do it. Allow them to discuss their ideas and encourage them to explain them clearly.

Continue the discussion until they are able to explain the following process:

1. First divide the shapes into rectangles and triangles.
2. Calculate the area of each part of the shape using the formulae  **$a = l \times w$  for the rectangles** and  **$a = \frac{1}{2} b \times h$  for the triangles.**
3. Then add together the area of each part of the shape to calculate the total area.

Can they tell you what information they will need in order to be able to do this? **(They will need the height and width measurements of each shape).**

## C<sub>4b</sub>

Ask the class to work in groups of three. Give each group one of the cut out shapes and tell them to try to find the area, using the method they have identified. You may need to remind them of the process as they work.

They should first sketch the shape in their exercise books, then measure the dimensions of the shape with a ruler and add the measurements to their sketch. Next they should decide how to split the shape into composite parts, before calculating the area of each part.

Finally they should add up the area of the different parts of the shape to find the total area.

Provide more practice by swapping the shapes around between the groups until each group has had a chance to calculate the area of two or three different shapes.

To end the activity, bring the class back together and ask them to explain in their own words how to find the area of a trapezium, a parallelogram and so on.

Revise the formula for finding the area of a parallelogram.

**$a = b \times h$  (area = the length of the base  $\times$  height)**

Make sure everyone has understood before moving on to do the activities in the Pupil's Resource Book on pages 143 and 144.

## Unit 10: Measurement

### Answers

#### Activity A

1.  $8 \text{ cm}^2$       2.  $12 \text{ cm}^2$       3.  $14 \text{ cm}^2$       4.  $12 \text{ cm}^2$

#### Activity B

Check each pupil's sketches in their exercise book.

1.  $13.5 \text{ cm}^2$       2.  $14 \text{ cm}^2$       3.  $12 \text{ cm}^2$

#### Activity C

1.  $7.5 \text{ m}^2$       2.  $8.75 \text{ m}^2$       3.  $18.5 \text{ m}^2$       4.  $13.5 \text{ m}^2$

T<sub>4c</sub>

In this activity, you will extend the pupil's ability to find the area of a composite shape and help them to apply it to solving real life problems.

Explain the following problem to the pupils using a diagram on the board, add to the diagram as you work through the problem.

A woman clears a rectangular garden which measures 20 m by 15 m.

What is the total area of the garden? ( **$300 \text{ m}^2$** )

She fences one corner of the garden for her chickens as shown.

How much land is left for planting vegetables?

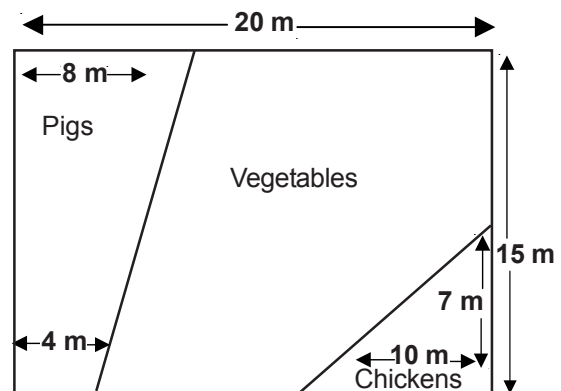
Ask the pupils to explain how they will find the answer, allow them to discuss it and work it out for themselves. Do not tell them the answer.

Guide their discussion and help them to see that they can work out the area of the chicken fence and take it away from the total area of the garden to find the answer as follows:

**Total area ( $a = l \times w$ )  $20 \text{ m} \times 15 \text{ m} = 300 \text{ m}^2$ .**

**Area of chicken fence ( $\frac{1}{2} b \times h$ )  $\frac{1}{2} 10 \times 7 = 35 \text{ m}^2$**

**Area remaining  $300 \text{ m}^2 - 35 \text{ m}^2 = 265 \text{ m}^2$**



When all the pupils have understood how to make the calculation, add another line to the drawing to show the pig fence at one end of the garden as shown.

Again allow the pupils to discuss how to work out the area of the pig fence themselves.

Ask them to explain how they will do it and tell you what information they will need.

They should be able to explain that they will divide the pig fence into two (**a rectangle and a triangle**) and calculate the area of each using the measurements provided, then add them together to find the area of the pig fence.

They should arrive at the answer  $90 \text{ m}^2$ , calculated as follows:

## Topic 21: Area

$$4 \text{ m} \times 15 \text{ m} = 60 \text{ m}^2 + \frac{1}{2} \text{ of } 4 \text{ m} \times 15 \text{ m} = 30 \text{ m}^2$$

$$60 \text{ m}^2 + 30 \text{ m}^2 = 90 \text{ m}^2$$

Can they also work out the total area left for planting vegetables?

$$265 \text{ m}^2 - 90 \text{ m}^2 = 175 \text{ m}^2$$

If your pupils need more practice using the procedure for finding the area of a composite shape, prepare more problems like this one and work through them together before moving on.

**C4c**

Have the children work in pairs. Ask each pair to design and plan a garden. It can be any shape they like as long as it is made up of triangles, rectangles and squares. Tell them to sketch their plan on a piece of paper. It should include a pig fence, a chicken fence and an area planted with cabbage and one for fruit trees, kumara or other crops. They should add the measurements for each plot to their sketch, as well as the overall measurements for their garden.

When they have finished their plan, they should write down one or two questions about the area of their garden such as:

What is the total area given over to cabbage and kumara?

How much of the land is used for animals?

How much land is left after the kumara has been planted? and so on.

They should work out their answers too, but write these on a different piece of paper.

Next ask them to swap their plans and their questions with another pair and try to work out the answers to the questions.

Assist them as they work and check that they know how to break down the shapes in order to find the area.

When they have finished they should join with the other pair to make a group of four to check, compare and discuss their answers.

If they need more practice they can complete the activities on pages 144 and 145 of the Pupil's Resource Book.

### Answers

#### Activity A

1. Area of the whole park =  $2,625 \text{ m}^2$
2. Area of the large bed =  $300 \text{ m}^2$ . Area of each small bed  $100 \text{ m}^2$ .
3. Area of the grass  $600 \text{ m}^2$
4. Total grass area  $2,125 \text{ m}^2$ .  $2,625 \text{ m}^2 - 500 \text{ m}^2 = 2,125 \text{ m}^2$

#### Activity B

1. The area of the yellow section -  $110 \text{ cm} \times 50 \text{ cm} = 5,500 \text{ cm}^2$ .
2. The total area of the blue sections -  $4,000 \text{ cm}^2$ .
3. The area of the green section -  $110 \text{ cm} \times 50 \text{ cm} = 5,500 \text{ cm}^2$ .
4. The area of the whole flag -  $1 \text{ m} \times 1.5 \text{ m} = 1.5 \text{ m}^2$  or  $15,000 \text{ cm}^2$ .

#### Activity C

1.  $2 \text{ m}$
2. Length  $10 \text{ m}$ , width  $5 \text{ m}$ .
3.  $120 \text{ cm}$ .



Can all the pupils calculate the area of composite shapes?



## Unit 10: Measurement

### Support Activities

For pupils who are struggling with finding the area of composite shapes provide more practice with using the formulae.

You could use the **area poster** as a reminder of the different formulae and provide lots of examples of finding the area of simple shapes (rectangles, triangles parallelograms and trapezia) before moving on to composite shapes. Work with the children and talk them through the process each time until they are able to tell you what to do.

#### Finding the Area of Real Objects

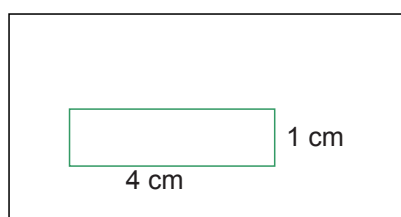
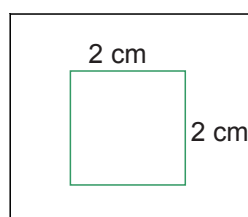
Ask pupils to use a rule or meter rule to measure real objects around the classroom and find the area using the formulae they have learnt, such as books, louvres, desktops etc.

#### Games with Shapes

Use the cardboard cut out shapes (triangles, rectangles, parallelograms and trapezia) for sorting and matching games, such as matching shapes with the same area, sorting shapes with the same base length and so on.

#### Pairs Game

Prepare a set of cards showing pairs of different shapes with the same area for example:



Have the pupils play the game in small groups, taking turns to turn over two cards at a time and check whether they have the same area or not.

### Extension Activities

#### Surface Area

Ask pupils to apply their knowledge of finding the area of two-dimensional shapes to calculating the **surface area** of solid shapes. This activity combines skills learned in this unit with the knowledge of nets and solids pupils learned in Unit 9.

Give them some examples, such as those below, and leave them to work out the surface area for themselves. They could also design their own solid shapes and work with a partner to calculate the surface area.

1. A cube measuring 4 cm x 4 cm x 4 cm.
2. A square based pyramid with a 5 cm base and a height of 6 cm.
3. A cuboid measuring 20 cm x 14 cm x 12 cm.

They could make a poster to illustrate how to find the surface area of a solid object.

#### Problem Solving

Give the pupils some of the following problems and allow them to work in pairs to discuss how they can solve them.

## Extension and Support

1. The perimeter of a square is 24 cm. What is its area?
2. The perimeter of a rectangle is 26 cm. If the difference between the length and the width is 5 cm. What is the area?
3. The perimeter of a rectangle is 26 cm. If the length is 3 cm more than the width, what is the area?
4. Draw rectangles that have the following perimeters and areas.
  - a. perimeter 6 cm, area 2 cm<sup>2</sup>.
  - b. perimeter 10 cm, area 4 cm<sup>2</sup>.
  - c. perimeter 12 cm, area 5 cm<sup>2</sup>.
  - d. perimeter 12 cm, area 8 cm<sup>2</sup>.

### Investigation

Ask pupils to investigate what happens to the area of a shape if the length of each side is doubled.

For example a **rectangle**.

Start with 2 cm x 3 cm	2 cm x 3 cm	area = 6 cm <sup>2</sup> .
Then double the length of each side	4 cm x 6 cm	area = 24 cm <sup>2</sup> .
	8 cm x 12 cm	area = 96 cm <sup>2</sup> .

and so on. Ask them to compare the areas and look for patterns.

Next try the same thing with a **triangle**.

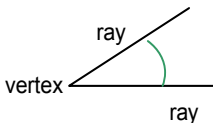
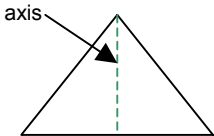
Start with a base of 2 cm and a height of 3 cm	area = $\frac{1}{2} 2 \times 3$ <b>3 cm<sup>2</sup>.</b>
Then double it to 4 cm x 6 cm	area = $\frac{1}{2} 4 \times 6$ <b>12 cm<sup>2</sup>.</b>
Double it again to 8 cm x 12 cm	area = $\frac{1}{2} 8 \times 12$ <b>48 cm<sup>2</sup></b>

(They should be able to see that each answer is 4 x the previous answer)

### Answers to the Check Up Page

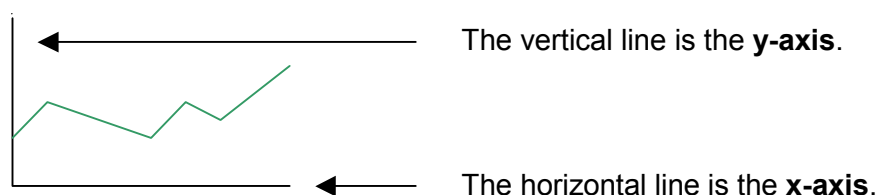
1. a. 16 cm<sup>2</sup>      b. 26 cm<sup>2</sup>      c. 9,000 m<sup>2</sup>
2. a. 204 m<sup>2</sup>      b. 50 cm<sup>2</sup>      c. 256 m<sup>2</sup>
3. 4 days
4. a. 210 cm<sup>2</sup>      b) 98 cm<sup>2</sup>.

## Glossary of Terms

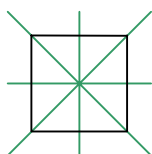
<b>acute angle</b>	An angle which is less than $90^\circ$ .
<b>addition</b>	The process of putting amounts together to obtain a sum or total.
<b>adjacent</b>	Next to.
<b>algorithm</b>	The setting out of a mathematical problem in a certain way.
<b>a.m.</b>	Short for <b>ante meridiem</b> , Latin for the morning. Any time between midnight and noon.
<b>analogue clock</b>	A clock face with numbers from 1 to 12 and two hands to show the time.
<b>angle</b>	The amount of turn between two lines around a common point.  <p>The lines are called rays. The common point is the vertex.</p>
<b>annual</b>	Happening once every year.
<b>anti-clockwise</b>	The opposite direction to the normal movement of a clock.
<b>apex</b>	The highest point of a solid (3D) shape from its base.
<b>approximation</b>	An estimate. For example $398 \times 5$ can be rounded to $400 \times 5$ to give an estimate or approximation of about 2,000.
<b>arc</b>	A section of a circle or curve with two end points.
<b>area</b>	The surface covered by any 2D shape. Area can be measured in $\text{cm}^2$ , $\text{m}^2$ , and $\text{km}^2$ .
<b>arm</b>	A term often used to describe the rays that form an angle.
<b>ascending order</b>	From smallest to largest. For example: 12, 21, 31, 54, 79, 103.
<b>asymmetrical</b>	Without any lines of symmetry.
<b>attribute</b>	A feature or characteristic by which something can be classified. For example, shapes can be classified according to the following attributes: size; colour; shape; thickness number of sides.
<b>average</b>	The total of a series of numbers divided by the amount of numbers in the series. For example, to find the average of 3, 5, 7, and 9, add $3 + 5 + 7 + 9$ and divide by 4 (because there are 4 numbers).
<b>axis (1)</b>	A line which divides a shape into two equal parts. 

**axis (2)**

The horizontal and vertical lines used for measurement in a graph.

**axis of symmetry**

An imaginary line that divides a shape into two identical parts, also referred to as **line of symmetry**.



For example, a square has four axes of symmetry.  
Axes is the plural of axis.

**balance scale**

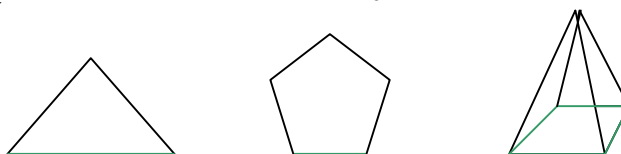
A device used to measure the mass of objects.

**bar graph**

A method of recording information as a graph, in either columns (vertical) or rows (horizontal). This is also called a **column graph**.

**base (1)**

The bottom face or line of any shape.

**base (2)**

The number on which a number system is based. The decimal number system is a **base 10** system. (Hindu-Arabic system)

**brackets**

Symbols ( and ) used to group numbers in a sum to show the order of operations.

For example.  $(3 + 6) \times 7 = 63$

**breadth**

The lesser measurement of a shape which is also called **width**.

**C**

The symbol for Celsius.

**calculate**

To work out.

**calculator**

A small machine that performs quick mathematical operations.

**calendar**

A system of breaking the year up into months, weeks and days.

**capacity**

The amount a container can hold. Capacity is also called **volume**. Capacity can be measured in  $\text{cm}^3$ ,  $\text{m}^3$ , mL, L and kL.

**Celsius**

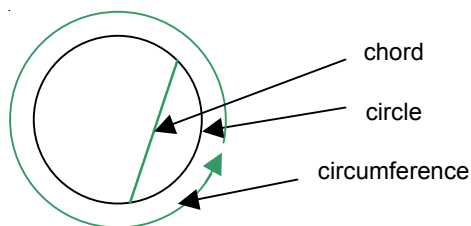
A scale for measuring temperature from  $0^\circ$  to  $100^\circ$ .

For example:  $0^\circ\text{C}$  is the temperature at which ice begins to melt,  $100^\circ\text{C}$  is the boiling point of water and  $37^\circ\text{C}$  is healthy human body temperature.

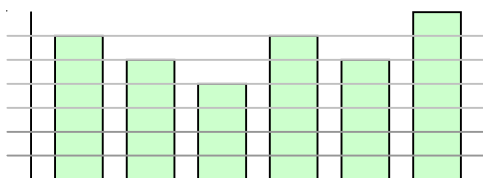
**centimetre**

A unit of measurement for length. One hundredth of 1 metre.  $100\text{ cm} = 1\text{ m}$ .

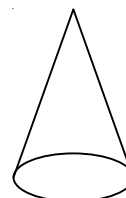
<b>century</b>	One hundred years.
<b>chance</b>	The likelihood of an event happening. Used in probability.
<b>change</b>	Money that is given back when making a purchase. For example: If a \$10.00 note is used to pay for a \$3 item, the change is \$7.00.
<b>chord</b>	A line joining two points on the circumference of a circle.



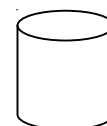
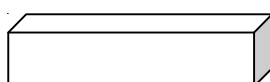
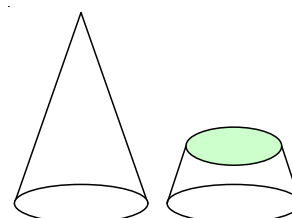
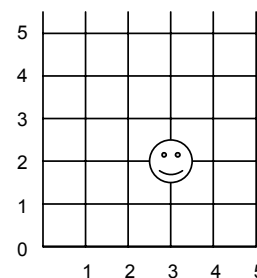
<b>circle</b>	A plane shape bounded by a continual curved line which is the same distance from its centre point.
<b>circumference</b>	The distance around a circle.
<b>classify</b>	To arrange into groups according to given characteristics. For example, to classify shapes according to the number of sides or angles.
<b>clockwise</b>	The direction in which the hands of the clock move.
<b>cm</b>	The abbreviation for centimetre.
<b>column graph</b>	A graph which uses vertical columns to represent data. Also called a vertical bar graph.



<b>common denominator</b>	A common multiple of the numbers in two or more fractions, must be found when an operation is to be performed on fractions with different denominators. Such as, $\frac{1}{3} + \frac{1}{4}$ . The common denominator is 12.
<b>compass (1)</b>	An instrument used for drawing circles.
<b>compass (2)</b>	An instrument used for telling direction. (North, South, East and West).
<b>composite</b>	Made up of more than one.
<b>computation</b>	Working out an answer.
<b>concentric circles</b>	Circles with the same centre.
<b>concrete materials</b>	Real objects used to teach mathematical concepts.
<b>cone</b>	A shape with a circular base, one vertex and one curved surface.



<b>congruent</b>	Identical, or exactly the same.
<b>conservation</b>	<p>The concept that an object or group of objects will retain the same value even when rearranged.</p> <p>For example, twelve objects arranged in two rows of six is the same as twelve objects arranged in three rows of four, or a watermelon cut into two pieces has the same volume and mass as the whole melon.</p>
<b>coordinates</b>	<p>Numbers or letters used to show location on a grid.</p> <p>For example (3,2). The first coordinate refers to the horizontal position (x-axis), the second coordinate refers to the vertical position (y-axis).</p> <p>Maps also use coordinates.</p>
<b>cross section</b>	<p>The face that is left when a three dimensional shape has been cut through.</p> <p>For example: the cross section of a cone is a circle.</p>
<b>cube</b>	A three dimensional shape that has six square faces of equal size, eight vertices and twelve edges.
<b>cubic centimetre</b>	A cube used for measuring volume that has sides of one centimetre in length. Written as $\text{cm}^3$ .
<b>cubic metre</b>	A cube that has sides of one metre in length used for measuring volume. Written as $\text{m}^3$ .
<b>cuboid</b>	A cube-like shape. Also called a <b>rectangular prism</b> .
<b>curve</b>	A curved line.
<b>cylinder</b>	<p>A three-dimensional shape constructed of two congruent circular faces and one, wrap around, rectangular face. A can is a cylinder.</p>
<b>data</b>	Information that has been collected such as a set of numbers or facts, or the results of a survey.
<b>day</b>	A 24-hour time period. The time it takes for the Earth to go once around its own axis.
<b>decade</b>	Ten years.
<b>decagon</b>	A two-dimensional shape with 10 sides.
<b>decahedron</b>	A three-dimensional shape with 10 faces.
<b>decimal fraction</b>	Any fraction recorded as a decimal. For example, 0.1, 0.5, 2.45



**decimal place**

The place occupied by a numeral which indicates its value in a decimal number.

thousands	hundreds	tens	ones	decimal point	tenths	hundredths	thousandths
2	4	5	8	.	3	7	9

**decimal point**

The point which separates whole numbers from decimal fractions, placed between the ones and the tenths decimal places.

**degrees (1)**

A unit of measurement of temperature. Represented by the symbol °. Temperature is measured in degrees Celsius or °C.

**degrees (2)**

A unit of measurement of an angle of turning. Based on a complete rotation of 360 degrees. Degrees are written using the symbol °.

**denominator**

The number below the line in a fraction that tells how many parts in the whole.  
For example, in the fraction  $\frac{1}{3}$  1 is the numerator and 3 is the denominator.

**descending order**

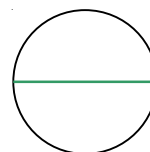
Decreasing in value.  
For example a number sequence starting with the largest and going to the smallest 23, 17, 15, 13, 9.

**diagonal**

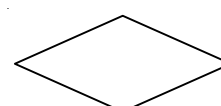
A line which joins two non-adjacent vertices of a polygon.

**diameter**

A straight line touching both sides of a circle which passes through the centre point.

**diamond**

A two-dimensional shape with four equal sides and two sets of matching angles. Also called a **rhombus**.

**dice**

Cubes marked with spots or numbers. The plural of die.

**digit**

A symbol used to write a numeral.

For example, 5 is a 1-digit number, 724 is a 3-digit number.

**digital clock**

A clock which displays the time in numerals; it has no hands.

**dimension**

A measurement. The dimensions of a shape include its height, breadth and length. Flat shapes have only two dimensions while solid shapes have three.

**direction**

The course, or line, along which something moves. For example, up, down, left, right, forward, north, south, east and west.

**displacement**

A method used to measure the volume of an object by submerging it in water. The volume of the water displaced is equal to the volume of the object.

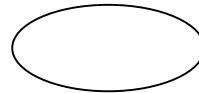
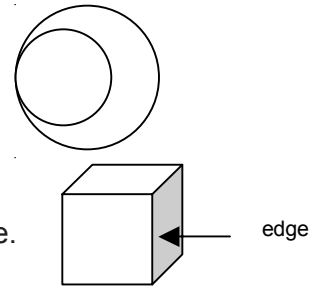
**distance**

The space between two objects or points.

**dividend**

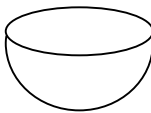
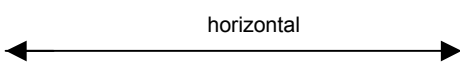
An amount which is to be divided.

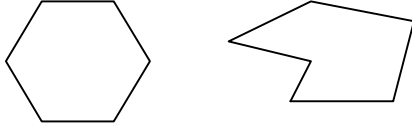
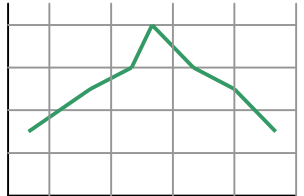
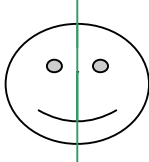
	For example, in the sum $27 \div 3 = 9$ , 27 is the dividend.
<b>divisible</b>	A number is divisible if it can be divided without remainders. For example, 12 is divisible by 4, 6, 3, 12, 2 and 1.
<b>division</b>	The mathematical operation that involves breaking up groups or numbers into equal parts. Also called <b>sharing</b> .
<b>divisor</b>	The number which is to be divided into the dividend. For example, in the sum $27 \div 3 = 9$ , 3 is the divisor.
<b>dodecagon</b>	A two-dimensional shape with 12 sides.
<b>dodecahedron</b>	A solid (3D) shape that has twelve identical faces.
<b>dollar</b>	A unit of money equal to 100 cents. Written as \$.
<b>dot paper</b>	Paper covered with equally spaced dots and used for drawing graphs and shapes.
<b>double</b>	Twice as much, multiply by two.
<b>dozen</b>	A group of twelve.
<b>eccentric circles</b>	Circles which do not share the same centre.
<b>edge</b>	The intersection of two faces in a solid shape.
<b>element</b>	An element is a member of a set. For example, <b>a</b> is an element of the set of vowels and <b>4</b> is an element of the set of even numbers.
<b>ellipse</b>	An oval-shaped closed curve.
<b>enlarge</b>	To make larger or project.
<b>equal</b>	The same in value or amount. Shown by the symbol $=$ . Means the same as <b>equivalent</b> .
<b>equilateral triangle</b>	A triangle with three equal sides and three equal angles.
<b>equivalent fractions</b>	Fractions with the same value. For example, $\frac{3}{4} = \frac{6}{8}$
<b>estimate</b>	A rough calculation, performed to give an idea of the answer before calculating. For example, $206 \times 2.1$ is about $200 \times 2$ giving an estimated answer of 400.
<b>even number</b>	Any number that can be divided by 2 without a remainder.
<b>expanded notation</b>	A way of writing numbers to show the actual value of each digit. For example, $2,567 = 2,000 + 500 + 60 + 7$ or $(2 \times 1,000) + (5 \times 100) + (6 \times 10) + 7$
<b>faces</b>	The surfaces of a three-dimensional shape. For example a cuboid has 6 faces.
<b>factor</b>	Any whole number that can be multiplied by another number to make a given number. For example, the factors of 12 are 6, 4, 3, 2, 1 and 12. 5 is not a factor because it cannot be multiplied by another whole number to give twelve.



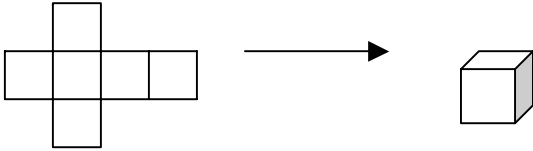
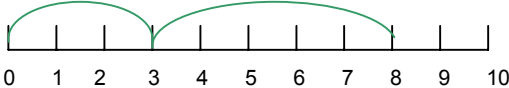
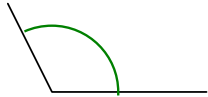


**A common factor** is a number which is the same for two different numbers.  
For example the common factors of 6 and 9 are 3 and 1 because  $3 \times 2 = 6$ ,  $1 \times 6 = 6$ ,  $3 \times 3 = 9$ ,  $1 \times 9 = 9$ .

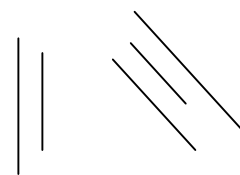
<b>formula</b>	A rule or principle expressed in algebraic symbols. For example, the formula for area of rectangle is <b><math>a = l \times w</math></b> .
<b>fortnight</b>	The time span of 14 days or 2 weeks.
<b>fraction</b>	A part of a whole. Written as either a common fraction or a decimal fraction. For example, 23 parts out of 100 = $\frac{23}{100}$ or 0.23
<b>geo board</b>	A board studded with pegs or nails used to make shapes using elastic bands or string.
<b>geo-strips</b>	Strips of card or paper that can be joined together to make shapes. They can be used to test rigidity.
<b>gram</b>	A unit of measurement for mass. Written as g. There are 1,000 grams in a kilogram, $1,000 \text{ g} = 1 \text{ kg}$ .
<b>graph</b>	A visual way of recording and presenting information. There are many types of graphs including column, bar, line and pie graphs.
<b>greater than</b>	A symbol ( <b>&gt;</b> ) used to show the relationship between numbers. For example $25 > 18$ , $100 > 75$
<b>grid paper</b>	Squared paper often used for drawing graphs.
<b>gross mass</b>	The total mass of any item including its packaging.
<b>grouping</b>	Breaking things into groups, used in the teaching of division.
<b>ha</b>	The symbol for hectare.
<b>half</b>	One part of something that is divided into two equal parts.
<b>hectare</b>	A unit of measurement of area used to measure land. A hectare measures $10,000 \text{ m}^2$ .
<b>hemisphere</b>	One half of a sphere. 
<b>heptagon</b>	A two-dimensional shape with seven sides.
<b>hexagon</b>	A two-dimensional shape with six sides.
<b>horizontal</b>	A surface parallel to the horizon. 
<b>hour</b>	A unit of measurement for time. One hour equals 60 minutes.
<b>hundredth</b>	One part of a whole that has one hundred parts.

<b>improper fraction</b>	A fraction in which the numerator is larger than the denominator. An improper fraction has a value higher than one. For example $\frac{7}{3}$ or $\frac{8}{5}$ .
<b>interval (1)</b>	The portion of a straight line lying between two points.
<b>interval (2)</b>	The space of time between two events.
<b>irregular polygon</b>	A polygon which is not in its regular shape. The angles are different sizes and the sides have different lengths. For example a regular hexagon and an irregular hexagon:
	
<b>isosceles triangle</b>	A triangle that has two sides and two angles the same.
<b>kg</b>	The symbol for kilogram.
<b>kilogram</b>	The base unit of mass in the metric system. 1 kilogram = 1,000 grams. (1 kg = 1,000 g)
<b>kilolitre</b>	A unit of measurement of capacity, which is equal to 1,000 litres. Written as <b>kL</b> .
<b>kilometre</b>	A unit of measurement of length which is equal to 1,000 metres. Written as <b>km</b> .
<b>kite</b>	A quadrilateral with two different pairs of sides of equal length.
<b>kL</b>	The symbol for kilolitre.
<b>km</b>	The symbol for kilometre.
<b>L</b>	Symbol for litre.
<b>leap year</b>	A year in which there are 366 days, instead of the usual 365. This happens every four years when there is an extra day added to February.
<b>length</b>	The measurement of a line or the longer measurement of a shape.
<b>less than</b>	A symbol (<) used to show the relationship between numbers. For example $24 < 42$ , $250 < 520$
<b>line graph</b>	Information represented on a graph by joining plotted points with a line.
	
<b>line of symmetry</b>	A line which divides something exactly in half.
	

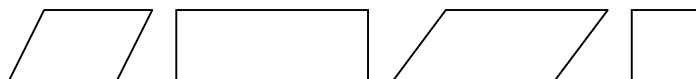
<b>litre</b>	A unit of measurement of capacity used to measure liquids. For example, 1,000 millilitres equals 1 litre. L is the symbol for a litre.
<b>location</b>	A place or position of something, sometimes shown by coordinates.
<b>m</b>	Symbol for metre.
<b>magic square</b>	A number puzzle in which all numbers when added either horizontally, vertically or diagonally give the same answer.
<b>mass</b>	The amount of substance in an object. Common mass measurements are grams, kilograms and tonnes. Mass is sometimes referred to as <b>weight</b> .
<b>measure</b>	To work out the length, width, height, mass, volume or area of an object using a standard unit.
<b>mental</b>	Making calculations in your head rather than writing anything down on paper.
<b>metre</b>	A unit of measurement of length. 100 centimetres equals 1 metre. (100 cm = 1 m)
<b>metric</b>	A system of measurement. The basic units are the metre to measure length, the kilogram for mass and the litre for volume or capacity.
<b>millennium</b>	A unit of measurement for time, one millennium is equal to one thousand years.
<b>millilitre</b>	A measure of capacity. 1,000 millilitres equals 1 litre. A one-centimetre cube (1 cm <sup>3</sup> ) would hold 1mL of liquid.
<b>millimetre</b>	A unit of measurement of length. There are 10 mm in one centimetre.
<b>million</b>	1,000,000
<b>minus</b>	To take away or subtract. The symbol for minus is –.
<b>minute</b>	A measure of time which is one sixtieth of an hour. A minute is equivalent to sixty seconds.
<b>mirror image</b>	The reflection of an object.
<b>mirror line</b>	A line drawn to separate an object from its reflection.
<b>mL</b>	Symbol for millilitre.
<b>mm</b>	Symbol for millimetre.
<b>month</b>	A period of approximately four weeks, between 28 and 31 days. There are 12 months in a year.
<b>multiple</b>	A number formed by multiplying one whole number by another whole number. For example, 24 is a multiple of 4 because 24 is the result when 4 is multiplied by 6.
<b>multiplication</b>	A mathematical operation where a number is added to itself a number of times. Multiplication is the same as repeated addition. The symbol for multiplication is x. For example, 2 + 2 + 2 + 2 + 2 is the same as 2 x 5 = 10
<b>multiply</b>	The act of multiplication. The symbol for multiplication is x.

<b>negative numbers</b>	Negative numbers have a value less than zero. A minus sign is placed in front of the number to identify it. (-6, -28)
<b>net</b>	A two-dimensional shape which can be folded to form a three-dimensional shape. An unfolded cardboard box is the net of the box. The example shows the net of a cube.
	
<b>nonagon</b>	A two-dimensional shape with nine sides.
<b>notation</b>	Symbols used in mathematics to represent numbers or operations, such as the numerals 0 –9 and symbols $\times$ , $+$ , $=$ and $\div$ .
<b>number line</b>	<p>A line on which numbers are marked. Number lines can be used to represent operations.</p> <p>For example, <math>3 + 5 = 8</math></p> 
<b>number sequence</b>	<p>A set of numbers which follow a regular pattern.</p> <p>For example:     1, 3, 5, 7, 9,   (+2)</p> <p>                      3, 9, 27, 81,   (<math>\times 3</math>)</p>
<b>numeral</b>	<p>A symbol or character used to represent a number.</p> <p>For example, Hindu Arabic numerals 1, 2, 3, 4, 5 or Roman numerals I, II, III, IV, V</p>
<b>numerator</b>	<p>The number above the line in a fraction that tells how many parts of the whole.</p> <p>For example, in the fraction <math>\frac{1}{3}</math>, 1 is the numerator and 3 is the denominator.</p>
<b>oblong</b>	A rectangle with two sets of parallel sides of different lengths.
<b>obtuse angle</b>	<p>An angle that is larger than <math>90^\circ</math> but less than <math>180^\circ</math>. Obtuse angles appear blunt compared to acute angles, which are less than <math>90^\circ</math> and appear sharp.</p> 
<b>octagon</b>	A two-dimensional shape with eight sides.
<b>odd number</b>	<p>A number that cannot be divided by 2.</p> <p>For example, 1, 3, 5, 7, 9, 11, 13.</p>
<b>operations</b>	Mathematical processes such as, multiplication, subtraction, division and addition used to solve mathematical problems.
<b>ordinal number</b>	<p>A number which shows place or the order.</p> <p>For example, 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup>, 4<sup>th</sup>, 5<sup>th</sup>, 6<sup>th</sup>,</p>
<b>oval</b>	A two-dimensional shape in the form of an egg. An oval has only one line of symmetry. One end is more pointed than the other.

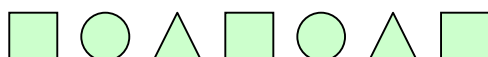
**parallel lines** Two or more lines exactly the same distance apart. Parallel lines do not need to be the same length.



**parallelogram** A four sided figure, in which each pair of opposite sides are parallel and of equal length.



**pattern** A series of shapes, letters, numbers or objects arranged in a recurring order.

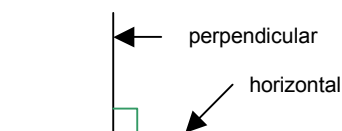


**pentagon** A closed two-dimensional shape with five sides.

**per cent %** Out of a hundred. A percentage is a fraction of 100. For example, 65% means 65 out of 100 or  $\frac{65}{100}$ .

**perimeter** The total distance around the outside of a shape. The perimeter of a circle is its circumference. The perimeter of a field is the sum of the lengths of each side.

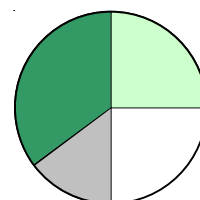
**perpendicular** A vertical line forming a right angle with the horizontal.



**picture graph** A graph using pictures or symbols to represent data.

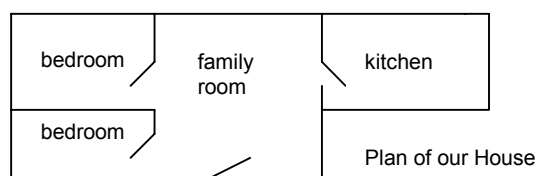
**pie graph** A circular graph used to represent how the whole of something is divided up. The parts look like portions of a pie or cake.

Also known as a **circle graph**, a **pie chart** or **sector graph**.



**place value** The value of a digit depending on its place in a number. For example: In the number, 237, the digit 2 has a place value of 200, 3 has a value of 30 and 7 has a value of 7.

**plan** A diagram drawn from above showing the position of objects.

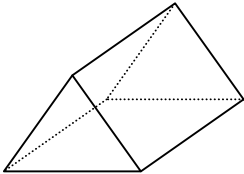
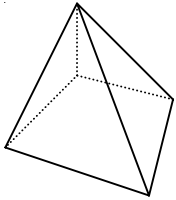
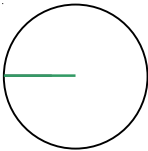
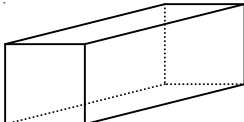


**plane** A flat surface, such as a drawing on a page.

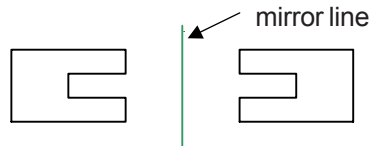
**plane shape** A two-dimensional shape. The boundary of a plane surface. For example, a square.

**plus** Add. The symbol for addition (+) is often called a plus sign.

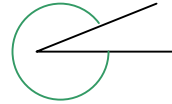
**p.m.** Abbreviation for the Latin, **post meridiem**, meaning after midday. Any time between 12 noon and 12 midnight.

<b>polygon</b>	A closed shape with three or more angles or sides. For example, triangle, square, rectangle, hexagon and pentagon.	
<b>position</b>	The location of one object in relation to other fixed objects. For example, third from the left; north of Honiara.	
<b>prime number</b>	A number that is only divisible by itself and 1. For example, 2, 3, 5, 7, 11, 13, 17, 19, 23, 29	
<b>prism</b>	A three-dimensional shape with two similar, parallel bases joined by rectangular faces.	
<b>probability</b>	The likelihood or chance of an event happening. The range of probability extends from zero to one. A probability of 0 means that an event is certain <b>not</b> to happen while a probability of 1 means that it is certain to happen.	
<b>problem</b>	A mathematical problem is a question which requires the application of mathematical knowledge and skills in order to find a solution.	
<b>product</b>	The answer to a multiplication sum. For example: The product of 12 and 10 is 120	
<b>properties</b>	Distinguishing features of objects or shapes such as the number of sides, or the number of angles etc.	
<b>protractor</b>	An instrument used to measure angles.	
<b>pyramid</b>	A three-dimensional shape which has one base. All other faces are triangular and meet at a single apex opposite the base.	
<b>quadrant</b>	A quarter of a circle.	
<b>quadrilateral</b>	A two-dimensional shape with four sides, such as a square or a rectangle.	
<b>quarter</b>	One of four equal parts of a whole or group. Written as $\frac{1}{4}$ .	
<b>radius</b>	A straight line extending from the centre of a circle to the outside. A radius is half the diameter.	
<b>random selection</b>	A sample taken in which all items have an equal chance of being selected. No restrictions apply. For example, drawing names out of a box.	
<b>ratio</b>	The number of times one quantity contains another quantity. For example, The ratio of petrol to oil is 9:1. This means that in the mixture for every 9 parts of petrol one part of oil is added.	
<b>ray</b>	A line with a starting point but no end.	
<b>rectangle</b>	A four-sided figure with four right angles and two pairs of parallel sides. An oblong is a rectangle with two sets of parallel sides of different lengths. A square is also a rectangle.	
<b>rectangular prism</b>	A three-dimensional prism with two similar rectangular bases.	

**reflective symmetry** The mirror image of a shape creates a symmetrical image when viewed alongside the shape itself.



**reflex angle** An angle between  $180^\circ$  and  $360^\circ$ .



**regroup** To alter the formation of a group, usually for a specific purpose. For example, 42 may be regrouped to 30 and 12 for subtraction of a number larger than 2 from the ones column.

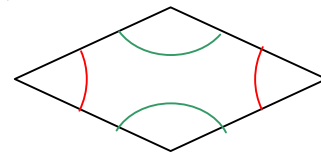
**regular polygon** A two-dimensional shape which has sides of equal length and equal angles.

**remainder** The amount left over after a number has been divided. For example,  $29 \div 4 = 7$  and the remainder is 1.

**repeated subtraction** The process of subtracting a divisor from a number until no more can be subtracted. For example,  $24 - 8 = 16 - 8 = 8 - 8 = 0$

**revolution** A complete turn of  $360^\circ$ .

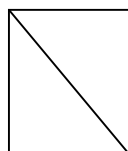
**rhombus** A four-sided shape with four equal sides. Opposite angles are equal.



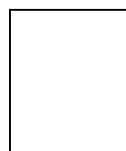
**right angle** An angle of  $90^\circ$ .



**rigid** Strong and secure. A rigid structure is one that cannot be altered.



rigid



non-rigid

**Roman numerals** A number system devised by the ancient Romans which uses letters to represent the numbers.

I, II, III, IV, V, VI, VII, VIII, IX, X (1 – 10)  
50 = L, 100 = C, 500 = D, 1,000 = M

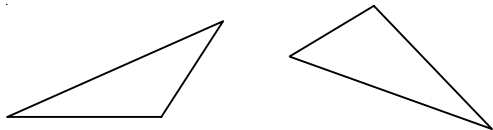
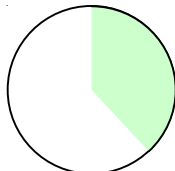
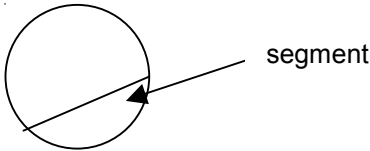
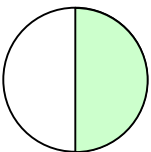
**rounding off** To alter the exact value of a number by giving that number a more convenient value, usually for the purpose of estimating. For example 96 can be rounded off to 100, or 2,189 can be rounded off to 2,000.

**rule** An instruction or pattern to be followed.

**sample** Some items taken from a larger group.

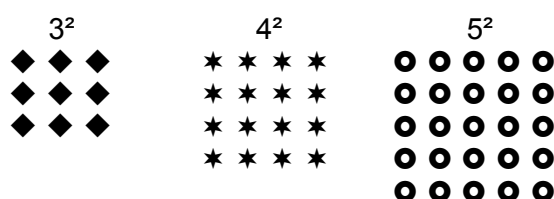
For example, a sample of the pupils' work was displayed. A sample of 25 out of 250 villagers were interviewed.

**scale (1)** A system of measurements used on instruments such as, thermometers, rulers, and speedometers. For example the scale on a thermometer measures temperature, the scale on bathroom scales measures mass.

<b>scale (2)</b>	A system of measurements drawn on a graph to show what data is represented by each axis, or on a map to show the distances represented by the drawing. For example 1 cm = 10 km.
<b>scalene triangle</b>	A triangle with sides of different lengths and angles of different sizes. 
<b>scales</b>	An instrument used to measure mass.
<b>second</b>	A unit of measurement of time. There are 60 seconds in one minute.
<b>sector</b>	Part of a circle, bounded by two radii and the arc of the circle. 
<b>segment</b>	A part of a circle formed by a line which joins any two points on the diameter. 
<b>semi-circle</b>	Half a circle. 
<b>sequence</b>	An group of numbers or objects arranged to follow a particular rule. For example, 5, 10, 15, 20, 25, 30.
<b>set</b>	A group of objects or numbers belonging to a distinct group. For example: The set of prime numbers (1, 3, 5, 7, 11 ...) The set of two-dimensional shapes (square, circle, triangle ...), The set of Solomon Islanders.
<b>set square</b>	A triangular instrument used for drawing.
<b>shape</b>	The outline of an object.
<b>sharing</b>	A method of division in which a number of objects are shared into equal groups.
<b>side</b>	The boundary line of a two-dimensional shape. For example, a parallelogram has four sides.
<b>side view</b>	The shape of an object when viewed from the side. For example, the side view of a cube is a square.
<b>signs</b>	Another word for symbols. For example =, +, -, x, ÷.
<b>solid</b>	Three-dimensional.
<b>sort</b>	To separate objects according to given criteria such as colour, shape or weight.
<b>speed</b>	Distance travelled in a specific time. For example, 60 kilometres per hour; 60 km/h.



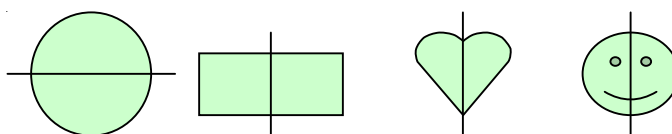
- sphere** A perfectly round three-dimensional shape.
- square** A two-dimensional shape consisting of four equal sides and four right angles. A square is also a rectangle.
- square centimetre** A unit of measurement for area measuring 1 cm x 1 cm. Written as cm<sup>2</sup>.
- square kilometre** A unit of measurement for area measuring 1 km x 1 km. Written as km<sup>2</sup>.
- square metre** A unit of measurement for area measuring 1 m x 1 m. Written as m<sup>2</sup>.
- square number** The product of a number multiplied by itself.  
For example,  $2^2 = 2 \times 2 = 4$ ,  $3^2 = 3 \times 3 = 9$   
Square numbers can be represented in the shape of a square.



- squared paper** Paper with a square grid pattern. Used for constructing two-dimensional drawings and graphs.
- straight angle** An angle of 180° made up of two right angles.



- subtract** To remove part of a group to find the difference in value. Also known as to **take away** or **minus**.
- sum** The total after addition.
- surface area** The total area of all the faces of a three-dimensional object.
- symmetry** An exact match or balance between the two halves of a shape, pattern or object. A shape has line symmetry if both its parts match when it is folded along a line.



- tables (1)** Charts used to present data or information in columns and rows.  
For example:

A Table to Show the Hours of Sunshine in One Week						
Sun	Mon	Tues	Weds	Thurs	Fri	Sat
12	4	6	10	8	3	6

- tables (2)** Lists of multiplication facts used to help pupils learn .  
For example,  $0 \times 3 = 0$ ,  $1 \times 3 = 3$ ,  $2 \times 3 = 6$ ,  $3 \times 3 = 9$

**take away**

To subtract.

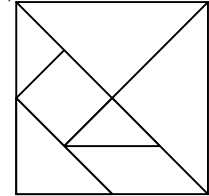
**tally**

A quick way of recording and counting. One stroke represents each item. The fifth stroke usually crosses the four preceding strokes so that the tally can be easily counted.

 = 18

**tangram**

A square cut into seven pieces. Traditional Chinese tangrams are arranged to make pictures.

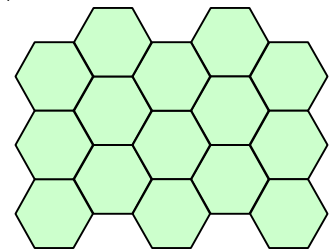


**temperature**

A measure of the heat or coldness of things. Temperature is measured in degrees Celsius °C.

**tessellation**

A tessellation is formed by repeating one or more shapes so that they fit together without leaving gaps or overlapping. Tiles and bricks can be laid in a tessellating pattern. For example, this tessellation uses regular hexagons.



**thermometer**

An instrument used to measure temperature.

**three-dimensional**

Having the three dimensions: height, length and width. Solid objects have three dimensions whilst flat shapes have only two (length and width). This term is abbreviated to **3D**

**time line**

A line which represents a period of time. Intervals of time within the period can be shown on the line.



**tonne**

A unit of measurement for mass. Written as **t**, 1 tonne equals 1,000 kilograms.

**top view**

The shape an object has when viewed from above.

For example the top view of a cone is a circle and the top view of a triangular cube is a square.

**total**

The result of addition.

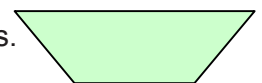
For example,  $4 + 5 = 9$  The total is 9.

**trading**

A process used in mathematical operations. In subtraction for example, where there are not enough ones to subtract, a ten is traded from the tens column and added to the ones column.

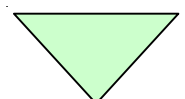
**trapezium**



A four sided figure with only one pair of parallel sides.



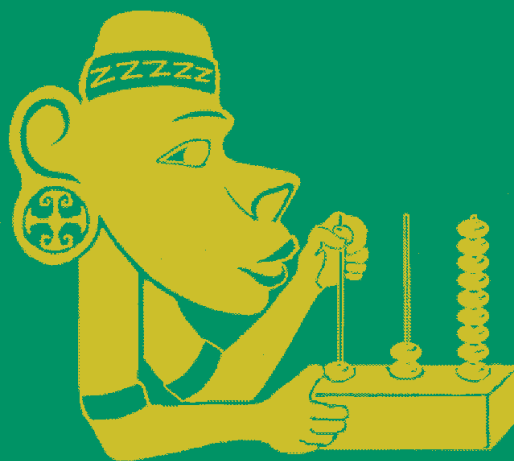
**triangle**

A two-dimensional shape with three sides and three angles.



<b>turn</b>	To rotate around a point.
<b>twelve-hour time</b>	Traditional clocks and watches show time on a clock face that is divided into 12 hours. Two 12-hour periods (a.m. and p.m.) make up each 24-hour day. For example: Half past three in the afternoon or 3.30 p.m.
<b>twenty-four hour time</b>	Some digital clocks and watches display time in 24 hour intervals, to distinguish a.m. from p.m. For example: 1530h
<b>two-dimensional</b>	Having only two dimensions. A flat or plane shape is two-dimensional having width and length but not height. Two-dimensional is abbreviated to 2D
<b>unit</b>	One. The units column is the ones column in a place value chart.
<b>units</b>	Formal or standardised amounts agreed upon for taking and recording specific measurements. For example: a unit of length is the metre and a unit of mass is the kilogram.
<b>vertex</b>	The point where two or more lines meet to form an angle. 
<b>vertical</b>	Upright. A straight line at right angles to the horizontal. 
<b>vertices</b>	Plural of vertex. For example, a triangle has 3 vertices.
<b>volume</b>	The amount of space taken up a substance or object is the. The basic units for recording volume are cubic metres (m <sup>3</sup> ), cubic centimetres (cm <sup>3</sup> ), litres (L), and millilitres (mL).
<b>week</b>	A time period of seven days. Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday.
<b>weight</b>	How heavy an object is. In everyday use the terms <b>weight</b> and <b>mass</b> are used to mean the same. In Mathematics, mass is the amount of matter in an object. Weight is (more accurately) a measure of the effect of the force of gravity acting on the mass.
<b>whole numbers</b>	Numbers from zero to infinity without fractions or decimals. For example 0, 1, 2, 3, 4, 5, 6.....
<b>width</b>	The shorter side a shape. Sometimes called breadth.
<b>year</b>	A unit of time. There are 365 days in a year or 366 days in a leap year. January 1 is the first day of the year. It takes one year for the Earth to orbit the sun.
<b>zero</b>	The numeral 0. Other terms used for this are <b>nought</b> , <b>nothing</b> , <b>nil</b> and <b>none</b> .





**Nguzu Nguzu Mathematics**

**Standard Five**