

Nguzu Nguzu Mathematics

**Teacher's Guide
Book 2**



Nguzu Nguzu Mathematics

Standard Five



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

Standard Five Syllabus Objectives

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

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

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

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

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

Theme: Time	
Topics	Objectives
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.
Theme: Money	
Topics	Objectives
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.

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



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 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.



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"> Led by the teacher The teacher leads the pupils through a new skill, method or concept Probably a whole class activity – (though not always) 	<ul style="list-style-type: none"> To introduce the topic To teach new skills To explain new ideas, mathematical language or concepts To do demonstrations 	<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 not 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"> Pupil focussed Learning is through activity and exploration, and is led by the children themselves. The teacher takes a supervisory role. Probably done in groups, pairs or sometimes individually. 	<ul style="list-style-type: none"> To consolidate what the teacher has taught in the teachers activity To give the children time to practice and understand new concepts in a practical way. To encourage enquiry, extension and conceptual thinking. To encourage group work, cooperation, working together, following rules 	<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.

<p>Materials board compass circular shaped objects rulers</p>
--

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 ability 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'.
Mixed ability groups can also be useful where more able pupils can help less able ones. This is a goods way of approaching practical tasks.
Different activities may be suited to different ways of grouping children. Vary 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 names 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 colour groups 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 the fish groups 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 **clear instructions**. Pupils in each group must understand what to do before they start the task.

Monitor 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:

Stage 1	Yearly Planning	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.
Stage 2	Termly Planning	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.
Stage 3	Weekly Planning	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.
Stage 4	Lesson Preparation	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.

Title of Lesson	
Objective (s)	<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 Knowledge, Skills and Attitudes</p> <p>What are the pupils going to learn in this lesson?</p>
Materials	<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>What do I need to teach the lesson effectively?</p>
Introduction	<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>Why are we learning about this?</p>
Activities 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"> • to balance listening and doing • to follow the sequence of teaching, consolidation and practice of new skills. <p>What will we do in the lesson?</p>
Organisation	<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>
Conclusion	<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>
Evaluation	<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		
Unit 1	Place Value Poster (T1a, T1b) <i>Use also for Unit 3</i>	Topic 1 Place Value Charts (T1a&b) Number Expanders and Numeral Cards (T1a&b) Number Cards 0 – 9 (T1c)	Topic 2 Plastic water bottles (T1c) Counters shells or stones (T4a)	Topic 1 6-digit numbers cards (T1c) Rounding off chart (T2b) Topic 2 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)
Unit 2	Topic 11 Circle Parts Poster (T2b) Topic 12 Regular Shapes Poster (T1a) Irregular Shapes Poster (T1a) Symmetry Poster (T2b)	Topic 12 Symmetry Pairs Game (T2c)	Topic 11 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) Topic 12 Symmetrical found objects such as citrus fruits, seeds, flowers (T2b) Mirrors and reflective objects such as spoons, metal tins, glass louvers. (T3a) Pins (T3a)	
Unit 3	Place Value Chart (T2b T1a) <i>Use the one from unit 1</i>	Number Dice Nets (Support Activity)		Wooden Number Dice (Support Activity)
Unit 4	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)
Unit 5	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)
Unit 6	Multiplication Square (T2b)	Multiplication Bingo Game Cards (Support Activity) Set 1 Tables x2 – x5 Set 2 Tables x6 – x10	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)
Unit 7			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)
Unit 8		Topic 19 Decimal Weight Game Cards (T3a) Topic 20 Building Instructions Cards (T2b)	Topic 19 Groceries and grocery boxes/tins that show the weight of each item clearly (T1a, T2a) Spring balance, kitchen scales (T2a, T4a) Topic 20 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) Topic 20 Centimeter cubes made from timber or card (T1a, T2b)

Unit 9	Three Dimensional Shapes Poster (Topic 12 T2b)	Topic 12 Card Nets: Prisms and Cuboids (T2a) Card Nets: Pyramids (T2b)	Topic 12 A range of cardboard boxes and cases (T1a, T1b) Scissors / cutting knives (T1a, T1b) Cloth for blindfolds and to cover objects (T2a) Topic 13 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) Topic 13 Geostrips cut from card (T1b) Two dimensional shapes made from geo strips or local materials (T1c)
Unit 10	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)
Unit 11	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)
Unit 12		Four Operations Matching Game (C1a)		
Unit 13	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
Unit 14	Line / Bar Graphs Poster	Line Graph Samples (C2a)		Buried Treasure Game (C4a)
Unit 15	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)
Unit 16			Stones and shells to use as counters (T1a)	Cardboard Circles
Unit 17		Probability Shape Cards	Twenty cent coins A cloth bag (T1b) A selection of coloured stones (T1b&c)	Probability Scale Chart (T2a)
Unit 18			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
Unit 19		Shop Cards x6 sets (T1a&b) Paper coins and notes Special offer cards (T1f)		
Unit 20	Location Grid Poster (T1a)	Shape cards to stick on grid (T1a) Noughts and Crosses Dice Nets (C1a)	Grid Paper, cm ² 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.

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

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.

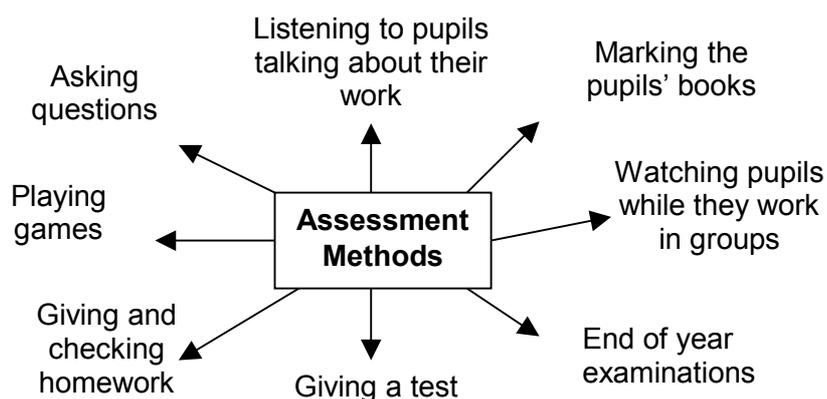
However, there are some serious problems, with using tests as the **only** method of assessment. Here are some, which many teachers will recognise:

- 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
Recalling facts	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?
Applying or using facts	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?
Hypothesising or predicting	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?
Designing and comparing procedures	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 th triangular number? Are there other ways of doing this?
Interpreting results	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?
Applying reasoning	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.

Ask pupils who are just getting started with a piece of work:	Ask pupils who are stuck and do not know what to do next:
<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>
Check progress while pupils are working by asking:	At the end of the lesson ask:
<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? 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.

Aim:

To introduce and develop an understanding of 24 hour clock notation as another way of telling and recording time. Using knowledge of time to use timetables and calculate time intervals.

Sequence of objectives: **To teach the pupils:**

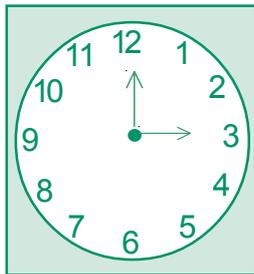
1. the 24 hour clock notation of time.
2. to read and use 24-hour timetables and schedules.
3. to calculate time intervals in 24-hour notation.

Rationale:

This unit builds on the pupils knowledge of the 12 hour clock and enables them to relate 12 hour and 24 hour times and to readily use this in calculations and estimation skills through a variety of activities. Being familiar with telling the time and using timetables and schedules are essential skills which will be used through out the pupils' lives.

T_{1a}

Revise telling the time using a 12 hour clock. Show pupils both a digital and an analogue clock.



3 : 00

Materials

am/pm dice: one set per group.
digital clock
analogue clock
St 4 am/pm Chart

Explain that the clocks are showing the same time in two different ways.

The time shown on both clock faces is 3 o'clock.

Explain to the pupils that we cannot tell what part of the day is shown on the analogue clock. It could be 3 in the morning or 3 in the afternoon. We need to indicate the part of the day by writing in **a.m.** to indicate the morning and **p.m.** for the afternoon.

For example:

If it was 3 o'clock in the morning, we indicate it by writing the time as 3:00 a.m.

But if it was in the afternoon it would be written as 3:00 p.m.

Use the a.m. / p.m. chart from Standard 4 to revise the difference between a.m. and p.m.

C_{1a}

Ask the pupils some oral questions to practice using **a.m.** and **p.m.** correctly and to introduce the group activity.

For example, how do we say the following times using a.m. and p.m.?

- School finishes at half past one in the afternoon, **(1:30 p.m.)**
- I woke up when I heard the cock crow at half past five. **(5:30 a.m.)**

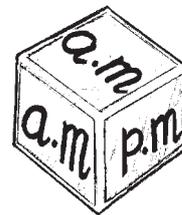
Unit 11: Time

- The ship left Honiara at quarter past six, just as it was getting dark. **(6:15 p.m.)**
- I finished my breakfast at ten to eight. **(7:50 a.m.)**

Think of more examples of your own and ask the pupils to think of some examples too until you are happy that they understand how to use a.m. and p.m.

Split the class into groups of 6.

Give each group 2 dice. Nets for these dice are provided for you to cut out to make. Players take it in turns to throw the two dice and say what time they show, e.g. 7 a.m.



They then have to think of an activity that they might do at 7 a.m. for example: **At 7 a.m. I wake up.** They must not repeat an activity that has been said already and they must make sure that the activity they choose is appropriate for that time of day.

The players take turns to throw the dice and name an activity. If any player cannot think of an activity they are out. The game continues until only one player is left. That person is the winner.

When they have finished playing the game the pupils should move on to complete the activities in their Pupil's Resource Book on pages 4 and 5. These activities give them more practice reading the time using the 12-hour clock and using a.m. and p.m. correctly.

Answers

Activity A

- | | | | |
|---------------|----------------|--------------------|---------------|
| 1. 1:30 a.m. | 2. 9:00 p.m. | 3. 7:00 a.m. | 4. 4:00 p.m. |
| 5. 1:00 a.m. | 6. 3:30 p.m. | 7. 8:30 a.m. | 8. 1:30 p.m. |
| 9. 10:00 p.m. | 10. 10:00 a.m. | 11. 12:00 midnight | 12. 5:00 a.m. |

Check the activities the pupils have chosen too.

Activity B

- 6:15 a.m. Get up and get dressed
- 7:00 a.m. Prepare breakfast
- 8:00 a.m. School starts
- 12:00 noon Eat lunch
- 1:30 p.m. Return home from school
- 3:15 p.m. Play football
- 4:45 p.m. Swim
- 6:45 p.m. Have dinner
- 9:30 p.m. Go to bed
- 1:30 a.m. Sleep

Activity C

1.	half past five in the morning	5:30 a.m.
2.	quarter past three in the afternoon	3:15 p.m.
3.	twenty-five to nine in the evening	8.35 p.m.
4.	twenty to eleven in the morning	10:40 a.m.
5.	ten past twelve in the afternoon	12:10 p.m.
6.	quarter to five in the afternoon	4.45 p.m.
7.	half past midnight	12:30 a.m.
8.	twenty-five past seven in the evening	7:25 p.m.
9.	9:30 p.m.	fifteen minutes earlier
10.	10:05 a.m.	thirty minutes earlier
11.	4:45 p.m.	twenty minutes later
12.	11:20 a.m.	forty-five minutes later
13.	8:00 p.m.	ten minutes earlier
14.	3:30 a.m.	fifty-five minutes later
15.	12:10 p.m.	one hour earlier

Topic 24: The Twenty-four Hour clock

T_{1b}

Materials
 24-hour clock poster
 scissors or cutting knives for each group
 digital clock cards

Begin this activity by revising some basic time facts with the pupils as shown in the box. You could put these on a poster to display in the class while you complete this unit.

Homework Activity

You can give the pupils a **challenge** for homework to use these facts to find answers to the following questions:

1. How many minutes in a day?
2. How many days in a year?
3. How many hours in a week?
4. How many seconds in a day?
5. How many minutes in a week?
6. How many hours in a year?

Basic Time Facts		
60 seconds	=	1 minute
60 minutes	=	1 hour
24 hours	=	1 day
7 days	=	1 week
52 weeks	=	1 year

Now use the 24-hour clock poster to explain **24-hour notation**. Go through all the information on the poster carefully and ask questions to make sure pupils understand.

Show the 24 hours in a day.

Remind the pupils that if we use the 12-hour clock we need to add a.m. and p.m. to show which part of the day we are talking about.

Explain that this is not necessary with the 24-hour clock because it tells us exactly which part of the day we are talking about.

The notation for the hours up to noon is the same for the 12-hour clock and the 24-hour clock, but after noon the notation changes:

1:00 p.m. becomes 1300h

2:00 p.m. becomes 1400h and so on....

Write these on the board and then ask pupils to come up and add to the list until you have completed it up to:

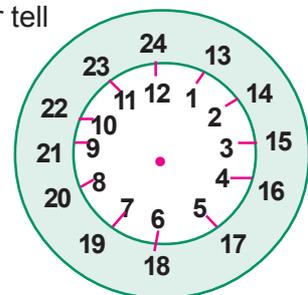
12:00 midnight becomes 2400h

Check that the pupils have understood by asking them to write down, or tell you the 24-hour notation for some different times of the day as follows:

3:00 a.m. 5:50 p.m. noon 1:30 p.m.
 3:20 p.m. 11:50 p.m. 6:30 a.m. 4.20 p.m.

Answers

0300h 1750h 1200h 1330h
1520h 2350h 0630h 1620h



Show them how to use the clock face on the poster to check the times.

Explain how to write 24-hour notation using 4 digits and a lower case h. There is no need to use a colon.

Continue to practise until the pupils are all confident with using the 24-hour clock notation both to tell the correct time and to write it down.

Unit 11: Time

C1b

For this activity the pupils should work in pairs or in small groups. They are going to make a simple 24 hour digital clock and use it to practice reading the time using 24-hour notation.

Demonstrate how to make the clock first and then give each group one Nguzu Nguzu card and a pair of scissors or a knife. Alternatively you can use strips of scrap card to make the clocks.

They should make their clock by following these instructions:

1. Take 4 thin strips of card and mark them as shown in figure 1.

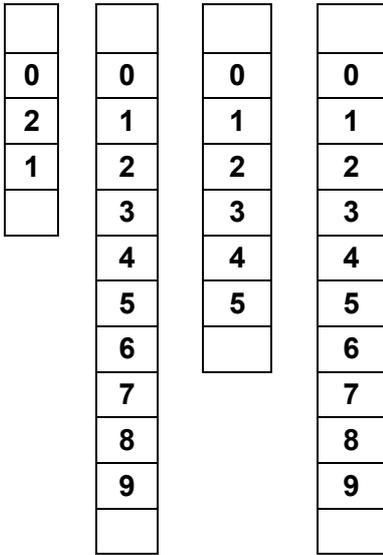


Figure 1

2. Cut 8 slits in the other piece of card as shown in figure 2 to make a digital clock face.

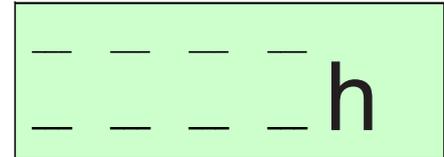


Figure 2

3. Thread the numbered strips through the clock face so that the numbers can be seen in the four boxes as shown in figure 3. The pupils can use the clock to show any time.

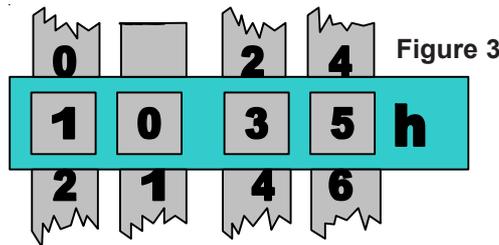


Figure 3

When they have completed their clocks the pupils can use them to practice telling the time using the 24-hour clock. Some activities are suggested below.

- Write a list of times in words on the blackboard, and ask the pupils to set their clocks to the right time.
- Show an analogue clock face with a set time and ask the pupils to set their 24 hour digital clock to the same time.
- Tell them an activity (such as getting up, going to school etc.) and have them set their digital clocks to the time they think it should happen.

You should give the pupils plenty of practice reading the digital times and make sure that they are confident before moving on to the activities in the Pupil's Resource Book on pages 5, 6 and 7 which give them further practice changing analogue to digital times and using the 24-hour clock.

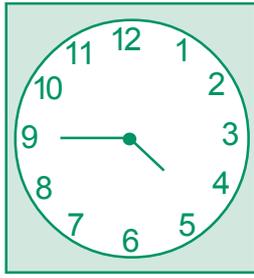
Answers

Activity A

1. a. 0330h b. 1445h c. 1700h d. 0710h
 e. 2120h f. 1650h g. 1110h h. 1745h

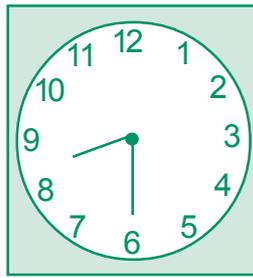
Topic 24: The Twenty-four Hour Clock

2 a.



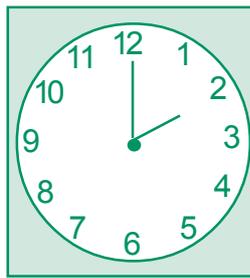
4:45 a.m.

b.



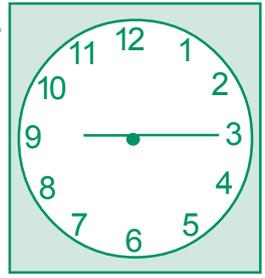
8:30 p.m.

c.



2:00 p.m.

d.



9:15 a.m.

Activity B

- | | | | | |
|----------|----------|----------|----------|-----------|
| 1. 1100h | 2. 1530h | 3. 0345h | 4. 1200h | 5. 0235h |
| 6. 1435h | 7. 0810h | 8. 2359h | 9. 0045h | 10. 1800h |

Activity C

- | | | |
|----------|----------|----------|
| 1. 0330h | 4. 1745h | 7. 2100h |
| 2. 0349h | 5. 2015h | 8. 2230h |
| 3. 2328h | 6. 0245h | 9. 0345 |

	Time in words	Analogue time	24 hour time
10.	half past six in the morning	6:30 a.m.	0630h
11.	twenty past three in the morning	3:20 a.m.	0320h
12.	two fifteen in the afternoon	2:15 p.m.	1415h
13.	quarter past three in the morning	3:15 a.m.	0315h
14.	quarter to one in the afternoon	12:45 p.m.	1245h
15.	ten thirty-five in the morning	10:35 a.m.	1035h
16.	five minutes to eleven at night	10:55 p.m.	2255h
17.	quarter past five in the evening	5:15 p.m.	1715h
18.	five past nine in the morning	9:05 a.m.	0905h

T_{1c}

This activity gives pupils more practice with the 24-hour clock and teaches them how to **say** the times correctly.

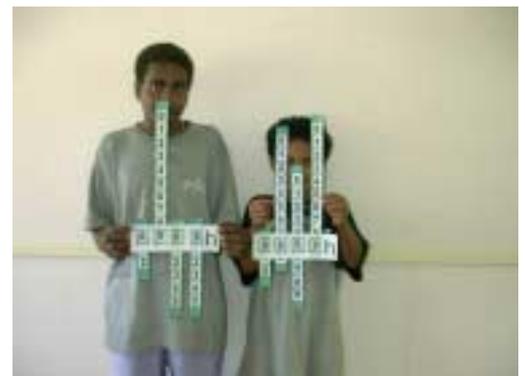
Remind the pupils that there are 60 minutes in one hour.

Ask them to think about when they made their digital clock in the last lesson. Ask them to explain why they only needed numbers up to 5 on the third strip of card? (Because this strip represents the minutes and after 59 minutes the clock changes over to the next hour.)

Using the clocks they have made have them all set their clock to 0855h.

Ask them to move the clock on as you call out the time in minutes as follows:

0855h 0856h 0856h 0858h 0859h 0900h



Unit 11: Time

Make sure that the children know how to move the hour strip as well as the minutes strips to change the clock from 0859h to 0900h. Each time ask the pupils to say the time aloud. When they get to 0900h they should say **zero nine hundred hours**.

Repeat this with different times for more practice.

When they are confident with moving one hour strip try the same activity starting from 0955h. Pupils will then have to move both hour strips to click the clock over to 1000h.

Try the same thing starting at 1955h and at 2355h.

Can the pupils tell you what comes one minute after 2359h? What comes one minute after 2400h?

The Speaking Clock

Now give the children more practice saying the 24-hour times by doing the same activity orally.

Ask 6 children to come to the front of the class and stand in a line. Tell the first child to start at 0655h and say the time aloud.



Repeat the game with different pupils and different times. Use both before noon and afternoon times to help them become familiar with the 24-hour clock.



Split the class into groups of 6 and have them continue the game for more practice.

Call out a starting time and have them count on in minutes around the group until they have all had a turn. They must listen to each other to make sure that they don't make mistakes and they can also use their digital clocks to move on the time as they go, if they need practice with this.



Can all the pupils use 24-hour clock notation both orally and in writing?

Topic 24: The Twenty-four Hour Clock

T_{2a}

Materials
school timetable poster

This activity helps the pupils to use their knowledge of the 24 hour clock to interpret timetables and schedules.

Start by revising what they covered at Standard 4.

Display the school timetable poster provided and use it for discussion.

Ask questions such as:

What time does the maths lesson begin?

Which subject is being taught at half past nine?

Which is the longest lesson? How long is it?

Which lesson is longer, Christian Education or Science?

Which three lessons are the same length?

What time does school end?

How long is the school day?

If a pupil arrived one hour late for school during which lesson would he arrive?

..... and so on.

Make sure that all the pupils have a chance to read information from the timetable.

You could ask some pupils to ask questions about it for other pupils to answer. This will also help them to understand and interpret the information.

Standard 5 Timetable		
Time	Lesson	Duration
0745h – 0800h	Registration	15 minutes
0800h – 0820h	Christian Education	20 minutes
0820h – 0910h	Maths	50 minutes
0910h – 1030h	English 1	1 hour 20 minutes
1030h – 1100h	Break	30 minutes
1100h – 1140h	English 2	40 minutes
1140h – 1220h	Community Studies	40 minutes
1220h – 1300h	Science/Agriculture	40 minutes
1300h – 1330h	Physical Education	30 minutes

C_{2a}

Ask the pupils to turn to the Pupil's Resource Book on page 8 and study the Solomon Airlines timetable.

Explain the abbreviations used as shown in the Pupil's Resource Book.

Explain that the first column in green type is the **departure time** and the second column the **arrival time** for each flight shown.

Explain too that each flight is identified by a number known as a **flight number**. These numbers all begin with the letters IE which is the international code for all Solomon Airlines flights.

Next ask some more questions about the information on the timetable to encourage pupils to study it and look for information.

Ask the pupils to tell you how to work out the **length of a flight**.

Explain that if a plane leaves Honiara at 1600h and arrives in Auki at 1630h then the flight has taken 30 minutes. They should be able to tell you that the difference between the departure time and the arrival time is the length of the flight.

Ask how long other flights are and help the pupils to find the information from the table for example:

Unit 11: Time

How long is the flight from Munda to Honiara?

Depart Munda 0940h Arrive Honiara 1100h

Flight time 1 hour 20 minutes

Write a number of these questions on the blackboard, discuss them with the pupils and ask pupils to come up and write the answers on the board. For example:

- | | |
|--|--------------------------------|
| How long is the flight from Honiara to Bellona? | (55 minutes) |
| How long is the flight from Rennell to Bellona? | (20 minutes) |
| How long is the flight from Santa Anna to Honiara? | (1 hour and 20 minutes) |
| How long is the flight from Honiara to Bellona? | (55 minutes) |
| How long is the flight from Rennell to Bellona? | (20 minutes) |
| How long is the flight from Santa Anna to Honiara? | (1 hour and 20 minutes) |

Continue until everyone understands how to work out the length of a flight.

Next ask some more questions about the information on the timetable to encourage pupils to study it and look for information.

Some suggestions:

- | | |
|---|--|
| 1. On which days of the week can you fly to Auki from Honiara? | (Tuesday & Wednesday) |
| 2. Which day can you fly to Gizo? | (Monday) |
| 3. What time is the direct flight to Gizo on Monday? | (1430h) |
| 4. What is the latest time that the plane flies, according to this timetable? | (1740h) |
| 5. What is the departure time of the earliest flight? | (0700h) |
| 6. What is the shortest flight? | (Munda to Gizo 15m) |
| 7. Can you find two flights that are the same length? | (Honiara to Seghe and Honiara to Kira Kira) |
| 8. Where does the plane stop on its way to Munda on Wednesday? | (Seghe) |
| 9. What is the flight number for the flight to Atoifi from Honiara? | (IE 132) |
| 10. What time is the flight to Rennell from Honiara on Tuesday? | (0730h) |

Use the timetable to ask more questions until you are happy that the pupils have understood how to read the information it gives them. This is a complicated piece of information and they will need lots of practice.

Then ask the pupils to complete the activities in the Pupil's Resource Book on pages 8 and 9. These help them to use their understanding of the 24-hour clock to read the timetable and interpret the information it contains.

Answers

Activity A

- 0700h Monday, 1100h Tuesday
- 0855h
- 30 minutes
- Yandina
- 1220h
- 1030h

Activity B

- 20 minutes
- Yandina to Honiara
- Tuesday IE132 1600h Weds IE132 1600h
- Stops in Atoifi on Wednesday
- Honiara to Bellona
- 1 hour 30 minutes

Topic 24: The Twenty-four Hour Clock

Activity C

- d, b, a, e, f, c
- a. 3 hours 35 min.
b. 3 hours.
c. 1 hour 40 m
d. 1 hour 25 min
- a. Between 20 + 50 mins
b. Between 10 + 20 mins
- Honiara to Santa Anna via Kira Kira

T_{2b}

Materials

clock face
Race Against
Time game cards

Remind the pupils how to read and write the time in 24-hour notation.

Write some times on the board and show them how to read them, for example:

0400h is read as zero four hundred hours

1400h is read as fourteen hundred hours

0630h is read as zero six thirty hours

2015h is read as twenty fifteen hoursand so on.

Play a game to help the pupils practice saying the time correctly as follows:

Ask three pupils to come to the front of the class. Show them a digital clock set at a given time. Each pupil must tell the time in a different way.

1015h



2145h



Unit 11: Time

Repeat with other examples until the pupils are comfortable with different ways of reading the time.

Explain that the 24-hour notation is used by ships and airlines.

Remind the pupils how to write the 24-hour notation using **four digits followed by the lower case h**, as shown:

Explain that the 24-hour notation does not have a colon (:).

Practise writing the 24-hour notation correctly by dictating some times for pupils to write in their exercise books or on the board.

12-hour clock	24-hour clock
6.30 a.m.	0630h
11.45 a.m.	1145h
1.15 p.m.	1315h
9.20 p.m.	2120h
11.45 p.m.	2345h

C2b

If pupils need more practice with saying or writing the 24-hour notation before doing the activities in the Pupil's Resource Book, you could try some of the following activities:

- Split into groups of three and play the game above again. You could give each group a selection of cards with times written on one side, they then have to pick the card and each tell the time in a different way.
- Still working in groups, use the Solomon Airlines timetable in the Pupil's Resource Book on page 8. Pupils can ask each other questions about the flight times and they have to respond giving the correct time, for example:

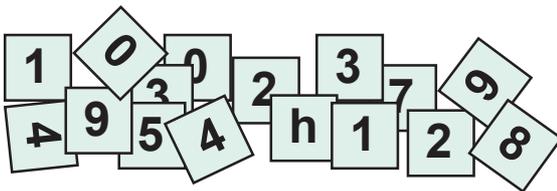
Q. What time does the plane depart for Munda on Monday morning?

A. Zero seven hundred hours.

- Give the pupils a list of times on the board written in different ways and have them write them in their exercise books using correct 24 hour notation, as shown in the box on the right.

Quarter to five in the evening	1645h
Half past three in the morning	0330h
10:20 a.m.	1020h
Six fifteen in the evening	1815h
10:40 p.m.	2240h

- **Race Against Time.** Divide the pupils into teams of about 6. Give each team a set of cards with numerals and lower case h on them as shown.



Call out a given time and have the teams race to see who can be first to put the cards in the correct order to show the 24-hour notation.

For example:

Half past nine in the evening



Topic 24: The Twenty-four Hour Clock

When all the pupils are comfortable with saying and writing the 24-hour notation correctly, they can complete the activities in the Pupil's Resource Book on pages 10 and 11.

Explain the **tidal chart** to the pupils before they start the activities. Make sure they know how to read the information it gives.

These activities help pupils to practise reading information from a chart using their knowledge of the 24-hour clock and to practice writing the correct 24-hour notation.

Answers

Activity A

1. 0503h 2. 0700h 3. 2221h
4. 1751h 5. 1852h 6. 2121h

Activity B

1. 1852h 2. 2322h 3. a. 0121h b. 0606h c. 0830h d. 0945h
4. 5. High 1852h 6. High 0243h
 Low 2322h Low 0121h

Wednesday		
High	0503h	1645h
Low	1105h	2322h

Activity C

	Thurs	Fri	Sat	Sun
High	0606h	0700h	about 0806h	about 0912h
Low	1219h	1323h	about 1427h	about 1531h
High	1751h	1852h	about 1953h	about 2054h
Low	0018h	0121h	about 0224h	about 0327h



Can all the pupils read and use a timetable showing information in 24-hour notation?

T3a

Materials

Digital clocks made in last lesson

Revise the basic time facts you taught pupils earlier in the unit, using your chart.

Make sure that they can tell you that 60 seconds is the same as 1 minute, 60 minutes is the same as 1 hour and 24 hours is the same as one day.

Check whether any pupils did the **homework challenge** you set them. Were they able to calculate how many seconds in an hour, how many hours in a week and so on?

Ask them to explain how they did it and check their answers.

Answers to Homework Activity T1b page 41.

1. 1,440 minutes 2. 365 3. 168 hours 4. 86,400 seconds
5. 10,080 minutes 6. 365 days = 8,760 hours

Note: There are actually 365 days in each year, but 52×7 is 364. Can pupils explain this? 365 days adds up to 52 weeks and one day. So there are actually 52 weeks + 1 day in a year. Which is why the new year always starts on a different day of the week.

Unit 11: Time

In this activity pupils will learn about **intervals of time**. They will learn to **calculate** intervals of time and to state what time it will be after a certain interval has passed. A problem solving approach is used to encourage pupils to relate their knowledge of time to real events and activities. They have already calculated time intervals when studying timetables and schedules.

Use the following examples to discuss and explain about time intervals. You will need to make up more examples of your own to make sure that the pupils fully understand.

Example 1

a. A bus leaves Rove for KGVl every 15 minutes. If the first bus leaves at 0815h, at what time will the next two buses be?

Pupils must count on in intervals of 15 minutes. **Answer: 0830h, 0845h**

b. A bus leaves Rove at 0845h and takes 25 minutes to get to KGVl. What time does it arrive?

Pupils must add an interval of 25 minutes to the given time. **Answer: 0910h**

Example 2

A new baby has to be fed every four hours.

How many times will he have to be fed in a day?

Work out the answer together with the pupils start at midnight with feed 1 then count on 4 hours and write down that feed 2 will be at 4 a.m. Continue until you have gone through a full 24 hour period and see how many feeds the baby has had.

Answer: 6 feeds in 24 hour period

Feed 1 0000h
Feed 2 + 4 hours 0400h
Feed 3 + 4 hours 0800h
Feed 4 + 4 hours 1200h
... and so on.



Split the class into groups of six pupils. They each need the home-made digital clock that they made earlier in the unit.

Give a starting time for the whole class such as 1045h.

The different groups have to add different time intervals to the starting time as follows:

- Group 1 Add 1 minute
- Group 2 Add 5 minutes
- Group 3 Add 15 minutes
- Group 4 Add half an hour
- Group 5 Add 1 hour.

Allow each group time to work out the different times that would be made by adding the interval they have been given then ask them to stand up and display their clocks in the right order, showing these times.



Topic 24: The Twenty-four Hour Clock

Repeat the game with different starting times and different intervals until the pupils are confident with adding intervals of time.

Then ask them to complete the activities in the Pupil's Resource Book on pages 11 and 12.

These help them to practice adding intervals of time, and to use these skills in problem solving activities.

Answers

Activity A

1.	Example					
2.	1259h	1300h	1301h	1302h	1303h	1304h
3.	1057h	1058h	1059h	1100h	1101h	1102h
4.	2158h	2159h	2200h	2201h	2202h	2203h
5.	1955h	1956h	1957h	1958h	1959h	2000h
6.	1559h	1600h	1601h	1602h	1603h	1604h

Activity B

1.	1358h	1359h	1400h	1401h	1402h
2.	1030h	1040h	1050h	1100h	1110h
3.	1645h	1650h	1655h	1700h	1705h
4.	1159h	1200h	1201h	1202h	1203h
5.	0645h	0700h	0715h	0730h	0745h

Activity C

1.	0800h	0848h	0936h	1024h	1112h	1200h
2.	0630h	1030h	1430h	1830h	2230h	0230h
3.	a. 1 hr 36 minutes	b. They will finish at 2100h				
4.	a. 3hrs 36 minutes	b. 1136h				



This activity follows on from the last lesson about **intervals of time**. It teaches pupils how to **subtract** intervals of time to find out what time something happened.

A problem solving approach is used to encourage pupils to apply their understanding of time and the 24-hour clock to real life situations.

Use the following examples to discuss and explain about time intervals. You will need to make up more examples of your own to make sure that the pupils fully understand.

Example 1

Ask the pupils to look at the **Solomon Airlines Timetable** on Page 8 of the Pupil's Resource Book.

Look at the information it gives about flights from Honiara to Munda for example:

Flight IE 140 leaves Honiara at 0700h on Monday morning and arrives at Munda at 0820h. See if the pupils can tell you how long the flight takes. (**1 hour and 20 minutes**).

Ask pupils to explain how they worked this out (by subtracting the departure time from the arrival time).

Unit 11: Time

Give some other arrival times and help pupils to work out the departure time from Honiara by subtracting 1 hour and 20 minutes from the time given.

Do the same for other flights to Seghe and Gizo, until you are satisfied that pupils understand how to subtract to find the flight time.

NOTE: Pupils must be careful with subtracting time because they are not using the decimal system they are used to. Some pupils may make mistakes by using the decimal system and calculating as if there are 100 minutes in an hour. Remind them that there are 60 minutes in an hour.

Example 2

Tell the pupils that it takes you 25 minutes to walk to school in the mornings. Draw the following table on the board and use it to discuss deducting intervals of time.

	Monday	Tuesday	Wednesday	Thursday	Friday
Left home					
Arrived at School	0805h	0755h	0759h	0810h	0800h

Ask the pupils to explain how they can find out what time the teacher left home. **(By subtracting 25 minutes from the time she arrived at school).**

Let different pupils calculate the times and write the answers on the board to complete the table. Let the other pupils check their answers.

Example 3

Tell the pupils to imagine that they have invited three friends to their birthday party which will start at 1530h on Saturday.

Sam lives 15 minutes walk from the house.

Ben has to paddle from a nearby island. This takes him 25 minutes.

James lives just nearby. It takes him only 4 minutes to get to the house.

Ask the pupils to tell you what time each person will need to leave home to get to the party on time. **(Answer: Sam 1515h, Ben 1505h, James 1526h)**

You will need to think up some more problems to help pupils practice subtracting intervals of time, to make sure that all the pupils understand.

C3b

Ask the pupils to work in pairs. Each person has to think up a time problem like some of the ones you have been working on in the lesson.

Tell them that their problem can be about adding or subtracting intervals of time.

They should write their problem down in their book or on a piece of paper and when they have finished swap with their partner and try to solve each other's problems.

As they work you should move around the classroom helping those who are having difficulty. You could use some of the pupil's problems as more examples to try with the whole class.

When they have finished they should move on to the activities in the Pupil's Resource Book on pages 13 and 14. These give them more practice both with adding and subtracting intervals of time.

Topic 24: The Twenty-four Hour clock

Answers

Activity A

1. 0710h 2. 1315h 3. 2130h
4. 1020h 5. 0915h

Activity B

1. a. 0900h b. 0955h c. 0850h
2. a. 0010h b. 0050h c. 0000h (2400h)
3. a. 2345h b. 0210h c. 0000h (2400h)
4. a. 0931h b. 1315h c. 0845h
5. a. 1501h b. 1429h c. 1259h

Activity C

1. 0935h
2. 1812h
3. a. Susie 1455h Joando 1450h Juliette 1503h
b. 1510h
c. 20 minutes



Can all the pupils calculate time intervals using 24-hour notation?

Unit 11: Time

Support Activities

To give the pupils more practice in using 24 hour clock notation give the pupils 4 figures such as 0, 1, 2, 6. Ask them to work out and write down as many different times as they can make using these 4 figures on their digital clock.



For example: 1026h, 1206h, 1226h, 1601h, 2106h ...and so on.

Play the Game - Snap

In groups, tell the pupils to play snap time using the Nguzu Nguzu Time Snap cards.

Place the cards face down on the table, shuffle them together and deal them out to their group. The pupils hold them face down. One pupil takes their top card and places it face up in front of them. In turn, each player turns over their top card and places it on top making a pile in the centre. If two cards with the same time are placed face up at the same time the first pupil to call out “**snap**” takes the 2 piles. The aim of the game is to win all the cards. The first pupil to win all the cards wins the game.

Making the cards as well as playing the game will reinforce the different ways in which time can be shown. Allow pupils to make their own sets of snap cards too. Encourage the pupils to talk about the cards as they make them. Let them choose which 15 times they are going to use. If more than one group is doing this activity they could swap sets of cards and play the game with each others sets.

How Many Ways?

Give pupils a time e.g. 30 minutes past 6 in the afternoon. Ask them to show this in as many different ways as they can. You could make this into a game by giving them a minute to race against each other. Tell them they can use analogue and digital clocks as well as words.

Your Timetable

Ask the pupils to accurately record a day at school. Tell them to start with what time they woke up in the morning. Then ask them to work out how long each activity took. For example:

- How long did they have between waking up and starting off to school?
- How long did they take to eat their breakfast?
- How long did it take them to get to school?
- How long was the first lesson? and so on...

This activity will help them to practice working out time intervals.

Extension Activities

Time Line

Pupils could make their own 24-hour timeline. They could mark on it something they do each hour. If you have coloured crayons they could show sleeping hours and waking hours in colour. These timelines could make a wall display.

The pupils could make a weekend timeline too.

Schedules

Pupils could work in pairs and research what other people do in their day. They have looked at school timetables so they know what happens in school. They could talk to a nurse at the clinic or a mother at home or a farmer and build up a weekly schedule for them. They could then give a presentation to other pupils telling them what they have found out.

What each person does each day and how long these activities take. If it's a job like a nurse, how many hours they are at the clinic each week and so on.

Check Up Page: Answers

1. a. 0642h b. 1842h c. 2215h d. 1200h
2. a. 1:08 p.m. b. 12:18 a.m. c. 5:45 a.m. d. 10:35 p.m.
3. a. 8 hours 40 mins
b. registration, assembly, Maths, break, English, lunch
c. 2 hours
d. St 2 = 45 mins St 3 = 1 hr 30 mins St 4 = 45 mins St 5 = 45 mins St 6 = 1 hr 15 mins
e. English, 1000h until 1200h = 2 hours
4. a. 45 mins b. 1045h c. 6 hours d. 1130h

Number Topic 7: Mixed Computation

Aim:

To develop the pupils' mathematical skills and understanding of calculations involving more than one operation.

Sequence of objectives: To

1. make calculations involving more than one operation.
2. make calculations involving more than one operation where brackets indicate the order of operations.

Rationale:

In this unit pupils will learn the mathematical rules to use when more than one operation is required. They learn to do addition, subtraction, multiplication and division in the same sum, and they learn to use brackets to help them with mixed computation.

This is an important skill as they will make incorrect calculations if they do things in the wrong order.

T_{1a}**Materials**

Four Operations
Matching Game
cards

In this lesson pupils are introduced to calculations involving more than one operation. They learn that some operations give the same answer whichever order they are completed in, and that other operations have to be completed in a certain order to get the right answer.

This prepares them for working on calculations involving more than one operation.

Write these examples on the board and ask the pupils to give the answers:

a. $7 + 8 =$ b. $15 + 9 =$ c. $2 \times 5 =$ d. $3 \times 4 =$

Next ask the pupils to change around the order of the numbers in each example and do the calculations again as follows:

a. $7 + 8 =$ b. $15 + 9 =$ c. $2 \times 5 =$ d. $3 \times 4 =$
 $8 + 7 =$ $9 + 15 =$ $5 \times 2 =$ $4 \times 3 =$

The pupils should be able to tell you that the answers are the same. It does not matter which order they are done in.

Ask the pupils to think of a rule for this.

Now look at similar examples for subtraction and division:

a. $7 - 8 =$ b. $15 - 9 =$ c. $12 \div 4 =$ d. $15 \div 3 =$

After pupils have calculated the answers ask them to reverse the order of the numbers and try again:

a. $7 - 8 = 1$ b. $15 - 9 = 24$ c. $12 \div 4 = 3$ d. $15 \div 3 = 5$
 $8 - 7 = -1$ $9 - 15 = -6$ $3 \div 12 = 3$ $3 \div 15 = 4$

Pupils will be able to tell you that the answers are different.

Explain that, in division and subtraction operations, the order of the numbers cannot be changed.

Topic 7: Mixed Computation

C_{1a}

This game reinforces pupils understanding of which operations can be reversed and which cannot. Prepare the cards for the **Four Operations Matching Game** before the lesson. There are 72 cards in all. There are three sets of 24 cards. Each set is a different colour to help you sort them out easily. These cards will last much longer if you paste them onto strong cardboard. Make sure you store the cards carefully so that you can use them again.

Split the class into three groups, or six groups if you have a large class, in which case you will need to prepare two sets of cards.

Explain the game to the pupils as follows:

First place all 24 cards face down on the table and mix them up.

Take turns to turn over two cards, one question card and one answer card.

Note the question cards and the answer cards are different shapes so they will be able to pick one of each easily.

If the answer is correct for the question they have picked, they win the pair and have another turn.

If the answer is wrong, they must turn the cards over again and the next player has a turn.

The winner is the person with the most pairs once all the cards have been won.

Remind pupils that it is a memory game so they have to try to remember where the cards are so that they can select the right answer.

Remind them too to check each other's answers to make sure that they are correct.

Allow the class time to play the game. Swap the different sets of cards around between groups to give more practice.

In case the Nguzu Nguzu cards are not available, here is a sample set of operations you can use to make your own game.

$12 \div 4 =$	3	$5 + 6 =$	11	$11 - 7 =$	4	$6 \times 5 =$	30
$4 \div 12 =$	$\frac{1}{3}$	$3 + 4 =$	7	$7 - 11 =$	-4	$1 \times 9 =$	9
$12 \div 3 =$	4	$4 + 3 =$	7	$12 - 5 =$	7	$9 \times 1 =$	9
$3 \div 12 =$	$\frac{1}{4}$	$4 + 9 =$	13	$5 - 12 =$	-7	$9 \times 0 =$	0
$12 \div 6 =$	2	$9 + 4 =$	13	$5 \times 4 =$	20	$0 \times 9 =$	0
$6 \div 12 =$	$\frac{1}{2}$	$9 + 8 =$	17	$4 \times 5 =$	20	$8 + 7 =$	15
$1 \div 12 =$	$\frac{1}{12}$	$8 + 9 =$	17	$3 \times 5 =$	15	$7 + 8 =$	15
$12 \div 1 =$	12	$10 - 7 =$	3	$5 \times 3 =$	15	$5 - 4 =$	1
$6 + 5 =$	11	$7 - 10 =$	-3	$5 \times 6 =$	30	$4 - 5 =$	-1

Once they have played the game a few times, ask pupils to complete the activities in the Pupil's Resource Book on pages 16 and 17.

These introduce the pupils to mixed computation. Before they begin, tell the pupils that they must always start the calculations on the left and work from left to right.

Do a couple of examples on the board first to start them off, such as:

$$2 + 12 - 7 = 7 \qquad 15 - 6 + 7 = 16$$

Topic 7: Mixed Computation

Example 2 $18 - 3 \times 4 + 1$ Multiplication first
 $= 18 - 12 + 1$ Then addition and subtraction as they occur from
 $= 6 + 1$ left to right
 $= 7$

Example 3 $(3 + 18) - 40 \div 5$ Brackets first
 $= 21 - 40 \div 5$ Division next
 $= 21 - 8$ Subtraction last
 $= 13$

Teach the pupils that BODMAS is only used when an operation mixes addition and or subtraction with multiplication and or division. BODMAS is used to work out the order of operations.

C1b

Work through some more examples until the pupils are familiar with using BODMAS.

Here are some examples you could use:

$$5 \times 2 + 3 = (13)$$

$$5 + 2 \times 3 = (11)$$

$$8 + 6 \div 3 = (11)$$

$$(5 + 2) \times 3 = (21)$$

$$(5 + 2) \times (6 + 1) = (49)$$

$$3 \times (6 + 4) - 10 = (20)$$

Tell the pupils to write the words **brackets**, **of**, **division**, **multiplication**, **addition** and **subtraction** on a piece of paper. Cut the paper so that each word is on a separate piece.

of

brackets

addition

multiplication

subtraction

division

Ask the pupils to shuffle the words. Work with a partner to see who can put the words in the right order of working first. BODMAS. Let them have a few goes at this. Are they improving?

Ask six pupils to come out to the front of the class. Put them in a line - tell the first one to say "brackets" then the next to say, "of" and so on. Tell the pupils to change places. Now let them try again.

When the pupils understand the order of operations ask them to complete the activities in the Pupil's Resource Book pages 17 and 18. Explain that these examples do not include any brackets so pupils will not need to use brackets yet. They still need to follow **BODMAS**, however.

Answers

Activity A

- 20
- 12
- 8
- 9
- 22

- 26
- 14
- 4
- 10
- 40

- 10
- 4
- 5
- 36
- 16

Activity C

- 7
- 7
- 30
- 4
- 25
- 36
- 50
- 45
- 7
- 7

Activity B

- 71
- 42
- 57
- 24

- 41
- 40
- 19
- 8

Unit 12: Number

T_{1c}

Teach the pupils that when a sum involves **only** division and multiplication BODMAS does not apply. Instead they must work through the operations from left to right.

Go through these examples on the board with the class.

a. $12 \div 4 \times 3 = 12 \div 4 = 3$ so then $3 \times 3 = 9$

b. $18 \div 3 \times 6 = 18 \div 3 = 6$ so then $6 \times 6 = 36$

If the pupils are confident when using their multiplication tables they will be able to calculate these quickly. For those pupils who are having difficulty with their multiplication facts let them use their multiplication fact chart or the multiplication square.

Go through some examples on the board to give the pupils some practice. Here are some examples you could use.

a. $21 \div 3 \times 6 =$ **Answer $7 \times 6 = 42$**

b. $9 \times 4 \div 3 =$ **Answer $36 \div 3 = 12$**

c. $16 \div 4 \times 8 =$ **Answer $4 \times 8 = 32$**

d. $10 \times 6 \div 2 =$ **Answer $60 \div 2 = 30$**

C_{1c}

Let the pupils work in pairs. Write up these numbers on the board 3, 4, 5, 12 and 15.

Tell them you are going to write up only the signs in a number sentence. Tell them they must use only the numbers you have written on the board to make the number sentence true.

They can only use each number once in each number sentence.

Tell them its a competition to see which pair can come up with the right answer first?

a. $__ \div __ \times __ = 20$ **$15 \div 3 \times 4$**

b. $__ \times __ \div __ = 16$ **$4 \times 12 \div 3$ or $12 \times 4 \div 3$**

c. $__ \times __ \times __ \div __ = 5$ **$5 \times 3 \times 4 \div 5$ or $3 \times 5 \times 4 \div 5$ or $4 \times 5 \times 3 \div 5$**

When the pupils have solved the puzzles tell them to complete the activities in the Pupil's Resource Book on pages 18 and 19.

Answers

Activity A

- | | | |
|-------|--------|--------|
| 1. 12 | 6. 12 | 11. 28 |
| 2. 8 | 7. 8 | 12. 12 |
| 3. 12 | 8. 36 | 13. 4 |
| 4. 10 | 9. 5 | 14. 16 |
| 5. 72 | 10. 48 | 15. 20 |

Activity B

- | | |
|-------|----------|
| 1. 12 | 5. 8 |
| 2. 5 | 6. 4 |
| 3. 25 | 7. 2 |
| 4. 6 | 8. 10, 4 |

Activity C

- | | | |
|-----------------------------------|------------------------|------------------|
| 1. $3 \times 2 \times 6 \div 3 =$ | $6 \times 6 \div 3 =$ | $36 \div 3 = 12$ |
| 2. $4 \times 2 \times 6 \div 3 =$ | $8 \times 6 \div 3 =$ | $48 \div 3 = 16$ |
| 3. $5 \times 2 \times 6 \div 3 =$ | $10 \times 6 \div 3 =$ | $60 \div 3 = 20$ |

Topic 7: Mixed Computation

T_{1d}

In this lesson pupils will use the left to right rule at the same time as using other BODMAS rules.

Continue to explore some of the properties of number sentences involving mixed computation with the class.

Discuss some questions that might confuse them when applying the rules they have learned.

Write this example on the board.

$$36 + 5 - 8 \times 4 = ?$$

What should they do first?

'Do division and multiplication before addition or subtraction.'

Can they remember?

Tell them to remember the rule. Ask the pupils to tell you the order of operations before they look back in their exercise books to check.

Work through some other examples with the whole class to reinforce this.

a. $20 - 10 \div 5 = 18$

c. $12 - 18 \div 3 = 6$

b. $15 - 3 \times 4 = 3$

d. $2 + 5 + 7 \times 3 = 28$

C_{1d}

Ask the pupils to practise applying the rule.

Write these number sentences on the board. Let the pupils work in pairs and talk about what they will do first.

a. $43 + 7 - 36 \div 4 = 36 \div 4 = 9$ **So $43 + 7 - 9 = 41$**

b. $27 \div 3 + 6 + 2 = 27 \div 3 = 9$ **So $9 + 6 + 2 = 17$**

c. $28 + 12 \div 4 - 4 = 12 \div 4 = 3$ **So $28 + 3 - 4 = 27$**

Talking through the number sentences is a good way to reinforce the order of operations. If the pupils know their multiplication tables, these number sentences will be quick for them to work out.

When the pupils have worked out the answers you could ask different pupils to show how they arrived at their answers on the board.

Let all pupils mark their working out and answers.

Ask the pupils to complete the activities in the Pupil's Resource Book page 19.

Answers

Activity A

- | | | | |
|-----|----|-----|----|
| 1. | 30 | 2. | 11 |
| 3. | 2 | 4. | 20 |
| 5. | 28 | 6. | 15 |
| 7. | 25 | 8. | 26 |
| 9. | 25 | 10. | 2 |
| 11. | 5 | 12. | 10 |

Activity B

- | | | | |
|----|------------------------|----|---------------------------------|
| 1. | $5 \times 6 + 7 = 37$ | 2. | $20 - 12 + 2 = 10$ |
| 3. | $10 - 3 \times 2 = 4$ | 4. | $12 \times 2 - 7 \times 2 = 10$ |
| 5. | $10 + 6 \times 7 = 52$ | 6. | $16 + 12 \div 2 = 22$ |
| 7. | $15 - 3 \times 2 = 9$ | 8. | $12 \times 3 - 7 \times 2 = 22$ |

Unit 12: Number

T_{2a}

In this lesson the pupils will learn to use brackets in number sentences involving the four operations.

Revise the rule that applies to questions involving addition and subtraction **or** division and multiplication. The rule is **work from left to right**.

Ask the pupils what the rule is. They should be able to tell you.

Now introduce them to the idea of brackets. Write this example on the board.

$$3 + 2 \times 4$$

Ask them what the answer is.

$$2 \times 4 = 8 \text{ so } 3 + 8 = 11.$$

Now write the example again but put in some brackets $(3 + 2) \times 4$

Tell them they must work out the brackets first. Think of **BODMAS**. So $3 + 2 = 5$

The sum is now $5 \times 4 = 20$.

So the process now is:

1. **Work out the sum in the brackets first.**
2. **Then do division and multiplication working from left to right.**
3. **Finally do addition and subtraction working from left to right.**

Work through this example on the board.

$$(10 - 3) \times (2 + 3) =$$

$$7 \times 5 = \mathbf{35}$$

Here are some more to use

$$(14 - 6) \times (1 + 3) = 8 \times 4 = \mathbf{32}$$

$$(2 \times 3) + (6 - 2) + (5 - 1) = 6 + 4 + 4 = \mathbf{14}$$

Go through more examples if you think the pupils need more practice.

C_{2a}

Tell the pupils to work in pairs. Write these puzzles on the board. Tell them they can only use the numbers 3, 4, 5, 12 and 15 to make these number sentences true. They can only use each number once in each number sentence.

The pupils have used this puzzle before but this time there are brackets as well as the four operations +, -, ÷ and x.

a. $(\underline{\quad} + \underline{\quad}) \div \underline{\quad} = 1$ $(3 + 12) \div 15 = 1$ or $(12 + 3) \div 15 = 1$

b. $(\underline{\quad} - \underline{\quad}) \times \underline{\quad} = 9$ $(15 - 12) \times 3 = 9$

c. $(\underline{\quad} + \underline{\quad}) \times \underline{\quad} = 27$ $(5 + 4) \times 3 = 27$ or $(4 + 5) \times 3 = 27$

Go through the answers with the whole class to check their working and understanding.

Ask the pupils to complete the activities in the Pupil's Resource Book pages 20 and 21.

Topic 7: Mixed Computation

Answers

Activity A

1. 27 2. 42 3. 4 4. 11 5. 21 6. 21 7. 92
8. 1 9. 50 10. 31 11. 42 12. 31 13. 3 14. 14

Activity B

1. 63 2. 48 3. 42 4. 30 5. 16

Activity C

- 2a. 14 < b. 36 6a. 10 > b. 6
3a. 20 < b. 32 7a. 40 > b. 16
4a. 0 < b. 27 8a. 18 < b. 48
5a. 14 > b. 6

T_{2b}

In this lesson the pupils will practice using brackets when calculating answers. The pupils will look at more complex examples and work with larger numbers.

Write this example on the board.

$$16 + 8 \div 2 + 1$$

Ask the pupils in which order this should be done. Let them come up with this sequence

$$\begin{aligned} &= 16 + 4 + 1 && \text{Division first} \\ &= 21 && \text{Addition next} \end{aligned}$$

Now write an example which includes brackets.

$$\begin{aligned} 7 \times 8 - (16 - 6 \div 2) & \quad \text{Brackets first but in the brackets division first. There is a mix of division and} \\ & = 7 \times 8 - (16 - 3) \quad \text{subtraction, so BODMAS applies we do the subtraction in the brackets next.} \\ & = 7 \times 8 - 13 && \text{Multiplication next} \\ & = 56 - 13 && \text{Subtraction last} \\ & = \mathbf{43} \end{aligned}$$

Work through some more examples with the class until all the pupils are applying the BODMAS rule confidently.

Here are some examples to use.

- a. $14 \div 7 + (21 - 18 \div 3) = \mathbf{17}$
b. $15 \times 4 - (10 + 9 \times 4) = \mathbf{14}$
c. $(18 - 44 \div 4) + (3 \times 6 - 9) = \mathbf{16}$

Unit 12: Number

C2b

Put the pupils in pairs and tell them to write their own number sentences. Tell them that each number sentence must include at least three different operations and one of those operations must be in brackets.

Tell them to write three number sentences.

Ask them to exchange their examples with another pair and then work together to check and talk through the order of operations and agree on an answer.

Ask the pupils to complete the activity in the Pupil's Resource Book on pages 21 and 22.

Answers

Activity A

- 1 a. 4
b. 13
c. 8
d. 19
e. 1
- 2 a. 2
b. 31
c. 5
d. 21
e. 23

Activity B

- 1 a. 80
b. 22
c. 24
d. 8
e. 15
- 2 a. $(15 + 25) \times 2 - 15 = 65$
b. $20 \div 2 - 36 \div 4 = 1$
c. $(24 \div 4) + (24 \div 6) = 10$
d. $(13 + 3) \div (42 \div 21) = 8$
e. $(21 - 17) \times (32 - 12) \div (9 + 7) = 5$

Activity C

- 1 a. 260
b. 200
c. 13
d. 75
e. 14
2. These answers will need to be marked individually.



Can all the pupils use brackets, +, -, x and \div in the correct order when they appear in the same sum?

Support Activities

Discussion

In order to work through the calculation of mixed operations accurately, the pupils must understand and be able to use all four operations effectively. This is the first thing to check if they are not able to work out the correct answers. Can the pupil divide, multiply, subtract and add?

If not, you need to work on tables and number bonds before doing more work on mixed operations.

Spend some time working with pupils who need support in small groups. Let them talk through some examples so you can identify what their actual problems are and how you can help them. Talking through procedures is a very good way for pupils to gain confidence in using and applying different mathematical skills.

You could give pupils more examples to work through.

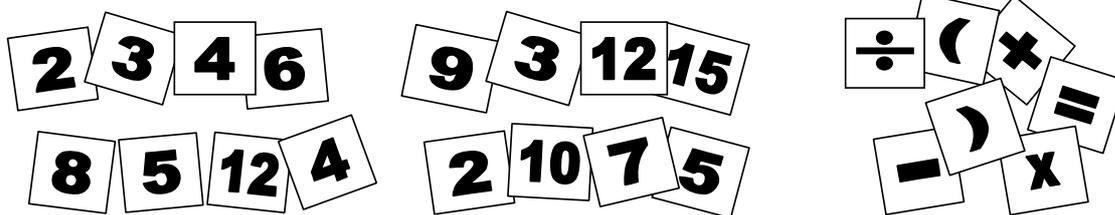
Playing the Four Operations Memory Game again will give pupils more useful practice.

Extension Activities

Writing Number Sentences

A good way for pupils to use their mathematical skills is for them to write their own number sentences. You could prepare sets of cards. Tell the pupils to take a set of 4 number cards and use them to make as many number sentences as they can. They should use brackets as well as addition, subtraction, multiplication and division. Provide plenty of these symbols on cards too. They must use all four numbers in each number sentence.

Here are examples of sets of numbers to use.



You will be able to think of other sets to make. Tell the pupils the answer does not have to be in the set.

Pupils could work in pairs and check each others' answers.

Using Clues

Give the pupils a set of numbers e.g. 2 3 4 6

Ask them to use these numbers in these number sentences. The answers are given and some signs are given as clues. They can only use each number once in each sentence.

Possible Answers

- | | |
|---|------------------------------|
| a. $15 = \square + \square + \square + \square$ | $15 = 2 + 3 + 4 + 6$ |
| b. $17 = \square \square \square \times \square$ | $17 = 6 + 3 + 4 \times 2$ |
| c. $10 = \square \square \square \square$ | $10 = 6 \div 3 + 2 \times 4$ |
| d. $26 = (\square \square) \times \square \square$ | $26 = (2 + 3) \times 4 + 6$ |
| e. $0 = \square + (\square \div \square) - \square$ | $0 = 2 + (6 \div 3) - 4$ |
| f. $10 = \square (\square \div \square) + \square$ | $10 = 3 + (6 \div 2) + 4$ |

Unit 12: Number

Check Up Page: Answers

- A.**
- | | | | |
|----|----|-----|----|
| 1. | 10 | 6. | 14 |
| 2. | 9 | 7. | 23 |
| 3. | 9 | 8. | 4 |
| 4. | 10 | 9. | 21 |
| 5. | 21 | 10. | 8 |

- B.**
- | | | | |
|----|----|-----|----|
| 1. | 11 | 6. | 26 |
| 2. | 13 | 7. | 15 |
| 3. | 3 | 8. | 16 |
| 4. | 10 | 9. | 3 |
| 5. | 7 | 10. | 28 |

- C.**
- | | | | |
|----|----|-----|----|
| 1. | 28 | 7. | 24 |
| 2. | 16 | 8. | 16 |
| 3. | 3 | 9. | 3 |
| 4. | 8 | 10. | 50 |
| 5. | 60 | 11. | 13 |
| 6. | 42 | 12. | 12 |

Aim:

To extend and develop the pupils knowledge and understanding of angles by classifying them and measuring them using a protractor.

Sequence of objectives: To

1. introduce degrees as the standard unit of measurement for angles.
2. use a protractor to measure angles.
3. classify angles: acute, obtuse, reflex, etc.

Rationale:

In this topic pupils reinforce and extend their understanding of angles. The pupils are introduced to degrees as the standard units in which angles are measured. They will use practical activities to familiarise themselves with measuring and drawing angles to construct a variety of shapes. By the end of the unit the pupils will be familiar with the appropriate terminology used to describe angles of varying size. An ability to draw and measure angles, acts as a foundation for pupils to take forward activities such as construction, building and sewing.

T_{1a}**Materials**

piece of string about 4m long, cardboard shape templates

In this lesson pupils will revise the work they did on angles in Standard 4. You will also teach them how to label and name angles in diagrams.

Begin the lesson by asking the pupils to look around their classroom and find some angles. Build up a list on the board with the class.

Your list could include things like:

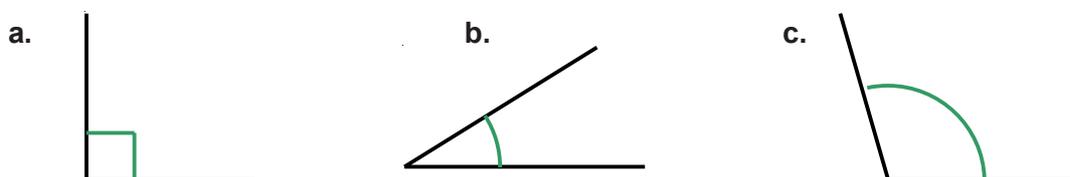
- corner of an exercise book
- place where the wall meets the roof
- place where the table leg is attached to the top
- pitch of the class roof
- where the shutter meets the window

You will be able to find many more.

Ask the pupils to describe these angles to reinforce the vocabulary they already know. They should be able to identify right angles as well as angles which are bigger than a right angle and angles which are smaller than a right angle.

Take a long piece of string and ask three pupils to come out to the front of the class. Ask two pupils to hold the string at each end and one to hold the string in the middle. Tell them to stand so that their string makes a right angle. Now let them make an angle which is bigger than a right angle and then one which is smaller than a right angle.

Now draw some angles on the board and ask the pupils to tell you which is a right angle (**a**), which is bigger than a right angle (**c**) and which is smaller than a right angle (**b**).



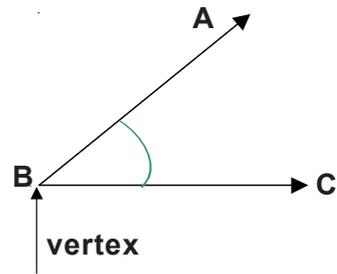
Unit 13: Shape

Now ask the pupils to explain in their own words what an angle is. They should be able to tell you that it is the **amount of turn between two lines which have a common point**.

Explain that the two lines are sometimes called **rays** or **arms** and the point where they meet is the **vertex**.

There are three main ways of naming the angle drawn:

1. $\angle ABC$ or $\angle CBA$
2. ABC or CBA
3. $\angle B$

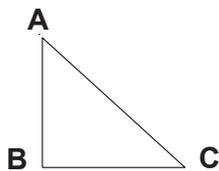


Tell the pupils that the vertex is always the middle letter when using method 1 or 2 and method 3 is only used when there is no possibility of confusion.

Copy the drawings a, b and c from the last page onto the board. Ask the pupils to notice how the angles are marked. Angles b and c are marked with an **arc**. Angle a is marked with a **square corner**. Tell the pupils that only right angles are marked with square corners all other angles are shown by an arc.

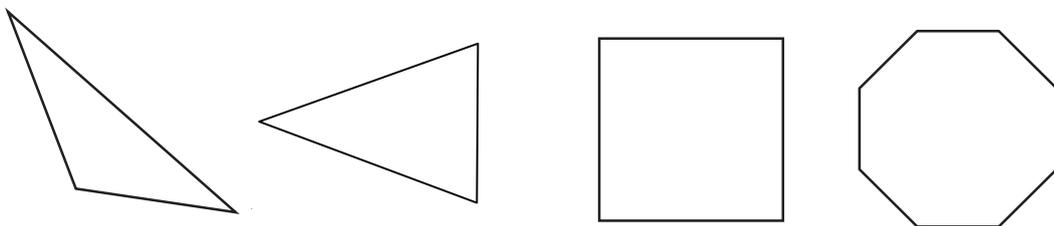


Before the lesson, prepare some cardboard shapes which the pupils can use as templates. Let the pupils work in pairs. Tell them to draw round a shape. Tell them to label each vertex on the shape. Then tell them to identify each angle and next to it write either right angle, more than a right angle or less than a right angle. You could do one example on the board.



- $\angle ABC$ is the right angle
- $\angle BAC$ is less than a right angle
- $\angle ACB$ is less than a right angle

Let the pupils complete this activity in their exercise books. Here are some shapes you could use. Move around the class and check that the pupils understand how to name the angles.



Topic 14: Angles

T1b

Materials

Clock face, rulers

In this lesson the pupils will be introduced to the units of measurement for angles.

Explain that angles are measured in units called **degrees**. Ask the pupils if they can think of other units of measurement and what they measure. They should be able to come up with:

- mass is measured in tonnes, kilograms and grams
- capacity is measured in litres and millilitres
- length is measured in kilometres, metres and millimetres
- area is measured in hectares, square metres and square centimetres
- volume is measured in cubic centimetres and cubic metres
- time is measured in days, hours, minutes and seconds

Show the pupils that the symbol for degrees is $^{\circ}$.

Explain to the pupils that a right angle is 90° . You could use a clock face to show 90° . Put both hands on 12. Move one hand to 3. Ask the pupils what the clock hand has turned through. (**one right angle**) Tell them it has turned through 90° .

				
No angle	90° turn. The rays or hands have turned through one quarter of a revolution	Half a revolution. This is a straight angle of 180° .	Three quarters of a revolution. The angle turned is 270° .	The hand or ray has turned through a whole revolution . It has turned through an angle of 360° .

Go through a half turn, a three quarter turn and a whole turn. Do this step by step and let the pupils work out the angle which the clock hands or rays have turned through. Remind them that the point where the **rays** meet is called the **vertex**.

Introduce the correct mathematical language. When the rays have turned through **180°** a **straight angle** is formed. When the rays have turned all the way round this is called a **revolution**. The pupils should be able to work out that a **revolution is 360°** .

Unit 13: Shape

C_{1b}

Put the pupils into small groups. Let them talk about everyday objects which turn or move through different angles. Tell them to build up a list together as a group. You could start off their list by giving an example and writing it on the board. Here are some examples. You will be able to think of some more.

1. door opening – moves up to half turn – moves from 0° to 180°
2. key in a lock – moves up to a complete revolution – 0° to 360°
3. screw top bottle – more than one whole turn – over 360°
4. shutter on a window – between 0° to 90°
5. louver window – 0° to 90°
6. opening a book – up to a straight angle - 0° to 180°
7. scissors – up to 90°
8. tin opener – some use more than one whole turn – over 360°

Bring the class together and build up a list on the board. Make sure that all groups are involved and give suggestions.

Ask the pupils to complete the activity in the Pupil's Resource Book on pages 24 and 25.

Answers

Activity A

1.b 2.a 3.d 4.a 5.a 6.e

Activity B

1. Some of these answers should be exact. On others, allow the pupils 5° each way. These have been indicated in the answers below.
 - a. 90°
 - b. between 50° and 60°
 - c. 180°
 - d. between 105° and 115°
 - e. between 25° and 35°
 - f. between 225° and 335°
 - g. 270°
 - h. between 185° and 195°
 - i. between 340° and 350°
 - j. 180°
2. and 3. You will need to check all the pupils' angles and mark them individually.



Do all the pupils understand the use of degrees as the standard unit of measurement for angles?

T_{2a}

Materials

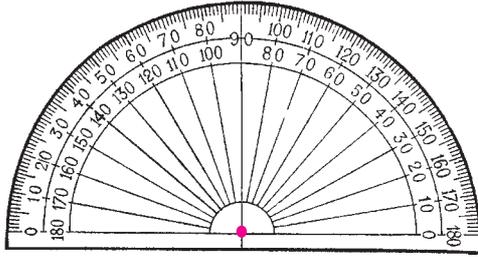
board protractor
pupils' protractors

In this lesson pupils will be introduced to using a protractor to measure angles.

Give out your protractors. Ask the pupils to describe to you what they think this instrument is, what it measures and how it could be used.

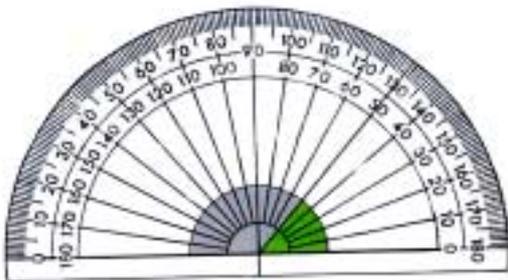
Explain that a protractor is an instrument used to accurately measure the size of an angle. Most protractors have 2 different sets of angle readings on them – a clockwise reading and an anticlockwise reading. The readings go from 0° to 180° both ways. Point out the centre point on the protractor.

Topic 14: Angles



Explain to the pupils that to measure an angle the pupils must follow three steps. If you have board protractor use this to demonstrate these steps on the board. Draw an angle on the board.

1. Place the centre of the protractor on the vertex of the angle.
2. Make sure the base line is exactly on top of one of the rays or arms of the angle.
3. Read the angle size where the second ray cuts the protractor.



The green angle measures 50° .
The grey angle measures 130°

Go through this procedure again on the board.

Ask some pupils to come to the board and measure angles. Then ask pupils to draw an angle in their exercise books and practice following the three steps to measure it.

C2a

The activities in the Pupil's Resource Book on pages 25 and 26 give pupils more practice measuring angles. Let the pupils work in pairs or small groups. Ideally every pupil should have a protractor. You will have to arrange the pupils according to how many protractors are available.

As the pupils are working through the activities go around the class and make sure all the pupils are using the protractor correctly. Make sure they are reading the scale correctly too. All pupils need to have mastered this skill before they progress to further activities.

Answers

Activity A

- | | | | |
|---|--|--|--|
| 1.a green 60°
shaded 120° | b. green 20°
shaded 160° | c. green 80°
shaded 100° | d. green 30°
shaded 150° |
| e. green 120°
shaded 60° | f. green 100°
shaded 80° | g. green 120°
shaded 60° | h. green 70°
shaded 110° |

Activity B

- | | | | |
|----------------------|-----------------------|-----------------------|-----------------------|
| 1. 90° | 2. 50° | 3. 125° | 4. 40° |
| 5. 68° | 6. 130° | 7. 52° | 8. 150° |

Activity C

- | | | | |
|--|---|--|---|
| 1. 70° 55° 55° | 2. 114° 26° 40° | 3. 90° 41° 49° | 4. 66° 66° 48° |
| 5. 90° 30° 60° | 6. 132° 18° 30° | 7. 70° 70° 40° | 8. 116° 32° 32° |

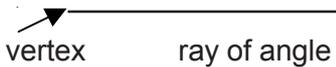
Unit 13: Shape

T_{2b}

Materials
protractors
rulers

In this lesson pupils will learn to use their protractors to draw angles. This is a very precise skill and pupils will need time to practice drawing angles correctly.

On the board draw a straight, horizontal line. Tell the pupils that this is one ray of your angle. Show the pupils where the vertex will be. In this case let it be on the left hand end of the line.



Now tell the pupils to place the base line of their protractor on the ray of the angle they have drawn. Tell them to put the centre point of the protractor exactly on end of their line where the vertex will be.

On the protractor, find the number of degrees of the angle you are going to draw. For example if you are drawing an angle of 40° find 0° on the right and move anticlockwise to find 40° . With a sharp pencil make a small dot to mark 40° . Then take the protractor away, and with a ruler, draw a line from the vertex to your dot. Make sure that the line goes through the two points exactly or the angle will not be correct.

Demonstrate drawing another angle on the board. Then ask the pupils to find 45° on their protractor. Tell them that each small line between the tens on the protractor represents 1° and the longer line in the middle represents 5° . Draw a line of 45° on the board.

Show the pupils how to draw an angle with the **vertex on the right** hand side of the angle. To do this they have to use the clockwise scale which begins on at 0° on the left hand side of the protractor.

C_{2b}

The best way for the pupils to draw accurate angles is for them to have lots of practise. Make sure the pupils are using a sharp pencil. Tell the pupils to draw the following angles in their exercise books. Ask to draw an arc or a square corner and put in the measurement in degrees.

- a. 90° b. 45° c. 60° d. 30° e. 20° f. 55°

Let the pupils work in pairs. Tell them to measure each others' angles and see if they are correct. As they are doing this activity go round and check that everyone can do this correctly. Some pupils may need extra help here.

There are activities for more practice in the Pupil's Resource Book page on 27 and 28.

Answers

Activity A

Check each pupil's work individually.

Activity B

1. Check each pupil's work individually.
2. The angles drawn should be the size below. Check each pupil's work individually.
a. 55° b. 30° c. 68° d. 50°

Activity C

1. Mark each pupil's work individually.



Can all the pupils use a protractor to measure and draw angles?

Topic 14: Angles

T_{3a}

Materials

Angles poster
Angles Matching
Game cards.

In this lesson pupils are going to look at how angles are classified. You will need the Nguzu Nguzu Angles Poster.

Explain to the pupils that angles can be arranged into six major types or groups.

Show the class the Angles Poster or build up the information on the board as you talk about the different angles

Tell the pupils that they should be able to classify an angle without measuring it accurately with a protractor. They should be able to estimate its size.

Diagram	Type	Angle size
	Acute angle	Less than 90°
	Right angle	Exactly 90°
	Obtuse angle	Between 90° and 180°
	Straight angle	Exactly 180°
	Reflex angle	Between 180° and 360°
	Revolution	Exactly 360°

Draw an angle on the board.



Ask the pupils to estimate the size of the angle you have drawn. **(It is about 45°).** Ask them What kind of angle it is. How can it be classified?

This is an acute angle because it is less than 90° .

Draw other angles on the board and go through the chart. Make sure all the pupils become familiar with the new vocabulary.

C_{3a}

Prepare the Angles Matching Game cards before the lesson. The pupils will work in small groups of four or five. You will need a set of cards for each group. Here is an example of cards you could use. Cut out the cards to make a pack of 18 for each group. This example shows two sets.

acute angle	45°	acute angle	15°	acute angle	80°
right angle	90°	reflex angle	320°	obtuse angle	100°
obtuse angle	120°	obtuse angle	95°	revolution	360°
straight angle	180°	obtuse angle	165°	straight angle	180°
reflex angle	200°	reflex angle	185°	reflex angle	350°
revolution	360°	acute angle	60°	obtuse angle	175°

Unit 13: Shape

Tell the pupils that there are two sizes of card. They must shuffle the pack and spread them out face down on a flat surface. Each pupil must take turns to turn over a small card, which gives an angle measurement in degrees, and a large card which gives one of the angle types. If the two match, the pupil wins that pair and has another turn. If they do not match the cards must be turned over again and put back in the same place. The winner is the one with the most pairs when all the cards have been picked up.

When the pupils are familiar with the different types of angles tell them to complete the activities in the Pupil's Resource Book on pages 28, 29 and 30.

Answers

Activity A

1. 90
2. 90
3. 90 180
4. 2 180
5. 2 4
180 360
6. 4 360

Activity B

1. 40° acute angle
2. 105° obtuse angle
3. 180° straight angle
4. 160° obtuse angle
5. 145° obtuse angle
6. 20° acute angle
7. 90° right angle
8. 360° revolution
9. 242° reflex angle

Activity C

1. $\angle BCA = 135^\circ =$ obtuse angle $\angle ACD = 45^\circ =$ acute angle
2. $\angle OMN = 90^\circ =$ right angle $\angle MNO = 37^\circ =$ acute angle $\angle NOP = 37^\circ =$ acute angle
3. $\angle SRT = 42^\circ =$ acute angle $\angle RSX = 135^\circ =$ obtuse angle $\angle SXA = 128^\circ =$ obtuse angle
 $\angle RTV = 105^\circ =$ obtuse angle $\angle TVA = 312^\circ =$ reflex angle
4. $\angle YTR = 150^\circ =$ obtuse angle $\angle TUR = 90^\circ =$ right angle $\angle TWR = 96^\circ =$ obtuse angle
 $\angle TRW = 25^\circ =$ acute angle

Remember that there are different ways of naming these angles which are also correct.

5 and 6. Mark each pupil's answers individually.

T3b

Materials

Angles Bingo Cards
stones or counters

In this lesson pupils will do practical activities to reinforce the different types of angles that were introduced in the last lesson. Ask the pupils to recall the names of the different types of angles without looking back in their books. Go through all the types revising the names as well as the size of each angle.

Ask the pupils to stand up and use their arms to make these angles

- a right angle
- an acute angle
- an obtuse angle
- a straight angle
- a reflex angle

Check the position the pupils put their arms in to make sure they understand the size of each. You could ask for a volunteer to come to the front of the class and demonstrate each one.

C3b

Play Angles Bingo

Prepare the game bingo cards before the lesson, or ask pupils to make their own bingo cards. If you paste these onto strong cardboard and store them carefully you can use them again and again. This is what a card should look like.

acute angle	right angle	obtuse angle
acute angle	obtuse angle	revolution
reflex angle	straight angle	reflex angle

Tell the pupils that each Bingo card must have the following once in any space:

- acute angle
- right angle
- obtuse angle
- revolution
- reflex angle
- straight angle

This will fill 6 out of their 9 spaces. Now tell them that they can choose any three to fill the empty spaces.

Play the game by calling out an angle size. Write down the angle you call since you will need to check the pupils answers. The pupils must identify the type of angle this is and cover the right space on their Bingo card with a counter or a stone. When someone has a complete line they call out **Bingo**. Check that their answers are correct before declaring them a winner and going on to another game.

Let the pupils complete the activities in the Pupil's Resource Book on pages 30 and 31.

Answers

Activity A

1. right angle
2. straight angle
3. right angle or obtuse angle
4. obtuse angle
5. obtuse angle or straight angle
6. obtuse angle or straight angle
7. revolution
8. obtuse angle
9. reflex angle
10. straight angle

Activity B

1. acute angle
2. acute angle
3. depends on the type of tap
4. depends on the type of door
5. acute angle or obtuse angle
6. depends on the switch
7. obtuse angle
8. These answers will vary - discuss each pupil's work individually

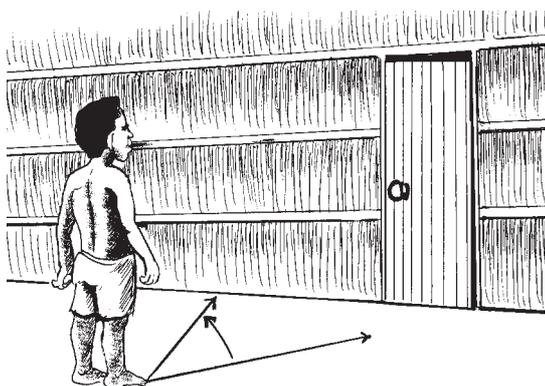
Unit 13: Shape

Support Activities

Practical Activities

Give the pupils extra practise measuring and estimating angles by letting them work in pairs on practical activities. They could give each other instructions such as:

- Stand facing the door of your classroom. Turn anticlockwise (to your left) through 40° .



The pupils then draw lines with chalk on the floor (or on some paper on the floor) to show the angle formed. They measure this angle to see how close they were. They can then try other angles.

Pupils could also practice drawing accurate angles between 10° and 170° using a protractor. The pupils again can check each others work. They should be encouraged to not only draw an accurate angle but also label it, mark it with an arc or square corner as appropriate and to classify it.

Extension Activities

Visualising Angles

Pupils could work with a partner outside. In turn they could give each other instructions like these:

- Tell your partner which object to face. Then tell them to close their eyes.
- Give an angle measurement. Your partner must turn through that angle.
- Ask your partner what they think will be looking at when they open their eyes.

This activity relies on the accuracy of both pupils. They can vary and develop the activity by doing it in different places and changing roles.

Angles in the Environment

Now pupils know how to classify angles they could analyse the angles in their environment. Tell the pupils to work in pairs again. Let them investigate the angles they find in a certain area e.g. in the school grounds the classroom, the school hall or their own house.

Let them write a report to present the information they have found out, their report could include diagrams too. The rarest angle found and so on.

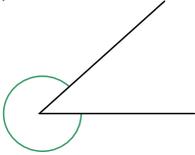
Check Up Page: Answers

1. degrees 4. ° or degrees.
2. degree 5. protractor
3. 2 6. 90

7. a. 90° b. 50° c. 67° d. 20°
e. 140° f. 33° g. 180° h. 123°

8. a. right angle b. acute angle c. acute angle d. acute angle
e. obtuse angle f. acute angle g. straight angle h. obtuse angle

9.



10. a. 180° - straight angle d. 90° - right angle
b. 360° - revolution e. 225° - reflex angle
c. 125° - obtuse angle f. 45° - acute angle



Do all the pupils know the different types of angles and can they identify and classify them correctly?

Aim:

To extend pupils understanding of graphs by introducing line graphs. For pupils to use line graphs to display a variety of data and to extract and interpret data from a line graph.

Sequence of objectives: To

1. revise reading and interpreting bar graphs.
2. read and interpret line graphs.
3. construct line graphs from tables of information.
4. construct line graphs using co-ordinates.

Rationale:

This unit extends pupils knowledge of graphs by introducing line graphs. It looks at data, scales and how to interpret a line graph. All these skills will help pupils when they come across graphs in newspapers, magazines or reports, and in other areas of the school curriculum.

T_{1a}

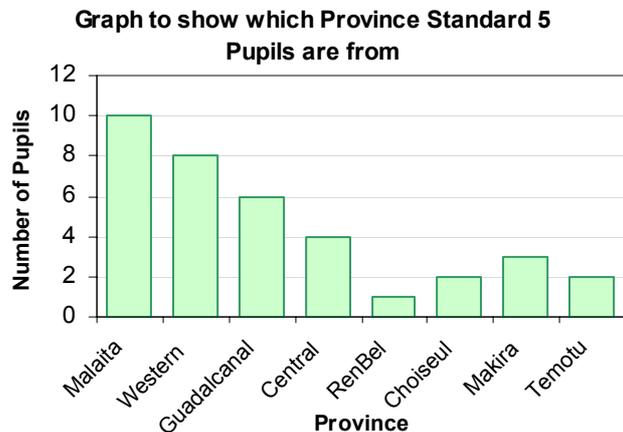
Materials
Nguzu Nguzu
Graphs Poster

Revise simple bar graphs from Standard 4. You could do this by conducting a class survey of the village or area. Look at where your pupils come from. Make a simple tally chart on the blackboard to show the information or data. Go over how a tally is recorded IIII.

Explain that the tally represents the number of pupils from each province. Explain that each stroke counts as one pupil.

Put the information from your tally chart onto a vertical bar graph as shown below.

Province	Tally	Total
Malaita	IIII IIII	10
Western	IIII IIII	8
Guadalcanal	IIII I	6
Central	IIII	4
Renbel	I	1
Choiseul	II	2
Makira	III	3
Temotu	II	2



Ask questions about the graph. Here are some you could use.

- a. Which province has the highest number of pupils in the class?
- b. Which province has the least number of pupils in the class?
- c. Which provinces have the same number of pupils in the class?
- d. How many pupils are from Renbel?
- e. How many pupils are from Malaita and Choiseul?
- f. How many pupils are there altogether in the class?
Can you work this out from the graph?
How can you do this?
- g. How many more people are there from Western Province than from Makira?

Topic 16: Line Graphs

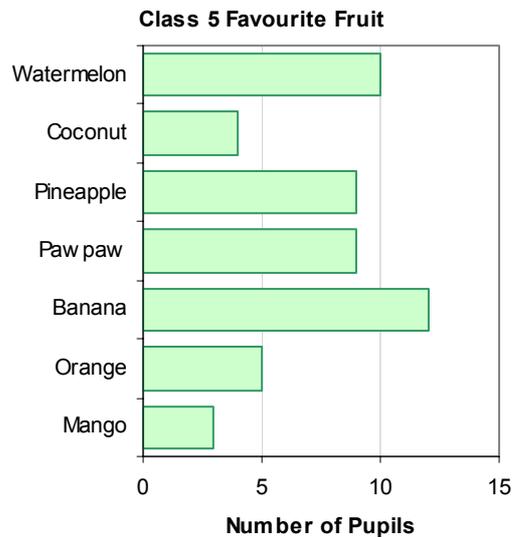
Here is another example to use. This time, show the pupils how to draw a horizontal bar graph. Work with the class to collect information by asking them to put their hands up for their favourite fruit. Use the data to give the pupils practice in constructing a tally table and a horizontal bar graph.

Make a tally table like this on the board.

Ask the pupils to work individually using the data collected to draw a horizontal bar graph.

Fruits	Tally	Total
Mango	III	3
Orange	HHH	5
Banana	HHH HHH II	12
Pawpaw	HHH IIII	9
Pineapple	HHH IIII	9
Coconut	IIII	4
Water melon	HHH HHH	10

Tally 1



Remind the pupils that we have to label the axes and give the graph a title.

A Nguzu Nguzu poster is provided to show the difference between bar graphs and line graphs. You could display this for the class and discuss the sample graphs on it too.

Ask pupils to form questions about the data present in the graphs and ask each other.

C1a

This is a group activity. Divide the pupils in the class into groups of five or six.

Ask them to conduct a survey about animals at their home.

Each group leader then gives their data to the other groups. This is to make sure that each group has the data for the whole class.

Ask the pupils to work on their own and draw a vertical or horizontal bar graph using the data collected. They must first draw out a tally table.

The table could look like this:

Animal	Tally	Total
Pigs	HHH HHH HHH	15
Cows	HHH	5
Dogs	HHH III	8
Cats	II	2
Horses	HHH	5

Unit 14: Graphs

After each pupil has drawn their bar graph tell the groups to think of other things they could collect data for and get them to research and draw a different graph.

They could collect data about their favourite sport or hobby for example.

Let them record their information using a tally chart.

Ask each group to draw a bar graph to display their data on chart paper. You could display the groups' graphs on the wall.

Ask the pupils to write two or three sentences about their graphs in their exercise books.

What have they found out?

Do their graphs show anything interesting or surprising?

Can they think of any reasons for the way the graphs have turned out?

T1b

Conduct a survey in the class to find out pupil's favourite subjects.

Make a list of all the different subjects taught at school on the board and ask the pupils to choose their favourite subject.

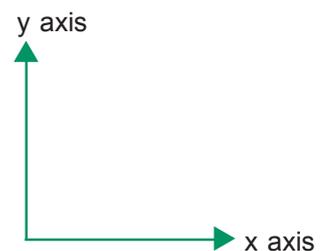
Tell the class they can only choose one subject. Record their choices on a tally table and work out the total for each subject.

Subject	Number of Pupils	Total
Mathematics		
Science		
Health		
English		

Work with the pupils to construct a bar graph on the board using the information collected from the survey.

Explain to the pupils that a graph is a method of representing information. The use of a graph to get information is called **interpretation**.

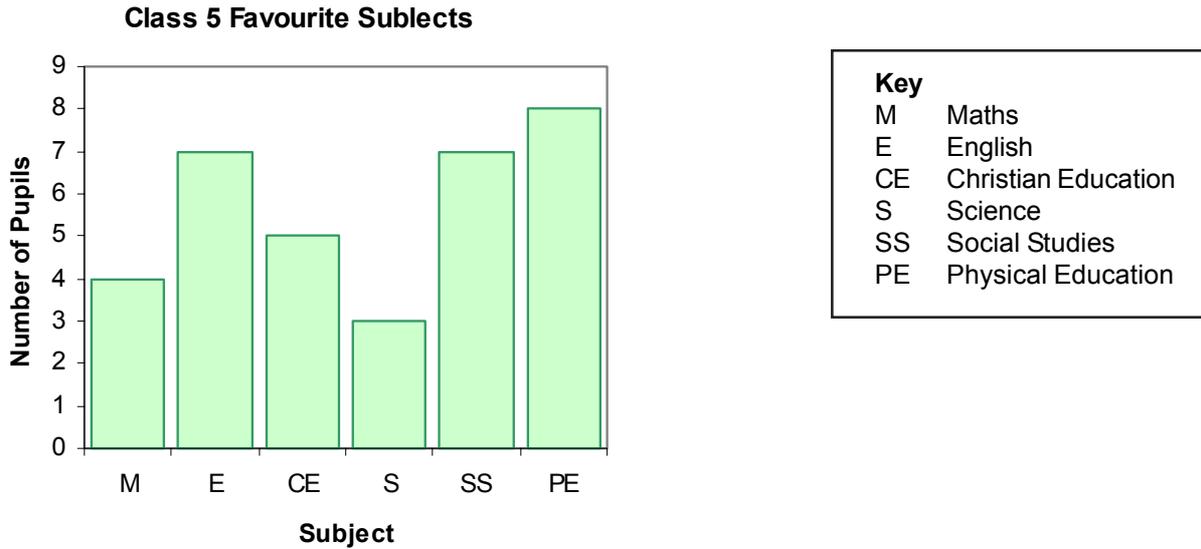
Teach that the graph is constructed on a vertical and horizontal axis. These axes are called the x axis (horizontal) and the y axis (vertical).



Remind the pupils that when they draw a graph:

- It must always have a clear **title**.
- Each axis must be **labelled** to show what category or quantity it represents.
- It may also have a **key** to explain the labels.

Topic 16: Line Graphs

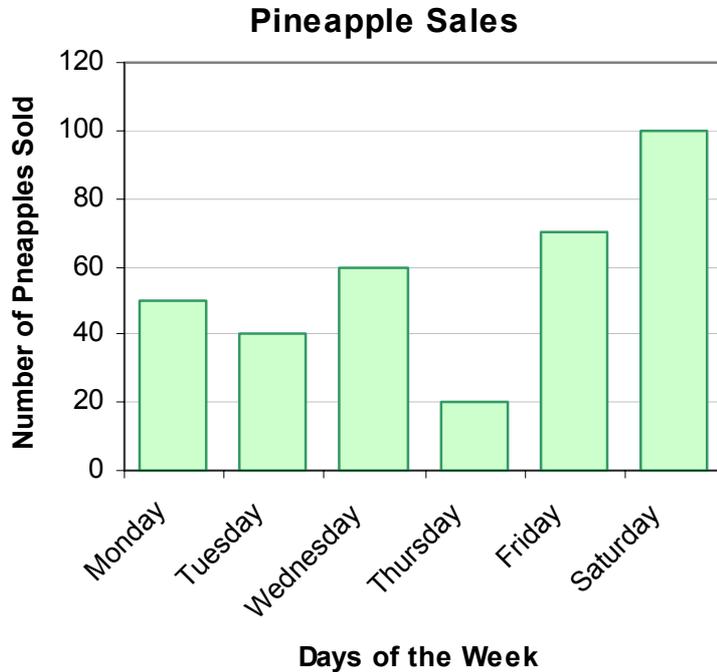


T_{1c}

Give the pupils practise at interpreting bar graphs.

Draw the pineapple sales graph below on the board or on a chart.

This example shows how many pineapples were sold by a West Kwaio farmer.



Talk about graphs as a method of showing information. Remind the pupils that, as well as **reading** information from a graph, we can also **interpret** information.

Ask some questions to help the pupils interpret the graph. Such as:

- On which day did the farmer sell most pineapples? (**Saturday**)
- When did he sell the least number of pineapples? (**Thursday**)
- How many pineapples did he sell on Thursday? (**20**)

Unit 14: Graphs

- d. What was the total number of pineapples he sold the whole week? **(340)**
- e. Why do you think the farmer sold most pineapples on Saturday? **(50)**

Questions **a - c** ask pupils to **read** information direct from the graph. Question **d** asks them to **use** information in the graph to **calculate** a total and question **e** asks them to **interpret** the graph by applying their knowledge of the market to the information it contains.



Tell the pupils to turn to pages 34 and 35 of the Pupil's Resource Book.

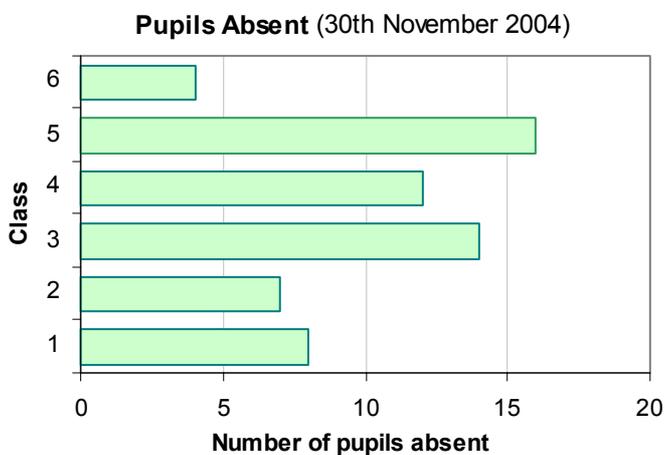
Ask the pupils work through the activities. Read through the instructions for each activity together before they begin.

Answers

Activity A

1. 25 pupils walked to school.
2. 5 pupils live at the school.
3. 10 (35 travelled by bus and 25 walked).
4. The total number of pupils in the survey was 95.
5. Bus.

Activity B



Activity C

1. 2,200 tonnes
2. 300 tonnes (900 tonnes of copra – 600 tonnes of cocoa).
3. 300 tonnes
4. 1,800 tonnes
5. 300 tonnes
6. 4,000 tonnes



Can all the pupils draw and interpret bar graphs?

Topic 16: Line Graphs

T2a

Materials

Nguzu Line Graphs Poster
Graphs drawn on chart paper
Pineapple Sales Poster

In this activity pupils are introduced to a new type of graph called a line graph.

A line graph shows data in the form of a series of points plotted on the graph and joined by a line.

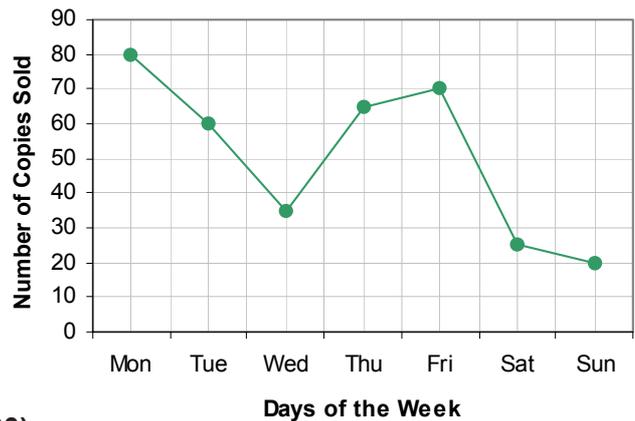
Use the example on the right to show the pupils how to interpret information from a line graph.

Explain that this is an example of a line graph, which is another way of representing data.

Ask the pupils to look at the graph and answer these questions.

- What does the graph show?
- What does each axis represent?
- How many magazines were sold on Monday? (**80**)
- How many magazines were sold altogether during the week? (**355**)
- On which day were fewest magazines sold? (**Sunday**)

Daily Magazine Sales



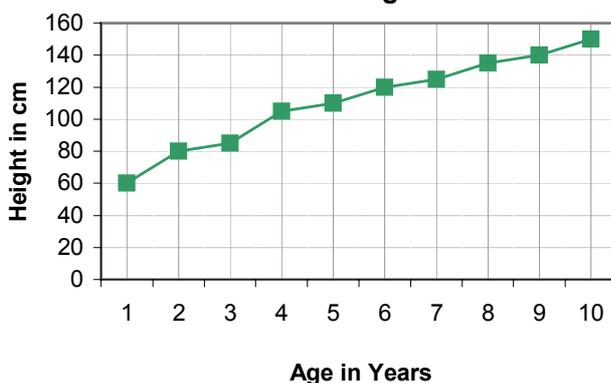
Discuss the differences between a bar graph and a line graph. Show the pupils the Pineapple Sales Poster again and look at how the same information is presented as a line graph. Ask them to tell you which is clearer.

C2a

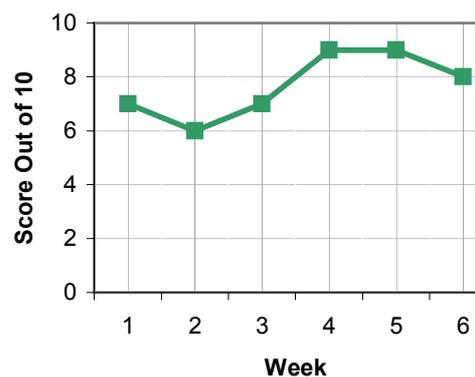
Use the line graphs provided on the Nguzu Nguzu poster or draw some of your own on chart paper.

You will need enough for each group of pupils to have one graph. Try to make some easy graphs and some more difficult ones so that you can group the children by ability.

Jonathan's Height

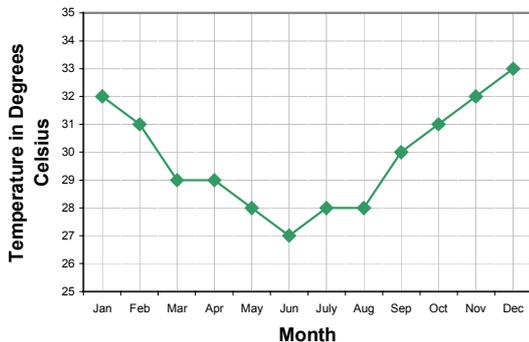


My Spelling Test Results

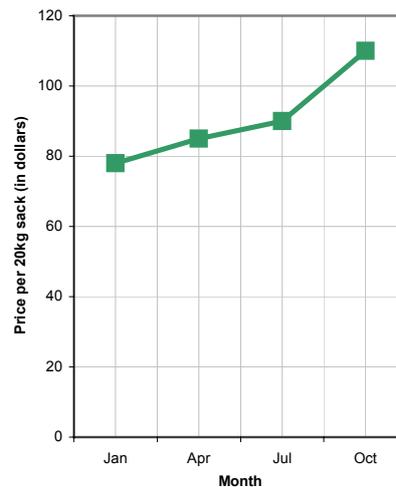


Unit 14: Graphs

Average Temperatures Lata Weather Station



Increase in the cost of rice



Give each group a different graph and ask them to look at it and discuss it in their group. They should talk about what the graph shows, identify the important features of the graph such as the title, how the axes are labelled, the scales and so on. Then ask them to note down some specific information shown in the graph and prepare a short presentation to explain their graph to the rest of the class.

Allow the each group to show and explain their graph to the rest of the class. Encourage the others to ask questions about the graph and help them to understand and interpret the information it shows.

When each groups has presented and discussed their graph, have the pupils complete the activities on pages 36 and 37 of the Pupil's Resource Book.

Answers

Activity A

1. The graph shows daytime temperatures for one week.
2. The y axis represents the temperature in degrees Celsius.
3. The lowest temperature was recorded on Monday.
4. The highest temperature recorded was 31°
5. The warmest days were Thursday and Sunday.

Activity B

1. 3,200g
2. 3.7 kilograms
3. No, the baby lost 200g in weight in the first week.
4. At 2 weeks the baby started to gain weight.
5. 600g
6. Check each pupil's work individually, they might come up with some of the following information: The baby gained weight most quickly between the fifth and the sixth week; or The baby was three and a half weeks old before got back to the weight at which it as born.

Activity C

1. 1,450
2. 7,700
3. Star 600, Voice 500.
4. 700
5. Friday
6. There are no papers printed on the weekend so those sold on Saturday were probably left over copies of the Friday edition and on Sunday there were none left. Also very few shops are open on Sunday to sell papers.

Topic 16: Line Graphs

T_{3a}

Materials
Chart paper and pens

In this activity pupils learn how to construct their own line graphs from given data.

Draw the table on the right on the board and explain that it shows how many sacks of copra a group of farmers produced in one year.

Tell the pupils that they are going to use the information to construct a line graph together and ask them to suggest their ideas for how to do this.

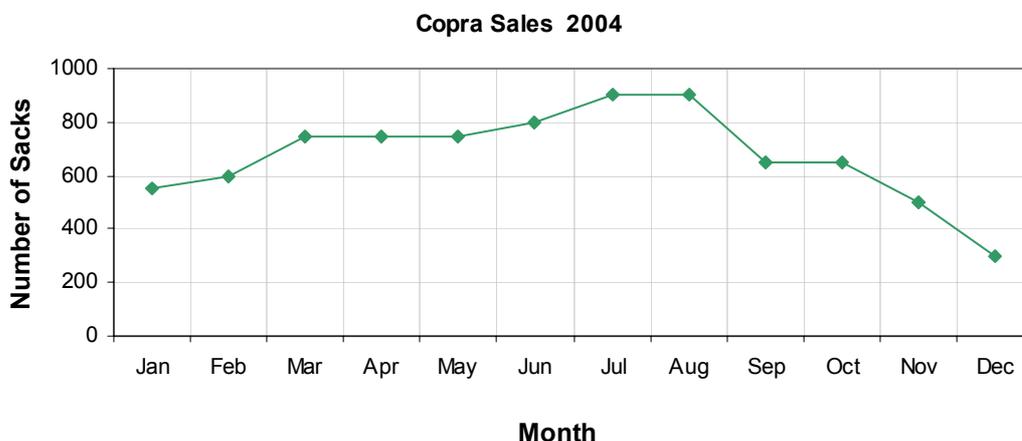
They should be able to tell you first that you need to draw two axes. Ask them how they think the axes should be labelled and add the labels they suggest. Talk through everything you do with the class and make sure that they know the importance of the following:

- a **clear title** which explains what the graph shows.
- **scales** which reflect the range of data to be displayed.
- clearly **labelled axes**.

Copra Sales (Sacks)	
Jan	550
Feb	600
Mar	750
Apr	750
May	750
Jun	800
Jul	900
Aug	900
Sep	650
Oct	650
Nov	500
Dec	300

Next ask the pupils to discuss how to plot the different points on the graph. Start with January and ask whether anyone can suggest where to plot the January figure (550 sacks).

Work through the whole table asking different pupils to come up and plot the points on the board. Finally ask one pupil to draw a line to link the points you have plotted. Your finished graph should look like the one below.



Discuss the finished graph with the class.

What does each of the horizontal gridlines represent? (**200 sacks**)

What does each vertical gridline represent? (**one month**)

What information can they read from the graph?

How did copra production vary over the year? When was most copra produced? When was least copra produced?

If you think it is necessary, work through another example on the board.

Unit 14: Graphs

C_{3a}

When they have understood how to draw a line graph, give them another table of similar data and have them work in groups to construct their own graph.

Copra Price 2004 (dollars)	
Jan	50
Feb	55
Mar	60
Apr	60
May	60
Jun	65
Jul	65
Aug	45
Sep	40
Oct	40
Nov	45
Dec	45

Ask the pupils to work in groups of three to construct a graph to show the price of copra per sack. Explain that this data is also for the year 2004 and therefore relates to the graph on the previous page.

Help the groups as they work and make sure they remember all the important points you have gone through together. Their finished graph might look like the one below.



After they have finished, bring the class back together and ask some questions to help them interpret the two graphs they have prepared in this lesson, such as:

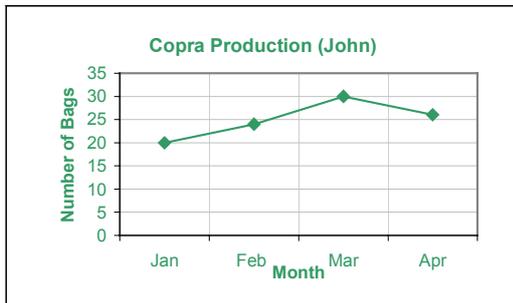
- How much money did the farmers make from copra in March? (**750 bags x \$60 per bag = \$45,000**)
 - When was the price of copra highest? (**June and July**)
 - What was the lowest price the farmers received per bag in this year? (**\$40**)
- ... and so on.

As an extension activity you might ask some pupils to interpret the graphs more carefully. For example you could ask them why they think copra production dropped in September (This question requires them to compare the two graphs and see that the price fell significantly in August). You could also ask them to do some more complex calculations, for example to work out in which month the farmers made the most money.

The pupils could also complete the activities on pages 37 and 38 of the Pupil's Resource Book. These give them more practice converting data tables into line graphs.

Topic 16: Line Graphs

Answers Activity A



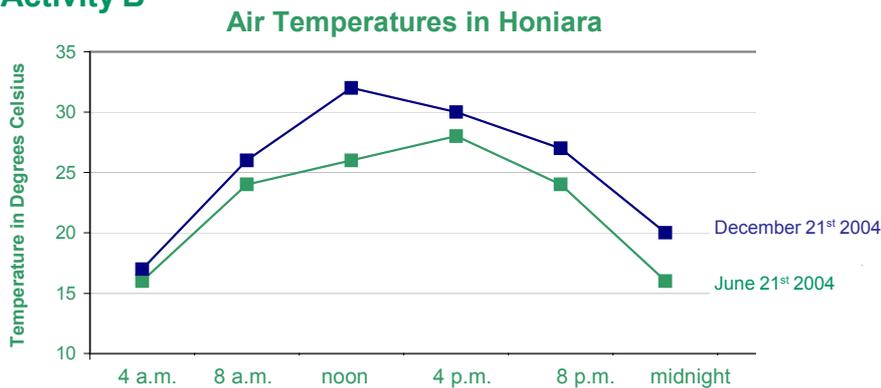
Sample sentences – check each pupil's work individually.

The first graph shows how many bags of copra John produced each month. He produced the most (30) in March and the least (20) in January.

The second graph shows that the price of copra was different in each month. It varied between \$50 and \$55 per bag.

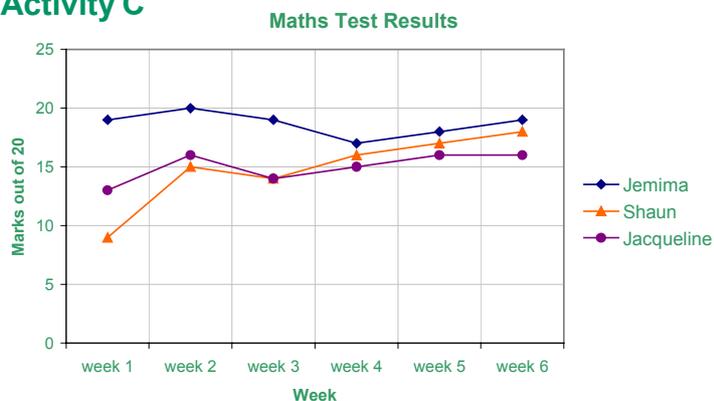
In March, John made the most money even though the price was lower, because he produced more bags of copra.

Activity B



- Highest – 12 noon 21st December 2004, lowest 4 a.m. 21st June 2004.
- 21st December.
- Noon.
- 21st June by 12°C. 21st December by 15°C.

Activity C



- Jemima
- Shaun's
- Week 2
- Jemima's
- Jacqueline

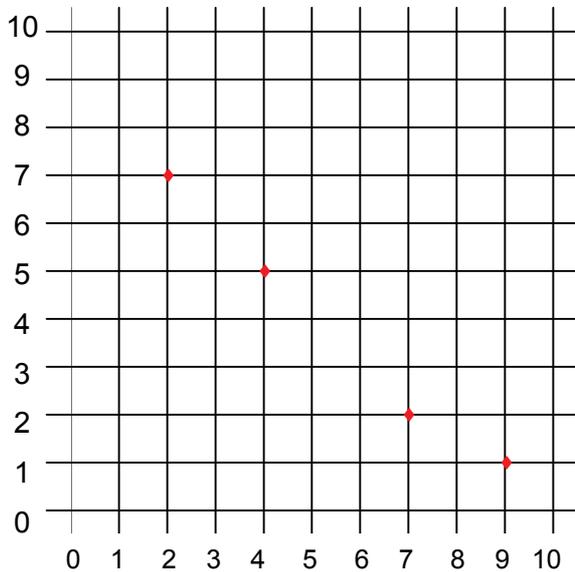


Can all the pupils construct line graphs from tables of information?

Unit 14: Graphs

T4a

In this activity pupil's revise how co-ordinates are used to plot points on a graph.



Draw a 10 x 10 grid on the board, label the x and y-axis with 0 and each grid line with numbers 1 – 10 as shown. Ask pupils to tell you how to identify specific points on the grid using **co-ordinates**.

Revise what they learned in Standard 4 as follows:

- **co-ordinates** are pairs of numbers or letters used to show the position of a point on a grid.
- the **first** coordinate refers to the **horizontal** position (x axis) and the **second** coordinate refers to the **vertical** position (y-axis).
- co-ordinates are written in brackets separated by a comma. For example: **(3,6)** **(A,6)**

Practice locating points on your grid by naming the co-ordinates and having pupils come to the board and circle the point named, as shown on the diagram, for example:

(2,7) (4,5) (7,2) (9,1).

Explain that co-ordinates refer to the **point of intersection** of two lines on the grid. This means **the point at which two lines cross**.

Ask pupils to come to the board and mark other points from given co-ordinates.

Also practice marking a point on the grid and asking pupils to tell you the co-ordinates.

Consolidate this revision by playing the game below.

C4a

Buried Treasure

This game gives the pupil's more practice using co-ordinates to plot points on a grid.

Draw a 10 x 10 grid on the board and draw an irregular shape to represent an island. Ask the pupils to copy your sketch and then choose **one** point on the grid on which to bury their 'treasure'. They should each mark their chosen spot on their graph with an X and should also write down the co-ordinates.

Then you call out a series of co-ordinates at random, marking them on the board with a cross as each one is called. Pupils have to mark off each co-ordinate called on their own sketch and the first person whose buried treasure is 'discovered' is the winner. They then take over calling out the co-ordinates and marking them on the board until someone else's treasure is discovered and so on until all the treasure has been found.

Topic 16: Line Graphs

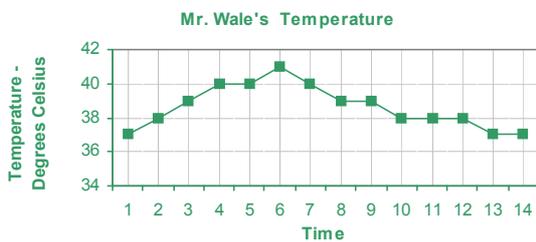
You could also have pupils play this game in small groups. They could make it more interesting by having different types of treasure buried in different places and each worth a different number of points, for example Gold 20 points, Silver 15 points, Diamonds 25 points and so on. The winner could then be the first to reach a given number of points (say 100). Allow the pupils to adapt the game and think up new ways to play.

Before moving on to the activities in the Pupil's Resource Book on pages 39 and 40. Explain that plotting points using co-ordinates is similar to the way in which points are plotted on line graphs. Talk through the activities to explain and demonstrate how this is done.

Have the pupils complete the activities. These give more practice plotting points on a graph using co-ordinates.

Answers

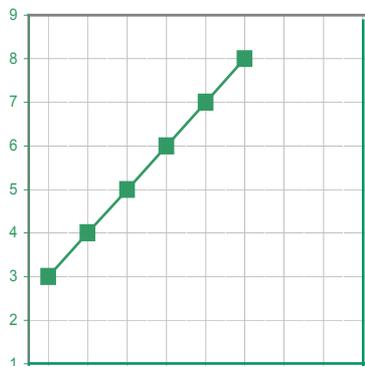
Activity A



1. Mr. Wale's temperature started to go down at 6 a.m.
2. His temperature returned to normal at 1 p.m. (1300 hours)

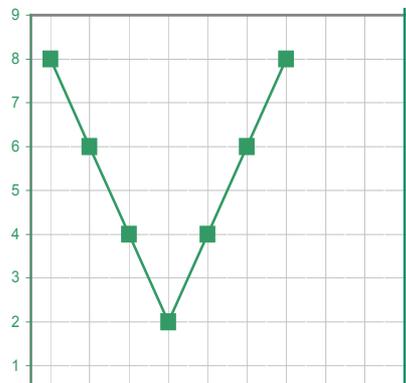
Activity B

1.



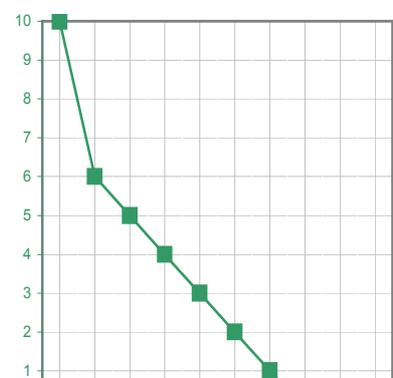
B. This graph shows a steady increase.

2.



C. This graph shows a gradual decrease to a low point in the middle, followed by a gradual increase.

3.

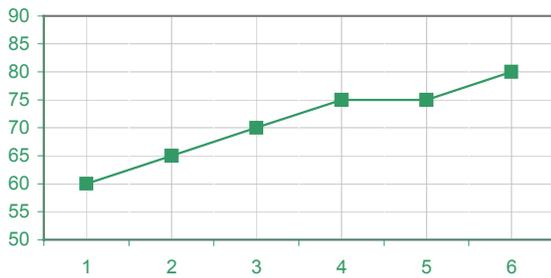


A. This graph shows a sudden decrease at first, followed by a more gentle decrease.

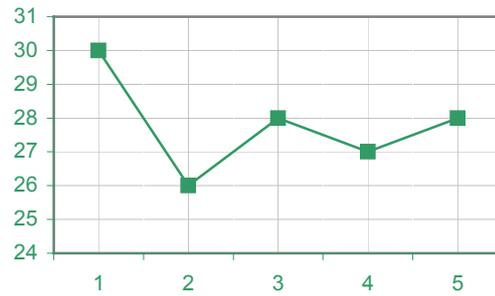
Unit 14: Graphs

Activity C

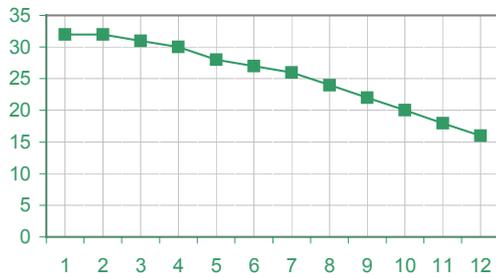
1. **B.** Increase in the price of rice over the first 6 months of the year.



3. **A.** Number of pupils attending school, Monday to Friday.



2. **C.** Air temperatures from 1.p.m. to midnight.



Can all the pupils construct line graphs using co-ordinates?

Support Activities

For pupils who are having difficulty reading information from line graphs, you will need to provide plenty of practice and work closely with them. Some of the following activities might be useful.

Constructing line graphs based on their own experiences.

For example, they could make line graphs to show how many pupils attend class each day for a week, adding new data and plotting a new point for each day.

They could draw a line graph to show how much money they spend on snacks each day, and so on.

If pupils are confident with using bar graphs, you could provide activities to help them **convert data from bar graphs to line graphs** to help them see the relationship between the data on each.

For example: Draw a bar graph to show how many bags of rice were used by the school each month. Then convert the graph from a bar graph to a line graph by plotting the points at the top of each column.

If pupils are struggling with the idea of a bar graph, take them back to making **picture graphs**, collecting their own data, using tally charts and presenting it in the form of a picture graph.

Display graphs on the classroom wall. Sometimes pupils find it difficult to remember the important points about constructing graphs. It can be helpful to display good examples of graphs on the wall of the classroom and refer to these often as pupils work on their own graphs. You could also work with a small group of pupils to **make a poster** to remind them of the important points such as giving the graph a title and labelling the axes as a support activity.

Extension Activities

Allow pupils who have a good understanding of line graphs to extend their skills by providing exploratory activities for them to work on, on their own

Research Projects

You could set them a project to find out some information from their family or community and present it in the form of a line graph. For example, they could research:

- cases of malaria recorded at the clinic for each month of the year;
- the amount of money raised by a local piggery project each month;
- the number of pupils passing the standard 6 exam from the school for the last 5 years;
- the number of canoes that pass the school at different times of the day;
- the number of customers at the local store at different times of the day;

... and so on.

Allow pupils to plan their research project themselves and decide the best way to collect and present their data.

Unit 14: Graphs

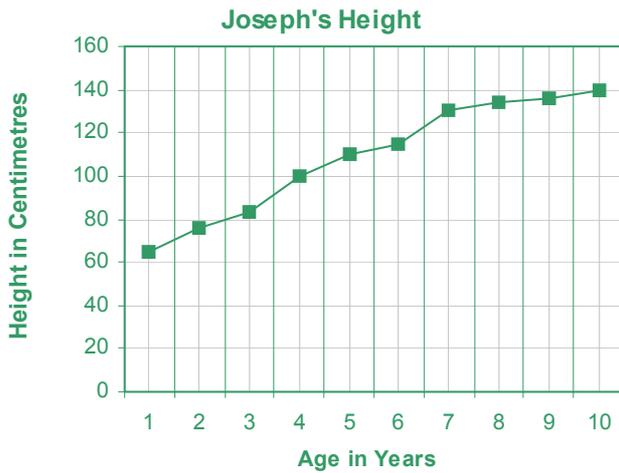
Check Up Page: Answers

1a. 230 1b. white 1c. 45 1d. 15 1e.

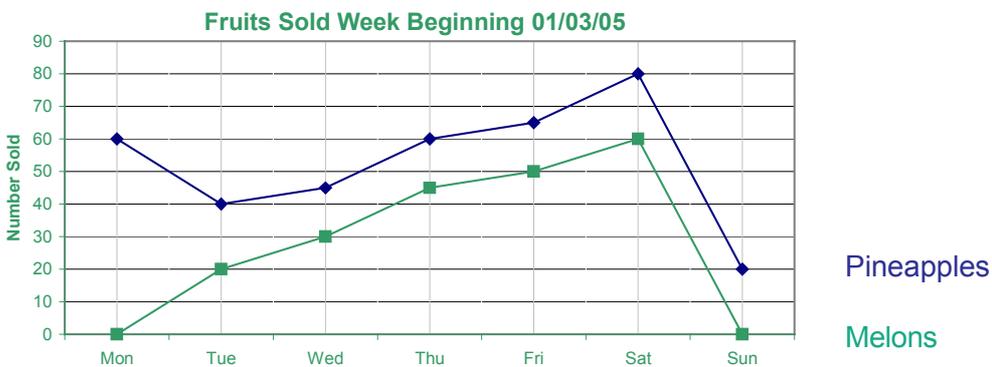
Standard 5 Traffic Survey					
Colour of car	green	blue	black	yellow	white
Number counted	20	35	45	50	80

- 2a. The graph shows the amount of rainfall in millimetres for each month of 2004 as recorded at Kira Kira Weather Station.
- b. The highest rainfall was in March and the lowest was in August
- c. 2,150mL
- d. May
- e. 830mL
- f. **Sample answer:** The rainfall was highest at the start of the year which the end at the end of the wet season. At that time there was as much as 350 ml of rainfall a month. The driest part of the year was between June and September when there was never more than 100 ml of rain per month.

3.



4.



Aim:

For the pupils to understand temperature and how it is measured and to learn to use a thermometer accurately.

Sequence of objectives: To

1. understand the use of degrees Celsius as a measure of temperature.
2. use a thermometer to measure and keep a record of air temperature.

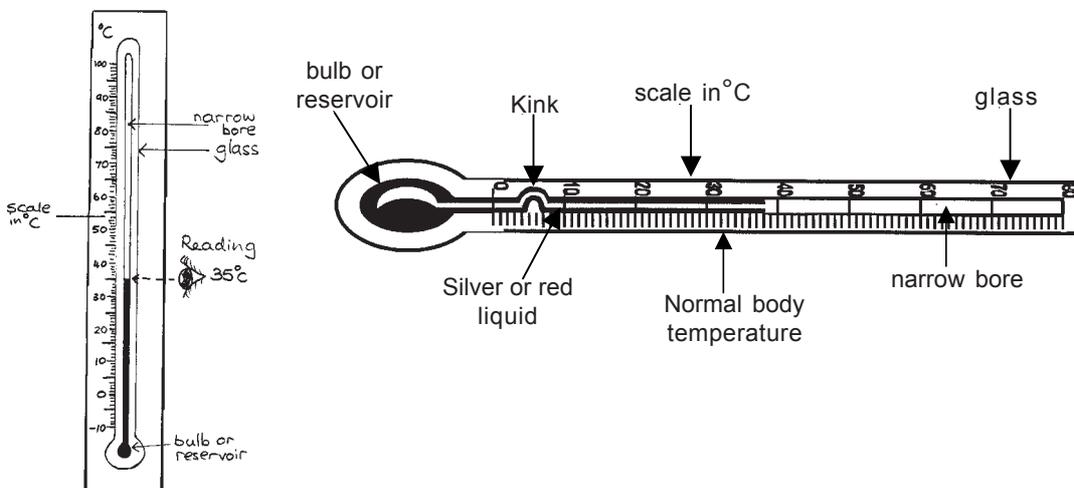
Rationale:

Pupils will be introduced to measuring temperature in degrees Celsius. In their everyday lives pupils will come across temperature recording and measuring particularly in studying weather, science, health care as well as cooking.

Background Information

Before starting to teach this unit read through the background information as well as the safety factors when using thermometers. This information is to help you to teach this topic successfully. It is to enhance your knowledge of the topic. It is not expected that you will teach all this to the pupils.

A thermometer is an instrument for measuring temperature. It is a fine glass tube which contains mercury, spirit or alcohol which is stored in a bulb at the bottom of the tube. As the temperature increases the liquid takes up more space (expands) so it rises in the tube. This rise is measured against a scale on or by the tube. The spirit or alcohol in a thermometer is usually coloured so it is easy to take a reading against the scale. The usual colour is red.



In 1742, a Swedish astronomer, Anders Celsius, devised a scale for measuring temperature. This scale was named after him. The point at which water turns to ice is called 0° Celsius and the point at which water boils is called 100° Celsius. It is a **centigrade scale** that is based on 100°. A 0° to 100° thermometer will usually have a hundred equal divisions marked on it.

38° Celsius means **thirty-eight degrees Celsius**. Eighty-five degrees Celsius would be written as **85° Celsius** or **85° C**.

It is important to note that not all thermometers begin at 0° and end at 100° . There are others, for example the clinical thermometer used to measure body temperature, which only cover a relatively small section of the scale. It is therefore, very important to make sure that the thermometer you use is designed to measure within the range needed.

Unit 15: Measurement

Safety Factors

There are a number of safety factors which should be carefully considered when using thermometers.

- Thermometers which have **mercury** inside, the silver looking liquid, should **not be used** by pupils. Mercury can be a harmful substance. A thermometer which has alcohol inside is safer.
- Thermometers should be handled carefully as they are **made of glass** and are easily broken.
- There are many different kinds of thermometer. Care should be taken that the **right thermometer is used for the right job**. For example, a clinical thermometer should only be used to measure body temperature; if it is used to measure boiling water it will break as the temperature is beyond its limits. It is therefore very important to **estimate the probable temperature** of the substance being measured then choose the right thermometer.
- The thermometer should return to room temperature after each use and before storing.
- Thermometers should be stored away from direct sunlight in a vertical position with the bulb downwards.
- If a thermometer is dropped or knocked a gap can sometimes be seen in the column of liquid inside. This thermometer is broken. It can not measure temperature accurately.

T1a

Materials

thermometer
Thermometer Poster
Units of Measurement
Matching Game.

If possible try and obtain a thermometer for this lesson. You may be able to borrow one from a nearby clinic if not, use the poster provided to show the different parts of the thermometer.

Introduce the topic by revising different units of measurement. Ask the pupils what units they would use to measure the following:

- The width of an exercise book (centimetres)
- The length of your classroom (metres)
- The mass of a large bag of rice (kilograms)
- The mass of a small packet of biscuits (grams)
- The amount of water in a bottle (litres)

You will also be able to think of other examples to include measuring volume, area, speed and time.

Now ask the pupils what we are measuring if we talk about how hot or cold something is. Try and get the pupils to come up with the term **temperature**.

Ask the pupils if they have heard temperature mentioned on the radio. They may have heard it mentioned in a weather forecast. The weather forecast often includes what the temperature will be in the day and in the night.

Build on the pupils' knowledge by asking questions such as these:

- What is temperature? (**A measure of how hot or cold things are.**)

Topic 22: Temperature

- Does anyone know what unit is used when measuring temperature? (**Degrees Celsius, or °C.**)
- What instrument do we use to measure temperature? (**a thermometer.**)

If you have a thermometer show it to the class. Remember to remind them of safety procedures when handling a thermometer. Show the class your diagram of the thermometer. Ask them questions about the thermometer. For example:

- What do the numbers on the thermometer mean? (**The numbers are the scale and they show the temperature in degrees Celsius.**)
- What do you think the liquid in the thermometer is? (**Mercury, alcohol or spirit.**)
- How does a thermometer work? (**The liquid expands as it gets warmer. It takes up more room and moves up the narrow glass tube.**)
- How should you hold a thermometer? (**Carefully by its sides.**)



Matching Units of Measurement Game

Prepare this matching memory game before the lesson. Make enough sets so that pupils can play this memory game in groups of three or four.

Here is an example of a set of cards like those provided. You will be able to think of other units of measurements to use.

length	millimeter	size of an angle	degrees	area	square centimeter
temperature	degrees Celsius	time	second	mass	gram
solid volume	cubic metre	speed	kilometres per hour	liquid volume	litre

Cut up the cards to make a set of 18. Put the pupils into small groups. Tell them to spread the cards face down. Let each pupil have a turn to turn over two cards. If they match the player wins the pair and has another go. If the cards do not match they must be turned face down again and put in the same place. Then it is the next players turn. When all the cards are used up the winner is the pupil with the most pairs.

Ask the pupils to use a ruler and pencil to draw a diagram of a thermometer in their exercise books. On the board write these key instructions.

1. Make sure your diagram has a **title**.
2. On your diagram **label** the following
 - the bulb
 - the scale in °C
 - glass tube
3. Make your thermometer read 35°C

Mark all the pupils' diagrams. Make sure you look for things like, equal divisions in the scale, bore and glass tube with no gaps in it, glass tube closed at the end. Talk through these kinds of drawing errors with the pupils. Encourage them to evaluate their work.

Unit 15: Measurement

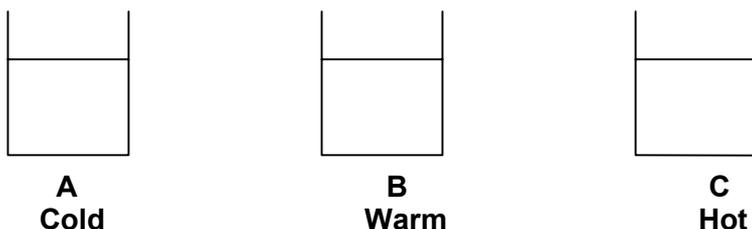
T_{1a}

Materials

3 cups of water of different temperatures
cloth for a blindfold
Temperature Order Game

In this lesson pupils will learn some specific temperatures as well as practice ordering a number of items which have different temperatures

Introduce this lesson with a whole class demonstration. Make sure that all the pupils gather around so that they can see. Have three cups of water ready. Each cup must contain water of a different temperature. If you have ice available or a refrigerator make the water in cup A the coldest. Make cup B warm or lukewarm and cup C the hottest. Make sure that cup C is not too hot. It must be comfortable for the pupils to hold their finger in. Here are the three cups.



Choose a pupil to come out to the front of the class to help you with the demonstration. Blindfold them with a piece of material. You could use a tea towel or a lava lava.

Tell them you are going to guide their fingers first into one cup and then into another. They must tell you which cup is hot and which is cold. Take their hand and guide their finger into cup A. Then guide them to cup C. Tell the rest of the class not to help the blindfolded pupil at all. Ask your helper, "Which is hot and which is cold?"

Now choose another pupil. Blindfold them. Put their finger into cup C followed by cup B. Ask the same question. This time cup C is hot and cup B is cold. Try different combinations in different orders with different pupils.

Then ask the pupils to comment on what they have found out. They should come up with the idea that just feeling something is not a reliable way to measure temperature. In this experiment two different temperatures were compared and depending on which cups were chosen varying results were obtained. Cup A was always cold and cup C was always hot but cup B was sometimes hot and sometimes cold even though it was in fact the same temperature.

Now introduce specific temperatures. Ask the pupils what happens if a kettle of water is put on a stove or a fire. **(It will get hotter and hotter until it starts to bubble and steam comes off the water.)**

Ask the pupils what this bubbling is called. **(When there are bubbles it is boiling.)**

Tell the pupils that the moment that boiling takes place is called the boiling point and this always takes place at exactly the same temperature.

The boiling point of water is 100°C. The steam is the water changing into water vapour.

The freezing point of water is 0°C.

A hot day in Solomon Islands is 32°C. At night the temperature may go down to about 22°C. In different parts of the world this temperature range can be greater or smaller. The top or **maximum** temperatures recorded can be very different as can the low or **minimum** temperatures.

Explain to the pupils that wherever a person lives their body temperature keeps constant if they are fit and well. **A healthy person has a temperature of 37°C.**

Topic 22: Temperature



Temperature Order Game

Prepare these cards before the lesson. Like your other game cards if you store them carefully you can use them more than once.

Set A

a bowl of hot soup	100°C
a very hot day	5°C
a pan of boiling water	160°C
an oven roasting meat	34°C
a glass of cold milk	65°C

Set B

a cold cup of water	0°C
a cold day in Solomon Islands	85°C
an ice block	5°C
a healthy child	20°C
a cup of tea	37°C

Cut up the strips or ask the pupils to cut them up.

Ask the pupils to work in pairs. Give them a set of temperature strips. See how quickly they can arrange them in the right order. Tell them they have to match an object with a temperature and then put them in order beginning with the hottest.

Let each pair work through Set A and Set B.

Go through the correct order with the whole class. You could play this game against the clock and see how quickly a pair comes up with the correct pairs in the correct order. They could play with each set more than once and you could also ask them to put them in order from coldest to hottest.

When the pupils have played the game ask them to complete the activities in the Pupil's Resource Book on page 43.

Answers

Activity A

1. a. 97°C 39°C 73°C c. 21°C 12°C 22°C 102°C
b. 11°C 1°C 100°C d. 0°C 13°C 3°C 43°C

2. and 3. Individual answers - check each pupil's book.
4. We use a **thermometer** to measure temperature.
5. Temperature is measured in **degrees Celsius** or °C.

Activity B

1. a. 0°C b. 34°C c. 5°C d. 20°C
2. c. freezing point.
3. b. the lava in a volcano.
4. a. 39°C b. 63°C c. 100°C

Unit 15: Measurement

T_{1c}

Materials

Temperature Bingo
Cards
counters or stones

In this lesson the pupils will be introduced to negative temperature readings, calculating the difference between different temperatures and reading thermometers correctly.

Revise the unit used for measuring temperature. This is degrees Celsius or °C.

So far the pupils have only looked at positive numbers when looking at temperatures. Tell the pupils that when a temperature goes below 0°C we can get a negative number of degrees Celsius.

Explain to the class that thermometers are made for specific purposes. Some thermometers like clinical thermometers have a range between 35°C and 41°C. Others can have a different range e.g. 100°C to -10°C (see the diagrams in Background Information).

Tell the pupils that in some countries the temperature in winter is often below zero degrees Celsius (0°C). If the temperature at night is -7°C and then rises to 15°C in the day the difference between these two temperatures is the **temperature rise**.

Example 1 Ask the pupils to work out the temperature rise.

Go through the example with the class.

$$-7^{\circ}\text{C to } 0^{\circ}\text{C} = 7^{\circ}\text{C}$$

$$0^{\circ}\text{C to } 15^{\circ}\text{C} = 15^{\circ}\text{C}$$

$$15^{\circ}\text{C} + 7^{\circ}\text{C} = 22^{\circ}\text{C}$$

The temperature rise is 22°C.

Explain to the pupils that if we calculate from a higher temperature to a lower temperature this is called a **temperature drop**. The difference between the two is the **temperature range**.

Example 2

If the daytime temperature is 13°C and the night time temperature is -5°C what is the temperature drop?

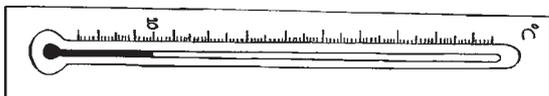
$$13^{\circ}\text{C to } 0^{\circ}\text{C} = 13^{\circ}\text{C}$$

$$0^{\circ}\text{C to } -5^{\circ}\text{C} = 5^{\circ}\text{C}$$

$$13^{\circ}\text{C} + 5^{\circ}\text{C} = 18^{\circ}\text{C}$$

The temperature drop is 18°C.

Draw a thermometer on the blackboard.



Ask the pupils to work out the temperature range of this thermometer.

$$-10^{\circ}\text{C to } 0^{\circ}\text{C} = 10^{\circ}\text{C}$$

$$0^{\circ}\text{C to } 100^{\circ}\text{C} = 100^{\circ}\text{C}$$

$10^{\circ}\text{C} + 100^{\circ}\text{C} = 110^{\circ}\text{C}$ so **the temperature range of this thermometer is 110°C.**

Ask the pupils to tell you what the reading on the thermometer is. Change the reading and ask the pupils if the temperature range of the thermometer has changed (**no**). What is your new reading? Do enough examples until all the pupils understand how to work out the difference between two given temperatures.

Topic 22: Temperature

C1c

You could prepare Temperature Bingo cards before the lesson or the pupils could make their own during the lesson. Each card should be a 3 x 3 grid. You should set a temperature range. For example the temperatures should range from 10°C to 30°C.

Here are examples of three cards.

10°C	12°C	17°C
21°C	11°C	18°C
20°C	30°C	29°C

14°C	12°C	17°C
11°C	10°C	16°C
27°C	30°C	28°C

22°C	12°C	20°C
21°C	19°C	23°C
24°C	17°C	15°C

The pupils could play in pairs. Make sure each pair has a card and some counters or small stones. Now call out two temperatures. Tell the pupils they have to work out the difference or the temperature range between the two temperatures. If they have that temperature range on their card they must cover it with a counter or a small stone.

E.g. 70°C to 55°C (temperature range of 15°C)

-3°C to 10°C (temperature range of 13°C)

-50°C to -20°C (temperature range of 13°C)

Remember your answers must fall in the temperature range you have set, in this case between 10°C and 30°C. Write down the ranges you call out so that you can check pupils have calculated correctly at the end of the game.

The winner is the first card which has three covered temperatures in a row. This line could be horizontal, vertical or diagonal. You could start with easier examples and then go on to more difficult ones. The pupils could exchange cards for different games.

When the pupils have had some practice at working out temperature ranges let them do the activities in the Pupil's Resource Book on pages 44 and 45.

Answers

Activity A

1. a. 70°C 2. a. 50°C
b. 0°C b. -20°C
c. 20°C c. -10°C

3. a. 30°C 4. a. 160°C
b. 0°C b. 100°C
c. 25°C c. 130°C

5. a. -10°C 6. a. 90°C
b. -40°C b. 20°C
c. -20°C c. 90°C

Activity B

1. a. 50°C b. No. Scale does not go up to 100°C which is the boiling point of water.
c. 42°C d. 23°C
2. a. 25°C b. No. Scale does not go over 100°C. Oven temperature is very high.
c. i) 42°C ii) 6°C iii) 0°C iv) -5°C

Unit 15: Measurement

Activity C

- a. 7°C b. measuring body temperature
c. 37°C d. temperature of a healthy person
- 24°C
-

Country	minimum temperature	maximum temperature	temperature change
Norway	-12°C	-3°C	9°C
Australia	18°C	34°C	16°C
New Zealand	11°C	27°C	16°C
France	-2°C	6°C	8°C
South Africa	18°C	37°C	19°C
Arctic	-40°C	-20°C	20°C
Solomon Islands	28°C	35°C	7°C
India	15°C	27°C	12°C



Do all the pupils understand that temperature is measured in degrees Celsius?

T_{2a}

Materials
thermometers or diagrams of thermometers
rulers

If thermometers are available in this lesson pupils will practice the skill of using a thermometer, recording the readings, using their data and interpreting their results.

Use thermometers for this lesson if they are available. If not make sure you have diagrams of thermometers prepared. Make sure these are large enough for all the pupils to see, or use the Thermometer Poster.

First of all, revise the safety precautions which are very important when using thermometers. These are listed in Background Information page 93 at the beginning of this unit. Lead a brainstorming session and build a list of safety points with the class.

Remember that one of the most important aspects of using a thermometer is that you use one which is **suited to the job**. For example if you have borrowed a thermometer from the clinic this is for measuring body temperature only. You cannot use it for measuring air temperature or temperature of hot and cold water and so on.

Tell the pupils that when they read a temperature from a thermometer they must first of all be **aware of the scale**. What does each mark on the scale represent? How many degrees Celsius?

When they read the thermometer they must read it at **eye level**. If they are taking air temperature they can move the thermometer. If they are taking the temperature of a glass of water they must move themselves so that their eyes are level with the height of the coloured liquid in the thermometer. This will give them an **accurate reading**.

If you have a clinical thermometer or a diagram of a clinical thermometer, ask the pupils why they think there is a kink (a sharp bend) in the thermometer. See if the pupils can come up with a reason.

Topic 22: Temperature

Explain that when body temperature is taken the thermometer has to be removed from the person's mouth before it is read. The kink stops the liquid in the clinical thermometer contracting back into the bulb. When the thermometer has been read it needs to be reset. This is done by holding the top end of the thermometer – not the bulb - and giving it a sharp flick with the wrist. The liquid then travels down into the bulb and the thermometer is ready for use again.

If you have a thermometer which can measure between 0°C and 100°C you can carry out a practical demonstration of how to read the thermometer.



Let the pupils work in small groups. Your group organisation will depend on how many thermometers you have available. The pupils are going to be asked to record air temperature throughout the day. Even if you only have one thermometer each group can take turns to read it. If you do not have a thermometer you can still go through the process of discussing how to do an exercise such as this. Data for further work is available in the Pupil's Resource Book.

Tell the pupils that they are going to record the air temperature throughout the day. With the class design this experiment. Build up the procedure on the board. Here are some points which you should include.

Aim of the Experiment

To find the range of air temperature during a day.

Method

Place the thermometer outside in the shade.

Every 30 minutes take a reading.

Record your reading in a table you have prepared.

Present your Data

These could be presented as a graph.

Interpret your Results

Analyse the graph and draw conclusions from it.

Here is an example of a table which could be prepared ready for the thermometer readings. You will need to adjust the times and put in the date in the title.

Time	0900	0930	1000	1030	1100	1130	1200	1230	1300	1330
Temp °C										

Table to Show Temperature Readings on

When all the data has been collected ask the pupils to complete the activities in the Pupil's Resource Book on pages 45 and 46.

If you do not have thermometers in your class you will need to ask the pupils to use the table of data in the Pupil's Resource Book.

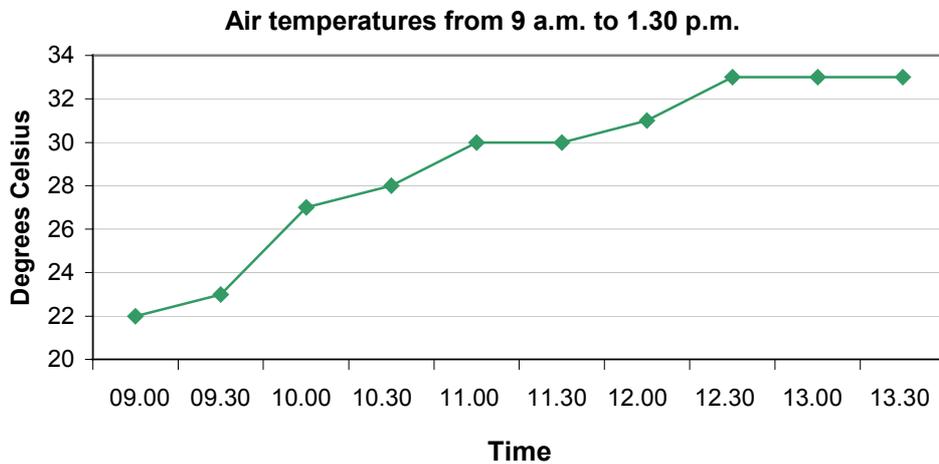
Unit 15: Measurement

Answers

Activity A

If the pupils are using their own data they you will need to mark each graph individually.

If the pupils are using the data in the Pupil's Resource Book their graph will look like this.



Mark all the pupils' sentences individually.

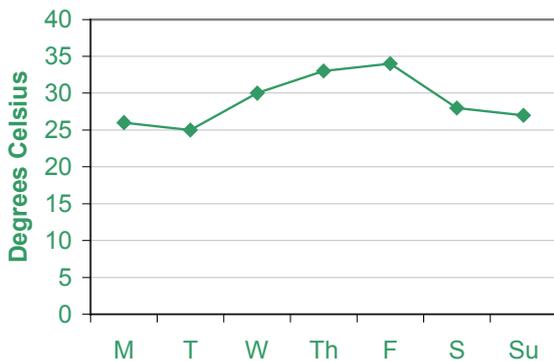
Activity B

1 a.

Day	Mon	Tues	Weds	Thurs	Fri	Sat	Sun
Temp °C	26°C	25°C	30°C	34°C	34°C	28°C	27°C

b.

Noontime Air Temperatures



When you mark the graph make sure that there is a title. Make sure both the axes are labelled. Is the scale correct? Are the co-ordinates plotted correctly?

c. Mark answers individually. Look for appropriate vocabulary. Look for comparisons, trends and reasoning in the pupil's interpretation.



Can all the pupils use a thermometer to measure and keep a record of air temperature?

Support Activities

Playing Games

A good way to reinforce the first objective in this unit is to play the games again which were outlined in C1a, C1b and C1c. By playing these games the pupils will become more familiar with the new vocabulary as well as the new concepts.

Word Bank

Build on the knowledge the pupils have by working with them in small groups to produce a **Temperature Word Bank**. As pupils think of a word or phrase to add they are asked to define it to the rest of the group. Other group members can ask questions about their word. Through discussion new concepts are assimilated.

Here is a selection of words that could be included. You and the pupils will be able to think of some more.

eye level	alcohol	body temperature	boiling point	bulb	column
clinical thermometer	cold	colder	coldest	coloured thread	degrees Celsius
difference in temperature	falling	freezing point	hot	hotter	hottest
isn't as hot as	label	less than	liquid	maximum	minimum
more than	much warmer than	predicted temperature	read a thermometer	rising	room temperature
scale	smaller	standard unit	temperature drop	temperature	thermometer
warm	warmer	warmest	water temperature	lukewarm	tepid
mercury	expands	average temperature	reservoir	temperature range	temperature rise

Discussion

Small group activities and discussions which raise awareness of temperature difference should be carried out. Here are some suggestions.

- List hot things. List cold things.
- Classify a selection of items that are hot or cold to touch.
- Order a series of pictures from hottest to coldest and then give reasons for the order.

In the discussion draw attention to the differences in the way in which people describe temperature and develop an awareness that reliance on the senses alone is an unreliable way of measuring temperature.

Unit 15: Measurement

Extension Activities

Practical Activities

If you have a thermometer available ask the pupils to collect data, record their data and then show their results as a graph. Pupils could work in small groups and display their results on a large piece of paper. This would make a good class display.

Here are some ideas for different investigations.

- The air temperature in different rooms or parts of the school.
- The air temperature over a few days.
- The temperature of different water sources e.g. sea, river, pond, well, tap water etc.
- The temperature differences over a period of time of a cup of water left out in the sun.

All these activities (you and the pupils will be able to think of more) will give the pupils more practise at reading the thermometer as well as designing their own experiments and carrying out their investigations co-operatively.

The activities will also reinforce drawing both line and column graphs and encourage pupils to interpret and analyse their results.

Temperatures in Other Countries

If you have resources available such as atlases and geography books pupils could try and find out about temperatures in different parts of the world. They could get information about Solomon Islands and compare this to other places.

Investigating a topic like this very much depends on resources you have available in your school.

Check Up Page: Answers

1. thermometer 2. degrees Celsius 3. 100° C 4. 37° C
5. a. 40° C b. -15° C c. 150° C d. 145° C e. -30° C f. 90° C
6. The following statements are true **c, d, e, f, h** and **j**.

Aim:

To develop the pupils' understanding of percentages.

Sequence of objectives: To

1. introduce percentages.
2. investigate fraction and percentage equivalence.

Rationale:

The pupils need to understand percentages and their fractional equivalence since they will come across them in their daily lives particularly when looking at statistical data, money etc. This topic builds on the pupils' knowledge of fractions and decimals.

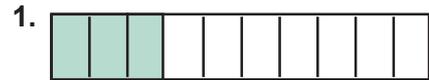
T_{1a}

Materials
number cards
counters/stones

In this lesson pupils will revise fractions using concrete materials. Use appropriate language and the correct symbols when writing fractions.

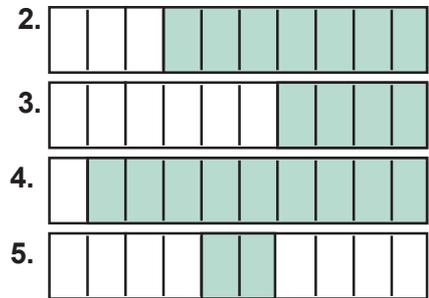
Draw this diagram on the board.

Ask the pupils what this represents.



Get the pupils to tell you that the shape is divided into 10 equal parts or tenths. Ask the pupils to look at the shape on the board and answer these questions.

- a. How many parts are there altogether? (**10**)
- b. What is the name given to each part? (**tenths**).
- c. How many parts are shaded? (**3 or 3 tenths**).
- d. How do we write 3 tenths? ($\frac{3}{10}$)



Continue with other examples using tenths as shown.

Reinforce different ways of saying and writing fractions. Draw the table below on the board showing different ways of how 5 tenths can be represented.

Diagram	Name	Fraction notation	Decimal fraction
	five tenths	$\frac{5}{10}$	0.5
	two tenths	$\frac{2}{10}$	0.2
	nine tenths	$\frac{9}{10}$	0.9

Complete the table with the class.

Unit 16: Number

C1a

Prepare sets of number cards with 1 tenth to 10 tenths on them.

Let the pupils work in small groups. Let them work with small cubes, counters or stones. Tell them to put a pile of number cards face down in the middle of the group. The cards are numbered 1 tenth to 10 tenths. Let each pupil in the group have 20 counters or stones. One pupil turns the first card over. The race is then onto see who can count out that many tenths from their pile of counters or stones. e.g. $\frac{4}{10}$ if is turned over this means so the first one to count out 8 counters or stones wins that card. The pupil with the most cards at the end is the winner.

You could repeat the game with a different number of objects. They must always be in multiples of ten.

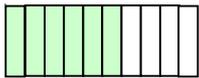
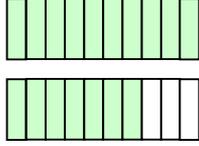
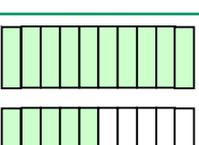
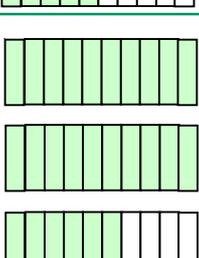
Ask the pupils to complete the activity in the Pupil's Resource Book on pages 49 and 50.

Answers

Activity A

1. $\frac{2}{10}$ 2. $\frac{1}{10}$ 3. $\frac{4}{10}$ 4. $\frac{7}{10}$ 5. $\frac{5}{10}$ 6. $\frac{3}{10}$ 7. $\frac{7}{10}$
 8. $\frac{9}{10}$ 9. $\frac{1}{10}$ 10. $\frac{5}{10}$ 11. 0.8 12. 1.2 13. 0.7 14. 2.4
 15. 0.5

Activity B

	Parts Shaded	Fraction in Words	Fraction Notation	Decimal Notation
1.		three tenths	$\frac{3}{10}$	0.3
2.		six tenths	$\frac{6}{10}$	0.6
3.		one and seven tenths	$1 \frac{7}{10}$	1.7
4.		two tenths	$\frac{2}{10}$	0.2
5.		one and five tenths	$1 \frac{5}{10}$	1.5
6.		two and six tenths	$2 \frac{6}{10}$	2.6

T_{1b}

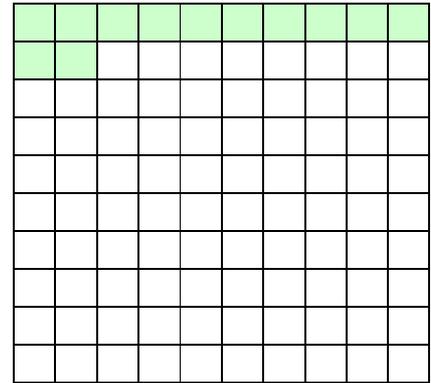
Introduce the pupils to the idea of percentages by revising the concept of one hundredth as a fraction.

Use a large square 10 x 10 grid as shown to represent one whole.

Shade different parts of it to show hundredths.

For example the shaded part shown is 12 hundredths.

We write this as $\frac{12}{100}$



Which tells us that 12 out of the total of 100 parts have been shaded.

Ask the pupils the following questions to reinforce their understanding.

- How many small squares are in the grid? (**100**)
- How many of these have been shaded? (**12**)
- What fraction is shaded (**12 hundredths**) $\frac{12}{100}$
- How can we write the shaded part as a fraction?

Explain to the pupils that when we describe a fraction out of a hundred we give it a special name. We call it a **percentage**.

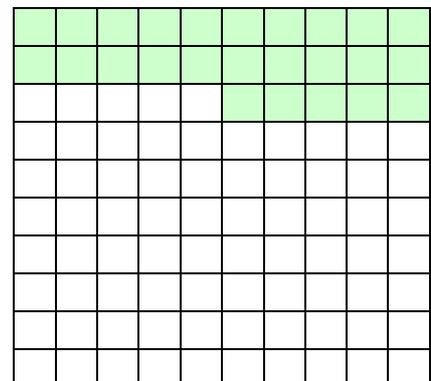
A **percentage** is a fraction of one hundred and **per cent** means per hundred.

The fraction they have identified above is called 12 per cent because it is 12 parts out of 100.

Teach the pupils the symbol for percentage which is % Allow them to practice writing this and show them that 12 percent is written as **12%**.

Repeat the procedure using a different percentage. This time shade 25 of the small squares in the grid as shown and ask.

- How many small squares are in the grid? (**100**)
- How many of these have been shaded? (**25**)
- What fraction is shaded (**25 hundredths**)
- How can we write the shaded part as percentage? (**25%**)



Go through the some other examples using the grid until the pupils are confident with the idea that hundredths can be expressed as a percentage.

Unit 16: Number

C1b

Let the pupils work in pairs. Write the words **per cent** on the board.

Tell the pupils to work together to write what they have learned about per cent in their exercise books. When the pupils have finished working, bring the class back together and build up a set of sentences on the board. Your list could begin like this:

- Per cent means in a hundred, or per hundred
- The sign for per cent is %.
- 100 per cent means one whole or all of it.

Add any other facts they come up with to the list.

The pupils can reinforce today's lesson by doing the activity in the Pupil's Resource Book on pages 50 and 51.

Answers

Activity A

1. $\frac{16}{100}$

2. $\frac{10}{100}$

3. $\frac{22}{100}$

4. $\frac{40}{100}$

5. $\frac{58}{100}$

6. 30%

7. 40%

8. 20%

9. 16%

10. 50%

The following number of squares in each grid should be shaded.

11. 2

12. 15

13. 6

14. 18

15. 51



Do all the pupils understand that a percentage is a fraction of one hundred?

Topic 9: Percentages

T_{2a}

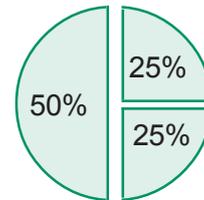
Materials
cardboard circles
counters or small stones

Trace and cut out circles out of cardboard before the lesson. Give one to each pupil. Ask the pupils to cut their circle into two equal parts.

Can they tell you what fractions they have?

The pupils should tell you they have 2 halves. Ask them how to write a half as a fraction. ($\frac{1}{2}$)

Then ask the pupils what percentage each piece is. Remind the pupils that percentages are expressed as a fraction out of a 100.



Show them how to work this out as follows $\frac{1}{2} = \frac{50}{100} = 50\%$

Now ask the pupils to cut one of the halves into two equal parts again.

They now have two $\frac{1}{4}$. This can also be written as $\frac{25}{100}$ or $= 25\%$.

Remind the pupils that **1 whole = 100%**.

Draw a table on the board like the one below.

Diagram	Fractions in Words	Fraction Notation	Percentage	Decimal Fraction
	25 hundredths	$\frac{25}{100}$ or $\frac{1}{4}$	25%	0.25

Revise with the pupils how to simplify $\frac{25}{100}$ to get $\frac{1}{4}$.

Remind them that the numerator and the denominator must be divided by the same number.

$$25 \div 25 = 1$$

$$100 \div 25 = 4$$

Therefore, $\frac{25}{100} = \frac{1}{4}$

Give the pupils more practice, simplifying fractions of one hundred.

Ask them to simplify $\frac{75}{100}$, $\frac{25}{100}$, $\frac{60}{100}$, $\frac{40}{100}$, to their lowest terms.

Answers = $\frac{3}{4}$, $\frac{1}{4}$, $\frac{3}{5}$, $\frac{2}{5}$

Unit 16: Number

C_{2a}

Matching Game

Before the lesson prepare sets of cards. Write a percentage on one of the cards, a fraction represented as a 100th on the next and then the fraction in its simplest form on the 3rd.

Each set of cards should have 12 cards in it. You will need a set for each group of 6 pupils. Your twelve cards will look like this.

100%	75%	50%	25%
$\frac{100}{100}$	$\frac{75}{100}$	$\frac{50}{100}$	$\frac{25}{100}$
1	$\frac{3}{4}$	$\frac{1}{2}$	$\frac{1}{4}$

Explain to the pupils that they must shuffle their 12 cards and spread them out face down. Now the first pupil turns over three cards. If they all match the pupil wins those 3. If they don't match then the cards are turned over again and left in the same place. It is the next pupil's turn. If a pupil wins a set of three then they have another go. The game continues until all the four sets have been won. Each group could play the game a few times to reinforce the equivalence between these fractions and their percentages.

When you have played the game several times, ask the pupils to complete the activities in the Pupil's Resource Book on pages 51 and 52.

Answers

Activity A

1. 60% 2. 11% 3. 36% 4. 93% 5. 25%
6. 0.25 7. 0.5 8. 0.5 9. 0.75 10. 0.75

Activity B

1. 25%
2. fifty hundredths $\frac{50}{100}$ or $\frac{1}{2}$, 50%, 0.5
3. seventy-five hundredths $\frac{75}{100}$ or $\frac{3}{4}$, 75%, 0.75
4. one hundred hundredths $\frac{100}{100}$ or 1, 100%, 1.0

Activity C

1. a. 75% 2. $\frac{1}{2}$
 b. 25%
3. a. \$50 i. 500g
 b. \$75 j. 500g
 c. \$2 k. 30m
 d. \$25 l. 600m
 e. \$20 m. 3km
 f. \$30 n. 12 minutes
 g. 90c o. 30 minutes
 h. \$75 p. 1 hr 45 minutes

T_{2b}

Reinforce with the pupils the idea of finding an equivalent fraction to a percentage. Explain that when changing percentages to fractions there are a few rules that the pupils need to follow:

1. Write the percentage as a fraction over one hundred.
2. Simplify the fraction.
 - a. Find a common factor that can be divided into both the numerator and the denominator.
 - b. Continue until the fraction cannot be simplified anymore.

For example:

1. $50\% = \frac{50}{100}$

2. a. Divide the numerator and the denominator by 10

example: $\frac{50 \div 10}{100 \div 10} = \frac{5}{10}$

- b. Continue to simplify by dividing by another common factor 5

example: $\frac{5 \div 5}{10 \div 5} = \frac{1}{2}$

Tell the pupils to ask themselves. Can you simplify any further? **(No)**

So $50\% = \frac{1}{2}$ in its lowest term.

Write these percentages on the board. Ask the pupils to write them as fractions. Tell them to simplify each one to its lowest terms.

1. 75% ($\frac{3}{4}$)

2. 10% ($\frac{1}{10}$)

3. 60% ($\frac{3}{5}$)

4. 35% ($\frac{7}{20}$)

5. 20% ($\frac{1}{5}$)

Unit 16: Number

C_{2b}

Let the pupils work in pairs. Write the following two lists on the board.

- | | | | |
|--------|-------------------|---------|-------------------|
| 1. 75% | a. $\frac{4}{5}$ | 6. 15% | f. $\frac{2}{5}$ |
| 2. 50% | b. $\frac{3}{5}$ | 7. 24% | g. $\frac{7}{50}$ |
| 3. 80% | c. $\frac{1}{4}$ | 8. 60% | h. $\frac{3}{25}$ |
| 4. 14% | d. $\frac{6}{25}$ | 9. 40% | i. $\frac{1}{2}$ |
| 5. 25% | e. $\frac{3}{4}$ | 10. 12% | j. $\frac{3}{20}$ |

Tell the pupils that it is a race to match each percentage with the correct fraction. The first pair to complete all 10 will be the winner. Let the pupils check through the answers when they have finished.

Percentage Bingo

Ask the pupils to make a 9 square grid. Draw one on the board.

Now tell them to put in a percentage in each square. Tell them it must be a multiple of 5. ie. 5, 10, 25, and so on.

When the pupils are ready, call out a fraction. If the pupils have the equivalent fraction on their number grid they must cover it with a counter or stone.

For example if you call out one quarter, they cover 25%. The first to cover a line of 3 percentages is the winner.

A line can be horizontal, vertical or diagonal. As you call out the fractions make a note of what you say so that you can check a pupils grid when they have finished.

When you have played the game several times ask the pupils to complete the activities in the Pupil's Resource Book on pages 53 and 54.

Answers

Activity A

- | | | | | | |
|---------------------|---------------------|---------------------|---------------------|-------------------|-------------------|
| 1. $\frac{10}{100}$ | 2. $\frac{5}{100}$ | 3. $\frac{20}{100}$ | 4. $\frac{60}{100}$ | | |
| 5. $\frac{40}{100}$ | 6. $\frac{25}{100}$ | 7. $\frac{80}{100}$ | 8. $\frac{15}{100}$ | | |
| 9. $\frac{1}{4}$ | 10. $\frac{1}{10}$ | 11. $\frac{9}{20}$ | 12. $\frac{1}{2}$ | 13. $\frac{3}{4}$ | 14. $\frac{3}{5}$ |

Activity B

- | | | | |
|---------------------|-------------------|------------------|--------|
| 1. a. $\frac{1}{2}$ | b. $\frac{3}{20}$ | c. $\frac{1}{4}$ | d. 10% |
| 2. a. $\frac{2}{5}$ | b. 60% | | |



Can all the pupils recognise when a fraction and a percentage have the same value?

Support Activities

Games

A good way to give extra support to pupils who are having difficulty in understanding the concept of percentages, and particularly fraction equivalence, is for them to play the games again already described in this unit.

Practical

Pupils could cut up fruit to show fractions and then convert this to using percentages. e.g. Cut up an orange or a pawpaw so each part is 50% of the whole. ($\frac{1}{2}$) Cut it up so each part is 25% of the whole (cut into 4 or $\frac{1}{4}$ s) and so on.

Extension Activities

Plan a Sale

Let the pupils look at grocery items. Tell them to record the cost of each item. Tell them to make a poster for a sale at a shop where there is say 25% off certain items. Let them work out the sale prices and include these in their poster. You could use different percentages for different items.

Shopping in Town

Often things in town are cheaper than things the rural areas. Make a shop list of ten items. Tell the pupils the cost of buying these items in the village. Now tell them they would buy them 5% cheaper in town. Ask the pupils to work out the cost of their shopping in town.

Check Up Page: Answers

1. $\frac{5}{10}$ 2. $\frac{2}{10}$ 3. $\frac{2}{5}$ 4. $\frac{50}{100}$ 5. $\frac{25}{100}$
6. 0.9 7. 0.13 8. 0.6 9. 0.3 10. 0.1 11. 0.26 12. 0.17
13. 26% = $\frac{26}{100}$ 14. $\frac{60}{100}$ = 60% 15. True 16. 0.4
17. a. Anna = 25% Martha = 75%
- b. $\frac{3}{4}$ c. $\frac{3}{4}$ d. $\frac{1}{4}$
18. a. 20%, $\frac{1}{4}$, 0.5 b. 10%, 0.25, $\frac{1}{3}$ c. 0.1, $\frac{2}{5}$, 75%
- d. $\frac{3}{4}$, 0.8, 100% e. 16%, 0.25, $\frac{1}{2}$

Measurement Topic 23: Probability

Aim:

For pupils to use fractions to describe the probability of an event occurring.

Sequence of Objectives: To

1. use fractions to describe the probability of events.
2. understand that a probability of $\frac{1}{2}$ represents an even chance.

Rationale: In this unit pupils are encouraged to make predictions about the likelihood or probability of events. They learn to express this probability in terms of a fraction. They also learn to compare their predictions with results of experiments.

Chance plays a significant role in everyday life and influences many of our decisions. Being able to assess the probable outcome of events will help us to make informed decisions. Pupils will learn that understanding probability can help them to win in a game of chance.

T_{1a}

Materials

2 twenty cent coins,
paper, shape
cards.

Remind the pupils of the meaning of **probability**.

Probability is the likelihood or chance that an event might happen.

Discuss some familiar events with pupils and have them demonstrate their understanding of probability by explaining these in their own words. Some examples you could use are as follows:

- a. If a woman is pregnant, what is the probability that she will have a girl or a boy?
- b. If a woman is pregnant with her fifth child and she already has four boys, what is the probability that she will have a girl or a boy this time?
- c. In a game of Estimate all the cards (52) are shared out between four players. Each player has 13 cards. What is the probability that one player gets the ace of spades?
- d. If you pick a card from a pack without looking
 - what is the probability that it will be a red card?
 - what is the probability that it will be a heart?
 - what is the probability that it will be an ace?

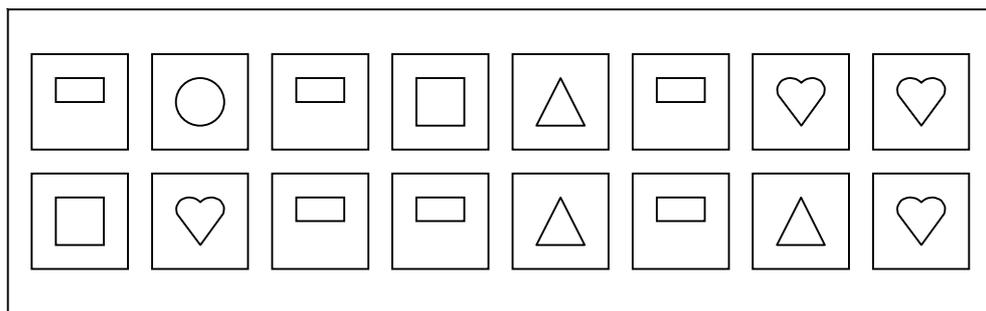
In your discussion make sure pupils understand and use the following terms:

probable	less likely	impossible
likely / unlikely	more likely	certain

C_{1a}

Have the class work in groups and give each group a set of 16 cards with shapes drawn on one side. Each set of 16 cards should include the following shapes:

one circle
two squares
three triangles
four hearts
six rectangles



Topic 23: Probability

Have the pupils study their set of cards and discuss the following questions:

- a. How many of each shape are there? Of which shape are there the most? of which shape are there the least?
- b. If you picked a card at random what is the probability that it would be a circle? a square? a rectangle? and so on.
- c. Which shape are you most likely to pick?
- d. Which shape are you least likely to pick?

Have the pupils experiment with their shape cards. Turn them all face down and mix them up. Have pupils take turns to pick a shape at random. Have one person in the group record all the shapes picked on a tally chart.

After about 60 picks have them analyse their results and help them to explain what they find using probability terms for example:

- There is only one circle so it's unlikely that you will pick it.
- The probability of picking a rectangle is high because there are lots of rectangles.
- You have three out of sixteen chances of picking a triangle.
...and so on.

When you are satisfied that pupils have revised and understood these concepts, have them complete the activities in the Pupil's Resource Book on page 57 .

Answers

Activity A

- 1a. a T-shirt
- 1b. a skirt
- 2a. Half / half, or fifty / fifty, or one in two chance.
- 2b. No. it is impossible to pick a raspberry lolly because there are no raspberry lollies in the bag.
3. More likely to be a boy.

Activity B

1. a six in sixteen chance
2. an eight in sixteen chance – or half/half or 50/50
3. circle
4. heart
5. Any estimate from 10 - 20 would be reasonable. The important thing here is that pupils are able to explain their estimates in probability terms.

Unit 17: Measurement

T_{1b}

Materials
a bag and a selection of coloured stones

In this activity pupils will learn that probability can be expressed as a fraction.

To express probability as a fraction we put the number of chances that the event will occur over the total number of possible outcomes.

For example: If there are 5 balls in a bag of which only one is white, the probability of picking a white ball out of the bag is expressed as:

$$\frac{1}{5} \quad \frac{\text{The one chance of picking the white ball from the bag}}{\text{The total number of balls in the bag}}$$

If an event is **certain** to happen, then the probability of it happening is 1.

For example: If I pick one stone from a bag containing all black stones, then the stone I pick will be black. The probability of picking a black stone is 1.

If there are different coloured stones in the bag, there is a chance that I will pick a different colour. We express this chance as a fraction of 1.

If there are two stones in the bag, one black and one white, I am **equally likely** to pick a black stone or a white stone. We say I have a $\frac{1}{2}$ chance of picking a black stone and a $\frac{1}{2}$ chance of picking a white stone. These two $\frac{1}{2}$ s add up to make 1.

Demonstrate this concept carefully using different coloured stones in a bag as follows.

1. 12 black stone	Probability of picking a black stone is $\frac{12}{12}$ which is 1
2. 6 black and 6 white	Probability of picking a black stone is $\frac{6}{12}$ which is $\frac{1}{2}$ Probability of picking a white stone is $\frac{6}{12}$ which is $\frac{1}{2}$
3. 4 black, 4 white and 4 grey	Probability of picking a black stone is $\frac{4}{12}$ which is $\frac{1}{3}$ Probability of picking a grey stone is $\frac{4}{12}$ which is $\frac{1}{3}$ Probability of picking a white stone is $\frac{4}{12}$ which is $\frac{1}{3}$
4. 3 each black, white, grey and brown	Probability of picking black stone is $\frac{3}{12}$ which is $\frac{1}{4}$ Probability of picking a grey stone is $\frac{3}{12}$ which is $\frac{1}{4}$ Probability of picking a white stone is $\frac{3}{12}$ which is $\frac{1}{4}$ Probability of picking brown stone is $\frac{3}{12}$ which is $\frac{1}{4}$

Write these probabilities up on the board as fractions.

Discuss other ways of expressing the same probability including the following: an equal chance; a fifty / fifty chance; a one in three or one in four chance. Help pupils to see how these relate to the fractions in your examples.

Topic 23: Probability

C1b

Have the class work in three groups to test out probability predictions. Prepare three bags of stones as described in 2, 3 and 4 on the last page.

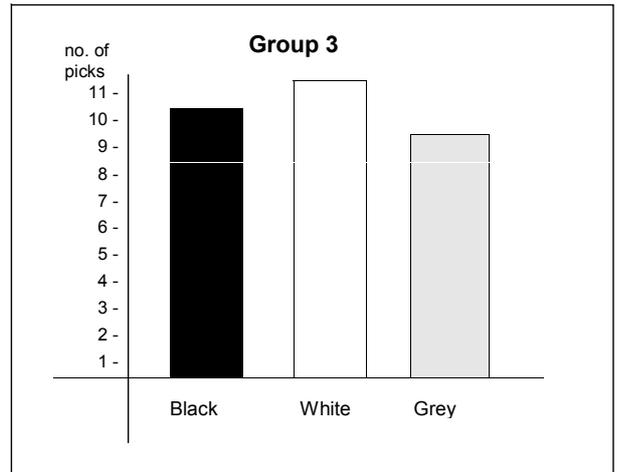
Each group should have one bag of stones and take it in turns to take 30 picks from the bag.

They should record the results on a tally chart and make a bar graph to show their results as shown:

Allow time for pupils to experiment with different combinations of stones.

Make sure that they talk about their predictions and their results using the probability words you have taught.

When they have completed their explorations they should complete the activities in the Pupil's Resource Book on pages 57 and 58.



Answers

Activity A

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

Activity B

1. $\frac{1}{4}$
2. $\frac{1}{2}$
3. $\frac{1}{26}$
4. $\frac{5}{26}$
5. $\frac{1}{2}$

Activity C

- 1a. heart $\frac{1}{4}$
- 1b. square $\frac{1}{8}$
- 1c. rectangle $\frac{3}{8}$
- 1d. circle $\frac{1}{16}$
- 1e. triangle $\frac{3}{16}$

T1c

Materials
About 12 twenty cents coins

Revise with the pupils how to simplify fractions by dividing by the lowest common denominator (**Unit 4**). You could use the following examples on the board to practice this.

Simplify the following fractions:

$12/36 (1/3)$

$11/55 (1/5)$

$3/15 (1/5)$

$12/20 (3/5)$

$13/52 (1/4)$

$3/21 (1/7)$

$26/65 (2/5)$

$3/9 (1/3)$

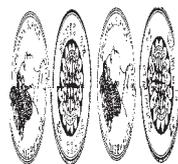
$21/49 (3/7)$

$2/8 (1/4)$

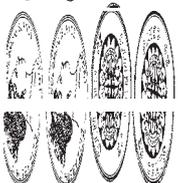
Demonstrate the following activity to give the pupils further practice at expressing probability in fractions.

Explain to pupils that there are four possible results when you toss two coins, which are:

1. head / head;



2. head / tail:



3. tail / head and

4. tail / tail.

Unit 17: Measurement

Either as a class, or in groups, test this probability by throwing two coins 12 times and recording the results.

Use the data to draw a bar graph.

Help the pupils to see that the probability of each different combination is as follows:

tail / head or head / tail $6/12$ or $\frac{1}{2}$

The probability of throwing tail / tail is therefore one out of four which can be expressed as a fraction. Can the pupils tell you what this is? ($\frac{1}{4}$).

Ask the pupils to explain this in their own words and state the probability of throwing other combinations as a fraction.

Help them to explain why throwing one tail and one head is twice as likely, as throwing two heads or two tails.

Either as a class, or in groups, test this probability by throwing two coins 12 times and recording the results.

Use the data to draw a bar graph.

Help the pupils to see that the probability of each different combination is as follows:

tail / tail $3/12$ or $\frac{1}{4}$

tail / head or head / tail $6/12$ or $\frac{1}{2}$

head / head $3/12$ or $\frac{1}{4}$



Have the pupils complete the activities in their Pupil's Resource Book on pages 58, 59 and 60. These give the pupils practice with investigating probability and expressing their predictions as a fraction.

Answers

Activity A

Check each pupil's book individually and go around the class as they work to make sure they are talking about their work with understanding.

Activity B

1a. $8/40$ or $1/5$

1b. $20/40$ or $1/2$

2. Check each pupil's work individually.

Activity C

1a. $5/35$ or $1/7$

1b. $6/35$

1c. $8/35$

1d. $3/35$

1e. $7/35$ or $1/5$

1f. $4/35$

1g. $2/35$

2a. $4/5$

2b. $3/4$

2c. $2/3$ and $1/3$

2d. $1/4$

2e. $1/3$

Topic 23: Probability

T_{1d}

Materials
pack of cards

Revise the following concept.

The more chances there are of an event happening, the higher the probability that it will happen.

Use a pack of cards, with the jokers removed.

Show the cards to the pupils and ask them questions to make sure that they are familiar with the contents of a pack as follows:

- a. How many suits are there? **(4: hearts; clubs; spades and diamonds)**
- b. How many cards are there in total? **(52)**
- c. How many are red and how many are black? **(26 of each)**
- d. How many cards are there in each suit? **(13)**
- e. How many aces are there in a pack? **(4)**

How many picture cards are there in each suit? **(3: jack; queen and king)**

Experiment with picking a card at random from the pack and ask pupils to tell you the probability that they would pick that card using the above criteria.

For example:

If a child picked the jack of spades you could ask:

- | | |
|--|-----------------------------|
| What was the probability that you would pick a black card? | $\left(\frac{1}{2}\right)$ |
| What was the probability that you would pick a spade? | $\left(\frac{1}{4}\right)$ |
| What was the probability that you would pick a jack? | $\left(\frac{1}{13}\right)$ |
| and so on. | |

Continue until all the pupils have had a chance to pick a card.

C_{1d}

Guess the Card.

Pick a card at random from the pack and give the pupils a clue by telling them something about the card, for example

It is a picture card.

It is a black card.

It is a heart.

Pupils can then take it in turns to guess the card.

If a pupil's guesses correctly, they then have to tell you what the probability that their guess was correct was as a fraction – if they are correct they get to keep the card and the game continues.

If you have more than one set of cards pupils could play this game in groups.

Unit 17: Measurement

T_{2a}

Remind the pupils that a **probability of 1 is the same as a certainty**. If the probability of an event happening is 1, then we can say that the event is certain to happen.

Then explain that if an event is certain **not** to happen, then it has a probability of 0. For example: The probability of a dog talking is 0. It is impossible. Explain that this is the same as saying that there is no chance (zero chance) that it will happen.

Draw a chart on the board as shown, showing a scale of 0 (impossible) to 1 (certain).

Discuss some likely and unlikely events with the pupils and have them suggest one event to complete each row of the chart.

Some suggestions have been included, but take your ideas from the pupil's suggestions.

0	impossible	Your dog learns to read
0.1	extremely unlikely	
0.2	very unlikely	Your sister will become Prime Minister
0.3	quite unlikely	
0.4	a bit unlikely	
0.5	equally likely or unlikely	Your mum's new baby will be a boy
0.6	a bit likely	There will be an earthquake next week
0.7	quite likely	There will be a cyclone in December
0.8	very likely	
0.9	extremely likely	
1	certain	The sun will rise tomorrow morning

Explain that 0.5 is the same as a half and show them that it comes half way between 0 and 1 on your chart.

Explain that a 0.5 chance is like a probability of a half ($\frac{1}{2}$). Have them suggest other events with the probability of $\frac{1}{2}$, such as:

A coin landing on its head when tossed.

An egg hatching into a female chicken.

Ask if the pupils know any other ways to describe a probability of $\frac{1}{2}$? These might include a 50 / 50 chance, an even chance, or an equal chance.

Show them how the other figures in your table can be turned into fractions too. For example: 0.1 is the same as a fraction of $\frac{1}{10}$; 0.4 is the same as $\frac{4}{10}$ or $\frac{2}{5}$ and 0.9 is the same as a $\frac{9}{10}$ chance.

Topic 23: Probability

C2a

Write the following list of events on the board and ask pupils to discuss each one with a partner and rate them according to the above scale:

1. A child picked at random from the class was born on a Monday.
2. Your brother will grow to be two metres tall.
3. You will grow up to be a doctor.
4. You will pass the standard 6 exam.
5. You will live forever.
6. You will get married when you are older.

Move around the class as the children work and help them to discuss the events using the language of probability that they have learned.

When they have finished they should complete the activities in the Pupil's Resource Book on pages 60 and 61. These help them to explore the idea of an equal chance or the probability of $\frac{1}{2}$.

Answers

Activity A

Probability of 1	Probability of $\frac{1}{2}$	Probability of 0
<p>If I am alive I will be older this time next year</p> <p>A paw paw seed will grow into a paw paw tree.</p>	<p>My mum's new baby will be a boy.</p> <p>My teacher next year will be a woman.</p> <p>If I pick a card from the pack without looking it will be a black card.</p> <p>In a football match between Kolalae and Kossa, Kossa will win.</p>	<p>I will live for ever</p> <p>Oranges will grow on my banana tree.</p> <p>My engine will run without petrol.</p> <p>A melon seed will grow into a pumpkin.</p>

Activity B

1. c
2. b
3. b
4. c
5. a

Activity C

- 1a. I pick either a grey, white or brown stone.
- 1b. black
- 2a. $\frac{1}{2}$, Player 1 has the ace of spades
- 2b. 1, Player one has 26 cards
- 2c. 0, Neither player has the 6 of hearts.
- 3a. I pick a square or a triangle
- 3b. I pick a circle
- 3c. I pick a black shape
- 3d. I pick a white shape

Unit 17: Measurement

Support Activities

Heads and Tails Game.

How to play:

Have two pupils come to the front of the class to toss two coins.

All the players must stand up. Before each throw they must predict the result. They show their prediction as follows:

- a. Both hands on their head means two heads;
- b. Both hands on their buttocks means two tails; and
- c. One hand on their buttocks and one on their head means one of each.

If you are playing the game with a large group, you can make all those who predict wrongly sit down. The game continues until only one person is left.

Alternatively you can keep score with each child getting a point for every correct prediction, the winner is the first to score 5 points.

After playing, ask pupils to talk about the strategy they used to decide on their predictions.

They may be able to tell you that the best strategy is to always put one hand on their head and one on their buttock since the probability of this outcome is highest.

Extension Activities

Have pupils work in groups of three.

Each group will need three coins. They will experiment with tossing the coins repeatedly to find answers to the following questions:

- a. How many different combinations of heads and tails are possible?
- b. What is the probability of throwing each of these combinations, expressed as a fraction?
- c. Test your predictions by tossing the coins 40 times and recording your results on a bar chart. Compare their results with your predictions in **b** above.

Answers

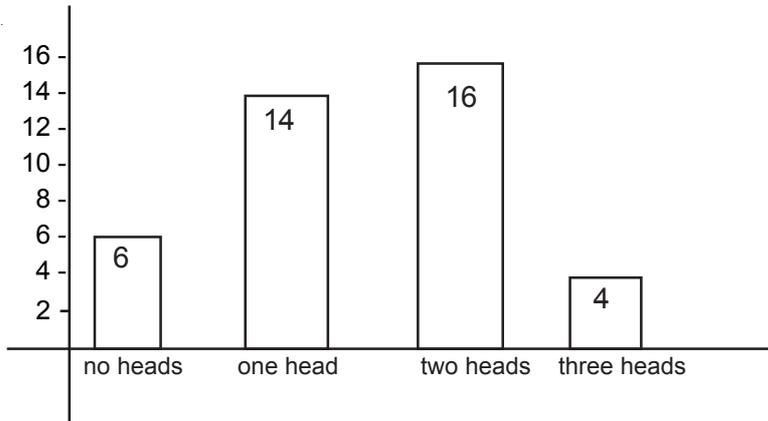
a. There are 8 different combinations as follows.

- | | | |
|-----------------------|-----------------------|-----------------------|
| 1. head / head / head | 4. tail / head / head | 7. tail / head / tail |
| 2. head / head / tail | 5. tail / tail / tail | 8. head / tail / tail |
| 3. head / tail / head | 6. tail / tail / head | |

b. The pupils should be able to explain that some of these combinations are the same as follows:

- | | |
|---------------------------------|---------------------------|
| 1. three heads (1 above) | probability $\frac{1}{8}$ |
| 2. two heads (2, 3 and 4 above) | probability $\frac{3}{8}$ |
| 3. one head (6, 7 and 8 above) | probability $\frac{3}{8}$ |
| 4. no heads (5 above) | probability $\frac{1}{8}$ |

c. Their bar chart might look something like the one below.



Check Up Page: Answers

- 1a. $\frac{1}{2}$
- 1b. $\frac{1}{6}$
- 1c. $\frac{1}{3}$
- 1d. $\frac{1}{2}$
- 1e. $\frac{2}{3}$
- 1f. $\frac{5}{6}$

2.

Possible Combinations	Number of Throws	Probability
Two heads	7	$\frac{1}{4}$
One head / one tail	14	$\frac{1}{2}$
Two tails	7	$\frac{1}{4}$

- 3a. $\frac{1}{12}$
- 3b. $\frac{1}{6}$
- 3c. $\frac{1}{2}$
- 3d. $\frac{1}{3}$
- 3e. $\frac{1}{4}$
- 3f. $\frac{5}{12}$
- 3g. green
- 3h. purple
- 3i. 0
- 3j. 1
- 4a. Coke
- 4b. An equal chance, an even chance or a fifty / fifty chance.
- 4c. Sprite $\frac{1}{6}$, Vimto $\frac{1}{4}$, Fanta $\frac{1}{12}$.

Aim:

To encourage pupils to devise non-standard ways of measuring time.

Sequence of objectives: To

1. devise non-standard ways of measuring time.

Rationale:

In this unit, the pupils will be involved in practical activities to devise non-standard ways of measuring time. The pupils will then use these to carry out timed investigations.

Some of the activities used in this unit are suggested in Standard 4, Unit 15 as alternative activities for the pupils to explore. In this objective need teachers to teach and make use the different clocks with the pupils.

T_{1a}**Materials**
clocks

It is important that suitable materials are provided for all the lessons to enable you and pupils to carry out these activities effectively. In this lesson the pupils will use the sun and their own bodies to measure time.

Begin the first lesson by talking about different ways in which people can measure and tell time and periods of time without using a clock.

Ask the pupils questions like these.

How do you know:

- when it is 6:00 am in the morning?
- when it is 8:00 am in the morning?
- when it is time for the school break?
- when it is the end of school?

Encourage the pupils to explain how they know these times. For example,

The pupils might know that when birds and other little creatures began to chirp and screech early in the morning then it is about 6:00 am .

When the sun is above a coconut tree then it is about 8:00 am in the morning.

When the sun's rays are at the doorstep of their classroom then it is 10:30 am and time for school break.

When they are tired and feeling hungry it is time for the end of school.

Continue with the discussion. Now ask the pupils to explain how they might be able to measure lengths of time not using a clock or watch. Encourage the pupils to come up with different suggestions, such as using:

- the sun's movement
- pulse rate or beat, etc.

Pupils have used these methods in Standard 4, so ask them to explain how these things might be used to measure time.

Topic 25: Measuring Time

C1a

Organise the pupils into groups of three. Give the pupils real clocks to use for this activity. If the school has enough real clocks then one should be given to each group.

If there are not enough real clocks then the pupils could use one that everyone can see at the front of the class.

Using the sun's movement, the pupils should try to measure these different lengths of time.

10 minutes

15 minutes

20 minutes

The pupils should decide how they could measure these lengths of time. For example they might be able to mark the sun's shadow against the wall or on the sand to show 10 minutes, 20 minutes, etc. They will look how far the sun has moved by marking the position of the shadow.

Now check your shadow timing. Use it to e.g. play a volleyball game 10 mins each way. Check with a real clock. Was it accurate?

Repeat this using a pulse rate. Record the number of beats for a length of time.

Encourage the pupils to assess and evaluate other methods of measuring time.

Are the methods useful? Can they give accurate measurements?

Is there any way to improve any of the methods? How?

Can you suggest any other other ways of improving the methods?

Ask the pupils to write a paragraph in their exercise books to explain their suggestions.

Get the pupils to write up their experiments in their exercise books too.

Tell them to write about:

- What they did.
- Did it work?
- How could they improve their method?

You could build up a word bank on the board. This will help them with their writing activity.

Encourage pupils to draw labelled diagrams too.

T1b

In this lesson you will help the pupils to make some non-standard apparatus for measuring time.

Materials

empty plastic containers
candles
sticks, water, sand,
matches, markers, sharp
knives, a real clock.

Begin the lesson by revising how they measured time in the last lesson using a clock.

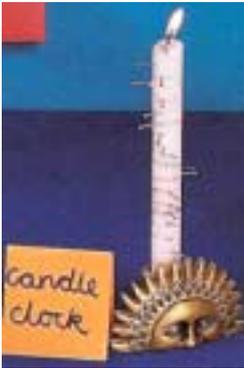
Now show the pupils all the materials you have collected. Ask them to come up with ideas of how these could be used to measure periods of time. Write up some of their ideas on the board.

Do not simply give the pupils the instructions and tell them to make each timer.

They may be able to describe some of the following ideas.

Unit 18: Time

1. candle clock



2. water clock



3. sand clock



C1b

Put the pupils into small groups. Give each group a complete set of materials for one of the timers 1, 2 or 3.

Tell them to use the materials to invent an apparatus for measuring time. Let them have time to discuss and experiment with different ideas. Go around each group and join in with their discussion. The instructions for making each one are in the Pupil's Resource Book on pages 65 and 66.

When the groups have successfully made their timer let them show their timer to the rest of the class and demonstrate how it works.

You could make a display of all the pupils' clocks. Let them evaluate them. Which one do they think works the best? Which was the easiest to make? How could the clocks be improved?

T1c

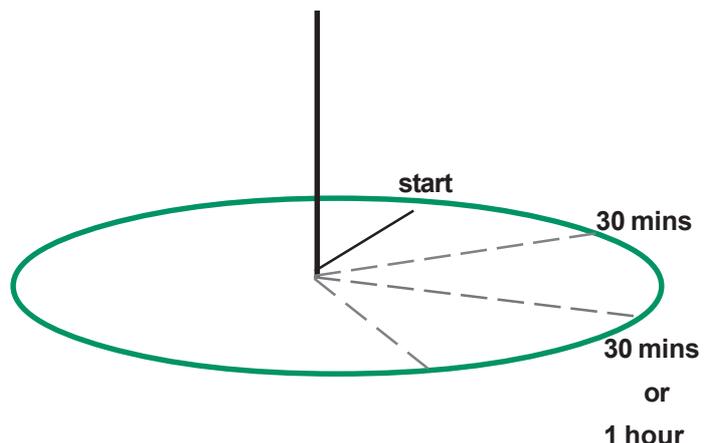
Take the class outside and make a **sun stick clock**. Choose a place that is exposed to full sunlight.

Draw a large circle on the ground, about 1m in diameter. Do this with a stick tied to the end of a piece of string 50cm long. Push a stick into the ground through the centre of your circle. Make sure it is vertical.

Watch the shadow of the stick as the sun moves. Mark the shadow after every 30 minutes checking a real clock for this.

Discuss the **sun stick clock** with the pupils. You could set this up and mark every 30 minute or one hour interval throughout the whole day to see how the time can be measured by the movement of the sun.

Materials
sticks, pencils,
paper
a clock,
compasses
string



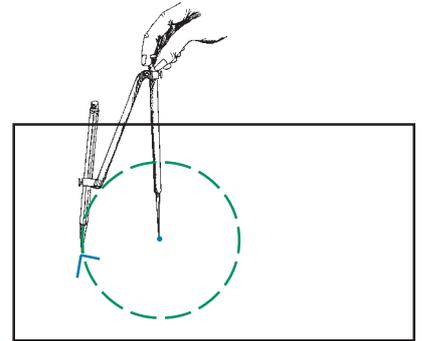
Topic 25: Measuring Time

C1c

In pairs the pupils make their own **sun stick clock** outside their classroom.

The pupils could use paper instead of using the ground outside the classroom. They will need to tape their paper to a flat surface to make sure that it doesn't move.

Help the pupils to draw their sun stick clock using a compass. Remind the pupils to put a mark after every 30 minutes, or every hour throughout the day.



At the end of the day let them display the chart on the classroom wall.

The pupils could use their sun stick clock to time their lessons during the next day.

Encourage the pupils to think of other ways to use their non-standard clocks. Ask them to evaluate and describe how the sun clock works and think of ways to improve it.

Tell the pupils to write a paragraph in their exercise book to explain how they made the sun clock and how they could improve it. Would the sun clock work every day? Why not?

T1d

Materials

Clocks made in lesson 1b
A Standard 3 Nguzu
Nguzu Story Book

Today the pupils will use the clocks they made in lesson 1b to measure time.

Look at the display of clocks in the classroom. Discuss each different apparatus and ask the pupils to explain how they work. Ask pupils to make suggestions about what they can be used for.

Devise some activities which use the different types of clock to measure time. For example:

Water Clock Ask pupils to measure how long they can hold their breath using the water clock.

Sand Clock Challenge pupils to walk from the classroom, to the school gate and back again in 3 minutes or less.

Candle Clock Use the candle clock to time the length of the next lesson.

Ask the pupils to suggest other activities too. In your discussion try to get them to select the most appropriate clock for each activity and to say why.

Unit 18: Time

C1d

Let the pupils work in groups. Give each group a clock. Try to have pupils work with different clocks to the ones they made.

Using their clock tell them to find out how long it takes to do the following activities.

1. Read the whole page of a Standard 3 Nguzu Nguzu story book or the whole book out aloud.
2. Complete the answers to a set of sums on the board.
3. Walk around the classroom.
4. Walk from one end of the school and back again.
5. Hop from one end of their classroom and back again.

Encourage the pupils to estimate first and then check their estimates using their clock.

Encourage the pupils to compare their results with other groups and discuss them, for example:

1. Are each groups results the same? If not why?
2. Are there ways in which they could make these experiments more precise?
3. Ask the pupils to write up a paragraph in their exercise book about what they have found at in this lesson.

T1e

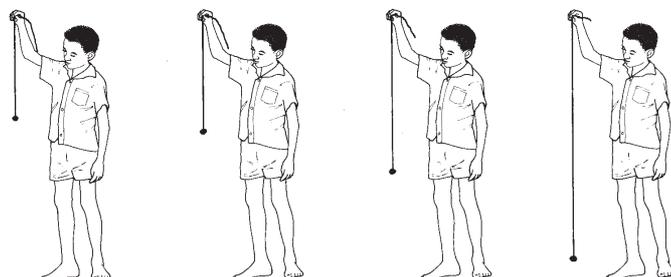
Materials
stone or fishing
sinker, strings of
different length
(1m - 3m)
clock

Show pupils how to make a pendulum. A pendulum can be made from a string and a weight.



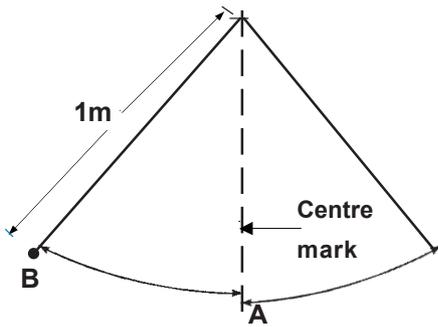
Make a selection of short and a long pendulum.

Ask for pupils to come and swing the pendula in front of the class while the other pupils watch. Ask them to observe which one swings fastest and which one swings slowest. Discuss their observations.



Make a pendulum exactly 1m long. Swing the pendulum in front of the class. Time how long each swing takes. Tell pupils that, each swing of a meter pendulum takes one second.

Topic 25: Measuring Time



Show them how to count each time the weight passes the centre mark, of its swing.

Now use the 1m pendulum to find out how many seconds it takes to do these things:

1. Run around the school building.
2. Hop around the school building.
3. Say the alphabet.
4. Say the 6 times table correctly.

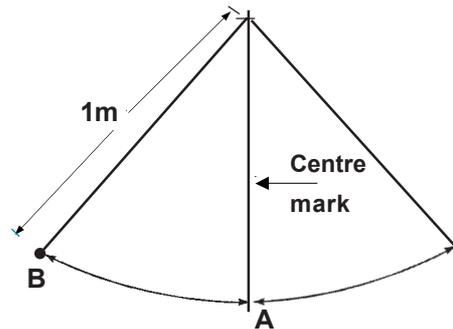
Try this with another pendulum with a different length, e.g. (1.5m or 2m). You may need to stand up high. Find out how these swing. Does each swing take the same amount of time?

C1e

In groups of three or four, let the pupils make their own 1 metre pendulum. Ask them to make up their own activities and find out how long it takes to do each activity.

Here are some suggestion of activities which they could use.

- counting their heart beats
- transferring water from one container to another
- writing their name
- singing a song



Can the pupils devise non-standard ways of measuring time and use them in a variety of activities?

Unit 18: Time

Support Activities

Pupils who are still having difficulty with the idea of non-standard measurement of time should have more practise using the apparatus you have made in this unit. Encourage them to discuss their ideas and activities as talking about these things will help them to understand them.

Encourage the pupils to compare the different clocks they have made.

Have the different types of clocks in the classroom as a display.

The pupils could work in groups of three and devise their own activities to use the clocks.

The pupils could make a written record what they have found out too.

Materials

sand clock, water clock, candle clock, pendulum swing clock,

Water Clock

Activities	My Estimated Time	Actual Time
Hop around the classroom		
Reading the Nguzu Nguzu story book (Kima the Giant)		

Encourage the pupils to compare their estimates and their actual readings and find out the difference.

Once the pupils have finished, encourage them to assess and compare their records and find out the following things.

Are the records the same? If not why?

Which activities takes the longest time? Why?

Which activities takes the shortest time?

Which clock do they think is the most accurate?

Encourage the pupils to write some sentences to describe their experiments after they have talked about it in their group.

Extension Activities

1. Graphing Results

The following activities allow pupils who are confident with non-standard measurement of time to extend what they have learnt.

Ask the pupils to collect the results of the activities they have measured using their clocks and present them in a graph. For example here is the data from their water clock activity.

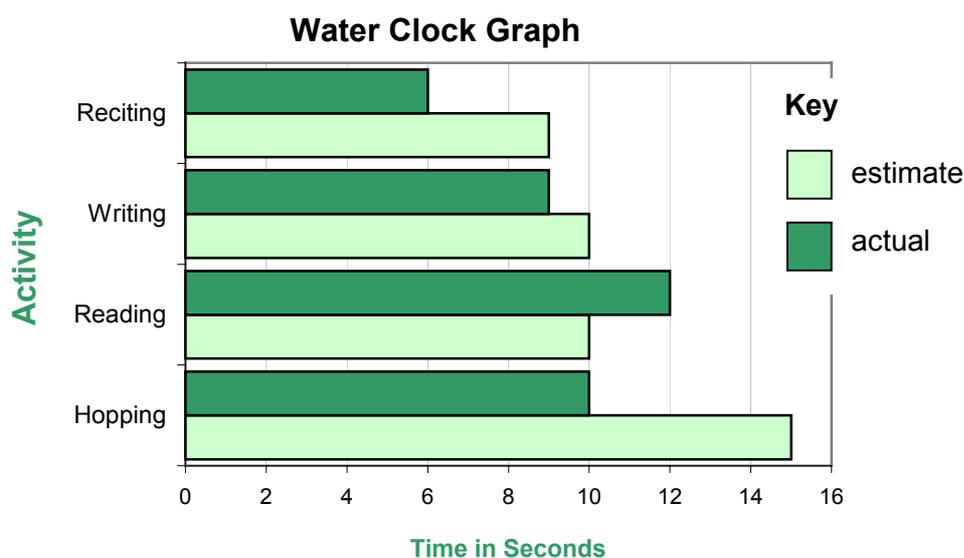
Materials

A4 plain papers, pencils, colours

Water clock

Activities	My Estimated Time	My Actual Measurements
Hop across the classroom.	15 seconds	10 seconds
Reading the first page of the story Kima the Giant.	10 seconds	9 seconds
Writing my name five times	10 seconds	9 seconds
Reading the alphabet	9 seconds	6 seconds

Have them design and draw a bar graph to show their results.



Encourage the pupils to evaluate their data. You could ask them to write some sentences to compare the data. Ask the pupils to display their graphs on the classroom wall. Which do they think is most accurate?

2. Accuracy Checks

Ask pupils to use different clocks to measure the same activity and to evaluate the accuracy of each type of clock. Have them write about their findings.

Check Up Page

There is no Check Up Page for this unit, because the practical skills it teaches are best assessed through observation of how the pupils participate in the activities.

You will need to assess the pupils as they work through the activities by observing them at work. Listening to them as they talk about their work and asking them questions about what they are doing.

These are the skills you should be looking for:

- Can the pupils follow written instructions?
- Do the pupils have a clear idea of what they are investigating or trying to find out?
- Can they organise and plan their investigations well?
- Can they evaluate and compare the different kinds of apparatus?
- Can they suggest improvements to the design?
- Are they able to use their timing device, and think of imaginative ways in which it can be used?

Money Topic 26: Computation of Money

Aim:

For pupils to use their number skills and knowledge in a practical way to solve money problems such as they might meet in everyday life.

Sequence of objectives:To

1. Solve problems involving the computation of money Including:
 - a) Addition of different amounts of money using estimation, mental and written addition;
 - b) Giving change using the counting on method and the subtraction method;
 - c) Multiplication of sums of money using repeated addition and multiplication;
 - d) Division of sums of money, using repeated subtraction and division;
 - e) Percentage reductions and discounts;
 - f) Average prices.

Rationale:

In this unit pupils will make use of many of the number skills that they have learned in Standard 5 Maths. These include mental arithmetic skills in addition, subtraction, multiplication and division; mixed computation skills; rounding off amounts to the nearest dollar; decimal notation; averages and percentages. All the work in this unit is based on real life activities. It should be easy for pupils to see the value of good number skills as they work through these money problems.

As well as using these to solve problems, this unit also provides an opportunity for the teacher to revise a range of number strategies taught in earlier units with the class.

T_{1a}

Revise how to add different prices to find the **total cost** of a number of items.

Using the shop cards you have prepared, show pupils three different cards from one store, for example:



Materials

- Shop cards for each of the following stores:
- Hardware
- Market
- Second Hand Clothes,
- Fisheries
- Handicrafts
- General Store
- Plenty of paper coins and notes

Ask if anyone can estimate the total cost of the three items. Then add up the prices to work out the **total cost** of all three. When a pupil gives the right answer ask them to explain **how** they did it. Go through the process together on the board, as follows:

Mango	\$1.50
Cucumber	\$2.00
<u>Pumpkin</u>	<u>\$4.00</u>
<u>Total Cost</u>	<u>\$7.50</u>

Remind the pupils that in money calculations, we add or subtract the cents column first and then the dollars. Remind them of the importance of the decimal point in writing down amounts of money. The decimal point always goes between the dollars and the cents.

Topic 26: Computation of Money

Do some more examples in the same way until you are sure that pupils can all add up the cost of three different items. You can vary the difficulty by choosing cards with larger amounts or with both cents and dollars for the pupils to add up. You can also ask them to add up more or less than three items to make the task harder or easier.

Try to make sure that everyone in the class has had a turn at adding up prices before moving on to the next activity.

Revise making up different amounts of money using notes and coins.

Show the pupils all the paper notes and coins and ask them the value of each. Write a number of prices up on the board and ask pupils to select coins and notes to make up the given amount. For example:

\$3.50	A \$2 note, a \$1 coin and a 50c coin.
\$10.25	A \$10 note, a 20c coin and a 5c coin.
\$12.10	A \$10 note, a \$2 note and a 10c coin.

And so on.

Remind the pupils that these amounts can usually be made up in a number of different ways. Have them suggest different ways in which we could make up the same amount. For example:

\$3.50	2x \$1 coins,, 5x 20c coins and a 50c coin.
\$10.25	2x \$5 notes, 2x 10c coins and a 5c coin.
\$12.10	A \$10 note, 2x \$1 coins and a 10c coin.

When everyone has had a chance to practice making up a given amount of money using coins and notes, move on to the pupil's activity.

C1a

Explain that, for this unit, pupils are going to set up some stores in the class for practical activities. Split the class into 6 groups and give out the cards for the following stores, one set to each group.

Hardware	Fisheries	General Store
Handicrafts	Market	Second Hand Clothes

Each store has 12 items for sale, each of which is marked with a different price. Ask the pupils to set up their store on a table or desk and decide who will be the storekeeper. If you have time you could ask them to think up a name for their store and make a sign board for the store.



The other pupils in the group will be the 'customers'. They will take turns to visit the store and ask the storekeeper for a number of items. The storekeeper has to add up the cost of the items and tell the customer the total cost. The customer then selects notes and coins to make up the exact amount to pay for the items. The other customers must check that both the amounts are totalled correctly and that the correct money is given.

Allow plenty of time for this activity. Each pupil must practise being both the storekeeper and a customer. As they play, move around the different stores and check that they are doing their addition properly.

Remind pupils to use mental addition where possible.

Unit 19: Money

T_{1b}

Materials
classroom stores
paper money

Revise two different ways of giving change from \$10 and extend this to giving change from larger amounts of money.

Choose a number of cards from the different stores with prices lower than \$10. Display these in front of the class.

Give one pupil a \$10 note and ask her/him to choose one card. Explain that the item costs less than \$10 so the pupil must have some **change**. Ask the pupils to explain how they will work out how much change to give.

Pupils learnt two different methods for doing this in Standard 4. Revise each method as follows:

Giving change by subtracting:

Subtract the cost of the item (e.g \$5.50) from the amount of money given (\$10.00).

$$\begin{array}{r} \$10.00 \\ - \$ 5.50 \\ \hline \$ 4.50 \end{array}$$

Giving change by counting on:

Starting with the cost of the item, (\$5.50) **count on** in coins and notes, until you reach the amount of money given (\$10.00).

\$5.50 add 50c is \$6, add \$2 is \$8 dollars and another \$2 makes \$10.

Practice each method with the class. Although the second method may be harder to understand at first, it is easier to use for larger amounts of money, because it relies less on mental arithmetic. Therefore, encourage the pupils to use the counting on method.

Do some more examples together giving change from \$10, \$20 and \$50.

Do some examples in which the pupils have to add the cost of two items and work out the change from \$10, \$20 and \$50.

C_{1b}

Allow the pupils time to practice giving change using their classroom stores. Have them work in a different store today to the one they were in yesterday. If some pupils are finding it difficult to calculate the change, start them off in the market store where prices are lower and easier to work with. Pupils who are already confident can deal with the larger amounts in the other stores.

Again allow the pupils plenty of time to play and make sure everyone has a turn at being storekeeper and calculating change. Move around the groups to check the strategies the pupils are using for giving change.

When they have had enough practice ask the pupils to turn to pages 68, 69 and 70 in the Pupil's Resource Book and complete the activities. These activities give more practice in adding up different amounts, making up given amounts from coins and notes and working out the correct change. Explain the activities clearly and do some examples together before the pupils start work.

Topic 26: Computation of Money

Answers

Note: Question 3 in Activity A and B has a number of different possible answers. Check each pupil's work individually.

Activity A

1a. \$4.10 2a. \$4.00 2e. None
1b. \$8.95 2b. \$3.50
1c. \$15.75 2c. \$8.00
1d. \$12.50 2d. \$1.50

Activity B

1a. \$18.30 2a. \$1.70
1b. \$19.10 2b. 90c
1c. \$13.70 2c. \$6.30
1d. \$18.80 2d. \$1.20
1e. \$12.50 2e. \$7.50

Activity C

1a. \$35.95 2a. \$4.35
1b. \$46.90 2b. \$10.90
1c. \$53.60 2c. \$48.90
1d. \$51.05 2d. None
1e. \$69.10 2e. \$45.10

T_{1c}

In this activity pupils will learn important vocabulary associated with money which will help them to talk about and solve money problems.

Pupils need to know and use the terms in the box.

You will teach the meaning of each of these terms by discussing problems orally with the class. They will then practise using them in practical activities using their class stores.

Use the following questions to introduce and explain the new vocabulary. Encourage pupils to talk about and explain their answers.

Money Vocabulary

total cost
how much altogether?
change
exact amount
cheaper / cheapest
more expensive / most expensive
enough money
price / cost
buy / sell

1. Have the pupil's look at the lunch menu on page 68 of the Pupil's Resource Book and discuss the following questions:
 - a. Which is the **most expensive** meat dish?
 - b. Which is the **cheapest** meat dish?
 - c. Which is **cheaper**, rice or kumara?
 - d. Which is **more expensive**, bush lime or a soft drink?
 - e. If you had \$10 would you have **enough money** to buy a soft drink and an ice cream?
 - f. If you had \$20 would you have **enough money** to buy beef with chips, a soft drink and an ice cream?

Note: Rounding amounts off to the nearest dollar is a useful strategy for a quick check of whether you have enough money to buy a number of items.

Unit 19: Money

2. Have them turn to the price list for tools on page 69 of the Pupil's Resource Book and discuss the following questions:
- Which is the **most expensive** item on the list?
 - Which is the **cheapest** item on the list?
 - What is the **total cost** of a set of three Phillips screwdrivers?
 - Is \$20 **enough** to buy a claw hammer?
 - Which is the **cheapest** type of saw available?
 - What notes and coins would you need to pay the **exact amount** for two kilos of 2-inch nails?

C_{1c}

Have pupils work in groups with their store cards. They should work in a different shop today.

Write some question starters on the board and ask them to practise asking each other these questions about the items in their store. Move around the groups and help them to form and answer the questions properly. Check that they are practising the new vocabulary they have learned.

Question Starters

- Which is cheaper ... ?
- Which is more expensive ... ?
- Is \$20 enough to buy ... ?
- Is \$50 enough to buy ... ?
- What is the total cost of ... ?

T_{1d}

In this activity the pupils will revise and practice two strategies for multiplying sums of money. These are multiplication and repeated addition.

For example: If one mango costs \$1.50 find the cost of three mangoes.

Repeated Addition

$$\begin{array}{r} \$ 1.50 \\ + \$ 1.50 \\ + \$ 1.50 \\ \hline \$ 4.50 \end{array}$$

Multiplication

$$\begin{array}{r} \$ 1.50 \\ \times \quad 3 \\ \hline \$ 4.50 \end{array}$$

The cost of 1 mango
The number of mangoes

Emphasise to the pupils that as they begin to work with larger and more complicated sums of money, multiplication is the best method to use.

Demonstrate this on the board using these and other examples:

- If one heap of kumara is \$2.00 how much will 5 heaps cost? **(\$10)**
- If a worker is paid \$10 per hour, how much will she be paid for a 7-hour day? **(\$70)**
- If meals are \$15 per plate how much will 4 plates cost? **(\$60)**
- If the Solomon Star costs \$3 per day, how much does it cost for one week's papers? Remember that there is no paper on Saturday or Sunday. **(\$15.00)**

Topic 26: Computation of Money

C_{1d}

Allow pupils time to practise multiplying amounts of money using the classroom store cards. They should work in groups and ask each other multiplication problems based on the items in their store. For example:

1. If one coconut shell bowl costs \$3.50, how much will a set of 6 cost? **(\$21)**
2. If one tin of Solomon Blue costs \$2.20, how much will a case of 24 tins cost? **(\$52.80)**
3. If one kilo of size 2 nails costs \$15, how much will 5 kilos be? **(\$75)**
4. If 500g of prawns cost \$60 how much for 2 kilos? **(\$240)**

T_{1e}

In this activity pupils will revise division of sums of money, using different strategies for different types of problem. Work through the following examples with the pupils to demonstrate the different methods.

1. If a case of tinned fish containing 12 tins costs \$24.00, how much does one tin cost?

The strategy here is **division**.

The total cost	\$24.00
Divided by the number of tins	12
Gives the cost of one tin	\$2.00

2. If I have \$20 how many loaves of bread, costing \$5 each, can I buy?

The **repeated subtraction** strategy may be used here.

Start with	\$20.00	\$20.00 - \$5.00
Buy one loaf costing \$5, leaving	\$15.00	\$15.00 - \$5.00
Buy a second loaf costing \$5 leaving	\$10.00	\$10.00 - \$5.00
Buy a third loaf costing \$5 leaving	\$ 5.00	\$5.00 - \$5.00
Which is enough for a fourth loaf		\$0.00

3. A group of 10 panpipers earned \$100 for playing at the school function. How much will each boy get?

This can be done by **sharing**.

Give each boy five dollars until all the money is used up:

Boy 1	Boy 2	Boy 3	Boy 4	Boy 5	Boy 6	Boy 7	Boy 8	Boy 9	Boy 10	Total
\$5.00	\$50									
\$5.00	\$100									

Each boy has received a total of \$10.00

Unit 19: Money

The **division strategy** is most useful. Encourage the pupils to use this to apply to some division problems. Discuss these as a class, for example:

1. If a 10 kilo bag of rice costs \$60.00 how much would 1 kilo cost? **(\$6)**
2. If the total cost of lunch for 5 people is \$125.00 How much does each person's lunch cost? **(\$25)**
3. If 5 women work together to brush the playing field and the school pays \$120 for the job. How much will each woman be paid? **(\$24)**
4. If a man is paid \$56.00 for a 7-hour day how much does he earn an hour? **(\$8)**

Remind pupils that they should use mental strategies where possible instead of always writing the sums down. Encourage them to explain the strategy they have used to work out the answer as well as giving the answer.

Prepare some more examples and discuss these with the pupils.



Have the pupils complete the activities in their Pupil's Resource Book on pages 70, 71 and 72. These activities give the pupil's practice using the new vocabulary they have learned and combine a number of different money calculations including multiplication and division, finding the total cost and giving change.

These are problem-solving activities, which means that the pupils first have to analyse the problem, then work out a strategy to solve it and then they have to apply their strategy to find a solution. Each stage of this process is just as important as getting 'the right answer'. It is very important, therefore, that pupils discuss their work as they go along. They should also write down their working out in their exercise books.

As they work, move around the class and help them to talk about each problem and explain their strategy for solving it.

Answers

Activity A

1. \$69.60
2. \$6.00
3. \$3.50
4. 3 tins. 20c left
5. \$320.40 (2 cases + 2 tins)
6. 3

Activity B

- 1a. 17 tins, Special is the best you can afford for less than \$100, 17 tins at \$5.20 cost \$88.40
- 1b. \$4.80
- 1c. \$7,027.20
- 2a. 250mL \$8.80, 500mL \$8.00, 1L \$7.80, 2L \$7.00
2L is the best value for money.
- 2b. \$52.80. 24 x 250 mL is the same as 6L. Buy 3 x 2 litre bottles for a total cost of \$42.00

Activity C

1. \$385.50
2. a. \$210.00 b. The 40hp canoe is cheaper at \$155.63 per person.
3. a. 50% to Allan, 30% to Peter and 20% to Ben
b. Allan \$1,200, Peter \$720 and Ben \$480.
c. \$40.00
4. a. \$85.00 b. 9 (3 teachers and 6 pupils)

Topic 26: Computation of Money

T_{1f}

Materials

Nguzu Nguzu Special Offer Cards x6
Plenty of paper coins and notes

Tell the Pupils that today is “**Special Offer Day**” in their classroom stores. Explain that some stores have special offers to encourage people to buy their goods. Show the class the discount cards you have prepared. Explain what each one means and discuss it in relation to examples from the classroom stores, as follows:



In the clothing store, for example, this means that dresses that are usually \$30 each would be sold for \$15. Ask some questions to see if pupils can apply the ‘**half price**’ rule to other items.



This means that there is a **percentage reduction** on all prices. For example if the hardware store usually charges \$15 per kilo, they will now charge 10% less $\frac{10}{100} \times \$15 = 1.50$, sale price = \$15.00 - \$1.50 or \$13.50.



A 20% reduction on crayfish at \$100 per kilo is $\frac{20}{100} \times \$100$ or 20. So the crayfish would be reduced to \$80 per kilo.

Practice working out a 10% or 20% reduction on other items in different stores. Refer pupils back to the work they did in Unit 16 on percentages, if they need to revise how to work out the percentage discount.



‘**Buy one get one free**’ is an offer that stallholders might use in the market to get rid of all their fruit at the end of the day. For example: A mango usually costs \$1.50, but if a person buys one mango for \$1.50 they will get an extra one free. The average cost per mango works out at 75c.



‘**Buy two get one free**’ is similar. This time you would need to buy two mangoes at a total cost of \$3.00 to receive a free one, so the average cost per mango would be \$1.00.

Practice working out the unit cost of other items when there is a buy one/ two get one free special offer.



The last one offers a fixed reduction (\$10) when the customer spends \$50 or more. For example if you buy 5 metres of nylon rope at a total cost of \$60, you would get a \$10 **discount** leaving only \$50 to pay.

In your discussion of these special offers you will teach the pupils some new vocabulary. Check that they understand the words in the box on the right.

More Money Vocabulary

better value / best value
sale
reduction
discount / percentage discount
cut price / price increase
special offer
average price

Unit 19: Money

C_{1f}

Have pupils work in groups using your classroom store cards. Give each group one of the special offer cards and ask them to work out the special offer cost of two or three items in their store. They should discuss their work with each other.

Move around the groups and talk about the discounts using the new vocabulary from the box. You could ask questions such as these:

1. How much for ten tins of Solomon Blue if there is a 20% reduction sale?
2. If you bought a spade and a hand saw (total cost \$182.49) what would the total cost be with a 10% discount?
3. If pomelos are on sale, buy one (for \$3) get one free. How many pomelos can you get for 12 dollars? How many could you get if they were 'buy two get one free'?
4. How much would a hat (\$9.50) cost in a half price sale?
5. If your total bill in the supermarket was \$108.50. How much would you have to pay if they had a 'spend \$50 get \$10 off' special offer?

If pupils need more practice, swap the special offer cards around and have them work out other discounts.

T_{1g}

In this activity pupils will learn to find the average cost of a number of items. Revise the method for finding an average from unit 6 as follows:

Add up the total cost of all the items and divide this total by the total number of items.

Where the price of an item varies from time to time it is useful to be able to work out the average cost. Draw the following table on the board. The table shows the cost of water, electricity and telephone bills for the first 5 months of the year for one house.

	January	February	March	April	May
SIEA	\$41.20	\$36.00	\$38.55	\$29.30	\$31.25
SIWA	\$63.00	\$68.50	\$71.25	\$59.60	\$55.25
Telekom	\$101.20	\$77.40	\$125.20	\$66.95	\$98.75

Use the information in the table to demonstrate how to calculate the average cost of each bill as follows:

SIEA	Add up the total amount for the 5 months	\$41.20 \$36.00 \$38.55 \$29.30 <u>\$31.25</u> \$176.30
	Divide the total by the number of months (5)	\$35.26 is the average per month

Topic 26: Computation of Money

Repeat the process to find the average cost of water and telephone bills for the 5 months.

Explain that the average figure can be used to estimate the total annual bill, by multiplying by 12 (months).

Give the pupils more practice calculating average prices by working through some more examples on the board. Some suggestions are included below:

	QQQ	Lee Hong	Sunflower	Kim's Store	Spendless
1kg	N/A	\$4.50	\$6.10	\$5.20	\$5.75
10kg	\$55.00	\$50.00	\$59.95	\$57.25	\$58.50
20kg	\$96.00	\$98.50	\$110.00	\$105.00	\$106.50
Cost of rice in local stores			N/A means Not Available		

Use the information in the table to calculate the average cost of 1kg, 10kg and 20 kg of rice.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Kimi	\$290	\$320	\$250	\$120	\$140	\$200	\$195	\$190	\$195	\$300	\$320	\$120
Leana	\$150	\$150	\$150	\$120	\$100	\$110	\$120	\$140	\$200	\$150	\$150	\$90
Piu	\$350	\$290	\$320	\$250	\$300	\$340	\$250	\$300	\$340	\$390	\$380	\$295
Tahi	\$95	\$150	\$90	\$88	\$85	\$120	\$100	\$110	\$105	\$90	\$85	\$75

Use the information in the table to answer the following questions:

1. Which person had the lowest average salary for the year? (**Tahi**)
Who had the highest? (**Piu**)
2. In which month was the average salary of all 4 workers highest?
(**November**)
3. In which month was it lowest? (**April**)

Answers:

Average Salaries:

Kimi	\$ 220.00
Leana	\$ 135.83
Piu	\$ 337.08
Tahi	\$ 99.42

C1g

Have the pupils turn to pages 72, 73 and 74 in their Pupil's Resource Book and study the activities together. These are problem-solving activities requiring a combination of the different computation skills pupils have revised in this unit. Go through some of the problems together. Do not work out the answers, instead, just talk about different methods for solving each problem.

Have the pupils work in pairs and encourage them to talk to each other about the strategies they will use to complete the problems. Working out how to tackle the problem (the method) is as important as being able to find the right answer.

Move around the class and help students as they work. If they are having difficulty try not to tell them "how to do it". Instead ask them questions about the problem that will help them to work out a strategy for themselves.

Remind them that problem solving is a challenge. They can approach it in a number of ways. There are some tips in the Pupil's Resource Book on page 72 to help them. Discuss these before they begin.



Can all the pupils solve problems including the computation of money?

Unit 19: Money

Answers

Activity A

1. The two-kilo pack, which works out at \$5.50 per Kilo.
2. \$28.00
3. 20. There would be 1 dollar left over
4. 12 x 500g (\$46.80) x5 2 kg packs contain more washing powder.
5. \$143 dollars (13 x 2kg bags)

Activity B

1. A fork and a shovel.
2. A frying pan, a utensils set and a serving dish. (Total \$85.85) Change \$14.15.
3. He can use x2 6 blade frames at a cost of \$300 per window or one eight and one 4 blade frame at a cost of \$284. Difference in price is \$16 per window.
4. He can buy 2x 8 litre and 1x 4 litre tins at a total of \$1,040. Average cost per litre is \$52 dollars.
5. \$104.00

Activity C

1. x4 8 blade + 7 blade, (for x4, 15 blade windows) x2, 8 and x2 4, blade (for the 12 blade windows and x2, 4 blades (for the 4 blade windows). Total cost \$2,144.
2. Wasi needs a total of 92 louvre glasses, he needs to buy 62 @ \$6.50 for a total cost of \$403. He will receive 31 free making a total of 93.
3. Total cost after 25% discount \$1,990.90 (Note cents are rounded to the nearest 5) Total saving is \$663.60.
4. **a.** For a 12 blade window, ITA is cheapest, 8 blade + 4 blade at \$284
For a 15 blade window, LKP is cheapest, 10 blade + 5 blade at \$329
b. Average costs: LKP \$23.32 per blade, ITA \$24.45 per blade.
c. ITA has the best value louvre glass – buy two get one free at \$6.50 each works out at \$4.33 per glass LKP price (10 for \$50) is \$5 per glass.

Support Activities

If pupils are finding the problem solving approach to the computation of money difficult, you should provide them with much **more practice**.

Use paper coins and notes or real money where possible to help them count out the sums of money they are dealing with, as this will make the problems more meaningful.

Devise some **simpler problems**, for example:

1. If Johnson spends \$3.00 on bus fares to go to school each day, how much will he spend in a week?
2. If Bill has \$25 to spend on school lunches each week, how much can he spend every day? How much will he need for 2 weeks?
3. If Juliette buys a bundle of firewood for \$15, how much change will she get from a \$20 note? How much from a \$50 note?
4. If all items in the store are half price, how much will I pay for a toy boat priced at \$30.00? What about a bicycle priced at \$200?
5. If three pencils cost \$1.50, how much is one pencil? How much are 5 pencils?

Problems which require **repetition of the same strategy**, or using the same figures more than once are good because they help pupils to feel more confident with using the information they have found out.

You could use the poster Problem Solving Tips to help the pupils to select a suitable strategy. Talk through each strategy and help the pupils to explain their ideas about how to solve the problem.

Extension Activities

Write some **more difficult problems** on the board for pupils who are confident with the problem solving approach and leave them to work on their own. For example:

1. Jenny's monthly salary is \$1,995.00 After every year of work she receives a pay rise of 5%. What will her annual salary be after she has worked for 5 years?
2. \$240 is shared between Kimo, Judith and Jilly. Kimo receives twice as much as Judith and Judith receives three times as much as Jilly. How much does each person get?
3. The entrance fee to the Museum is \$3.50 for children, \$7.75 for adults. In one week the total money collected was \$575.50. How many adults and how many children had visited in total?

You could also set them some **investigative tasks** such as the following:

1. At a school fundraising event parents and visitors were asked to place a dollar contribution on the floor to make a chain of money all around the school hall. If the school hall measures 20m x 30m, how much do you think would be raised
 - a. If the chain filled only one side of the hall?
 - b. If the chain went right around the hall?
 - c. How long would the chain have to be in metres to raise \$1,500?
 - d. What would happen if the contribution was 20c not \$1?
2. Find out how many different ways you can make up a dollar using 5c, 10c, 20c and 50c coins.
3. How many different ways can you make up \$50 using \$2, \$5, \$10 and \$20 notes?

Let the pupils plan their own strategies and extend the problems to find other interesting facts and statistics.

Check Up Page: Answers

1. \$1,884.55
2. a. \$36.00 b. \$23.00 c. \$7.80 d. \$4,153.20
3. a. 1.5 metres wide at \$10.75 per metre. b. \$26.25,
c. \$6.00, d. 12m of 1m cloth and 6 m of 1.5 m cloth.
4. a. \$63.00, b. \$45.00, c. \$75.00,
5. a. Lowest Ben, \$1.70, Highest Mr. Ramo, \$4.85. b. \$15.85 c. \$81.00 d. \$5,412.00

Aim:

For pupils to use number co-ordinates to locate points on maps and graphs.

Sequence of objectives: To

1. locate points on a map using number co-ordinates.
2. find points on a graph using 'x' and 'y' axes.

Rationale:

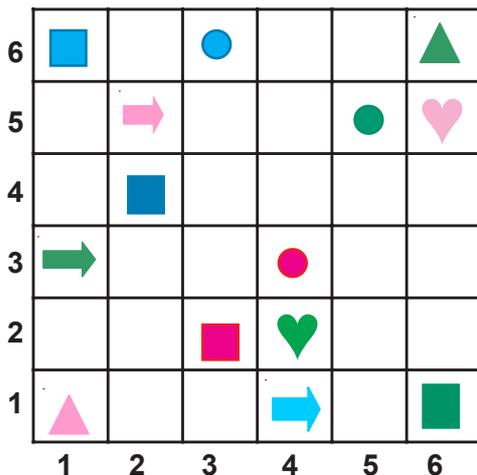
These location skills will enable pupils to read maps as well as interpret graphs. Both of these skills will be useful to them in studying other subjects such as social studies as well as in real life situations.

T1a

Materials

Nguzu Nguzu
Location Grid Poster
and Shapes.

Revise the use of number co-ordinates to locate an object in a grid. You could draw this example on the board or you could use the Nguzu Nguzu Location Grid Poster.



Tell the pupils that, on this grid, both columns and rows are numbered.

Revise how to use the numbers to identify the position of different shapes. For example:

The position of the blue square is 2 along and 4 up. This position is called (2,4).

Ask the pupils to tell you what is found at other positions on the grid. For example:

- (1,3) **green arrow**
- (4,2) **green heart**
- (3,6) **blue circle**
- (5,5) **green circle**
- (6,6) **green triangle**
- (2,5) **red arrow**

Ask the pupils to use the numbers to tell you the positions of the following:

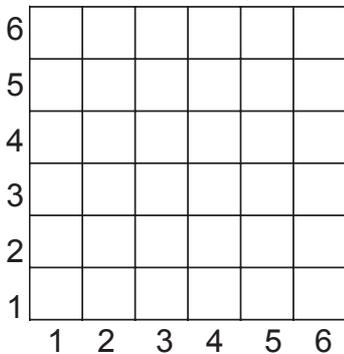
- red square **(3,2)**
- red triangle **(1,1)**
- blue circle **(3,6)**
- blue square **(1,6)**
- red circle **(4,3)**
- red heart **(6,5)**
- blue arrow **(4,1)**

Provide plenty of practice using your grid until all the pupils are confident at identifying positions on the grid.

Unit 20: Shape

C1a

Have pupils play Noughts and Crosses in pairs.



They will need a grid like this and two different coloured dice say one white and one red.

The white die gives the or horizontal value and the red die gives the vertical value.

How to Play

Each player in turn throws the two dice and marks the point shown by the numbers on the dice or on the grid.

One player marks with a cross. X

One player marks with a nought O

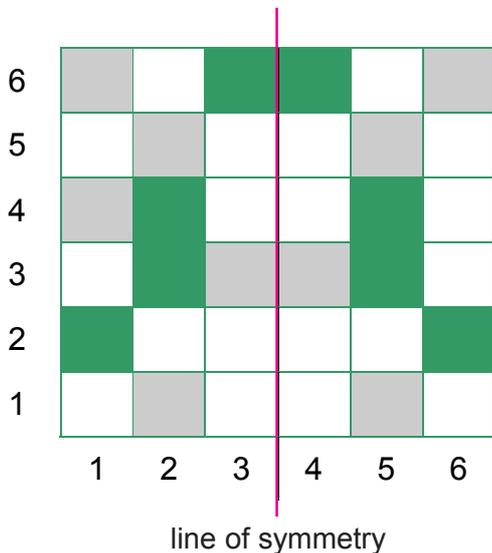
The winner is the first player to mark any three crosses or any three noughts in a straight line. After pupils have had time to play the game ask them to complete the activities in the Pupil's Resource Book on page 77. These include practical work with a partner so you will need to organise the class into pairs.

Answers

Activity A

1. The best player usually wins.
2. Check each pupil's work.

Activity B



Topic 15: Location

T1b

Materials
squared paper

Draw this grid on the board. Ask the pupils to describe it. Is it the same kind of grid they have worked with before? How is it different?

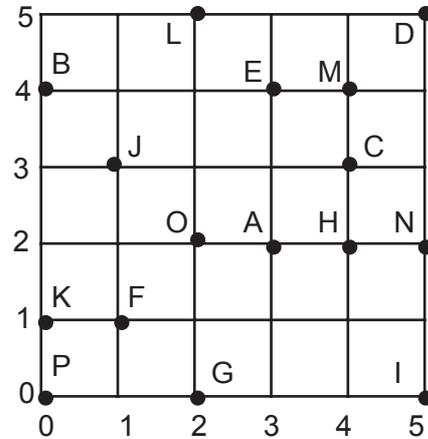
Explain to the pupils that in this grid it is the **lines** that are numbered. Both sets of lines are marked 0 to 5. Tell them to find **A** on the grid.

Explain that **A** is the **point of intersection** of the line 3 horizontal and 2 vertical.

Use the correct mathematical language.

The point **A** has a **co-ordinate (3,2)**.

The point **B** has a **co-ordinate (0,4)**.



Build up a list on the board with the class. Write the co-ordinates of all the marked points like this:

A (3,2) **B (0,4)** **C (4,3)** and so on.

C1b

Ask the pupils to work through the activities in the Pupil's Resource Book on pages 78 and 79. This will reinforce their understanding of the use of number co-ordinates. The pupils could do these activities in pairs. They should discuss their work. This will help them to understand the concept of co-ordinates more fully.

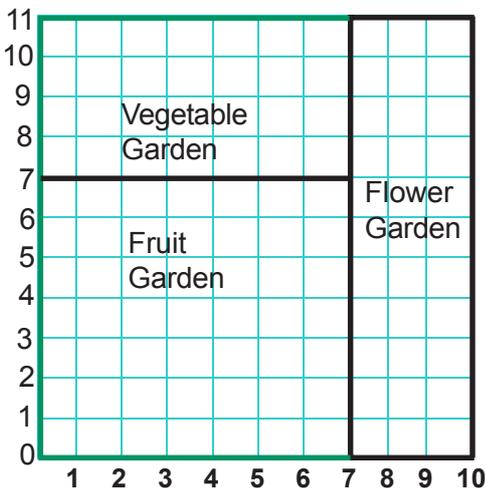
Answers

Activity A

1. a. (1,1) b. (6,3) c. (1,3) d. (7,3) e. (4,0) f. (5,1)
 2. a. Lucky Turtle b. Star c. Sundown d. Bonito e. Noah f. Dawn
 3. a. 4 km b. 3 km 4. 6 km 5. Rainbow

Activity B

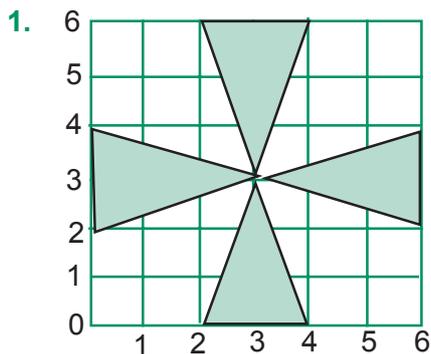
1. a + b



- c. Vegetable garden
(0,7) (7,7) (7,11) (0,11)
 2 a. perimeter 28 m area 49 m²
 b. perimeter 28 m area 33 m²
 c. perimeter 22 m area 28 m²

Unit 20: Shape

Activity C



Pupils should have copied the first design.
This is the second one.

- 2a. yes - larger - same co-ordinates but doubled
b. doubled c. (3,3)

T1c

Materials
squared paper

Remind the pupils that a pair of numbers or letters that show the position of a point are called **co-ordinates**.

The first number is always the number on the horizontal axis or the **x co-ordinate**.

The second number is always the number on the vertical axis or the **y co-ordinate**.

The *x* and *y* co-ordinates show an exact position. This is the point where the two lines intersect or cross each other.

Draw a simple map of an island on the board. Explain that the letters show the location of villages.

Draw and label the grid lines and the axes.

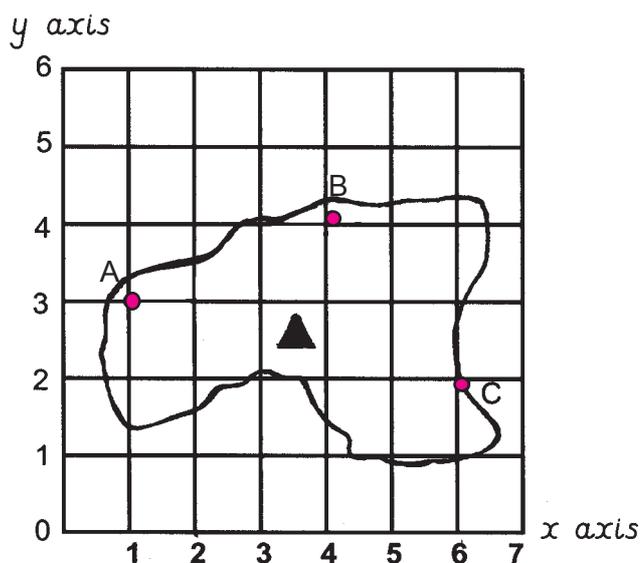
Point out that the numbers on the horizontal axis are the **x co-ordinates**.

Point out that the numbers on the vertical axis are the **y co-ordinates**.

Ask the pupils to identify the co-ordinates for **A**, **B** and **C**.

A (1,3) B (4,4) C (6,2)

Ask them to come to the board and mark villages at the following points (3,3), (6,3), (2,2).



C_{1c}

Go through finding places on a map using number co-ordinates. If you have maps or atlases in your classroom use these to let the pupils practice this skill. You could have prepared some more examples by drawing some simple maps on chart paper before the lesson.

There are some exercises in the Pupil's Resource Book on pages 80 and 81. You could encourage the more able pupils to draw maps of their own using numbered grid lines. Let them work with a partner to identify points on their map using number co-ordinates.

Answers

Activity A

- | | | |
|-------------------|------------|-----------------|
| 1 a. Museum | 2 a. (3,3) | 3. Lini Highway |
| b. ANZ Bank | b. (2,4) | 4. Market |
| c. Iririki Island | c. (3,4) | 5. Post Office |

Activity B

- | | | | |
|----------|-------------------|-----------|----------------------------------|
| 1. Tanna | 2. Banks & Torres | 3. Santo | 4. Pentecost |
| 5. (6,6) | 6. (5,11) | 7. (10,2) | 8. North of (6,7) South of (6,8) |



Can all the pupils locate points on a map using number co-ordinates?

T_{2a}

Materials
cm² paper.
a fly

Use centimetre squared paper for these activities if you have some. If the pupils have squares in their maths exercise books they can use these. If the pupils have lined paper let them practice drawing a squared grid. They should be able to do this quickly.

Remind the pupils that axes are drawn when we draw graphs. Axes are also drawn to make grids. These need to be labelled carefully. Remind the pupils that the vertical axis is the **y axis** and the horizontal axis is the **x axis**.

Tell the pupils to notice that the *x* and *y* are usually written in cursive style.

Remind the pupils that **axis is singular** this means one.

Axes is plural this means more than one.

Draw a 5 x 5 co-ordinate grid on the top right of the board to allow for extension. You will need to use something which will stick to the board. Tell the pupils that they are to imagine that it is a fly.

Stick the 'fly' at a point on the grid, e.g. (5,3). Ask the class to tell you where it has landed.

They should describe its position using two co-ordinates. The first co-ordinate is the number on the horizontal axis or *x* axis (5) and the second co-ordinate is the number on the vertical axis or *y* axis (3). Write '(5,3)' on the board.

Remember **along** then **up**. To help pupils remember that you always say the horizontal coordinate first you can tell them to use the following rhyme as a reminder

"Along the beach and **up** the coconut tree".

Choose pupils to practise stating the co-ordinates as you move the 'fly' to different positions.

Unit 20: Shape

C2a

Some pupils may need extra practice in using co-ordinates and drawing grids.

You could give those pupils some more examples of joining co-ordinates on small grids to practise before asking them to complete the activities in the Pupil's Resource Book on pages 81 and 82.

In the exercises in the Pupil's Resource Book all the pupils must start with Activity A. Those who are more able will go on to Activity B. They will need to work with a partner to discuss their results.

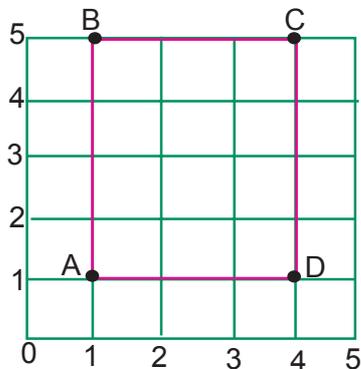
The most able pupils can go on to complete Activity C. If the pupils are able to work with squared paper then they will complete the exercises more quickly. If they are having to draw out the grids, they may need more than one lesson to complete these activities.

Answers

Activity A

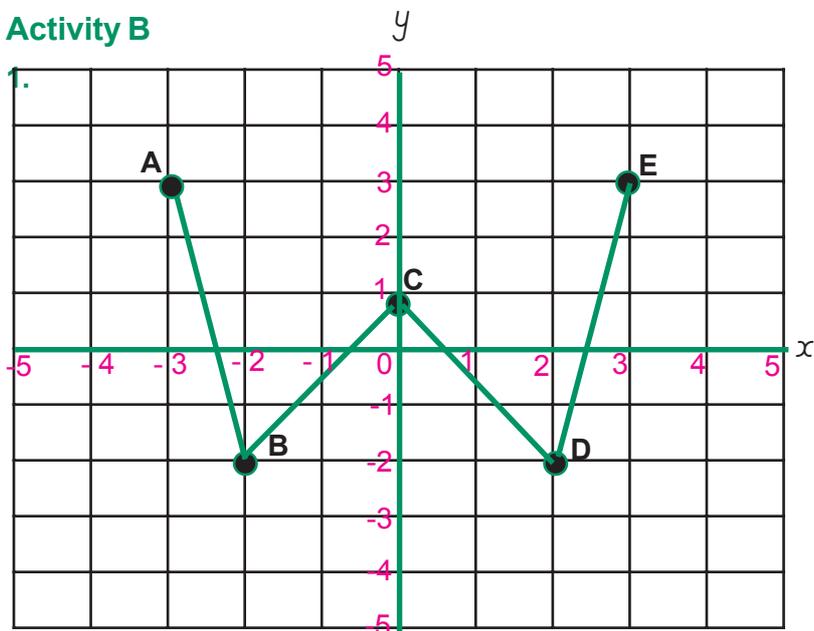
- 1. P (5,4)
- Q (4,1)
- R (2,2)
- S (1,0)
- T (0,3)

2.



4. (4,1)

Activity B

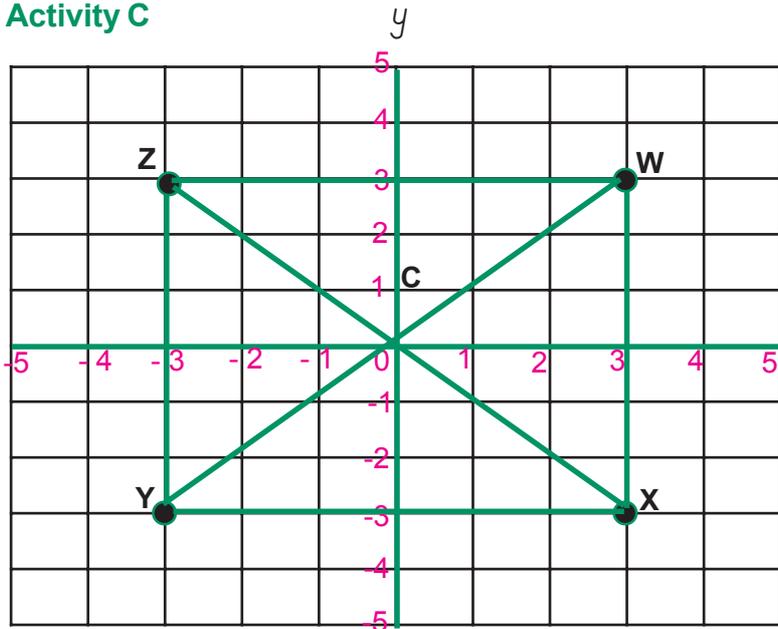


Answer to 1 is the W plotted on the grid lines.

2. W

Topic 15: Location

Activity C



1. 2. This grid and square plotted with Z as marked.
3. (-3,3)
4. a. (0,0) b. (origin)

T_{2b}

Negative Number Co-ordinates

Extend the horizontal axis on your grid to the left. Mark five points along the line.

Point to the first mark and ask the pupils to suggest how to label this? **(-1)**. Label it '-1' on the board.

Continue for the other marks up to -5.

Stick the 'fly' in this new quadrant, e.g. (-2,4).

Where is the fly? Remember: along first, then up. The first co-ordinate is negative two, the second is four. Its co-ordinates are negative two, four.

Write '(-2,4)' on the board.

Place the 'fly' in different positions in this quadrant. Choose pupils to state its co-ordinates.

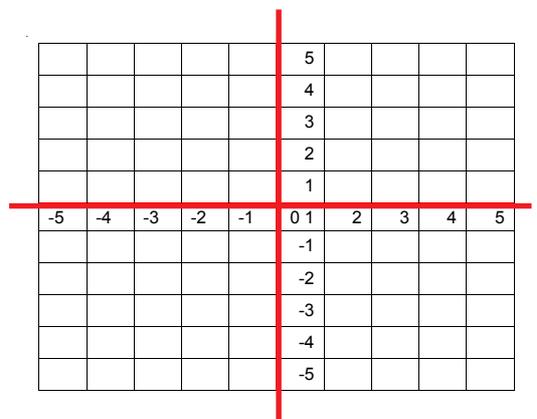
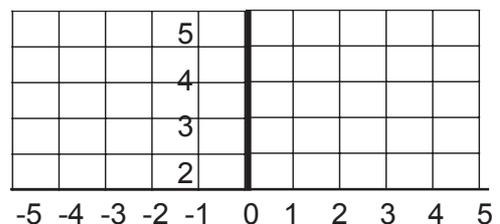
Extend the vertical axis downwards. Mark five points down the line. Point to the marks. **How shall we label these?** Label them '-1,-2' etc.

Put the fly in different positions in the third and fourth quadrant and choose pupils to state the co-ordinates.

Joining Co-ordinates

Tell the pupils to draw two axes on a squared grid. Tell them to number each axis up to 5. Go round the classroom and check that all the pupils have done this correctly.

Draw the same axes on the board. Now tell the pupils to mark three co-ordinates. Write the co-ordinates on the board.



Unit 20: Shape

(3,4) (1,1) and (4,2). Tell them to join these points together.

Call pupils out to the board to put in the same points on your grid.

Check that all the pupils have done theirs correctly. Ask the pupils to tell you what shape they have drawn (a triangle).

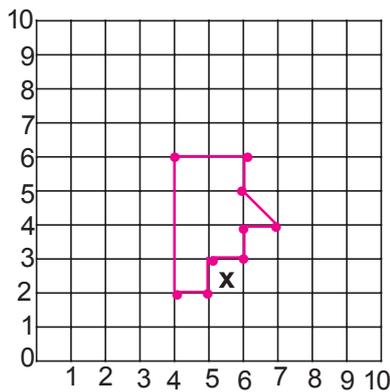
You could call out different co-ordinates to make different shapes. The pupils will need to draw a new grid each time.

C2b

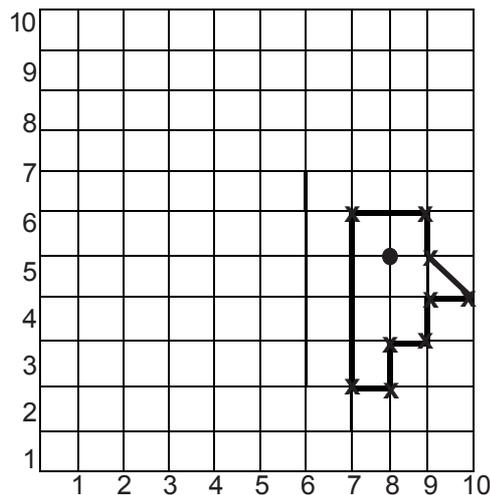
Ask the pupils to complete the activities in the Pupil's Resource Book on pages 83 and 84. This will give them extra practice in drawing, locating and using co-ordinates. Let the pupils work in pairs and discuss their work. They must do these activities in order. Let everyone do Activity A. The pupils who can do this should move onto Activity B. The able pupils will complete Activity C too.

Answers

Activity A



Activity B



Activity C

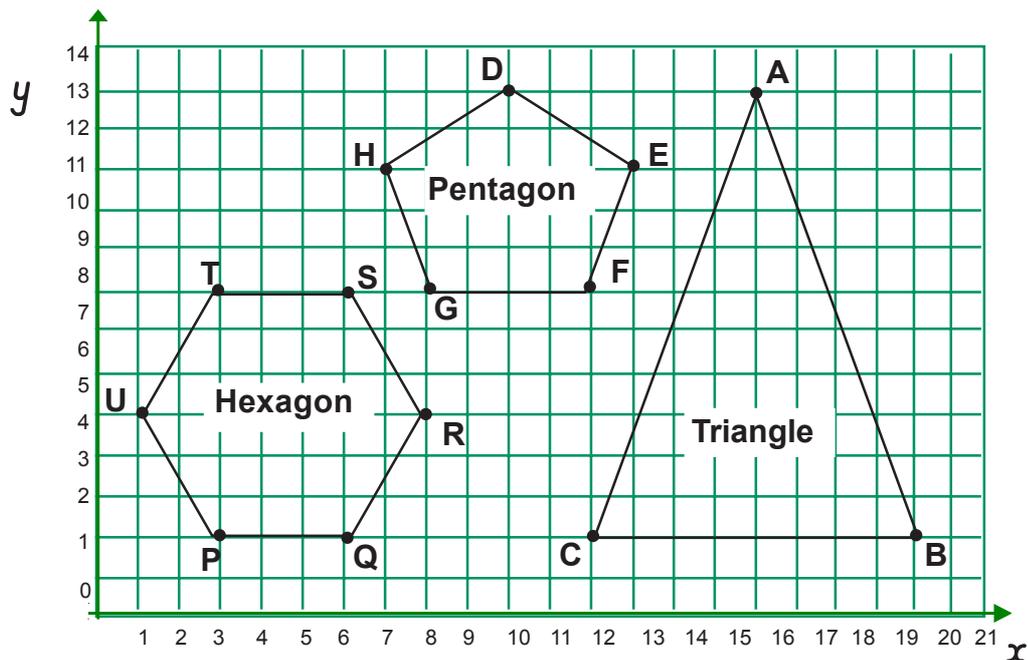
Check each pupils work and discuss their predictions and their findings with them.

Support Activities

Identifying Co-ordinates

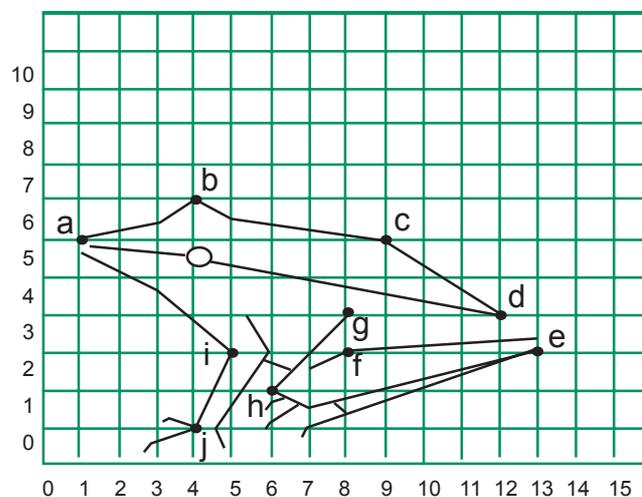
Encouraging the pupils to work in pairs and talk about their work is a very good way for pupils to reinforce their work. By talking through ideas they become more familiar with concepts and procedures.

You could give pupils grids with shapes on them and ask them to write out the co-ordinates of each point. From these co-ordinates they should be able to reproduce an exact image of the shape you have given them. If pupils work in pairs they could try out each others co-ordinates and plot them. If the shape is the same as the original then the co-ordinates are correct. Here are some examples you could use.



Using Co-ordinates

Give the pupils co-ordinates and ask them to locate them and plot then on a grid to make a picture, for example:



Unit 20: Shape

Extension Activities

Own Designs

Ask the pupils to draw shapes on a grid and then set co-ordinates for them. They can then exchange a list of co-ordinates with a partner and try out each others' designs.

Map Work

Locating Places on a Map

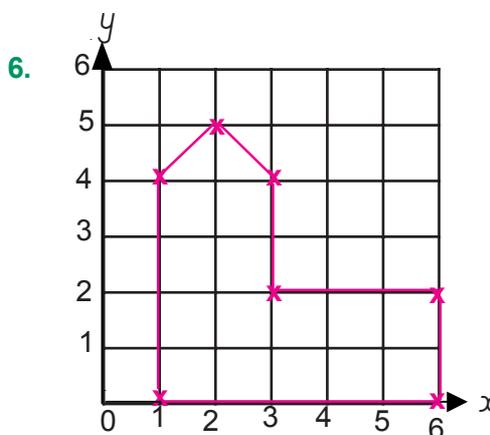
If you have atlases or maps in your classroom use these for pupils to locate specific countries, towns or villages. An atlas usually has co-ordinates for locations listed in the back as an index. Using this would give the pupils very good practise of using co-ordinates.

Drawing and using maps is another useful skill that the pupils could explore. If you have a map of Solomon Islands you could ask the pupils to plan routes using co-ordinates. They could then give their route to a partner and see if they arrive at the correct destination after following the co-ordinates.

Pupils could draw a map. They should include a key as well as grid lines which are labelled. They could then design a set of questions to find specific locations on their map. They could work on a task like this in pairs and display their work so that other class members could answer the questions. An interactive wall display like this not only benefits the more able child who has designed it, but other pupils too who will use it to reinforce their skills.

Check Up Page: Answers

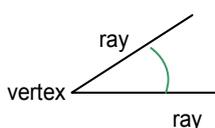
- 1 a. (4,1) (6,3) (4,5) (2,3)
b. (0,0) (4,0) (4,1) (2,3) (0,1)
c. (4,0) (6,2) (6,3) (4,1)
- 2 a. Lali Bay 3. (1,2)
b. Sogo 4. (6,1)
c. Bula 5. (4,3)
d. Arap



Can all the pupils find points on a graph using x and y axes?

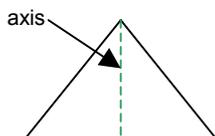
Glossary of Terms

acute angle	An angle which is less than 90° .
addition	The process of putting amounts together to obtain a sum or total.
adjacent	Next to.
algorithm	The setting out of a mathematical problem in a certain way.
a.m.	Short for ante meridiem , Latin for the morning. Any time between midnight and noon.
analogue clock	A clock face with numbers from 1 to 12 and two hands to show the time.
angle	The amount of turn between two lines around a common point.



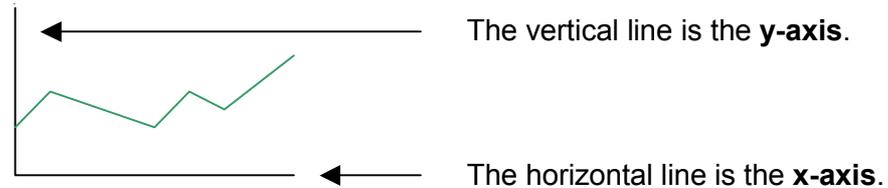
The lines are called rays. The common point is the vertex.

annual	Happening once every year.
anti-clockwise	The opposite direction to the normal movement of a clock.
apex	The highest point of a solid (3D) shape from its base.
approximation	An estimate. For example 398×5 can be rounded to 400×5 to give an estimate or approximation of about 2,000.
arc	A section of a circle or curve with two end points.
area	The surface covered by any 2D shape. Area can be measured in cm^2 , m^2 , and km^2 .
arm	A term often used to describe the rays that form an angle.
ascending order	From smallest to largest. For example: 12, 21, 31, 54, 79, 103.
asymmetrical	Without any lines of symmetry.
attribute	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.
average	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).
axis (1)	A line which divides a shape into two equal parts.



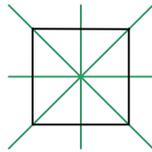
axis (2)

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

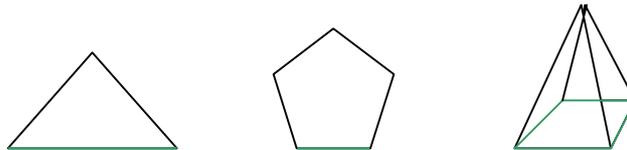
A device used to measure the mass of objects.

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 cm^3 , m^3 , mL, L and kL.

Celsius

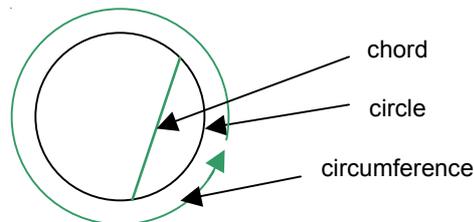
A scale for measuring temperature from 0° to 100° .

For example: 0°C is the temperature at which ice begins to melt, 100°C is the boiling point of water and 37°C is healthy human body temperature.

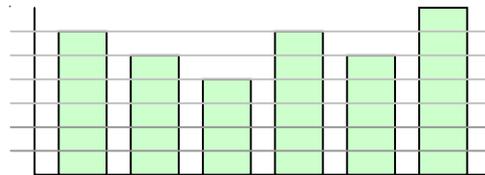
centimetre

A unit of measurement for length. One hundredth of 1 metre. $100\text{cm} = 1\text{m}$.

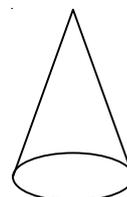
century	One hundred years.
chance	The likelihood of an event happening. Used in probability.
change	Money that is given back when making a purchase. For example: If a \$10.00 note is used to pay for a \$3 item, the change is \$7.00.
chord	A line joining two points on the circumference of a circle.



circle	A plane shape bounded by a continual curved line which is the same distance from its centre point.
circumference	The distance around a circle.
classify	To arrange into groups according to given characteristics. For example, to classify shapes according to the number of sides or angles.
clockwise	The direction in which the hands of the clock move.
cm	The abbreviation for centimetre.
column graph	A graph which uses vertical columns to represent data. Also called a vertical bar graph.



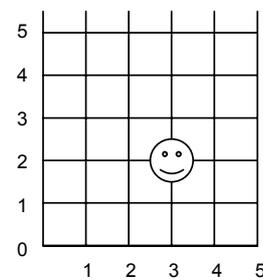
common denominator	A common multiple of the numbers in two or more fractions, must be found when an operation is to be performed on fractions with different denominators. Such as, $\frac{1}{3} + \frac{1}{4}$. The common denominator is 12.
compass (1)	An instrument used for drawing circles.
compass (2)	An instrument used for telling direction. (North, South, East and West).
composite	Made up of more than one.
computation	Working out an answer.
concentric circles	Circles with the same centre.
concrete materials	Real objects used to teach mathematical concepts.
cone	A shape with a circular base, one vertex and one curved surface.



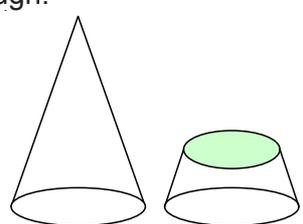
congruent Identical, or exactly the same.

conservation The concept that an object or group of objects will retain the same value even when rearranged.
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.

coordinates Numbers or letters used to show location on a grid.
For example (3,2). The first coordinate refers to the horizontal position (x-axis), the second coordinate refers to the vertical position (y-axis).
Maps also use coordinates.



cross section The face that is left when a three dimensional shape has been cut through.
For example: the cross section of a cone is a circle.

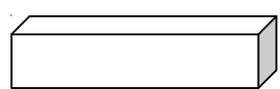


cube A three dimensional shape that has six square faces of equal size, eight vertices and twelve edges.

cubic centimetre A cube used for measuring volume that has sides of one centimetre in length. Written as cm^3 .

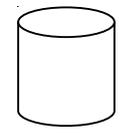
cubic metre A cube that has sides of one metre in length used for measuring volume. Written as m^3 .

cuboid A cube-like shape. Also called a **rectangular prism**.



curve A curved line.

cylinder A three-dimensional shape constructed of two congruent circular faces and one, wrap around, rectangular face. A can is a cylinder.



data Information that has been collected such as a set of numbers or facts, or the results of a survey.

day A 24-hour time period. The time it takes for the Earth to go once around its own axis.

decade Ten years.

decagon A two-dimensional shape with 10 sides.

decahedron A three-dimensional shape with 10 faces.

decimal fraction 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 °.

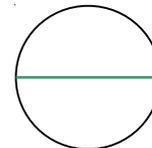
denominator The number below the line in a fraction that tells how many parts in the whole.
For example, in the fraction $\frac{1}{3}$ 1 is the numerator and 3 is the denominator.

descending order Decreasing in value.
For example a number sequence starting with the largest and going to the smallest 23, 17, 15, 13, 9.

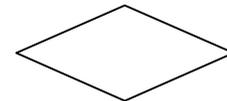
diagonal A line which joins two non-adjacent vertices of a polygon.



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.

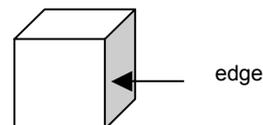
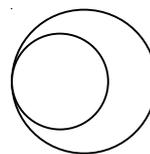
direction The course, or line, along which something moves. For example, up, down, left, right, forward, north, south, east and west.

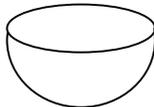
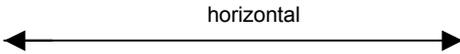
displacement A method used to measure the volume of an object by submerging it in water. The volume of the water displaced is equal to the volume of the object.

distance The space between two objects or points.

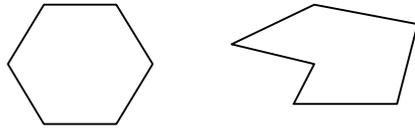
dividend An amount which is to be divided.
For example, in the sum $27 \div 3 = 9$, 27 is the dividend.

divisible	A number is divisible if it can be divided without remainders. For example, 12 is divisible by 4, 6, 3, 12, 2 and 1.
division	The mathematical operation that involves breaking up groups or numbers into equal parts. Also called sharing .
divisor	The number which is to be divided into the dividend. For example, in the sum $27 \div 3 = 9$, 3 is the divisor.
dodecagon	A two-dimensional shape with 12 sides.
dodecahedron	A solid (3D) shape that has twelve identical faces.
dollar	A unit of money equal to 100 cents. Written as \$.
dot paper	Paper covered with equally spaced dots and used for drawing graphs and shapes.
double	Twice as much, multiply by two.
dozen	A group of twelve.
eccentric circles	Circles which do not share the same centre.
edge	The intersection of two faces in a solid shape.
element	An element is a member of a set. For example, a is an element of the set of vowels and 4 is an element of the set of even numbers.
ellipse	An oval-shaped closed curve.
enlarge	To make larger or project.
equal	The same in value or amount. Shown by the symbol =. Means the same as equivalent .
equilateral triangle	A triangle with three equal sides and three equal angles.
equivalent fractions	Fractions with the same value. For example, $\frac{3}{4} = \frac{6}{8}$
estimate	A rough calculation, performed to give an idea of the answer before calculating. For example, 206×2.1 is about 200×2 giving an estimated answer of 400.
even number	Any number that can be divided by 2 without a remainder.
expanded notation	A way of writing numbers to show the actual value of each digit. For example, $2,567 = 2,000 + 500 + 60 + 7$ or $(2 \times 1,000) + (5 \times 100) + (6 \times 10) + 7$
faces	The surfaces of a three-dimensional shape. For example a cuboid has 6 faces.
factor	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 $3 \times 2 = 6$, $1 \times 6 = 6$, $3 \times 3 = 9$, $1 \times 9 = 9$.



formula	A rule or principle expressed in algebraic symbols. For example, the formula for area of a rectangle is $a = l \times w$.
fortnight	The time span of 14 days or 2 weeks.
fraction	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
geo board	A board studded with pegs or nails used to make shapes using elastic bands or string.
geo-strips	Strips of card or paper that can be joined together to make shapes. They can be used to test rigidity.
gram	A unit of measurement for mass. Written as g. There are 1,000 grams in a kilogram, 1,000g = 1kg.
graph	A visual way of recording and presenting information. There are many types of graphs including column, bar, line and pie graphs.
greater than	A symbol ($>$) used to show the relationship between numbers. For example $25 > 18$, $100 > 75$
grid paper	Squared paper often used for drawing graphs.
gross mass	The total mass of any item including its packaging.
grouping	Breaking things into groups, used in the teaching of division.
ha	The symbol for hectare.
half	One part of something that is divided into two equal parts.
hectare	A unit of measurement of area used to measure land. A hectare measures 10,000m ² .
hemisphere	One half of a sphere. 
heptagon	A two-dimensional shape with seven sides.
hexagon	A two-dimensional shape with six sides.
horizontal	A surface parallel to the horizon. 
hour	A unit of measurement for time. One hour equals 60 minutes.
hundredth	One part of a whole that has one hundred parts.
improper fraction	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 $\frac{8}{5}$.
interval (1)	The portion of a straight line lying between two points.
interval (2)	The space of time between two events.

irregular polygon 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:



isosceles triangle A triangle that has two sides and two angles the same.

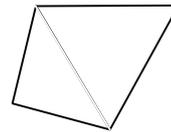
kg The symbol for kilogram.

kilogram The base unit of mass in the metric system. 1 kilogram = 1,000 grams. (1kg = 1,000g)

kilolitre A unit of measurement of capacity, which is equal to 1,000 litres. Written as **kL**.

kilometre A unit of measurement of length which is equal to 1,000 metres. Written as **km**.

kite A quadrilateral with two different pairs of sides of equal length.



kL The symbol for kilolitre.

km The symbol for kilometre.

L Symbol for litre.

leap year 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.

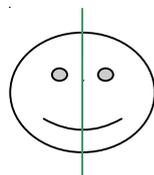
length The measurement of a line or the longer measurement of a shape.

less than A symbol (<) used to show the relationship between numbers.
For example $24 < 42$, $250 < 520$

line graph Information represented on a graph by joining plotted points with a line.



line of symmetry A line which divides something exactly in half.



litre 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.

location A place or position of something, sometimes shown by coordinates.

m Symbol for metre.

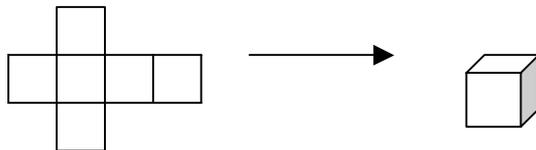
magic square A number puzzle in which all numbers when added either horizontally, vertically or diagonally give the same answer.

	21	21	21	21	
	▼	▼	▼	↘	
10	3	8		←	21
5	7	9		←	21
6	11	4		←	21

- mass** The amount of substance in an object. Common mass measurements are grams, kilograms and tonnes. Mass is sometimes referred to as **weight**.
- measure** To work out the length, width, height, mass, volume or area of an object using a standard unit.
- mental** Making calculations in your head rather than writing anything down on paper.
- metre** A unit of measurement of length. 100 centimetres equals 1 metre. (100cm = 1m)
- metric** A system of measurement. The basic units are the metre to measure length, the kilogram for mass and the litre for volume or capacity.
- millennium** A unit of measurement for time, one millennium is equal to one thousand years.
- millilitre** A measure of capacity. 1,000 millilitres equals 1 litre. A one-centimetre cube (1cm³) would hold 1mL of liquid.
- millimetre** A unit of measurement of length. There are 10mm in one centimetre.
- million** 1,000,000
- minus** To take away or subtract. The symbol for minus is –.
- minute** A measure of time which is one sixtieth of an hour. A minute is equivalent to sixty seconds.
- mirror image** The reflection of an object.
- mirror line** A line drawn to separate an object from its reflection.
- mL** Symbol for millilitre.
- mm** Symbol for millimetre.
- month** A period of approximately four weeks, between 28 and 31 days. There are months in a year.
- multiple** 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.
- multiplication** 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
- multiply** The act of multiplication. The symbol for multiplication is x.

negative numbers Negative numbers have a value less than zero. A minus sign is placed in front of the number to identify it. (-6, -28)

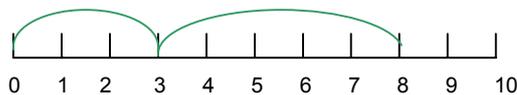
net A two-dimensional shape which can be folded to form a three-dimensional shape. An unfolded cardboard box is the net of the box. The example shows the net of a cube.



nonagon A two-dimensional shape with nine sides.

notation Symbols used in mathematics to represent numbers or operations, such as the numerals 0–9 and symbols \times , $+$, $=$ and \div .

number line A line on which numbers are marked. Number lines can be used to represent operations.
For example, $3 + 5 = 8$



number sequence A set of numbers which follow a regular pattern.

For example: 1, 3, 5, 7, 9, (+2)

3, 9, 27, 81, ($\times 3$)

numeral A symbol or character used to represent a number.

For example, Hindu Arabic numerals 1, 2, 3, 4, 5 or Roman numerals I, II, III, IV, V

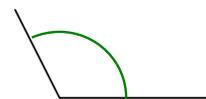
numerator The number above the line in a fraction that tells how many parts of the whole.

For example, in the fraction $\frac{1}{3}$, 1 is the numerator and 3 is the denominator.

oblong A rectangle with two sets of parallel sides of different lengths.

obtuse angle An angle that is larger than 90° but less than 180° .

Obtuse angles appear blunt compared to acute angles, which are less than 90° and appear sharp.



octagon A two-dimensional shape with eight sides.

odd number A number that cannot be divided by 2.

For example, 1, 3, 5, 7, 9, 11, 13.

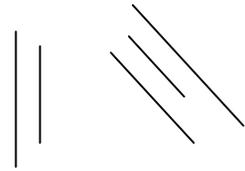
operations Mathematical processes such as, multiplication, subtraction, division and addition used to solve mathematical problems.

ordinal number A number which shows place or the order.

For example, 1st, 2nd, 3rd, 4th, 5th, 6th,

oval 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.

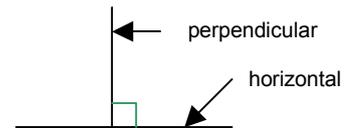


pentagon A closed two-dimensional shape with five sides.

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.

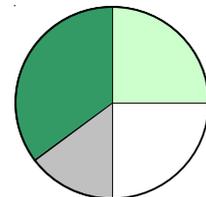
perpendicular A vertical line forming a right angle with the horizontal.



picture graph A graph using pictures or symbols to represent data.

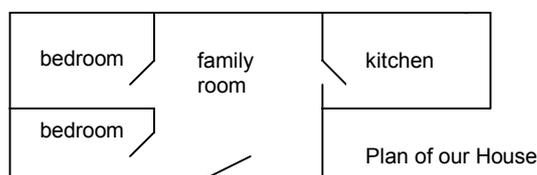
pie graph A circular graph used to represent how the whole of something is divided up. The parts look like portions of a pie or cake.

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.

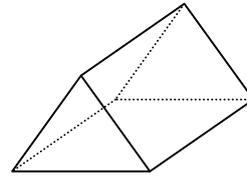
p.m. Abbreviation for the Latin, **post meridiem**, meaning after midday. Any time between 12 noon and 12 midnight.

polygon A closed shape with three or more angles or sides. For example, triangle, square, rectangle, hexagon and pentagon.

position The location of one object in relation to other fixed objects.
For example, third from the left; north of Honiara.

prime number A number that is only divisible by itself and 1.
For example, 2, 3, 5, 7, 11, 13, 17, 19, 23, 29

prism A three-dimensional shape with two similar, parallel bases joined by rectangular faces.



probability 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 **not** to happen while a probability of 1 means that it is certain to happen.

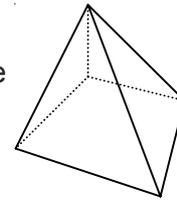
problem A mathematical problem is a question which requires the application of mathematical knowledge and skills in order to find a solution.

product The answer to a multiplication sum.
For example: The product of 12 and 10 is 120

properties Distinguishing features of objects or shapes, such as the number of sides, or the number of angles etc.

protractor An instrument used to measure angles.

pyramid A three-dimensional shape which has one base. All other faces are triangular and meet at a single apex opposite the base.

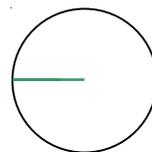


quadrant A quarter of a circle.

quadrilateral A two-dimensional shape with four sides, such as a square or a rectangle.

quarter One of four equal parts of a whole or group. Written as $\frac{1}{4}$.

radius A straight line extending from the centre of a circle to the outside.
A radius is half the diameter.



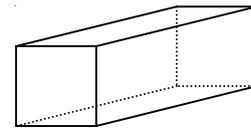
random selection A sample taken in which all items have an equal chance of being selected. No restrictions apply.
For example, drawing names out of a box.

ratio 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.

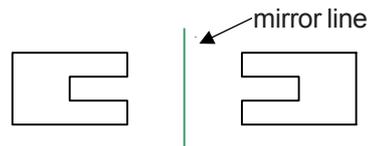
ray A line with a starting point but no end.

rectangle 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.

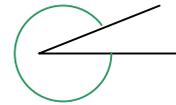
rectangular prism A three-dimensional prism with two similar rectangular bases.



reflective symmetry The mirror image of a shape creates a symmetrical image when viewed alongside the shape itself.



reflex angle An angle between 180° and 360° .



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.

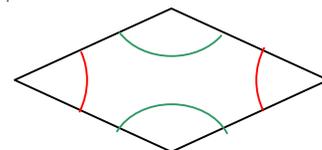
remainder The amount left over after a number has been divided. For example, $29 \div 4 = 7$ and the remainder is 1.

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° .

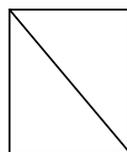
rhombus A four-sided shape with four equal sides. Opposite angles are equal.



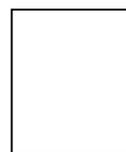
right angle An angle of 90° .



rigid Strong and secure. A rigid structure is one that cannot be



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.

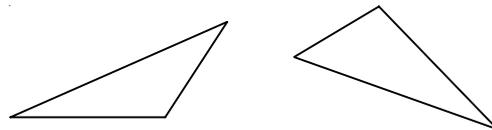
rule An instruction or pattern to be followed.

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.

scale (2) 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 1cm = 10km.

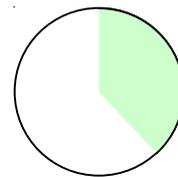
scalene triangle A triangle with sides of different lengths and angles of different sizes.



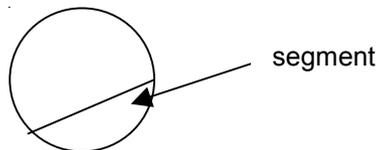
scales An instrument used to measure mass.

second A unit of measurement of time. There are 60 seconds in one minute.

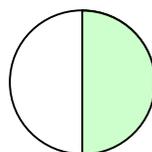
sector Part of a circle, bounded by two radii and the arc of the circle.



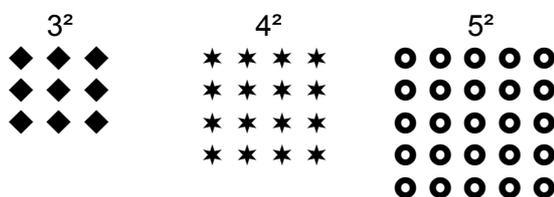
segment A part of a circle formed by a line which joins any two points on the diameter.



semi-circle Half a circle.



sequence	An group of numbers or objects arranged to follow a particular rule. For example, 5, 10, 15, 20, 25, 30.
set	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.
set square	A triangular instrument used for drawing.
shape	The outline of an object.
sharing	A method of division in which a number of objects are shared into equal groups.
side	The boundary line of a two-dimensional shape. For example, a parallelogram has four sides.
side view	The shape of an object when viewed from the side. For example, the side view of a cube is a square.
signs	Another word for symbols. For example =, +, -, x, ÷ .
solid	Three-dimensional.
sort	To separate objects according to given criteria such as colour, shape or weight.
speed	Distance travelled in a specific time. For example, 60 kilometres per hour; 60km/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 1cm x 1cm. Written as cm ² .
square kilometre	A unit of measurement for area measuring 1km x 1km. Written as km ² .
square metre	A unit of measurement for area measuring 1m x 1m. Written as m ² .
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.

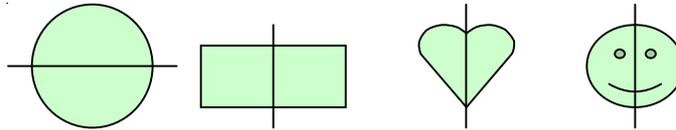


subtract To remove part of a group to find the difference in value. Also known as to **take away** or **minus**.

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

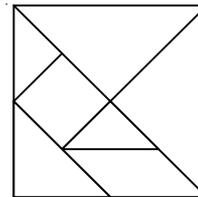
tables (2) Lists of multiplication facts used to help pupils learn . For example, $0 \times 3 = 0$, $1 \times 3 = 3$, $2 \times 3 = 6$, $3 \times 3 = 9$

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.

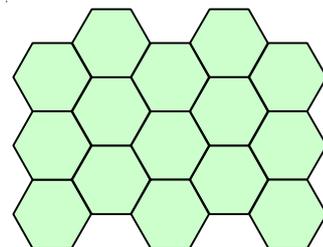
|||| | ||| = 18

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.



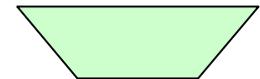
tonne A unit of measurement for mass. Written as **t**, 1 tonne equals 1,000 kilograms.

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 cube is a square.

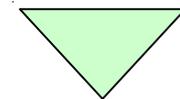
total The result of addition.
For example, $4 + 5 = 9$ The total is 9.

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.



turn To rotate around a point.

twelve-hour time 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.

twenty-four hour time Some digital clocks and watches display time in 24 hour intervals, to distinguish a.m. from p.m.
For example: 1530h

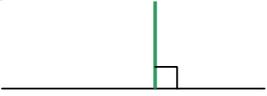
two-dimensional Having only two dimensions. A flat or plane shape is two-dimensional having width and length but not height. Two-dimensional is abbreviated to 2D

unit One. The units column is the ones column in a place value chart.

units 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.

vertex The point where two or more lines meet to form an angle.



vertical Upright. A straight line at right angles to the horizontal. 

vertices Plural of vertex.
For example, a triangle has 3 vertices.

volume The amount of space taken up a substance or object is the. The basic units for recording volume are cubic metres (m^3), cubic centimetres (cm^3), litres (L), and millilitres (mL).

week A time period of seven days. Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday.

weight How heavy an object is. In everyday use the terms **weight** and **mass** 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.

whole numbers Numbers from zero to infinity without fractions or decimals.
For example 0, 1, 2, 3, 4, 5, 6.....

width The shorter side a shape. Sometimes called breadth.

year 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.

zero The numeral 0. Other terms used for this are **nought**, **nothing**, **nil** and **none**.

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