Nguzu Nguzu Mathematics

# Teacher's Guide Book 1


## Standard 6

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# Foreword

This Standard 6 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 6 Maths materials build on the ideas and methodologies which have been used in Standard 1 through to Standard 5 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.

To achieve numeracy pupils 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 6 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**
**September 2005**

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## Important Note

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

# Standard 6 Mathematics

# Teacher's Guide One

## Contents

## The Mathematics Units

## 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 series 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 Islanders if they are to fully participate in life, both at school, and in the future, as adults.

Mathematics is part of everyday life for all of us. We use mathematical skills and understanding, in many situations, to make judgments about quantity, distance, size, time and shape. Many children's games and activities also involve the use of mathematical skills and concepts.

As pupils near the end of their primary education, the level of mathematical skills they require increases in range and sophistication. Whether they continue on to secondary education or not they require a good foundation in mathematical thinking. In order to cope with the changes they will face, pupils must be able to adapt their skills to suit different situations and they must be able to solve problems using many different strategies.

At the beginning of each unit in this Teacher's Guide, the rationale for each topic is explained. Teachers should try to keep this in mind as they work through the activities with the pupils.

Assessment of pupils' progress, understanding and practical skills should also be made with this rationale in mind.

### Aims of Mathematics Education

The Mathematics Syllabus has 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 pupils in practical activities and games which are relevant to their age and experience.
4. To encourage the planning and presentation of lively, varied and interesting lessons.
5. To encourage pupils to use mathematical skills in practical and problem solving situations.
6. To encourage pupils to appreciate and enjoy 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.

A sequence of objectives is provided to help the teacher achieve the aims.

### Mathematical Themes and Topics

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

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

Within each theme there are a number of topics, which are numbered and arranged in sequence. For example in Standard 6 the **Shape** theme contains four topics as follows:

Topic 6 Angles
Topic 7 Triangles
Topic 8 Tessellation
Topic 9 Three Dimensional Shapes

These topics should be taught in the order in which they are presented, as a good understanding of each is required before moving onto the next topic.

The complete list of syllabus objectives for Standard 6 is included for your reference on the following pages.

Theme, scope and sequence objective tables for Standard 5 and Standard 6 are also included on pages 8 - 12. These detail the knowledge, skills and attitudes pupils should develop as they work through each theme. The Standard Five tables are included to give the teacher a record of what the pupils should have covered already, as well as what they will cover in Standard 6.

| **Standard Six Syllabus Objectives** | |
|---|---|
| **Theme: Number** | |
| **Topics** | **Objectives** |
| 1. Whole Number Calculations | 1. Adding and subtracting large numbers, up to 5 and 6-digits.<br>2. Making estimates in addition and subtraction.<br>3. Multiplying, including multiplication of 3 and 4-digit by 2-digit numbers.<br>4. Dividing 3 and 4-digit numbers by 2-digit numbers.<br>5. Making calculations and solving problems involving more than one operation.<br>6. Making calculations which give negative answers, e.g. 25 – 32 = -7. |
| 2. Fractions | 1. Recognising equivalent fractions and reducing fractions to their simplest form, e.g. $\frac{8}{12} = \frac{4}{6} = \frac{2}{3}$<br>2. Adding and subtracting fractions with the same denominator,<br>e.g. $\frac{3}{6} + \frac{2}{6} = \frac{5}{6}$ $\frac{7}{10} - \frac{3}{10} = \frac{4}{10}$<br>3. Adding and subtracting fractions with unlike denominators,<br>e.g. $\frac{2}{3} + \frac{3}{9} = \frac{6}{9} + \frac{3}{9} = \frac{9}{9} = 1$ $\frac{5}{8} - \frac{1}{4} = \frac{5}{8} - \frac{2}{8} = \frac{3}{8}$ |
| 3. Decimals | 1. Changing common fractions to decimal fractions, e.g. $\frac{3}{4} = 0.75$.<br>2. Recognising place value in decimal fractions, e.g. the 3 in 2.35 = 3 tenths.<br>3. Rounding decimals to the nearest whole number and nearest tenth.<br>4. Adding and subtracting decimal fractions including tenths and hundredths, e.g. 2.53 + 0.75 = 3.28, 6.20 – 4.68 = 1.52.<br>5. Multiplying decimal numbers by whole numbers.<br>6. Dividing the remainder in division calculations to give an answer including tenths, e.g. 16 ÷ 5 = 3.2.<br>7. Using decimal notation when recording measurements and money. |
| 4. Percentages | 1. Making simple calculations involving percentages, e.g. 17 as a percentage of 50 = 34% and 40 as a percentage of 200 = 20%.<br>2. Calculating a percentage increase, e.g. if the number of children in a school increases from 50 to 60 this is a 20% increase.<br>3. Solving problems involving percentages. |
| 5. Ratios | 1. Comparing values using number ratios, e.g. in a school with 75 children and 3 teachers, know that the ratio of children to teachers is 25:1.<br>2. Knowing that quantities can be expressed as a ratio, e.g. the mixture of petrol and oil used in a chainsaw. |

| Theme: Shape | |
|---|---|
| **Topics** | **Objectives** |
| 6. Angles | 1. Measuring and comparing angles using a protractor.<br>2. Investigating the total of the angles inside triangles and quadrilaterals.<br>3. Plotting a course using bearings. |
| 7. Triangles | 1. Classifying and naming different triangles, including right-angled, equilateral, isosceles, scalene.<br>2. Drawing triangles from given instructions, e.g. draw a right-angled triangle with a base of 12 cm and a height of 7 cm. |
| 8. Tessellation | 1. Creating tessellating patterns using two-dimensional shapes. |
| 9. Three-dimensional Shapes | 1. Using nets to make three-dimensional shapes from two-dimensional drawings. |
| **Theme: Graphs** | |
| **Topics** | **Objectives** |
| 10. Pie Charts | 1. Reading information from pie charts.<br>2. Drawing simple pie charts to display information. |
| 11. Bar and Line Graphs | 1. Collecting and showing data on bar and line graphs.<br>2. Reading and interpreting information from bar and line graphs and calculating totals and averages.<br>3. Representing information such as population and weather statistics on bar and line graphs. |
| **Theme: Measurement** | |
| **Topics** | **Objectives** |
| 12. Speed, Distance and Time | 1. Introducing the concept of speed and distance travelled.<br>2. Understanding and using the formula, distance = speed x time.<br>3. Calculating the time taken to cover a distance and the distance travelled in a given time. |
| 13. Mass, Volume and Capacity | 1. Recognising commonly used containers and their mass or capacity, e.g. know the weight of a bag of rice, the capacity of a drum of petrol, etc.<br>2. Calculating and comparing the volumes of different containers.<br>3. Solving problems involving capacity and weight. |
| 14. Probability | 1. Investigating the probability of events, e.g. finding the probability (written as a fraction) of scoring 12 when throwing two dice and adding the numbers. |
| **Theme: Time** | |
| **Topics** | **Objectives** |
| 15. Investigating Time | 1. Using a calendar.<br>2. Understanding longer units of time: years, decades, centuries.<br>3. Investigating time zones: knowing that other parts of the Pacific and the World have different time zones; working out the current time in another country. |
| **Theme: Money** | |
| **Topics** | **Objectives** |
| 16. Calculating Money | 1. Dividing and multiplying amounts of money.<br>2. Solving money problems, e.g. finding the average cost per kg of fish at the market. |

## Scope and Sequence Objectives Tables

| Standard Five Syllabus Objectives | | | |
|---|---|---|---|
| | **Knowledge** | **Skills** | **Attitudes** |
| **Themes** | **Pupils should have knowledge of..** | **Pupils should be skilled in..** | **Pupil's attitudes should include..** |
| **Numbers** | • the nature and structure of the number system 0 – 1,000,000<br>• the concept and properties of whole numbers and their place value<br>• addition and subtraction of 5- and 6-digits numbers<br>• multiplying 2- and 3-digit numbers by 2-digit numbers<br>• dividing by a single digit number with remainder<br>• the concept of equivalence in fractions and decimal fractions<br>• the concept of percentages | • reading, writing and ordering numbers up to one million<br>• exploring, recognising and sequencing negative and square numbers<br>• adding and subtracting 5 and 6-digit numbers<br>• multiplying 2 and 3-digit numbers by 2-digit numbers<br>• developing mental strategies in addition, subtraction and multiplication<br>• the use of division algorithm<br>• adding and subtracting fractions with the same denominator<br>• recognising, and investigating equivalence and decimal fractions<br>• investigating relationships between fractions and percentage equivalence | • the recognition that mathematics is relevant to their daily lives<br>• an appreciation of mathematics as a useful tool<br>• an appreciation of the structure and patterns of negative and square numbers<br>• the recognition that algorithms are necessary in addition, subtraction, multiplication and division<br>• the willingness to solve addition, subtraction, multiplication and division problems<br>• the recognition that fractions, decimals and percentages are relevant in their daily lives |
| **Shape** | • constructing circles and circle patterns<br>• the properties of a circle and irregular shapes<br>• the concept of reflection of irregular shapes in square grids<br>• pyramids and prisms<br>• the nature and structure of two-dimensional irregular shapes<br>• the nature and structure of three-dimensional solids<br>• the concept of angles: acute, obtuse, reflex, etc.<br>• the concept of degrees as the standard measurement of angles<br>• the concept of locating points on a map using 'x' and 'y' axes co-ordination | • drawing circles and circle patterns using devices such as, tins and coins<br>• identifying properties of two-dimensional shapes including symmetry and angle properties<br>• identifying, measuring and estimating, diameter, radius and circumference of a circle<br>• constructing pyramids and prisms from nets<br>• strengthening simple two and three-dimensional structures<br>• classifying angles such as obtuse, acute and right angles<br>• using a protractor to measure angles<br>• finding and locating points on a map using number co-ordination and 'x' and 'y' axes co-ordination | • an appreciation of the presence of circles and circle patterns in their local environment<br>• the recognition of the properties of circles<br>• the appreciation of irregular shapes in the local environment<br>• an appreciation that reflection is a way of constructing irregular shapes<br>• an appreciation of the nature and the structure of two-dimensional shapes<br>• a willingness to construct pyramids and prisms from nets<br>• the recognition of pyramids and prisms in the local environment<br>• the recognition of angles in the local environment<br>• an appreciation that angle measurement and location are relevant in their daily lives |
| **Graphs** | • of the concept of line graphs as a method of representing data | • distinguishing line graphs from horizontal and vertical bar graphs<br>• reading and interpreting information in line graphs<br>• constructing line graphs from tables of information<br>• constructing line graphs using co-ordinates | • an appreciation that information can be collected, represented and readily retrieved and interpreted from line graphs<br>• the recognition that a line graph is another way of representing data collected from tables of information |

| | | | |
|---|---|---|---|
| **Measurement** | • the appropriate units in measuring lengths and weights<br>• the concept of scale drawings and plans<br>• decimal notation as it relates to 0.5 = $\frac{1}{2}$<br>• the relationship between units of weight: g/ kg, kg/ tonnes<br>• the concept of weight and volume and their appropriate units of measurement<br>• calculating areas of squares, rectangles and triangles<br>• the use of degree Celsius as a measure of temperature<br>• using fractions to describe the probability of events<br>• the probability of $\frac{1}{2}$ as the representation of 'even chance' | • calculating lengths including cm, mm and m and weights in grams and kilograms including 2.5m, 3.5kg<br>• calculating distance on a map using a scale<br>• constructing scale drawings and plans<br>• using the formula for calculating volumes of boxes (v = l x b x h) in $m^3$ and $cm^3$<br>• the use of formula a = l x w to calculate areas of squares and rectangles and composite shapes in $cm^2$ and $m^2$<br>• the use of formula Area = $\frac{1}{2}$ base x height to calculate areas of a triangle<br>• using a thermometer to measure temperature and record air temperatures<br>• using fractions to describe the probability of an event | • the recognition that standard units are necessary in measuring and calculating lengths, weights and volumes<br>• an appreciation that a special formula is used to measure and calculate areas of triangles and volumes of boxes<br>• the recognition that there is a relationship between units of measurement in length, weight and volume<br>• an appreciation that scale drawings, plans, thermometers and probability are relevant in our daily lives |
| **Time** | • the concept of the standard notation of the 24 hour clock<br>• the 24 hour clock schedules and timetables<br>• measuring time using non standard units of measurement | • interpreting and recording 24 hour clock using the standard notation of time<br>• writing and saying the 24 hour time and reading from timetables and schedules<br>• calculating time intervals in the 24 hour clock<br>• devising non standard ways of measuring time | • an appreciation that 24 hour time is relevant to daily life<br>• an appreciation that measuring, recording and saying 24 hour time intervals in seconds, minutes and hours is relevant in their daily lives.<br>• the recognition that devising non standard ways to measure time is useful in daily life |
| **Money** | • money computation | • solving problems involving computation of money | • 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..** |
| **Numbers** | • the nature and structure of a number system up to 5 and 6-digits<br>• adding and subtracting large numbers up to 5 and 6- digits<br>• the concept of estimates in addition and subtraction<br>• multiplying and dividing 3 and 4-digit numbers by 2-digit numbers<br>• calculating and solving problems involving more than one operation<br>• the concept of a negative answer calculation<br>• simplifying a fraction to its lowest form<br>• calculating fractions with like and unlike denominators<br>• the concept of rounding decimal fractions and their place value | • reading, writing and ordering numbers up to 5 and 6-digit numbers and decimal fractions<br>• adding and subtracting 5 and 6-digit numbers<br>• making accurate estimates in addition and subtraction<br>• division and multiplication of 3 and 4-digit, by 2-digit numbers<br>• making calculations and solving problems using more than one operation<br>• making calculations which give negative answers<br>• reducing fractions to their simplest form<br>• adding and subtracting fractions with like and unlike denominators<br>• rounding, adding and subtracting decimal fractions and multiplying and dividing simple decimal fractions | • the recognition that mathematics is relevant to their daily lives<br>• an appreciation of mathematics as a useful tool<br>• the recognition that algorithms are useful in mathematical operations<br>• a willingness to use more than one operation to calculate and solve mathematical problems<br>• the recognition and appreciation of negative answers in subtraction<br>• an appreciation of fraction equivalence and how to simplify fractions<br>• an appreciation that percentages and ratios are useful in their daily lives |

| | | | |
|---|---|---|---|
| | • calculating percentages<br>• the concept of number ratio | • making simple calculations and solving problems involving percentages<br>• calculating increases and decreases involving percentages<br>• comparing values and quantities using number ratios | |
| **Shape** | • using a protractor for measuring and comparing angles<br>• angles in triangles and quadrilaterals<br>• the concept of right angled, equilateral, isosceles and scalene triangles<br>• how to draw certain triangles from given instructions<br>• the concept of plotting using bearings<br>• the concept of tessellation using two dimensional shapes<br>• creating three-dimensional solids from nets of two-dimensional drawings | • measuring and comparing angles using a protractor<br>• investigating the sum of angles in triangles and quadrilaterals<br>• classifying and naming triangles: right angled, equilateral, isosceles, scalene, etc.<br>• drawing triangles from given instructions<br>• plotting a course using bearings<br>• creating tessellation patterns using one or more two-dimensional shapes<br>• using nets from two-dimensional shapes to make three-dimensional solids | • the recognition that a protractor is a useful tool for measuring angles<br>• the recognition and appreciation of the different angles in triangles and quadrilaterals<br>• the recognition and appreciation of the properties and patterns in regular shapes<br>• a willingness to construct solid shapes from nets<br>• an appreciation that plotting courses is a useful life skill<br>• the recognition and appreciation of tessellation patterns around the local environment |
| **Graphs** | • the concept of pie charts as a method of representing data<br>• organising information on bar and line graphs | • reading information from pie charts<br>• drawing simple pie charts to display information<br>• reading, collecting and showing data on bar and line graphs<br>• calculating a total and average from bar and line graphs<br>• representing information such as population and weather on bar and line graphs | • an appreciation that a pie chart is a useful tool for representing and organising information<br>• an appreciation that information can be collected, represented and readily retrieved from pie charts and bar and line graphs |
| **Measurement** | • the concept of speed, distance and time<br>• the commonly used weights, capacity and volumes for containers and drums<br>• decimal notation as it relates to 0.58 = 58/100<br>• the probability of events | • using the appropriate formula to calculate distance, speed and time travelled; i.e. distance = speed x time<br>• recognising commonly used containers and their weights and capacities<br>• calculating and comparing volumes and solving problems involving capacity and weights<br>• using decimal notation, e.g. 2.53 m = 2 m 53 cm<br>• investigating the chances in an event | • an appreciation that the calculation of time, speed and distance travelled is a useful tool in their daily lives<br>• the recognition that there is a need for a standard formula to calculate time, speed and distance travelled<br>• an appreciation of commonly used containers for weight and capacity<br>• an appreciation that solving problems with capacity and volume is useful in daily life<br>• a willingness to investigate, observe and predict chances of events using probability |
| **Time** | • time and its use in the calendar both here and in different parts of the world | • using the calendar to express the date<br>• explaining and differentiating time: years, decades and centuries<br>• investigating time zones | • the recognition of different terms in the units of time<br>• an appreciation that time is relevant to their daily lives<br>• an appreciation of where they live in relations to world time zones |
| **Money** | • money calculations | • adding, subtracting, multiplying and dividing money | • the recognition that calculating money is necessary and useful in their daily lives |

## The Four-Term Arrangement of Units and Topics

Pupils learn at different rates and in different ways. Although these materials are designed within a unit structure, it is important that teachers respond to the needs of their pupils rather than rigidly following the programme unit by unit, if this does not seem appropriate. The four-term arrangement that follows, suggests how the twelve units might be taught throughout Standard 6 to ensure that all the syllabus objectives are addressed. Teachers should use this flexibly, as a guide, whilst they allow as much time as is needed for pupils to master the skills and concepts with confidence. For each of the first three 10 week terms, four units are suggested. The time allowed for each unit is approximately two weeks, but this will vary from unit to unit and from class to class.

For the fourth term, there is no clear unit structure to follow. A range of creative, cross curricula mathematics activities are provided for the teacher to use as they choose in the final term. These activities are suitable for the weeks following the Standard 6 examination. They allow pupils to explore their maths in exciting ways and extend their skills and confidence. The second volume of this Teacher's Guide explains in more detail how these activities can be used.

| Term 1 | Term 2 | Term 3 | Term 4 |
|---|---|---|---|
| **Unit 1: Number**<br>Topic 1:<br>Whole Number Calculations | **Unit 5: Number**<br>Topic 3:<br>Decimals | **Unit 9: Number**<br>Topic 5: Ratios<br>**Measurement**<br>Topic 14: Probability | **Cross Curricular Maths Projects**<br>1. Fun with Numbers<br>2. Fun with Words and Numbers<br>3. Challenges in Shape and Space<br>4. Census Project<br>5. Environmental Projects<br>6. Investigating Time<br>7. Shopping Survey<br>8. Puzzles |
| **Unit 2: Measurement**<br>Topic 12: Speed Distance and Time | **Unit 6: Graphs**<br>Topic 10: Pie Charts<br>Topic 11: Bar and Line Graphs | **Unit 10: Time**<br>Topic 15:<br>Investigating Time | |
| **Unit 3: Number**<br>Topic 2: Fractions | **Unit 7: Number**<br>Topic 4: Percentages | **Unit 11: Money**<br>Topic 16: Calculating Money | |
| **Unit 4: Shape**<br>Topic 6: Angles<br>Topic 7: Triangles | **Unit 8: Measurement**<br>Topic 13: Mass, Volume and Capacity | **Unit 12: Shape**<br>Topic 8: Tessellation<br>Topic 9: Three-Dimensional Shapes | |

# The Standard 6 Mathematics Materials

## The Teacher's Guide

The Teacher's Guide is designed to help you plan and teach mathematics lessons. It contains advice, activities and ideas for lessons under each of the objectives of the syllabus. The activities are divided into teacher led activities and pupil focussed activities as follows:

### 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 which objective this activity covers, followed by 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 the whole class working as a group.

## 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, **2** tells you that it supports objective 2 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 practical activities 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 pupils time to practice and understand new concepts in a practical way;
- to encourage pupils to talk about their mathematics, with each other and their teacher;
- to encourage group work, cooperation, working together, following rules;
- to encourage enquiry, extension and conceptual thinking.

**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 **T1b** and **C1b** in the Teacher's Guide. It supports objective 1 **(1)** and is part of the second lesson on that objective **(b)**.

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 |
|---|---|---|
| • Led by the teacher.<br>• The teacher teaches the pupils a new skill, method or concept.<br>• Probably a whole class activity (though not always). | • To introduce the topic.<br>• To teach new skills.<br>• To explain new ideas, mathematical language or concepts.<br>• To do demonstrations. | 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.<br>Pupils should participate by discussion and asking questions.<br>Child centred / exploratory activities will **not** work effectively to reinforce children's learning if they do not understand the concepts involved. |

| Children's Activity | Purpose | Comments |
|---|---|---|
| • Pupil focussed.<br>• Learning is through activity and exploration, and is led by the children themselves.<br>• The teacher takes a supervisory role.<br>• Probably done in groups, pairs or sometimes individually. | • To consolidate what the teacher has taught in the teachers activity.<br>• To give the pupils time to practice and understand new concepts in a practical way.<br>• To encourage enquiry, extension and conceptual thinking.<br>• To encourage group work, cooperation, working together, following rules. | Pupil's activities should be motivating. Pupils should enjoy doing them and find them rewarding.<br>They include games, puzzles and practical tasks.<br>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. |

### Teaching Materials Boxes

**Materials**

Shells or stones
Place Value Game Cards
Dice

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. It may include equipment such as scissors or protractors, locally available teaching aids such as stones, shells, games or posters provided by the Nguzu Nguzu programme and charts or teaching aids that the teacher needs to make.

It is a checklist of everything the teacher needs to prepare for the lesson. If you have added other activities 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, Pupil's Resource Books or blackboard and chalk as it is assumed that these will always be available.

## Extension and Support Activities

At the end of each unit 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 pupils.

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, to take their understanding further.

**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 mathematical concepts independently.

A range of suggestions and examples of activities, relating to the different objectives is 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. A range of suggestions and examples for the teacher to choose from is included.

**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.

### Answers

The answers to all the exercises in the Pupil's Resource Book are found in the Teacher's Guide in purple at the end of the lesson in which they are completed.

When marking pupil's work, however, the right answer is not always the most important thing to look at, 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 pupils have achieved the objective and are ready to move on to the next step. They look like this:

Can all the pupils add and subtract larger numbers with up to 5 and 6-digits?

These refer back to the syllabus objectives and remind 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 Books

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 Books support 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 Books 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 6 Pupil's Resource Books 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 they 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 like Activity A, but, at this level, 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.

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 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 concepts taught.

Teachers should record the pupils' performance in the Check Up Pages at the end of each unit. One way of recording pupil's scores is suggested on page 31. Teachers may also devise their own record keeping system.

Other methods of continuous assessment are discussed further on page 26 in the section on assessment.

### 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. The instructions for how to prepare each card are written in the bottom left hand corner. They should be labelled and stored carefully so that they can be used again the following year.

Where posters are provided, it may be tempting to display these around the classroom just to make the place look attractive. Teachers should not do this. They contain specific information to be used in specific lessons. Teachers should use the posters to support the teaching activities at the appropriate time rather than leaving them on the classroom wall for the whole term.

## Teaching Methodology

### Active Learning

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 Primary Maths 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 5 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 6 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 encouraged to **teach** first, and then let the pupils **consolidate** what has been taught through pupil focussed activities. Then they allow the pupils 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 x b x h).
>
> The area of a triangle is half the base x the height (a = $\frac{1}{2}$ b x 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 pupils how to do things, the good teacher teaches the pupils to work out how to do things for themselves and to ask **why?** This encourages them 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 as working together as a whole class. If your pupils have used Nguzu 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 them 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 good 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 groups 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 because 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 pupil 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 pupils also learn other skills like following rules, cooperating with each other and taking turns;
- playing games helps pupils 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. Label your materials with the unit number and the name of the game so that you can use them again the following year. Games are very valuable teaching aids, especially in the teaching and learning of mathematics.

## Planning in Mathematics

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.<br>The four term arrangement on page 11 of this Teacher’s Guide 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 decides what will be covered in each lesson of the week. Objectives for each lesson are 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 below. 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 include 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.

**Sample Lesson Plan**

| | |
|---|---|
| **Title of Lesson** | |
| **Objective (s)** | 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.<br>Sometimes teachers will plan extra lessons for revision or extension of an objective in the Teachers' Guide.<br>Remember to think about **Knowledge, Skills** and **Attitudes**<br>**What is this lesson going to teach the pupils?** |
| **Materials** | 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.<br>**What do I need to teach the lesson effectively?** |
| **Introduction** | An introductory activity led by the teacher.<br>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.<br>This is a good time for the teacher to talk about the rationale for learning the skills included in this lesson.<br>**What are we learning and why are we learning about this?** |
| **Activities**<br><br>Teacher Led Activities:<br><br>Pupils' Activities: | Some will be selected from the Teacher's Guide, some will be planned by the teacher to reinforce learning.<br>Remember:<br>• to balance listening and doing<br>• to follow the sequence of teaching, consolidation and practice of new skills.<br>**What will we do in the lesson?** |

| | |
|---|---|
| **Organisation** | How will pupils be grouped for each activity?<br>How will the teacher's time be divided up?<br>How will the teacher supervise and monitor the pupils as they work?<br>What teaching methods will be used?<br>How long will each part of the lesson take?<br>What will early finishers do? |
| **Conclusion** | It is helpful to bring the class back together for the end of the lesson.<br>A good concluding activity might be a game, an opportunity to show/share work completed or a class discussion.<br>You could also use this time to discuss any difficulties pupils have had with their work and clarify their understanding. |
| **Evaluation** | 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. |

## 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 you look after the teaching aids you make, they can be used for many different lessons and should last for the whole year, and for following years too.

There are different kinds of teaching aids:

1. **Aids provided by the Nguzu Nguzu programme**. These include 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. Teachers will need to prepare them for use by cutting and pasting the teaching aids, following the directions on each card.
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. 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 a Community High School or a Rural Training Centre or from a local carpenter. Teachers may also be able to borrow resources from the local clinic such as 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 in this Teacher's Guide is included on page 22. Use this table as you plan your teaching in each unit to make sure that you have everything that you need.

| Teaching Aids and Materials Required for Standard 6 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** | Multiplication Square | Addition Sums Game Cards<br>Quick Multiplier Game Cards | | Multiplication Cards<br>Place Value Chart<br>0-9 Number Cards for Place Value Game<br>Addition Cards<br>Calculation Bingo Game |
| **Unit 2** | | Solomon Airlines Timetable Poster | Measuring Tapes<br>Watches or clocks with a second hand<br>Stop clocks<br>Balls | Trundle wheel to measure distance in metres |
| **Unit 3** | Fractions Charts (x2) | Fraction Dominoes<br>Fraction Addition and Subtraction Cards<br>Equivalent Fractions Cards | Cutting knives<br>Cardboard | Fraction Shapes<br>(Support Activity) |
| **Unit 4** | Different Types of Triangle Poster<br>Different Types of Angels Chart | Angles Vocabulary Race Game<br>Tangram Templates | Map of Solomon Islands<br>String | Cardboard triangle Shapes set.<br>Shape Templates (Support Activity) |
| **Unit 5** | Units of Measurement Poster | Pick a Card Game | Grocery Items with weights marked<br>Dice<br>containers graduated in mL<br>cups, cans, buckets, jugs | |
| **Unit 6** | Solomon Islands Population Chart | Pick a Number Game Cards<br>Sample Bar Graphs Chart | Dice (Extension) | Pie Chart Samples for pupils to cut up. |
| **Unit 7** | | Percentage/Fractions Card Game | Grocery items marked with prices (Support) | |
| **Unit 8** | Units of Measurement Equivalence Poster<br>Problem Solving Poster | Kilogram / Tonne Matching Game Cards | Assorted food packets and tins, weights marked<br>scales/ balances<br>Pictures of large objects<br>Selection of liquid containers e.g. glass, drinks bottles, medicine bottles<br>teaspoon, tablespoon<br>range of different sized cardboard boxes and packets<br>containers graduated in mL | Calculation Bingo cards (Support) |

## Storage and Display Ideas

The way the teacher organises resources is important. There are many different ways of organising a classroom and there are many different types of classroom too. 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 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 Pupils' Work in the Classroom**

There are many reasons for displaying pupils' 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 pupils' 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.

| | |
|---|---|
| **Start by using the terms orally during practical work.** | Pupils develop a practical understanding of what mathematical words mean in a variety of contexts, using real materials. |
| **Develop pupils' understanding through more oral and discussion work, and during practical tasks.** | This might include opportunities to:<br>▪ listen to adults and other pupils using the words correctly;<br>▪ participate in discussions where they are required to use technical vocabulary;<br>▪ describe, define and compare mathematical properties, positions, methods, patterns, relationships, rules;<br>▪ discuss how to tackle a problem, collect data, and organise their work;<br>▪ hypothesise or make predictions about possible results;<br>▪ present, explain and justify their methods, results, solutions or reasoning, to the whole class or to a group or a partner; |
| **Introduce them to reading technical terms.** | This may include reading:<br>▪ numbers, signs and symbols, expressions and equations from the board;<br>▪ instructions and explanations in the Pupil's Resource Books.<br>▪ labels and captions on displays, in diagrams, graphs, charts and tables;<br>▪ definitions in dictionaries in order to discover meanings, origins of words, and words with similar roots (such as triangle, triplet, tricycle, trisect). |
| **Teach pupils to use mathematical vocabulary in a variety of ways in their writing.** | This may include:<br>▪ labelling diagrams;<br>▪ writing sentences to describe, compare, predict, interpret, explain or justify their maths work;<br>▪ writing formulae, first using words, then symbols;<br>▪ drawing and labelling 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:

1. Identifying the problem to be solved;
2. Selecting a suitable strategy (or strategies);
3. Choosing which mathematical operations are needed;
4. Working through the problem to find an answer;
5. 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 work through the problem 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 **how** to solve problems. This will include teaching and developing the following skills:

- Reading the problem carefully two or three times until pupils are sure that they know what it is about;
- Deciding what the problem is asking them to discover;
- Identifying and writing down any useful information that is given in the problem;
- Identifying any information that is given that is not useful;
- Thinking about which method or strategy to use;
- Choosing an alternative strategy if the first one doesn't work;
- 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;
- Showing their working out and using this to work through the problem;
- Presenting their final answer clearly;
- 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.

## Assessment in Mathematics

Assessment involves collecting information about each pupil's 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 a pupil's 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 6 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. These 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 tools 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, or need to be challenged further.

Assessment for learning focuses on **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, such as Check Up Page scores, can be used for grading and reporting on individual pupils as well as on overall class achievement. Summative assessment is also a good tool for evaluating teacher effectiveness. For example, If your class have all got a very low score in the Check Up Page, this suggests you have not covered all the teaching points in that unit effectively.

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. Understanding mathematics, however, 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 the 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 in the Standard 4 Teacher's Guide, 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.

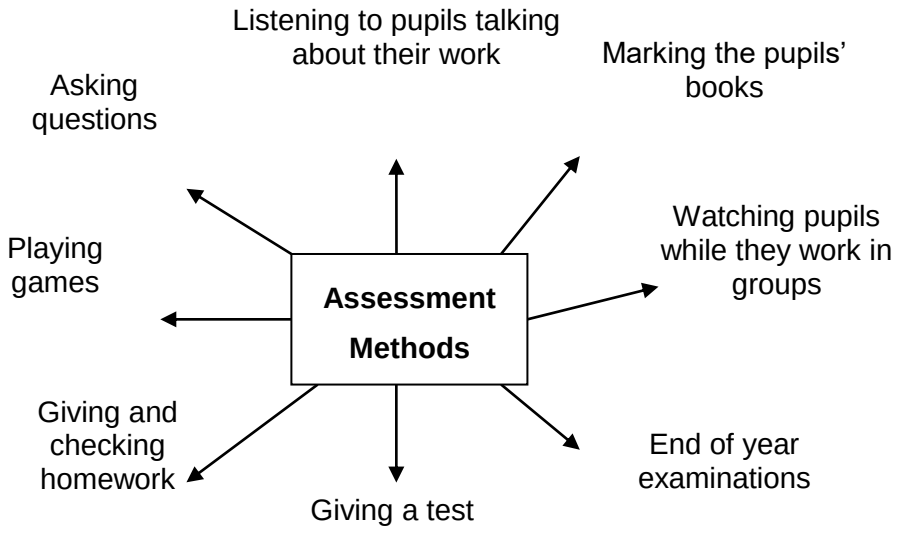
There are some serious problems, however, with using tests as the **only** method of assessment. Here are some, which many teachers will recognise:

- The language may be too difficult. The pupil may not understand what is being asked even if he or she 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 for reasoning, hypothesising and problem solving. The table below explains the different types of questions by giving examples.

| Question Type | Examples |
|---|---|
| **Recalling facts** | What is 3 add 7?<br>How many days are there in a week?<br>How many centimetres are there in a metre?<br>Is 31 a prime number? |
| **Applying or using facts** | Tell me two numbers that have a difference of 12.<br>What unit would you choose to measure the width of the table?<br>What are the factors of 42? |
| **Hypothesising or predicting** | Estimate the number of stones in this jar.<br>If we did our survey again on Friday, how likely is it that our graph would be the same?<br>Roughly, what is 51 times 47? |
| **Designing and comparing procedures** | How might we count this pile of sticks?<br>How could you subtract 37 from 82?<br>How could we test a number to see if it is divisible by 6?<br>How could we find the $20^{th}$ triangular number?<br>Are there other ways of doing this? |
| **Interpreting results** | So what does that tell us about numbers which end in 5 or 0?<br>What does the graph tell us about the most common crops grown?<br>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?<br>In how many different ways can four pupils sit round a table?<br>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 pupil'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.

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

**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 pupils' 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 4 has two topics; Topic 6, Angles and Topic 7, Triangles. The Check Up Page which can be found in the Pupil's Resource Book page 54 has 10 questions. Some have a. b. c. parts in them so there are 66 answers altogether. If a pupil scores 33 out of 66 then 33 is the raw score. To change this raw score into a percentage, multiply it by 100 as shown:

$$\frac{33}{66} \times 100 = 50\%$$

On the following page, is an example of how you could record these percentages. This sheet is designed for the first two terms of Standard 6. 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.

| Check Up Page Record Sheet - Term 1 and Term 2<br>Scores Recorded as Percentages | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Names** | **Unit 1** | **Unit 2** | **Unit 3** | **Unit 4** | **Term Aver-age** | **Unit 5** | **Unit 6** | **Unit 7** | **Unit 8** | **Term Aver-age** |
| John Wale | 45% | 55% | 50% | 60% | **50%** | 55% | 60% | 63% | 61% | **59.7%** |
| Nerinda Base | 68% | 72% | 80% | 75% | **73.7%** | 65% | 72% | 68% | 65% | **67.5%** |
| | | | | | | | | | | |
| | | | | | | | | | | |

## Managing Composite Classes

A composite class is a class in which one teacher teaches pupils from different standards at the same time. This usually happens because of teacher shortages, or because the intake of pupils into each year group is small, so classes are combined.

Composite classes are the reality for most schools, especially smaller, more rural schools where yearly intakes of pupils are small.

All teaching is, in a way, composite class teaching since, even within one Standard 6 class there will be a wide range of ability, interests and needs.

Some teachers see teaching a composite class as a **problem** because they have to manage pupils working at different levels and often on different subjects or topics. But composite classes have many **advantages** too:

- The teacher can focus more on the individual needs of the pupils and provide learning activities at the right level for each pupil.
- The pupils have the opportunity to develop good social relationships with pupils of different ages in their class.
- A family atmosphere can be created in the class, with older pupils helping younger ones. Each pupil can feel part of the group. This is sometimes called **peer teaching** which means pupils teaching other pupils.
- In a composite class teachers often get to know pupils over a longer period of time because they teach the same class for two or sometimes three years. This means that they can work more effectively with them and build a good working **relationship** with the pupils.
- Pupils learn to study more **independently** in a composite class when they cannot always have the attention of the teacher. Pupils become less reliant on the teacher.
- Pupils take more **responsibility** for their own learning in a composite class. Teachers can appoint group leaders, or class monitors to assist with classroom organisation. Pupils can be given different jobs to do, such as preparing the materials, arranging the desks for group work and so on. All of these tasks are time consuming for the teacher, but build a sense of responsibility and maturity if they are given to pupils to do.
- Teachers become more flexible and more skilled at managing the learning process when they are experienced at managing composite classes.

### 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, for example Standards 1&2 not Standards1&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 principal's 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 on how to teach composite classes more effectively.

Unit 1

# Number Topic 1: Whole Number Calculations

**Aim:**

To further develop an understanding of adding and subtracting, multiplying and dividing of larger numbers as well as making calculations which give negative answers.

**Sequence of objectives:** To

1. add and subtract larger numbers, up to 5 and 6-digits.
2. make estimates in addition and subtraction.
3. multiply 3 and 4-digit numbers by 2-digit numbers.
4. divide 3 and 4-digit numbers by 2-digit numbers.
5. make calculations and solve problems involving more than one operation.
6. make calculations which give negative answers.

**Rationale:**

This unit further develops the pupils' knowledge and skills in addition and subtraction, multiplication and division of larger numbers. They also use more than one operation in calculating and solving problems and work with negative numbers in subtraction and addition.

Numbers are used in so many ways in everyday life. They are essential counting tools for buying and selling goods and calculating materials needed to build a house or make a garment. If pupils understand the algorithms used in addition, subtraction, multiplication and division they enhance their grasp of number as a useful tool in solving real life problems.

## T1a

**Materials**
place value chart

Revise the addition and subtraction of larger numbers up to 5 and 6-digits.

Prepare a place value chart on the board, or on a chart, for 5 and 6-digit numbers. Write ones, tens, and hundreds on the chart then ask the pupils to help you to complete the other headings**.**

Briefly remind pupils that place value gives each digit in any number a value according to the position in which the digit is placed.

| Hundred Thousands | Ten Thousands | Thousands | Hundreds | Tens | Ones |
|---|---|---|---|---|---|
| | 1 | 2 | 4 | 8 | 6 |
| 3 | 2 | 4 | 5 | 6 | 4 |

Ask the pupils to call out some 5 and 6-digit numbers and list them on the board. For example:

| | | |
|---|---|---|
| 5-digits | 12,486 | Twelve thousand, four hundred and eighty-six |
| 6-digits | 324,564 | Three hundred and twenty-four thousand, five hundred and sixty-four |

Continue until you have about eight or ten numbers on your list.

Ask pupils to come up to the board, choose any number from the list and write the number on the place value chart. Ask the class some questions about the value of the digits.

For example: write the number 12,486 in the place value chart and ask questions such as:

1. What is the value of 2 in the above number? **(2 thousand)**
2. What does the digit 6 represent? **(6 ones)**
3. How many thousands are there in this number? **(12)**
4. How many ten thousands? **(one)**

…and so on.

Ask similar questions for other 5 and 6-digit numbers.

Now use the place value chart, to set out some addition and subtraction problems, for example: 23,456 + 12,422 =

| | Hundred Thousands | Ten Thousands | Thousands | Hundreds | Tens | Ones |
|---|---|---|---|---|---|---|
| | | 2 | 3 | 4 | 5 | 6 |
| + | | 1 | 2 | 4 | 2 | 2 |
| | | **3** | **5** | **8** | **7** | **8** |

Go through the digits and calculate the value for each column from the ones to the hundred thousands column. Remind the pupils to start with the ones, to work from right to left and to place each digit in the correct column.

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

Repeat with an example of a subtraction sum such as 223,345 - 111,222 =

Use more examples to provide practice if necessary.


Write the following sums on the board and ask the pupils to copy and complete them in their exercise books.

Move around the class to check and assist pupils while they do these activities. Mark their work as they go along so that you can identify any difficulties they might have.

**Addition**

| **1.** | **2.** | **3.** | **4.** | **5.** |
|---|---|---|---|---|
| 11,234 | 23,451 | 321,452 | 860,500 | 444,223 |
| +12,244 | + 12,123 | +321,123 | +120,211 | +432,006 |
| **23,478** | **35,574** | **642,575** | **980,711** | **876,229** |

**Subtraction**

| **6.** | **7.** | **8.** | **9.** | **10.** |
|---|---|---|---|---|
| 25,564 | 336,451 | 72,644 | 145,756 | 869,948 |
| -15,562 | - 26,341 | - 51,543 | - 44,330 | -764,812 |
| **10,002** | **310,110** | **21,101** | **101,426** | **105,136** |

## T1b

**Materials**

Place Value Game
0 – 9 number cards
scrap paper

In this activity, pupils revise addition with regrouping and subtracting with trading, which they covered in Standards Four and Five.

Prepare a place value chart on the board or on chart paper for 5 and 6-digit numbers.

| | Hundred Thousands | Ten Thousands | Thousands | Hundreds | Tens | Ones |
|---|---|---|---|---|---|---|
| | | | *1* | *1* | *1* | |
| | 3 | 2 | 3 | 4 | 5 | 6 |
| + | 2 | 4 | 2 | 5 | 4 | 6 |
| | **5** | **6** | **6** | **0** | **0** | **2** |

Write these questions in the place value chart one at a time and work through the calculations together.

323,456 + 212,422 = **535,878**

223,345 - 111,222 = **112,123**

Say the numbers as you write them in their correct place value. For example:

Three hundred and twenty-three thousand, four hundred and fifty-six plus two hundred and twelve thousand, four hundred and twenty-two

Ask:

- If we add the numbers and the answer is more than 10 what are we going to do? (**Regroup 1 to the next column)**
- If we want to take away but the top number is smaller than the bottom number then what are we going to do? **(Trade 1 from the top number in the next column)**

Use these as examples to give the pupils more practice with trading and regrouping.

| | | | |
|---|---|---|---|
| 24,632 | 140, 236 | 52,230 | 340,121 |
| +15,370 | + 72,134 | -34,117 | -224,644 |
| **40,002** | **212,370** | **18,113** | **115,477** |

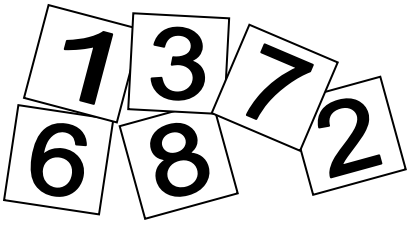
## C1b

Before the pupils do the activities from the Pupil's Resource Book on page 5, put them in groups of four and ask them to play the **Place Value Game**.

Pupils must make a game card like this in their books or on scrap paper.

Place a set of 0 – 9 number cards face down on the table. Pick one card at random and read out the number.

The pupils have to write the number on their game card. They have to choose where they will place the number in order to make the biggest possible six-digit number. Continue picking, reading and placing the numbers on the game card until all six spaces have been filled.





Have pupils read out their numbers to see who has made the biggest six-digit number. The pupils with the largest number get a point. The first pupil to reach 5 or 10 points wins the game.

In this example, the largest possible number would be 876,321.

The pupils should now complete the activities in their Pupil's Resource Book on page 5.

**Answers**

**Activity A**

**1.** 184,971 **2.** 239,000 **3.** 194,675
**4.** 201,220 **5.** 710,101 **6.** 181,115

**Activity B**

**1**. 504, 966 **2**. 353,337 **3**. 239,121 **4**. 74,366 **5**. 35,400
**6**. 19,432 **7**. 21,712 **8**. 110,802 **9.** 39,062 **10.** 100,818

**Activity C**

**1.** 211,150 **2.** 104,610 **3a.** 94,932 **b.** 205,961 **c.** 17,701

Can all the pupils add and subtract larger numbers with up to 5 and 6-digits?

## T2a

**Materials**

Addition Sums Game Cards

In this lesson pupils revise how to make estimates when adding numbers up to 5 and 6-digits.

Ask the pupils to tell you the meaning of the word **estimate**.

Estimate means to make a **rough calculation**. It is **not a guess**. This is usually done before an actual calculation so that the estimate can then be compared to the calculated answer to see if the answer is a sensible one.

Ask the pupils to estimate:

- the number of pupils in the school;
- the number of people living in their village;
- the population of their island;
- the population of their province.

Remind them that estimating gives a rough answer before actually calculating to find out the answer. You should provide the actual answers to the questions you ask, to allow pupils to check how close their estimates were.

Revise the work already done on estimation, approximation and rounding in Units 3 and 4 of Standard 5. Write some numbers on the board and work through the process of **rounding** to the nearest 10, 100 and 1,000 as follows:

**1,479**.

- To round this number to the nearest 10

  Look at the digit to the right of the tens place. The number is 9.

  Since this is more than five, we round it **up** to give **1,480**.

- To round this number to the nearest 100

  Look at the digit to the right of hundreds place. The number is 7.

  This is more than five so we round it **up** to give **1,500**.

- To round this number to the nearest 1,000

  Look at the digit to the right of the thousands place. The number is 4.

  This is less than five so we round it **down** to give **1,000**.

Now write the following example on the board. To estimate the answer, pupils must round the numbers to the nearest thousand.

Use the three steps that they are familiar with **estimate, calculate, compare**.

**1. Estimate**

| | | |
|---|---|---|
| 14,900 | rounded to nearest thousand | 15,000 |
| + 10,308 | rounded to nearest thousand | + 10,000 |
| | **Estimate** | **25,000** |

**2. Calculate**

| |
|---|
| 14,900 |
| + 10,308 |
| **25,208** |

**3. Compare**

| | |
|---|---|
| Estimation | 25,000 |
| Calculation | 25,208 |
| Difference | 208 |

The answer is **25,208**. My calculation is sensible because it is close to the estimate of 25,000.

The estimate of 25,000 gives a rough idea of what the correct answer will be. Estimation gives us an approximation of what the answer would be. It gives us something against which to check our answer.


Before the lesson prepare the addition sums game cards provided for the pupils to use to practise estimating. The class will work in groups of four and you will need enough cards for each group to have about five or six.

Here are some examples you could use, if you need to make your own.

| | | | | |
|---|---|---|---|---|
| 14,102<br>+ 20,721 | 19,801<br>+ 10,412 | 53,304<br>+ 34,597 | 17,110<br>+ 61,857 | 49,904<br>+ 37,301 |
| 62,111<br>+ 37,000 | 82,610<br>+ 13,005 | 23,450<br>+ 11,981 | 27,101<br>+ 44,252 | 99,001<br>+ 70,412 |

Divide the pupils into groups of three or four. Share out the cards. Let each group have four or five cards. Tell the pupils to put the cards face down on the table so that they cannot see the addition sums.

One pupil should turn over one card so that everyone can see it. Allow the group to mentally **estimate** the answer by rounding to the nearest thousand. Each pupil should write down his or her estimate.

Now the pupils look at the sum again and **calculate** the actual answer together. Then the pupils **compare** the actual answer to their estimates.

Allow time for pupils work through the remaining cards.

The pupils can have more practice in estimating and calculating answers by working through the activities in the Pupil's Resource Book on page 6.

Read the instructions first with the class. Emphasise that they should round to the nearest thousand then **estimate** an answer before **calculating** to find out the actual answer. Finally they should **compare** their two answers to check the accuracy of their calculation.

Estimating is a way of checking if the answer is correct.

### Answers

#### Activity A

| | | | |
|---|---|---|---|
| **1.** | 1,340 | 1,300 | 1,000 |
| **2.** | 4,660 | 4,700 | 5,000 |
| **3.** | 5,210 | 5,200 | 5,000 |
| **4.** | 3,800 | 3,800 | 4,000 |
| **5.** | 12,530 | 12,500 | 13,000 |
| **6.** | 24,750 | 24,700 | 25,000 |
| **7.** | 124,560 | 124,600 | 125,000 |
| **8.** | 139,010 | 139,000 | 139,000 |

#### Activity B

**1.** Estimate 82,000 Calculation 82,007
**2.** Estimate 91,000 Calculation 90,106
**3.** Estimate 591,000 Calculation 590,623
**4.** Estimate 92,000 Calculation 91,897
**5.** Estimate 208,000 Calculation 208,046

#### Activity C

**1a.** 22,000 **b.** 22,120 **2a.** 12,000 **b.** 12,449 **3a.** 32,000 **b.** 32,099
**4a.** 229,000 **b.** 228,038 **5a.** 661,000 **b.** 661,331 **6a.** 835,000 **b.** 834,715

## T2b

In this lesson pupils practice estimation in subtraction of five and six-digit numbers. The process is the same as for addition. First **round off the numbers** then **estimate, calculate** and **compare.**

Begin the lesson by writing the following example on the board.

Estimate the difference between 76,002 and 48,875.

Ask the pupils:

What operation do you need to find the difference? **(Subtraction)**

How can you estimate the answer? **(Round each number to the nearest thousand and then take one away from the other.)**

**First, estimate**

76,002 rounded to nearest thousand is 76,000

48,875 rounded to nearest thousand is 49,000

6 16
~~7~~6,000
- 49,000
**27,000**

**Next, calculate the answer**

6 15 9 9 12
~~7~~~~6~~,002
- 48,875
27,127

the actual answer is **27,127.**

Finally, compare.

**The calculation of 27,127 is close to the estimate of 27,000.**

Remind the pupils that estimating should always be done before calculating as it gives a rough idea of what the answer will be. Comparison of the estimated answer and the actual answer is done to check whether the calculated answer is a sensible one.

Estimation is particularly useful when solving problems.

Go over the **language of subtraction and addition**.

In the example you asked 'What is the difference between?'

Ask the pupils to come up with other language which means that they need to subtract. Write their suggestions on the board.

For example: **subtract**, **minus**, **take away**, **by how much is one number bigger than another**, **by how much is one number smaller than another**, and so on.

Do the same for addition: total, sum, altogether, add and so on.

## C2b

**Before the lesson prepare some data about the school as follows:**

- the number of boys and girls in your class;
- the number of boys and girls in each standard;
- the number of boys and girls in the school;
- the number of males and females in your community.

Show the pupils the figures you have collected and ask them to estimate the difference between males and females in each case. Tell them they must decide on whether to round to 10, 100 or 1,000 depending on the numbers involved.

When the pupils have worked through these examples there are more examples to practice estimating skills in the Pupil's Resource Book on page 7.

The activities are organised in three levels of difficulty. Activity A is the easiest, B is more difficult and Activity C is the most difficult. You should decide which activities would be appropriate for which pupils. They do not all need to do all three activities.

## Answers

### Activity A

| | | | | |
|---|---|---|---|---|
| **1.** | Estimate | 0 | Calculation | 100 |
| **2.** | Estimate | 46,000 | Calculation | 45,446 |
| **3.** | Estimate | 27,000 | Calculation | 27,130 |
| **4.** | Estimate | 197,000 | Calculation | 197,007 |
| **5.** | Estimate | 19,000 | Calculation | 18,516 |
| **6.** | Estimate | 78,000 | Calculation | 78,329 |
| **7.** | Estimate | 8,000 | Calculation | 7,694 |
| **8.** | Estimate | 357,000 | Calculation | 357,491 |
| **9.** | Estimate | 23,000 | Calculation | 23,322 |
| **10.** | Estimate | 556,000 | Calculation | 555,939 |

### Activity B

**1.** 146 more girls than boys
**2.** $252
**3.** 441 pupils at the other school
**4.** 900,000
**5.** 424,350
**6.** 107,895
**7.** 302,911
**8.** 274,587

### Activity C

**1a.** Australia
**1b.** 20,275,653
**1c.** Solomon Islands and Vanuatu = 246,200. Solomon Islands and Fiji = 386,600
**1d.** 71,700
**1e.** 16,215,800
**1f.** 30,000
**1g.** 119,900
**1h.** Pitcairn Island has not been rounded because its population is too small. Rounding to the nearest 100 would give a population of 0.

**2a.** 35,825
**2b.** 211,219
**2c.** Honiara Town Council – has increase to more than 4x what it was in 1970.
**2d.** 37,101
**2e.** 73,513
**2f.** 38,525
**2g.** 7,149
**2h.** 51,058

Can all the pupils make estimates before adding and subtracting?


In this activity pupils revise multiplication by 2 and 3-digit numbers.

Write this multiplication story on the board.

**32 canoes transported bags of clamshell from Visale to Rove.**
**The boats carried 28 bags each.**
**How many bags did they transport all together?**

Ask the pupils to explain how they think they will solve the problem.

Help them first to identify the important information, such as the number of canoes and the number of the bags of clamshell each canoe carried.

Ask the pupils to suggest ways of finding the answer. They must multiply the number of canoes by the number of clamshell bags each canoe carried.

Work through the calculation together as shown on the next page.

```
  2
    1
  28
 x32
  56
+840
 896
```

First multiply 2 ones by 8 ones **(16).**

Write down 6 in the ones column in the first row of your answer, then regroup 1 on top of the 2 tens.

Next multiply the 2 ones by 2 tens **(4)** then add the 1 to make 5. Write 5 in the tens column.

Place a zero in the ones column in the next line of the answer before multiplying by the 3. (this multiplies by 10)

Work through this calculation together in the same way and finally, add the two rows of figures to find the total number of bags of clamshell **(896 bags).**

Work through some more examples together in the same way. Choose problems that involve multiplication of 2 and 3-digit numbers, such as:

**a.** 21 lorries transported cargo from the wharf to the warehouse. If each lorry can carry 150 tons, how many tons can be carried all together? **(3,150 t)**

**b.** Farmer Ben has 120 hens. If each hen lays 25 eggs a month, how many eggs would Farmer Ben collect each month? **(3,000 eggs)**

**c.** A woman sold two hundred and seventy four watermelons for $35 each.

How much money did she make? **($9,590)**

## C3a

**Materials**

Quick Multiplier Game Cards
scrap paper

This game is called **Quick Multiplier**. It gives the pupils more practice with multiplication of 2 and 3-digit numbers.

Prepare the set of multiplication cards provided before the lesson. These have the sum on one side and the answer on the other. They include 2 and 3-digit numbers. You will need about 10 cards for each group of five pupils.

The pupils will play this game in groups of five. One child will act as a group leader. The leader will pick a card then show it to the other four pupils in the group. The pupils will try to work out the answer as quickly as possible using scrap paper or their exercise book. The first child who calls out the right answer gets a point. The answer for each sum is written on the back of each card. Only the leader can check the answer.

Continue until all the cards have been picked up, or until someone gets to 10 points.

| | | | | | | |
|---|---|---|---|---|---|---|
| **37 x 15** | **131 x 25** | **33 x 33** | **27 x 421** | **30 x 51** | **321 x 54** | **17 x 210** |
| **27 x 60** | **20 x 181** | **25 x 27** | **27 x 204** | **14 x 45** | **190 x 63** | **360 x 30** |

When they have had enough practice, pupils should complete the activities in their Pupil's Resource Book on page 9. Read through the instructions and explain the activity to them.

### Answers

**Activity A**

**1.** 3,200
**2.** 5,500
**3.** 25,500
**4.** 1,665
**5.** 4,020
**6.** 2,750

**Activity B**

**1.** 25,776
**2.** 15,936
**3.** 12,145
**4.** 9,384
**5.** 15,479
**6.** 53,037
**7.** 36,176
**8.** 33,376
**9.** 8,159
**10.** 43,505
**11.** 17,112
**12.** 16,380

**Activity C**

**1. a.** 8 **b.** 6 **c.** 6
**2. a.** 4 **b.** 7 **c.** 4 **d.** 1
**3. a.** 1
**4.** 13,090
**5.** 54,648
**6.** 17,271
**7.** 19,899
**8.** 15,984

# T3b

**Materials**
Place value chart

In this lesson you extend the task to multiplying 4-digit numbers by 2-digit numbers. The method is the same. Work through the example together on the board revising the method and using the appropriate language to describe each part of the operation.

| | | | | | |
|---|---|---|---|---|---|
| | | 4 | 1 | 2 | 2 |
| | x | | | 4 | 2 |
| | | 8 | 2 | 4 | 4 |
| 1 | 6 | 4 | 8 | 8 | 0 |
| **1** | **7** | **3** | **1** | **2** | **4** |

First, multiply by the 2 ones, write the result in the first row of your answer.

Place a 0 in the ones column of the next row of your answer, and then multiply by 4 tens.

Add the two results to find the answer.

The key things for pupils to remember are:

1. Always work from right to left, starting with the ones column.
2. Use regrouping when the answer is more than 9 and always remember to add in the regrouped amount to the next place.
3. Always remember to put a 0 in the ones column before multiplying by the tens.
4. Add the two rows of figures to find the final answer.

Work though some more examples together on the board. This time, ask pupils to take turns to come up and explain the process. Talking through the sums aloud in this way helps pupils to understand what they are doing and helps you to see where they might be going wrong.

If necessary you could write the sums on a place value chart to help pupils as shown below.

| Tth | Th | H | T | O |
|---|---|---|---|---|
| | *1* **2** | **3** | *2,1* **1 3** | **6 4** |
| | 9 | 2 | 6 | 4 |
| 6 | 9 | 4 | 8 | 0 |
| **7** | **8** | **7** | **4** | **4** |
| *1* | | *1* | | |

**First** multiply by the 4 ones. **4 x 6 = 24**

Put the 4 in the ones column and regroup the 2 tens into the tens column.

**4 x 1 = 4** add the 2 tens you have regrouped and write the answer 6.

**4 x 3 = 12** … and so on.

**Next** multiply by the three tens.

Place a zero in the ones column before you begin.

**3 x 6 = 18** put the 8 in the tens column and regroup the ten into the next column.

**3 x 1 = 3**, add the regrouped ten and write the answer 4.

**3 x 3 = 9** … and so on.

**Finally** add the two rows of multiplication together to find the answer.

Here are some more examples you could work through together.

| | | | | | |
|---|---|---|---|---|---|
| **a**. | 2,356<br>x 54 | **b**. | 1,982<br>x 23 | **c**. | 2,224<br>x 36 |

As well as teaching the pupils how to do the multiplication sums, teach them how to set them out for themselves, making sure that they put all the numbers in the correct columns. You can practice this by giving them some examples in words and having them set the sums out in their books themselves. For example:

**a.** **Multiply** four thousand and eighteen by twenty-seven.

**b.** What is 54 **times** one thousand two hundred and fifty?

**c.** Find the **product** of three thousand and twenty-four and nineteen.

By presenting these examples in different ways you can revise the different vocabulary used in multiplication. This also helps pupils to think carefully about how to set out the sums.

## C3b

Ask the pupils to work in pairs. Write the following multiplication sums on the board and ask them to work together to find the answers. Move around the class to check that they have set them out correctly.

1. One thousand five hundred and sixty-two multiplied by twenty-seven. **(42,174)**
2. Thirty-four times one thousand five hundred and thirty-four. **(52,156)**
3. Find the product of one thousand three hundred and eighty-five and twenty-three. **(31,855)**

When they are ready, ask the pupils to complete the Pupil's Resource Book activities, page 10.

**Answers**

**Activity A**

**1.** 206,280 **2.** 69,120 **3.** 232,611 **4.** 70,708
**5.** 84,025 **6.** 180,544 **7.** 140,580 **8.** 74,720

**Activity B**

**1.** 128,260 **2.** 25,632 **3.** 162,486

**Activity C**

**1.** 80,064 **2.** 64,350 **3a.** 29,640 **3b.** $51,870

## T3c

In this lesson, pupils apply the multiplication skills they have learnt to solving real life problems.

The focus is on identifying what information is required and on setting out the sums correctly. You should remind the pupils to use **rounding** and **estimation** to check that their answers are reasonable.

Write up this multiplication story on the board and work through it with the pupils.

1. Deliveries of bread are made on 261 days of the year. The delivery route is 67 kilometres in length. How far does the truck travel in a whole year?

**a.** Ask the pupils to identify what information is required. **(The total distance the truck travels in km, in a year)**

**b.** Ask them how they will find this. **(By multiplying the km travelled each day (67) by the number of delivery days in the year (261))**

**c.** Ask one pupil to set out the calculation on the board and ask the class to check that they have set it out correctly (as shown).

**d.** Ask the pupils to work out the answer in their books and then compare and check it together.

| | | | | |
|---|---|---|---|---|
| | | *4,3* | | |
| | | **2** | **6** | **1** |
| x | | | **6** | **7** |
| | 1 | 8 | 2 | 7 |
| 1 | 5 | 6 | 6 | 0 |
| **1** | **7** | **4** | **8** | **7** |
| | *1* | | | |

Work through some more problems with the class. Check that they are able to identify what is required as well as calculating the correct answer. Some of these combine different operations and require two stages of calculation.

**2.** A driver travels 39 kilometres from home to work and back each day. (19.5 km each way) How far does he drive to and from work in 1,250 days? **(48,750 km)**

**3.** Curtain fabric costs $28 a metre. The school needs 420 m to make curtains for the school hall, 125 m for the staff room and 513 m for the classrooms. How much will the curtains for the whole school cost? **($29,624)**

**4.** Billy earns $58 per day. He works for 261 days each year. How much will earn in 5 years? **($75,690)**

## C3c

Provide more practice solving multiplication problems. Have the pupils work in pairs for this activity and encourage them to discuss how to solve each problem with their partner. Talking about their work will help them to understand the problem solving process.

Write some multiplication stories on the board and allow the pupils to discuss them and work them out in pairs. Check that they are setting them out correctly.

**1.** The manager drives to and from work on 235 days each year. Her return journey is 27 kilometres. How far does she travel to and from work each year? **(6,345 km)**

**2.** 230 T-shirts were stolen from Island Clothing store last week. Each T-shirt was worth $14. What was the total value of the stolen T-shirts? **($3,220)**

**3.** A plantation worker plants out 1,280 seedlings every day for two weeks. If he does not work on Saturdays or Sundays, how many seedlings does he plant altogether? **(12,800)**

**4.** 28 pupils in the Standard 6 class made cakes for the school fundraising day. They each made 12 cakes and sold each one for $25.

**a.** How many cakes did they make? **(336)**

**b.** How much money did they raise? **($8,400)**

When ready, ask the pupils to complete the Pupil's Resource Book activities on Page 11.

### Answers

| Activity A | | Activity B | Activity C | |
|---|---|---|---|---|
| **1**. 233,368<br>**2.** 43,966<br>**3**. 50,496 | **4**. 230,400<br>**5**. $4,860<br>**6.** $36,325 | **1.** 14,676<br>**2**. 43,200<br>**3**. 13,440<br>**4**. $23,400 | **1.** 52,320<br>**2.** 57,792<br>**3.** $9,000<br>**4.** **$**12,600 | **5.** Soap 196,200<br>Powder 71,100<br>Liquid 170,550 |

Can all the pupils multiply 3 and 4-digit numbers by 2-digit numbers accurately and solve problems involving multiplication?

# T4a

**Materials**

Sets of 0 – 9 number cards, one set per pair,
Nguzu Nguzu Multiplication Square Poster

In this lesson pupils will revise the division of a 4-digit number by a 1-digit divisor. Begin by going through some examples with the whole class on the board.

Write this division problem on the board and ask pupils to read it out to you and then tell you how to set it out correctly as shown below:

**1,885 ÷ 5 =**

**One thousand eight hundred and eighty-five divided by five.**

**5 ⟌ 1,885**

Remind pupils that this is the same as sharing 1,885 objects among 5 people.

Work through the calculation as a class as follows:

Remind pupils that in division we work from left to right. In this sum we start with the thousands column.

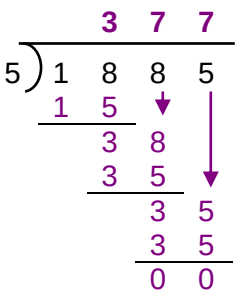
How many 5s in 1 (thousand)? **None**

Move on to the hundreds column. How many 5s 18 (hundreds)? **3 and 3 left over.**

Bring down the 8 tens. How many 5s in 38 (tens)? **7 with 3 left over.**

Bring down the 5 ones. How many 5s in 35 (ones)? **7 with none left over.**

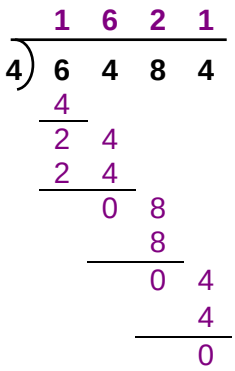
So 1,885 ÷ 5 = 377

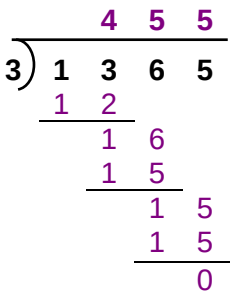


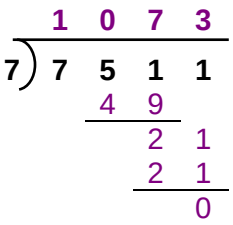

Go through some more examples with the class. Choose examples that divide exactly (without remainders) at first until they are confident with the division.

Pupils need a good knowledge of their tables to be able to do these division sums confidently. You could provide some practice with tables to support this lesson if necessary, or allow pupils to use the multiplication square provided on the Nguzu Nguzu poster.

Here are some more examples you could use.



## C4a

**Race Against the Clock**

Let the pupils work with a partner. Give each pair a set of number cards (0-9). Tell them that they must each take three cards from the pack. They must then write down as many division sentences as they can in a set time of say three minutes.

You could get all the pupils to choose their 3 cards but the pupils cannot look at them until you say 'Go' and start the timing.

Go through an example with the class first to make sure that they understand what to do.

If the cards 6, 5 and 4 are picked the following division sentences could be written:

**54 ÷ 6 =** 9 **45 ÷ 6 =** 7 r 3 **56 ÷ 4 =** 14

**65 ÷ 4 =** 16 r 1 **64 ÷ 5 =** 12 r 4 **46 ÷ 5 =** 9 r1

Have pupils check each other's answers at the end of each race. Record their scores, one point for each sentence with a correct answer, before playing again.

The winner is the pupil who has the most points at the end of the game.

You could vary this game by asking pupils to pick 4 or 5 cards but they can only make division sentences with a 1-digit divisor. There are more activities to practice dividing by a 1-digit number in the Pupil's Resource Book on page 12.

### Answers

**Activity A**

**1.** 1,160
**2.** 854
**3.** 865
**4.** 538
**5.** 568
**6.** 952
**7.** 625
**8.** 777
**9.** 675
**10.** 956
**11.** 2,876
**12.** 732

**Activity B**

**1.** $94.25 or $94 and $1 left over.
**2.** 32 L
**3.** 25 shells
**4.** 1,675 bags
**5.** 33
**6.** 16

**Activity C**

**1.** 1,396 are girls
**2.** 6,250 km
**3.** $75
**4.** $35
**5.** 19

## T4b

In this lesson you teach how to divide 3-digit numbers by 2-digit divisors. All the examples used give answers without remainders.

Remind the pupils that, in the last lesson, they revised how to set out and then calculate division sums. Tell them that in this lesson they are going to do exactly the same, but this time they will use divisors with two digits.

First, teach and revise the following vocabulary:

| | |
|---|---|
| **Divisor** | The number by which we divide. |
| **Dividend** | The number which is to be divided. |
| **Quotient** | The result of the division (the answer). |
| **Remainder** | Any number left over when we have finished dividing. |

So in the sum, 5,250 ÷ 6 = 875.

6 is the **divisor**
5,250 is the **dividend**
875 is the **quotient**
There is no **remainder.**

Write this example on the board:

**648 ÷ 12 =**

Ask the pupils: Which is the divisor? **(12)**

Which is the dividend? **(648)**

What do we call the answer when we have worked it out? **(The quotient)**

What do we call any number left over when we have finished dividing? **(The remainder)**

Encourage pupils to use the correct mathematical language as they talk through the process of each calculation.

Work through one example with the whole class. What you should write down on the board is on the right. What you say as you go through the calculation is on the left.

Can we divide 12 into 6? **(No)**

Move on to the next column. Can we divide 12 into 64? **(Yes)**

There are 5 x 12 in 64, 5 x 12 = 60. Write 5 in the tens column.

Write the 60 underneath the 64. Subtract 60 from 64 to leave 4 (tens)

Bring down the 8 from the ones column to make 48.

Can we divide 12 into 48? **(Yes)**

There are 4 x 12 in 48. Write the 4 in the ones column.

Are there any left over? **(No)** The quotient is 54.

```
      5  4
   ┌──────
12 ) 6  4  8
   - 6  0  ↓
   ──────
      4  8
   -  4  8
   ──────
      0  0
   ──────
```

Go through some more examples with the pupils.

As pupils are not likely to have memorised multiplication facts beyond 10, they may need to write down rough calculations on scrap paper as they work through each sum.

Here are some more examples you could go through with the class.

517 ÷ 11 = 47 403 ÷ 13 = 31 384 ÷ 12 = 32

Make sure that the pupils understand that the procedure is the same as the last lesson when the pupils divided by a 1-digit divisor.

## C4b

Write these division problems on the board.

**a.** $\begin{array}{r} \mathbf{53} \\ 13\overline{)\,689} \end{array}$ **b.** $\begin{array}{r} \mathbf{62} \\ 12\overline{)\,744} \end{array}$ **c.** $\begin{array}{r} \mathbf{45} \\ 11\overline{)\,495} \end{array}$ **d.** $\begin{array}{r} \mathbf{41} \\ 12\overline{)\,492} \end{array}$

Ask the pupils to work with a partner to set out and calculate these division sums. Move around the class to check that they have set out their sums correctly and encourage them to talk about the process with their partner. Talking about what they do helps them to understand it better.

Try to identify any common problems the pupils are having and explain these again.

When they are ready, have the pupils go on to the activities in the Pupil's Resource Book on page 13.

## Answers

### Activity A

**1.** 9
**2.** 12
**3.** 4
**4.** 6
**5.** 8
**6.** 11
**7.** 7
**8.** 10
**9.** 9
**10.** 12
**11.** 7
**12.** 5

### Activity B

**1.** 62
**2.** 45
**3.** 41
**4.** 53
**5.** 62
**6.** 61
**7.** 61
**8.** 50

### Activity C

**1.** 42
**2.** 53
**3.** 72
**4.** 57
**5.** 25
**6.** 82

## T4c

**Materials**

scrap paper.

In this lesson pupils will extend their division skills by dividing 4-digit dividends by 2-digit divisors. Explain that the procedure is exactly the same even though we are now dealing with larger numbers.

Write an example on the board and work through it together as shown.

Remind the pupils to work from left to right as before. Make sure that the pupils understand the place value of all the digits in the dividend before they begin.

Talk through the example as before.

```
        7  6  7
    ┌──────────
12  │ 9  2  0  4
  - │ 8  4
    ──────
      8  0
    - 7  2
      ─────
         8  4
       - 8  4
         ─────
         0  0
```

Here are some more examples to try. Write these up on the board and call pupils out to the front to work through each one step by step. Encourage them talk through what they are doing as they work through their calculations.

```
      827          679          121
   ┌──────       ┌──────       ┌──────
10 │ 8270     12 │ 8148     13 │ 1573
```

## C4c

This activity gives the pupils extra practice with multiplication facts. This will help them when they do division calculations.

Pupils are not expected to know multiplication tables beyond 10. When working with figures higher than this, explain that they should make an informed guess or an estimate.

Write an example on the board, such as: **81 ÷ 18 =**

Ask the pupils to explain how they will find out how many 18s there are in 81.

Since they do not know their 18 x table, they will need to estimate and check. They will need scrap paper to do this.

Show pupils how to estimate and then check. Write your rough calculations on the board as you go along as shown on the next page:

| | | | | | |
|---|---|---|---|---|---|
| estimate 6 | 18 | estimate 5 | 18 | estimate 4 | 18 |
| | x **6** | | **x 5** | | **x 4** |
| | **104** too many | | **90** too many | | **72** |

They should be able to tell you that **81 ÷ 18 = 72 remainder 9**

Ask the pupils to work in pairs. Give them some more examples to estimate and check. Write these on the board. Make sure pupils work together and discuss their work.

**a.** 81 ÷ 15 = **5 r 4**
**b.** 81 ÷ 17 = **4 r 13**
**c.** 81 ÷ 19 = **3 r 24**
**d.** 81 ÷ 22 = **3 r 15**
**e.** 81 ÷ 14 = **5 r 11**
**f.** 81 ÷ 25 = **3 r 6**
**g.** 86 ÷ 16 = **5 r 6**
**h.** 54 ÷ 16 = **3 r 6**
**i.** 120 ÷ 16 = **7 r 8**
**j.** 235 ÷ 16 = **14 r 11**
**k.** 65 ÷ 16 = **4 r 1**
**l.** 128 ÷ 16 = **8**

Provide plenty of practice with this activity. This will help pupils get used to making more accurate estimates. Use different dividends with the same divisors as well as the same dividend and different divisors. When they have had plenty of practice, ask them to complete the activities in the Pupil's Resource Book on page 14.

### Answers

**Activity A**

**1.** 573
**2.** 765
**3.** 836
**4.** 492
**5.** 798
**6.** 731
**7.** 666
**8.** 430

**Activity B**

**1.** 152
**2.** 465
**3.** 632
**4.** 520
**5.** 194
**6.** 337
**7.** 297
**8.** 186

**Activity C**

**1.** 125
**2.** 156
**3.** $360
**4.** $328
**5.** $125

## T4d

In this lesson pupils practice long division giving answers **with remainders**. This is when a number cannot be divided exactly. Tell the pupils they will use 4-digit numbers and divide them using 2-digit divisors as they did in the last lesson. Go through an example on the board.

Use the example **4,578 ÷ 10** to revise the division method.

Make sure pupils understand each step. Talk through each step as you work out the example as shown. Remind the pupils of the place value of the digits and how to set out the sum correctly.

```
        4  5  7  r 8
    ┌──────────────
10  )4  5  7  8
    4  0
    ──
       5  7
       5  0
       ──
          7  8
          7  0
          ──
Remainder 8
```

Start from the left. Share the thousands first.
How many 10s in 4 (thousands)? **(Can't be done so move on to the hundreds column.)**
How many 10s in 45? (**4).** Write the 4 in your answer.
4 x 10 = 40. Write the 40 under the 45.
45 – 40 = 5. Bring down the 7.
How many 10s in 57? **(5)** Write the 5 in your answer.
5 x 10 = 50. Write the 50 under the 57.
57 – 50 = 7. Bring down the 8.
How many 10s in 78? **(7)** Write the 7 in your answer.
7 x 10 = 70. Write the 70 under the 78
78 – 70 = 8. There is a remainder of 8.

Go through some more examples with the pupils on the board if necessary. Here are some you could use:

**a.** $15\overline{)3562}$ = **237 r 7**

**b.** $19\overline{)3587}$ = **188 r 15**

**c.** $27\overline{)7946}$ = **294 r 6**

## C4d

Tell the pupils that parents have sent in some food for the class to take on an end of term picnic. Let the pupils work out how many of each item, each pupil will get and whether there will be any left over.

Use the number of pupils in your class as the divisor. The answers will depend on the number of pupils in your class.

Write the list of items on the board.

Let the pupils complete the activities in the Pupil's Resource Book on page 15, for extra practice with division.

```
53 bread buns
14 litres of cordial
35 oranges
76 sausages
8 packets of biscuits
with 12 biscuits in
each packet
```

### Answers

**Activity A**

**1.** 9
**2.** 2
**3.** $4
**4.** 2
**5.** 5
**6.** 44 m
**7.** 1
**8.** $32

**Activity B**

**1.** 53 r 2
**2.** 32 r 5
**3.** 32 r 4
**4.** 220 r 9
**5.** 407 r 6
**6.** 212 r 7
**7.** 45 rows with 7 left over
**8.** 61 sacks with 18 left over
**9.** $567 with $11 left over
**10.** 518, no remainder

**Activity C**

**1.** 11
**2.** 131 trips, 9 on last load.
**3.** **a.** 5,445
**b.** 218 rows
**c.** 20
**4.** 150 bags.

? Can all the pupils divide 3 and 4-digit numbers by 2-digit numbers?

## T5a

In this lesson pupils revise the order in which they should perform operations when more than one operation appears in a number sentence. Refer back to Standard 5 Unit 12 to see what the pupils have already learnt about mixed computation.

Remind pupils of **B O D M A S**. (Brackets of, Division, Multiplication, Addition, Subtraction). This is a tool to help them to remember the order of operations.

Write this example on the board.

**15 + 25 ÷ 5 =**

Ask the pupils how they work out the answer. What would they do first?

Following the BODMAS rule they must **divide first** and **then add**.

**25 ÷ 5 = 5** **15 + 5 = 20**

Now write this on the board.

**(15 + 25) ÷ 5 =**

Following the BODMAS rule, in this example they must work out the **brackets first, then divide.**

**15 + 25 = 40** **40 ÷ 5 = 8**

Once the pupils have revised the order of operations with simple numbers give them some examples which involve larger numbers to try, such as.

4,205 – 134 x 7 = **(3,267)**

(2,307 – 1,566) ÷ (200 – 197) = **(247)**

Tell the pupils that when they read a problem they must **first decide the order of operations**. This will help them identify the steps necessary to solve the problem. Provide some examples that require pupils to apply the BODMAS rule to problem solving, such as:

**a.** Timi bought 2 tins of taiyo for $5.50 each. He had $20.00. How much change did he get?

$ 5.50 $20.00
x 2 - $11.00
**$11.00** $ 9. 00

**First multiply** the cost of one tin of Taiyo by 2.

Then **subtract** this from $20.00.

Timi got $9.00 change.

**b.** 2,450 cocoa seedlings were planted in a plantation, but 640 of them died. After 5 years, the remaining trees produced 14 kg of cocoa each. Cocoa was sold for $7 per kg. How much money did the plantation make?

Ask pupils what the problem is asking them to find out. **(The amount of money made after the first year's harvest.)**

Ask them to explain how they think they will work this out.

Show the pupils how to set out this problem as a sum as follows:

**(2,450 – 640) x 14 kg x $7**

Explain that we use **brackets** around the subtraction sum so that it is done first. This is because the 640 trees that died did not produce any cocoa so we do not want them to be counted in the harvest. Work it out together as follows:

**2,450 – 640 = 1,810** **1,800 x 14 kg = 25,340 kg** **25,340 kg x $7 = $177,380**

## C5a

Copy these sums onto the board and ask the pupils to work through them in pairs. Encourage them to talk about their work.

**1.** 5,601 – 2,154 x 2 = **(1,293)**

**2.** 211 + 144 ÷ 12 = **(223)**

**3.** 28 + (3,470 – 1,670) ÷ 60 = **(58)**

**4.** (14 x 17) ÷ 14 = **(17)**

Move around the class to check that they are using BODMAS correctly before they move on to the activities in the Pupil's Resource Book on page 16.

**Answers**

**Activity A**

**1.** 126 **2.** 39 **3.** 6 **4.** 292
**5.** 66,585 **6.** 36 **7.** 87 **8.** 121

**Activity B**

**1.** 1,526 **2.** 657 **3.** 19,200 **4.** 292,992

## T5b

Guide the pupils through some more examples of calculating using more than one operation.

Write some problems on the board and discuss the pupil's ideas about how to find the answers. Here are some that you could use:

**1.** A logging company employs 1,152 workers. The company has a $25 bonus to give to each worker, but first, they had to pay $6,990 from the bonus money to the landowners. How much bonus will be left to divide between the workers?

First **multiply** 1,152 by 25 to find out how much money is available in total for the bonus payment. **($28,800)**

Next **subtract** the amount that has to be paid to the landowners from this total to find the answer. **($20,810)**

Allow the pupils to do the calculations on scrap paper as you work out the problem together.

**2.** A shipment of 2,528 cartons of biscuits costing $42 each was sent to North Malaita province. The shipment was shared between 16 different trade stores.

**a.** What was the value of the total shipment? **($106,176)**
**b.** How many cartons did each trade store receive? **(158)**
**c.** How much did each trade store have to pay to the shippers? **($6,636)**

**3.** School fees are $25 per term. There are 362 children in the school and 46 of these are in Standard 6. Standard 6 pupils only have to pay for 3 terms but all other classes pay for 4 terms.

**a.** How much money does the school collect in fees for term 1? **($9,050)**
**b.** How much in term 4? **($7,900)**
**c.** How much money does the school collect in the whole year? **($35,050)**

## C5b

Ask the pupils to do the activities in the Pupil's Resource Book on page 17. They should work in pairs to complete activities B and C. Encourage them to discuss their strategies for solving each problem. More around the class and help those pupils who still need help.

**Answers**

**Activity A**

**1.** $205
**2.** 537
**3.** 224

**Activity B**

**1.** $240.50
**2.** $30
**3.** 28 m

**Activity C**

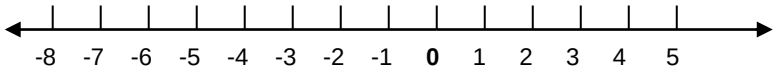
**1.** $184
**2.** $16
**3.** 1 tin of milk
**4.** 8

? Can all the pupils make calculations and solve problems involving more than one operation?

## T6a

In this lesson the pupils will revise the work they did on negative numbers in Standard 5. Refer back to Standard 5, Unit 1 to see what they have covered already.

Draw a number line on the board. Mark it from 0 to 5. Extend the line to the left as shown. Ask the pupils what we call the numbers to the left of the zero. **(Negative numbers)**




Ask the pupils to start at 0 and add 4. Remind them that to add a positive number they move to the right along the number line, so **0 + 4 = 4**

Now ask them to start at 5 and take away 7. Remind them that to take away a positive number they must move to the left along the number line, so **5 – 7 = -2**

Ask the pupils to start at 2 and add – 4. To add a negative number they must move left along the number line. **2 + (-4) = -2**

Start at – 3 and take away – 5. To take away a negative number they must move right along the number line. **-3 – (-5) = 2**

Work through some more examples with the class using the number line. For example:

-2 + 3 = **1**
-2 + (-2) = **-4**
-1 – (-1) + 1 = **1**

-7 + 11 = **4**
-1 + (-4) = **-5**
2 – (-3) = **5**

3 – 9 = **-6**
-5 – (-2) = **-3**
-4 + (-2) + (-1) + 5 = **-2**

## C6a

Remind the pupils what a magic square is. They should be able to tell you that, in a magic square, all the lines horizontally, vertically and diagonally add up to the same total.

Copy each of these magic squares onto the board. Do not copy the answers (in purple) copy only the figures in black type.

| | | |
|---|---|---|
| **0** | 5 | **-2** |
| -1 | 1 | **3** |
| 4 | -3 | **2** |

| | | |
|---|---|---|
| -7 | -8 | **-3** |
| -2 | **-6** | -10 |
| **-9** | -4 | **-5** |

| | | |
|---|---|---|
| **-3** | 2 | **-5** |
| -4 | **-2** | 0 |
| 1 | -6 | **-1** |

Work through the first one together. In this magic square each row, column and diagonal must add up to 3.

Let the pupils work in pairs to complete the other two magic squares.

When they have finished they can move on to the activities in the Pupil's Resource Book on page 18.

## Answers

### Activity A

1. -15, -3, -2, -1, 0, 2, 6, 12
2. -12, -10, -9, -4, 0, 3, 4
3. -7, -6, -5, -4, -1, 0, 3, 5,
4. -2 **>** -4
5. -19 **>** -52
6. 0 **<** 5
7. 0 **>** -3
8. –11 **<** -1

### Activity B

1. -2
2. 15
3. -14
4. -4
5. -4
6. -14
7. -6
8. -3
9. 4
10. -14
11. 14
12. -4
13. -16
14. -15
15. -3
16. -11

### Activity C

1. -12
2. 85
3. -56
4. 39
5. -46
6. 28
7. -41
8. 35
9. -12
10. 3
11. -6
12. -63

## T6b

In this lesson pupils extend their use of negative numbers to explore real life situations in which negative numbers are used.

The first example draws on work pupils completed in Standard 5 Unit 15, Temperature.

Ask pupils the following questions to introduce the topic:

What is the range of temperature in Solomon Islands? **(About 14°C to 35°C)**

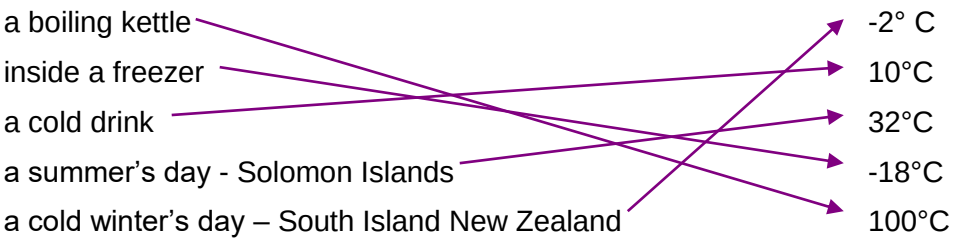
As we travel further south what happens to the temperature? **(It gets colder)**

Can you name any cold places? **(New Zealand, Antarctica, UK, Alaska)**

What happens at 0°C? **(Ice begins to melt, or water begins to freeze)**

How can we record temperatures which are below 0°C? **(Use negative numbers)**

Write these two lists on the board ask the pupils to come up to the board one and a time and match the correct temperatuire to the events described, by drawing an arrow.




Ask pupils to suggest other real life situations in which we might use negative numbers. They might come up with the following ideas. Discuss and explain these.

**Sea level** Above normal sea level is a postive reading e.g. the highest point in Solomon Islands is Mount Makarakomburu 2,447 m on Guadalcanal. This means it is 2,447 metres above sea level which is 0 m. Death Valley in California U.S.A. is 90 metres below sea level or -90 m.

**Money** For example in a bank account if you have taken out more money than you put in then your account is in **debit.** This is a negative number. If you have money in your account then this is a positive number and is a **credit.**

## C6b

Explain that pupils are going to study problems which involve both positive and negative numbers. Remind the pupils about problem solving and the steps needed to solve a problem successfully before they begin the tasks. Pupils must think about the following questions:

- What do I need find out?
- What information is given?
- Is there enough information?
- Is there any information that I do not need?
- Do I need to do my calculation in steps?
- What do I need to do first?
- Can I estimate an answer before I start to solve the problem?

Let the pupils work through the problems in the Pupil's Resource Book on page 19. You could have the pupils work in pairs so that they can discuss their strategies with their partner.

When you mark their work remember that the process they follow is just as important as getting the right answer at the end. Move around the class and mark their work as they go along. Discuss their strategies with them so that you can assess their understanding of the process as well as check their answers.

### Answers

**Activity A**

**1.** -$15
**2.** +$250
**3.** +7
**4.** -4
**5.** -8 m
**6.** -16°C
**7.** +200 m
**8.** -20°C

**Activity B**

**1.** -29°C
**2.** -3°C
**3.** 3 m
**4.** $85 loss
**5.** **a.** $16 **b.** $600

**Activity C**

**1.** $490
**2.** $1,780
**3.** -$1,330. He is in debit.
**4.** $4,998
**5.** -$968. He is in debit.
**6.** He had to deposit $968.

?

Can all the pupils make calculations involving negative numbers?

# Extension and Support

## Support Activities

Below are some suggested activities that you could give pupils who need extra help, or more practice with the number skills they have been developing in this unit.

### Place Value Game

To help pupils understand place value, allow them to play the Place Value Game again in small groups. (See C1b on page 41)

### Calculation Bingo

Design and make a bingo game using multiplication and division facts that the pupils still need to practice. The first pupil to make a line of three answers wins a point.

For example:

| | | |
|---|---|---|
| **60 ÷ 4 =** | **72 ÷ 6 =** | **100 ÷ 4 =** |
| **121 ÷ 11 =** | **56 ÷ 4 =** | **54 ÷ 3 =** |

| | | |
|---|---|---|
| **12** | **15** | **16** |
| **14** | **11** | **25** |
| **9** | **10** | **18** |

You can adapt the cards and processes used in the bingo game to support whatever the pupils need extra help with. e.g. long division, negative number calculations, multiplication tables, estimating, addition, subtraction and so on.

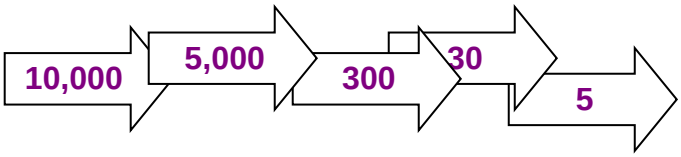
### Digit Values

Write numbers on the board then ask the pupils to write down the value of the underlined digit in their exercise books.

| | | | | |
|---|---|---|---|---|
| 3<u>6</u>,437 | 609,<u>5</u>32 | <u>2</u>9,652 | <u>4</u>12,522 | 3<u>8</u>0,941 |

### Arrow Cards

Prepare some sets of arrow cards that can be used to show the expanded notation of four, five and six-digit numbers. Allow pupils to experiment with these to make up given numbers to improve their understanding of the value of each digit in larger numbers.



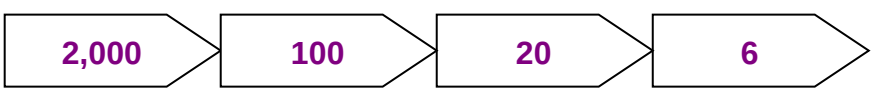

**15,335**

Show pupils how to check the value by adding all the numbers on their arrow cards together

10,000 + 5,000 = 300 = 30 = 5 = 15,335

You could also draw sets of arrow cards on the board and ask pupils to write down the number they make in words and in figures. For example:

1.




**2,126 Two thousand one hundred and twenty-six**

## Extension Activities

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

**Magic 77**

Write the following multiplication problems on the board and ask the pupils to complete them and find out the pattern their answers make.

| | | | | | |
|---|---|---|---|---|---|
| **77 x 13 =** | **77 x 26 =** | **77 x 39 =** | **77x 52 =** | **77 x 65 =** | **77 x 78 =** |
| **77 x 91 =** | **77 x 104 =** | **77 x 117 =** | **77 x 130 =** | **77 x 142 =** | **77 x 156 =** |
| **77 x 169 =** | **77 x 182 =** | **77 x 195 =** | | | |

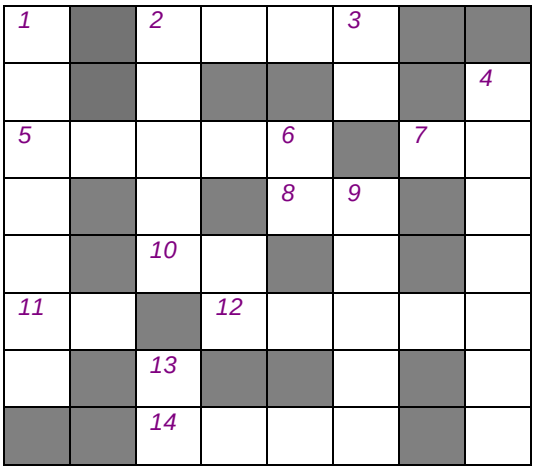
**Magic Squares**

Pupils could extend the activity in C6a to design their own magic squares using negative as well as positive numbers.

**Number Crosswords**

On grid or squared paper pupils could design a number crossword.

When they have the numbers in place they then need to design calculations to fit the answers. Tell them to use a theme e.g. all the clues are division questions. When they have finished their crossword tell them to prepare a blank crossword grid for a partner and see if he/she can solve the crossword.




Here is an example grid with some clues get them started:

| | | |
|---|---|---|
| **1 Down** | 25 x 44,907 | **(1,122,675)** |
| **5 Across** | 11 x 2361 | **(25,971)** |
| **6 Down** | 570 ÷ 30 | **(19)** |
| **8 Across** | 2,470 ÷ 26 | **(95)** |

## Check Up Page: Answers

**1.** 356,386
**2.** 503,000
**3.** 43,420
**4.** 849,251
**5.** 44,000
**6.** 23,000
**7.** 45,000
**8.** 253,000
**9.** 24,000
**10.** 220,000
**11.** 190,000
**12.** 7,000
**13.** 5,616
**14.** 67,562
**15.** 8,736 hours
**16.** 16
**17.** 705 r 5
**18.** 189
**19.** 243 r 2
**20.** 600
**21.** 954
**22.** 144
**23.** 150
**24.** 112
**25.** 106
**26. a.** 312 kg
**b.** 4,056 kg
**27.** 3
**28.** -2
**29.** -4
**30.** -28

Unit 2

# Measurement Topic 12: Speed, Distance and Time

**Aim:**

To develop pupils' understanding of the concept of speed and to teach skills for measuring, comparing and calculating speed.

**Sequence of objectives:** To

1. introduce the concept of speed and distance travelled.
2. understand and use the formula, distance = speed x time.
3. calculate the time taken to cover a distance and the distance travelled in a given time.

**Rationale:**

Speed is an important concept with many applications to real life situations. This unit will enable pupils to describe and measure speed and to appreciate how some objects move faster than others in a given time. Pupils will acquire skills for measuring speed accurately and learn to use standard units of measurement for distance and time in order to calculate the speed of a moving object.

## T1a

Begin the lesson with a brainstorming session about the word **speed**. Ask the pupils to explain in their own words what they understand by this word. Make notes on the board of what they say. Do not correct any misconceptions they may have at this stage.

Highlight useful words to describe speed, such as **fast, quick** and **slow,** and words to compare speed, such as **faster** and **slower, quickest, slowest.**

Next introduce the concept of speed by talking about different ways of travelling. Ask the pupils to come up with examples. Build up a list on the board. Write the list in terms of an object, person or means of transport travelling between two fixed points.

- a person walking between two villages, e.g. Salio and Hofi
- a ball thrown from one end of the netball court to the other
- a canoe travelling between two islands, e.g. Guadalcanal and Savo
- an arrow shot from a bow
- a ship travelling between two ports e.g. Honiara and Tulagi
- a plane travelling between two airports e.g. Auki and Atoifi

Ask the pupils to describe and compare the speed of these events. Use terms such as fast, faster, fastest, slow, slower, slowest. Introduce the concept of distance into the pupil's descriptions using words such as **far, farther, farthest, near, nearer, nearest** and the concept of time too including **seconds, minutes** and **hours**.

Bring your discussion to a close by asking pupils to think of a **definition of speed.** Ask, **"What is speed?"**

Write their suggestions on the board and draw out the most important ideas. Have them write a clear definition in their exercise books as follows:

**Speed is a measure of how fast an object moves a certain distance, in a given time.**

Look at list of moving objects you have made on the board. Ask pupils to think of appropriate units of measurement they could use for the distance travelled and the time it would take.

You could build up a table like this:

| | unit of distance | unit of time |
|---|---|---|
| **person walking** | metres or kilometres | minutes or hours |
| **ball** | metres | seconds |
| **canoe** | metres or kilometres | hours |
| **arrow** | metres | seconds |
| **ship** | kilometres | hours |
| **plane** | kilometres | minutes or hours |

Explain that, to measure speed we need a standard unit that compares the distance travelled with the time taken. Ask pupils to suggest how we might describe this unit of measurement for speed? Encourage the pupils to talk about their ideas.

They might suggest the following:

**metres travelled in a second**

**metres travelled in a minute**

**metres travelled in an hour**

**kilometres in a second**

**kilometres in an hour**

Explain that all of these are standard units for measuring speed and show the pupils how they are written as follows:

**metres per second** which is written as **m/s**

**metres per minute** which is written as **m/m**

**metres per hour** which is written as **m/h**

**kilometres per second** which is written as **km/s**

**kilometres per hour** which is written as **km/h**

Discuss what these different standard measures might be used for. Tell pupils that some are more useful than others and ask them to explain why.

For example: km/s is not a very useful measurement of speed because not many things can travel as fast as that. m/h is also not used very often as it is a measure of very slow speeds. This unit might only be useful for measuring the movement of a very slow animal such as a snail or slug for example.

Explain that the most common units used for measuring speed are the following:

**Metres per second (m/s)** is a measure of fast travel over a short distance, this is useful for measuring the speed of things such as the flight of an insect, a ball being thrown or a sprinter.

**Kilometres per hour (km/h)** is a measure of slower travel over a longer distance. This is useful for measuring the speed of slower moving objects that travel long journeys such as cars, trucks, boats or planes.

## C1a

Let the pupils work in pairs or groups of three. Tell them to come up with four journeys, using each of the units of speed which they have identified. Draw a table on the board. Tell each group to copy the table and complete it. They need to think of one event or journey that can be measured in each of the given units.

Before they begin, tell them to be ready to present their ideas to the whole class at the end of the session.

| Unit of Speed | Object that Moves | Journey |
|---|---|---|
| **m/m** | A child walking | From home to school |
| **m/s** | | |
| **m/h** | | |
| **km/h** | | |
| **km/m** | | |

Here are some suggestions for each unit of speed. You will be able to think of some more.

m/s A cyclist racing, a sprinter, a bird flying, a stone falling.

m/m A snail walking across a garden, a hermit crab walking on the beach.

km/h A truck travelling on a road, a train, plane, ship.

km/m A rocket travelling to the moon.

km/s The speed of light, (300,000 km/s). A bullet shot form a gun (1 km/s)

At the end of the lesson ask each group to tell the rest of the class what examples they have come up with.

? Do all the pupils understand the concept of speed and can they define it?

## T2a

**Materials**

measuring tape or metre ruler.
watch with a second hand or a stop clock
trundle wheel

In this lesson the pupils are going to work out a way to calculate the speed of a moving object, for themselves, through practical activities.

Begin by revising the definition of speed that you worked out in the last lesson. Ask pupils to explain this to the rest of the class.

Explain that pupils are going to try and find out the speed at which they can run. Ask them to suggest how they can do this. What will they need to carry out their experiment?

Pupils should be able to come up with the idea that, if they run a given **distance** measured accurately in **metres,** (say 50 m) and **time** how long it takes accurately in **seconds**, this will tell them their **speed** in **m/s**

By dividing the total distance **(50 m)** by the number of seconds it took to run **(say 8 seconds)** pupils will be able to calculate their speed in m/s. **(In this example it would be 6.25 m/s)**

## C2a

This practical activity should be done in the school playground or field. Put the pupils into groups of about four and tell them they are going to find out the **speed** at which they can run.

Let them plan their activity in the classroom before they work outside. Tell them to write down the procedure for their experiment in their exercise books.

Go around the groups and listen to their discussion. You might need to help some of the groups with their planning. Make sure everyone knows what to do before they go outside.

They should have the following steps in their procedure:

1. Accurately measure out the distance to be run. This could be 100 metres or 50 metres depending on the space you have available. Mark the start line and the finish line carefully.
2. Let one pupil be the timekeeper. Make sure they know how to use the watch or stop clock.
3. Decide how to record the results. Pupils might want to draw a simple table in their exercise books to do this.
4. Let pupils take turns to run the distance. Time it carefully from when each runner starts to when he or she crosses the finish line.
5. Record the data.
6. Calculate the speed at which each pupil ran, by dividing the distance run by the time taken.

Allow plenty of time for the pupils to complete this activity. They may need to use more than one lesson to make sure everyone has time to collect and record their data.

When all the groups have finished, ask them to report on what they have found out. Compare the results between groups and discuss how they calculated the speed. Find out who is the fastest runner in the class, and at what speed they can run.

Ask each pupil to write a few sentences to describe the activity and explain what they found out.

## T2b

Recap on the activity in the last lesson in which pupils found out the speed at which they could run. Ask them to try and work out a formula which links the speed to distance and time.

Write this example on the board to help them.

> **An athlete runs in a race. If his speed is 10 m/s and he takes 10 seconds to complete the race how long is the race?**

Let the pupils work in pairs and discuss this example. Bring the class together and talk through the example.

The athlete runs 10 metres in every second. If he runs for 10 seconds then he has run 10 x 10 metres. So the race is 100 metres long.

The formula used is **distance = speed x time**

Give the pupils some more examples to use and check this formula. Here are some you could use:

1. A boat takes 2 hours to travel from one island to another. It travels at 20 km/h. What is the distance between the two islands? **(40 km)**
2. A cyclist took 4 hours to complete a race. If his average speed was 12 km/h how long was the race? **(48 km)**
3. A speed boat took 30 minutes to travel from Munda to Gizo. It travelled at 100 km/h. What is the distance from Munda to Gizo? **(50 km)**

Go through each of the examples as a class after the pupils have discussed them. Reinforce the formula and explain that the formula is the same whatever the units of measurement used.

## C2b

When you are sure that they understand the formula, ask the pupils to complete the activities in the Pupil's Resource Book on page 22. Check their work carefully and discuss it with them as they go along.

**Answers**

**Activity A**

**1.** 100 m
**2.** 100 m
**3.** 50 m
**4.** 200 m
**5.** 150 m

**Activity B**

**1.** 160 km
**2.** 17.5 km
**3.** 1 km
**4.** 1,725 km
**5.** 500 m

**Activity C**

**1.** 9 km
**2.** 2 km/h
**3.** 30 minutes

## T2c

**Materials**

scrap paper

In this lesson the pupils are going to adapt the formula they have devised to calculate distance, so that they can also use it to calculate speed and time. Write the formula on the board and ask them to look at it again.

**distance = speed x time**

Write this example on the board and discuss it with the class.

**If I throw a ball 25 metres and it takes 5 seconds to land on the field, at what speed was the ball travelling in the air?**

Ask the pupils to write out the formula, adding in the information that they are given in the example as follows:

**25 metres = speed x 5 seconds**

Explain that, in this problem, speed (not distance) is the **unknown**.

Explain that we can use the same formula to calculate speed, by rearranging it as follows:

**25 m = speed x 5 seconds.**

is the same as: **speed = 25 m ÷ 5 seconds** or **speed = $\frac{\text{25 m}}{\text{5 seconds}}$**

Help the pupils to understand that the formula is the same however it is arranged.

**speed = $\frac{\text{distance}}{\text{time}}$** is the same as **distance = speed x time**

Ask pupils to suggest a third way in which they might arrange the formula when time is the unknown as follows:

$$\textbf{time} = \frac{\textbf{distance}}{\textbf{speed}}$$

Give the pupils some more examples to practice using the formula in three different ways. Here are some to try. Work through them together, discussing each one as a whole class activity.

**1.** If a car takes 2 hours to travel 60 km at what speed is it travelling?

Ask pupils to identify the **unknown** in this problem **(speed)**

Ask them how they will arrange the formula with speed as the unknown.

**speed = $\frac{\text{distance}}{\text{time}}$** or **$\frac{\text{60 km}}{\text{2h}}$** **so speed = 30 km/h**

**2.** If I walk the 4 km to school at a speed of 8 km per hour, how long will it take me?

Ask pupils to identify the **unknown** in this problem **(time).**

Ask them how they will arrange the formula with time as the unknown.

**time = $\frac{\text{distance}}{\text{speed}}$** or **$\frac{\text{4 km}}{\text{8 km/h}}$** **so time = 0.5 hours or 30 minutes**

**3.** If it takes me 2 hours to walk to the next village at a speed of 3 km/h. How far away is the next village?

Ask pupils to identify the **unknown** in this problem **(distance)**

Ask them how they will arrange the formula with distance as the unknown.

**distance = speed x time** or **3 km/h x 2 hours** **so distance = 6 km**

Prepare some more problems for the pupils to try if they need further practice rearranging and using the formula they have learnt.

## C2c

Have the pupils work with a partner. Provide scrap paper for them to work on.

Each pair of pupils is to make up three **speed problems** to try out on another pair. Explain that, of their three problems:

one must have an unknown **distance**, this will be a **'How far…?**' question;
one must have an unknown **speed**, this will be a **'How fast…?'** question;
and one must have an unknown **time**, this will be a **'How long…?** question.

Allow plenty of time for the pupils to make up their problems and remind them to calculate and write down their answers too, on a separate piece of paper.

When all the pairs are ready allow them so swap their problems with another pair and spend time working out the answers to each others' problems.

The first pair should check the answers when they have finished.

You will need to move around the class during this activity and assist pupils who hare having difficulty thinking of good problems.

## T2d

**Materials**

balls
clocks or watches with second hands

Follow up the theoretical work you did on formulae in the last lesson with a practical task in which pupils use the formula to calculate speed.

Explain that you want the pupils to plan and carry out an experiment to measure the speed a ball travels in the air when they throw it as far as they can.

Discuss their ideas for how they might do this as a class before they split into groups to plan and carry out their experiments.

Allow plenty of time for this practical activity. Tell them they are going to write up their experiment and compare their results with other groups at the end of the lesson.

## C2d

Put the pupils into groups of three and let them plan their activity in the classroom. Tell them to make a list of what they will need and what they will do as they did for the last practical activity. When the pupils have completed their activity outside give them time to write up and discuss their findings. Remind them to use the formula they have learnt.

?

Can all pupils use the formula, distance = speed x time and rearrange it to calculate both speed and time?

## T3a

This lesson provides the pupils with more practice working out the relationship between distance, time and speed through problem solving.

They will use the formulae they have devised while doing their practical activities. Remind the pupils about how to approach problem solving. Go through these tips to remind them:

- What is the problem asking you to find out? Is the unknown speed, distance or time?
- What information is given?
- How can I apply the formula to help me solve the problem?
- What do I need to do first?

Use an example of a problem and work through it with the class.

> **John can walk 8 km in 40 minutes. He lives 7 km away from his school. How long would it take John to walk all the way to school?**

The problem is asking **how long** it will take to walk to school, so the solution will be a length of **time**. Time is the unknown.

To find out the **time** you need the **distance** as well as the **speed** of walking.

The **distance** is **7 km**.

If John can walk 8 km in 40 mins then he can walk **1 km** in **5 min**. (40 min ÷ 8 km = 5)

To walk 7 km to school will take John **35 min**. (7 km x 5 mins = 35 min)

You could now introduce another part to this problem.

**When John walks to school with his friend, he walks more slowly. It takes them 49 minutes. What speed do they walk?**

The problem is asking **how fast they walk**, so speed is the unknown.

To find out the **speed** you need the **distance** as well as the **time taken**.

$$\textbf{speed} = \frac{\textbf{7 km}}{\textbf{49 min}} = \textbf{7 km/h}$$

Finally, add another part to the problem in which distance is the unknown, for example:

**If John walked to school and back again for a whole week how far would he have walked? There is no school at the weekend.**

The problem is asking "**How far** would John walk in a week?" so the answer will be a **distance**.

You know that the distance to school is 7 km. To walk there and back again in one day is 7 km x 2 = **14 km**.

John goes to school 5 times in one week. Therefore he walks 5 x 14 km = **70 km**.

Prepare some more problems to work through together if necessary, before moving on.

## C3a

The pupils could work in pairs to talk through the problems in the Pupil's Resource Book on page 23.

They could discuss how to solve the problems first, then work independently to solve them in their exercise books. They could then compare and check their answers.

### Answers

### Activity A

| | | | | | |
|---|---|---|---|---|---|
| **1a.** | 8 km | **b.** | 20 km | **c.** | 13 km |
| **2a.** | 60 km/h | **b.** | 120 km/h | **c.** | 80 km/h |
| **3a.** | 30 minutes | **b.** | 2 hours | **c.** | 2½ hours or 2 h 30 m |

### Activity B

**1.** 5 m/s **2.** 5 km/h **3.** 37 km/h **4.** 6 km/h **5.** 10 km/h

### Activity C

| | | | | |
|---|---|---|---|---|
| **1.** | 107km/h | **2.** 7.30 a.m. | **3.** 17 km/h | **4.** 624 km |
| **4.** | 3½ hours or 3 h 30 min | **6.** 79 km/h | **7.** 11.30 a.m. | **8.** 65 km/h |

Can all pupils use calculations to find out distance covered and time taken when looking at problems involving speed?

# Extension and Support

## Support Activities

For pupils who do not easily understand the concept of speed and measuring speed, provide a range of practical activities that will give more practice. Particularly encourage them to talk about the activities as they work through them. Discussing the concepts and processes they are using will help them to understand them better.

There are many different skills involved in these practical tasks including taking accurate time measurements, measuring distance accurately and adapting and applying the formula. Make sure that pupils have the necessary skills to do each of these by working closely with them as they do their practical tasks.

**Data Collection**

Set pupils some practical tasks, collecting data involving distance and time. For example they could do a survey to find how long it takes each member of the class to walk to school, then measure the distance that each pupil walks and then use their data to calculate their speed.

Alternatively they could measure a certain distance and then measure how long it takes them to walk, run, hop, skip or walk backwards from the start line to the finish line. After calculating their speeds they could then compare their speed for each way of moving.

Encourage pupils to estimate the time it will take to complete given activities before they measure it as this will help them to think more about the speed concepts they are working with.

**Sharing Problems**

Pupils could work in pairs to write more problems which include calculations in them using time, distance and speed. They could then exchange problems with another pair of pupils and work at solving each others'. Discussing their problems, methods used in solving them and agreeing on solutions is a good way to reinforce the concepts.

**Fill in the Chart**

Prepare some cards and let pupils practice using the formula by filling in the missing numbers. Here are some examples you could use. You will be able to make some more.

| Distance | Time | Speed |
|---|---|---|
| ? | 2 hours | 10 km/h |
| 15 km | 1 hours | ? |
| 24 m | ? | 8 m/s |
| ? | 25 min | 4 km/min |

| Distance | Time | Speed |
|---|---|---|
| 108 km | ? | 12 km/h |
| ? | hour | 32 m/s |
| 48 km | 3 hours | ? |
| 9 km | ? | 9 m/min |

## Extension Activities

For pupils who are confident with using the speed/time/distance formula, you should provide some extra activities to develop their skills and encourage them to think more about speed time and distance. These activities should be things that they can work at independently while you work with pupils still needing extra help. You might choose to set some of them as homework tasks.

**Airline Timetables**

Show pupils the Solomon Airlines Timetable Poster provided and have them compare it with a map of Solomon Islands. They should use the information in both to find out the distances

between different airports in Solomon Islands and around the Pacific region and then calculate the average speed of the different types of aircraft used by Solomon Airlines.

**Research Topics**

Pupils could use whatever resources they have available to collect data involving speed on a topic of their choice. This could involve looking at newspapers, magazines or books as well as talking to members of their community. Some examples of what they could look for are listed below. You will be able to think of some more.

- World athletic records;
- Land speed records;
- The speed of different vehicles;
- Speed of different planes;
- Speed of travel in Solomon Islands using different forms of transport;
- Speed of flying between different airports in Solomon Islands using different planes.

Pupils could write up their findings using graphs, maps and text and make a booklet or an information poster to show what they have found out. They could share this with the rest of the class.

## Check Up Page: Answers

**1.** distance
**2.** time
**3.** speed
**4.** speed = distance ÷ time
**5.** **a.** time **b.** speed
**6.** **a.** 18 km **b.** 15 km **c.** 2 km
**7.** **a.** 2 h **b.** 3 h 30min **c.** 🗁 h or 30 min
**8.** **a.** 5 m/m **b.** 4 m/m **c.** 100 m/m
**9.** 105 km
**10.** **a.** 2 h **b.** 24 km/h **c.** 66 km

Unit 3

# Number Topic 2: Fractions

**Aim**:

To develop pupils' understanding of fractions. To teach addition and subtraction of fractions using like and unlike denominators.

**Sequence of objectives:** To

1. recognise equivalent fractions and reduce fractions to their simplest form.
2. add and subtract fractions with the same denominator.
3. add and subtract fractions with unlike denominators.

**Rationale:**

An understanding of fractions of whole numbers is essential if pupils are to apply their number skills usefully to everyday activities such as measurement and dealing with money. In this unit pupils learn to add and subtract common fractions and to simplify fractions to their simplest form. This both reviews and extends work done in Standard 5 Unit 4.

## T1a

**Materials**

Fractions chart
Equivalent Fraction Cards

In this lesson you revise the work pupils did on equivalent fractions in Standard 5 Unit 4. Refer back to the Standard 5 Teacher's Guide to see what they have already covered.

It may be helpful to use a fraction chart at this stage. Prepare the chart provided before the lesson to show a whole, halves, quarters, eighths and sixteenths.

Begin by writing $\frac{1}{2}$ on the board.

Ask pupils to tell you some other fractions which have the same value. They might suggest:

$\frac{2}{4}$ $\frac{3}{6}$ $\frac{4}{8}$

Use the chart to emphasise fraction equivalence. Help the pupils to see why and how the fractions are equivalent using the fraction chart. Encourage the pupils to use the appropriate language such as **equivalent**, **equal to**, **is the same as**, **has the same value as**, etc.

Now give the pupils a challenge. What is the missing numerator in the following?

$\frac{1}{3} = \frac{?}{6}$ **(2)** $\frac{1}{4} = \frac{?}{8}$ **(2)** $\frac{1}{6} = \frac{?}{12}$ **(2)**

Give the pupils more examples. Ask them to find the missing denominator in the following.

$\frac{3}{4} = \frac{6}{?}$ **(8)** $\frac{1}{4} = \frac{3}{?}$ **(12)** $\frac{2}{8} = \frac{4}{?}$ **(16)**

Ask the pupils to explain how they reached their answers each time.

## C1a

Prepare the fraction cards provided before the lesson. These contain groups of equivalent fractions. You will need one set for each group. Have the class work in groups or 5 or 6.

Pupils can use these cards in a number of different ways.

First tell them just to sort them into groups of equivalent fractions.

Then play a **pairs game** taking turns to turning over two cards at a time. If the two fractions are equivalent, the player keeps the pair and has another turn, if they are not the same they are replaced face down and the next player as a turn.

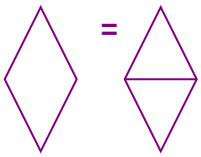
When you are happy that the pupils all understand fractions equivalence, allow them to do the activities in the Pupil's Resource Book on Page 26.

### Answers

### Activity A

**1.** $\frac{5}{5}$ **2.** $\frac{4}{8}$ or $\frac{1}{2}$ **3.** $\frac{3}{4}$ **4.** $\frac{2}{4}$ or $\frac{1}{2}$ **5.** $\frac{6}{8}$

**6.** $\frac{6}{6}$ or 1 **7.** $\frac{5}{5} = \frac{6}{6}$, $\frac{4}{8} = \frac{1}{2}$, $\frac{6}{8} = \frac{3}{4}$

**8.**  **9.**  **10.** $1 = \frac{2}{2} = \frac{3}{3} = \frac{6}{6}$

### Activity B

**1.** $\frac{1}{2}$ $\frac{2}{4}$ $\frac{4}{8}$ $\frac{5}{10}$ $\frac{6}{12}$ $\frac{7}{14}$ $\frac{8}{16}$ $\frac{18}{36}$

**2.** $\frac{1}{3}$ $\frac{2}{6}$ $\frac{3}{9}$ $\frac{4}{12}$ $\frac{5}{15}$ $\frac{6}{18}$ $\frac{7}{21}$ $\frac{8}{24}$

**3.** $\frac{1}{4}$ $\frac{2}{8}$ $\frac{3}{12}$ $\frac{4}{16}$ $\frac{5}{20}$ $\frac{6}{24}$ $\frac{7}{28}$ $\frac{8}{32}$

**4.** $\frac{1}{5}$ $\frac{2}{10}$ $\frac{3}{15}$ $\frac{4}{20}$ $\frac{5}{25}$ $\frac{6}{30}$ $\frac{7}{35}$ $\frac{8}{40}$

**5.** $\frac{1}{6}$ $\frac{2}{12}$ $\frac{3}{18}$ $\frac{4}{24}$ $\frac{5}{30}$ $\frac{6}{36}$ $\frac{7}{42}$ $\frac{8}{48}$

## T1b

**Materials**

fraction dominoes
cutting knives and cardboard

In this lesson you introduce pupils to mixed fractions. Explain that mixed fractions are numbers that contain some whole numbers and some fractions. Ask the pupils to suggest some examples and put these on the board, such as.

$1\frac{1}{2}$ $4\frac{3}{8}$ $2\frac{3}{4}$

Explain that mixed fractions can also be written as common fractions, but that this will give them a value of more than one. We call a fraction with a value of more than one an **improper fraction**. Rewrite the examples the pupils have given you as improper fractions.

Explain how to do this as follows:

First multiply the whole number by the denominator, then add the numerator to your answer. This total is the new numerator and the denominator stays the same.

So $1\frac{1}{2}$ = 1 x 2 + 1 or $\frac{3}{2}$

And $4\frac{3}{8}$ = 4 x 8 + 3 or $\frac{35}{8}$

Give the pupils some more examples to practice converting mixed fractions to common, improper fractions.

When they understand this well, teach them that the opposite method can be used to convert an improper fraction to a mixed fraction. Can any of the pupils explain how they could do this?

To find the whole number in a mixed fraction we divide the numerator by the denominator. The result becomes the whole number and any remainder becomes the new numerator as follows:

$\frac{19}{2}$ = 19 ÷ 2 = 9 r 1 $9\frac{1}{2}$

$\frac{35}{8}$ = 35 ÷ 8 = 4 r 3 $4\frac{3}{8}$

Do some more examples together on the board until pupils are confident with changing mixed numbers to improper fractions and improper fractions to mixed numbers.

## C1b

**Fraction Dominoes**

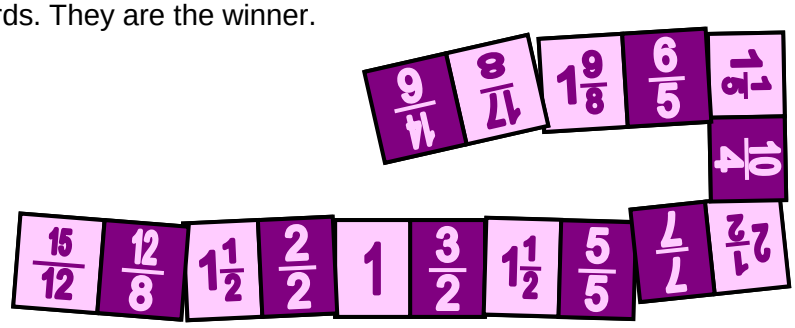
Prepare the fraction dominoes cards before the lesson. Have pupils work in groups of 4 to play, each group will need a set of dominoes.

If you prefer you can have pupils make their own domino cards, they need about 40 cards containing ten sets of four fractions with the same value.

**How to Play**

Share five dominoes for each player and mix the rest of the cards face down on the table. Pick any card from the pack to start the game and place it face up in the centre of the table. Player 1 has to match a fraction from his or her own hand to either end of the card on the table. If they cannot they have to pick another card from the pile. Play continues in turn, until one player has managed to place all of their cards. They are the winner.

**Note**: Cards can be placed at either end of the chain, but not in the middle. Cards can be placed either way up as long as the two fractions that join have the same value. The start of a sample game is shown on the right.




## T1c

The purpose of this lesson is to consolidate what was learnt in the last lesson. Pupils revise the method and practice converting mixed numerals into improper fractions and vice versa.

Revise some of the vocabulary you have been using already in this unit with the class. Write the following terms on the board and ask the pupils to give you a definition of each term.

| | |
|---|---|
| **denominator** | the number below the line in a fraction |
| **numerator** | the number above the line in a fraction |

| | |
|---|---|
| **equivalent fractions** | fractions that have different numbers but the same value |
| **improper fraction** | a fraction in which the numerator is larger than the denominator |
| **mixed number / mixed fraction** | a number containing both whole numbers and fractions |
| **simplify** | to reduce a fraction to its simplest form |

Ask the pupils to give examples of each as you work through the list of words. Encourage pupils to use the correct terms when they are discussing their work.

Revise how to **simplify** fractions, by dividing the numerator and denominator by the same number. Use these examples to remind the pupils how to do this:

$\frac{10}{12}$ divide by 2 $\frac{5}{6}$

$\frac{6}{18}$ divide by 3 $\frac{2}{6}$ divide by 2 $\frac{1}{3}$

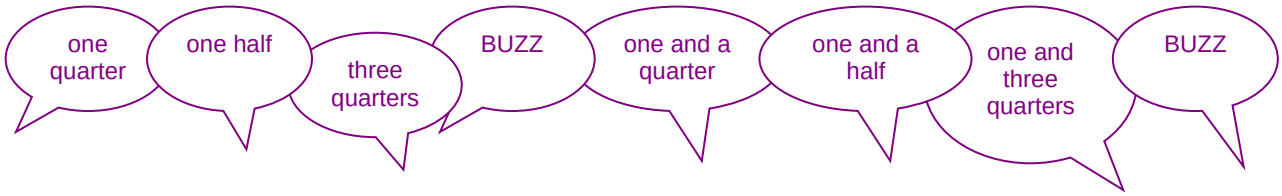
Now extend the concept of simplifying fractions to simplify mixed numbers. Show pupils some examples of mixed numbers expressed as fractions as follows:

$1\frac{3}{8} = \frac{11}{8}$ $4\frac{3}{4} = \frac{19}{4}$

## C1c

### Whole Number Buzz

This is a fun game to play with the whole class that helps pupils to become familiar with fractions. Have the class stand in a circle around the outside of the classroom. Explain that pupils are going to count around the circle in quarters starting from one quarter. They are not allowed to say whole numbers. Every time they get to a whole number they are to say **buzz** instead. So the game will go like this:




If any pupil makes a mistake they are out of the game. The aim of the game is to go on counting for as long as possible without making any mistakes.

You can vary the game by counting in thirds, halves, fifths, sixths or eighths.

Have pupils work through the activities on page 27 of the Pupil's Resource Book. Help pupils who are having difficulty with any of the processes and mark their work as they go along so that you can identify any errors they are making.

### Answers

### Activity A

**1.** $\frac{5}{6}$ **2.** $\frac{7}{9}$ **3.** $\frac{1}{2}$ **4.** $\frac{1}{2}$ **5.** $\frac{3}{7}$

**6.** $\frac{1}{2}$ **7.** $\frac{3}{5}$ **8.** $\frac{1}{3}$ **9.** $\frac{2}{5}$ **10.** $\frac{4}{5}$

### Activity B

**1.** $2\frac{1}{4}$ **2.** $1\frac{1}{3}$ **3.** $2\frac{1}{3}$ **4.** $3$ **5.** $2\frac{1}{5}$

**6.** $4\frac{1}{4}$ **7.** $2\frac{1}{12}$ **8.** $6$ **9.** $2\frac{1}{4}$ **10.** $4$

### Activity C

**1.** $\frac{7}{2}$ **2.** $\frac{10}{7}$ **3.** $\frac{17}{3}$ **4.** $\frac{41}{4}$

**5.** $\frac{38}{9}$ **6.** $\frac{37}{5}$ **7.** $\frac{27}{7}$ **8.** $\frac{28}{25}$

Can all the pupils recognise equivalent fractions and reduce fractions to their simplest form?

## T2a

The purpose of this lesson is to revise the basic principles for addition of fractions with the same denominator. Where fractions have the same denominator, we call this a **common denominator**.

Explain that when fractions have a common denominator we can simply add them by adding the numerators together and putting the total over the same denominator.

Revise how to add common fractions and mixed fractions with the same denominator. Demonstrate, using the examples below.

$3\frac{5}{8} + 2\frac{1}{8} = 5\frac{6}{8}$ $2\frac{1}{3} + 1\frac{1}{3} = 3\frac{2}{3}$

Ask the pupils to talk about the different steps used to get to the answer and prepare some more examples for them to try.

$3\frac{3}{4} + 2\frac{2}{4} = 6\frac{1}{4}$ $3\frac{6}{8} + 5\frac{3}{8} = 9\frac{1}{8}$

Here, the same method is used with regrouping. Explain that where the total of the numerators is higher than the denominator this amounts to more than one. This is regrouped and added to the whole numbers in the answer, leaving the remainder as the new numerator.

Use these and other examples to explain and practice this.

$3\frac{3}{4} + 2\frac{2}{4} = 6\frac{1}{2}$ $3\frac{6}{8} + 5\frac{3}{8} = 9\frac{1}{8}$

Get the pupils to talk about different ways of calculating the answer. Guide them during the discussion.

Once the pupils understand the general idea they can find the sum of any two fractions with a common denominator.

Here are some more examples to try. Write them up on the board.

$\frac{4}{8} + \frac{3}{8} =$ $\frac{4}{9} + \frac{2}{9} =$ $2\frac{3}{7} + 1\frac{2}{7} =$ $5\frac{1}{8} + 1\frac{5}{8} =$

## C2a

When they have had enough practice, ask the pupils to complete the activities in the Pupil's Resource Book on page 28. These provide more practice with adding fractions with the same denominator.

### Answers

### Activity A

**1.** $\frac{4}{5}$ **2.** $\frac{6}{7}$ **3.** $\frac{10}{11}$ **4.** $\frac{1}{2}$ **5.** $\frac{11}{20}$ **6.** $\frac{2}{3}$ **7.** 1 **8.** $\frac{7}{8}$

### Activity B

**1.** $7\frac{4}{5}$ **2.** $8\frac{1}{2}$ **3.** $31\frac{7}{9}$ **4.** $23\frac{1}{2}$ **5.** 6 **6.** $11\frac{5}{7}$ **7.** $27\frac{1}{2}$ **8.** $11\frac{1}{5}$ **9.** $10\frac{6}{7}$ **10.** $11\frac{1}{2}$ **11.** $35\frac{4}{5}$ **12.** $16\frac{1}{2}$

### Activity C

**1.** $5 **2.** Nothing **3.** $5\frac{1}{4}$ hours **4.** $1\frac{1}{2}$ cakes **5.** $21\frac{1}{5}$ **6.** $27\frac{2}{7}$ **7.** $8\frac{4}{15}$

## T2b

In this lesson you revise the process for subtracting fractions with the same denominator, which the pupils covered in Standard 5 Unit 4.

Write some examples on the board as follows:

$\frac{4}{7} - \frac{2}{7} = \frac{2}{7}$ $2\frac{3}{8} - \frac{1}{8} = 2\frac{2}{8}$ $15\frac{8}{9} - 3\frac{5}{9} = 12\frac{3}{9}$

Use these examples to revise subtraction of fractions with the same denominator. Work through the examples together with the class on the board.

Ask, How can we find the answer to the question?

What do we take away first? **(the fractions)**

How many parts are left?

Explain that, as with addition, to subtract fractions they have to have the same denominator.

Use the examples above to revise subtraction of mixed fractions with the same denominator.

You can use a place value chart or draw fraction diagrams to help with the explanation if pupils are having difficulty.

Explain that, in these examples, no trading is required. We simply subtract as we would for whole numbers, starting with the fractions.

Do some more examples without trading to be sure that the pupils have understood. Such as:

$5\frac{6}{8} - 3\frac{3}{8} = 2\frac{3}{8}$ $4\frac{1}{3} - 3\frac{1}{3} = 1$ $8\frac{4}{5} - 6\frac{1}{5} = 2\frac{3}{5}$

Now work through some examples in which regrouping is required. Such as:

$5\frac{1}{4} - 3\frac{3}{4}$ = **(1 )** $6\frac{3}{8} - 3\frac{5}{8}$ = **(2 )** $12 - 4\frac{4}{5}$ = **(7 )**

Set these out vertically on the board using a place value chart as shown on the next page:

| Ones | Quarters |
|---|---|
| 5 ~~4~~ | 5 1 |
| - 3 | 3 |
| 1 | 2 |

Explain that we cannot take $\frac{3}{4}$ away from $\frac{1}{4}$, so we have to use trading.

We trade one whole (or four quarters) from the ones column to give us 5 quarters then subtract three from five, giving us the answer two quarters.

Next subtract the ones column to get the final answer of $1\frac{1}{2}$ (Note we can simplify the 2 quarters to make 1 half).

Work through the other examples above to practice subtraction with trading.

To do this accurately pupils have to remember that the number of parts in a whole is different according to what fraction they are working with. For example, when they regroup fifths, there are 5 parts, when they regroup eighths there are 8 parts and so on.

Encourage the pupils to use the appropriate language such as thirds, sixths, tenths, as they talk about the examples. You could ask different pupils to come to the front of the class and work through some examples too explaining what they are doing as they go along.

## C2b

Provide some more examples for pupils to work through in pairs. Move around the class and help them with their work. Encourage them to set out the sums in place value charts and to talk about their work as they go along.

Here are some examples you could use:

**a.** $12\frac{6}{8} - 6\frac{7}{8} =$ **(5✈)** **b.** $15\frac{1}{8} - 10\frac{5}{8} =$ **(4🗁)** **c.** $9\frac{1}{4} - 4\frac{3}{4} =$ **(4🗁)**

**d.** $21\frac{1}{3} - 9\frac{2}{3} =$ **(11✎)** **e.** $19\frac{6}{8} - 2\frac{7}{8} =$ **(16✈)** **f.** $10\frac{1}{10} - 9\frac{2}{10} =$ **($\frac{9}{10}$)**

When pupils have had enough practice they can move on to the activities in the Pupil's Resource Book on page 29.

### Answers

#### Activity A

**1.** $\frac{5}{9}$ **2.** $\frac{5}{7}$ **3.** $\frac{1}{5}$ **4.** $\frac{1}{4}$ **5.** $\frac{1}{10}$ **6.** $\frac{1}{6}$ **7.** $\frac{7}{9}$ **8.** $\frac{1}{2}$

#### Activity B

**1.** $6\frac{5}{7}$ **2.** $4\frac{7}{9}$ **3.** $4\frac{3}{5}$ **4.** $5\frac{1}{10}$ **5.** $11\frac{3}{5}$ **6.** $\frac{4}{9}$ **7.** $10\frac{3}{4}$ **8.** $4\frac{2}{5}$ **9.** $7\frac{3}{5}$ **10.** $15\frac{5}{7}$ **11.** $2\frac{1}{5}$ **12.** 5

#### Activity C

**1.** $3\frac{1}{4}$ m **2.** $1\frac{1}{4}$ m **3.** $\frac{5}{6}$ m

? Can all the pupils add and subtract fractions with the same denominator?

# T3a

**Materials**

Nguzu Nguzu Addition Fraction Cards

In this lesson pupils learn to add fractions with different denominators. This is a new skill that was not covered in Standard 5 so teach the process carefully.

Write this sum on the board.

$\frac{1}{4} + \frac{1}{6} =$

Ask pupils if they know how to add these two fractions.

Explain that we cannot add the fractions together in this form, because they have different denominators. Therefore we have to find a **common multiple** for both the denominators. A common multiple is a number that can be divided into both 4 and 6 exactly.

To help clarify the meaning of the word **common** in this context, give other examples of its use. Ask for instance, what two class members have in common, such as the colour of their eyes.

Ask the pupils to give you some of the **common multiples** of 4 and 6. Write them on the board. Encourage pupils to talk about the multiples listed on the board.

For example: 12, 24, 36, 48, are all common multiples 4 and 6.

Explain that we always choose the **lowest common multiple** (**LCM**) of the two denominators when adding fractions with different denominators. In this case 12 is the lowest common multiple of 4 and 6.

Show pupils how to rewrite the sum, converting each fraction to have a denominator of 12. The LCM becomes the new denominator as follows:

$\frac{1}{4} + \frac{1}{6} =$ is the same as $\frac{3}{12} + \frac{2}{12} = \frac{5}{12}$

12 is the **lowest common denominator** for this calculation.

Once the two fractions have the same denominator, pupils can add them using the method that they already know (adding the numerators) as shown.

Explain to the pupils that we are not changing the value or quantity of the fraction. We are only changing it to an equivalent fraction.

Work through some more examples with the pupils following the same process as follows:

- First find the lowest common multiple for both fractions;
- Next convert each fraction to an equivalent fraction using the lowest common multiple as the new denominator;
- Then rewrite the sum;
- Then add the two fractions;
- Finally simply your answer if this is possible.

Here are some examples you could use:

$\frac{1}{4} + \frac{1}{2} =$ Lowest common multiple is 8

Rewrite as $\frac{2}{8} + \frac{4}{8} = \frac{6}{8}$ simplify to $\frac{3}{4}$

$\frac{1}{5} + \frac{2}{3} =$ Lowest common multiple is 15

Rewrite as $\frac{3}{15} + \frac{10}{15} = \frac{13}{15}$ cannot simplify

$\frac{3}{8} + \frac{1}{6} =$ Lowest common multiple is 24

Rewrite as $\frac{9}{24} + \frac{4}{24} = \frac{13}{24}$ cannot simplify

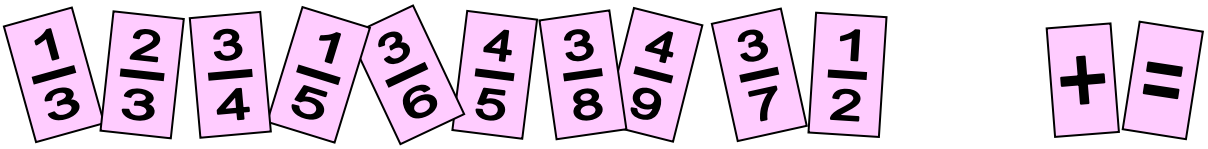
$\frac{3}{4} + \frac{2}{3} =$ Lowest common multiple is 12

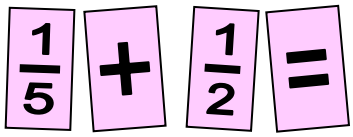
Rewrite as $\frac{9}{12} + \frac{8}{12} = \frac{17}{12}$ simplify to $1\frac{5}{12}$

## C3a

In this activity, pupils make up their own addition problems using fractions with different denominators. This provides them with lots of practice with the method they have just learnt for adding fractions with different denominators

Have pupils work in groups of three. Provide each group with a set of fraction cards like these. Each group should have about 10 or 12 cards as well as a plus sign (+) and an equals sign (=).




Ask them to place all the fractions cards face down on the table and mix them up. Turn over two cards, arrange them to make a sum as shown on the left and then add the two fractions.

Compare and check answers, then replace the cards and turn over two more to make a new sum. You could vary the level of difficulty according to the ability of the pupils, giving more able pupils more difficult fractions to work with.

When they have had enough practice ask pupils to complete the activities on page 30 of the Pupil's Resource Book.

### Answers

**Activity A**

**1.** $\frac{7}{12}$ **2.** $\frac{4}{9}$ **3.** $\frac{9}{20}$ **4.** $\frac{13}{22}$ **5.** $\frac{13}{42}$ **6.** $\frac{10}{21}$ **7.** $\frac{3}{10}$ **8.** $\frac{11}{24}$

**Activity B**

**1.** $\frac{13}{15}$ **2.** $\frac{1}{2}$ **3.** $1\frac{7}{12}$ **4.** $1\frac{1}{28}$ **5.** $\frac{19}{24}$ **6.** $\frac{13}{20}$ **7.** $\frac{16}{21}$ **8.** $\frac{5}{8}$

**Activity C**

**1.** $\frac{1}{10}$ **2.** $\frac{1}{20}$ **3.** $\frac{1}{6}$

## T3b

**Materials**

Nguzu Nguzu Subtraction Fraction Cards

In this lesson pupils learn how to subtract fractions with different denominators.

Write this sum on the board:

$\frac{3}{8} - \frac{1}{6} =$

Talk about pupils' ideas for calculating this sum. Encourage them to think of what they know about subtraction of fractions with like denominators and what they have just learnt about addition of fractions with unlike denominators.

Encourage them to try to suggest how they might approach this subtraction before you work through the process with them.

Now go through the example on the board. Go through the following stages for subtracting fractions with unlike denominators.

First identify common multiples of 8 and 3 **(24, 48, 96 and so on)**

Then choose the lowest common denominator **(24)**

Next rewrite the sum using the LCM as the new denominator $\frac{9}{24} - \frac{4}{24} = \frac{5}{24}$

This example cannot be simplified.

Work through some more examples together on the board. You could ask pupils to come to the board and work through them with the class as talking through the process will help them to understand it better.

Here are some examples you could try.

$\frac{1}{2} - \frac{1}{4} =$ Lowest common multiple is 4

Rewrite as $\frac{2}{4} - \frac{1}{4} = \frac{1}{4}$ cannot simplify

$\frac{5}{6} - \frac{2}{3} =$ Lowest common multiple is 6

Rewrite as $\frac{5}{6} - \frac{4}{6} = \frac{1}{6}$ cannot simplify

$\frac{6}{8} - \frac{1}{3} =$ Lowest common multiple is 24

Rewrite as $\frac{18}{24} - \frac{8}{24} = \frac{10}{24}$ simplify to $\frac{5}{12}$

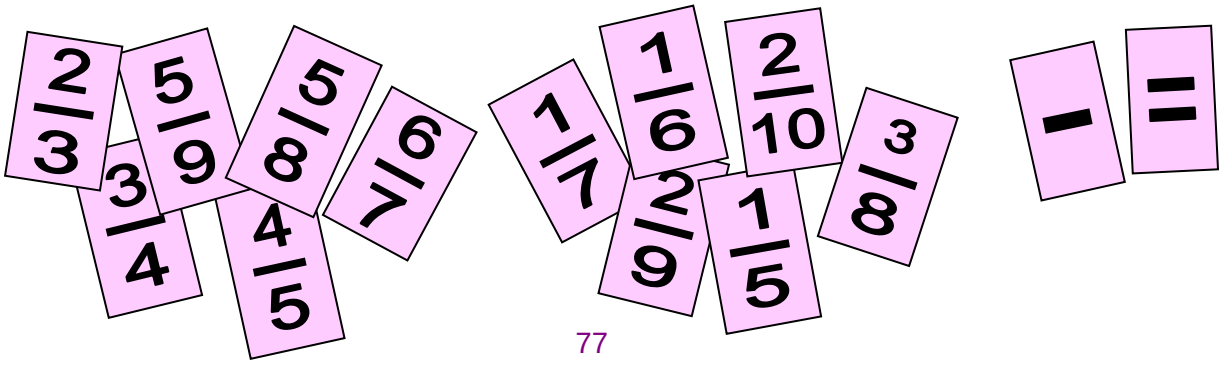
$\frac{3}{4} - \frac{2}{3} =$ Lowest common multiple is 12

Rewrite as $\frac{9}{12} - \frac{8}{12} = \frac{1}{12}$ cannot simplify

## C3b

Pupils could use the fraction cards like the ones you made for the last lesson to practice subtracting fractions with different denominators.

To do this they will have to separate them into two groups with larger fractions in one group and smaller fractions in the other group. This will ensure that the sums they make do not have negative answers. Place the two groups of cards separately and have pupils pick one card from each group to make a sum.



When pupils have had enough practice, they can complete the activities in the Pupil's Resource Book on page 31.

### Answers

### Activity A

**1.** $\frac{1}{4}$ **2.** $\frac{1}{12}$ **3.** $\frac{5}{12}$ **4.** $\frac{1}{4}$ **5.** $\frac{11}{20}$ **6.** $\frac{1}{12}$ **7.** $\frac{1}{3}$ **8.** $\frac{1}{8}$ **9.** $\frac{1}{8}$ **10.** $\frac{7}{20}$ **11.** $\frac{4}{15}$ **12.** $\frac{1}{10}$

### Activity B

**1.** $\frac{5}{12}$ **2.** $\frac{1}{4}$ **3.** $1\frac{3}{8}$ **4.** $1\frac{1}{6}$ or $\frac{7}{6}$ **5.** $5\frac{9}{20}$ **6.** $2\frac{1}{40}$ **7.** $5\frac{2}{21}$ **8.** $2\frac{19}{40}$

### Activity C

**1.** $\frac{2}{5}$ **2.** $\frac{7}{20}$ **3.** $\frac{1}{3}$

?

Can all the pupils add and subtract fractions with different denominators?

# Extension and Support

## Support Activities

For pupils who are still having difficult with addition and subtractions of fractions you need to provide activities that will help them to understand the processes better. Work with these pupils in small groups and allow them to use shapes and concrete materials to reinforce the concepts.

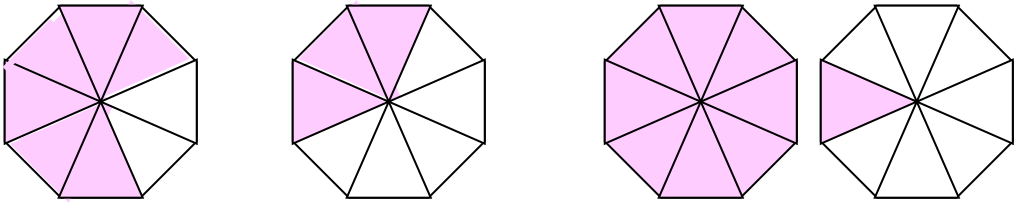
Here are some activities that you could try.

**Fraction Cards**

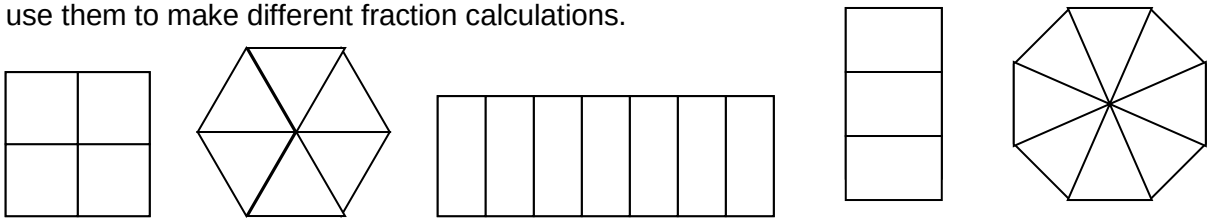
Use card shapes divided into different fractions to help pupils to understand the calculations they are making more easily. For example the following sum

$\frac{6}{8} + \frac{3}{8} = 1\frac{1}{8}$

Can be illustrated with fraction cards as follows:

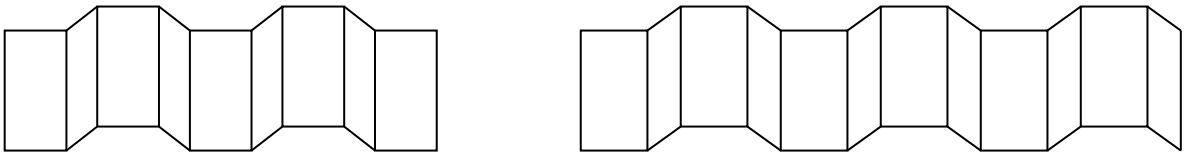


Prepare fraction cards of different shapes as shown below and allow pupils to cut them up and use them to make different fraction calculations.



quarters sixths sevenths thirds eighths

You could also use folded paper strips to represent different fractions as shown below for ninths and twelfths.



**Fraction Games**

Playing any of the games in this unit such as Fraction Dominoes, or Whole Number Buzz again will help the pupils to practice the skills they have learnt and understand them better.

**Explain Yourself**

Work with small groups of pupils and have them talk through addition and subtraction problems aloud, explaining each step of the problems as they work through it. Talking about what they do helps them to understand the process and when pupils explain themselves it is easy for the teacher to see where they are going wrong.

### Fraction Problems

Present addition and subtraction sums in terms of real problems to try to make them more meaningful for the pupils. Sometimes pupils find it easier to understand number concepts when they can relate them to real events. For example:

**1.** Joanna made 10 cakes to sell in the market. She cut each cake into 6 slices.

On Saturday she sold 25 slices and on Sunday she sold 21 slices.

How many of her cakes did she sell on Saturday?

**4 cakes and one slice or 4 $\frac{1}{6}$**

How many did she sell on Sunday?

**3 cakes and 3 slices or 3 $\frac{3}{6}$**

How many did she sell altogether?

**$4\frac{1}{6} + 3\frac{3}{6} = 7\frac{4}{6}$** which we can simplify to **$7\frac{2}{3}$**

How many cakes did she have left?

**$10 - 7\frac{2}{3} = 2\frac{1}{3}$**

How many slices? **14**

Pupils might find it helpful to draw sketches in their exercise books to illustrate the problems as they work through them.

## Extension Activities

For pupils who are confident with adding and subtracting fractions, you should provide activities to extend their skills. Choose activities that they can work at on their own without too much help from you so that they also develop their investigation skills. This will leave you free to work with pupils who need more help. Here are some activities they could try.

### Fraction Posters

Ask pupils to make a poster to display in the classroom to show what they have learnt in this unit. They should include the any new mathematical language that the have learnt, the method for addition and subtraction of fractions and they should illustrate their poster with diagrams or pictures.

### Fraction Challenge

Give pupils some harder fraction problems to work through independently. Here are some they could try.

**1.** Find the number for each of the following clues:

**a.** half of the number is 8 **(16)**

**b.** one quarter of the number is 8 **(32)**

**c.** three quarters of the number is 12 **(16)**

**d.** two thirds of the number is 18 **(27)**

**e.** two sevenths of the number is 14 **(49)**

**f.** nine tenths of the number is 90 **(100)**

**g.** four thirds of the number is 24 **(18)**

**h.** half of the number plus 5 is the same as the number itself **(10)**

**i.** half of the number plus eight is the same as the number itself **(16)**

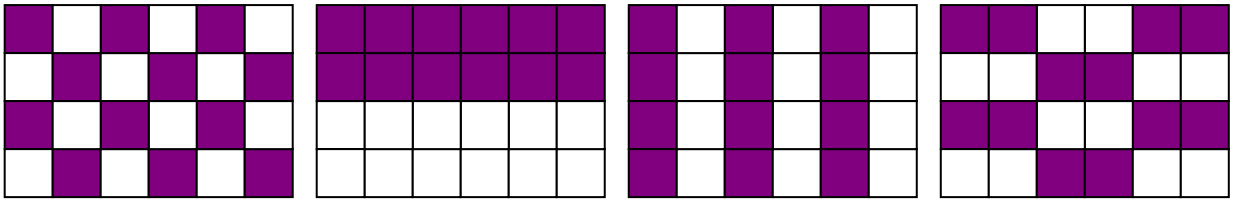
**2.** How many times can three quarters be subtracted from 12? **(16)**

**3.** How many times can two thirds be subtracted from 10? **(15)**

**4.** A boy spent three quarters of his money. Half of what he had left was 60c. How much did he have to start with? **($4.80)**

**Fraction Designs**

Have pupils create designs on squared paper to illustrate different fractions. They might use colours to show different ways in which a half can be presented as shown.



You could challenge them to make designs to illustrate how a third or a quarter might be illustrated too.

**The Camel Mystery**

**Tell pupils the following story and ask them to solve the mystery and explain why it is not a mystery at all in terms of fractions.**

An old Arab man lay dying in his bed. He called his three sons to his bedside and told them that, although he was a poor man, he had at least got his herd of camels. When he died, he told them, he wanted the herd divided between the three boys. The eldest was to have one half, the middle son was to have one third, and the last boy was to have one ninth of the herd.

Soon afterwards the man died and the three sons set about trying to divide the camels between them. When they gathered the herd together they found that their father had left them 17 camels.

This caused a problem for the boys because the eldest son wanted half of the camels, but half of 17 was 8🗁 and they could not split the camels in half. They began to argue amongst themselves as to how many camels each should get.

Their wise uncle saw a solution to the problem and offered to help. “If I give you one more camel from my herd you will find it easy to share them out.” he said.

He was right! Once the boys had 18 camels to share they divided them easily. The first boy got 9, which was half the herd. the second boy got 6 which was one third of the herd and the last boy got two, which was, as his father had said, one ninth of the herd.

The boys were surprised however to find that although they had shared the camels out exactly as their father had said, there was still one camel left over. Their uncle understood what had happened and happily took back his one camel and went home.

**Solution**

This is a trick. When pupils hear the story they immediately assume that the father has divided the whole herd, but this is **not** so.

$\frac{1}{2}$ and $\frac{1}{3}$ and $\frac{1}{9}$ **do not** add up to one whole, but to $\frac{17}{18}$, which explains why one camel was left over for the boys uncle to take back.

## Check Up Page: Answers

**1. a.** $\frac{2}{5}$ **b.** $\frac{3}{4}$ **c.** $\frac{1}{3}$ **d.** $\frac{3}{8}$ **e.** $\frac{3}{7}$

**2. a.** $\frac{3}{6}$ $\frac{4}{8}$ **b.** $\frac{6}{8}$ $\frac{12}{16}$ **c.** $\frac{14}{16}$ $\frac{28}{32}$ **d.** $\frac{8}{12}$ $\frac{2}{6}$ **e.** $\frac{5}{8}$ $\frac{10}{16}$

**3.** $\frac{7}{10}$ **4.** $1\frac{1}{4}$ **5.** $1\frac{4}{15}$ **6.** $\frac{4}{8} = \frac{1}{2}$ **7.** $\frac{2}{3}$ **8.** $\frac{5}{12}$

**9.** $1\frac{1}{20}$ **10.** $1\frac{5}{6}$ **11.** $8\frac{2}{7}$ **12.** $1\frac{1}{5}$ **13.** $8\frac{13}{28}$ **14.** $2\frac{27}{40}$

**15. a.** $1\frac{7}{8}$ **b.** $1\frac{1}{8}$ **16.** $\frac{1}{6}$ **17.** $\frac{7}{24}$ **18.** $\frac{1}{8}$

Unit 4

# Shape Topic 6: Angles and Topic 7: Triangles

**Aim:**

To revise vocabulary and concepts relating to angles and triangles and to further develop skills in measuring angles and triangles accurately, using a protractor and ruler. To apply knowledge of angles and triangles to practical situations, such as giving directions and taking bearings.

**Topic 6: Sequence of objectives:** To

1. measure and compare angles using a protractor.
2. investigate the total of the angles inside triangles and quadrilaterals.
3. plot a course using bearings.

**Topic 7: Sequence of objectives:** To

1. classify and name different triangles including right angle, equilateral, isosceles and scalene.
2. draw triangles from given instructions.

**Rationale:**

In topic 6, pupils are given further practice in measuring angles using the standard unit of degrees. An understanding of angles can help pupils in a variety of practical tasks such as giving directions, taking bearings or construction. In topic 7 they explore triangles and apply their knowledge of angles to measuring and drawing triangles. The work in both of these topics provides the foundation for developing future skills in design and technical drawing.

## T1a

**Materials**

board protractor
rulers
protractors
strips of card
paper fasteners

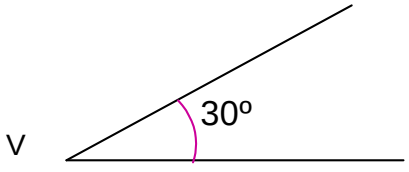
Introduce the unit by revising what pupils already know about angles. Ask some questions and allow the pupils to explain their answers fully to the class. Encourage them to illustrate their answers by drawing on the board.

Pupils will understand the concepts more clearly if they have to explain them themselves rather than listening to the teacher's explanation. If they find it difficult, ask other pupils to assist them. Here are some questions you could start with:

1. What is an angle? **(The amount of turning between two lines, about a common point.)**
2. What is the standard unit of measurement for measuring angles or turns? **(degrees)** How do we write this? **(º)** Can pupils tell you how many degrees are in a right angle and a full turn? **(90º and 360º)**
3. What instrument do we use for measuring angles? **(A protractor)** Can pupils describe how to use a protractor?

Explain that, in this topic, the pupils will practice measuring angles accurately with a protractor and will learn about how angles can be useful in real life situations.

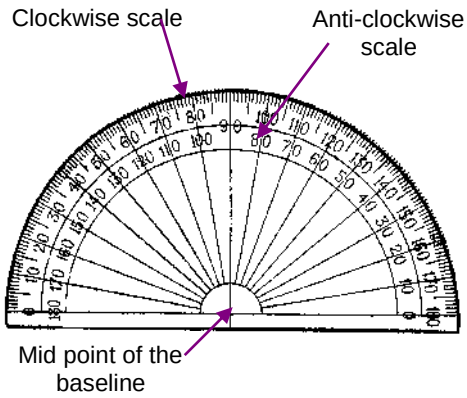
Demonstrate the use of a protractor on the board using a board protractor as follows:




Draw an angle and identify the **vertex** (V).

Show how to place the **centre point** of the protractor on the **vertex** of the angle.

Remind the pupils to align the **baseline** of the protractor with one **ray** of the angle.




**A protractor with bi-directional scales**

Show how to read the **scale** on the protractor identify the size of the angle. Write the measurement next to the angle as shown.

Remind the pupils that **most protractors have two scales, one clockwise and one anti-clockwise**. They can use either scale to read the size of an angle.

Discuss how they will decide which scale to read.

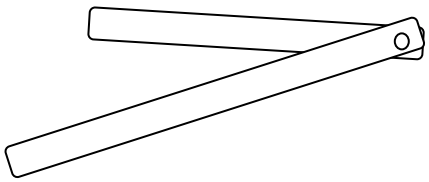
This will depend on whether the vertex of the angle is on the left (in which case the anti-clockwise scale is used) or the right (in which case the clockwise scale is used).

Repeat this with several more angles, include examples of right angles and angles larger and smaller than right angles, but do not introduce angles larger than 180º yet.

Ask pupils to come and measure angles on the board using the board protractor.

Check that all the pupils have understood before moving on.

## C1a



Have the class work in groups of 2 or 3.

Each group will need a protractor and strips of card to make an angle maker.

Explain how to make an angle maker using two strips of card and a paper fastener as shown.

Then ask the groups to use their angle maker to draw the following:

- a right angle
- three different angles smaller than a right angle
- three different angles larger than a right angle

When they have drawn their angles tell them to measure them accurately with a protractor and write the size of each angle using the correct notation for degrees.

Move around the groups and encourage pupils to work together and discuss their work. Check that they are all using the protractor correctly and help those having difficulties.

Have the pupils complete the activities in the Pupil's Resource Book on page 34 to practice using the protractor to measure angles.

### Answers

### Activity A

**1.** 30º Acute angle. **2.** 90º Right angle. **3.** 120º Obtuse angle. **4.** 45º Acute angle.
**5.** 23º Acute angle. **6.** 80º Acute angle. **7.** 145º Obtuse angle. **8.** 53º Acute angle.

### Activity B

**1.** Acute angle, 23º, less than a right angle.
**2.** Acute angle, 33º, less than a right angle.
**3.** Obtuse angle, 130º, larger than a right angle.

4. Acute angle, 45º, half a right angle.
5. A right angle, 90º, one quarter turns.
6. Obtuse angle, 145º, larger than a right angle.
7. A straight angle, 180º, one half turn.
8. Obtuse angle, 160º, larger than a right angle, almost a half turn.

**Activity C**

**1 – 8.** Ask pupils to work in pairs to measure and check each other's angles.
**9.** acute angle, right angle, obtuse angle, straight angle, reflex angle, revolution**.**

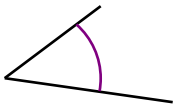
## T1b

**Materials**

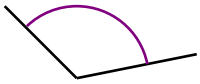
Angles Vocabulary Race cards
Different Types of Angle Poster

In this activity pupils revise the terms for different angles they learned at Standard 4. They also learn how to label angles in diagrams.

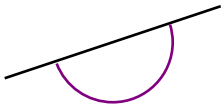
Check that pupils understand and can use the following terms correctly by asking them to explain them. They should be able to describe angles in degrees as well as in relation to a right angle or a full turn. Allow pupils to draw angles on the board to illustrate their answers.



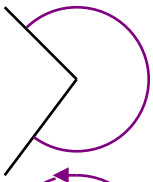
**Acute angle** — An angle less than a right angle, or less than 90º. Acute means sharp.



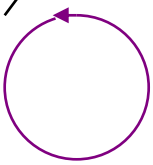
**Obtuse angle** — An angle greater than a right angle but less than a straight angle, or between 90º and 180º. Obtuse means blunt.



**Straight angle** — An angle of 180º, the same as two right angles.



**Reflex angle** — An angle larger than a straight angle but less than a full revolution. An angle between 180º and 360º.



**Revolution** — A full turn or 360º,

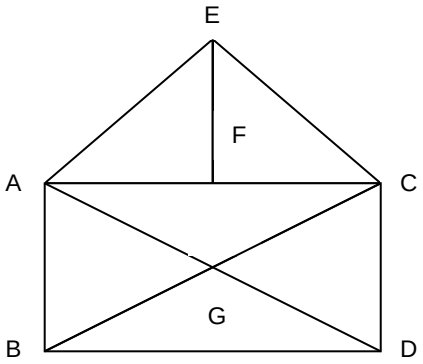
Use the Nguzu Nguzu Poster provided to revise and discuss the different types of angle. Display it on the classroom wall as you work on this topic. You could prepare a chart as a support activity with a group of pupils who need more help remembering what the terms mean.

Ask pupils to compare different types of angles by asking questions such as:

Which is larger an acute angle or a right angle?

Which is smaller a straight angle or a reflex angle?

…and so on.




Explain to the class how angles are labelled using the diagram on the left. Draw the diagram on the board and label the vertices with letters of the alphabet as shown.

Explain that angles are named using three letters for example:

The right angle in the lower left of the diagram is labelled ABD.

The acute angle in the same part of the diagram is labelled CBD or GBD.

The apex is labelled AEC and so on.

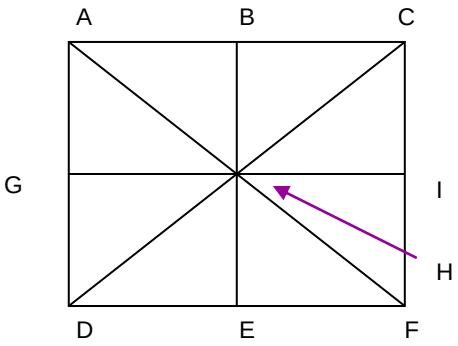
Ask the pupils to come to the board and identify different angles, by their correct labels, for example, you might ask them to find the following: CGD, AGC, or EFC.

Ask them to find some obtuse angles too such as DCE, BGD, and angles which are more difficult to identify such as EAB.

Can any of the pupils suggest how to label an angle of 180º on the diagram? **(BGC or AGD)**

Can they identify a right angle? **(BAC, CDB, EFC, EFA or ABD)**

To check whether the pupils have understood this method of labelling angles you could draw another similar diagram on the board. Set the pupils a competition to see how many different angles they can find and label from the diagram.




In the example on the right there are more than 40.

You could also use the same diagram for a different game. Call out the name of an angle (e.g. ABH) and see which pupil can be the first to call out the name of another angle which is the same size (CIH).

For more practice comparing angles you could use the activities in the Pupils' Resource Book on page 35. You could have one group work on these activities while another group plays the game below.

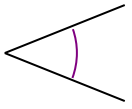
## C1b

**Angles Vocabulary Race Game**

In this game there are six sets each containing four cards, a total of 24 cards. The aim of the game is to find a full set of cards which all mean the same thing. The first four pupils to form a correct group are the winners.

Share out the cards giving one to each pupil. If you have more than 24 pupils use more sets of cards, if you have less, then remove some cards from the set.

Ask the pupils to move around the class, looking at each other's cards until they find the three other pupils who make up their complete set, such as:

| | | | |
|---|---|---|---|
| An angle of less than 90º | An acute angle |  | Less than a quarter turn |

Repeat the game until you feel the pupils are confident with using these terms. Pupils can have more practice measuring and comparing angles by completing the activities on page 35 of the Pupil's Resource Book.

**Answers**

**Activity A**

**1.** b **2.** a **3.** a **4.** b **5.** a

**Activity B**

**1.** e,b,a,c,d. **2.** e,c,b,d,a.

**Activity C**

Check pupil's estimates as well as their measurements.
Green 10°, red 18°, purple 46°, blue 74°, orange 100°, yellow, 112°.

## T1c

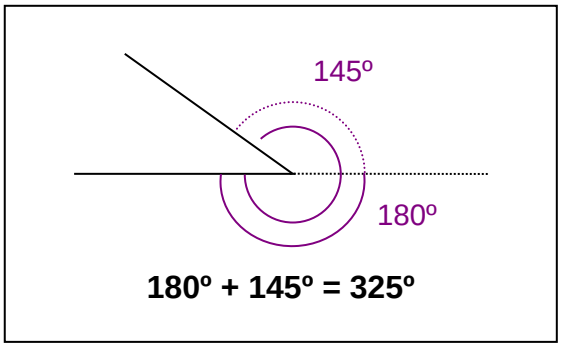
In this activity pupils learn how to use their protractor to measure angles larger than 180º.

Measuring angles larger than 180º (reflex angles) can be difficult so allow plenty of time to explain and practice this process.

Draw a reflex angle on the board and ask one of the pupils to try to measure it using the board protractor.

They will probably choose to use the addition method, measuring and marking 180º and then measuring the remaining part of the angle and adding it to 180º.

Allow some other pupils to try the same thing and discuss the method. Is it the best way to do this?



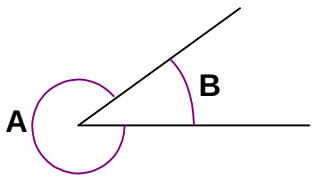

**180º + 145º = 325º**

## C1c

Have the pupils work in pairs. Ask them to draw some reflex angles in their exercise books and measure them. Their task is to try to find an easier way of measuring angles of more than 180º.

Move around the groups as they work and help them to try different ways of measuring angles.

Pupils should be able to come up with the formula shown in the box below for themselves.




**Reflex angle A = 360º - angle B**

**360º – 35º = 325º**

Bring the class back together at the end of the lesson and ask pupils to explain the formula they have discovered.

Do some examples on the board to test the formula. Use both methods to measure these and see if they are correct.

Then write the formula up on the board.

Reflex angle A = 360º - angle B.

Pupils can do the activity in the Pupil's Resource Book on page 36 to practice measuring reflex angles. Read the instructions with the class before they complete the activities on their own.

**Answers**

**Activity A**

**1.** 320º **2.** 270º **3.** 325º **4.** 318º **5.** 305º **6.** 144º

**Activity B**

**1.** 270º **2.** 316º **3.** 250º **4.** 240º **5.** 209º

**Activity C**

**1.** 210º **2.** 270º **3.** 330º **4.** 300º **5.** 240º **6.** 270º **7.** 330º **8.** 210º

The method for calculating these angles is as follows:

Each hour on the clock is 30º (a full revolution (or 360º) divided by 12 hours, 360 ÷ 12 = 30). Count how many hours there are between the two hands and x by 30. The angle = 360º minus the number of hours between the hands x 30.

## T1d

Revise the terms **clockwise** and **anti-clockwise** before completing this quick warm up game.

Ask the class to stand up and follow your instructions. Give them some commands such as:

| | | |
|---|---|---|
| Turn 90º clockwise | Turn 180º anti-clockwise | |
| Turn 40º clockwise | Turn 360º anti-clockwise | and so on… |

You can extend the game by asking pupils to give the instructions, or by asking two pupils to stand at the front facing in different directions. The class must give instructions to one pupil to try to get them to face the same direction as the other one.

Next, ask the pupils to think about how knowing about angles might help them solve other real life problems. You could discuss constructing buildings, sports, such as snooker or soccer, following directions and following maps.

## C1d

Look at the activities in the Pupil's Resource Book on page 37 together and discuss the examples given. Read through the instructions together before asking pupils to work in pairs to discuss and complete the activities.

**Answers**

**Activity A**

1. The church
2. Any angle between 80º and 100º would be correct.
3. Between 80 and 100º
4. Check each pupil's work individually.

**Activity B**

1. No
2. About 25º.
3. About 50º
4. Between about 62º and 75º

**Activity C**

Check each pupil's work individually

? Can all the pupils measure and compare angles using a protractor?

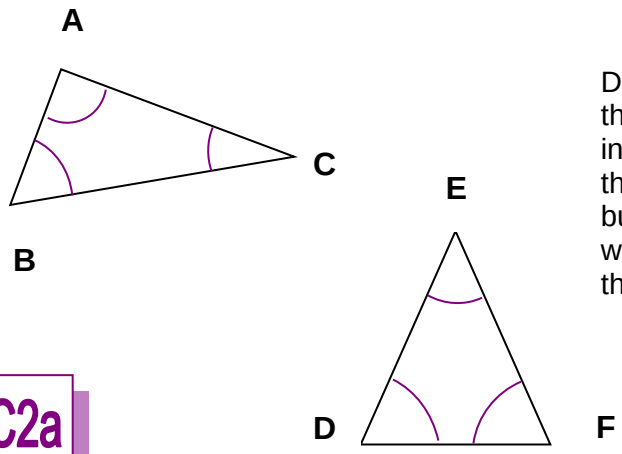
## T2a

**Materials**

scrap paper
protractors and rulers

Introduce the activity. Explain that this activity includes more work on measuring angles using protractors. Quickly ask the pupils to recap over how to use a protractor if you think this is necessary.

Explain that pupils are going to investigate the size of angles in triangles and see what they find out. Ask them to define and describe a triangle. **(A polygon with three sides and three vertices).**




Draw some triangles on the board and label the three vertices. Show the pupils the three internal angles, one at each vertex. Explain that there is something special about these angles, but tell them that you are **not** going to tell them what it is. They have to work it out for themselves!

## C2a

Have pupil's work in groups of three. Give them the instructions for the activity as they go along.

First each pupil is to draw a triangle on a piece of scrap paper using a ruler. The triangle can be any size and any triangular shape.

When they have finished ask the pupils to pass their triangles on to the next person in their group. They then each have to measure and write down the size of the three angles in the triangle using a protractor. Allow plenty of time for them to do this. Make sure that they are using their protractors correctly and help those having difficulty. When they have finished pass the triangle diagrams on again to the next person in the group.

Now ask them to study the size of the angles and discuss them with their group. Can anyone notice anything about the three angles they have measured?

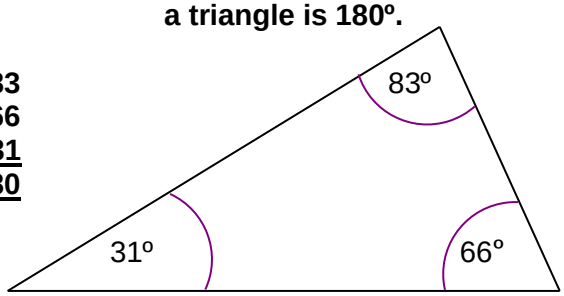
If they can, ask them to explain what they see. If they cannot, tell them the next step, which is to total up the number of degrees in all 3 angles.

Allow them time to do this and then to discuss their answers with their group. What do they find?

When they have done so they should be able to tell you that the angles add up to 180º.

**The sum of the three internal angles of a triangle is 180º.**

**83**
**66**
**+ 31**
**180**




Bring the class back together and check that all their results added up to 180º. If there are any that did not, ask pupils to check their measurements again. This will help you to identify any pupils still having difficulties using a protractor correctly.

Write the rule on the blackboard and draw and measure one triangle using the board protractor to illustrate the rule as shown.

Check that all the pupils have understood the rule, before moving on.

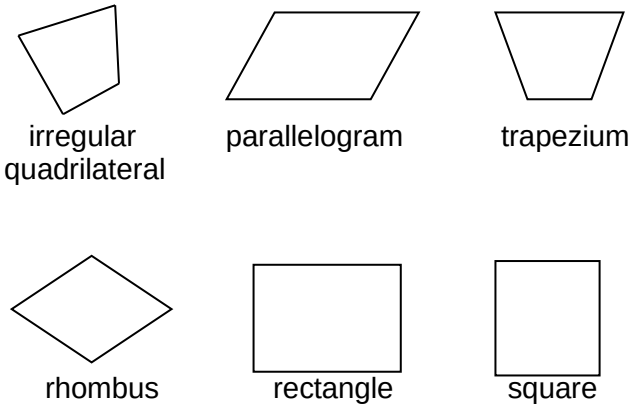
## T2b

Ask the pupils whether they think that there might be a similar rule for other two-dimensional shapes. Discuss their ideas. Ask them to predict whether there might be a similar rule for quadrilaterals, for example.

Revise the definition of a quadrilateral (a polygon with four vertices and four sides).

Ask pupils to describe some different kinds of quadrilaterals, such as square, rectangle, rhombus, trapezium, parallelogram and irregular quadrilateral.

Have some pupils draw these shapes on the board. Ask them to predict whether there might be a similar rule.




Have pupils work in their groups of three again and repeat the activity they did in the last lesson to explore whether a similar rule can be deduced about the angles inside a quadrilateral.

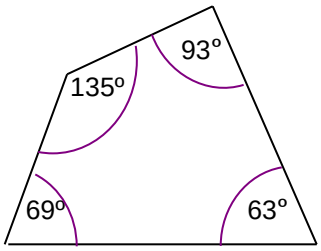
First draw a quadrilateral, then pass it on to a friend to measure the angles, then pass it on again to find the total of the angles.

Allow them plenty of time and encourage them to predict and discuss their findings together.

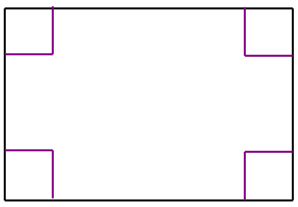
At the end of the activity bring the class back together and have them explain the rule they have discovered for quadrilaterals. Write this on the board and illustrate it as shown below.

Encourage the pupils to check their own calculations and measurements to make sure that they have used their protractors accurately and have added up the figures correctly.

**The sum of the four internal angles of a quadrilateral is 360°.**




**93**
**135**
**63**
**+ 69**
**360°**



**90° x 4 = 360°**

Have the pupils work in groups to complete the activity on Page 39 of the Pupil's Resource Book.

This should help them to consolidate their understanding of the rules they have discovered.

Each group will produce a poster to illustrate the rules they have just found out about triangles and quadrilaterals.

They have to read and follow instructions given in the Pupil's Resource Book. Assist those who have difficulty with reading. Pupils should work in mixed ability groups to complete this activity together.

When they are finished, these posters would make a good class display.

## T2c

In this activity pupils will apply the rules they have learned about the angles inside triangles and quadrilaterals and use them to calculate the size of a missing angle.

Ask one or two pupils explain the rules again. Check that they all understand.

Explain that knowing these facts about angles can be useful.

Draw a triangle on the board and label all but one of the angles as shown below.

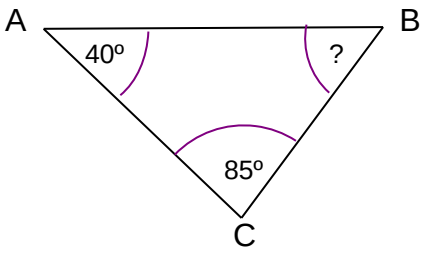
Ask whether anyone can tell you how to work out the size of the missing angle.

Explain that, since we know that the total of all three angles is 180º, we can work out the size of the missing angle by adding up the two we know, and taking the total away from 180º as follows:

85º + 40º = 125º

180º – 125º = 55º

Angle B = 55º

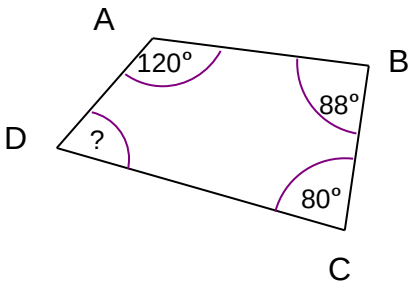



Repeat the process with several more examples and check that pupils understand how to calculate the missing angle.

## C2c

Ask the pupils to work in pairs.

Each pupil is to draw a quadrilateral on a piece of paper and measure and label the size of three out of four angles as shown.




Then tell them to swap with their partner and calculate the size of the missing angle. They can check their calculations by measuring.

Repeat the activity until everyone understands how to calculate the missing angles.

When they have finished they can complete the activities in the Pupil's Resource Book on Page 40. These give them more practice in calculating the missing angles in the given shapes.

**Answers**

**Activity A**

**1.** 40º **2.** 120º **3.** 69º **4.** 115º **5.** 30º

**Activity B**

**1a.** 60º **1b.** 60º **2a.** 90º **2b.** 90º **2c.** 90º **3.** 27º **4.** 46º **5.** 71º

**Activity C**

**1.** BCD 90º **2.** BJD 150º **3.** CBD 45º **4.** FEL 80º **5.** ABK 60º **6.** BAH 120º

Have all the pupils investigated the total of the angles inside triangles and quadrilaterals and can they explain their findings clearly?

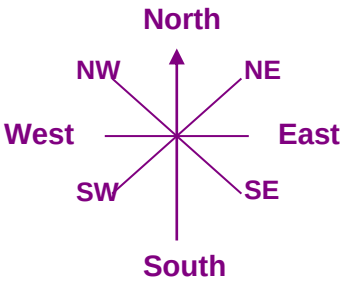
T3a

The following activities develop the pupils understanding of how angles can be used to give precise directions or bearings. They should help them to appreciate how what they have learned about angles can be applied to real life problems.

Revise what the pupil's already now about the points of a compass.

Ask one pupil to come up and draw a compass on the board showing the four main points.

Ask the pupils to tell you the angle of turning between given points for example:




- North and East **(90ºclockwise)**
- South and North **(180º)**
- North and West **(90º anti clockwise or 270º clockwise).**

Add North East, (NE) South East, (SE) South West (SW) and North West (NW) to the compass drawing and ask some similar questions.

- What is the angle of turning between North East and South? **(135º)**
- What is the angle of turning between South East and South West? **(90º)**
- What is the angle of turning for a full revolution? (north to north) **(360º)**

Explain that we can use degrees to give precise directions using a compass. We call a compass direction expressed in degrees a **bearing**.

Teach the following rules.

North is always classed as 0º.

Bearings are always measured in a clockwise direction, starting from North **(0º).**

Bearings are measured in degrees.

Bearings are always written as three figures **(For example: 340º 090º or 045º).**

Check that the pupils have understood the rules by asking them to tell you some of the points on the compass as bearings. Such as:

| | | | | | |
|---|---|---|---|---|---|
| North East | **(045º)** | East | **(090º)** | South East | **(135º)** |
| South | **(180º)** | South West | **(225º)** | West | **(270º)** |
| North West | **(315º)** | North | **(000º or 360º)** | | |

## C3a

In their exercise books, ask the pupils to draw a compass and label all of the above points both by name and in degrees.

Allow them plenty of time to do this and have them use their protractors to make sure that they get the angles correct. Work with those children having difficulties, encourage them to talk about their work.

## T3b

**Materials**

coloured chalk
scrap paper
string

Sketch a picture on the board like the one below.

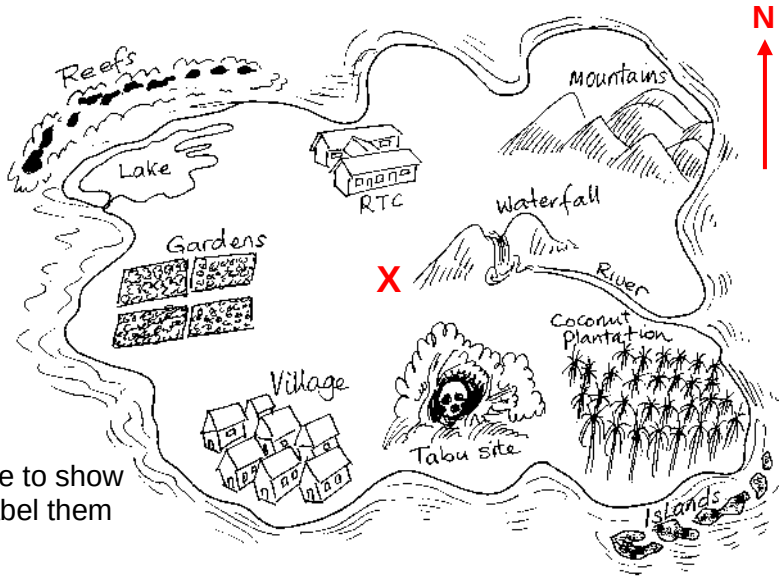
Ask pupils to imagine that they are standing in the middle of the island (x). Draw a compass to show which way is North and add the North line from the middle of the island.

Ask pupils to estimate the angle, or bearing from the middle of the island to various landmarks.

Show them how to measure and record their bearings as follows:

- Rural Training Centre 000º
- Waterfall 080º
- River mouth 095º
- Tambu site 150º
- Coconut plantation 110º
- Village 200º

…and so on.




Draw coloured lines on the picture to show the bearings you agree on and label them with the correct measurements.

## C3b

Organise the class into groups of about four pupils. Each group will need a notebook and a pencil. They will also need a piece of string about 1 m long.

Explain the activity first before sending the groups outside to take some bearings.

Each group will go to a different location around the school or village, such as the centre of the school playing field, the church, the top of a hill, the wharf, etc.

Tell them to mark a line on the ground using string or chalk to show which direction is North. It doesn't matter if this is not exactly right but you should help them to get a rough idea of the right direction before they go.

Then tell them to look around them and identify a number of landmarks. These might be buildings, hills, islands, trees or anything else they can see.

In their notebooks they should make a note of about five or six landmarks and estimate the bearing at which they lie, before returning to class.

When they get back to class each group can draw a sketch map of the area showing the landmarks they have identified and drawing on the bearings using a protractor and coloured pens to show the bearings.

Have them display their maps on the wall of the classroom for other groups to see and discuss.

Ask pupils to turn to page 41 of the Pupil's Resource Book and complete the activities.

**Answers**

**Activity A**

1. Between 000º - 060º or between 320º - 360º
2. Between 270 and 285º
3. Between 070º and 105º
4. 140º
5. 160º
6. Between 205º - 225º

**Activity B**

1. Malaita Province
2. The Russell Islands
3. Guadalcanal
4. Vangunu
5. Isabel Province
6. San Jorge
7. 070º
8. 140º
9. 250º
10. 060º

**Activity C**

1. Malaita and the Florida Islands.
2. Marovo / Vangunu and Mary Island.
3. Savo and Guadalcanal.
   Canoe 1 Approximately 290º, Canoe 2 approximately 070º, Canoe 3, approximately 310º


In this activity pupils use their knowledge of bearings to plot a course. Use the map of central Solomon Islands in the Pupil's Resource Book on page 42. Sketch a map on the board too.

Explain that bearings can be used to plot a course. Discuss the example below with the class. Mark the course on your board map as you go.

> Start at the Russell Islands. Follow a 295º course until you meet another Island. On which Island are you now? **(Vangunu)**

Try some more examples such as:

> Begin in Honiara and follow a 020º course until you meet another island. From this island follow a 100º course. Where do you end up? **(Savo)**

Ask some pupils to come to the front and plot courses using the map. Allow other pupils to predict where each course will take them.


Ask the pupil's to work in pairs using the map on page 42 of the Pupil's Resource Book. Tell each pupil to plot a course containing three different bearings. They then exchange their course with their partner and each has to try to work out where the course leads them. Pupils can start from anywhere they like on the map and their course must end up on an island.

## T3d

**Materials**

map of Solomon Islands

Show the pupils the picture in the Pupil's Resource Book on page 43 of a circular plaque. Tell them that this plaque is fixed to the ground somewhere in Solomon Islands.

They have to study the bearings on the plaque and work out where it is.

Working out the location of a point from bearings is quite a difficult concept for the pupils so make sure you allow plenty of time for discussion and have pupils explain their ideas for finding the location. They will need a map of Solomon Islands to help them.

The answer is that the plaque is located in Central Province somewhere near Tulagi.

As a class, design another plaque for a different location using the map of Solomon Islands to help you. Make sure all the pupils understand the idea before going on to the next activity.

## C3d

Split the class into groups of three. Each group has to make a plaque for a specific place. They can choose anywhere in the Solomon Islands. Tell them to work together and to add about six bearings to their plaque.

When all the groups have finished swap their plaques around and see how quickly another group can work out where the plaque they have designed is located.

You could try the same activity for plaques to place around the school campus or the village.

?

Can all the pupils plot a course using bearings?

# Extension and Support

## Support Activities

### Bearings and Turns

Work with a small group of pupils to practice making turns clockwise and anti clockwise on given directions. Draw a chalk compass on the floor to help them to make the correct turns.

For example: Face North, now turn to face South East

Now turn to face South

Have them tell you how many degrees they have turned though and in what direction.

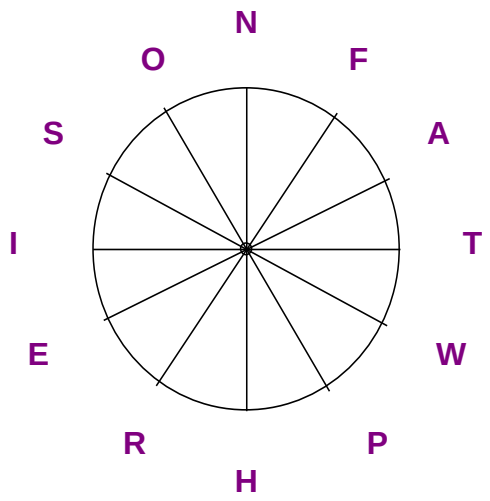
Have pupils work with a partner to complete a table like this for further practice:

| Face | Turn to face | Angle turned (in degrees) | Direction | Bearing |
|---|---|---|---|---|
| **1.** North | South | 180º | Clockwise | 180° |
| **2.** South | North West | | | |
| **3.** North East | East | | | |
| **4.** South West | North West | | | |
| **5.** North East | South | | | |

### Coded Messages

Draw a circle on the board marked off in 12, 30º sections as shown. Each section should be marked with a different letter of the alphabet.

Explain to pupils how to use the diagram to send a code message.




For example:

110º, 180º, 240º, 210º, 240º

270º, 300º,

120º, 240º, 090º, 240º, 210º?

**(Where is Peter?)**

Have the pupils work in pairs to send a coded message to their partners.

They can use their protractors to measure the angles if necessary.

Remind them that all their instructions should be given as bearings. Bearings are always given as a measurement of degrees starting from North (0º) and are written as three figure numbers.

## Extension Activities

For extension work pupils could try the following activities:

### Pie Charts

Put the following information on the board and ask pupils to draw two pie charts to show the results of an election for head boy and head girl.

They should use protractors to measure the angles accurately before they draw.

| **Head Girl** | | **Head Boy** | |
|---|---|---|---|
| Susan | 30 votes | James | 70 votes |
| Mary | 44 votes | Kimo | 40 votes |
| Lencia | 18 votes | Wasi | 194 votes |
| Jemima | 60 votes | Lenci | 40 votes |
| Katy | 208 votes | William | 20 votes |
| Total votes | 360 | Total votes | 360 |

**Constructing Shapes**

Give the instructions for the construction of various shapes and have pupils use their rulers and protractors to construct these shapes.

For example:

1. Draw a quadrilateral in which two angles are larger than right angles and the other two angles are 35º and 48º. Label your drawing with the size of all the angles.
2. Construct a triangle in which all three angles are the same.
3. Construct a quadrilateral in which two angles are the same and the other two angles measure 25º and 85º
4. Construct a triangle in which one angle measures 25º and the remaining two angles are the same.

**Plotting a Course**

Ask pupils to work in pairs to design and draw a map of an imaginary island, lagoon or country. They should put in as many different landmarks as they can and think up names for the different islands and places on their map.

Then ask them to plot a course using five or six bearings, to take them from one place to another on their map. When they have finished they can swap with another pair and try to follow each others' courses.

## T1a

**Materials**

tangram sets
scissors
cardboard

Start this topic by revising what the pupils already know about two-dimensional shapes.

Reinforce their knowledge by reminding them of the correct mathematical vocabulary.

Ask pupils to define a 2-dimensional shape.

A 2-dimensional shape is a closed shape made from straight or curved lines. 2-dimensional shapes are **flat** and have no depth or body. They are sometimes called **plane shapes**.

Ask pupils to draw some 2-dimensional shapes on the board.

Revise the names of some familiar two dimensional shapes and ask pupils to look for examples of these around the classroom and sketch them on the board.

Include the following, **square**, **trapezium**, **parallelogram**, **rectangle**, **circle**, **triangle**, **hexagon**, **pentagon**, **and octagon**.

Ask pupils to suggest how these shapes are useful to us in everyday activities such as building houses, carpentry, dressmaking and so on.

Revise the term **polygon**, used to describe **a closed shape with more than two straight sides**.

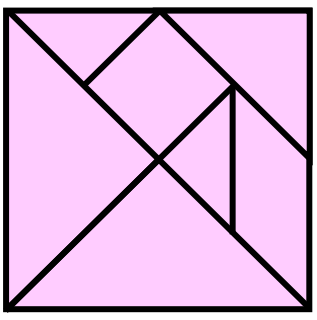
Ask pupils to sketch some polygons on the board and label them using the proper names.

## C1a

This activity allows pupils to explore the properties of some of the two dimensional shapes that they have been discussing.

Have them work in groups of three. Give each group a tangram set, or allow them to make their own tangrams.

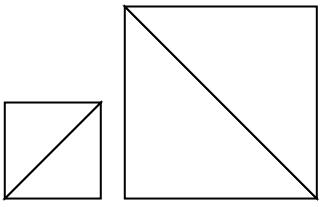
A template for this tangram is provided in the set of Nguzu Nguzu cards. Allow pupils to use the template or copy your tangram from the board, as shown below, to make their own. They should draw the shape first, add all the lines and then cut out the parts.



Ask them to lay out all the shapes in their sets. Ask them to describe and classify the shapes.

**(There are two big triangles, one medium triangle, two small triangles, one square and one parallelogram.)**

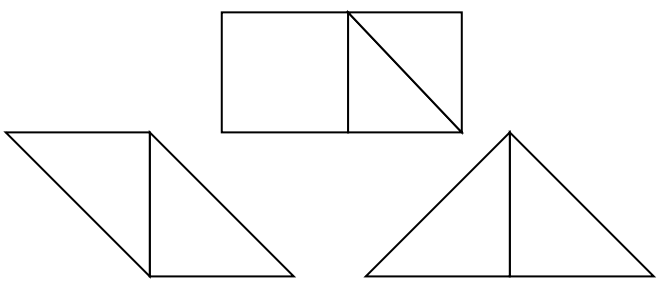
Ask pupils to make two squares with the shapes they have. Ask different groups to describe what they did and how they made their shapes.



Now ask pupils to make other shapes:

- A rectangle using three pieces
- A parallelogram using two pieces
- A triangle using two pieces

..and so on.



Finally ask them to try to solve the tangram puzzle. To do this they have to arrange all seven pieces into one single square. If you have drawn the solution on the board, rub it off before they try this. Most pupils find it very hard to solve the puzzle so allow plenty of time for them to try, before you show them the solution.

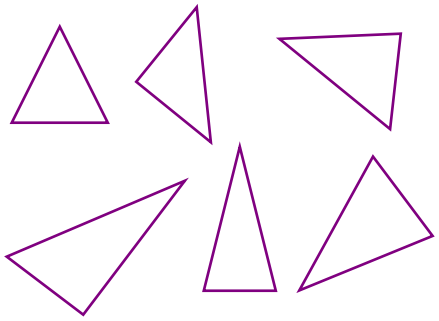
## T1b

**Materials**

scrap paper
scissors

Explain that, in this topic, pupils will explore the properties of triangles in more depth. They will learn about different types of triangles and they will learn to construct triangles accurately. Remind them of some of the situations in real life where these skills may be useful. Refer back to the work they did on structures in Standard 5 Topic 13.

Draw some different triangles on the board and ask pupils to describe them.



They could describe the common properties of the triangles (what features they have that are the same) as follows:

They are all polygons with **three sides**;

All the sides are **straight**;

They all have **three angles**;

The **angles inside** the triangles all **add up to 180°**;

Next ask pupils to identify some things that are **different** about the triangles you have drawn.

The **sides** are **different lengths**;

The **angles** are **different sizes**;

Some have **right angles** and some do not. …and so on.

Explain that triangles can be drawn in many different ways and that, in this topic, pupils will learn about different types of triangles.

## C1b

These activities allow pupils to experiment with two different ways of making triangles. Have pupils work with a partner to complete both activities.

Give each pair two square pieces of scrap paper, a pair of scissors and a template for an equilateral triangle.

1. Fold one square of paper to make 16 triangles, all of the same size.
2. Cut out an equilateral triangle from the other square and fold this to make four triangles of the same size.

The solutions are shown on the right.

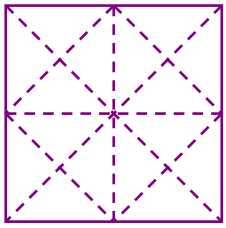


**Figure 1**

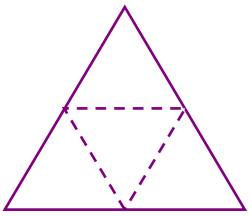


**Figure 2**

After they have completed each task ask pupils to discuss the differences between the triangles they made in Activity 1 and those they made in Activity 2, with their partner.

Finish off by asking them to write one or two sentences describing the differences they have identified. They should be able to identify the following differences:

> The triangles in figure 2 have three sides of the same length, but those in figure 1 have different length sides.
>
> The triangles in figure 1 contain right angles but those in figure 2 do not.
>
> The triangles in figure 1 contain different size angles but in figure 2 the angles in each triangle are all the same.

When they have finished, pupils can move on to the activities in the Pupil's Resource Book on page 44. They can work through all three activities, A, B and C, or you can decide which activity they should do.

Go around the class and check that the pupils are on task, and mark their work as they go along.

**Answers**

**Activity A**

**Set 1**. 1, 7, 8 and 10. These all have two sides the same length.
**Set 2.** 2, 9 and 4. These all contain right angles.
**Set 3.** 3, 5 and 6. These all have three sides the same length and three angles the same size.

**Activity B**

**1.** 1 and 6. **2.** 2 and 8. **3.** 3 and 7. **4.** 4 and 5. **5.** 9 and 10.

**Activity C**

Answers will vary; check each pupil's work individually.

## T1c

**Materials**

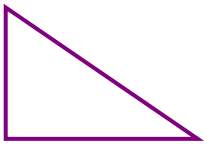
Triangles Poster
rulers
coloured pencils

In this activity you teach the pupils the correct names for the different types of triangle that they have started to identify.

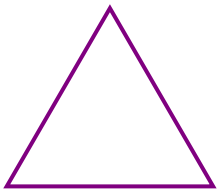
Explain that there are different types of triangles and that these can be classified by the size of their angles and the length of their sides in relation to each other.

Draw the four triangles shown below on the board.

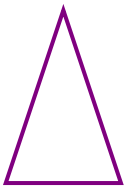
**A.**



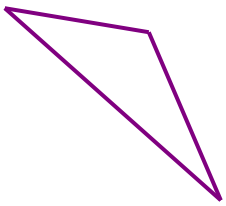
**B.**



**C.**



**D.**



Teach the pupils that each of these triangles has a different name. Teach them the name and the definition as follows:

| | | |
|---|---|---|
| **A.** | **Right Angled Triangle** | Any triangle containing a right angle. |
| **B.** | **Equilateral Triangle** | Any triangle in which all three angles are equal and all three sides are the same length. |
| **C.** | **Isosceles Triangle** | A triangle in which there are two sides of the same length and two angles of the same size. |

**D.** **Scalene Triangle** A triangle in which the three sides are different lengths and the three angles are all different.

As you teach each definition, ask pupils to come to the board and draw different examples of each type of triangle. Practice saying the names as they are quite difficult to pronounce.

Ask pupils to take it in turns to come to the board and draw a triangle for the rest of the class to identify and name.

You should also take time to teach the pupils the correct spelling of each of the names as they are difficult to spell.

You could display the Nguzu Nguzu Poster **Different Types of Triangle** to help explain the properties of each triangle. Allow plenty of time for the pupils to discuss the examples on the poster and make sure that they are clear about the four types of triangle before they move on.


Ask pupils to turn to a clean page in their exercise books and have them draw their own triangles poster to illustrate the different types of triangle they have identified. Tell them that their poster must include a diagram, the name and a definition of each type of triangle.

Allow them to use coloured pencils to make their posters attractive and rulers to make their diagrams neat.

Check their work as they go along to make sure that they have spelt the names correctly and understood the definitions. If they need help you could allow them to look at the poster again, but they will remember the information better if they work form memory.

When they have finished tell them to take their exercise books home and learn the spellings of the names before tomorrow's lesson.


**Materials**

card triangles
card, scissors and rulers

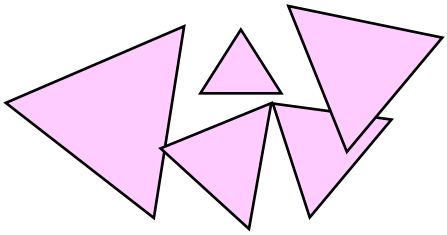
This lesson provides more opportunities for pupils to practice using the new vocabulary you have taught them. By working with a set of triangle shapes they learn to classify and sort them, become familiar with the properties of the different triangles and confident with using the correct mathematical names.

Before the lesson prepare a set of triangle shapes cut from cardboard packing cases. Your set should include about 6 to 8 of each of the four triangles you have identified with the pupils. Make sure that they are different sizes, and different shapes as shown on the following page.

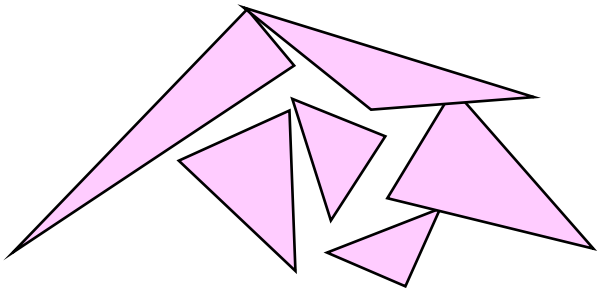
Display your set of shapes on the table where all the pupils can see them and use them to continue work on classifying and naming triangles and identifying their different properties. Mix up the shapes and try the following:

1. Ask pupils to pick out all of one, named type of triangle.
2. Ask pupils to sort the triangles into 4 piles according to their type.
3. Ask pupils to name a triangle selected from the group.
4. Ask pupils to find another similar triangle when shown one selected from the group.

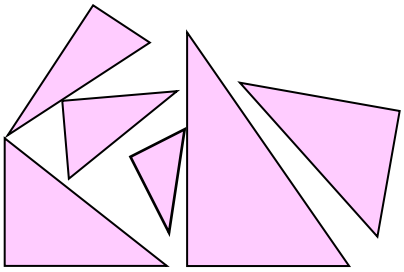
Encourage pupils to talk about their choices using the vocabulary you have taught them.



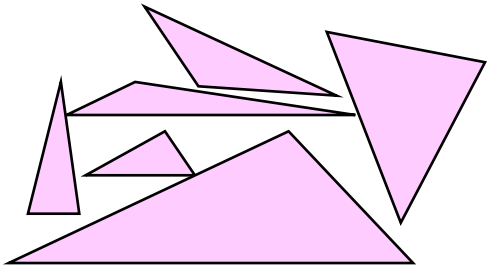
**Equilateral Triangles**



**Isosceles Triangles**



**Right-Angled Triangles**



**Scalene Triangles**

You could also use these shapes to play games if you think pupils need more practice handling the shapes. For example, you could distribute the shapes, one for each pupil, then tell them to move around the class until they have found all the other pupils with the same type of triangle and form a group.

## C1d

When you think the pupils have had enough practice with naming and classifying triangles, have them complete the activities in the Pupil's Resource Book on page 45.

You can use these activities to check that the pupils have all learnt the vocabulary and concepts from the last two lessons. Move around the class and mark their work as they go along so that you can identify any difficulties they might be having.

Pupils do not all need to do Activity A. Those who are more confident with the concepts could start with Activity B or C.

**Answers**

**Activity A**

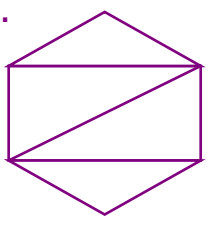
**1.** scalene **2**. isosceles **3.** scalene **4.** equilateral **5.** right-angled **6.** isosceles

**Activity B**

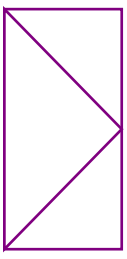
**1.** right-angled c and d. **2.** isosceles b, i and e. **3.** scalene f, h and g. **4.** equilateral a.

**Activity C**

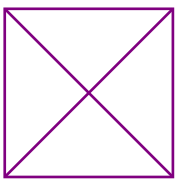
**2.**



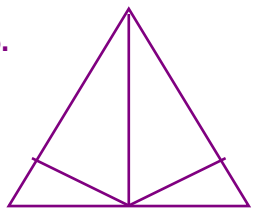
**3.**



**4.**



**5.**



# T1e

**Materials**

board protractor
board ruler

In this lesson the pupils learn the meaning of the term **congruent** and they explore **congruence** in relation to triangles.

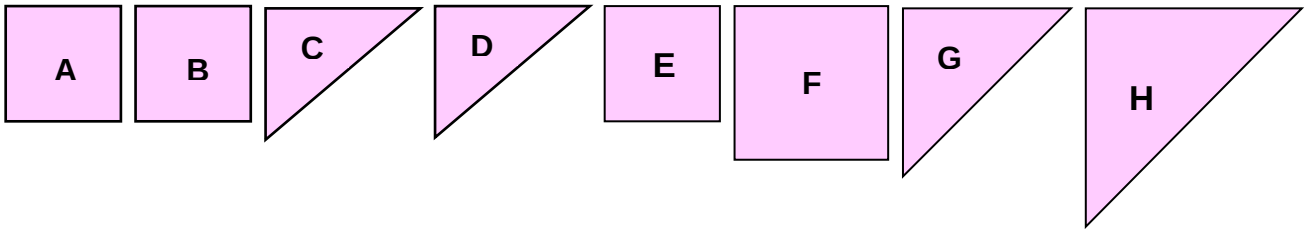
First explain the term congruent as follows.

2 figures or shapes are **congruent** if they have exactly the same shape and size.

Sketch some examples on the board to show congruent shapes. You could draw one shape and ask two pupils to come to the board. Ask one to sketch a congruent shape (exactly the same in every way) and the other to draw a shape that is not congruent.

Make sure the pupils understand the term and can pronounce and spell it correctly.

Draw some shapes on the board to reinforce the idea as follows:




Explain that shapes A and B are congruent, but E and F are not, even though they have many common properties.

Ask pupils to tell you which pair is congruent between C and D and G and H.

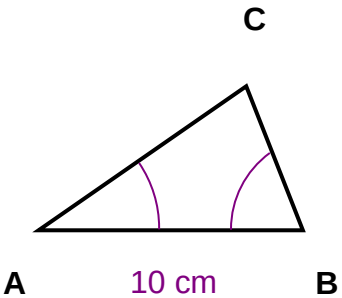
**G and H are not congruent** because, although they are similar in every other way, they are different sizes.

Teach pupils how to construct congruent triangles as follows.

Draw a triangle on the board and show pupils how to measure the lines and angles to construct a congruent triangle, using the following steps.

**Step 1**

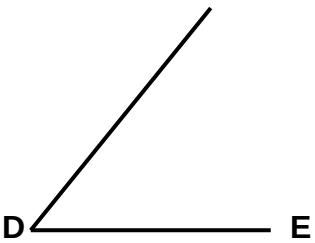
Measure AB and draw a line the same length, label your line DE

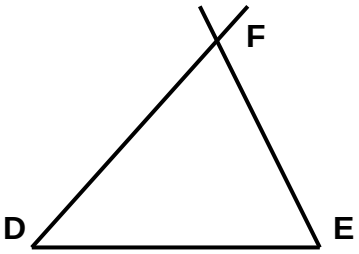




**Step 2**

Measure angle CAB using a protractor; construct the same angle at point D. Demonstrate how to construct the angle with the protractor carefully to revise what pupils learnt in Topic 6. Draw a ray to make angle FDE.



**Step 3**

Measure angle ABC, use the protractor to construct angle DEF, the same size as ABC. Draw another ray, long enough to cross the first. The point at which these rays cross becomes angle DFE and it will measure the same as angle ACB.

Measure and check this to help pupils see that they do not need to measure the third angle, if the first two are correct the third will be too.

Triangle DEF is congruent to triangle ABC.

Pupils move on to more work on constructing triangles accurately in the next lesson.

## C1e

Ask pupils to work through the activities in the Pupil's Resource Book on page 46. Pupils do not need to do all three activities; some could start with Activity B.

**Answers**

**Activity A**

**1.** congruent **2.** not congruent **3.** not congruent,
**4.** congruent **5.** congruent **6.** congruent

**Activity B**

Check each pupil's drawings. You could ask pupils to swap books and mark each others work by measuring and checking.

**Activity C**

Check the accuracy of each pupil's drawings.

**1.** 53° and 37° **2.** 7.1 cm, 40° **3.** 13 cm

?

Can all the pupils identify and classify different types of triangles and use their proper names with confidence?

## T2a

**Materials**

board protractor
board ruler
protractors and rulers

Revise what pupils have learnt about different types of triangles and their properties. Ask pupils to name the different triangles they have learnt about and to describe each type using to correct mathematical language. Ask them to support their descriptions by drawing sketches on the board.

Then tell pupils that, in this lesson, they are going to learn how to construct triangles accurately. Explain that all they need to do this is a ruler and a protractor.

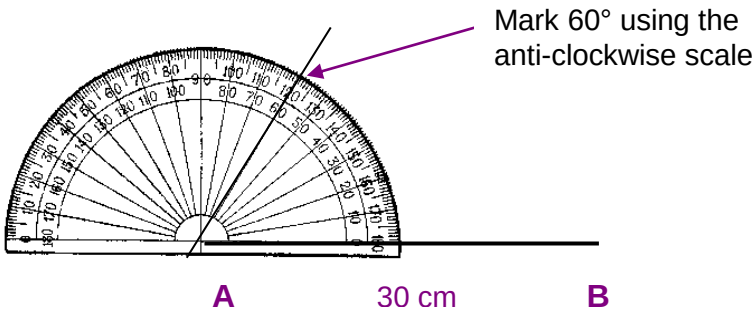
Write up the following instructions on the board.

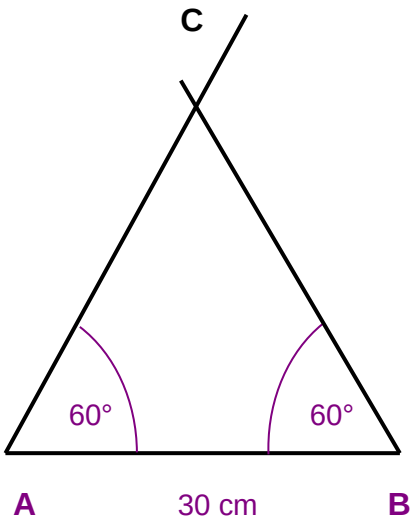
Draw triangle ABC with a base of 30 cm, and two base angles of 60° each.

Work through the following steps as you draw this triangle. This is the same process as the pupils used to construct congruent triangles in the last lesson so they should be able to talk you through the process and explain what to do at each step.

1. **Measure, draw and label the baseline of 30 cm.**


2. **Now use the protractor to measure and mark a 60° angle to the left of the base.**




3. **Now use the ruler to draw the second side of the triangle.**
4. **Use the protractor to measure and mark a 60° angle to the right of the base.**
5. **Use the ruler to draw the third side of the triangle to intersect with the second side to make the angle ACB.**

Ask pupils to tell you what sort of triangle they have constructed. **(an equilateral triangle)**.

Can they tell you what the angle ACB measures without having to use a protractor? **(60°)** Remind them that the angles inside a triangle always add up to 180°.

Pupils will need plenty of practice constructing triangles in this way before they are confident with the method and can follow instructions accurately. The following activities are designed to provide practice.

## C2a

Write the following instructions on the board and have pupils draw the triangles in their exercise books. Move around and check that pupils are using their protractors correctly and following the method they have been taught.

1. Draw triangle DEF where DE is the base of 6 cm, angle FDE measures 45° and angle FED is a right angle.
2. Draw triangle HIJ in which the base (HI) is 4 cm. angle JHI measures 20° and the angle JIH measures 150 degrees.

Ask pupils to identify which type of triangle they have drawn and describe it. Can they give the measurements for the third angle?

Present some instructions differently for pupils to construct triangles from the given length of two sides and the measurement of only one angle, as follows, the method is the same:

**3.** Draw triangle UVW where the base (UV) measures 5 cm, angle WUV measures 25° and the side WU is 7 cm long.

**4.** Draw triangle XYZ in which the base (XY) is 6 cm long, angle ZXY measures 70° and side ZX measures 8 cm.

Allow plenty of time for constructing these diagrams. Provide more sets of instructions if necessary. When pupils are confident with the method and have practiced the skill, they can move on to the activities in the Pupil's Resource Book on page 48.

Activity C asks pupils to work out other methods for constructing triangles. They could work in pairs for this activity so that they can discuss their ideas.

### Answers

### Activity A

Check pupil's drawings carefully to make sure they are following the instructions and using their instruments accurately.

### Activity B

**1.** 30° **2.** 3 cm **3.** Right-angled. **4.** 5.9 cm scalene **5.** 10.3 cm

### Activity C

**1.** 48°, 48°, 84° **2.** 9 cm **3.** 60°, 30° 90°

Can all the pupils construct triangles from given instructions?

# Extension and Support

## Support Activities

For pupils who need more practice classifying, naming and constructing triangles you should provide hands-on, practical activities which help them become more confident in using the vocabulary and skills have learnt in this unit. The following are some suggested activities:

**Working with Triangle Shapes**

Using the shapes you made for activity T1d, allow pupils to, sort, match, classify and name these triangles. You could also use them as templates for drawing and labelling triangles.

Work with a small group of pupils to revise the properties of triangles using these shapes. You could also ask pupils to measure sides and angles in the triangle shapes and construct triangle drawings that are congruent to the shapes.

As you work on these different activities remember to constantly reinforce the correct names for the triangles.

**Cut up Shapes**

This is another hands-on activity that allows pupils to handle and manipulate real shapes. This increases their understanding of the properties and characteristics of the shapes.

Provide pupils with some card polygons such as a square, triangle, parallelogram and pentagon to use as templates. Have them draw around them on scrap paper or card and then cut up the shapes into different types of triangles.

First allow them to cut them freely, and then challenge them to cut them into a given set of triangles using as few cuts as possible, for example:

Cut a square into four right-angled triangles.

Cut a pentagon into four scalene triangles.

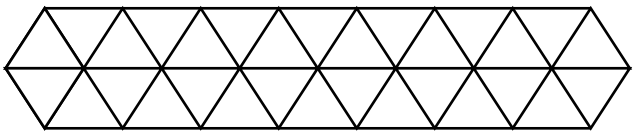
Cut a hexagon into six equilateral triangles.

Cut a scalene triangle into two right-angled triangles…. and so on.

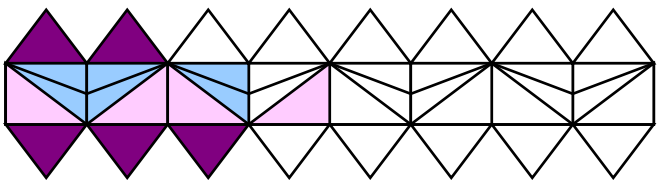
**Triangle Patterns**

Allow pupils to design their own patterns using a pencil and ruler to draw them in their books. Here are some that they could try.

A repeating pattern made up of all equilateral triangles:



Alternatively you could give the pupils a pattern and have them colour it according to your instructions, for example:



Colour all the right-angled triangles pink, all the isosceles triangles purple and all the scalene triangles blue.

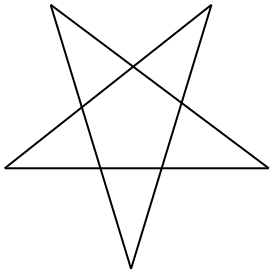
## Extension Activities

Pupils who are confident with the concepts and skills you have taught them in this unit can extend their knowledge through exploratory activities that they work on independently while you concentrate on pupils needing more practice. Here are some suggestions:

**More Complex Constructions**

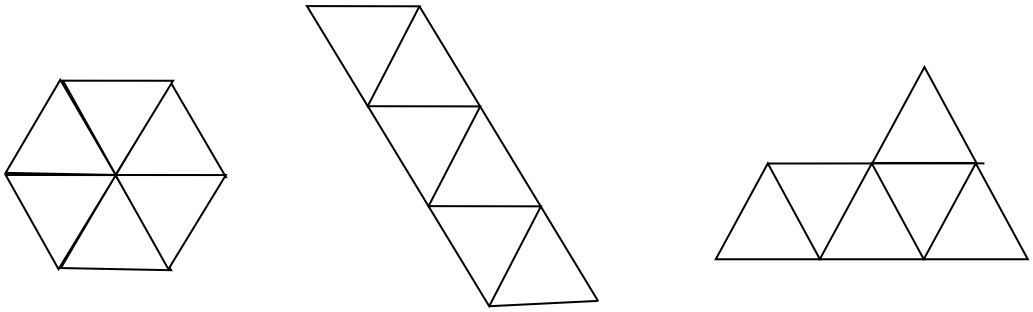
Give instructions for pupils to follow to construct more complicated shapes, for example to construct a star.

1. Draw a regular pentagon measuring 6 cm on all sides. (The angles inside a pentagon are 108°)
2. Draw an isosceles triangle with a base of 6 cm on each side to make the fingers. The base angle in the isosceles triangle will be 72°.



**Joining Triangles**

Tell pupils that there are 12 different shapes than can be made by joining 6 equilateral triangles along at least one side. Challenge pupils to find all 12. Here are some to start them off:

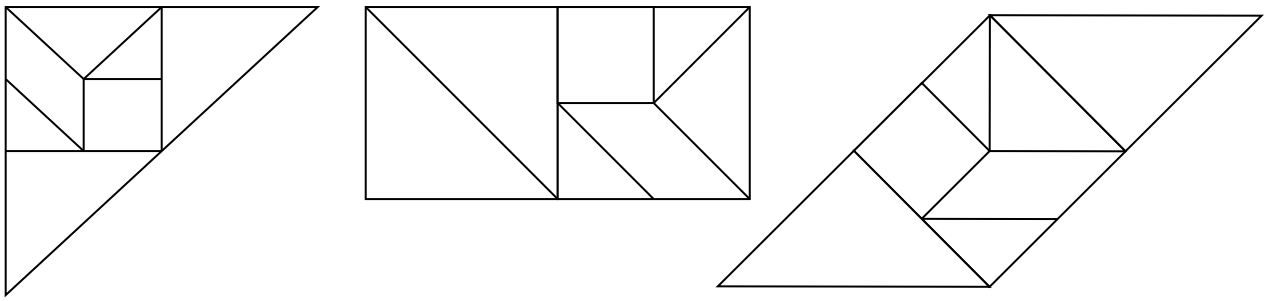


Next see if they can work out for themselves how many different shapes can they make with 5 triangles or 7?

**Tangram Puzzles**

Use the tangrams you made in Activity T1a to challenge pupils to make more shapes.

Can they use all 7 pieces to make a single triangle, rectangle or parallelogram? The answers are shown below.



## Check Up Page: Answers

**1.** Check the pupil's estimates as well as their measurements.

A. 83° B. 96° C. 90° D. 120°
E. 75° F. 30° G. 138° H. 270° I. 136°

**2.** Pupils may word their answers differently; check their diagrams as well as their definitions.

**a.** An obtuse angles is an angle between 90° and 180°.

**b.** A reflex angle is an angle between 180° and 360°.

**c.** A revolution is a full turn or 360°.

**d.** A right angle measures 90° and forms a square corner.

**e.** An acute angle measures less than 90°.

**f.** A straight angle measures 180°.

**3.** **a.** 312° **b.** 25° **c.** 130° **d.** 315°
**e.** 106° **f.** 56° **g.** 90° **h.** 60° **i.** 300°

**4.** Check each pupils drawings carefully.

**5.** **a.** 020° **b.** 120° **c.** 230° **d.** Phosphate Stockpile
**e.** Parliament House **f.** Wireless Station

**6.** **a.** equilateral **b.** scalene **c.** right-angled **d.** isosceles

**7.** **a.** C is the only right-angled triangle.

**b.** D is the only one that is not right-angled.

**c.** B is the only scalene triangle.

**d.** C is the only equilateral triangle.

**8.** **a.** a and d **b.** b and e **c.** c and h **d.** g and f

**9.** Check each pupil's diagrams individually.

Unit 5

# Number Topic 3: Decimals

**Aim:**

To extend pupils' understanding of decimals by changing common fractions to decimal fractions, recognising place value, rounding decimals to the nearest whole numbers and tenths, adding and subtracting, multiplying and dividing decimal fractions.

**Sequence of objectives:** To

1. change common fractions to decimal fractions.
2. recognise place value in decimal fractions.
3. round decimals to the nearest whole number and nearest tenth.
4. add and subtract decimal fractions including tenths and hundredths.
5. multiply decimal numbers by whole numbers.
6. divide the remainder in division calculations to give an answer including tenths.
7. use decimal notation when recording measurements and money.

**Rationale:**

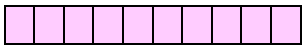
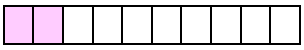
Our system of money and measurement is totally dependent on an understanding of decimals, their place value and their links to common fractions. Pupils therefore need a thorough grounding in the use of decimals to be able to solve problems and use them in practical activities.

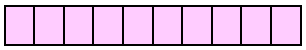
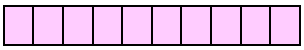
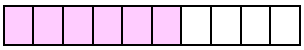
## T1a

In this lesson pupils revise the work they did on decimals from Standard 5.

Begin by revising how to change simple common fractions into decimal fractions.

Write these examples on the board and go through them with the pupils.

1.   = **1 whole and** ☞ or **1**☞

2.   

Now ask pupils to change the following common fractions into decimal fractions.

$3\frac{7}{10}$ = **3.7** $\frac{3}{10}$ = **0.3** $2\frac{5}{10}$ = **2.5**

Ask the pupils to now change these decimal fractions into common fractions.

6.5 = **6** $\frac{5}{10}$ 0.8 = $\frac{8}{10}$ 1.9 **= 1** $\frac{9}{10}$

Write the decimal fraction 0.65 on the board. Ask the pupils the value of the 6 **(tenths)**. Ask the pupil the value of 5 (**hundredths)**. This decimal fraction therefore has to be written in hundredths. It is sixty five hundredths or $\frac{65}{100}$**.** Work through some more examples with the class.

2.25 = **2** $\frac{25}{100}$ 4.33 = **4** $\frac{33}{100}$ 0.22 = $\frac{22}{100}$

Pupils have learnt that changing common fractions to decimals is simple when the common fraction has a denominator of 10 e.g. $\frac{5}{10}$ = 0.5, $\frac{6}{10}$ = 0.6, $\frac{1}{10}$ = 0.1, $\frac{3}{10}$ = 0.3, and so on.

If the denominator is 100 then the second place of decimals is used e.g. $\frac{3}{100}$ = 0.03, $\frac{15}{100}$ = 0.15, $\frac{7}{100}$ = 0.07 and so on.

Write some more examples like these on the board and make sure the pupils can change common fractions to decimals when the denominator in the common fraction is 10 or 100.

## C1a

Ask the pupils to work in pairs. Write a list of decimal fractions on the board such as those on the right. Tell them to number from 1 -10 in their books. Have a competition to see how quickly they can write down the equivalent common fractions. Check their answers as a whole class. You could then have another competition changing common fractions to decimal fractions.

The activities in the Pupil's Resource Book on page 54 provide more practice.

**1.** 1.7 **($1\frac{7}{10}$)**
**2.** 3.5 **($3\frac{5}{10}$)**
**3.** 1.55 **($1\frac{55}{100}$)**
**4.** 0.9 **($\frac{9}{10}$)**
**5.** 0.15 **($\frac{15}{100}$)**
**6.** 2.06 **($2\frac{6}{100}$)**
**7.** 0.08 **($\frac{8}{100}$)**
**8.** 5.3 **($5\frac{3}{10}$)**
**9.** 4.25 **($4\frac{25}{100}$)**
**10.** 10.4 **($10\frac{4}{10}$)**

### Answers

**Activity A**

**1.** 1.8 and $1\frac{8}{10}$ **2.** 0.5 and $\frac{5}{10}$ **3.** 2.3 and $2\frac{3}{10}$ **4.** 1.4 and $1\frac{4}{10}$

**5.** 3.6 **6.** 0.2 **7.** 2 .2 **8.** 3.4 **9.** 0.6 **10.** 3.5

**11.** 21.1 **12.** 16.3 **13.** 9.2 **14.** 0.8 **15.** 5.9 **16.** 0.7

**Activity B**

**1.** $\frac{5}{10}$ **2.** $\frac{65}{100}$ **3.** $6\frac{4}{10}$ **4.** $3\frac{15}{100}$ **5.** $12\frac{8}{10}$ **6.** $4\frac{22}{100}$

**7.** 2.4 **8.** 14.6 **9.** $21\frac{8}{10}$ **10.** $26\frac{5}{10}$ **11.** $12\frac{38}{100}$ **12.** 12.17

**13.** 0.08 **14.** 3.3 **15.** 5.4 **16.** $\frac{1}{10}$ **17.** $3\frac{5}{100}$ **18.** $\frac{6}{100}$ **19.** 1.19

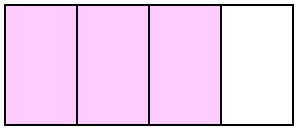
**20.** $15\frac{99}{100}$ **21.** 12.12 **22.** 0.51 **23.** 1.8 **24.** $60\frac{1}{100}$

## T1b

**Materials**
Pick a Card game

In this lesson pupils continue to look at decimal fractions and their relationship and equivalence to common fractions.

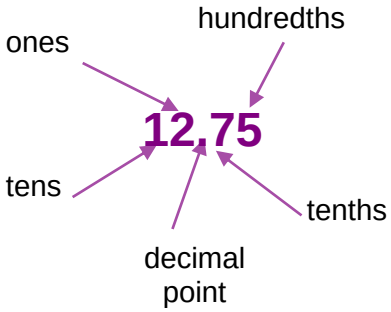
Remind pupils what is meant by a **common fraction**. Draw a diagram like the one below on the board and use it to shade the fractions.



Write $\frac{3}{4}$ on the board. Ask the pupils to explain what it means.

The **whole** is divided into **4 parts.** $\frac{3}{4}$ means **3 parts** out of the **4** which make up the whole**.** Repeat this with other common fractions $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{5}$, $\frac{1}{6}$, and so on.

Now write 1.2 on the board. Ask the pupils what this means. They should tell you this is 1 whole and ☞ or two tenths. 1.2 is a **decimal fraction**. Decimal fractions show tenths, hundredths and thousandths and so on.




Remind the pupils that in 1.2 the dot is called the **decimal point**. It separates the whole number from the fraction.

Write and label some more decimal fractions on the board as shown. Make sure the pupils can identify each digit and say what it represents.

Now revise changing common fractions to decimal fractions. Write these common fractions on the board and revise the process of how to change them into decimal fractions.

First teach the pupils that, in a decimal fraction, the whole is always divided into a multiple of 10, such as 10 (tenths), 100 (hundredths) and so on.

🗁 of a whole, where the whole is 10 equals 5. Therefore as a decimal fraction 🗁 is 0.5.

Ask the pupils if they can see another way to find this same answer. Help them to work out that, if they divide the **denominator** into the **numerator** this will change the fraction into a decimal fraction.

Work through the examples in the box on the right to practice this method as shown below:

| | | |
|---|---|---|
| **1.** | 🗁 = __. __ | (**0.5**) |
| **2.** | 📣 = __. __ | (**0.1**) |
| **3.** | 👆 = __. __ | (**0.75**) |
| **4.** | 😐 = __. __ | (**0.8**) |
| **5.** | 📄 = __. __ | (**0.25**) |

$$2\overline{)1.0}\quad 0.5$$

Say, 'How many times will 2 go into 1?' The answer is none so write a 0 in the answer place.

Now **add a decimal point** in the answer line and in the sum.

Add a 0 to make 1 into 1.0. Tell the pupils that this has not changed its value.

Now say, 'How many times does 2 go into 10?' The answer is 5. Write 5 in the answer line.

It is in the **tenths place**. The answer is 0.5.

Get the pupils to try this with other fractions. Let them test out the strategy.

Notice that in changing 👆 into a decimal fraction 3 needs to be written as 3.00 since the decimal fraction includes **hundredths** as well as **tenths**.

The method used is exactly the same as division of whole numbers which the pupils are familiar with and have revised again in Unit 1. The only difference is the use of the decimal point. Stress to pupils how important it is to get this in the right place.

Give the pupils more practice by going through other examples as a class.

$$\begin{array}{r} 0.75 \\ 4\overline{)3.00} \\ -2\,8 \\ \hline 20 \\ \underline{20} \\ 0 \end{array}$$

**Example 1**

Write $\frac{4}{5}$ on the board. Explain that $\frac{4}{5}$ means 4 parts out of a whole of 5, or 4 out of 5.

To work out the decimal fraction by the division strategy we divide 5 into 4 as shown on the following page.

$$5\overline{)4.0}\quad 0.8$$

Here is the language we use. 5 into 4 is 0.

Put 0 in the answer line. Now put a **decimal point** after the 4 in the sum as well as in the answer line after the 0. Point out again that by adding **.0** to the **4** you have not changed the value of the 4.

Now ask, How many 5s in 40 **tenths**? There are 8 so write 8 in the answer line.

**So $\frac{4}{5}$ as a decimal fraction = 0.8.**

**Example 2**

$$8\overline{)6.00}\quad 0.75$$
$$-\underline{5\,6}$$
$$40$$

Write $\frac{6}{8}$ on the board. The pupils have learnt that as a decimal fraction this is 0.75. Check this using the dividing method above. Follow through the working out orally.

How many 8s in 6? **(0)**. Write 0 in the answer line. Put in the **decimal points** and the 0 in the **tenths** place.

Now say how many 8s in 60 tenths? **(7).** Write 7 in the answer live. 7 x 8 = 56 so put 56 under the 60 tenths and subtract.

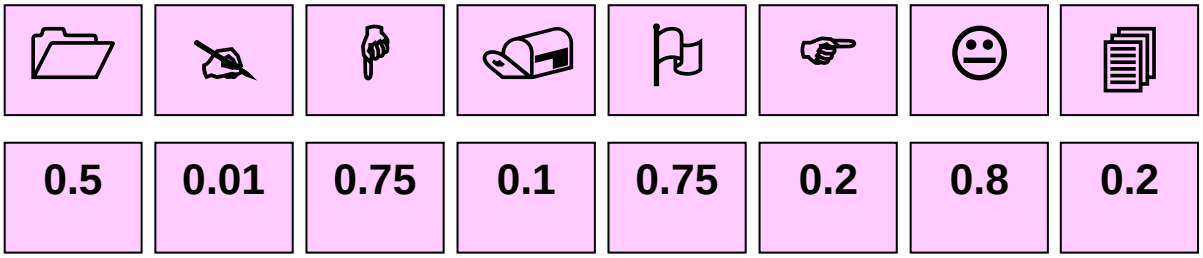
You had 60 tenths and have used 56 tenths. So there are 4 left over. Now add a 0 in the **hundredths** place. How many 8s in 40 hundredths? **(5)** so write that in the answer line.

Thus $\frac{6}{8}$ as a decimal fraction is **0.75.**

## C1b

**Pick a Card**

This memory game gives more revision of common fraction / decimal fraction equivalence. Pupils will play the game in groups of four.




**How to Play**

Prepare enough sets of cards for each group of 4. One set should contain 8 pairs of decimal and common fractions as shown above.

Place all the cards face down. Each pupil takes turns to turn over two cards. If the two cards show the same value, he/she keeps both cards and has another turn. If the cards do not match then they put the cards back face down. Then it's another pupil's turn. The pupils continue the game until all cards are used up. The winner of the game is the pupil who has the most cards.

When they are ready, pupils should do the activities in the Pupil's Resource Book on page 54.

**Answers**

**Activity A**

**1**. 0.6 **2**. 0.2 **3**. 0.5 **4**. 0.25 **5**. 0.5 **6**. 0.4 **7**. 0.4 **8**. 0.5 **9**. 0.2 **10**. 0.75

**Activity B**

**1.** 3.4 **2.** 2.75 **3.** 1.75 **4.** 0.5 **5.** 3.5 **6.** 2.75 **7.** 2.25 **8.** 1.25 **9.** 3.6 **10.** 0.9

Can all the pupils change common fractions into decimal fractions?

## T2a

**Materials**

card strips, scissors, glue

Prepare a place value chart on the board as shown. Ask one pupil to write in the number 3,352.

| Thousands | Hundreds | Tens | Ones |
|---|---|---|---|
| **3** | **3** | **5** | **2** |

Explain that, in this lesson they will learn about **decimals and place value**.

Revise that one whole number can be divided into ten tenths. Show how the place value can be extended to the right to show **tenths** like this:

| Thousands | Hundreds | Tens | Ones | Decimal point | tenths |
|---|---|---|---|---|---|
| | **3** | **3** | **5** | **.** | **2** |

Explain that a **decimal point** is always used to separate the fraction part of the number from the whole number.

Write 335.2 on the board and ask the pupils to read this number aloud. (**Three hundred and thirty five point two)**. Show them how to write it on the place value chart as above. Practice saying and writing different numbers on the chart. Ask pupils to tell you the **value** of each of the digits in the numbers you choose, for example, a 5 in the tens place is worth five tens, a 3 in the tenths place is worth three tenths and so on.

Introduce a decimal with the hundredths place, such as 120.25. Ask pupils to tell you how to amend the chart and write this number as shown below.

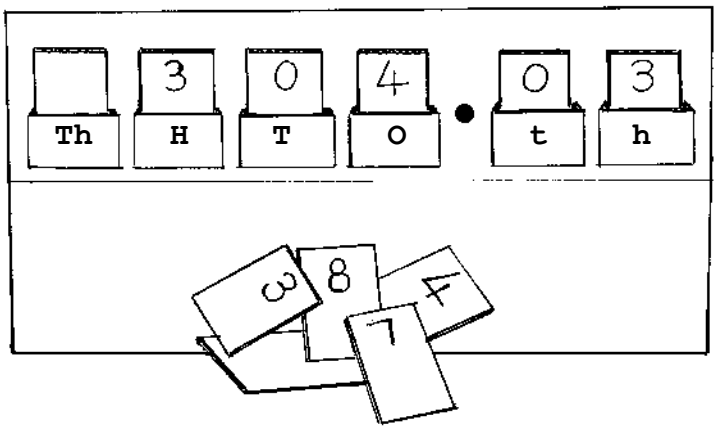
| Th | H | T | O | Decimal Point | tenths | hundredths |
|---|---|---|---|---|---|---|
| | **1** | **2** | **0** | **.** | **2** | **5** |

Repeat this with other numbers until the pupils understand the value of the tenths and hundredths places on the chart.

## C2a

This is a practical lesson in which pupils make place value strips and practice putting given numbers in their correct place value.

If you have card strips and glue, have pupils make an envelope place value chart in which they can place the digits to show different numbers as shown in the picture on the next page. If you do not, they can do this activity by drawing a place value chart in their exercise books.




Write these numbers on the board. Ask some pupils to say them aloud. Make sure they are saying the numbers correctly and remembering to say "point" for the decimal point.

**1**. 23.4
**2**. 1.7
**3**. 1,157.3
**4**. 22.67
**5**. 0.89
**6.** 304.03
**7.** 9.08
**8.** 0.59
**9.** 10.74
**10.** 200.15

Get the pupils to practice putting each number in its correct place on a place value chart.

Ask pupils to work in pairs to do this activity and to check each others' answers. Move around the class and check that the pupils are putting the digits in the correct places and are saying the numbers correctly.

## T2b

In this activity pupils develop their understanding of the place value of digits in decimal numbers.

| Th | H | T | O | Decimal point | tenths | hundredths |
|---|---|---|---|---|---|---|
| | | **2** | **3** | **.** | **5** | **6** |

Prepare a place value chart on the board as shown above. Write the number **23.56** on the chart and ask the pupils some questions.

For example:
What is the place value of the 3? **(three ones)**
What is the place value of the 5? **(five tenths)**
What is the place value of the 2? **(two tens)**
What is the place value of the 6? **(six hundredths)**

**Remind pupils that the decimal point is always used to separate the fraction part of the number from the whole number.** Now ask the pupils to tell you:

How many ones there are in this number? **(23)**
How many tenths are there? **(235)**
How many hundredths? **(2,356)**

Go through some more examples on the board, saying each number aloud correctly, writing it accurately on the chart and discussing the value of each digit. Here are some you could use.

**5.65** **123.3** **3.7** **18.2** **1,105.75**

To check that the pupils understand place value you could try the activity in reverse. Write **357 tenths** on the board. Tell the pupils to write this number on their chart. (**35.7)**

Now write **3,570 hundredths**. This number is **35.7** too.

Tell them to write the following numbers:

37 tens **(370)** 37 tenths **(3.7)** 37 ones **(37)** 37 hundredths **(0.37)** 37 hundreds **(3,700)**

If pupils need more practice use other numbers until they are confident with all the place values.

## C2b

Before starting the activity in the Pupil's Resource Book, do a mental warm up activity using the numbers below.

Ask the pupils to write numbers 1 to 5 in their exercise book. Write a decimal number on the board. For example: **2.06**

Ask the pupils to: Write down the place value of the 6. **(hundredths)**

Write how many hundredths there are in this number. **(206)**

Give the pupils enough time to write down both answers.

**1.** 23.45 **tenths, 234 tenths**
**2.** 10.79 **tens, 1 ten**
**3.** 2.34 **hundredths, 234 hundredths**
**4.** 12.78 **ones, 12 ones**
**5.** 0.45 **tenths, 4 tenths**

After the activity ask the pupils to exchange books. Mark their answers as a class activity.

The pupils should now complete the activities in their Pupil's Resource Book on page 55. Read through the instructions and explain the activity to them.

### Answers

### Activity A

| | H | T | O | | $t^{th}$ | $h^{th}$ |
|---|---|---|---|---|---|---|
| **1.** | | 1 | 0 | . | 8 | |
| **2.** | | | 4 | . | 6 | 5 |
| **3.** | | 1 | 4 | . | 2 | 6 |
| **4.** | 2 | 4 | 6 | . | 3 | 4 |
| **5.** | | 9 | 0 | . | 6 | |
| **6.** | | | 1 | . | 0 | 8 |
| **7.** | | | 0 | . | 3 | 8 |
| **8.** | | 2 | 0 | . | 0 | 6 |
| **9.** | 1 | 0 | 0 | . | 9 | 3 |
| **10.** | | 7 | 2 | . | 4 | |
| **11.** | 1 | 0 | 1 | . | 0 | 1 |
| **12.** | | 8 | 2 | | | |

### Activity B

**1.** 22.5 8.8 4.20 4.0 1.0 0.88 0.5 0.21
**2.** 9.1 8.2 7.6 6.3 5.9 3.9 3.5 2.5
**3.** 32.11, 32.02, 32.01, 32, 23.31, 23.11, 23.01, 23
**4.** 100.99, 100.91, 100.19, 100.11, 100.09, 100.01, 100, 99.99
**5.** 111.01, 101.01, 100, 11.11, 10.1, 1.1, 0.1, 0.01

### Activity C

**1**. ones **2**. tens **3**. tenths
**4**. thousands **5**. tenths **6**. hundreds
**7**. hundreds **8.** tenths
**9.** hundreds and hundredths **10.** hundredths

Can all the pupils recognise place value in decimal fractions?

## T3a

In this activity pupils revise rounding decimal fractions up and down to make whole numbers. Write up some numbers on the board and demonstrate how to round them to the nearest ten, hundred and thousand.

Pupils should be able to tell you that they round up if the digit to the right of the place value they are rounding to is 5 or more, and they round down if it is less than 5.

For example, here is how you round 4,854 to different places:

| Number | Round to the nearest | Digit to the right | Is it 5 or more? | Round |
|---|---|---|---|---|
| 4,854 | ten | 4 | no | down to 4,850 |
| 4,854 | hundred | 5 | yes | up to 4,900 |
| 4,854 | thousand | 8 | yes | up to 5,000 |

Work through this on the board with the pupils. This is revision for them so ask them to explain the process and method they use as well as give you the answers.

Do this again with other examples. For example: 3,907  7,519  3,594.

## C3a

If your pupils need more practice with rounding numbers, you could use this practice activity. Copy the table below onto the board. Ask pupils to copy and complete it in their exercise books.

Move around the class to check the pupils while they do this activity. In this way you will identify the pupils needing extra help and can teach them the method.

| Number | Round to the nearest | Digit to the right | Is it 5 or more? | Round |
|---|---|---|---|---|
| 162 | ten | 2 | no | down to |
| 3,865 | ten | 5 | yes | |
| 583 | hundred | 8 | | |
| 2,447 | hundred | | | |
| 8,462 | thousand | | | |
| 19,699 | thousand | | | |

## T3b

Teach pupils how to **round decimals to the nearest whole number**. Explain that we round decimals in the same way as we do whole numbers, by looking at the digit in the place to the right of the place value to which we are rounding.

Copy this table on the board then work through it with the pupils. Let the pupils read the numbers out orally. Let them explain the process of rounding. Remember that when pupils themselves explain how and why they are performing different processes they understand the method much better.

| Number | Digit to the right | Is it 5 or more? | Rounded to the nearest whole number |
|---|---|---|---|
| 4.5 | 5 | yes | Round up to 5 |
| 16.3 | 3 | no | Round down to 16 |
| 23.4 | 4 | no | Round down to 23 |
| 1.8 | 8 | yes | Round up to 2 |
| 41.62 | 6 | yes | Round up to 42 |

Go through some more examples if your pupils need more practice.

## C3b

Working with a partner is another good way to encourage pupils to talk about their maths. Have pupils work in pairs for this activity and talk about how they arrive at their answer.

Write the following numbers on the board and tell pupils to round each one to the nearest whole number:

| | | |
|---|---|---|
| **1.** 51.7 **(52)** | **2.** 2.3 **(2)** | **3.** 4.6 (**5**) |
| **4.** 17.9 **(18)** | **5.** 10.5 **(11)** | **6.** 12.55 (**13**) |

Go around the class and check the pupils' answers as they are working. This gives you an opportunity to identify anyone who is having difficulty so that you can help them.

Now ask the pupils to work on their own and complete the activities in the Pupil's Resource Book on page 56.

**Answers**

**Activity A**

| | | | | | |
|---|---|---|---|---|---|
| **1.** 5 | **2.** 6 | **3.** 3 | **4.** 45 | **5.** 231 | **6.** 1 |

**Activity B**

| | | | | | |
|---|---|---|---|---|---|
| **1.** 2 | **2**. 4 | **3.** 6 | **4.** 1 | **5**. 3 | **6.** 5 |
| **7.** 6 | **8.** 1 | **9.** 7 | **10.** 5 | **11.** 12 | **12.** 13 |
| **13.** 33 | **14.** 25 | **15.** 9 | | | |

## T3c

In this lesson you introduce pupils to the concept of **rounding to the nearest tenth**. All pupils should understand the tenth place value.

Copy this table onto the board then work through it with the pupils as a whole class activity. You could choose different pupils to come up to the board and talk through how they complete each line in the table.

| Number | Round to the nearest | Digit to the right? | Is it 5 or more? | Rounded |
|---|---|---|---|---|
| 7.56 | whole number | 5 | yes | up to 8 |
| 6.35 | tenth | 5 | yes | up to 6.4 |
| 2.41 | tenth | 1 | no | down to 2.4 |
| 0.85 | tenth | 5 | yes | up to 0.9 |
| 4.62 | tenth | 2 | no | down to 4.6 |
| 49.99 | tenth | 9 | yes | up to 50.0 |

Tell the pupils that another way of saying, **round your answer to the nearest tenth**, is work out your answer to **one decimal place**.

## C3c

Write this exercise on the board and ask the pupils to work through it in pairs. Tell them to write each number to **one decimal place**.

**1.** 0.62 **(0.6)** **2.** 1.35 **(1.4)** **3.** 1.64 **(1.6)** **4.** 5.25 **(5.3)** **5.** 32.07 **(32.1)**

Go through the answers together on the board before asking the pupils to copy and complete the activity in the Pupil's Resource Book on page 57.

**Answers**

**Activity A**

**1.** 3 **2.** 3.3 **3.** 2.4 **4.** 0.2 **5.** 4.0

**6.** 8 **7.** 8.2 **8.** 17.6 **9.** 24 **10.** 6.7

**Activity B**

**1a.** 5 **b.** 15 **c.** 29 **d.** 50 **e.** 110

**2a.** 6.9 **b.** 8.1 **c.** 13 **d.** 30.1 **e.** 40.8

**Activity C**

**1.** 0.6 **2.** 0.7 **3.** 0.7 **4.** 0.4 5. 0.9

? Can all the pupils round decimals to the nearest whole number and nearest tenth?

## T4a

Revise how to add decimal fractions. Use this example to explain how to add decimal fractions. It is very important that the numbers to be added are placed in their correct place value.

| | Tens | Ones | decimal point | tenths |
|---|---|---|---|---|
| | 2 | 2 | . | 3 |
| + | | 6 | . | 3 |
| | **2** | **8** | **.** | **6** |

Start with the **tenths** column, 3 + 3 = 6.

Write in the answer. Then put in the **decimal point** in the answer line.

Now add the **ones** 2 + 6 = 8. Write in the answer. Then add the **tens**. 2 + 0 = 2. Write this in the answer line.

The answer reads **28.6, (twenty eight point six).**

Emphasise that pupils must always remember the place value of the whole number and the decimal fraction.

Remind them that, when adding, they must always **start with the column on the right and work form right to left.**

In this next example they must start with the hundredths column and work from right to left.

| | Tens | Ones | decimal point | tenths | hundredths |
|---|---|---|---|---|---|
| | 2 | 6 | . | 3 | 3 |
| + | 1 | 6 | . | 3 | 4 |
| | **4** | **2** | **.** | **6** | **7** |

Start with the **hundredths** column, 3 + 4 = 7.

Then add the **tenths** 3 + 3 = 6.

Put in the **decimal point**.

Now add the **ones** 6 + 6 = 12. Regroup this into 2 ones and 1 ten.

Add the **tens** 2 + 1 +1 = 4. The answer is **42.67.**

Remind the pupils that they must always begin their calculation with the **smallest** value. This is in the right hand column. Encourage pupils to talk through the calculation as they do it. Make sure they use the correct mathematical language and understand the process. Regrouping is done in exactly the same way as when adding whole numbers.

## C4a

Here are some more examples to work through to give the pupils more practice. Pupils who need to, can draw a place value chart and use it to do the addition sums. If pupils are more confident they can simply set out their sums on the page without a place value chart. Check that they are setting them out correctly.

| | | |
|---|---|---|
| 1 | 1 1 | |
| 1 0 . 6 | 1 1 . 8 1 | 7 . 8 |
| + 5 . 8 | + 0 . 1 9 | + 1 1 . 0 2 |
| **1 6 . 4** | **1 2 . 0 0** | **1 8 . 8 2** |

Now ask the pupils to complete the activities in the Pupil's Resource Book on page 58.

**Answers**

**Activity A**

**1.** 5.0 **2.** 7.3 **3.** 2.9 **4.** 35.0 **5.** 537.1 **6.** 71.8

**7.** 7.9 **8.** 99.9 **9.** 10.1 **10.** 128.8 **11.** 28.05 **12.** 179.92

**Activity B**

**1.** 41.01 **2.** 10.67 **3.** 50.03 **4.** 46.90 **5.** 13.32

**6.** 300.90 **7.** 15.99 **8.** 10.00 **9.** 26.89 **10.** 105.4

**Activity C**

**1.** 19.2 t **2.** $5.45 **3.** 13.5 m **4.** 4.1 km **5.** 3.805 kg **6.**13.53 km

## T4b

**Materials**

grocery items with weights marked on them.

In today's lesson, you teach pupils how to **subtract decimal fractions** including tenths and hundredths.

Refer back to the last lesson first and briefly revise addition of decimal fractions. Then use the example below to show how to **subtract** decimal fractions. Point out that, as before, all digits **must** be placed in their correct place value column. Working starts from the right.

| | Tens | Ones | decimal point | tenths |
|---|---|---|---|---|
| | 4 | 6 | . | 3 |
| – | 2 | 2 | . | 2 |
| | **2** | **4** | **.** | **1** |

Start with the **tenths** column, 3 - 2 =1.

Write in the answer. Put in the **decimal point.**

Now subtract the **ones** 6 – 2 = 4.

Then subtract the **tens** 4 – 2 = 2.

Answer = **24.1**

Emphasise that, as with addition, pupils must always start with the column on the right and work from right to left. In this next example they should start with the hundredths column.

This next example also requires trading.

| | Tens | Ones | decimal point | tenths | hundredths |
|---|---|---|---|---|---|
| | 2 | 6 | . | **6** ~~7~~ | **1**4 |
| – | 1 | 4 | . | 3 | 8 |
| | **1** | **2** | . | **3** | **6** |

Start with the **hundredths** column, 4 – 8. Cannot, so we **trade** 1 **tenth** from 7 tenths and put it with the 4 hundredths and it becomes 14 hundredths. So 14 – 8 = 6

6 tenths – 3 tenths = 3. Then write in the decimal point. Next is the **ones** column. 6 – 4 = 2. Then 2 **tens** – 1 ten = 1 ten.

Answer = **12.36**

## C4b

Revise the **language** used in subtraction. Ask pupils to suggest different ways of saying **subtract**. Build up a list on the board. The pupils could come up with the following:

- minus
- the difference between
- take away

Put the pupils into groups of three. Display some grocery packets on a table in the classroom such as rice bags, taiyo tins, washing powder packets, tea boxes and so on. Make sure that all the items you choose have the weight marked clearly on them. Tell each group to choose two items and work out the **difference in weight** between the two.

Tell them to work in kilograms. If their item is marked in grams they must first change the weight to a decimal fraction of a kilogram. So 500 g = 0.5 kg, 250 g = 0.25 kg, 185 g = 0.185 kg and so on. Remind pupils that making an **estimate** first is a good way of them checking if the answer they work out is a sensible one.

You could also put prices on your items and let them work out the **difference in price**.

Bring the class together at the end of the activity and talk about what they have found out. Have they included **units** in their answers? Make sure you check all the pupils' work.

Now ask the pupils to do the activities in the Pupil's Resource Book on page 59. Read through the instructions and make sure all the pupils understand what they have to do.

**Answers**

**Activity A**

**1.** 2.2 **2.** 0.9 **3.** 7.4 **4.** 5.9 **5.** 5.0 **6.** 46.1
**7.** 39.9 **8.** 8.4 **9.** 12.4 **10.** 41.6 **11.** 10. 5 **12.** 239.2

**Activity B**

**1.** 2.21 **2.** 0.88 **3.** 7.37 **4.** 5.88 **5.** 4.98 **6.** 46.06
**7.** 39.92 **8.** 8.44 **9.** 12.41 **10.** 41.58 **11.** 10.45 **12.** 239.24

**Activity C**

**1.** 6.2 t **2.** 1.9 m **3.** 0.66 m

## T4c

In this lesson pupils are introduced to combining addition and subtraction of decimal fractions in the same question or problem.

Write these examples on the board and do them together with the pupils.

Calculate 5.2 + 2.2 – 2.1 = **(5.3)**

This needs to be done in **two steps** and these can be set out as shown on the right:

**1.**

| | | | |
|---|---|---|---|
| | 5. | 2 | |
| + | 2. | 2 | |
| | 7. | 4 | |

**2.**

| | | | |
|---|---|---|---|
| | 7. | 4 | |
| - | 2. | 1 | |
| | **5.** | **3** | |

First **add** the **tenths** 2 + 2 = 4. Record the answer. Put in the **decimal point**. Then add the ones 5 + 2 = 7.

Take the answer **7.4** and **subtract** 2.1 from it.

First subtract 1 tenth from the 4 tenths then subtract the 2 ones from the 7 ones. Remind the pupils about the decimal point.

The answer is **5.3**.

Go through some more examples with the class, such as:

1. 20.5 + 11.43 - 31.93 = **(0)**
2. 4.5 + 4.2 – 0.25 = **(8.45)**
3. 3.66 +12 – 0.5 = **(15.16)**

You may need to work through more examples until all the pupils can work through the calculations confidently.

## C4c

Pupils should work in pairs for this activity which gives them practice using mixed computation with decimals. Write these numbers on the board:

**35** **29.67** **11.25**

Tell pupils to make up as many addition and subtraction sums as possible using the given numbers. Each sum must use all three numbers. They can use addition, subtraction and a combination of both functions. Here are some possible examples:

35 + 29.67 – 11.25 = **53.42** 35 + 29.67 + 11.25 = **75.92**

35 + 11.25 – 29.67 = **16.58** 29.67 – 11.25 + 35 = **53.42**

11.25 + 29.67 – 35 = **5.92** 11.25 + 35 – 29.67 = **16.58**

When they can't think of any more, let them exchange questions with another pair and work out the calculations in their exercise books. Have them check and mark each others' work.

Ask the pupils to complete the activities in the Pupil's Resource Book on page 60 which give more practice adding and subtracting decimals, through real life problems.

**Answers**

**Activity A**

**1.** 37.7 **2.** 134.1 **3.** 88.24 **4.** 11.13 **5.** 445.41 **6.** 9.5

**7.** 23.36 **8.** 70.32 **9.** 10.5 **10.** 327.88

**Activity B**

**1.** 8.25 m **2.** 10.50 km **3.** 12.65 t **4.** Yes, $29.45 **5.** 562.5 L

Can all the pupils add and subtract decimal fractions including tenths and hundredths?

# T5a

**Materials**
2 dice for each pair of pupils

In this lesson, introduce **multiplication of decimal numbers by whole numbers**.
Revise how to set out and calculate multiplication with whole numbers. Write these examples on the board and work through them together.

| **a.** 4,152 | **b.** 1,200 | **c.** 312 | **d.** 205 | **e.** 113 |
|---|---|---|---|---|
| x 2 | x 10 | x 5 | x 4 | x 16 |

As you work through the examples, revise the following:

- The importance of **setting out** the and the answer correctly, with all the digits in their correct place value.
- Always **work from the right to the left**, starting with the ones column.
- If there are more than ten in any column these must be **regrouped**.

Ask volunteers to come to the board and do the sums. Let the other pupils check if they are correct. Tell them to explain what they are doing as they work.

Pupils should be confident with this before you introduce multiplication with decimals.

Explain that, to multiply a number which includes a decimal fraction by a whole number, we use **exactly the same method** we have used before.

But we **have to remember the decimal point.**

Write this example on the board. The number at the top is a decimal fraction and is multiplied by a whole number.

Teach how to multiply decimal numbers by whole numbers by working through the example

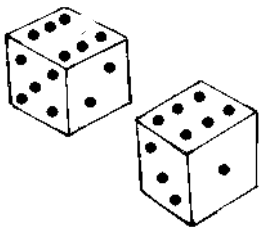
2.1
x 4
**8.4**

First multiply 1 **tenth** by 4. Record the answer **4** and put in the **decimal point.** Then multiply 4 by 2 ones = **8**. The answer is **8.4**.

Go through some more examples until all the pupils are confident with the method used. Pupils need to be confident using their multiplication tables to be able to do these examples quickly.

# C5a

The pupils need dice to complete this activity. Tell them to take turns with their partner to throw the 2 dice.



Using the numbers on each dice. Tell them to make a number with a decimal point in it. For example if they throw a 4 and a 5 they can make 4.5 or 5.4.

Next they throw the two dice again and this time they add together the two numbers. So if they throw a 6 and a 2 they add these to make 8. This is the whole number they will multiply by.

4.5
x 8
**36.0**

Tell the pupils to set out the sums in their exercise books and then calculate the answer. You could set a time limit of say 5 minutes and see which pair of pupils can set out and work out the most multiplications correctly.

For those pupils who are more confident you could get them to throw the dice twice to make larger number decimal number with could include not only tenths but hundredths and thousandths.

| 153.6 | 15.36 | 1.536 |
|---|---|---|
| x 3 | x 3 | x 3 |
| **460.8** | **46.08** | **4.608** |

There are more examples in the Pupil's Resources Book on page 61 if the pupils need more practice.

**Answers**

**Activity A**

**1.** 4.2 **2.** 4.2 **3.** 4.8 **4.** 6.9 **5.** 0.0
**6.** 8.8 **7.** 20.4 **8.** 3.6 **9.** 20.0 **10.** 36.3

**Activity B**

**1.** 100 **2.** 88.2 **3.** 269.1 **4.** 254.1 **5.** 87.5 **6.** 121.6
**7.** 137.9 **8.** 367.2 **9.** 364.8 **10.** 201.6 **11.** 97.7 **12.** 287

## T5b

This lesson extends the pupils' skills in multiplication of decimals by using numbers to 2 decimal places as well as larger whole numbers.

Write the example on the right on the board.

Explain that, if there are two decimal places in the sum, we work in exactly the same way as we did with tenths to calculate the answer.

```
  3 2
  2.75
x   5
13.75
```

First multiply 5 **hundredths** by 5 = 25. Write down **5** and regroup 2 to **tenths**.

Next multiply 7 tenths by 5 = 35. Add 2 = 37. Record the **7 in the answer** and regroup the 3 to **ones** column.

Put in the **decimal point**. Finally, multiply 2 ones by 5 = **10**. Add 3 = 13.

Record the **13**. The answer is **13.75**.

Go through some more examples with the class. Here are some you could use. Make sure you use the appropriate mathematical language.

```
 4.25      12.3      21.8
x   4     x   6     x   4
17.00     73.8      87.2
```

### Multiplying with a 2-digit Whole Number

In Standard 5 pupils learnt to multiply using 2-digit numbers. Work through some examples to revise this process first. This is how you could explain the example on the right**.**

Start on the right. Multiply by the ones first. 5 x 2 **ones** = **10.** Write 0 in the ones column and regroup 1 ten.

5 x 4 **tens** = 20. Add 1 = 21. Write 1 in the tens column and regroup 2 hundreds.

5 x 1 **hundred** = 5. Add 2 = 7. Write 7 in the hundreds column.

Now multiply by the two tens. Begin by **multiplying by 10**. Put a 0 in the **ones** column. now 2 x 2 = 4. Write 4 in the **tens** column. 2 x 4 = 8. Write 8 in the hundreds column. 2 x 1 = 2. Write 2 in the thousands column.

```
  2 1
  142
x  25
  710
+ 2840
 3550
 1
```

Now **add** together your **two answer lines**. The answer is **3,550**.

The process for multiplication including decimal places is exactly the same, but special care must be taken as to where to place the decimal point.

Teach pupils the following points by working through examples.

- If a decimal place is involved, we use the same process

- **We do not put the decimal point in the two answer lines.**
- After we have added the two answer lines together we then **count how many decimal places were in the original sum** and **count off those places from the right in our answer.**

When we have worked through the multiplication as above we add together the two answer lines. The digits are 3550.

Now, we count how many places of decimals there were in the original sum. **There are 2 decimal places (.42)**.

Count back two places from the right on the final answer line and put in the decimal point. The answer is **35.50**.

```
  2 1
 1.42
 x 25
  710
+2840
 35.50
  1
```

Go through some more examples until the pupils have had enough practice and are to confident with this method, especially with how to place the decimal point.

## C5b

Pupils need plenty of practice at setting out multiplication sums and working out their answers, so that they learn to use the method fluently. There are exercises in the Pupil's Resource Book on page 61 which will give the pupils more practice. You could set these up as a timed competition. The pupils who are confident with their times tables will do well here.

**Answers**

**Activity A**

| | | | | | |
|---|---|---|---|---|---|
| **1.** 18.32 | **2.** 12.45 | **3.** 28.56 | **4.** 10.65 | **5.** 7.14 | **6.** 49.08 |
| **7.** 46.08 | **8.** 31.02 | **9.** 20.70 | **10.** 85.12 | **11.** 185.92 | **12.** 0 |

**Activity B**

| | | | | | |
|---|---|---|---|---|---|
| **1.** 86.8 | **2.** 244.5 | **3.** 335.4 | **4.** 152.0 | **5.** 183 | **6.** 306 |
| **7.** 138.6 | **8.** 182.4 | **9.** 154.0 | **10.** 547.4 | **11.** 640.64 | **12.** 782.64 |

**Activity C**

| | | | | |
|---|---|---|---|---|
| **1.** 37.1 kg | **2.** $332.50 | **3.** 3,817.5 L | **4.** 16.5 kg | **5.** 63.75 m |

? Can all the pupils multiply decimal numbers by whole numbers?

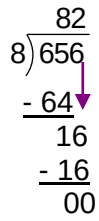
## T6a

In this lesson we introduce **division of whole numbers to give an answer to one decimal place.** Revise division with the pupils first. Divide whole numbers by whole numbers first.

When we divide we begin with the digit of the highest value. So **we divide from left to right**. Ask the pupils where we start with addition, subtraction and multiplication. They should be able to tell you that when performing the functions +, –, and x we begin from the right. This is the digit of the lowest value in the number.

Write the following example on the board. Talk through the process as you work out the answer with pupils.

In this example we start by dividing first the hundreds, then the tens, and finally the ones.



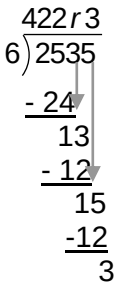

8 into 6 hundreds will not go so we change it to 6 tens and put it with the 5 already there. 8 into 65 tens = 8. 8 x 8 = 64. Record 8 tens in the answer line. Write 64 under the 65 and subtract. Bring down the 6 ones and put them with the 1 ten so that the number becomes 16.

8 into 16 = 2. 8 x 2 = 16. Record 2 ones in the answer line. Subtract the 16 from 16 = 0

So **656 ÷ 8 = 82**

Ask the pupils what we call a number which is left over sometimes when we calculate a division sum**. (The remainder.)**

Work through the next example **2,535 ÷ 6** on the board. Remind the pupils to **start from the left**. In this case this is the thousands column.




6 into 2 thousand? **Cannot go**. 6 into 24 hundreds = **4**. 4 x 6 = 24.

Write 4 in the hundreds place on the answer line. Take 24 from 25 = 1.

Bring down 3 tens. 6 into 13 tens = **2**. 2 x 6 = 12.

Write 2 in the tens place on the answer line. Take 12 away from 13 = 1.

Bring down 5 ones. 6 into 15 ones = **2**. 2 x 6 = 12.

Write 2 in the ones place on the answer line. Take 12 away from 15 = 3.

There are 3 ones left over or a **remainder** of **3**. So **2,535 ÷ 6 = 422 r 3.**

Let the pupils try these examples in pairs, then go through them on the board to reinforce the method.

**1.** $12\overline{)4860}$ **(405)** **2.** $6\overline{)2722}$ **(453 r 4)** **3.** $4\overline{)345}$ **86 r 1**

## C6a

Remind the pupils of the signs > and <.

**> means greater than** **< means smaller than or less than**

Write the divisions below on the board. See how quickly the pupils can work out if the statements are true or false. Tell them to show the working out of all their division calculations in their exercise books. They must set them out correctly.

**1**. 53 ÷ 8 < 67 ÷ 9 **2**. 49 ÷ 9 < 78 ÷ 9 **3**. 32 ÷ 8 < 27 ÷ 4

**4**. 345 ÷ 5 > 345 ÷ 6 **5**. 220 ÷ 4 > 120 ÷ 4 **6.** 254 ÷ 4 > 452 ÷ 6

Move around the class and mark the pupils' examples as they work. Some pupils may need extra help and this is a good way to give them some individual teaching.

As a whole class, go through the examples and complete marking the exercise. The answers are given below.

**1**. 6 r 5 > 7 r 4 **false** **2**. 5 r 4 < 8 r 6 **true** **3**. 4 < 6 r 3 **true**

**4**. 69 > 57 r 3 **true** **5**. 55 > 30 **true** **6.** 62 r 2 < 65 r 2 **false**

# T6b

In this lesson pupils learn how to divide the remainder to result in an answer which includes a decimal fraction. Go through a simple example first.

How many 2s in 1 ten? – cannot go.

How many 2s in 13 ones = 2 x 6 = 12. Write **6** in answer line.

Write 12 under 13 and subtract. 13 – 12 = **1 left over**.

So the answer to **13 ÷ 6 = 6 r 1**. Now put in a **decimal point after the 13 and write in 0 tenths** and **continue dividing**.

Remember to **put in the decimal point in answer line** too. Bring down the 0 tenths. How many 2s in 10 tenths? 2 x 5 = 10. Write **5** in answer line. Write 10 under 1 and subtract. 10 –10 = 0.

```
   6.5
2)13.0
 -12
  1 0
 -1 0
  0 0
```

So **13 ÷ 2 = 6.5.**

Tell the pupils that we can continue dividing like this until there is no remainder or we can work to a given number of places of decimals.

If we work to **one decimal place** this means our answer will have **tenths** in it. To make our calculation as accurate as possible, we can work out the hundredths or second decimal place too and then round up or round down according to the digit in that place.

Go through some examples to demonstrate this. Talk through all the steps as you work out the answer. You can call pupils out to the board and let them do some of the steps too.

Here are some examples you can use. **Write your answer to one decimal place**.

**a.**
```
   25.71
7)180.0 0
 -14
  40
 - 35
   5 0
 - 4 9
     1 0
   -   7
       3
```

180 ÷ 7 = 25.71 so to **round to tenths** – **number to the right** is 1. This is smaller than 5.

So **180 ÷ 7 = 25.7**

**b.**
```
   9.66
6)58.0 0
 - 54
   4 0
 - 3 6
   4 0
 - 3 6
     4
```

58 ÷ 6 = 9.66 so to **round to tenths** – **number to the right** is 6. This is larger than 5.

So **58 ÷ 6 = 9.7**

**c.**
```
   22.33
3)67.00
 - 6
   07
 - 6
   10
 -  9
    10
 -  9
     1
```

67 ÷ 3 = 22.33 so to **round to tenths** – **number to the right** is 3. This is smaller than 5.

So **67 ÷ 3 = 22.3**

Explain that when the same number comes up in the decimal place over and over again, as in examples b and c, it is called a **recurring number**.

Ask the pupils how they can check their answers when they have completed their division sum. They should be able to tell you that **if the answer is multiplied by the divisor they will get the same number when they have rounded it to the nearest whole number.**

**For example:**

| | | |
|---|---|---|
| **a.** | 25.7 x 7 = 179.9 | This is **180** to the nearest whole number. |
| **b.** | 9.7 x 6 = 58.2 | This is **58** to the nearest whole number. |
| **c.** | 22.3 x 3 = 66.9 | This is **67** to the nearest whole number |

## C6b

Pupils have been used to dividing and getting remainders in some of their answers. Now they have to continue dividing by adding a decimal point and changing their remainders into tenths, then hundredths. Of course they could also carry on dividing to thousandths, tens of thousandths and so on.

To divide to a given place of decimals the pupils must use their rounding skills which they practised earlier in this unit in lesson 3b.

Let the pupils practice division and rounding skills by complating activities on page 62 in the Pupiil's Resource Book. Activity A and B give them mechanical practice of the method while Activity C lets them use their skills to solve problems.

**Answers**

**Activity A**

| | | | | | |
|---|---|---|---|---|---|
| **1.** 34.4 | **2.** 29.8 | **3.** 48.5 | **4.** 74.5 | **5.** 57.75 | **6.** 31.25 |
| **7.** 459.5 | **8**. 1,650.8 | **9**. 880.5 | **10**. 5,470.25 | **11**. 232.25 | |
| **12.** 9,463.75 | **13.** 5,470.8 | **14.** 6,507.5 | **15.** 5,226.6 | **16.** 83.75 | |

**Activity B**

| | | | | | |
|---|---|---|---|---|---|
| **1.** 9.3 | **2.** 13.8 | **3.** 8.2 | **4.** 10.1 | **5.** 6.9 | **6.** 28.3 |
| **7.** 20.5 | **8**. 35.7 | **9**. 90.7 | **10**. 64.6 | **11**. 220.7 | |
| **12.** 666.7 | **13.** 200.4 | **14.** 3,014.3 | **15.** 123.4 | **16.** 524.3 | |

**Activity C**

**1a.** 2,027 km **b.** 405.4 km **2.** $429.40

? Can all the pupils divide the remainder in division calculations to give an answer including tenths?

## T7a

**Materials**
metre strips, rulers
Nguzu Nguzu Units Poster

In this lesson pupils revise units of measurement and use their decimal skills by recording measurements using decimal notations.

Copy the tables below onto the board or use the Nguzu Nguzu Units of Measurement Poster. Ask the pupils to identify each symbol or abbreviation and say what it stands for. Ask them to suggest what each unit could be used to measure.

| unit symbol | unit | measure of |
|---|---|---|
| kg | **kilogram** | **mass** |
| g | **gram** | **mass** |
| t | **tonne** | **mass** |
| L | **litre** | **capacity** |
| mL | **millilitre** | **capacity** |
| cm | **centimetre** | **length** |
| m | **metre** | **length** |
| mm | **millimetre** | **length** |

| unit symbol | unit | measure of |
|---|---|---|
| km | **kilometre** | **distance** |
| $m^2$ | **metre squared** | **area** |
| $cm^2$ | **centimetre squared** | **area** |
| $m^3$ | **metre cubed** | **volume** |
| $cm^3$ | **centimetre cubed** | **volume** |
| $ | **dollar** | **money** |
| c | **cent** | **money** |

All these units use the **metric system**, which is a **decimal** or base ten system.

Revise with the pupils that this means that the units are graded in tens, hundreds, thousands and so on. Thus:

| | | |
|---|---|---|
| 1,000 g = 1 kg, | 10 mm = 1 cm, | 100 cm = 1 m, |
| 1,000 m = 1 km, | 100 mL = 1 L, | 100 cents = $1.00 |

Explain that, in this lesson, pupils will measure and record their measurements using decimal notation.

Ask one pupil to come to the front of the class. Measure his/her height. Write their height in centimetres on the board e.g. 143 cm. Now ask the pupils to change this into metres and centimetres. **1 m 43 cm**. Ask the pupils how they came to this answer. **This is because there are 100 cm in 1 m.** Now ask them to write this as a decimal. **1.43 m**.

Write some other examples on the board and ask the pupils to change them to decimal notation.

| For example: | 357 cm | 505 cm | 26 cm | 5 cm |
|---|---|---|---|---|
| | **3.57 m** | **5.05 m** | **0.26 m** | **0.05 m** |

Talk about the place value of each of the units. Do the same with other units from the chart you have written upon the board. For example you could use grocery packets to measure and record weight in decimal notation or a price list to record money in decimal notation.

## C7a

In this practical activity pupils measure the distance they can cover in the long jump. They will measure their jump in **centimetres** then they record their jump in **metres** too using the correct decimal notation. Show the pupils how they will record their results. For example:

| Name | cm | m |
|---|---|---|
| **Eva** | **123** | **1.23** |
| **Ella** | **112** | **1.12** |
| **Sonny** | **120** | **1.2** |

Ask the pupils to do the activity in groups of five. They could work outside. Tell them to mark a line on the ground as the start line. They must take one jump from the start line and see how far they jump. Tell them to measure each jump carefully using a metre strip marked in centimetres or a ruler.

They must record all their jumps in **centimetres** and then **change them to metres** in their table of results.

When the groups have finished their activity they should write up their results in their exercise books. Ask the pupils to **analyse** their results. They could compare them using **sentences** e.g. Ella jumped further than Eva but not as far as Sonny. They could draw a **graph** to show their results too.

Make sure you go around the groups as they are working to give encouragement and check on the pupils' measuring skills. Mark their completed work in their exercise books.

## T7b

**Materials**

scales ,rulers, metre strips
objects to weigh
container graduated in mL
cups, cans,

In this lesson pupils are going to look at measuring mass and capacity using decimal notation.

Remind the pupils of the relationship between the different units, for example:

| | | | |
|---|---|---|---|
| 1,000 g = 1 kg | 1,000 kg = 1 tonne | 1,000 mL= 1 L | 100c = $1 |

Write up some measurements like these on the board:

**a.** 1,000 g **b.** 250 g **c.** 1,500 g **d.** 50 g

Ask pupils to change these into kg and write them in decimal notation. Remind them to write decimals as tenths, hundredths, thousandths etc. A place value chart could help you here.

1,000 g = 1 kg so:

| | Hundreds | Tens | Ones | decimal point | tenths | hundred - ths | thousand -ths |
|---|---|---|---|---|---|---|---|
| **a.** | | | **1** | **.** | **0** | **0** | **0** |
| **b.** | | | **0** | **.** | **2** | **5** | **0** |
| **c.** | | | **1** | **.** | **5** | **0** | **0** |
| **d.** | | | **0** | **.** | **0** | **5** | **0** |

Show the pupils how the answers would be written like this:

**a. 1 kg** **b. 0.25 kg** **c. 1.5 kg** **d. 0.05 kg**

Explain the following important points about writing in decimal notation:

- If there is **no digit in the ones column** as in **b** and **d** they must put a **0**.
- If the answer is a whole number they do **not** need to put in the decimal point, as in **a**.
- If there are no digits to the right of the decimal they do not need to put in the 0's as in **a, b, c and d**.

Explain how to say each of the answers aloud too as follows:

**a.** one kilogram **b.** nought point two five kilograms

**c.** one point five kilograms **c.** nought point nought five kilograms

Go through some more examples until the pupils are confident changing grams to kilograms. You could use kg to tonnes too. For example:

| | | | |
|---|---|---|---|
| 750 kg | 80 kg | 3,400 kg | 100 kg |
| **0.75 t** | **0.08 t** | **3.4 t** | **0.1 t** |

Now look at **millilitres** and **litres**. These are units of **capacity** used for measuring the volume of a liquid. 1,000 mL = 1 L. Use a place value chart and convert **mL** to **L** as well as L to mL. Write examples like these on the board and work through them with the class.

| | | | |
|---|---|---|---|
| 1000 mL<br>**1 L** | 500 mL<br>**0.5 L** | 200 mL<br>**0.2 L** | 5750 mL<br>**5.75 L** |
| 2006 mL<br>**2.006 L** | 3 L<br>**3,000 mL** | 3.6 L<br>**3,600 mL** | 0.25 L<br>**250 mL** |

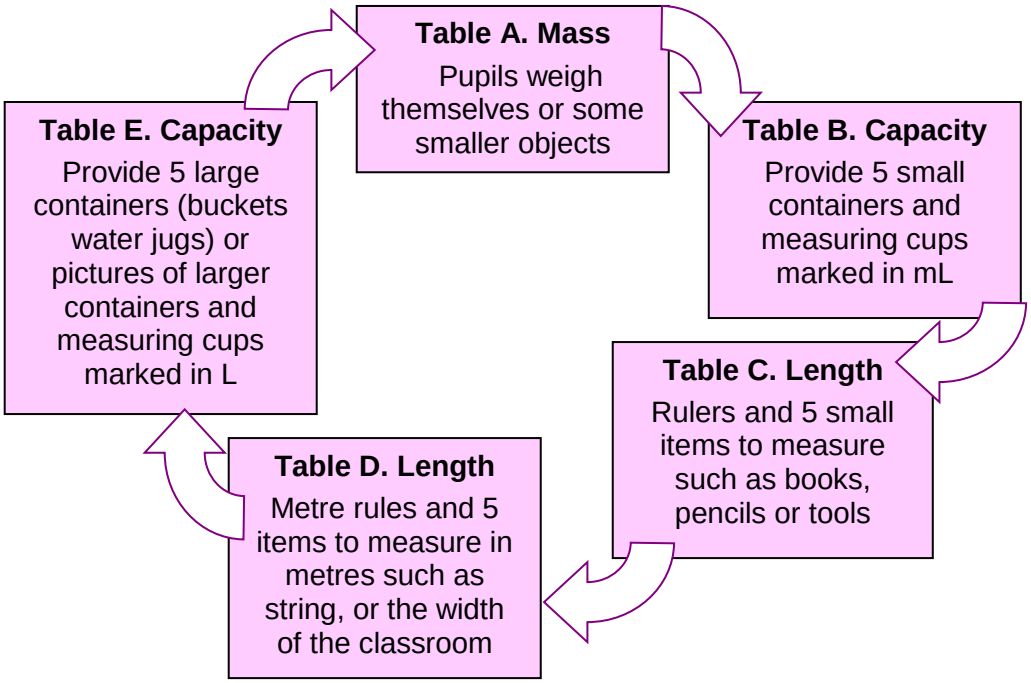
## C7b

**Materials**

containers, weights, rulers and metre rules
a range of items to measure and weigh
scales

Pupils are going to do practical measuring activities today. They will work in groups of 5. Before the lesson starts you could prepare **measuring stations** in your classroom.

Set out five tables each containing a different measuring activity spaced out in your classroom as shown in the diagram on the next page.




Your measuring stations will depend on what equipment and materials you have available. For example the activity on table A will depend on what type of **scales** you have available.

Decide on your activities and collect all the materials you need before the lesson. On Table E you could include pictures of larger containers such as water tanks , petrol drums, and so on, clearly labelled with their capacity in mL. The pupils could then change these to litres.

Organise your group activity as a **circus**. This means that the five groups will work for a set amount of time at each table and then all the groups will move around to the next activity when you tell them to. It doesn't matter where the pupils start and where they finish. By the end of the lesson each group will have completed all five measuring activities.

Write clear instructions on each table telling the pupils what they have to do. Here is an example of what could be at each station.

**A.** Record your own weight in **kilograms**.

**B.** Measure the capacity of each container, record your measurements in **litres**.

**C.** Measure each item in centimetres and millimetres and record your results as **centimetres** using decimal notation.

**D.** Measure the five given items in metres and centimetres. Record your results in **metres**.

**E.** Measure and record the capacity of these containers in **litres**.

Tell the pupils to record all their results in their exercise books. Make sure that you go through their work. You could all work through the results together as a whole class activity.

## T7c

Money is also recorded using decimal notation. Pupils are already familiar with this method of writing decimal notation as they have already practiced writing money amounts in dollars and cents.

Remind the pupils that, when we write an amount of money, there are only two digits, **tenths** and **hundredths**, after the decimal notation because there are just **100 cents in $1**.

Write these examples on the board and go through them with the pupils.

| | | | |
|---|---|---|---|
| 9,105 cents | 3, 005 cents | 910 cents | 11,753 cents |
| **$91.05** | **$30.05** | **$9.10** | **$117.53** |

Remind the pupils that when they record money as dollars in decimal notation they do **not** need to put a c symbol or write 'cents' at the end.

Also point out that, unlike the other decimals they have been writing, when recording money if they include a **decimal point there must always be two digits following**. The hundredths are recorded even if they are 0 as in $9.10.

Practice writing given amounts of money by reading out some figures and asking pupils to write them down with two decimal places. Check that they are all writing their amounts.

| | |
|---|---|
| Three dollars and eighty-five cents | **($3.85)** |
| Eighteen dollars and five cents | **($18.05)** |
| Twenty five cents | **($0.25)** |
| Nine dollars and ninety-five cents | **($9.95)** |
| One hundred and fifty dollars | (**$150.00)** |

## C7c

Here are some more examples for the pupils to practice with. Write these on the board and tell them to record their answers in dollars. Pupils could work in pairs.

| | |
|---|---|
| **1.** Nineteen thousand, four hundred and twenty-three cents | **($194.23)** |
| **2.** Two thousand, four hundred and sixty-six cents | **($24.66)** |
| **3.** 43,589 cents | **($435.89)** |
| **4.** 270 cents | **($2.70)** |
| **5.** 10,100 cents | **($101.00)** |
| **6.** $14 and 5 cents | **($14.05)** |
| **7.** $32 and 47 cents | **($32.47)** |
| **8.** $201 and 1 cent | **($201.01)** |

Remind the pupils that when we use the **$ sign we do put the 0 in the hundredths column**.

There is an activity in the Pupil's Resource Book on page 63 for all the pupils to work on. It gives them good practice to use money and decimal notation. Let all pupils to Activity A.

### Answers

#### Activity A

**1.**

| | |
|---|---|
| Manila folders | $2.45 for pack of two |
| Stapler | $29.80 each |
| Clear file | $32.80 each |
| Writing pad | $18.40 each |
| Biro | $26.30 a pack |
| Ruler | $1.05 each |
| Hole punch | $49.00 each |
| white board marker | $12.90 each |

**2.** $639.80

#### Activity B

**a. $2.50** **b.** $4.35 **c.** 57,040c
**d.** 3,701 cents **e.** $0.25 **f.** $17.30
**g.** 9,000 cents **h.** $17.05 **i.** $35.00
**j.** 10,110 cents **k.** 300,000c **l.** $635.50

#### Activity C

**1.** 74.15 kg **2.** 5.47 m **3.** 0.63 m
**4.** $28.87 **5.** $17.43

? Can all the pupils use decimal notation when recording measurements and money?

# Extension and Support Activities

## Support Activities

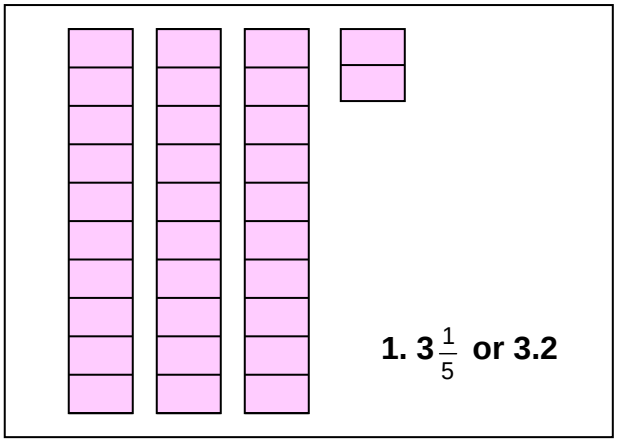
Here are two practical activities to give pupils extra practice in working with decimal fractions. You could choose one activity to do with the whole class if you think they all need some extra practice. Both activities would also work well for support in small groups.

**Activity A**

The pupils will need scissors, rulers and strips of paper for this activity.

Write the common fractions below on the board then ask the pupils to use strips of paper to show them as decimal fractions as shown in the diagram.

They could also draw them in their exercise books and write both the decimal fraction and common fraction notation by the side.




**1.** $3\frac{1}{5}$ **2.** $2\frac{3}{10}$ **3.** $1\frac{1}{2}$

**4.** $\frac{1}{10}$ **5.** $2\frac{4}{5}$

**6.** $1\frac{3}{5}$

**Activity B**

In a group ask the pupils to measure and record their heights. Make sure each has a turn at both measuring and recording.

Let them measure first using centimetres then change readings to metres.

To be measured each pupil must stand straight up with feet together. It is best to stand against a wall with heels touching the wall. A second pupil holds a ruler or stick straight across the top of the head horizontally to mark the height on the wall with a piece of chalk. A third pupil should then measure the height from the floor and record the measurement.

A table of results should be put together.

| Name | cm | m |
|---|---|---|
| Linda | 144 | 1.44 |
| Lionel | 148 | 1.48 |
| Ellen | 146 | 1.46 |
| David | 152 | 1.52 |

Ask the pupils to think of a way to present their data. They could write some sentences comparing their results.

They could draw a graph to show their data.

A practical activity like the one above is a very good way to practice a variety of skills. It links different topics in the maths syllabus. You will be able to think of other ideas for collecting data that include decimal notation. Here are some ideas:

- distance in metres that a ball can be thrown or kicked
- length in centimetres of hand span
- length in centimetres of foot

## Extension Activities

These activities are designed to challenge pupils who are confident with using decimal notation for a variety of computations.

Write up these number sentences on the board then ask the pupils to complete them by filling in the correct sign +, x, –, or ÷ to make the number sentences true.

**a.** 2.7 ς 2.7 = 5.4 **(+)**
**b.** 18.6 ς 5.4 = 13.2 **(–)**
**c.** 1.98 ς 4 = 7.92 **(x)**
**d.** 127.4 ς 14.6 = 142 **(+)**
**e.** 12.62 ς 2 = 6.31 **(÷)**
**f.** 300 ς 2.5 = 120 **(÷)**
**g.** 7.58 ς 7 = 53.06 **(x)**
**h.** 18.02 ς 7 = 25.02 **(+)**
**i.** 3.75 ς 8 = 30 **(x)**
**j.** 12.4 ς 4 = 3.1 **(÷)**
**k.** 122.47 ς 48.5 = 73.97 **(–)**
**l.** 246.8 ς 4 = 61.7 **(÷)**
**m.** 211.5 ς 5 = 42.3 **(÷)**
**n.** 68.88 ς 1.5 = 103.32 **(x)**

A good way of getting pupils to extend their skills is to ask them to write puzzles like the ones above for each other.

As they write them they have to work out the answers and this gives them extended practice with working with decimals. They can try out each other's puzzles and talk together about their answers and how they worked them out. This is an excellent way of reinforcing mathematical skills.

## Check Up Page: Answers

**1.** **a.** < **b.** < **c.** > **d.** < **e.** <
**f.** < **g.** < **h.** >

**2.** **a.** 2.2 **b.** 12.25 **c.** 3.5 **d.** 0.75 **e.** 1.2
**f.** 5 **g.** 4 **h.** 3 **i.** 10 **j.** $\frac{4}{10}$ or $\frac{2}{5}$

**3.** **a.** ones **b.** ones **c.** tenths **d.** thousands **e.** tenths
**f.** hundreds **g.** tens **h.** tenths **i.** hundredths **j.** hundredths
**k.** ones **l.** hundredths

**4.** **a.** 1 **b.** 22 **c.** 17 **d.** 20 **e.** 110
**f.** 99 **g.** 4.8 **h.** 2.7 **i.** 53.1 **j.** 44.0
**k.** 29.1 **l.** 40.0

**5.** **a.** 40.74 **b.** 10.58 **c.** 1.82 **d.** 3.86 **e.** 12.04
**f.** 62.60 **g.** 116.5 **h.** 192.5

**6.** **a.** 18.9 kg **b.** 42.5 cans

**7.** **a.** 3.5 m **b.** 750 cm **c.** 2.5 L **d.** 3,750 mL **e.** 1,050 cents
**f.** $3.95 **g.** 8,350 g **h.** 1.359 kg

Unit 6

# Graphs Topic 10: Pie Charts
# Topic 11: Bar and Line Graphs

**Aim:**

For pupils to appreciate the value of graphs, including pie charts, line graphs and bar graphs as a means of presenting information or data. They will develop skills and confidence both in reading information from graphs and in presenting information in the graphic form.

**Topic 10: Sequence of objectives:** To

1. read information from pie charts.
2. draw simple pie charts to display information.

**Topic 11: Sequence of objectives:** To

1. collect and show data on bar and line graphs.
2. read information from bar and line graphs and use the information to calculate totals and averages.
3. present information on bar and line graphs, such as weather or population statistics.

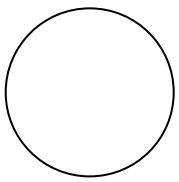
**Rationale:**

Graphs are a very useful way of presenting a lot of information so that it is easy to read, understand and interpret. If pupils learn how to read graphs with confidence and present information in a graphic form, they will find these skills useful in other subject areas of the primary and secondary curriculum. Graphs may be used in Science, Social Studies, Business Studies and many other subjects. In adult life knowledge of graphs will give pupils access to a range of useful and interesting information as they are used in many factual, newspaper, scientific and public information reports.

## T1a

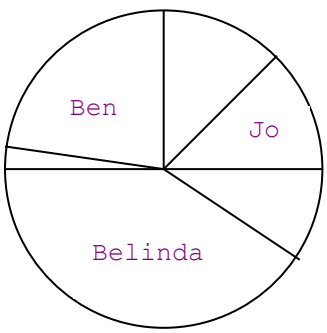
**Materials**
board compass
coloured chalks

In this activity, pupils are introduced to a new type of graph known as a **pie graph** or pie chart. Pie graphs use a circle to show how something is divided up into parts. They are useful for comparing component parts of a whole.



Explain to the pupils what a pie graph is in the following way:

On the board draw a circle and explain that it represents a circular whole meat pie (or cake) as shown.




Explain that you are going to share the whole pie out between six different pupils and draw lines on the pie to show how it is divided up. Ask pupils to come to the board one at a time and choose a slice of pie, they should write their name on the slice they choose.

When they have finished ask some questions about the diagram, such as:

Who had the largest slice of pie?

Who had the smallest slice?

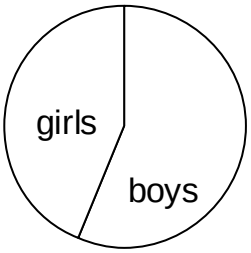
Who had more pie, Ben or Jo? and so on…

Explain that the pie diagram is like a graph. It tells you some information about how the pie was divided up. The circle, or pie, represents **one whole** of something.

Explain that the circle in this diagram can be used to **represent** different things. Draw another circle on the board and explain that this circle represents all the pupils in the class. You could label it **Class 6.**

Divide it into 2 parts as shown. You could use coloured chalks for the different parts. Explain that one part represents boys in the class and the other represents girls. Ask them to tell you what the chart shows about the class.

**(There are more boys than girls.)**




**Class 6**

**Class 6 Footwear**


Next draw a chart and divide it into three parts as shown. Explain that this graph divides up Class 6 according to what they are wearing on their feet.

Ask some questions about the pie graph to check that pupils can see how the information is represented:

What three things do pupils wear on their feet? **(shoes, slippers, bare feet)**

Which one do most pupils wear? **(slippers)**

Do more children wear shoes or bare feet? **(bare feet)**

… and so on.

As well as giving the answers ask pupils to explain **how** they have read the information from the pie graph.

Ask the pupils to suggest other ways in which the class might be divided up and prepare some more pie graphs on the board to show their suggestions. These could be by age, by the province they are from or by the village that they live in for example.

Remind them of the following definitions before moving on:

- A **pie graph is a circular graph** where each part looks like a slice of a pie.
- The **purpose** of a pie graph is **to show how the whole of something is divided up**.
- We call each part of a pie graph a **sector**.

## C1a

Have pupils work in pairs or groups of three. Have them turn to page 67 of the Pupil's Resource Book and look at the pie chart there which shows the ages of a group of Standard 6 pupils.

Ask them to discuss the graph in their group and make a list of any information they can read from the graph.

Move around the groups as they do this and help those who are having difficulty. Encourage them to use the new words you have taught them as they discuss the graph.

When they have spent some time talking about it in their group, have them work individually to complete the activities in the Pupil's Resource Book on page 67.

**Answers**

**Activity A**

**1.** False
**2.** True
**3.** True
**4.** True
**5.** True

**Activity B**

**1.** 14 year olds
**2.** 11 years
**3.** 13 years
**4.** 15 years
**5.** 13 and 14

**Activity C**

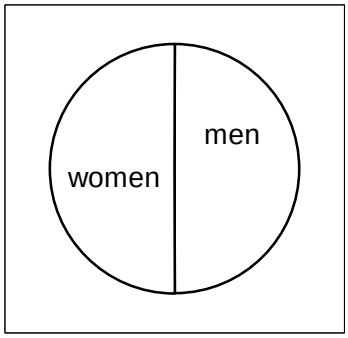
**1.** 15, 11, 14, 12, 13
**2. a.** 6 **b.** 4 **c.** 2
**3.** About 20

## T1b

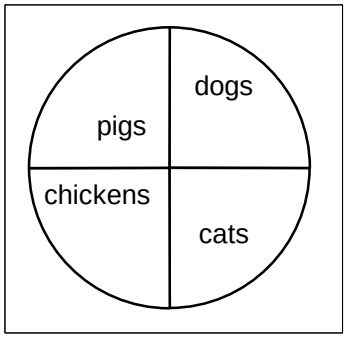
**Materials**
board compass
coloured chalks

In this lesson the pupils learn how to describe different sectors of a pie chart in terms of a fraction and a percentage of the whole. They will also see how they can calculate the actual numbers represented once they know the value of the whole.

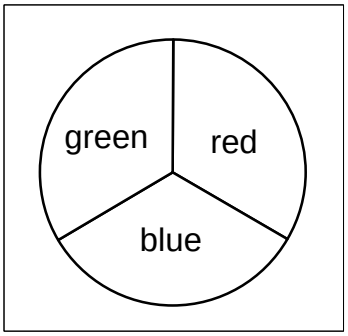
Draw some different pie charts on the board divided into equal parts as shown below. Label each one with a title to show what they represent.




Pie graph showing the number of men and women in Malaita Province




Pie graph showing animals in the village




Pie graph showing Class 6's favourite colours

Ask pupils to tell you what proportion, or part, of the whole is represented by each sector of each graph. For example:

What proportion of the people in Malaita are women? **(half)**

What proportion are men? **(half)**

Can pupils tell you the same information using a percentage? **(50%)**

Ask some more questions about the other pie graphs. Have pupils express the proportion both as a fraction and as a percentage. For example:

What proportion of the animals in the village are cats? **(one quarter or 25%)**

What proportion of pupils prefer red? **(one third or 33%)**

Continue with more examples until all the pupils can express this information in terms of a fraction and a percentage. Ask them to explain their answers.

Now give the pupils some more information.

Tell them that there are 85,000 people in Malaita Province and ask:

How many are women and how many are men? **(42,500)**

Help them to see that when they know what the total or whole is, they can use the sectors on the pie chart to work out the actual numbers for each sector.

Use the other two examples for further practice. Tell the children that there are a total of 200 animals in the village and 27 children in class 6. They should now be able to work out the answers to the following.

How many chickens are there in the village? **(200 ÷ 4 = 50)**

How many children prefer the colour green? **(27÷ 3 = 9)**

## C1b

Have the pupils' complete the activities in the Pupil's Resource Book on page 68. They should work with a partner and talk about the information in the graphs as they work.

Move around the class and assist any pupils having difficulty.

For **Activity B** you should explain how the **key** is used to label the different parts of the graph.

**Answers**

**Activity A**

**1.** 🗁 , 50% **2.** 25% **3.** 5 **4.** 15 **5.** Cassava **6.** 🖹

**Activity B**

**1.** 2002, 🗁, 2004, 🖹. **2.** 2004 **3.** 2002 about 10%, 2004 about 33%.
**4.** 2002 about 3, 2004 about 12 **5.** 7 **6.** 9

**Activity C**

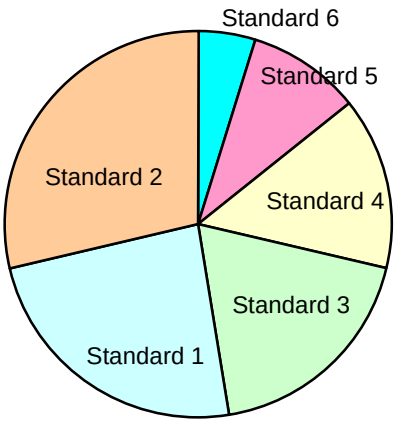
| **Month** | J | F | M | A | M | J | J | A | S | O | N | D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Number of Pupils** | 2 | 5 | 9 | 0 | 0 | 3 | 10 | 0 | 6 | 0 | 0 | 1 |

## T1c

**Materials**
pie charts drawn on pieces of card, scissors, chart paper, glue, coloured pencils

This lesson provides more practice for pupils in **how to read and interpret information from a pie graph**. Draw the following pie graph on the board before the lesson begins.

**Pupils in Each Standard at Nukiki Primary School**




Explain that this shows how many children are in each standard of a large primary school.

Ask the pupils some questions about the information presented in the graph and check that they are able to read it accurately. For example:

Can we tell from the graph which standard has the most pupils? **(Yes, Standard 2)**

Can we tell from the graph which has the least? **(Yes, Standard 6)**

What does the full circle represent? **(The total number of pupils in the school.)**

What do we call each shaded part of the circle? **(A sector).**

What does the green sector represent? **(The number of pupils in Standard 3)**

Now ask the pupils if they can tell you exactly **how many** pupils are in Standard 4. From the information in the graph at the moment we **cannot tell** the exact numbers.

We can add information to the graph to tell us the numbers.

Tell the class that there are 12 pupils in Standard 6 and have them estimate how many are in the other classes. They will do this by comparing the the standard 6 sector with other sectors.

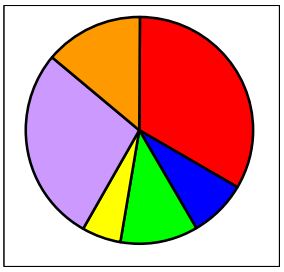
When they have made their estimates write the following figures on the graph and see how close their estimates were to the correct figures.

| | | | | | |
|---|---|---|---|---|---|
| Standard 1 | **45** | Standard 3 | **30** | Standard 5 | **18** |
| Standard 2 | **50** | Standard 4 | **25** | Standard 6 | **12** |

Using this information, can anyone tell how many pupils there are in the whole school? **(180)**

## C1c

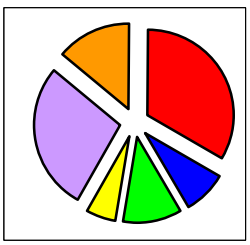
**Favourite Colours of Standard 6**



Before the lesson prepare some pie charts drawn on card or paper. There should be a different graph for each group of about 3 pupils. Each one should have about 6 – 8 sectors and they should each be different sizes. Label each chart clearly with a title and the total number of pupils.

For example they may be favourite colours, favourite sports, favourite foods and so on.

Ask the pupils to cut up their pie chart into sectors and rearrange the sectors in order of size starting with the largest.



Then ask them to **estimate** the following:

a) What fraction of the whole each sector represents.

b) What percentage of the whole each sector represents.

c) What number of pupils is represented by each sector if the total number of pupils in the class is 36?

Ask them to stick their sectors on to a table like the one below and add their estimates as shown: They can make their tables into a poster to display on the classroom wall.

Remind them that **the fractions and percentages will just be estimates**, but that they can calculate the numbers exactly once they know the number of pupils in the whole class.

| **Sector** | **red** | **purple** | **orange** | **green** | **blue** | **yellow** |
|---|---|---|---|---|---|---|
| **Fraction** | about | about | about | about | about | about |
| **Percentage** | about 33% | about 25% | about 14% | about 12% | about 8% | about 5% |
| **How many?** | 12 | 10 | 5 | 4 | 3 | 2 |

At the end of the lesson, ask the pupils to come back together as a class.

Introduce the idea of dividing up pie graphs by degrees, as they will need to know this when they start to draw their own pie graphs in the next lesson.

Ask if any pupils can think of another way of describing the size of each sector of a pie graph.

Remind them of the work they did in Unit 4, and ask whether anyone can remember how many degrees there are in a full circle? **(360º)**. How many in a half turn? **(180º)** How many in a third turn **(120º)** and how many in a quarter turn? **(90º)**

They should be able to see that the angle of turning in each sector of a pie graph can be measured in **degrees.**

Explain that **the angles in a pie chart give important information**.

You will go back to this idea when you teach the next objective.

? Can all the pupils read and understand information from pie graphs?

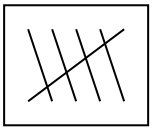
## T2a

**Materials**
board compass
coloured chalks

In this lesson pupils learn different ways of collecting and organising data. They also begin to develop the skills to construct their own pie graphs.

First explain the meaning of the term 'data'. **Data is factual information**, which has to be gathered before a graph can be constructed.

Data is both the information that goes **into** a graph, and the information that **can be taken from** a graph.



Ask pupils if they know any ways of collecting data. Discuss these.

In Standard 4 and 5 they have used **tally charts** to record data. Ask them to explain how to do this.

**(One mark is recorded for each item and each group of 4 marks is crossed to make 5. Groups of 5 marks are then easy to count up to find a total.)**

Discuss how to find data. This might be through a **survey**, asking people questions and recording their answers; through **observation**, watching something that happens and writing it down, and so on.

Demonstrate collecting data by completing a table like the one shown on the right.

Ask each pupil to choose their favourite colour from the list and mark their choice as a tally mark in the correct column as shown.

When the table is completed ask pupils to tell you what the total number of people surveyed was. This should be the total number of pupils in your class. **(45 in the example here.)**

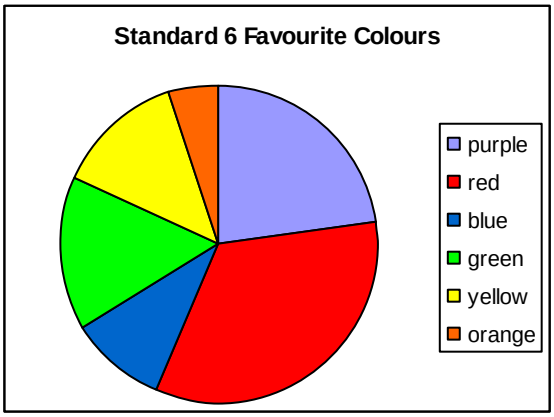
Next explain that, you want to represent the **data** you have collected on a **pie graph**.

First ask one pupil to come to the board and sketch the graph.

Other pupils can help by making suggestions about which sector will be biggest and which will be smallest etc.

| | | |
|---|---|---|
| red | 𝍸 𝍸 \| | 13 |
| blue | 𝍸 | 5 |
| green | 𝍸 / | 8 |
| yellow | 𝍸 \ | 7 |
| orange | \ | 2 |
| purple | 𝍸 𝍸 | 10 |

Help them to put a reasonable sketch together by comparing the relative size of the different sectors. Their graph should look something like the one on the right. Remind them to add a title.




## C2a

Ask the pupils to work in pairs to complete the activities in the Pupil's Resource Book on page 69.

These activities give them more practice sketching pie graphs.

### Answers

Check each pupil's exercise book individually and ask them to explain how they designed and sketched their pie charts. This will help you know whether they have understood how to sketch a pie graph.

Their drawings should look something like these.

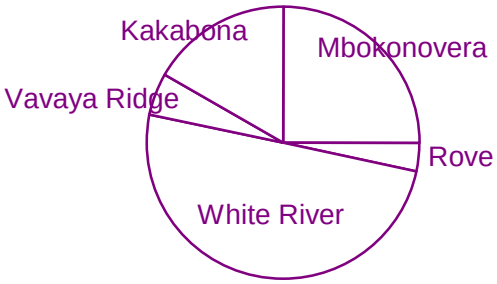
### Activity A

**1.** 30,0,10,15,2,3

**2.** 60

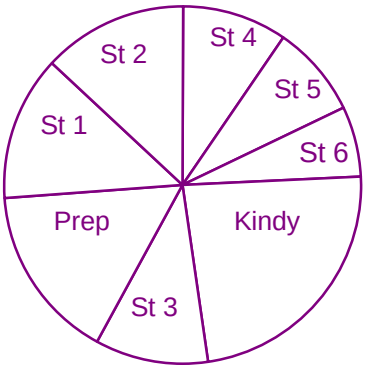
**3a. b. c. d.**

**Where Standard 6 Pupils Live**



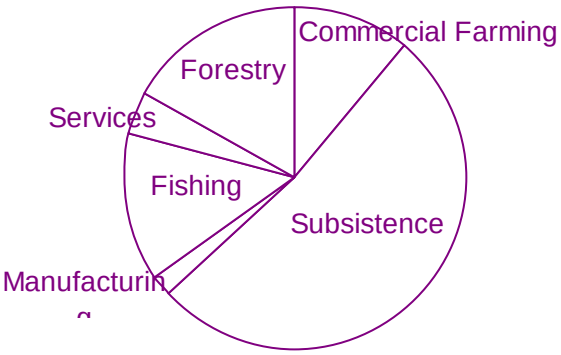

### Activity B

**Pupils in the School**




**1.** 10 **2.** 260 **3.** None

**Rural Employment**




## T2b

**Materials**
board compass
coloured chalks
board protractor
protractors, compasses

In this lesson pupils learn how to represent information on a pie chart more accurately by measuring the angles of each sector. They learn to divide up pie graphs by degrees.

Ask pupils to remind you of the following:

how many degrees are there in a full circle? **(360º),**

how many in a half turn? **(180º)**

how many in a third turn? **(120º)**, and

how many in a quarter turn? **(90º)**.

Explain that, when we measure the angles in a pie chart, they tell us exactly what proportion of the whole each sector represents.

Ask if any pupils can tell you how many degrees there are in a whole pie chart? **(360º - one full circle turn)**

Ask them how many degrees they would need to measure a 25% sector on a pie chart **(90º or a quarter turn)**. Point out that 90 is one quarter of 360.

Ask them some more questions to help them see how the angle of turning relates to the size of the sector in a pie chart. For example

1. To make a sector showing 33% what angle would you use? **(120º)**
2. What proportion is represented by an angle of 180º? **(half)**
3. What angle would you use to represent a quarter? **(90º)**
4. What angle would you use to represent one eighth? **(45º)**

Explain that you are going to do an example of constructing a pie chart together on the board.

**Challenge** pupils to see if they can work out a rule which will help them to calculate the angle of turning required for a given sector of a pie chart, as you work through the example.

Draw the following data table on the board:

| Village | Population |
|---|---|
| Chuchulu | 550 |
| Keto Keto | 320 |
| Miche | 700 |
| Mbopo | 200 |
| Patutiva | 1,010 |
| Chumbikopi | 820 |

Explain that the table shows the number of people living in 6 villages in Marovo.

Ask the pupils to tell you how many people live in the 6 villages in total. **(3,600)**

Explain that this information can be represented accurately on a pie graph by measuring the angles of each sector.

Ask which will be the largest sector **(Patutiva)** and ask pupils to estimate how large the sector will be. **(a bit less than a third)**.

Explain that the whole circle (360º) represents the total number of people (3,600) and ask if anyone can tell how many people are therefore represented by one degree on the pie graph **(10)**.

Use this information to calculate how many degrees will be needed for each sector and draw the pie graph on the board as you go, measuring each angle with a board protractor. For example:

**Chuchulu** has 550 people, so every 10 people are represented by 1º. Therefore the sector will be 550 divided by 10 which is **55º**.

**Keto Keto** has 320 people: 320 ÷ 10 = **32º**

…and so on until the graph is completed as shown on the next page.

Add the angles to your graph too.

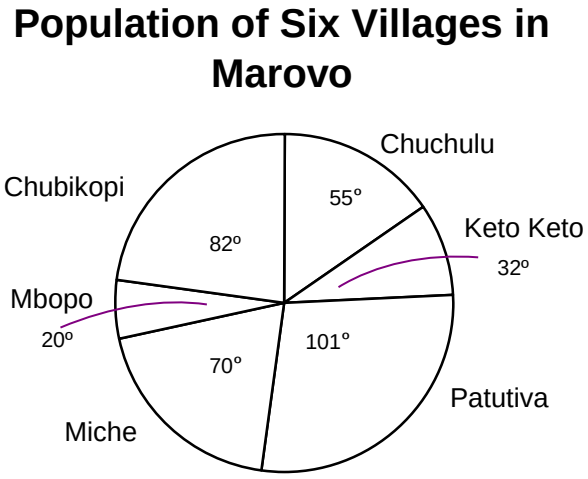
When you have finished ask the pupils to add up the angles you have used to check their working – they should total 360º.

Now ask whether pupils have been able to come up with the rule they should apply to calculate the angle for each sector.

Encourage them to talk about the process they followed in the example above and see if anyone can come up with the following rule:

**Angle of each sector =**

$$\frac{\textbf{The number in each sector}}{\textbf{The total sample} \div 360^{o}}$$




So, in the above example, the angle of the sector for Patutiva is $\frac{\textbf{1,010}}{\textbf{3,600} \div \textbf{360}} = 101^{o}$

## C2b

Pupils need to practice this concept with more examples. Draw the chart below on the board and have them work in pairs or small groups to complete the example. They should calculate the angle of each sector of the pie graph and draw their graph accurately using a protractor.

Move around the class as they work encouraging them to apply the rule they have learned and talk about **what** they are doing and **why**.

| Standard 6 Favourite School Subjects | |
|---|---|
| **English** | **8** |
| **Maths** | **6** |
| **Sports** | **12** |
| **Social Studies** | **2** |
| **Christian Education** | **3** |
| **Science** | **5** |

The **process** the pupils should follow is outlined here to help you assist them.

First add up all the figures on the chart to find out how many children there are in Standard 6. **(36)**

They need to relate this to the number of degrees in the full circle of their pie graph **(360º)**. In this case one pupil is represented by 10 degrees.

They should then be able to work out how many degrees are needed to represent each sector (each subject) on their pie graph.

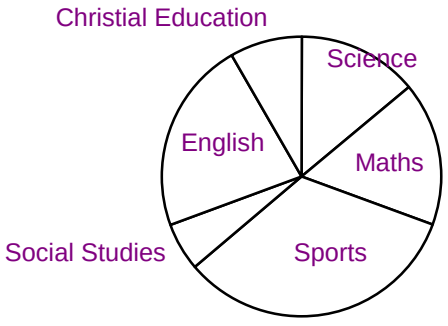
After they have drawn their pie chart remind them to label it with a title and write in the measurement of each angle.

The correct angles for the pie chart are as follows:

English 80º
Maths 60º,
Sports 120º
Social Studies 20º,
Science 50º.
Christian Education 30º,

Provide more examples if you think the pupils need more practice drawing pie graphs accurately.

**Standard 6 - Favourite Subjects**



When you are confident that the pupils know what to do have them complete the activities in the Pupil's Resource Book on page 71. These give them practice interpreting data and representing it in the form of a pie graph.

## Answers

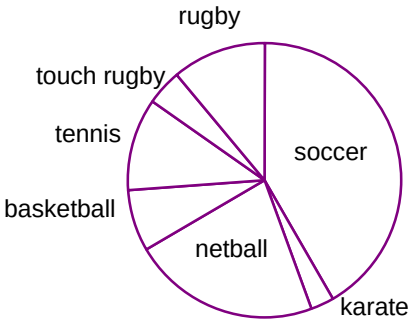
### Activity A

Check each pupil's graph. The angles should be as follows:

| | | | |
|---|---|---|---|
| Basketball | 26º | Touch Rugby | 15º |
| Netball | 80º | Soccer | 150º |
| Rugby | 39º | Karate | 10º |
| Tennis | 40º | | |

Check that pupils have labelled their graphs correctly.

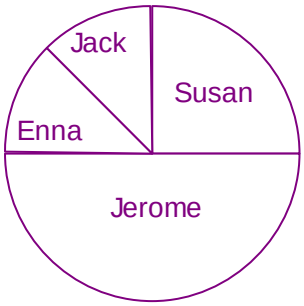
**Aola Pupils Favourite Sports**




### Activity B

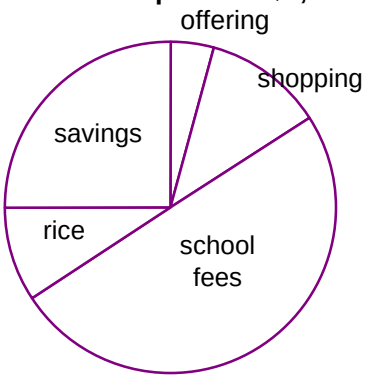
**1.**

**Watermelons Sold by 4 Farmers**




**2.**

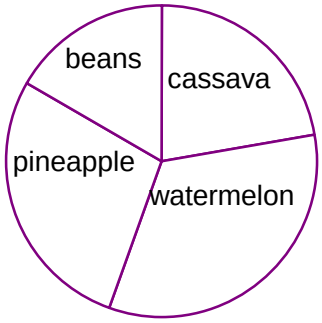
**How Susan Spent her $1,800**




### Activity C

**1.**

**Crops Planted in 2002**




Angles in this pie graph are as follows: beans 60º, pineapple 100º, watermelon 120º, cassava 80º.

**2.**

| Crop | Hectares Planted 2003 |
|---|---|
| cassava | 60 |
| watermelon | 35 |
| cabbage | 15 |
| beans | 45 |
| pineapple | 25 |

**3.** **a.** 2004 **b.** pineapple **c.** watermelon
**d.** 2002 **e.** 60 **f.** 25

## T2c

**Materials**

chart paper, scissors, glue, coloured pencils or pens, marker pens, compasses

In this lesson pupils plan their own research activity, collect data on a topic of their choice and use the data to construct a pie chart.

At the end of the lesson they present and explain their pie graphs to the rest of the class.

This activity may take two or more maths lessons to complete.

It would be best to group the pupils by ability for this activity so that the more able pupils can choose a more complex topic.

**Explain the activity to the pupils as follows:**

Tell them to work in groups of three. They must choose their own topic and do a survey to collect data on their chosen topic. This may involve them going out of the class to interview people. They could do this for homework after the first lesson.

They must then design a table to record their data and then use the data to construct a pie graph. These must be drawn on chart paper so that they can be displayed to the rest of the class.

When they have finished they must prepare a presentation for the rest of the class to explain their research and their pie chart.

The following are some **suggested topics** that pupils might choose, in order of difficulty, but pupils can suggest their own topics too.

Try to have each group work on a different topic.

| | |
|---|---|
| **Class 6** | **Favourite fruits.** |
| **Class 6** | **How people travel to school.** (walk, bus, canoe, car) |
| **School** | **Number of children in each class.** |
| **School or Class** | **Province where pupils come from.** |
| **Village** | **The number of children in each family.** |
| **Village** | **Which church people go to.** |


Put the children into groups and have them start planning their research.

As the pupils work, you will need to help them with the different stages of the process.

There are guidelines for them to follow in the Pupil's Resource Book on page 72, but you should help them with their work and guide them through the process. Most important is to encourage them to talk about what they are doing and explain their ideas clearly using the terms they have learnt.

When they have finished, and prepared their graphs and tables, bring the class back together and allow each group up to 5 minutes to present and explain their graphs to the rest of the class. Encourage other pupils to ask questions, and make comments.

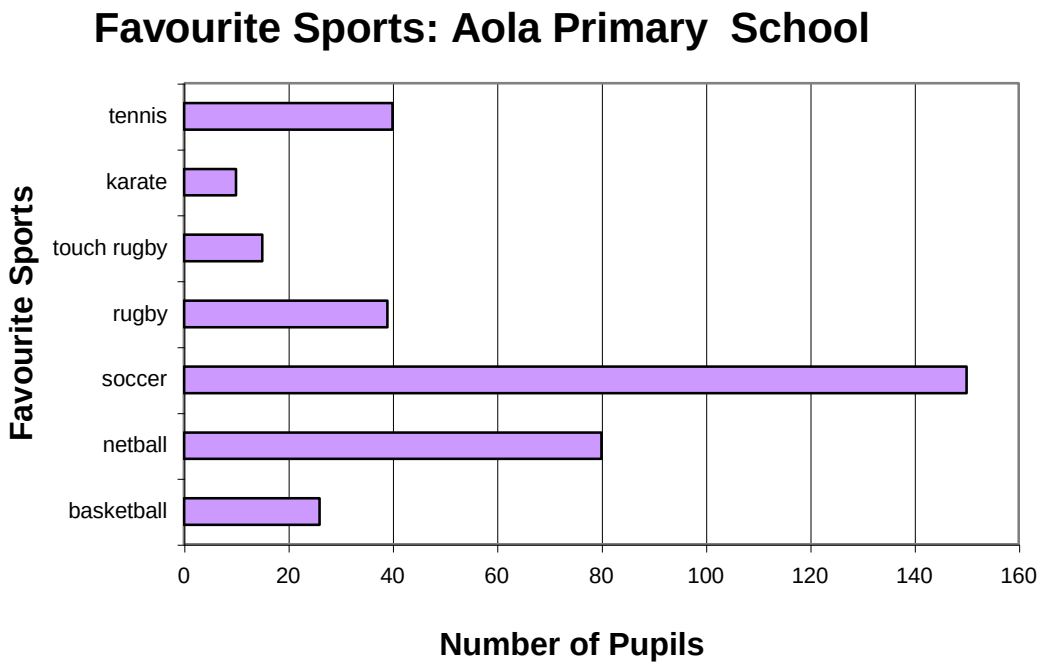

Can all the pupils draw simple pie graphs to display information?

## T1a

In this lesson you revise the features of bar graphs, which were covered in Standard 5 unit 14.

A **bar graph** is a popular type of graph, used to compare data. There are different types of bar graph, a **vertical** bar graph, also sometimes called a **column graph**, which uses columns to represent the data and a **horizontal** bar graph which uses **rows**.

Bar graphs, like pie charts, can be used to compare information. The example below is a horizontal bar graph showing the same data as one of the pie graphs the pupils sketched in the last topic. This data is now presented as a bar graph.




Draw the example above on the board and talk about it with the class. Use questions to guide your discussion and make sure that you **revise** all the important terms and information:

1. Describe the features the graph (two labelled **axes** horizontal (the x-axis) and vertical (the y-axis), **a title**, which tells us what the graph represents, a **horizontal scale** and **labels**, which tell us what each row represents.
2. Discuss how the graph is labelled, and identify the importance of the labels for reading the information. (the title, the axes, the scale)
3. Ask pupils to tell you what information they can read from the graph (such as 'soccer is the most popular sport' or 'very few pupils chose karate as their favourite sport').
4. You could also ask questions requiring them to read information from the graph such as: How many pupils preferred netball? Which is more popular, basketball or rugby?

## C1a

When all the pupils have revised the features of a bar graph ask them to work in groups of three or four to complete the next activity.

Explain that pupils must collect data for a bar graph similar to the example above. Have each group work on a different graph such as favourite sports, favourite colours, favourite fruits, school subjects, favourite food, favourite drink, etc.

Ask each group to prepare a table to collect data from the whole class. If your class is very small you could allow pupils to go and collect data from other classes in the school, to make their graphs more interesting.

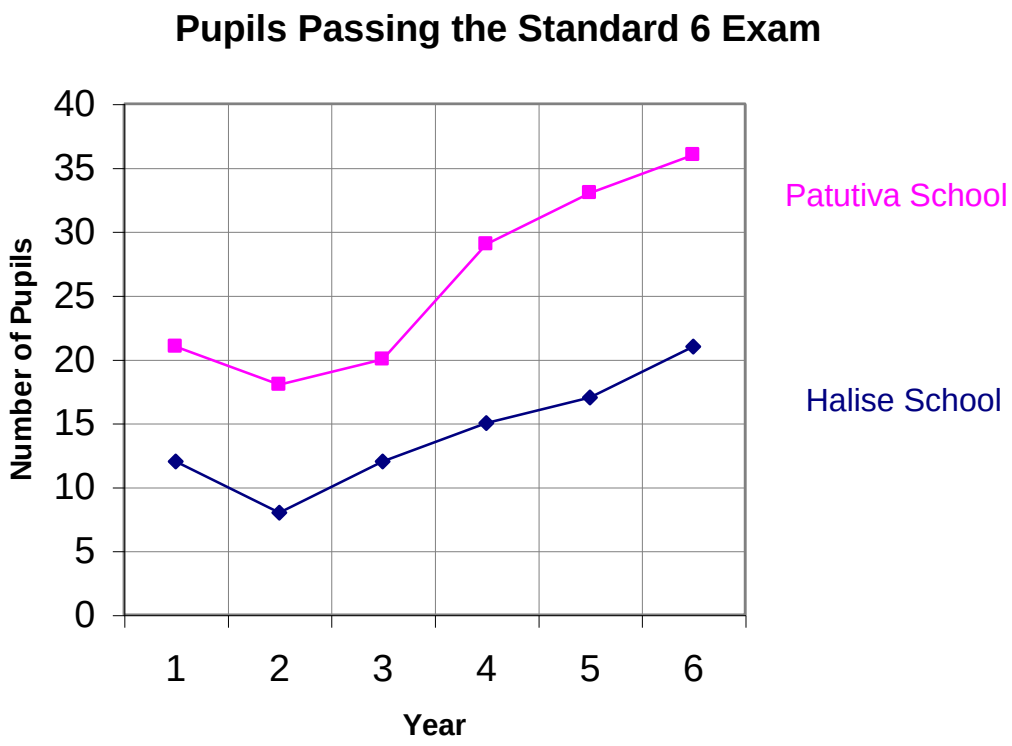
Have them use the data to design and construct a **vertical** bar graph.

As they work remind them to **label their axes** and **decide on a suitable scale**. Help them with the activity and encourage them to discuss it as they go along. If there is time each group could present their graph to the class and answer questions about it.

T1b

This lesson is revision of the features of **line graphs**, which were covered in Standard 5 Unit 14.

A **line graph** is another way of representing data. It shows information by joining the plotted points on a graph with a line. They are usually used to show how something has changed over time, so the x axis (horizontal) often shows a time period, such as the months of the year or a series of years, for example.




Line graphs may have **more than one line** so that different sets of data can be compared. In the example above the Standard 6 exam results of two schools over 6 years are compared.

Draw the example on the board and discuss it with the class Ask them to interpret the information in the graph by answering some questions such as.

1. Which school has a larger Standard 6 class? **(Patutiva)**
2. In which year did the lowest number of pupils pass the Standard 6 exam? **(2000)**
3. How many pupils from each school passed the Standard 6 exam in 2002? **(Patutiva 29, Halise 15)**
4. What changes does the graph show over time? **(Gradually more and more pupils are passing the Standard 6 exam.)**

5. Why do you think there was a low point in 2000? **(This could be because of the effects of the ethnic tension on education.)** … and so on.

Revise the importance of a **title** and choosing a suitable **scale** for a line graph. Remind pupils that the **axes** must be labelled clearly to show exactly what data is presented. Remind them too that if their line graph shows more than one line, each should be clearly labelled. If possible a different colour should be used for each different line. This makes reading the graph easier. A **key** can also be used to identify the different lines.

## C1b

Ask the pupils to work in pairs for this activity.

Explain that they are going to construct their own line graph to compare the attendance of Standard 6 pupils at school in two different weeks.

Use the records from your school register to complete the table below together. Choose two weeks where the attendance was quite different, for example because the weather was bad or because some pupils were sick.

| | Number of Pupils Attending Each Day | | | | |
|---|---|---|---|---|---|
| | **Monday** | **Tuesday** | **Wednesday** | **Thursday** | **Friday** |
| **Week 1** | | | | | |
| **Week 2** | | | | | |

Next split the pupils into pairs and have them plan and draw a line graph to represent the data you have discussed. Remind them that their graph will have a different line for each week and remind them to label the graphs clearly.

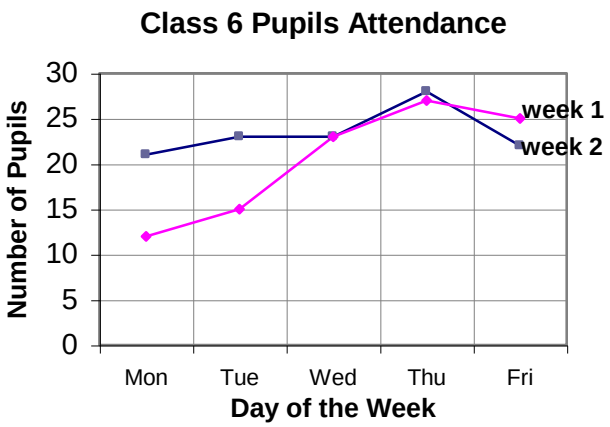
Remind the pupils that each point in their line graph should be marked with a small cross or a dot. The dots are joined with straight lines to make the line graph.

Remind the pupils to use their rulers to measure their scale to make their graphs as accurate as possible.

Below is an example of how the completed table (left) and graph (right) might look.

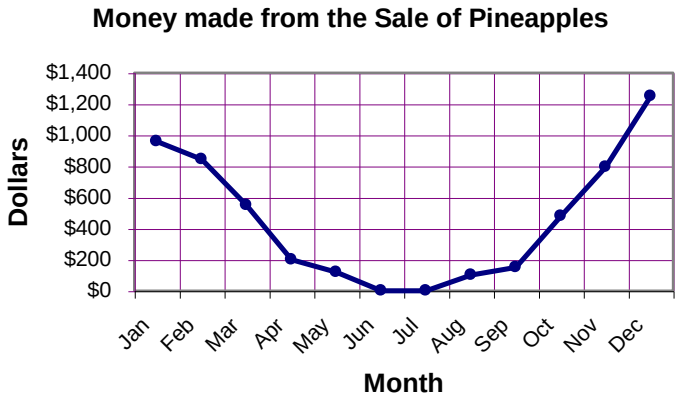
Check each pupil's work and discuss it with them as they work. When they have completed their graph have them work individually to complete the activities in the Pupil's Resource Book on page 73.

| | **Week 1 Attendance** | **Week 2 Attendance** |
|---|---|---|
| **Mon** | 21 | 12 |
| **Tues** | 23 | 15 |
| **Weds** | 23 | 25 |
| **Thurs** | 28 | 24 |
| **Fri** | 22 | 22 |

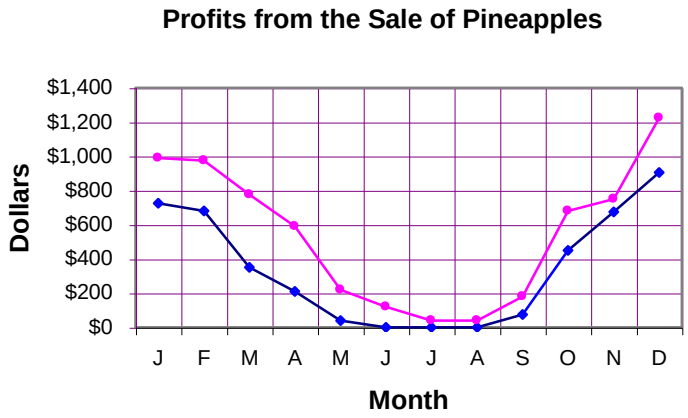


## Answers

### Activity A




### Activity B




### Activity C

1. December and January
2. June and July.
3. Each graph starts the year with higher figures and has a dip in the middle, then returns to high figures at the end of the year.
4. Pineapple is a seasonal fruit and the season falls around the end of the year, which is why profits are highest at this time.

Can all the pupils collect and show data on bar and line graphs?

## T2a

**Materials**

Nguzu Nguzu Poster, Sample Bar Graphs, chart paper, coloured pens

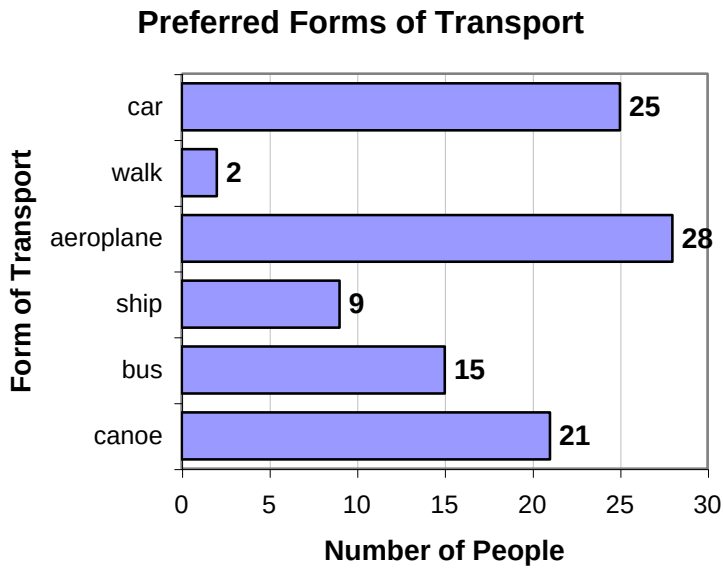
In this activity pupils extend their skills in **reading information** from bar and line graphs and learn how to use that information to calculate **totals**.

Explain that, as well as reading information from each column of a bar graph you can read some information from the graph as a whole.

Draw a simple bar graph on the board as shown on the following page.

Explain that the graph shows the results of a survey where people were asked which form of transport they preferred to travel on.

Ask the pupils to read some information from the graph to tell you how many people chose each of the different categories. Write the figures on the graph as the pupils tell you their answers, as shown.




Next ask pupils some more questions which require them to add more than one column together, for example:

1. How many people preferred to travel by sea? **(canoe + ship, 21 + 9 = a total of 30)**
2. How many people preferred to travel by motor vehicle? **(car + bus, 25 + 15 = 40)**

… and so on.

Next ask if any pupils can tell you how to work out the **total number of people** who were involved in the survey.

To do this they need to add together the total of all the rows in the bar graph. Allow them time to work out the total individually and check that they have got the right answer. **(100)**

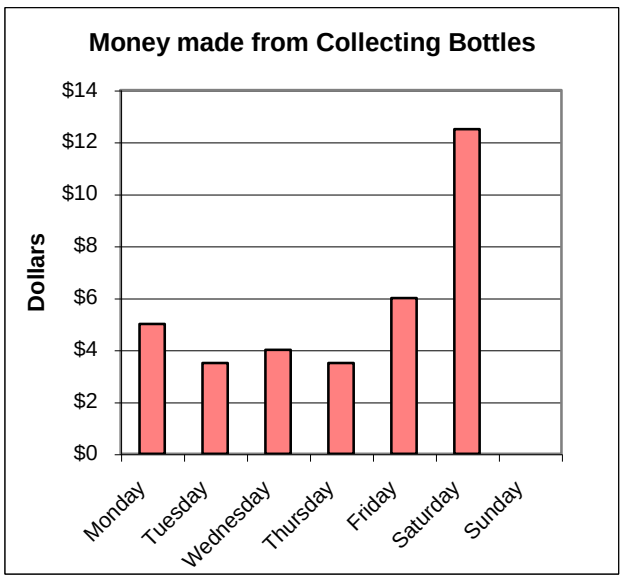
Provide some more examples of simple graphs and allow pupils to practice calculating totals from the graphs.

## C2a

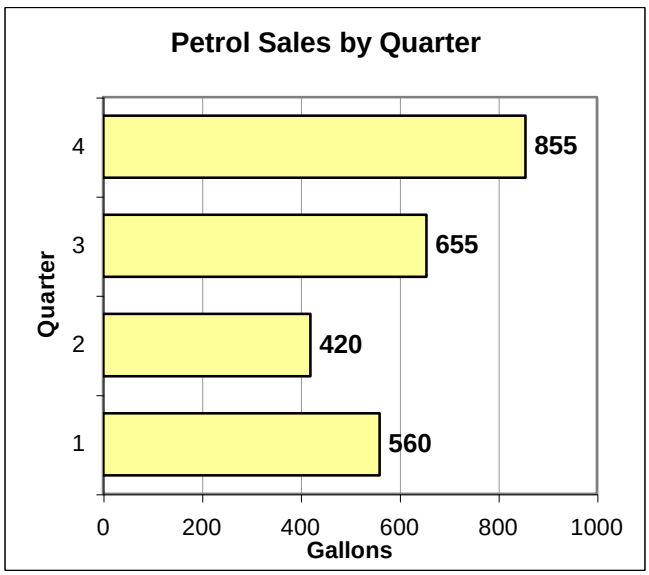
Before the lesson, prepare the sample bar graphs provided for this activity. Cut each poster in half. You need enough for one graph for each group when your class is working in groups of three.

You could also add your own ideas and prepare some graphs of your own on chart paper. Make sure that you use some vertical and some horizontal bar graphs.

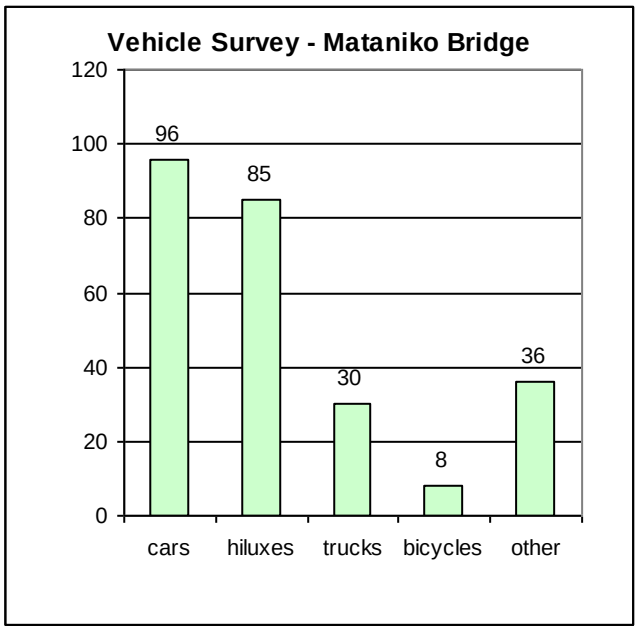
**Graph 1**



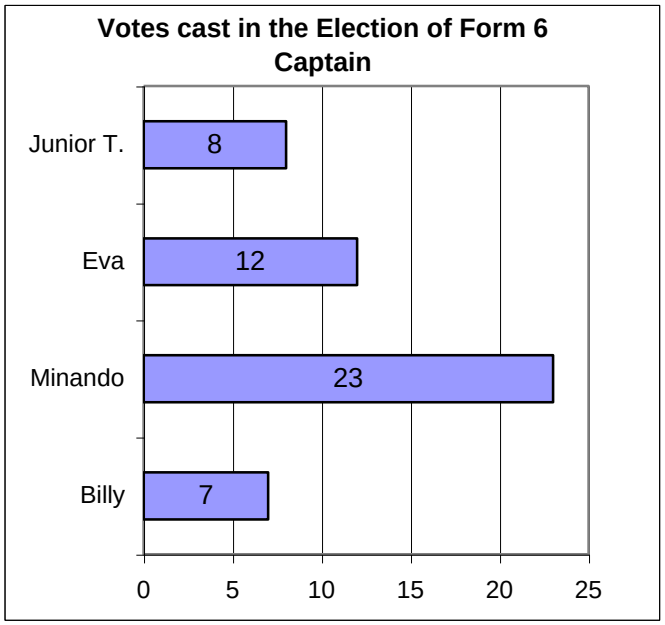

**Graph 2**



**Graph 3**




**Graph 4**




Ask the pupils to work in groups of three.

Give each group one of the graphs you have prepared on chart paper. Tell the pupils to study their graph carefully and discuss what information it shows.

Ask them to think up three questions about the information on the graph and write these on a piece of paper. The questions should all be about the information on the graph for example:

- How much money was made from collecting bottles at the weekend? (graph 1)
- What was the total number of pupils to vote in the class election? (graph 4)
- How many trucks and hiluxes were counted in the survey? (graph 3)
- How much petrol was sold in the last 6 months of the year? (graph 2)

They should work out the answers to their questions too and write these on a different piece of paper.

When each group has prepared three questions, tell them to swap their graph and their questions with another group. They then have to work out the answers to the questions they have been given by reading information from the graph.

At the end of the activity have the groups check and discuss each other's answers.

Try and get each group to work with as many graphs as possible.

T2b

**Materials**

Number cards for the "Pick a Number" game
scrap paper

In this activity pupils revise how to **calculate averages** and then use information from bar and line graphs to calculate average figures.

Explain that we can also use the information on a graph to calculate an **average** of the totals shown. Pupils learnt how to calculate averages in Standard 5, Unit 7. You will need to revise this with them.

Ask pupils to explain the meaning of the term **average**.

Technically, the average **is the total of a series of numbers divided by the number of numbers in the series** but pupils should also be able to tell you that an average tells you the most common or usual amount – or the approximate middle of the range of numbers.

Ask them to tell you why it might be useful to know an average. (**An average gives you a general overview of a range of data.**)

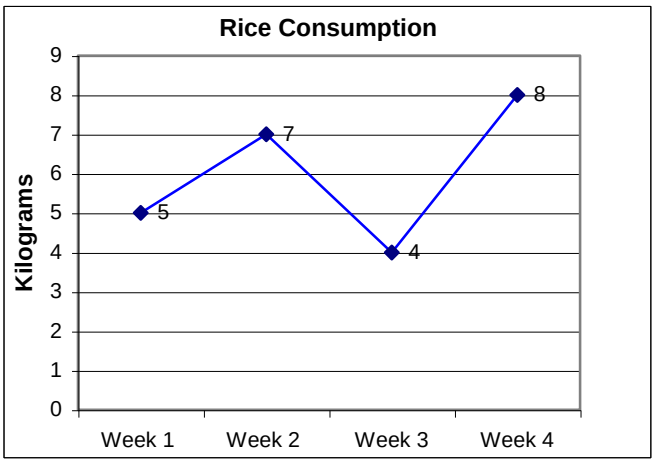
Work through the following example to revise the method for calculating an average.

Draw the line graph shown on the right on the board

It shows how much rice was used to feed a family each week for four weeks.

Ask pupils to tell you how many kilograms of rice the family ate in the four weeks **in total**. **(24)**

Then ask them to explain how to calculate the average amount of rice eaten each week.




Find the total for 4 weeks:

**5 + 7 + 4 + 8 = 24**

Divide the total by the number of weeks:

**24 ÷ 4 = 6** So the family eats an **average** of **6 kg** of rice a week.

Ask pupils to explain **why** it might be useful to know this information. It may help the family to plan their budget, or to do their shopping for example.

If there is a ship from Honiara once every 8 weeks, ask the pupils to work out how much rice the family would need to bring on the ship to meet their needs. **(6 kg x 8 = 48 kg)**

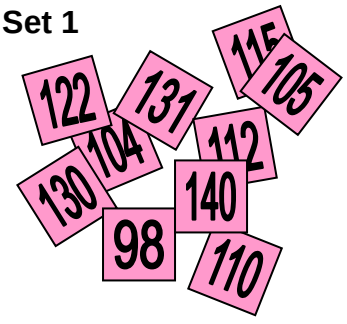
Do some more examples with the class using line and bar graphs. You could use the bar graphs 1 and 4 from the C2a activity above for example. Ask the pupils to calculate the daily average amount of money raised from collecting bottles or the quarterly or monthly average petrol sales.

## C2b

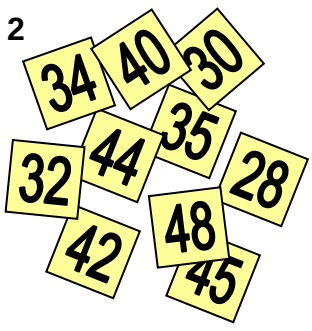
**Pick a Number Game**. This game gives pupils' practice with finding averages. You can play it as a whole class to begin with and then split into groups of five for more practice.

Prepare the sets of number cards provided. There are 10 cards in each set. The numbers are from a similar range in each set for example:

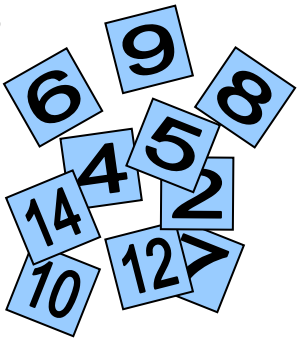
**Set 1**




**Set 2**




**Set 3**



**How to Play**

Place one set of cards face down on the table and mix them around.

Ask five pupils to turn over **one** card each, at the same time, (or each player if you are playing in groups of five).

Using scrap paper and a pencil, the players then have to work out the average of the numbers shown on the cards as quickly as they can. Tell them to round their answers to the nearest whole number. The first pupil to get the correct answer wins a point and then the cards are shuffled again for the next round.

Other players should be allowed time to check the winner's answer to make sure that it is correct.

The game can be varied to make it more or less difficult. To make it easier, use lower numbers and only turn over three or four cards at a time. To make it more difficult use higher or more difficult numbers and turn over 6 or 7 cards at a time.

When playing in groups you can organise the groups by ability so that each child gets practice at the level they need.

When they have had enough practice ask pupils to complete the activities in the Pupil's Resource Book on page 74. These provide more experience for the pupils in calculating totals and averages from bar and line graphs. Read through the activities together to make sure they understand the questions before they do their work individually.

**Answers**

**Activity A**

**1.** $325
**2.** $165
**3.** The boys
**4.** $65
**5.** $65

**Activity B**

**1.** 2003 - 1,152 mm  2004 - 1,848 mm
**2.** Highest - Feb 2004 (235 mm), Lowest - Aug 2003 (20 mm)
**3.** 96 mm
**4.** February. The average February rainfall is 217.5 mm
**5.** 175.5 mm
**6.** 51 mm (May to October 2003)

**Activity C**

**1.** $1,350
**2.** $6,900
**3.** $1,150
**4.** $225
**5.** April
**6.** 7
**7.** $14,250
**8.** $962.50

? Can all pupils read bar and line graphs and use the information to calculate totals and averages?

## T3a

**Materials**

chart paper , rulers coloured pencils, Solomon Islands Population Chart

In this activity, pupils revise important information on how to construct a **bar graph** and practice constructing bar graphs from given data.

Before the lesson you need to prepare the chart to show the population of Solomon Islands.

Revise the important points about **constructing bar graphs**. You could do this by asking some pupils to explain each one to the class.

What is a bar graph, and what different types of bar graphs are there?

**A graph that uses columns (vertical) or rows (horizontal) to represent data.**

What are bar graphs useful for?

**Comparing different categories of things, showing the results of a survey.**

What is the meaning of the terms axis (singular) and axes (plural)?

**The vertical and horizontal lines on a graph that show what is being represented. The vertical axis is called the** y-axis **and the horizontal axis is called the** x-axis.

How should you choose a suitable scale for a bar graph?

**Look at the data you want to represent, especially at the range of data – your scale should cover the range of data you need to show. Look at the size of your paper to help you decide the scale.**

What labels should you add to a bar graph?

**Each** axis **should be labelled and the graph should have a** title**. It may also be helpful to add the** total figures **for each row or column. Where more than one series of data is represented** a key **might also be added to explain each series.**

When you are satisfied that all the pupils understand how to construct a bar graph, explain that they are going to work in small groups to design and construct their own bar graph to show the population of Solomon Islands by province.

Show them the chart you have prepared as shown on the right.

Explain that these are the **real population figures** taken from the population census in 1986 and 1999.

Look at the table together and discuss the information it contains. Ask the pupils some questions to make sure that they understand all the information in the table. For example:

What was the population of Honiara in 1986? **(30,413)**

What was the population of Central Province in 1999? **(21,577)**

Which provinces have the largest and smallest populations? **(Malaita and Rennell Bellona)**

| | **1986** | **1999** |
|---|---|---|
| Choiseul Province | 13,569 | 20,008 |
| Western Province | 41,681 | 62,739 |
| Isabel Province | 14,616 | 20,421 |
| Central Province | 16,655 | 21,577 |
| Rennell-Bellona Province | 1,802 | 2,377 |
| Guadalcanal Province | 49,831 | 60,275 |
| Malaita Province | 80,032 | 122,620 |
| Makira-Ulawa Province | 21,796 | 31,006 |
| Temotu Province | 14,781 | 18,912 |
| Honiara City Council | 30,413 | 49,107 |
| **Total Population** | **285,176** | **409,042** |

By how many did the population of Solomon Islands increase between 1986 and 1999? **(123,866)**

Pupils could study the table and make up their own questions to ask each other in pairs, too.


Explain that the class will split into small groups and each group will make bar graphs to show the population figures from the table.

You can split the class according to ability and ask each group to draw a different graph suited to their level of ability.

For example, an easy graph might be to show how the population of only one or two provinces changed over the two different years of the census; a more difficult one might be to show all the provinces for one census and the most difficult might be to draw a graph comparing the figures for both census years.

Explain that the pupils will first need to **round the figures on the table to the nearest thousand**, because they will not be able to show the exact detail on their graphs. For example, the total population will be rounded to 285,000 in 1986 and 410,000 in 1999.

Remind them to **choose a suitable scale** for their graphs and to **draw a sketch first** before they draw their final graph on chart paper.

As they work move around the class and help them with their planning. Make sure they are discussing their work in their group.

Pupils may need two lessons to complete this activity.

## T3b

In this activity pupils revise important information on how to construct a **line graph** and then practice constructing a line graph from given data.

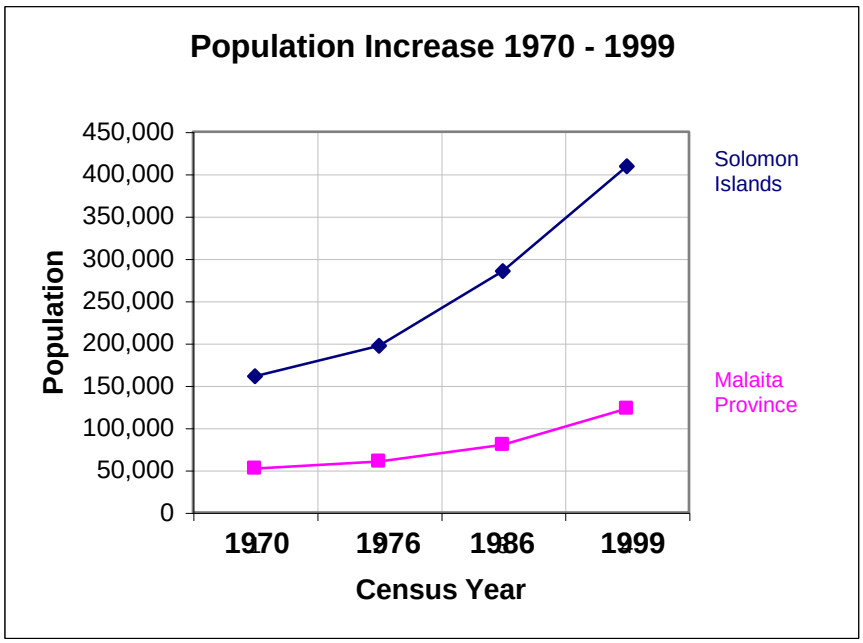
First revise the **difference between a bar graph and a line graph**. A line graph is often used to show how something has changed over time. The information is presented by joining a series of points plotted on a graph and joined with a line.

Draw the table below on the board. It shows the total population of Solomon Islands and the population of Malaita Province in four different census years.

As a class look at the table and work together to construct a line graph to show how the population has changed since 1970. Talk about the **scale,** how to **label the axes**, how to **plot the points** and how to **label the graph**, encourage the pupils to discuss their ideas and make suggestions. **Round** the figures to the nearest thousand before beginning.

| **Population** | **1970** | **1976** | **1986** | **1999** |
|---|---|---|---|---|
| **Solomon Islands** | 160,998 | 196,823 | 285,176 | 409,042 |
| **Malaita Province** | 51,722 | 60,043 | 80,032 | 122,620 |

Begin by drawing only the line for the total population and then plot and add a second line to show the population of Malaita. Your finished graph might look like the one below.



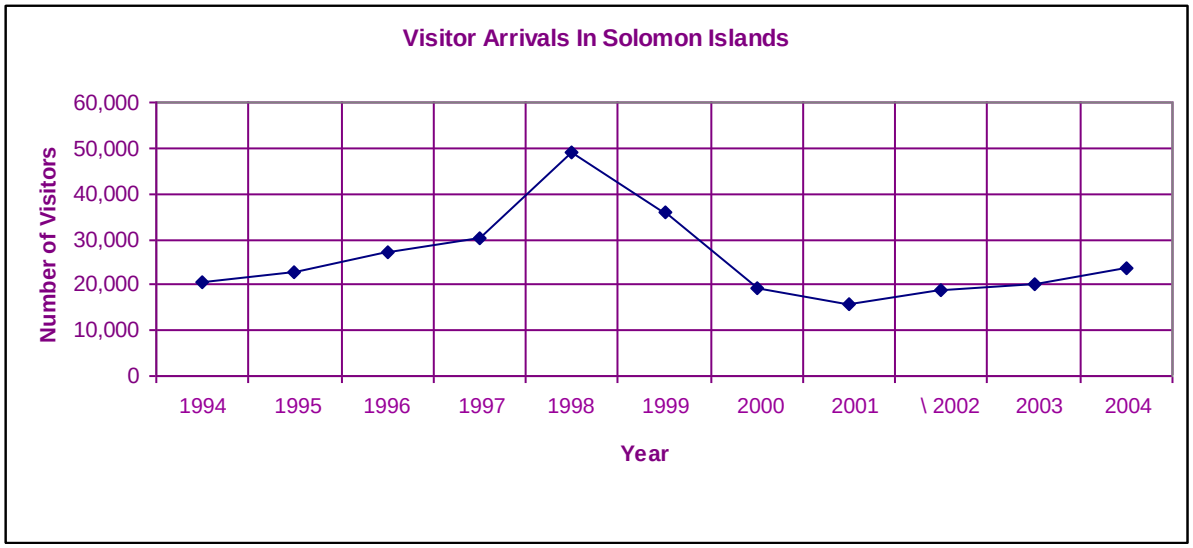

Ask some questions about the graph to check that pupils can **read** the information correctly, and **interpret** it too. Such as:

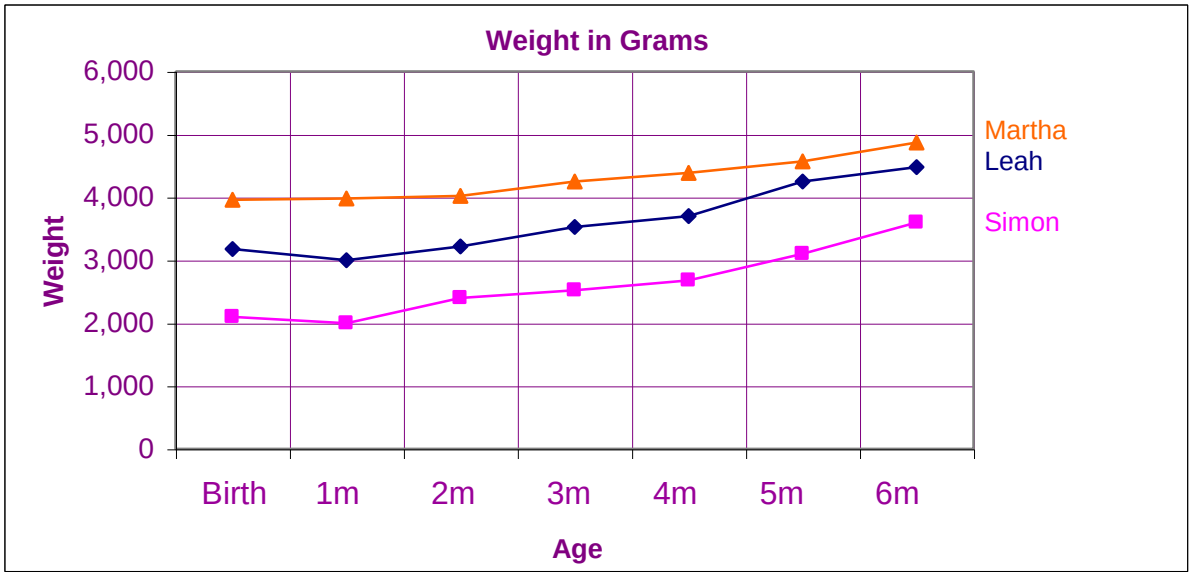
What trend does the graph show, an increase or a decrease in population?

If you think that your pupils need more practice constructing line graphs provide some more data so that they can do some more examples together.

## C3a

The activities in the Pupil's Resource Book on page 76 give more practice constructing line graphs from given data. Read through the instructions and discuss the data tables with the pupils as a class before setting them to work individually to complete the activities.




### Activity C

You will need to check each pupil's work individually and discuss it with him or her.

Can all the pupils present detailed statistical information on bar and line graphs?

# Extension and Support

## Support Activities

For pupils who still have difficulty working with the different types of graph you have covered in this unit you should provide more practice to help them read and interpret information from graphs and present their own data in graphic form.

Work closely with these pupils and encourage them to talk about their work to reinforce the skills and vocabulary you have taught them.

**Some suggested activities**:

**Collecting data** on tally charts from the class and turning these into graphs is a good activity because information about their own classmates or family is easy for pupils to identify with and understand. Some topics you might use are as follows:

> favourite foods, hobbies, age, height, weight, number of brothers and sisters, date of birthdays … and so on.

**Display**. Providing simple graphs on charts to display around the classroom wall and encouraging pupils to discuss them is a good idea. Most of the work pupils have done in this unit would make a really interesting display.

**Making graphs over a period of time** may help pupils to understand how line graphs show changes over time. For example you could make a graph of how many pupils are late each morning for two weeks; you can add a new column or plotting a new point for each day of the week.

## Extension Activities

For pupils who understand graphs well and need to extend their skills you could provide exploratory activities which encourage them to work independently and think for themselves.

Because graphs are so useful in so many other subjects you should encourage them to use ideas from other subjects and develop cross-curricular themes as well as linking in with other units of the maths curriculum.

**Some suggested activities**:

**Dice games:** Pupils can use different numbers of dice to collect and graph data. For example, throwing two dice 100 times and recording the results on a graph. They can link this to their probability work

**Research tasks:** Give the pupils a problem or challenge to research and show their findings in the form of a graph or series of graphs and then interpret their results. For example:

> Find out whether there is any difference in the number of girls and boys enrolled in the school between Prep and Standard 6.
>
> Find out the average age for each class between prep and Standard 6.

**Converting graphs**: Ask pupils to convert information from a pie chart to a column graph or vice versa, or to present the same information in different graphic forms.

## Check Up Page: Answers

**1a.** electricity
**1b.** food
**1c.** just over one quarter
**1d.** $1,080
**1e.** about $500
**1f.** $300
**1g.** about 10%
**1h.** $170

**2a.**

**Fish Caught**


**2c.**

**Money Raised from the Sale of Fish**


The angles in this graph should be as follows: bonito 130º, Spanish mackerel 100º, yellow fin 50º, marlin 46º and kingfish 34º.

**2b.**

| | Marlin | Spanish Mackerel | Kingfish | Bonito | Yellow fin |
|---|---|---|---|---|---|
| **total sales** | $1,380 | $3,000 | $1,020 | $3,900 | $1,500 |

**3a.** December, 32
**3b.** May, 6
**3c.** 204
**3d.** 17
**3e.** October - December, 28 and April - June, 9. The difference could be explained because October to December is the wet season, when there are more mosquitoes around.

**4a.** James - 1,260 litres
Ratah - 1,080 litres
Solo - 390 litres

**4b.** James – 252 litres
Ratah – 216 litres
Solo - 78 litres

**4c.** 370 litres more

**4d.** 546 litres
**4e.** 210 litres
**4f.** 560 litres

**4g.** Check each pupil's table individually as there are different ways in which they could have designed it. A suggested answer is shown below:

| Coconut Oil Production | | | | | |
|---|---|---|---|---|---|
| | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
| James | 170 L | 250 L | 250 L | 290 L | 300 L |
| Ratah | 150 L | 200 L | 230 L | 250 L | 250 L |
| Solo | 50 L | 80 L | 80 L | 90 L | 90 L |

**5.** You will need to check each pupil's work individually and discuss it with him / her.

Unit 7

# Number Topic 4: Percentages

**Aim:**

To extend the pupils' understanding of percentages by practical calculation work involving percentages as well as using percentages in problem solving.

**Sequence of objectives:** To

1. make simple calculations involving percentages.
2. calculate percentage increase.
3. solve problems involving percentages.

**Rationale:**

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

## T1a

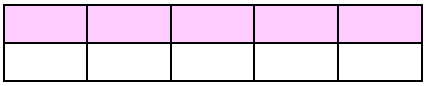
**Materials**

Percentage/Fractions card game

In this lesson pupils will revise the work which they did in Standard 5, Unit 16 on percentages.

Write **%** on the board. Ask the pupils what this sign means. **(per cent)** Can the pupils explain what this means? Remind them that **per cent** means **in every hundred.** So 5% means 5 in every hundred or $\frac{5}{100}$. 5% is called a **percentage**. 100% of something is **all of it**.

Draw these shapes on the board. Ask the pupils what percentage of the whole is shaded.



The shape has 10 rectangles.

10 is 100%.

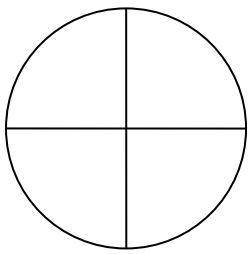
5 out of 10 are shaded.

$\frac{5}{10} = \frac{1}{2}$ $\frac{1}{2}$ of 100% = 50%.

Now 4 out of 10 are shaded. $\frac{4}{10} = \frac{2}{5}$.

$\frac{1}{5}$ of 100% = 20%

so $\frac{2}{5}$ = 40%



Tell the pupils that this cake has been divided into four equal pieces. What percentage of the cake is each piece? **(25%)**

If I eat three pieces of cake what percentage of the cake have I eaten? **(75%)**

Can the pupils write 75% in a different way?

75% means 75 out of 100 or $\frac{75}{100}$. Ask the pupils how I can make this fraction simpler or write it in its simplest form. If you can divide the **numerator** and **denominator** by the same number you can simplify this fraction. There are different ways of doing this. Here is one way.

$\frac{75}{100}$ divide by 5 = $\frac{15}{20}$. Now divide by 5 again = $\frac{3}{4}$

Ask the pupils to change these percentages to fractions and put them in their simplest form.

| 50% | 25% | 80% | 60% | 16% |
|---|---|---|---|---|
| $(\frac{1}{2})$ | $(\frac{1}{4})$ | $(\frac{4}{5})$ | $(\frac{3}{5})$ | $(\frac{4}{25})$ |

## C1a

Prepare some cards before the lesson for this activity. This is a memory game in which the pupils practise recognising fraction / percentage equivalence. One example of a set of cards is shown below. You could make more difficult sets for your more able pupils.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **50%** | $\frac{1}{2}$ | **25%** | $\frac{1}{4}$ | **100%** | **1** | **40%** | $\frac{2}{5}$ |
| **10%** | $\frac{1}{10}$ | **20%** | $\frac{1}{5}$ | **75%** | $\frac{3}{4}$ | **15%** | $\frac{3}{20}$ |
| **60%** | $\frac{3}{5}$ | **80%** | $\frac{4}{5}$ | **30%** | $\frac{3}{10}$ | **99%** | $\frac{99}{100}$ |

**How to Play**

Put the pupils into small groups and tell them to shuffle the cards and place them face down on the table. The pupils should take turns to turn over two cards.

They are trying to find two which have the **same value**. If they turn up two and they do not match they must turn them back over again without changing their place. The others must try and remember what the cards were. If they turn two over which do match they have won that pair and they have another turn.

When all the cards are used up the pupil with the most pairs is the winner.

As the pupils play the game, go around the groups and check that all pupils are taking part and that they understand the relationship between the percentage and the fraction. If some pupils are having difficulty you may want to do some support activities with them before they move on.

When the pupils have played the game through once or twice ask them to complete the activities in the Pupil's Resource Book on page 81.

**Answers**

**Activity A**

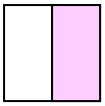
**1.** 40%
**2.** 15%
**3.** 21%
**4.** 75%
**5.** 50%

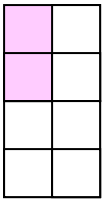
**Activity B**

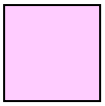
**1.** **a.** 10% **b.** 70% **c.** 30%
**2.** **a.** 20% **b.** 60% **c.** 40% **d.** 80% **e.** 100%
**3.** **a.** 50% **b.** 25% **c.** 75% **d.** 10% **e.** 30% **f.** 80%
**4.** **a.** 48% **c.** 60% **e.** 80%
**b.** 70% **d.** 34% **f.** 48%

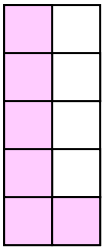
**Activity C**

Here are some examples of correct answers. You will need to mark each pupil's work individually as there are many different right answers.

**1a.** 

**1b.** 

**1c.** 

**1d.** 

**2. a)** $\frac{1}{2}$ **b)** $\frac{3}{4}$ **c)** $\frac{2}{5}$ **d)** $\frac{6}{25}$

**3. a)** $50 **b)** 25 metres **c)** 30 cents **d)** $22.50

**4. a)** 85% **b)** 15%

**5.** 90%

## T1b

**Materials**

Bingo cards
counters or small stones

This lesson revises the relationship between percentages and decimals.

Remind the pupils that percentages can also be written as decimals. Go through some examples with the class. They should remember this from Standard 5. It also builds on the work they have completed in Standard 6 Unit 3.

**Example 1** 75% means 75 out of a hundred or $\frac{75}{100}$

This can be written as 75 ÷ 100 = 0.75

So 75% = 0.75

**Example 2** 9% means 9 out of 100 or $\frac{9}{100}$

This can be written as 9 ÷ 100 = 0.09

So 9% = 0.09

Use some more examples until the pupils understand the equivalence. Here are some examples you could use:

35% **(0.35)** 8% **(0.08)** 50% **(0.5 remember you can leave off the 0)** 58% **(0.58)**

Now ask the pupils if they can change a decimal into a percentage. This is the opposite of the rule you have just revised.

Encourage them to come up with a strategy. Lead them to change the decimal back to **hundredths**, and then write this as a percentage, such as:

$0.85 = \frac{85}{100} = 85\%$ $0.04 = \frac{4}{100} = 4\%$ $0.3 = \frac{30}{100} = 30\%$

Give the pupils some more examples to work out to reinforce this strategy.

## C1b

**Percentage Bingo**

Write a list of 20 different **decimals** on the board as shown below:

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0.5 | 0.25. | 0.75 | 0.8 | 0.6 | 0.1 | 0.2 | 0.3 | 0.4 | 0.12 |
| 0.45 | 0.01 | 0.12 | 0.09 | 0.17 | 0.05 | 0.85 | 0.99 | 0.7 | 0.92 |

Ask the pupils to draw a 3 x 3 grid in their exercise books and choose 9 different decimals from the board to place in the squares of their grid. Their grid might look like this.

| | | |
|---|---|---|
| **0.5** | **0.75** | **0.09** |
| **0.12** | **0.25** | **0.8** |
| **0.45** | **0.01** | **1** |

The pupils will also need some counters or small stones.

Call out the **percentages** from the list below in random order.

50% 25% 75% 80% 60% 10% 20% 30% 40% 12%

45% 10% 12% 9% 17% 5% 85% 99% 7% 92%

If pupils have the equivalent decimal on their card they can cover it with a counter or a stone. The first pupil to have covered a line of three (either vertical, horizontal or diagonal) can call out bingo. If all their numbers have been correctly covered, they win the game

You could also play this game the other way round. The pupils write percentages on their grid, and you call out decimals. Here is an example of a percentage Bingo card.

| | | |
|---|---|---|
| **100%** | **3%** | **32%** |
| **60%** | **25%** | **7%** |
| **8%** | **55%** | **1%** |

When the pupils have played the game a few times have them complete the activities in the Pupil's Resource Book on page 82.

## Answers

### Activity A

**1.** **a.** 0.5 **b.** 0.18 **c.** 0.33
**d.** 0.85 **e.** 0.52 **f.** 0.7
**g.** 0.4 **h.** 0.1

**2.** **a.**35% **b.** 100% **c.** 91%
**d.** 43% **e.** 22% **f.** 90%
**g.** 56% **h.** 5%

**3.** **a.** 1.0, 100% **b.** 70%, 0.7 **c.** 0.8 80%
**d.** 0.07, 7% **e.** 0.08, 8%

### Activity B

**2.** **a.** 0.13 **b.** 0.81 **c.** 0.9
**d.** 0.6 **e.** 0.2 **f.** 0.09
**g.** 0.06 **h.** 0.02 **i.** 1.0

**3.** **a.** 37% **b.** 72% **c.** 50%
**d.** 30% **e.** 70% **f.** 5%
**g.** 3% **h.** 7%

### Activity B

**1.**

| Percent-age | Fraction | Decimal |
|---|---|---|
| 50 | $\frac{1}{2}$ | 0.5 |
| 60% | $\frac{3}{5}$ | 0.6 |
| 100 | $\frac{5}{5}$ | 1.0 |
| 3 | $\frac{3}{100}$ | 0.03 |
| 35% | $\frac{7}{20}$ | 0.35 |
| 80 | $\frac{4}{5}$ | 0.8 |
| 1% | $\frac{1}{100}$ | 0.01 |

## T1c

In this lesson pupils apply the numerical concept of finding percentages to real problems by making calculations to find the percentage of a quantity.

Give the pupils this problem and allow them time to try to work out the answer with a partner

**Four men helped unload a ship. The captain gave them $300 to share.**

**What percentage of the money would each man get? How much would that be?**

After discussing it with their partner ask pupil to explain orally how they would do this. Write their ideas on the board.

They should be able to tell you that each man should get 25% of the money.

There are different ways to calculate how much this would be. Accept any of these methods from the pupils and explain it clearly with examples to the rest of the class. You decide whether to teach all three methods or not depending on the ability of your class. Less able pupils may find it easier to learn only one method.

**Method 1: Change the percentage into a simplified fraction**.

25% = ▯ Then the sum is ▯ of $300

Remember that **of** in maths means **multiply.**

So $\frac{1}{4}$ x $\frac{300}{1}$ = $\frac{300}{4}$ = $75

Tell the pupils that, to multiply two fractions, we multiply the numerator and we multiply the denominator. In this case 1 x 300 = 300 **(numerator)** and 4 x 1 = 4 **(denominator)**

Remind the pupils that 300 is the same as $\frac{300}{1}$.

$\frac{300}{4}$ is an **improper fraction**. This means the numerator is bigger than the denominator. So 4 is divided into 300 to find how many whole numbers are there. The answer is 75. So 25% of $300 is **$75.**

**Method 2: Change the percentage into a fraction and multiply.**

25% = $\frac{25}{100}$

So 25% of $300 = $\frac{25}{100}$ x $\frac{300}{1}$

Multiply the **numerators and the denominators.** $\frac{7500}{100}$ **= $75**

**Method 3: Change the percentage into a decimal.**

You may need to revise the multiplication of decimals with the pupils here.

Change the percentage into a decimal

So 25% = 0.25

Now the sum is 0.25 of 300

$$\begin{array}{r} 3\,00 \\ \times\ 0.25 \\ \hline 15\,00 \\ +60\,00 \\ \hline 75.00 \end{array}$$

So 25% of $300 = **$75**

The pupils learnt how to multiply decimals by whole numbers in Unit 5. They worked out where to place the decimal point by counting how many decimal places were in the original sum.

In multiplication 300 x 0.25 is the same as 0.25 x 300 so the method they have used is the same.

Work through some more problems with the class. Here are some you could use:

**1.** Two girls shared 30 oranges between them. They each had 50% of the oranges. How many oranges did they each get? **(15 oranges)**

2. Joanne bought 600 m of material to make curtains. She gave 9% of it to her friend. How much material did her friend have? **(54 m)**
3. What is 30% of $120? **($36)**

## C1c

If you have taught all three methods, have pupils work in groups of three for this activity, each one using a different method. When they have finished their calculation have them compare answers and see if they are the same.

If pupils have not learnt all three methods, they can choose the method they use. Remind them that it doesn't matter which method they use. The answer should be the same.

Let the pupils work in pairs. Write these percentage problems on the board.

| | | | |
|---|---|---|---|
| **a.** 10% of 60 eggs | **(6 eggs)** | **b.** 50% of 28 pupils | **(14 pupils)** |
| **c.** 25% of 12 boxes | **(3 boxes)** | **d.** 20% of 100 bottles | **(20 bottles)** |
| **e.** 75% of $50 | **($37.50)** | **f.** 100% of $139 | **($139)** |

Follow up this activity with a whole class discussion about which method they think is easiest and mark their answers together.

When the pupils understand how to work out the percentages using different strategies let them complete the activities in the Pupil's Resource Book on page 83.

### Answers

**Activity A**

**1.** **a.** $8 **b.** 10 logs **c.** 17.5 kg **d.** 45 m **e.** 30 cents **f.** 57 girls
**2.** 50%
**3.** 48 minutes
**4.** 30
**5.** 50 minutes

**Activity B**

**1.** **a.** $24 **b.** 6 books **c.** 1 tomato **d.** 900 people **e.** 180 pineapples **f.** $112.50
**2.** **a.** $77 **b.** 25% **c.** 40 watermelons **d.** 10% **e.** 64 kg

**Activity C**

**1.** **a.** 100 g **b.** 250 mL **c.** $1.20 **d.** 1.5 m **e.** 1.4 t or 1,400 kg **f.** 3.25 cm
**2.** $2
**3.** 75%
**4.** **a.** 5 km **b.** 1 km
**5.** **a.** $11.25 **b.** $3.75

? Can all the pupils make simple calculations involving percentages?

## T2a

In this lesson pupils will learn how to calculate **percentage increases**.

When a total quantity increases by a given amount the percentage increase can be calculated. Explain this to the class using this example:

**In Halise school there were 120 pupils in 2003. In 2004 this number had gone up to 132. What was the percentage increase?**

The first or **original** number is 120 = 100%.

In 2004 there were 12 more pupils in the school (132 – 120 = 12).

Can the pupils work out what % the number has gone up by or the **percentage increase**?

$$\frac{\text{Increase}}{\text{Original}} \times 100\% = \frac{12}{120} \times 100\% = \textbf{10\% = percentage increase}$$

Tell the pupils to check their answer. They can work out what is 10% of 120. If the answer above is correct they should get **12.**

$$\frac{10}{100} \times \frac{120}{1} = \frac{1200}{100} = \frac{12}{1} = \textbf{12}$$ The answer is correct.

Try this with another example:

**Last year 50 pupils took part in sports day. This year 60 pupils took part. What was the percentage increase?**

The first or original number (50) is 100%. The difference in the number of pupils who took part is 60 – 50 = **10**.

Can the pupils work out what % the number has gone up by?

$$\frac{\text{Increase}}{\text{Original}} \times 100\% = \frac{10}{50} \times 100\% = \textbf{20\% = percentage increase}$$

Check the answer.

$$20\% \text{ of } 50 = \frac{20}{100} \times \frac{50}{1} = \frac{1000}{100} = \frac{10}{1} = \textbf{10}$$ The answer is correct.

When doing the multiplication, pupils may simplify their fractions by dividing numerator and denominator by the same number. The pupils have used this method before. The answer will be the same.

## C2a

The best way to make sure that the pupils understand how to calculate a percentage increase is to have them to talk through what they are doing (and why) with each other.

Let the pupils work in pairs. Encourage them to talk through the activities in the Pupil's Resource Book on page 84. They should check their answers each time too. This will reinforce the work they have done on percentages.

### Answers

### Activity A

**1. a.** 50% **b.** 100% **c.** 25%
**d.** 75% **e.** 10% **f.** 1%
**2.** 20%
**3.** 25%
**4.** 20%
**5.** 75%

### Activity B

**1. a.** 75% **b.** 30% **c.** 15%
**d.** 1% **e.** 60% **f.** 70%
**2.** 40%
**3.** 25%
**4.** 20%
**5.** 40%

**Activity C**

| 1. | Original Number | Final Number | Increase | Percentage Increase |
|---|---|---|---|---|
| **a.** | 40 | 72 | **32** | **80%** |
| **b.** | 200 | **210** | **10** | 5% |
| **c.** | **20** | 35 | 15 | **75%** |
| **d.** | **40** | **48** | 8 | 20% |
| **e.** | **84** | 168 | **84** | 100% |

**2. a.** 144 **b.** 12%
**3.** 1,632
**4.** 60%
**5.** 3 chickens

## T2b

This lesson reinforces the use of percentages by looking at money calculations. These have many practical applications in real life situations.

For example, when a store keeper sells goods he sells them for more than he paid for them. The original price he paid for the goods is called the **cost price**. The money he makes is called **profit.**

This profit is usually expressed as a percentage of the cost price. This is similar to a **percentage increase**.

Explain these concepts by working through an example with the class. Write this on the board:

**Example 1** A man bought a chain for $50. He then sold it for $65. What was his percentage profit?

Ask the pupils how they could find this out. They will remember the formula from the last lesson. Instead of putting in **increase** they can substitute it for **profit**. See if the pupils can tackle the problem and come up with this formula.

$$\frac{\textbf{Profit}}{\textbf{Cost Price}} \times 100\% = \textbf{percentage profit}$$

So $\frac{\$15}{\$50} \times 100\% = \mathbf{30\% = percentage\ profit}$

The pupils should see that they have found out the answer in exactly the same way as they calculated percentage increase. Go through another example with the class.

**Example 2.** A shop keeper buys T shirts at $15 and sells them at $18. What is her percentage profit? **(20%)**

Explain to the pupils that if a store keeper sells something at less than the cost price then he or she makes a **loss**. The percentage loss is calculated in exactly the same way as percentage profit. For example

**Example 3.** A shop keeper buys lollies at $5 and sells them for $4. What is her percentage loss?

$$\frac{\textbf{Loss}}{\textbf{Cost Price}} \times 100\% = \textbf{percentage loss}$$

So $\frac{\$1.00}{\$5.00} \times 100\% = \mathbf{20\% = percentage\ loss}$

Go through some more examples for extra practice. These are difficult concepts that pupils will need plenty of time to grasp.

Remind pupils to always write percentage loss or percentage profit in their answers. Make sure that all pupils understand the difference between **profit** and **loss**.

> **Profit** is the money made when an item is sold for **more than cost price.**
>
> **Loss** is the money lost when an item is sold for **less than cost price**.

## C2b

Ask the pupils to number from 1 to 10 in their exercise books. Ask them these questions orally. For each transaction they must write down whether a **profit** or a **loss** was made. Make sure that all the pupils work independently.

**1**. I buy a shirt for $18 and sell it for $20. **(profit)**

**1.** A farmer buys 10 ducks for $10 each and sells them all for $90. **(loss)**

**2.** A school buys exercise books for $3.50 and sells them for $3 each. **(loss)**

**3.** A shop keeper buys 10 watermelons for $8 each and sells them for $10 each. **(profit)**

**4.** I buy a heap of tomatoes for $2. There are 10 tomatoes altogether. I sell them for 25 cents each. **(profit)**

**5.** My mother buys some material for $20. She makes two dresses and sells them for $15 each. **(profit)**

**6.** A shop keeper buys a box of one dozen lollies for $8. He sells the lollies for 50 cents each. **(loss)**

**7.** I buy a goat for $50. It costs me $3 a week to feed it. After 4 weeks I sell it for $60. **(loss)**

**8.** The gardener buys 25 cabbage plants for $5. When the cabbages have grown she sells them for 50 cents each. **(profit)**

**9.** A trader buys 10 cartons of tinned fish for $500. There are 10 tins in each carton. He sells each tin for $6. **(profit)**

Let pupils exchange exercise books and mark their answers as a whole class activity. Talk through each one. Remember the pupils only have to work out whether there was a profit or a loss, not the percentage profit or loss.

When ready, pupils should complete the activities in the Pupil's Resource Book on page 85.

### Answers

**Activity A**

**1. a.** Profit
**b.** Loss
**c.** Profit
**d.** Profit
**e.** Loss
**2.** 25% percentage profit
**3.** 20% percentage profit
**4.** 10% percentage loss
**5.** 40% percentage profit

**Activity B**

**1. a.** 10% **b .**30%
**c.** 75% **d.** 150% **e.** 40%
**2.** 15% percentage profit
**3.** 25% percentage profit
**4.** 100% percentage profit
**5.** 75% profit

**Activity C**

**1.** 15% percentage profit
**2. a.** $72 **b.** 10% percentage profit
**3.** $4.50
**4 a.** 150% percentage profit
**b.** 150% percentage profit
**c.** $2,400

# T2c

**Materials**

Percentage/Fractions card game
Bingo cards

In this lesson pupils will continue using percentages when looking at bank interest rates.

Some background information is included here for you to read and understand before the lesson.

**Background Information**

People can save money by putting it into a bank. If they leave their money in the bank for a certain length of time the bank will pay **interest** on their savings. **Interest** is usually paid at a percentage rate per year.

In reverse, if you borrow money from a bank, you have to pay the bank interest on the loan. This is usually calculated as a yearly percentage of the amount borrowed.

The words 'per year' or yearly, are usually shortened to **p.a.** (this is from the Latin **per annum** which means **per year**). The interest is added to the balance. The **balance** is the total amount the person has in his/her account in the bank.

Write up this example on the board.

**Example 1**

Martha has $300 in the bank.

The bank pays her interest of 13% per year (p.a.)

**a.** How much interest will she earn in one year?

**b.** What will her balance be at the end of the year?

Explain to the pupils what **interest** and **balance** mean. Make your explanation simple so that all pupils can understand. Ask the pupils how they can find out the interest. They have done calculations like this before. They will have to find:

**a.** 13% of $300 $= \frac{13}{\cancel{100}_{1}} \times \frac{\cancel{300}^{3}}{1} =$ **$39.00** This is her **interest**.

**b.** $39.00 interest is added to the original sum, the **balance** is $300 + $39 = **$339**

Go through another example with the class. Here is one you could use.

**Example 2**

Patterson puts $2,000 in the bank. The **interest rate** is 12% p.a.

**a.** What will his interest be after one year?

**b.** What will his new balance be?

**a.** Interest for 1 year = 12% of $2,000 $= \frac{12}{\cancel{100}_{1}} \times \frac{\cancel{2{,}000}^{20}}{1} =$ $240.00

**b.** The **balance** = $2,000 + $240 = **$2,240**

Make sure pupils understand how to divide numerators and denominators by the same divisor to simplify the fractions. Cancelling with a line is the correct notation.

The pupils should be able to see how the formulae they have worked with before will help them to come up with an adapted formula here.

$$\frac{\text{Interest rate p.a.}}{100} \times \text{amount} = \text{interest earned}$$

Make sure that the pupils understand that the **interest rate** is always given as a **percentage**.

## C2c

**Play the games**

Put the pupils into small groups. Play the memory matching game and the Bingo game which you made with the pupils earlier in this unit again. This gives the pupils as much practice as possible to help familiarise them with equivalence between percentages, fractions and decimals. Fluency with these number facts will help them with their calculations.

Ask the pupils to complete the activities in the Pupil's Resource Book on page 87.

**Answers**

**Activity A**

**1.** $20
**2.** $32
**3.** $120
**4.** **a.** $21 **b.** $371

**Activity B**

**1** **a.** $112
**b.** take out
**c.** $12
**d.** $142
**2.** **a.** $50 **b.** $90
**c.** $360
**3.** $4,494
**4.** **a.** $21 **b.** $105

**Activity C**

**1** **a.** $42 **b.** $100 **c.** $27
**2.** 8%
**3.** 6%
**4.** 7.5%
**5.** $500

? Can all the pupils calculate percentage increases?

## T3a

In this lesson pupils use their knowledge of percentages to solve problems. Remind the pupils about the process involved in problem solving. A useful approach is to ask themselves the following questions as they read through a new problem:

1. What is the problem asking me to find out?
2. What information has been given?
3. How will I tackle this problem?
4. Do I need to take more than one step to get the answer?
5. Do I have enough information?
6. Is there anything I need to assume?
7. Have I been given too much information?
8. What shall I do first?

Write this problem on the board as an example.

> **5% of the pupils at St Mary's School play volleyball.**
>
> **If 20 pupils played volleyball and 35 pupils played netball, how many pupils were at St Mary's School all together?**

Now go through the checklist one by one with the class.

1. **The problem asks how many pupils there are at St Mary's School.**
2. **We know that 5% of pupils played volleyball. We know that 20 pupils played volleyball and 35 pupils played netball.**
3. **If 5% = 20 then we can work out what 100% equals.**

4. **Yes, find out how many 5% in 100% and then multiply my answer by 20 pupils.**
5. **Yes**
6. **No, all the information is there.**
7. **Yes, I do not need to know that 35 pupils played netball.**
8. **Say 100 divided by 5 = 20**

   **Then 20 x 20 = 400.**

   **So there are 400 pupils at the school.**

Explain to the pupils that when we tackle problems there is usually more than one way to get the right answer. There may be different strategies to use.

Tell pupils that they should always check the answer when they have finished a problem.

Ask pupils to suggest how they could check that their answer for the above problem is correct.

They should be able to tell you that if 5% of 400 = 20, then the answer is correct. Do the sum with the class.

$\frac{5}{1\cancel{100}} \times {}^{4}\cancel{400} = \mathbf{20}$ So yes, the answer is correct.

## C3a

A good way for pupils to work out problems is to talk about how they are going to do them first. Put the pupils in pairs or groups of three. You decide whether you put pupils of similar ability together or if you let them work in mixed ability groups. Give them the following problems to work out together:

1. **In his maths test, James scored 75%. If there were 20 questions in the test. How many did he get right?**
2. **Of the 25 pupils in Standard 6, only 20 passed the Standard 6 exam. What percentage of the class failed?**

Encourage the pupils to discuss their strategies and then work out their problems independently in their exercise books. Move around the class and check their work. Encourage pupils to check their own answers using estimates as well as calculations.

**Answers: 1. 15 2. 20%**

## T3b

To provide your pupils with more practice solving problems involving percentages read through the following problems together.

1. **If there are 450 children in the school and 270 of them are boys, what percentage of pupils are girls?**
2. **Jonathan borrowed $600 from his uncle. His uncle said he would have to pay what he owed plus 5% interest if he didn't pay it back by the end of the month. How much would Jonathan have to pay?**
3. **Annie bought goods worth $340 on Christmas Eve. The store had a Christmas sale giving everyone 10% off their bill – how much did Annie have to pay?**

4. **After 5 years in her job, Ethel was given a 15% pay increase. If her starting salary was $800 per fortnight, what was she paid after the increase?**

First discuss their ideas and strategies for how to solve each problem, but do not work out the answers.


Using the strategies you have discussed, allow pupils to work in pairs to discuss and solve each of the problems above. Move around the class as they are working and discuss their work. Check any finished work and help pupils who are having difficulties.

The section on questioning in the introduction to this Teacher's Guide on pages 28 - 29 may help you to come up with useful questions to ask to help pupils develop their problem solving skills.

**Answers:** **1. 40%** **2. $630** **3. $306** **4. $920**

When they have finished, ask the pupils to complete the activities in the Pupil's Resource Book on page 89.

## Answers

### Activity A

1. **a.** $81 **b.** $135 **c.** $135 **d.** $28
2. 82%
3. 10 chickens
4. 9 banana trees
5. 30

### Activity B

1. $150
2. 44%
3. **a.** 164 white **b.** 36 red and silver (6 red, 30 silver)
4. 80%
5. 75%

### Activity C

1. **a.** 35% **b.** 65% **c.** 20% **d.** 52%
2. 75%
3. $30,858
4. **a.** $30 **b.** 37.5 or 37 1/2 %
5. 18

Can all the pupils solve problems which have percentages in them?

# Extension and Support

## Support Activities

This activity helps pupils understand the basic concept on which this unit is based, that **per cent** means **out of 100.**

Draw the 10 x 10 grid shown on the board.

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| A | A | U | B | L | V | C | M | A | A |
| N | X | E | O | Y | F | P | Z | G | Q |
| H | R | I | S | J | T | A | B | C | D |
| E | A | G | H | I | J | K | L | M | N |
| O | P | Q | R | S | T | U | V | W | X |
| Y | Z | Z | A | A | A | A | Z | Z | Z |
| R | Q | P | O | N | M | L | K | J | I |
| H | G | A | E | Z | C | B | A | A | A |
| B | B | C | D | E | A | G | H | I | J |
| A | A | U | B | L | V | C | M | A | A |

Ask pupils to answer the following questions, which they can do simply by counting.

**a.** What is the percentage of the letter A?

**b.** What is the percentage of the letter B?

**c.** What is the percentage of the letter Z?

**d.** What is the percentage of the letter F?

Follow this up by asking pupils to draw their own 10 x 10 grid and colour it according to given instructions such as:

**a.** Colour the grid 25% yellow, 50% blue, 10% green and 15% blue.

**b.** Colour the grid 20% each of five different colours.

**c.** Colour the grid 10% red, 20% blue 30% green and 40% orange.

When they have finished pupils could swap grids with a partner and write down the percentage of each colour used in their partner's grid.

For pupils who are struggling with the application of percentage increases to real life situations, you should provide a range of practical activities for more practice. Here are some suggestions:

**Shopping**

Ask the pupils to collect store items with prices on them, or get them to make a list of items that their family usually buy at the store and their prices.

Tell the pupils that the store keeper is having a sale. Tell them that everything is reduced in price by 10%. Let them work out the new prices.

Tell them that if they buy 10 of an item then the cost of the total is reduced by 5%. Let them work out what they would save.

**Using School Data**

Let the pupils work in a group to calcualte:

**a.** the percentage of girls in your class.

**b.** the percentage of boys in your class.

**c.** the percentage of girls in the whole school.

**d.** the percentage of boys in the whole school.

**e.** What percentage of the whole school are teachers?

You may need to work through the formulae you have taught pupils again to make sure that they know how to do all the necessary calculations.

## Extension Activities

**At the Bank**

Tell the pupils that the calculations they have been doing when working out interest earned at a bank is **simple interest**.

Explain that, if money is kept in a bank for more than one year, the interest earned in the first year is added to the balance. The following year, the interest will be calculated as a percentage of the new balance. For example:

> If the bank interest rate is 10% p.a. and the amount in the bank is $200. What will the balance be after 3 years?
>
> Year 1 Balance = $200
>
> 10% of $200 = $20 so new balance = $220
>
> Year 2 New balance = $220
>
> 10% of $220 = $22 so new balance is $242
>
> Year 3 New balance = $242
>
> 10% of $242 = $24.20 so new balance is $266.20

So after 3 years the balance is **$266.20.**

$66.20 has been earned as interest over 3 years.

Tell the pupils that this is known as **compound interest**. Give some problems involving different amounts of money and different percentage interest rates and ask them to work out the compound interest earned in 5 years for example:

> $300 deposited for 3 years at an interest rate of 5%
>
> $2,200 deposited for 5 years at an interest rate of 8%

Remind pupils that they will have to use rounding to 2 decimal places in their answers.

This is a good way to reinforce accuracy in calculations since each year's calculations rely on the year before. Pupils could work in pairs and check each others calculations.

## Check Up Page: Answers

**1.**
- **a.** $4
- **b.** 8 pupils
- **c.** 2 lollies
- **d.** 12 boys
- **e.** 18 girls
- **f.** $132

**2.**
- **a.** 1
- **b.** 
- **c.** 
- **d.** 
- **e.** 
- **f.** 

**3**
- **a.** 50%
- **b.** 10%
- **c.** 100%
- **d.** 25%
- **e.** 60%
- **f.** 8%

**4.**
- **a.** 50%
- **b.** 25%
- **c.** 100%
- **d.** 60%
- **e.** 80%
- **f.** 3%

**5.**  , 21%, 0.25

**6.** 25% percentage increase

**7.** $16

**8.** $740

**9.** $171

**10.** $14,875

Unit 8

# Measurement Topic 13: Mass, Volume and Capacity

**Aim:**

To develop the pupils' practical skills in measuring mass, volume and capacity; and for pupils to understand the use of these as units of measurement, and to calculate the mass, volume and capacity of a variety of shapes and containers.

**Sequence of objectives:** To

1. recognise commonly used containers, their mass and capacity.

2. calculate and compare the volume of different containers.

3. solve problems involving capacity and mass.

**Rationale:**

Understanding and being able to measure and calculate mass, volume and capacity is essential knowledge for pupils. In their future lives they will be able to apply their skills in real situations as well as well as in other subjects such as science, cooking, engineering etc.

## T1a

**Materials**

scales
containers, assorted food packets and tins, pictures of large objects
Nguzu Nguzu Unit Equivalence Poster

In this lesson pupils revise work done on mass in Standard 5, Unit 8.

They will estimate mass then weigh different objects. They will revise the appropriate units of measurement as well as the skills of using a balance and interpreting a scale.

Guide the pupils through a brainstorming session. First get the pupils to define what is meant by **mass**.

The **mass of an object is the amount of material or substance in it.**

Explain to the pupils that, in every day language, we use **mass** and **weight** to mean the same thing. In fact they are different. They will come across this in science too and it is good if the pupils get used to using the correct terms.

Whereas mass is the amount of substance in an object, **weight is the effect of gravity which is a force acting on the mass**.

Use this example to explain this further:

On the moon the force of gravity or the force that pulls down to the centre of the moon is much weaker than the force of gravity on earth. This is why a man weighs less on the moon than he does on earth. His **mass is the same** but the gravitational pull on earth is much greater then the gravitational pull on the moon. This is why pictures of men on the moon show them doing huge leaps and being able to jump very large distances. Where there is no gravitational pull at all e.g. in a space ship the astronauts can float around – they have no weight at all but their **mass,** or the stuff they are made of, is in fact the same as it would be on earth.

Ask pupils what units are used to measure mass. These are **grams, kilograms** and **tonnes**. Ask how these are written as abbreviations. **(g, kg, t)**

Ask the pupils which unit they would use to measure light objects and which unit they would use for heavier objects. Use real objects to let them explain. For example: Hold up a tin of Milo, a packet of sugar, a bag of rice, a picture of a truck etc. and talk about which units they would use to measure the mass of each.

Pass an object around the pupils in the class and ask them to **estimate** its mass. If possible use scales to find the actual mass. Give the pupils two objects to compare their masses. Which is heavier? Which is lighter? Do they weigh the same?

Get the pupils to talk about measuring units used when finding mass. Revise the units' equivalence using questions such as;

How many kilograms are there in 6,000 grams? **(6)**

How many grams are in 5 kilograms? **(5,000)**

Use the Nguzu Nguzu Unit Equivalence Poster, to remind the pupils of the information in the box on the right. Display it in the classroom so the pupils can refer to it during this unit.

| | |
|---|---|
| **1,000 milligrams** | **= 1 gram** |
| **1,000 grams** | **= 1 kilogram** |
| **1,000 kilograms** | **= 1 tonne** |

## C1a

Put the pupils into groups of 4 or 5. Give each group a selection of objects to weigh. If possible let each group have a balance and a set of metric weights. Have some bathroom scales in the classroom too if they are available. Have the pupils weigh various objects.

Firstly, let the pupils prepare a table like the one below to record their results.

| Object | Estimate | Measurement | Difference |
|---|---|---|---|
| packet of tea | 120 g | 150 g | 30 g |
| taro | 260 g | 250 g | 10 g |
| bag of rice | 2 kg | 3 kg | 1 kg |

Ask each group to estimate the mass of each object and then weigh it using scales. Tell them to write their measurements using appropriate units such as grams and kilograms.

When they have both their estimate and the actual weight of each object let them compare these to see how close they are. Let them calculate the difference and decide whether their estimate was a good one.

Tell the pupils to comment on their table when they have finished. Ask the pupils if they think they can estimate and weigh accurately as well as use the appropriate units?

When the pupils have completed this activity tell them to move onto the activities in the Pupil's Resource Book on page 92.

### Answers

#### Activity A

**1.** **a.** kilograms
**b.** grams
**c.** tonnes
**d.** grams

**2.** **a.** 2 kg
**b.** 6,000
**c.** 1.5 kg
**d.** 7,500 kg
**e.** 0.7 kg
**f.** 4 kg
**g.** 4,300 g
**h.** 0.32 kg
**i.** 5,750 g
**j.** 2.27 kg

**3.** **a.** $0.50
**b.** $0.70
**c.** $2.00
**d.** 90c

#### Activity B

**a.** Note: these answers can be in any order.

| Solution | 150 g | 250 g | 500 g | 1 kg | Cost |
|---|---|---|---|---|---|
| **i** | 10 | 0 | 0 | 0 | $15 |
| **ii** | 0 | 0 | 1 | 1 | **$9.50** |
| **iii** | 0 | 2 | 0 | 1 | $11.00 |
| **iv** | 0 | 2 | 2 | 0 | $12.00 |
| **v** | 0 | 0 | 3 | 0 | $10.50 |
| **vi** | 0 | 6 | 0 | 0 | $15.00 |
| **vii** | 5 | 1 | 1 | 0 | $13.50 |
| **viii** | 0 | 4 | 1 | 0 | $13.50 |
| **ix** | 5 | 3 | 0 | 0 | $15.00 |

**b.** The cheapest option is to buy 1 x 500 g and 1 x 1,000 g at a total of $9.50

The cost of other possibilities is shown in the final column of the table above. Make sure the pupils have worked out the answer and have not guessed. They should have shown the calculations in their exercise books.

## T1b

**Materials**

Kilograms/Tonnes Matching Card Game,
Pictures of large objects, sacks, empty bags of rice etc.

In this lesson pupils extend their skills to work with the mass of heavier objects. They look at commonly used containers and become familiar with their mass depending on their content.

Get the pupils to suggest a list of heavy objects. Write their ideas on the board. Some are given here as examples. You and your pupils will be able to come up with many more.

| | | |
|---|---|---|
| bag of rice | carton of books | carton of Taiyo |
| water tank | car | ship's container of building supplies |
| bus | truck | canoe |
| outboard motor | sack of copra | bag of cement |
| cement block | bulldozer | |

Ask the pupils what unit they would expect big heavy objects to be measured in. **(tonnes)**. Ask them how the unit tonnes is abbreviated or written for short. **(t).**

Ask how many kilograms there are in a tonne. **(1,000 kg)**

Look at examples of heavier items that you can bring into the class, such as a rice bag. Get them to tell you what this bag would weigh when it was full. **(20 kg)**

Now ask them how many 20 kg bag of rice would make a tonne? **(50 bags)**

If you have a full bag of rice let the pupils feel its weight to let them try to appreciate what a tonne would feel like.

Make up some other questions so that pupils become confident when working with kilograms and tonnes.

Ask the pupils when it is important that heavy weights are carefully measured.

Here are some ideas.

- **For safety, a loaded weight for ships, canoes, boats, trucks, planes etc. is very important.**
- **Some bridges are not strong enough to carry very heavy weights.**
- **Cranes moving heavy parts have a maximum weight they can lift.**

## C1b

Play a game to reinforce pupils' understanding of the relationship between kilograms and tonnes. Prepare enough sets of the game cards provided before the lesson. There should be twenty cards in each set i.e. ten pairs. You will need one set of cards for each group.

Group the pupils in groups of three or four to play this matching game.

Let them spread the cards out face down on the table. The pairs of cards are different shapes so that when they are face down, pupils know to pick up one of each shape. The pupils take

turns to pick two cards and turn them over so everyone can see them. If the same mass is shown on both cards then the pupil keeps the cards and has another turn. If they do not match the cards are turned over in the same place and it is the next pupils turn and so on.

When all the cards are used up the pupil with the most pairs is the winner.

| | | | | |
|---|---|---|---|---|
| **30 kg** | **35,000 kg** | **500 kg** | **2,500 kg** | **5,000 kg** |
| **0.03 t** | **35 t** | **0.5 t** | **2.5 t** | **5 t** |

Let the pupils play the game a few times. There are two sets of cards, one yellow and one blue. Groups could exchange sets to try working with different weights.

Let the pupils do the activities in the Pupil's Resource Book on page 93 to give them further practice in working with kilograms and tonnes.

**Answers**

**Activity A**

**a.** 2 t
**b.** 1,500 kg
**c.** 4.5 t
**d.** 2,300 kg
**e.** 0.5 t
**f.** 0.028 t
**g.** 4.543 t
**h.** 2,200 kg
**i.** 6,750 kg
**j.** 0.456 t

**Activity B**

**1.** 1.24 t
**2.** 1.5 t
**3**. 0.752 t
**4.** 3.25 t
**5.** 0.75 t
**6. 0.**465 t

**Activity C**

**1.** 2,265 kg or 2.265 t
**2a.** 17.04 t **b.** 852 bags
**3a.** $352.00
**b.** No. 5 trucks would cost $400.00.
**c.** 4,800 sacks

## T1c

**Materials**
Unit Equivalence Poster
selection of containers
sketches of large containers
1 centimetre cube
glass, bottle, teaspoon, table spoon

This activity is a revision of capacity and how it is measured.

Ask pupils to define **capacity**. **Capacity is the amount a container can hold. Capacity is the same as volume.**

Then ask the pupils what units are used to measure capacity. These are:

**cubic centimetres (cm³ or cc)**

**cubic metres (m³)**

**milliliters (mL**

**litres (L).**

| | | |
|---|---|---|
| **1,000 millitres (mL)** | **=** | **1 litre (L)** |
| **1,000 litres (L)** | **=** | **1 kilolitre (kL)** |

**One centimetre cube (1 cm³) will hold 1 mL**

**One metre cube (1 m³) 1 will hold 1,000 L**

Look again at the Unit Equivalence Poster. Make sure pupils understand the equivalence between the different units.

Ask pupils if they have seen these units on any containers. Note their suggestions:

**Medicine** bottles that have liquid medicine in them often have the contents written in mL on them. Dosage is given in mL. **A teaspoon holds 5 mL**. 1,000 millilitres equal 1 litre. A one centimetre cube (1 cm³) would hold 1 mL of liquid.

**Drinks** bottles often have a capacity of 500 mL, 1 L or 1🗁 L. Cans have a capacity of 375 mL.

Ask the pupils to suggest a list of things which they use which contain liquids or gas. They could come up with things like water containers, water tanks, oils drums, petrol drums, petrol tanks, gas tanks, drinks bottles, paint tins, cooking pots, etc.

Try and bring some of these to the classroom. Obviously some containers are very big so you could sketch these on cards before the lesson so that you can talk about them with the pupils. Talk about the capacity of each one.

Build up a chart on the board of the containers or pictures of containers you have. Write the pupils estimates of how much they think each one holds and then give them the actual capacities. Some possible capacities are shown in the chart here.

| Container | Estimate | Actual Capacity |
|---|---|---|
| water containers | | 10 L |
| water tanks | | 1,500 L |
| oils drums | | 200 L |
| petrol drums | | 200 L |
| petrol tanks | | 25 L |
| gas tanks | | 50 L |
| drinks bottles | | 1 L |
| paint tins | | 5 L |
| cooking pots | | 5 L |

## C1c

Talk about different ways of measuring liquids using smaller containers.


Show the class a 1 centimetre cube. Ask the pupils to estimate how much water would fill the cube? **(1 mL).**

Find a container that has mL measurements marked on it such as a measuring jug used for cooking or a medicine cup. If you cannot find one, make one by measuring liquid into a bottle and marking the sides with a scale of 5 mL or 10 mL.

Using a drinking glass, ask the pupils to estimate how much water is needed to fill the glass. Ask pupils to the front of the class and let them demonstrate this experiment and come up with an actual capacity. How near were the pupils' estimates?

1. Ask the pupils to work in groups of four and give each group a variety of containers of known capacity such as a 500 mL drinks bottle. Let them measure and check its capacity.
2. Ask each group to investigate how many 50 mL cups can be filled with water from 1 litre drink container, how many times a 500 ml bottle is needed to fill a 5 litre bucket and so on.

Tell the pupils to write up their findings in their exercise books.

When they have completed the practical activity there are more exercises in the Pupil's Resource Book on page 94 to reinforce today's lesson.

### Answers

### Activity A

**1.** water tank — 1,200 litres
bottle of water — 500 mL
tin of paint — 2 litres
petrol tank for a truck — 40 litres

| 2. | Capacity when full | How much is used? | How much is left? |
|---|---|---|---|
| water tank | 1,500 L | 750 L | 750 L |
| paint tin | 10 L | 3.5 L | 6.5 L |
| oil drum | 200 L | 182.75 L | 17.25 L |
| kettle | 3 L | 850 mL | 2.15 L |
| plastic bottle | 1.5 L | 350 mL | 1.15 L |

**Activity B**

**1.** 362.25 litres **2.** **a.** 150 litres **b.** 75 litres **c.** 5 times **3.** 75,000 litres

? Can all the pupils recognise the mass and capacity of commonly used containers?

## T2a

**Materials**

cardboard boxes, selection of packets and other rectangular prisms, rulers

In this lesson pupils will revise work on volume from Standard 5, Unit 8, Topic 20.

Ask pupils to define the mathematical term **volume**. Give them enough time to talk about the word with a partner. They should come up with a definition like this:

**The volume of an object is the amount of space it occupies.**

Ask the pupils about the units used to measure volume. These are:

**cubic centimetres - $cm^3$**

**cubic metre - $m^3$**

Remind pupils that the volume of a three-dimensional object can be determined by the length, width and height of the object.

Show the pupils a rectangular prism (small box) and tell them its length, width and height.

Ask the pupils to estimate how many centimetre cubes would fit into the prism or box.

Now ask them how we could find the out the volume by calculation. Can they remember the formula?

**volume = length x breadth x height**

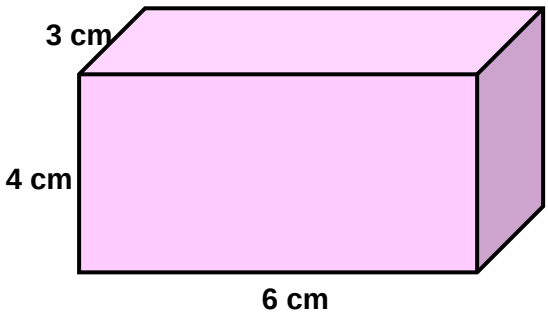
Remind the pupils that width and breadth are the same.

Either measure an actual example or draw a prism like this on the board.

Work out the volume with the class using the formula they know.

**Volume = 6 cm x 3 cm x 4 cm = 72 $cm^3$**

Can pupils explain this in terms of how many $cm^3$ would be needed to fill up the box? **(72)**



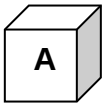
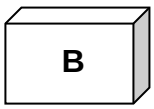
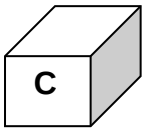

## C2a

In this practical activity pupils will work out the volume of a variety of rectangular prisms by measuring their dimensions and applying the formula.

Let pupils work in pairs. Make sure you have prepared a selection of cardboard boxes and other smaller boxes which are rectangular prisms. You may need to make some too.

Label each one carefully, A, B, C and so on.

Tell the pupils to prepare a table to record their results in their exercise book before they start. The table could look like the one on the next page.

| Shape | Estimate | Length | Breadth | Height | Actual volume |
|---|---|---|---|---|---|
|   | | | | | |
|   | | | | | |
|   | | | | | |

Tell pupils to **estimate the volume** before they **measure** their boxes. Remind them of the correct units to use, **cm for length, breadth and height** and **$cm^3$ for volume**.

When pupils have completed their table have them write a few sentences to compare their estimated volume with the actual volume calculated. Were they accurate? Did they over or under estimate?

There are more activities to practise working out the volume of rectangular prisms in the Pupil's Resource Book on page 96.

**Answers**

**Activity A**

**1.** 24 $cm^3$
**2.** 18 $cm^3$
**3.** 48 $cm^3$
**4.** 144 $cm^3$
**5.** 7 $cm^3$
**6.** 120 $cm^3$

**Activity B**

**1.** 125 $m^3$
**2.** 4,860 $m^3$
**3.** 288 $cm^3$
**4.** 128 $m^3$
**5.** 1,728 $cm^3$
**6.** 92 $cm^3$

**Activity C**

**1.** 300,000 $cm^3$ or 0.3 $m^3$
**2.** 146 $m^3$
**3.** 46,875 $cm^3$
**4.**168 $m^3$
**5.** 24 $m^3$
**6.** 640 $m^3$

**7.** 10 $cm^2$
**8.** 11 cm
**9.** 12 cm
**10.** 6 cm x 4 cm x 8 cm is one possible answer. Check all answers the pupils come up with.
**11.** 120 packets
**12.** 1,000,000

## T2b

**Materials**

labelled containers and pictures of containers,
rulers
measuring containers marked in mL
water
scales

In this lesson pupils compare the volume or capacity of different containers.

Begin the lesson by revising the terms **volume** and **capacity**.

Make sure that pupils understand the following:

Volume and capacity mean the same;
Both terms refer to the space taken up by an object;
Capacity is usually used in reference to liquids and gasses;
Volume is usually used in reference to solids.

Remind pupils, however that **1 cm³ is the same as 1 mL**. So a box which has a volume of 500 cm³ would have a capacity of 500 mL.

If you have a plastic box like an ice cream box you could demonstrate this to the class. Get a pupil to come up and measure the length, width and height of the container. Let another pupil calculate the volume in cm³ using the formula on the board.

Then, using a measuring jug measure the capacity of the box by filling it up with water. Write the capacity on the board in mL. Ask the pupils what they notice about the two readings. They should compare them and find that they are the same.

If they are nearly the same this may be due to **experimental error**. This means that our measuring wasn't quite accurate. To get an exact reading is difficult especially if your box has slightly rounded corners or your measuring jug is not finely graduated (marked in mL).

Another important fact for pupils to know is that **1 litre of water weighs 1 kilogram (kg)** as well as having a volume of 1,000 cm³. So that a box which has a capacity of holding 500 mL of water would weigh 🗁 kg when full. You could weigh the box you have demonstrated with too to test this fact.

## C2b

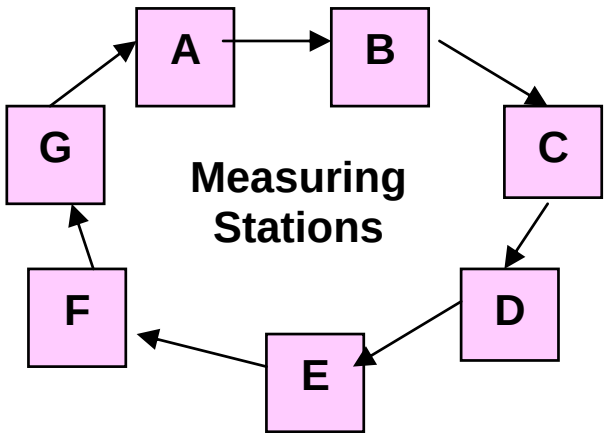
The best way for pupils to compare the volume and capacity of different containers is through practical activities. These may take a little more organisation and may take some time too, but do not be tempted to omit these activities because you think they are difficult. **Pupils learn far more, and understand far better when they are actively involved in doing things for themselves**.

Before the lesson organise all the containers and pictures of containers you have in pairs and clearly label them. Pair A, Pair B, Pair C and so on. Pair A could be a small jar or glass and a tall bottle. Pair B could be a picture of a water tank and a picture of an oil drum and so on.

If you are using a picture write the capacity of the container clearly on the back of the picture.

Organise different measuring stations around the class for a circus. Pupils will move around all the stations measuring and comparing each pair of containers. The pupils should work in groups of three. They can start at any station. Make sure they move from station to station in the same order.

By the end of the lesson the pupils should have visited all the stations.




Have water, measuring jugs and rulers available at each station for the pupils to use to compare the containers.

Tell the pupils that, at each station they must first of all estimate the capacity of the two containers. Tell them to record their estimates in their exercise book. Then they must either measure the capacity or look on the back of the pictures to find it.

They should then compare the actual readings with their estimates. In their exercise book they should write a sentence explaining what they have found out.

Make sure you go round the class as they are working. Mark all their work when they have finished. You should bring the whole class together at the end of the practical and talk through each station with the pupils.

A practical lesson like this will work well if you have prepared all the materials and organised your lesson well beforehand.

Can all the pupils calculate and compare volumes of different containers?

T3a

**Materials**
Problem Solving Poster

In this lesson pupils apply their knowledge of mass, volume and capacity to solving real life problems. In this way pupils have an opportunity to revise, practise, apply and integrate the concepts and skills they have learnt.

Pupils must be encouraged to develop **problem solving skills**. They should develop problem solving strategies. Here is one suggestion: **Ask, Think, Do.**

**Ask** (questions to ask)

**Identify the Problem**

- What is the problem?
- What do I need to find out?
- What information is given? Is it all important?
- Does it make sense?
- How could I check?
- Have I forgotten anything?
- Can I do it another way?

**Think** (things to consider)

**Decide on a Strategy**

- How can I find the answer?
- How can I present the problem in a different way?
- What do I know?
- How can I organise the information?
- What do I need to do?
- Estimate an answer
- Can I try a different strategy?
- How many steps do I need to follow?

**Do** (things we could do)

**Application**

- Add, subtract, multiply, divide
- Make a list
- Record data
- Draw a diagram
- Classify or order data
- Draw a graph
- Match, compare
- Estimate and check
- Analyse data

Go through the poster with the pupils discussing the different aspects of problem solving.

Talk about the different approaches to problem solving.

Encourage the pupils to talk about approaches they have used to solve every day problems they have come across. Give them time to compare the approaches they have used to what is given on the poster.

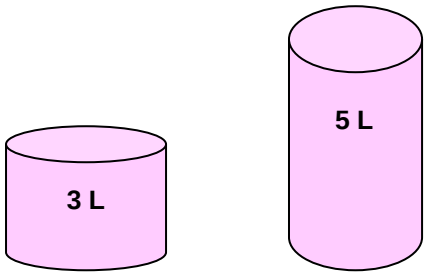
## C3a

This could be a whole class activity or a group or a paired activity. You decide depending on how much guidance you think your pupils will need.

Explain this problem to the pupils then ask them to discuss and solve it. Write it up on the board or on chart paper for the whole class to see.

Here are two different containers. One holds 3 litres of water the other holds 5 litres.

How can you use these containers to measure out 4 litres of water?




Get the pupils to talk about the problem.

What does it ask you to find out?

What information is given?

Is the information clear? Give the pupils enough time to discuss and try to work out the problem.

Let the pupils report back to the whole class.

Work through the solution together.

**Solution**

1. First fill the 5 L container.
2. From this fill the 3 L container
3. Now empty out the 3 L container.
4. Transfer the 2 L remaining in the 5 L container into the 3 L container so that it has 2 L in it.
5. Fill the empty 5 L container so it is full. Then top up the 3 L container, transferring one litre from the 5 L container.
6. There is now 4 L remaining in the 5 L container. **You have measured out 4 L.**

There are more problems for pupil's to work through in the Pupil's Resource Book on page 98.

**Answers**

**Activity A**

**1.** $2.25 **2.** 50 minutes **3.** 50 cartons **4.** 3 cm **5a.** 2 L **5b.** 6 L

**Activity B**

**1.** 2 m **2a.** 6 L **b.** 42 L **3**. 181 g **4.** 30 kg

**5a.** 1 litre tin = $90 per L, 4 litre tin = $75 per L, 10 litre tin = $60 per L

**b.** 10 litre tin

**c. (i)** 1x10 L, 1 x 4 L and 2 x 1 L costing $600 + $300 + $180 = $1,080
**(ii)** 4 x 4 L, costing $300 x 4 = $1,200
**(iii)** 1x 10 L and 6 x 1 L, costing $550 + $540 = $1,140

Option **(i)** is the best value.

**d.** The total cost would be the same, but if he bought two 10 litre containers he would get 4 litres more paint for his money.

**6a.** 15.6 kg **b.** 11.5 kg **c.** Mary **d.** 27.1 kg
**7a.** 52 kg **b.** 12 kg
**8.** 528,000 L

**Activity C**

**1.** 1,000 kg or 1 tonne
**2.** 2,580 kg
**3.** There are many possibilities including:

| | | |
|---|---|---|
| 12 cm x 4 cm x 2 cm | 8 cm x 6 cm x 2 cm | 32 cm x 3 cm x 1 cm |
| 12 cm x 8 cm x 1 cm | 16 cm x 3 cm x 1 cm | 96 cm x 1 cm x 1 cm |

**4a.** 4,000 mL or 4 litres of chemicals
**b.** $100.00
**5.** 60,000 kg or 60 t
**6.** 3,000 L
**7.** 57.75 kg
**8.** 0.2 L

Can all the pupils solve problems involving capacity and mass?

# Extension and Support

## Support Activities

### Practical Activities

The best way for pupils to become more confident with measuring and comparing mass, volume and capacity is through hands on experience of weighing and measuring. Give the pupils containers, sand and water and let them explore the size, weight and capacity of different containers by filling them and weighing them as well as measuring them to work out volume using the formula.

Using grocery items too is an excellent way of pupils relating different sized containers with what they contain. Encourage pupils to estimate weights and capacities and then take actual readings. They will become more accurate as they have more practice.

### Games

Reinforcing the relationship of different units can be achieved through playing a variety of games. Memory games like the one played earlier in this unit can be played again. You could also design simple matching games and or play a matching bingo game with a group to familiarise them more with the units used.

## Extension Activities

### Practical Investigations

Encouraging pupils to design and carry out their own practical investigations is excellent extension work. Let the pupils work in pairs and challenge other pairs by designing different practical weighing and measuring tasks. Provide a variety of containers for the pupils to work with. Estimating capacity and volume is a specialised skill and as the pupils practice they will become more able to do this more accurately.

### Volume of Irregular Objects

You could extend the pupils work on volume by challenging them to find the volume of irregular shaped objects such as stones, shells etc. They may remember looking at examples similar the ones below in Standard 5.

Here is some background information which pupils will find interesting as they do their investigations. You could make some information and challenge cards and let the pupils explore this topic by working through these. Some ideas of what to include on your cards are given below. Make sure you store the cards carefully when the pupils have used them. They will be a valuable resource you can use again next time you teach this unit.

### Background Information

Archimedes was a Greek philosopher who lived in Syracuse (now part of Sicily). He was born in 287 BC and died in 212 BC. He made some very important discoveries but his most famous one concerns floating bodies. History records that Archimedes suddenly jumped out of his bath and shouted “Eureka” which means “I’ve found it” when he realised that the apparent mass lost by a body when it is immersed in water equals the mass of water displaced.

Challenge pupils to think of how they might find out the volume of an irregular object. They cannot calculate it using a formula because it does not have a fixed length, breadth and height to measure. So how can they do it? Tell them that they can use only water and a measuring jug for their experiment.

### Experiment

**1.** Use a glass, measuring jug or a container with a millilitre (mL) scale marked clearly on it.

2. Put some water into the glass.
3. **Record** the reading in mL. **(Reading 1)**
4. Put an irregular object such as a stone carefully into the glass.
5. **Record** the new reading in mL. **(Reading 2)**
6. **Calculate** the amount of water the stone has displaced.

   Reading 2 take away Reading 1 = Change in the water level in mL.
7. Convert mL to cubic centimeters. **This is the volume** of the irregular object.

**Remind pupils that, the volume of 1 mL of water is 1 $cm^3$ So 1 mL = 1 $cm^3$**

**Challenge**

Collect five stones of different shapes and sizes from outside the classroom. Find the volume of each stone. Swap stones with a partner and find the volume of their stones too. Compare your answers to check for accuracy.

## Check Up Page: Answers

**1. a.** large bag of rice 20 kg
**b.** oil drum 200 L
**c.** fuel tank for my canoe 25 L
**d.** bottle of coke 285 L
**e.** bottle of lemon juice cordial 1.5 L
**f.** tin of Taiyo 185 g
**g.** tin of Milo 500 g
**h.** bag of sugar 1 kg
**i.** water tank 1,750 L
**j.** packet of tea 50 g

**2. a.** 300 $m^3$
**b.** 90 $m^3$
**c.** 1.000,000 $cm^3$

**3.** 9 times
**4.** 2
**5.** 18 L
**6.** $360
**7. a.** 4 drums
**b.** No, the fourth drum would only contain 20 litres.
**c.** 15 litres
**8.** 3 L

# Glossary of Terms

**acute angle** An angle which is less than 90°.

**AD** Stands for anno domini. This is Latin for, 'the year of our Lord'. For example: 153 AD means 153 years after the birth of Jesus Christ.

**addition** The process of putting amounts together to obtain a sum or total.

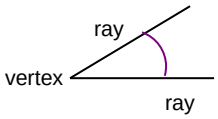
**adjacent** Next to.

**algorithm** The setting out of a mathematical problem in a certain way.

**a.m.** Morning. (From the Latin **ante meridiem**) 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 x 5 can be rounded to 400 x 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 $cm^2$, $m^2$, hectares and $km^2$.

**arm** A term often used to describe the rays that form an angle.

**ascending order** From smallest to largest.

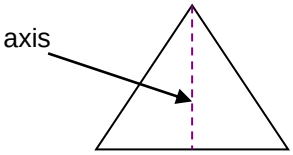
For example: 12, 21, 31, 54, 79, 103

**asymmetrical** Without any line of symmetry.

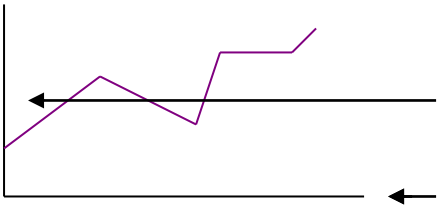
**attribute** A feature or characteristic by which something can be classified. For example, shapes can be classified according to the following attributes: size, colour, shape, thickness, number of sides.

**average** The total of a series of numbers divided by the number in the series.

**axis (1)** A line which divides a shape into two equal parts.



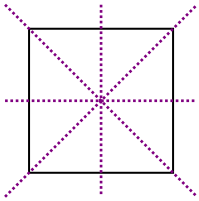

**axis (2)** The horizontal and vertical lines used for measurement on a graph.



The vertical line is the **y-axis.**

The horizontal line is the **x-axis**.

**axis of symmetry** Also referred to as **line of symmetry.** An imaginary line that divides a shape into two identical parts, also referred to as a line of symmetry.



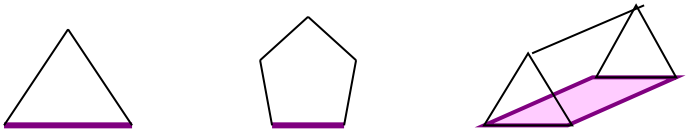
For example, a square has four axes of symmetry.

**balance (1)** A device used to measure the mass of objects or the act of balancing.

**balance (2)** This is a banking term for the total amount of money a customer has in their bank account at any specific time.

**bar graph** A method of recording information as a graph. This may be either in columns (vertical) or rows (horizontal) and is also called a column graph.

**base (1)** The bottom face or line of any face.



**base (2)** The number on which a number system is based. The decimal number system is a **base 10** system. (Hindu-Arabic system)

**BC** This stands for 'before Christ'. For example: 34 BC means 34 years before Christ was born.

**bearing** A direction that is taken from a fixed point using degrees.

**brackets** Symbols **(** and **)** used to group numbers and functions in a sum to indicate the order of operations. For example: (3 + 6) x 7 = 63

**breadth** The lesser measurement of a shape which is also called **width**.

**C** The symbol for Celsius.

**calculate** To work out an answer.

**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 of length. One hundredth of 1 metre. 100 cm = 1 m

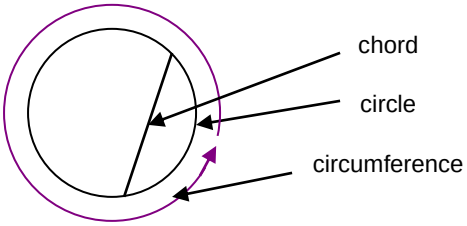
**century** One hundred years.

**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 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.

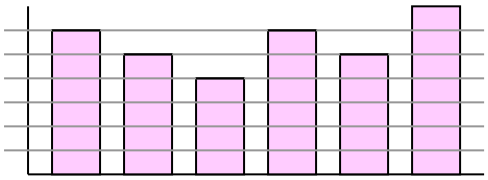
**circumference** The distance around a circle.

**classify** To arrange into groups according to given characteristics.
For example: to classify shapes according to 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. This must be found before performing an action on fractions with different denominators. Such as, 🗎 + 🗏. 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).

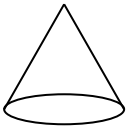
**composite** Made up of more than one.

**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 or objects will retain the same value even when rearranged.

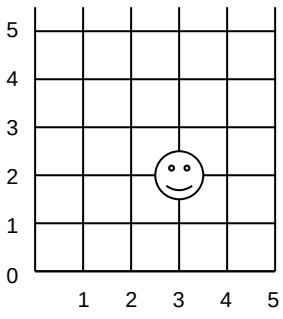
For example: A watermelon cut into two pieces has the same volume and mass as the whole watermelon.

12 objects arranged in two rows of six is the same in quantity as 12 objects arranged in three rows of four.

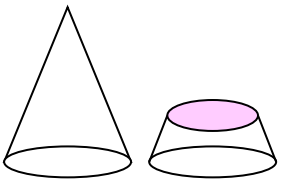
**coordinates** Numbers or letters used to show location on a grid.

For example (2,3). 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.

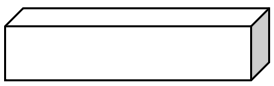


**cube** A three dimensional shape that has six square faces of equal size, eight vertices and twelve edges.

**cube octahedron** A polyhedron with 14 faces, six squares and eight triangles.

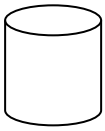
**cubic centimetre** A cube used for measuring volume that has sides of one centimetre in length. Written as **cm$^3$**.

**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 rotate once on its 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 shows 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.

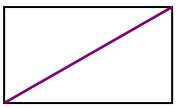
**degrees (1)** A unit of measurement of temperature. Represented by the symbol º. Temperature is measured in degrees Celsius or ºC.

**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 º.

**denominator** The number below the line in a fraction. It tells how many parts in the whole.
For example, in the fraction 🗎, 1 is the numerator and 3 is the denominator.

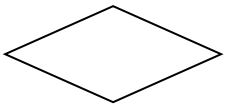
**descending order** Decreasing in value.
For example a number sequence starting with the largest and going to the smallest 23, 17, 15, 13, 9.

**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.

**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 equals 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 ÷ 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 ÷ 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 **$**.

**domino** A shape made up of two squares.

**dot paper** Paper covered with equally spaced dots and used for drawing graphs and shapes.

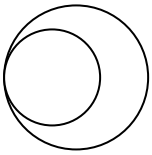
**double** Twice as much, multiply by two.

**double tetrahedron** A polyhedron with six triangular faces made up of two tetrahedrons.

**dozen** A group of twelve.

**dodecahedron** A polyhedron with ten pentagonal faces.

**eccentric circles** Circles which do not share the same centre.

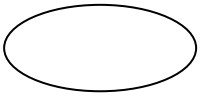


**edge** The intersection of two faces in a solid shape.

**element** 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, ½ = 2/4

**estimate** An approximate calculation, performed to give a rough idea of the answer
For example, 206 x 2.1 is about 200 x 2 an estimated answer is 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

**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 x 2 = 6, 1 x 6 = 6, 3 x 3 = 9, 1 x 9 = 9.

**formula** A rule or principle expressed in algebraic symbols.
For example, the formula for area is **a = l x 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, 1,000 g = 1 kg.

**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.

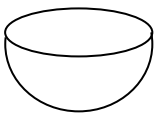
**gross mass** The total mass of any item including its packaging.

**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 10,000 m².



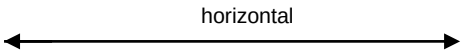
**hemisphere** One half of a sphere.

**heptagon** A two-dimensional shape with seven sides.

**hexagon** A two-dimensional shape with six sides.

**hexonimo** A shape made up of six squares.

**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 $\frac{7}{4}$ or $\frac{8}{8}$ .

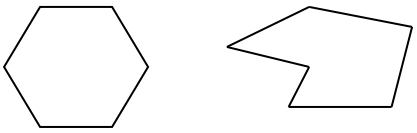
**interval (1)** The portion of a straight line lying between two points.

**interval (2)** The space of time between two events.

**interest** A banking term used for the amount of money the bank pays the customer for saving money in their bank account. Usually paid at a percentage rate per year.

**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.

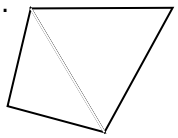
**kg** The symbol for kilogram.

**kilogram** The base unit of mass in the metric system. 1 kilogram = 1,000 grams. (1 kg = 1,000 g)

**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** The symbol for litre.

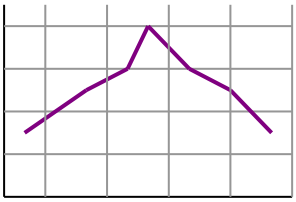
**leap year** A year in which there are 366 days, instead of the usual 365. This happens every four years when there is an extra day added to February.

**length** The measurement of a line or the longer measurement of a shape.

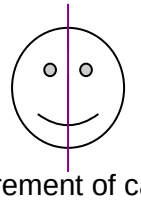
**less than** A symbol (**<**) used to show the relationship between numbers.

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 equal 1 litre.

**location** A place or position of something, usually shown by coordinates.

**loss** To sell something for less than you paid for it.

**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** in maths although this is scientifically incorrect**.**

**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. (100 cm = 1 m)

**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 equals one thousand years.

**millilitre** A measure of capacity. Written as **mL**. 1,000 millilitres equals 1 litre. A one-centimetre cube (1 $cm^3$) would hold 1 mL of liquid.

**millimetre** A unit of measurement of length. There are 10 mm 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.

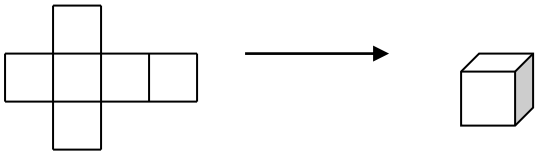
**month** A period of approximately four weeks, between 28 and 31 days. There are twelve months in a year.

**multiple** A number formed by multiplying one whole number by another.
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

**negative numbers** Numbers which have a value less than zero. A minus sign is placed in front of the number to identify it. (-6, -28)

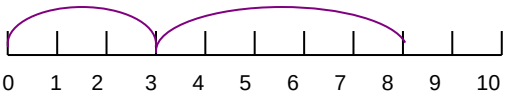
**net** A two dimensional shape which can be folded to form a three dimensional shape. An unfolded cardboard box is the net of the box. The example shows the net of a cube.



**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 x, +, = and ÷.

**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, (x3)

**numeral** A symbol or character used to represent a number.
For example, Hindu Arabic numerals 1, 2, 3, or Roman numerals I, II, III,

**numerator** The number above the line in a fraction that tells how many parts of the whole.
For example, in the fraction 🗎, 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.

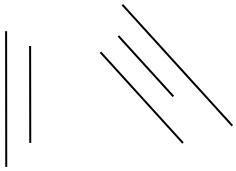
**operations** Mathematical processes such as, multiplication, subtraction, division and addition used to solve mathematical problems.

**ordinal number** A number which shows place or the order.
For example, 1st, 2nd, 3rd, 4th, 5th, 6th,

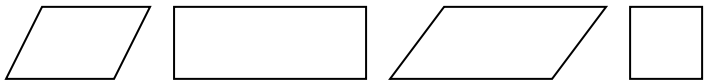
**oval** A two-dimensional shape in the form of an egg. An oval has only one line of symmetry. One end is more pointed than the other.

**palindrome** A number which reads the same forwards and backwards. For example: 121, 565, and 3,993.

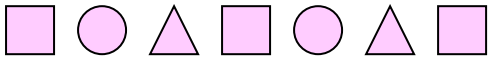
**parallel lines** Two or more lines exactly the same distance apart. Parallel lines do not need to be the same length.



**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.

**pentomino** A shape made up of five squares.

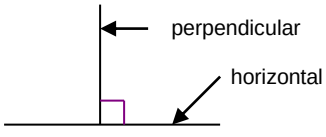
**per cent %** Out of a hundred. A percentage is a fraction of 100.
For example, 65% means 65 out of 100.

**percentage increase** When a total quantity increases by a given amount it can be calculated as a percentage increase.

**percentage loss** When a total quantity decreases by a given amount it can be calculated as a percentage loss.

**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.

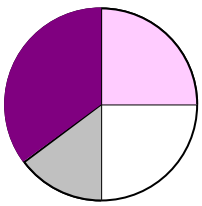
**perpendicular** A vertical line forming a right angle with the horizontal.




**picture graph** A graph using pictures or symbols to represent data.

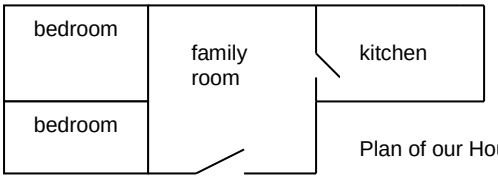
**pie graph** A circular graph used to represent how the whole of something is divided up. The parts look like portions of a pie or cake.

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.



Plan of our House

**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.

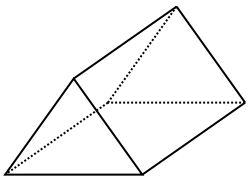
**polyhedron** A mathematical name for a three-dimensional shape. (Plural polyhedra).

**polyomino** A shape made up of two or more squares.

**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.

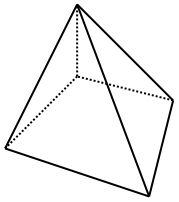
**product** The answer to a multiplication sum.
For example: The product of 12 and 10 is 120.

**profit** The difference between the amount of money earned and the amount of money spent.

**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.



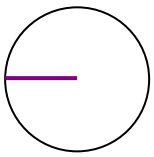
**quadrant** A quarter of a circle.

**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 ¼.

**quatronimo** A shape made up of four squares.

**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 picked. No restrictions apply. For example, drawing names out of a box.

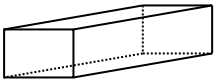
**ratio** The number of times one quantity contains another quantity.

For example: the ratio of petrol to oil is 9:1. This means that for every 9 parts of petrol one part of oil is added.

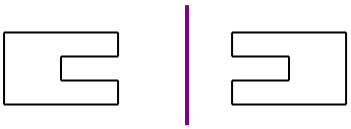
**ray** A line with a starting point but no end.

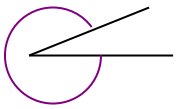
**rectangle** A four-sided figure with four right angles and two pairs of parallel sides. An oblong is a rectangle with two sets of parallel sides of different lengths. A square is also a rectangle.

**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 octahedron** A polyhedron with eight triangular faces, which can be made by joining two square based pyramids at the bases.

**regular polygon** A two-dimensional shape with sides of equal length and equal angles.

**remainder** The amount left over after a number has been divided.

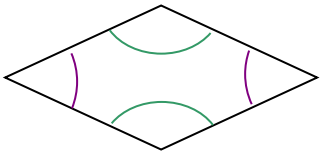
For example, 29 ÷ 4 = 7 and the remainder is 1.

**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

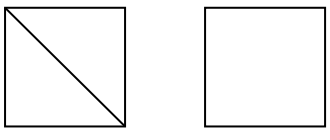
**revolution** A complete turn of 360°.

**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 moved.



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 to 100, or 2,189 can be rounded to 2,000.

**rule** An instruction or pattern to be followed.

**sample** Some items taken from a larger group.

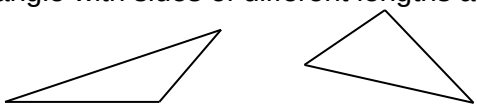
For example, a sample of the pupils' work was displayed. A sample of 25 out of 250 villagers was interviewed.

**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. On a map the scale is shown to define the ratio by which the map has been altered in comparison with the original. For example 1 cm = 10 km.

**scalene triangle** A triangle with sides of different lengths and angles of different sizes.

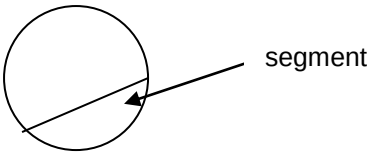


**scales** An instrument used to measure mass.

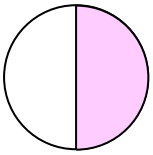
**second** A unit of measurement of time. There are 60 seconds in one minute.

**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** A 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 views of a pyramid and a cone are both triangles, but the side view of a cylinder is a rectangle.

**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; 60 km/h.

**sphere** A perfectly round three-dimensional shape.

**square** A two-dimensional shape consisting of four equal sides and four right angles. A square is also a rectangle.

**square centimetre** A unit of measurement for area measuring 1 cm x 1 cm. Written as $cm^2$.

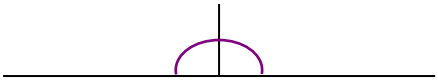
**square kilometre** A unit of measurement for area measuring 1 km x 1 km. Written as $km^2$.

**square metre** A unit of measurement for area measuring 1 m x 1 m. Written as $m^2$.

**square number** The product of a number multiplied by itself.
For example, $2^2 = 2 \times 2 = 4$, $3^2 = 3 \times 3 = 9$

**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.

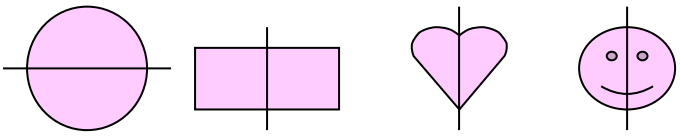


**subtract** To remove part of a group to find the difference in value. Also known as to **take away** or **minus**.

**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 of 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:

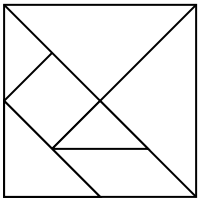
**tables (2)**

| 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 |

**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.

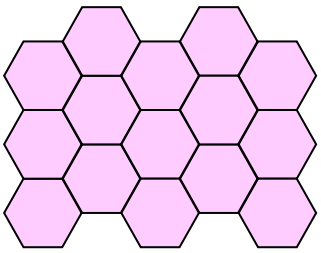

**tangram** A square cut into seven pieces. Traditional Chinese tangrams are arranged to make pictures.



**temperature** A measure of the heat or coldness of things. Temperature is measured in degrees Celsius written as **ºC**.

**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.

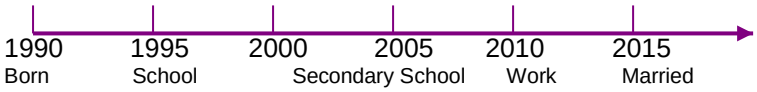
For example, this tessellation uses regular hexagons.



**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 is the same as 1,000 kilograms.

**top view** The shape an object has when viewed from above.

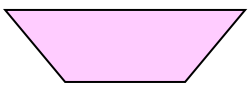
For example the top view of a cone is a circle and the top view of a triangular prism is a rectangle.

**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.

**trionimo** A shape made up of three squares.

**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

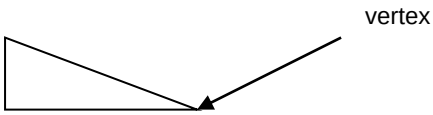
**two-dimensional** Having only two dimensions. A flat or plane shape is two-dimensional having width and length but not height. (Abbreviated to **2D**.)

**unit** One. The units column is the ones column in a place value chart.

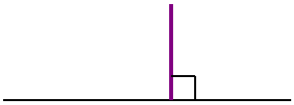
**units** Formal or standardised amounts agreed upon for taking and recording specific measurements.

For example: a unit of length is the metre and a unit of mass is the gram.

**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.

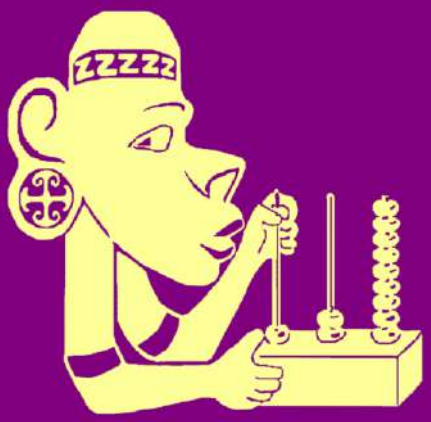
**whole numbers** Numbers from zero to infinity without fractions or decimals.

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.**




# Nguzu Nguzu Mathematics
# Standard 6