



Government of **Western Australia**  
School Curriculum and Standards Authority

# **MATHEMATICS**

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Foundation course  
**Year 11 syllabus**

## **Acknowledgement of Country**

Kaya. The School Curriculum and Standards Authority (the Authority) acknowledges that our offices are on Whadjuk Noongar boodjar and that we deliver our services on the country of many traditional custodians and language groups throughout Western Australia. The Authority acknowledges the traditional custodians throughout Western Australia and their continuing connection to land, waters and community. We offer our respect to Elders past and present.

## **IMPORTANT INFORMATION**

This syllabus is effective from 1 January 2018.

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## Overview of mathematics courses

There are six mathematics courses. Each course is organised into four units, with Unit 1 and Unit 2 being taken in Year 11 and Unit 3 and Unit 4 in Year 12. The Western Australian Certificate of Education (WACE) examination for each of the three ATAR courses is based on Unit 3 and Unit 4 only.

The courses are differentiated, each focusing on a pathway that will meet the learning needs of a particular group of senior secondary students.

**Mathematics Preliminary** is a course which focuses on the practical application of knowledge, skills and understandings to a range of environments that will be accessed by students with special education needs. Grades are not assigned for these units. Student achievement is recorded as 'completed' or 'not completed'. This course provides the opportunity for students to prepare for post-school options of employment and further training.

**Mathematics Foundation** is a course which focuses on building the capacity, confidence and disposition to use mathematics to meet the numeracy standard for the WACE. It provides students with the knowledge, skills and understanding to solve problems across a range of contexts, including personal, community and workplace/employment. This course provides the opportunity for students to prepare for post-school options of employment and further training.

**Mathematics Essential** is a General course which focuses on using mathematics effectively, efficiently and critically to make informed decisions. It provides students with the mathematical knowledge, skills and understanding to solve problems in real contexts for a range of workplace, personal, further learning and community settings. This course provides the opportunity for students to prepare for post-school options of employment and further training.

**Mathematics Applications** is an ATAR course which focuses on the use of mathematics to solve problems in contexts that involve financial modelling, geometric and trigonometric analysis, graphical and network analysis, and growth and decay in sequences. It also provides opportunities for students to develop systematic strategies based on the statistical investigation process for answering statistical questions that involve analysing univariate and bivariate data, including time series data.

**Mathematics Methods** is an ATAR course which focuses on the use of calculus and statistical analysis. The study of calculus provides a basis for understanding rates of change in the physical world, and includes the use of functions, their derivatives and integrals, in modelling physical processes. The study of statistics develops students' ability to describe and analyse phenomena that involve uncertainty and variation.

**Mathematics Specialist** is an ATAR course which provides opportunities, beyond those presented in the Mathematics Methods ATAR course, to develop rigorous mathematical arguments and proofs, and to use mathematical models more extensively. Mathematics Specialist contains topics in functions and calculus that build on and deepen the ideas presented in the Mathematics Methods course as well as demonstrate their application in many areas. The Mathematics Specialist course also extends understanding and knowledge of statistics and introduces the topics of vectors, complex numbers and matrices. Mathematics Specialist is the only ATAR mathematics course that should not be taken as a stand-alone course.

## Introduction to the Foundation courses

Foundation courses are designed for students who have not demonstrated the Western Australian Certificate of Education (WACE) standard of numeracy and Standard Australian English (SAE) literacy skills. These standards are based on Level 3 of the Australian Core Skills Framework (ACSF) which outlines the skills required for individuals to meet the demands of everyday life and work in a knowledge-based economy.

Foundation courses provide support for the development of functional literacy and numeracy skills essential for students to meet the WACE standard of literacy and numeracy through engagement with the ACSF Level 3 reading, writing, oral communication and numeracy core skills.

The Foundation courses are:

- Applied Information Technology (List B)
- Career and Enterprise (List A)
- English (List A)
- English as an Additional Language or Dialect (EAL/D) (List A)
- Health, Physical and Outdoor Education (List B)
- Mathematics (List B)

### Eligibility

Eligibility to enrol in Foundation courses is restricted to students who meet the eligibility criteria. For further information regarding eligibility refer to the WACE Manual at [www.scsa.wa.edu.au/publications/wace-manual](http://www.scsa.wa.edu.au/publications/wace-manual).

### Literacy and numeracy focus

While much of the explicit teaching of literacy and numeracy occurs in the English, English as an Additional Language or Dialect, and Mathematics Foundation courses, all Foundation courses provide opportunities for the development of the literacy and numeracy capabilities identified in the Pre-primary to Year 10 Western Australian curriculum. The following set of literacy and numeracy skills drawn from both the ACSF (Level 3) core skills of reading, writing, oral communication and numeracy, and the Pre-primary to Year 10 English and Mathematics curriculum have been identified and are common to all Foundation courses. Where appropriate, opportunities for students to engage in activities with significant literacy and numeracy demands should be the focus of teaching, learning and assessment programs in this course.

## Literacy

Literacy involves students:

- developing the knowledge, skills and dispositions to interpret and use language confidently for learning and communicating in and out of school and for effective participation in society
- listening to, reading, viewing, speaking, writing and creating, which includes oral, print, visual and digital texts
- using and modifying language for different purposes and for different audiences
- understanding how the English language works in different social contexts.

Foundation courses provide meaningful contexts for learning and practising specific literacy (L) skills as outlined below:

- L1 acquiring words leading to an appropriately expanding vocabulary; for example, discipline-related words such as 'perimeter' and 'ratio' in the Mathematics Foundation course
- L2 developing pronunciation and spelling of key words; for example, discipline-related words such as 'likelihood' in the Mathematics Foundation course
- L3 using Standard Australian English (SAE) grammar and punctuation to communicate effectively
- L4 expressing increasingly complex ideas using a range of simple and complex sentence structures
- L5 using a range of language features, including the use of tone (for example, formal as opposed to personal), symbols (for example, in the workplace and/or in web page design), simple description (for example, the use of similes and/or contrast), and factual as opposed to emotive language
- L6 organising ideas and information in different forms and for different purposes and audiences; for example, providing information in dot point form, and/or providing information in an explosion chart
- L7 achieving cohesion of ideas at sentence, paragraph and text level
- L8 editing work for accuracy, coherence, clarity and appropriateness; for example, ensuring subject and verb agreement, the correct use of apostrophes and the appropriate use of vocabulary and verb forms
- L9 using a range of speaking and listening skills, for example, using the etiquette of 'turn-taking' in conversation and discussion, asking clarifying questions when listening, matching tone of voice to audience, and using a pause for emphasis
- L10 comprehending and interpreting a range of texts
- L11 developing visual literacy skills; for example, creating images, designing graphs, reading tables and interpreting diagrams and symbols.

## Numeracy

Numeracy involves students:

- recognising and understanding the role of mathematics in the world
- developing the dispositions and capacities to use mathematical knowledge and skills purposefully
- increasing their autonomy in managing everyday situations.

Foundation courses provide meaningful contexts for learning and practising specific numeracy (N) skills and mathematical thinking processes as outlined in the examples below:

N1 identifying and organising mathematical information; for example, identifying the rate of pay and the number of hours worked

N2 choosing the appropriate mathematics to complete a task; for example, choosing to use multiplication to accurately determine the weekly amount of pay

N3 applying mathematical knowledge, tools and strategies to complete the task; for example, using a calculator to multiply the rate of pay and the number of hours worked

N4 representing and communicating mathematical conclusions; for example, using a table to record the calculated amounts of pay for different rates of pay and varying number of hours worked

N5 reflecting on mathematical results in order to judge the reasonableness of the conclusions reached; for example, referring to a table of calculated weekly pay amounts to help in deciding the optimum number of casual hours to be worked in a week

The level of complexity of mathematical information to which the above numeracy skills are applied is outlined below:

- whole numbers and familiar or routine fractions, decimals and percentages
- dates and time, including 24 hour times
- familiar and routine 2D and 3D shapes, including pyramids and cylinders
- familiar and routine length, mass, volume/capacity, temperature and simple area measures
- familiar and routine maps and plans
- familiar and routine data, tables, graphs and charts, and common chance events.



## Representation of the other general capabilities

In addition to the literacy and numeracy capabilities, teachers may find opportunities to incorporate the remaining capabilities into the teaching and learning program for the Mathematics Foundation course. The unit information, specifically the unit content, identifies the expected student learning within each syllabus. The general capabilities are not assessed unless they are identified within the specified unit content.

### Information and communication technology capability

In the Mathematics Foundation course, students use calculators and spreadsheets to process and represent information and to apply mathematical knowledge to a range of problems. They use digital technology for data representation and calculation.

### Critical and creative thinking

The Mathematics Foundation course provides students with opportunities to use their mathematical knowledge, skills and understanding to solve problems in real contexts. Solutions to these problems involve drawing on knowledge of the context to decide what and how mathematics will help to reach a conclusion.

### Personal and social capability

Students develop and use personal and social capability as they apply mathematical skills in a range of personal and social contexts. This may be through activities that relate learning to their own lives and communities, such as time management, budgeting and financial management, and understanding statistics in everyday contexts.

The Mathematics Foundation course enhances the development of students' personal and social capabilities by providing opportunities for initiative taking, decision making, communicating their processes and findings, and working independently and collaboratively in the classroom.

The elements of personal and social competence relevant to Foundation Mathematics mainly include the application of mathematical skills for their decision-making, life-long learning, citizenship and self-management. In addition, students will work collaboratively in teams and independently as part of their mathematical learning experiences.

### Ethical understanding

The areas relevant to the Mathematics Foundation course include issues associated with ethical decision-making as students work collaboratively in teams and independently as part of their mathematical explorations and investigations. Acknowledging errors, rather than denying findings and/or evidence, involves resilience and examining ethical behaviour. Students develop communication, research and presentation skills to express viewpoints.

### Intercultural understanding

Students understand mathematics as a socially constructed body of knowledge that uses universal symbols but has its origin in many cultures. Students understand that some languages make it easier to acquire mathematical knowledge than others. Students also understand that there are many culturally diverse forms of mathematical knowledge, including diverse relationships to number, and that diverse cultural spatial ability and understandings are shaped by a person's environment and language.

## Representation of the cross-curriculum priorities

The cross-curriculum priorities address contemporary issues which students face in a globalised world. Teachers may find opportunities to incorporate the priorities into the teaching and learning program for the Mathematics Foundation course. The unit information, specifically the unit content, identifies the expected student learning within each syllabus. The cross-curriculum priorities are not assessed unless they are identified within the specified unit content.

### Aboriginal and Torres Strait Islander histories and cultures

The Mathematics Foundation course values the histories, cultures, traditions and languages of Aboriginal and Torres Strait Islander Peoples' past, and their ongoing contributions to contemporary Australian society and culture. Through the study of mathematics within relevant contexts, opportunities may allow for the development of students' understanding and appreciation of the diversity of Aboriginal and Torres Strait Islander Peoples' histories and cultures.

### Asia and Australia's engagement with Asia

There are strong social, cultural and economic reasons for Australian students to engage with the countries of Asia and with the past and ongoing contributions made by the peoples of Asia in Australia. It is through the study of mathematics in an Asian context that students engage with Australia's place in the region. Through analysis of relevant data, students are provided with opportunities to further develop an understanding of the diverse nature of Asia's environments and traditional and contemporary cultures.

### Sustainability

The Mathematics Foundation course provides the opportunity for the development of informed and reasoned points of view, discussion of issues, research and problem solving. Teachers are encouraged to select contexts for discussion connected with sustainability. Through analysis of data, students have the opportunity to research and discuss this global issue and learn the importance of respecting and valuing a wide range of world perspectives.

## Rationale for the Mathematics Foundation course

In the Mathematics Foundation course, the main emphasis is on developing students' capacity, disposition and confidence to use functional numeracy in their personal life and workplace. The Mathematics Foundation course uses a practical approach and provides students with a variety of opportunities to apply mathematical concepts across a range of everyday situations.

The Mathematics Foundation course recognises some students have significant gaps in basic mathematical understanding and application by the time they enter senior school. However, these same students have the potential to learn, especially when involved in a learning program which connects with their current experience and knowledge. The course focuses on functional numeracy embedded in familiar and meaningful contexts which are relevant to young adults.

Numeracy involves understanding and applying mathematical skills related to:

- number and relationships between numbers
- measurement in the physical world
- gathering, representing, interpreting, and analysing data
- spatial sense and geometric reasoning
- chance processes.

It also involves drawing on knowledge of the context in deciding when to use mathematics and whether an estimate or an accurate answer is required; extracting the mathematical information from the context, and choosing the appropriate mathematics to use. Numeracy requires reflecting on and evaluating the use of the mathematics, and being able to represent and communicate the mathematical results.

## Course aims

The Mathematics Foundation course aims to develop students' capacity, disposition and confidence to:

- recognise and apply functional numeracy concepts and techniques in practical situations, including personal, community and workplace contexts
- interpret and apply mathematical information embedded in various documents, texts and other media, involving contexts from everyday life and work
- represent and communicate mathematically, consistent with the language of the context.

## Organisation

This course is organised into a Year 11 syllabus and a Year 12 syllabus. The cognitive complexity of the syllabus content increases from Year 11 to Year 12.

### Structure of the syllabus

The mathematics content in Mathematics Foundation is cumulative across the two years of the course. The sequence of content enables students to learn the fundamental mathematics knowledge, understandings and skills they may have missed in the past, and builds these across the two years.

The Year 11 syllabus is divided into two units, each of one semester duration, which are typically delivered as a pair. The notional time for each unit is 55 class contact hours.

#### Unit 1

This unit provides students with the mathematical knowledge, understanding and skills to solve problems relating to addition and subtraction, length, mass, capacity and time. It involves the extraction of information from, and the interpretation of, various simple forms of data representation used in everyday contexts. The number formats in Unit 1 are whole numbers and money.

#### Unit 2

This unit provides students with the mathematical knowledge, understanding and skills relating to fractions and decimals to solve problems relating to multiplication and division, perimeter, area and volume and qualitative probability from everyday contexts. The number formats in Unit 2 are whole numbers, money, fractions and decimals.

Each unit includes:

- a unit description – a short description of the focus of the unit
- learning outcomes – a set of statements describing the learning expected as a result of studying the unit
- unit content – the content to be taught and learned. This is arranged in content areas which include the following:
  - a content area description – a short description of the focus of the content area
  - content descriptors – arranged in three sections which emphasise the need for students to:
    - consider the relevance of mathematical ideas to everyday life and develop an understanding of the decisions they will need to make when solving familiar everyday problems
    - develop their understanding of fundamental mathematical concepts
    - communicate mathematically
  - examples which emphasise the intent of the course.

## Organisation of content

The content for each unit has been arranged in distinct content areas.

| Unit | Total unit class contact hours | Required (core) content | Content areas   |
|------|--------------------------------|-------------------------|---|
| 1    | 55                             | All content is core     | 1.1: Whole numbers and money<br>1.2: Addition and subtraction with whole numbers and money<br>1.3: Length, mass and capacity<br>1.4: Time<br>1.5: Data, graphs and tables   |
| 2    | 55                             | All content is core     | 2.1: Understanding fractions and decimals<br>2.2: Multiplication and division with whole numbers and money<br>2.3: Metric relationships<br>2.4: Perimeter, area and volume<br>2.5: The probability of everyday events |

Each content area may be delivered sequentially, or integrated within the unit, and should be applied in contexts that are meaningful and of interest to students. It is likely students will need to revisit content descriptors a number of times, and in different contexts, to ensure they develop the breadth and depth of understanding that is required.

The course is also designed to support students to learn to use the mathematical decision-making processes they need as adults. In the early units, this mathematical thinking process is modelled and taught explicitly; while in the later content area, 4.3, students learn to use this thinking process independently. The mathematical thinking process includes the following steps:

- interpreting the task and the key information
- choosing the mathematics which could help to complete the task
- applying their existing mathematical knowledge and strategies to obtain a solution
- interpreting the results in relation to the context
- communicating the solution to the problem as required.

Choosing the appropriate mathematics is complex and involves another series of decisions, including:

- whether an estimation or accurate answer is needed, and the level of accuracy required
- the relevant numbers/information
- one or more of the four operations; that is, addition, subtraction, multiplication and division
- sequence of operations
- whether mental strategies (with jottings if needed), calculator or spreadsheet are used.

When deciding how much time is needed to teach content from each content area, teachers need to consider:

- the needs and abilities of students
- the time required to achieve the learning outcomes for each unit
- integration of content across content areas.

### **Contexts for study**

All content is embedded in contexts referred to in the ACSF.

- Numeracy for personal
- Numeracy for work
- Numeracy for community

Teachers are encouraged to apply the core content in contexts which are meaningful and of interest to their students, and derived from one or more of these areas. Examples of contexts which may be used are provided; however, these may not be relevant for all students.

#### **Numeracy for personal contexts**

- using public transport; for example, fares, reading and interpreting timetables and maps
- budgeting and managing finances; for example, saving for a particular purchase, living expenses in shared accommodation, attending the school ball or a concert or music festival
- shopping including online; for example, compare prices, finance, freight costs, delivery schedules
- obtaining a driver's licence; for example, driving lessons, permits, family assistance, costs
- buying a car; for example, advertising, transfer of ownership, finance, licensing, insurance
- driving and maintaining a car; for example, calculating fuel and car maintenance costs, fuel economy
- using global positioning systems for distance, duration and directions when travelling between locations
- planning a trip; for example, fares, itinerary, accommodation, expenditure

#### **Numeracy for work contexts**

- identifying the mathematics used in a particular job; for example, hospitality, business, sport and recreation, information technology, creative industries, construction
- preparing for the workforce: estimating costs of preparing for work, including equipment, travel, training clothing
- keeping records and accounts
- pay scales, pay rates, taxation, future earnings
- estimating savings in the immediate future or long-term financial goals

**Numeracy for community contexts**

- participating in a sporting club; for example, practice schedules and timetables, buying and renting training equipment, interpreting data and statistics related to a preferred sport, calculating body mass index, and measuring the effects of exercise in relation to kilojoules expended
- planning and financing events; for example, barbecue, school ball
- participating in community and cultural events
- local community services, organisations and initiatives

**Progression from the Year P–10 curriculum**

The Mathematics Foundation course draws upon, knowledge, understandings, skills and processes related to the strands of Number and algebra, Measurement and geometry, and Statistics and probability, used in the Year P–10 curriculum.

In the Mathematics Foundation course, the primary focus is on the consolidation and application of core numeracy skills associated with work, learning, community and everyday personal contexts.

The Mathematics Foundation course provides an opportunity to develop understanding, fluency, problem-solving, reasoning skills and concepts which students may have missed during prior years, in order for their mathematical skills to have a functional quality consistent with desirable levels of numeracy.

# Unit 1

## Unit description

This unit provides students with the mathematical knowledge, understanding and skills to solve problems relating to addition and subtraction, length, mass, capacity and time, and involving the extraction of information from, and the interpretation of, various simple forms of data representation used in everyday contexts. Teachers are encouraged to apply the content of this unit in contexts which are meaningful and of interest to their students. The number formats for the unit are whole numbers and money.

This unit includes five content areas.

1.1: Whole numbers and money

1.2: Addition and subtraction with whole numbers and money

1.3: Length, mass and capacity

1.4: Time

1.5: Data, graphs and tables

## Learning outcomes

By the end of this unit, and within a range of everyday life and work contexts, students will:

- use place value to understand the meaning and magnitude of whole numbers and amounts of money
- choose addition and subtraction to solve problems in a range of everyday situations with whole numbers and money
- appropriately choose from, and use a range of, strategies to accurately and efficiently add and subtract whole numbers and quantities of money
- estimate, measure and use addition and subtraction to solve everyday problems in familiar practical situations involving length, mass and capacity
- interpret and construct a range of simple forms of data representation used in everyday contexts
- interpret, measure and record time in straightforward familiar situations and solve simple everyday problems.



## Unit content

This unit includes the knowledge, understandings and skills described below.

### Content area 1.1: Whole numbers and money

An understanding of the meaning, order and relative magnitude of whole numbers into the millions is required to access and interpret numerical information, such as that found in newspapers, store catalogues, instruction manuals, information printed on goods, financial contracts, accounts, bank statements and documentation in the workplace. A sound understanding of whole number place value, including an understanding of the patterns in our number system, is fundamental to developing this understanding.

An understanding of whole number place value also underpins robust understanding of the decimal system. This is included in Unit 2. While students may be able to solve money problems by thinking of dollars and cents as two separate whole numbers, teachers should promote early decimal understanding by supporting students to see the decimal point as a separator of a whole number of dollars on the left of the decimal point from the part of a dollar on the right. This underpinning idea about decimals allows students to work with money amounts in a way which leads to more robust understanding of decimal numbers.

| Content descriptions   | Examples  |
|--|---|
| <p><b>Numbers</b></p> <p>1.1.1 identify and describe the purpose of whole numbers in various texts and media from everyday life</p>  | <ul style="list-style-type: none"> <li>use categories, such as numbers as quantity, numbers as labels (football jumpers, postcodes), numbers to show order</li> </ul>   |
| <p><b>The numeration system</b></p> <p>1.1.2 use place value to understand the meaning and magnitude of whole numbers into the millions</p> <p>1.1.3 apply place value to read, write, say and compare whole numbers into the millions</p> <p>1.1.4 read, write, say and compare amounts of money, recognising that the decimal point in money separates whole dollars from part dollars; for example, \$1.50, \$3.99 and \$1013</p> <p>1.1.5 recognise and use patterns in the number system</p> <p>1.1.6 understand and use simple negative numbers on a number line (whole numbers and money)</p> <p>1.1.7 determine and explain whether the magnitude of a number is reasonable within everyday contexts</p> | <ul style="list-style-type: none"> <li>group and order numbers from a collection of brochures or newspaper cuttings into tens, hundreds, thousands, tens of thousands, hundreds of thousands and millions</li> <li>read and compare population figures: class, school, suburb, city, state and national</li> <li>read and compare the increasing value of items in catalogues or advertisements; for example, food, household appliances, hardware, furniture, cars, houses</li> <li>demonstrate the repetitive nature of our number system i.e. ones, tens, hundreds, ones of thousands, tens of thousands, hundreds of thousands, ones of millions, tens of millions, hundreds of millions</li> <li>discuss the meaning of negative numbers that represent real-life situations; for example, above and below sea level, debits and credits</li> <li>consider the cost of familiar items; number of people expected to attend different sporting or entertainment events</li> </ul> |

## Content area 1.2: Addition and subtraction with whole numbers and money

Students must understand when and why addition and subtraction are used, as well as how to carry out calculations associated with these operations. They need to choose addition and subtraction, even when no obvious verbal clues are provided in the problem situation or context. Students also need to understand the inverse relationship between addition and subtraction, and to use this relationship to assist in calculations and problem solving.

While students need to apply addition and subtraction to a wide range of problem situations, they also need to make decisions about the accuracy of the answer required and the reasonableness of their solution. In this content area, students should become confident in their capacity to correctly and efficiently carry out addition and subtraction calculations with whole numbers and money that may arise in their personal life and work. They should therefore develop, practise and maintain mental calculation strategies, using informal jottings if required, estimation techniques and effective use of a calculator. Students should be supported to flexibly generate, recall and extend basic addition and subtraction facts.

It is intended that students will consider these ideas as they are applied to problem situations in contexts relevant to them. As teachers discuss the mathematical ideas outlined in the content descriptors, it is important that the teacher makes explicit and models the mathematical thinking process, which involves:

- interpreting the task and the key information
- choosing the mathematics which could help to complete the task
- applying their existing mathematical knowledge and strategies to obtain a solution
- interpreting the results in relation to the context
- communicating the solution to the problem as required.

While students are not expected to independently use this process at this point, this will be expected in Unit 4.

| Content descriptions  | Examples  |
|---|---|
| 1.2.1 determine whether an estimation or an accurate answer is needed in everyday situations  | <ul style="list-style-type: none"> <li>• determine whether an exact amount or an estimation is required when shopping</li> </ul>  |
| 1.2.2 choose when it is appropriate to use addition or subtraction to solve a range of everyday problems; for example, combining quantities, comparing the difference | <ul style="list-style-type: none"> <li>• choose the operation for calculations involved in shopping</li> </ul>  |
| 1.2.3 understand and use the inverse relationship between addition and subtraction to assist in calculations  | <ul style="list-style-type: none"> <li>• demonstrate part-part-whole models for total money, money spent and change</li> </ul>  |
| 1.2.4 understand, recall, use and extend basic addition and subtraction facts to facilitate mental calculation  | <ul style="list-style-type: none"> <li>• discuss strategies, such as, if <math>6 + 6 = 12</math>, then <math>6 + 7 = 13</math>, and <math>60 + 70 = 130</math></li> </ul> |

| Content descriptions   | Examples   |
|--|--|
| 1.2.5 apply place value, partitioning and basic facts to mentally solve everyday problems involving addition and subtraction, with simple whole numbers, using informal jottings to keep track if required | <ul style="list-style-type: none"> <li>discuss the use of partitioning and counting forwards by tens in shopping; for example, <math>\\$56 + \\$27</math> is 56, 66, 76, add 4 to make 80, add 3 to make a total of <math>\\$83</math>, or 50 and 20 is 70 and <math>6 + 7</math> is 13, so total is <math>\\$83</math></li> </ul> |
| 1.2.6 use a calculator/spreadsheet efficiently and appropriately when more complex (unfriendly) numbers or tasks are involved  | <ul style="list-style-type: none"> <li>use calculators when larger whole numbers or money amounts are involved, or spreadsheets when setting up a budget</li> </ul>  |
| 1.2.7 use estimation strategies, including rounding, when an accurate answer is not required   | <ul style="list-style-type: none"> <li>use rounding to estimate <math>\\$90</math> is about the amount needed to purchase a <math>\\$47.95</math> toaster and a <math>\\$39.99</math> kettle</li> </ul>  |
| 1.2.8 determine whether an answer is reasonable by using estimation and the context of the problem   | <ul style="list-style-type: none"> <li>estimate amounts of <math>\\$50</math> and <math>\\$40</math> to decide that <math>\\$87.95</math> is the correct amount to pay for items which cost <math>\\$47.95</math> and <math>\\$39.99</math></li> </ul>   |
| 1.2.9 communicate solutions (oral and written), using language and symbols consistent with the context   | <ul style="list-style-type: none"> <li>write a money amount as <math>\\$325.40</math> and say as "three hundred and twenty five dollars and forty cents"</li> </ul>  |

### Content area 1.3: Length, mass and capacity

This content area supports students to develop their understanding of the attributes of length, mass and capacity and apply their measurement skills in practical situations. Students will need a sound sense of the size of common standard units and competency in estimating in standard units. They will also need to be proficient in using everyday measuring equipment and reading simple scales. While students are expected to know that standard units are sub-divided into smaller units, and to recall these numerical conversions, this content area does not demand understanding of decimal representation of part units, or the use of multiplication and division to convert between units and sub-units.

(Note: the words mass and weight should be used interchangeably)

| Content descriptions   | Examples  |
|--|---|
| 1.3.1 identify and discuss situations which involve using length, mass and capacity measures   | <ul style="list-style-type: none"> <li>discuss measurement involved in gardening and landscaping</li> </ul>   |
| 1.3.2 determine whether an estimate or an accurate length, mass or capacity measurement is needed in everyday situations   | <ul style="list-style-type: none"> <li>consider the level of accuracy required when setting up or maintaining a vegetable garden</li> </ul>   |
| 1.3.3 choose appropriate measuring tools to solve everyday problems involving length, mass and capacity  | <ul style="list-style-type: none"> <li>choose tools for measuring the dimensions of a large garden area, dry or liquid ingredients</li> </ul>   |
| 1.3.4 use informal units of length, mass and capacity, (for example, hand span, stride, cups) to estimate, measure and compare the size of everyday things   | <ul style="list-style-type: none"> <li>estimate the length of a garden or lawn using a stride, and lawn fertiliser using a cup or other container</li> </ul>  |
| 1.3.5 develop and use a sense of size of commonly used standard length, mass and capacity units; for example, 1 cm, 1 m, 500 mL, 1L, 500 gm, 1 kg to estimate in familiar situations   | <ul style="list-style-type: none"> <li>group and compare items which are a variety of common lengths, weights and capacities</li> </ul>   |
| 1.3.6 understand standard units are divided into sub-units and recall commonly used relationships, such as $1\text{cm} = 10\text{ mm}$ ; $1\text{ m} = 100\text{ cm} = 1000\text{ mm}$ ; $1\text{L} = 1000\text{ ml}$ ; $1\text{ kg} = 1000\text{ gm}$ | <ul style="list-style-type: none"> <li>discuss the use of <math>1000\text{ mm} = 1\text{ m}</math> when building an outdoor area, <math>100\text{ cm} = 1\text{ m}</math> for textiles, <math>1000\text{ mL} = 1\text{L}</math> for liquid ingredients</li> </ul> |
| 1.3.7 choose which standard length, mass or capacity unit is appropriate for everyday contexts   | <ul style="list-style-type: none"> <li>use millimetres (mm) for construction, metres (m) and/or centimetres (cm) for fabric lengths, millilitres for fertiliser concentrate</li> </ul>  |
| 1.3.8 use a variety of simple calibrated scales to measure and compare length, mass and capacity to the nearest whole number   | <ul style="list-style-type: none"> <li>choose from a range of rulers, tape measures, kitchen and weight scales, measuring cups and beakers/jugs</li> </ul>  |
| 1.3.9 add and subtract whole number length (including perimeter), mass and capacity measures, to solve everyday measurement problems   | <ul style="list-style-type: none"> <li>determine the total length of garden edging, the difference in weight between two brands of fertiliser, the total amount of water and concentrate in a mix of liquid fertiliser</li> </ul>                                 |
| 1.3.10 determine whether an answer is reasonable by using estimation and the context of the problem  | <ul style="list-style-type: none"> <li>consider the accuracy and correct use of measurement tools</li> </ul>  |
| 1.3.11 communicate solutions (oral and written) consistent with the language of the context  | <ul style="list-style-type: none"> <li>use millimetres to state the dimensions of a construction, and millilitres for a concentrate</li> </ul>  |

## Content area 1.4: Time

The mathematics related to time is quite complex. It includes making sense of the various ways we measure and record time, as well as the calculation of elapsed time. The focus of Unit 1.5 is on using digital and analogue time, restricted to 12-hour time, and using simple calendars and timetables. Students need a sound sense of the size of common standard units of time. They should know that these standard units are sub-divided into smaller units and be able to recall these numerical relationships. While students might use addition to carry out very simple conversions, such as two hours is sixty plus sixty minutes, the use of multiplication and division to efficiently convert between units and part-units of time is not considered until Unit 3. However, students are expected to use addition and subtraction of whole numbers to calculate elapsed time in simple problem situations. Such problems provide an appropriate and relevant context for students to consolidate the mathematics of choosing and carrying out addition and subtraction of whole numbers.

| Content descriptions   | Examples   |
|--|--|
| 1.4.1 identify and describe the tools and units commonly used to measure time  | <ul style="list-style-type: none"> <li>discuss situations such as getting to work on time, TV programs, calendars, timetables</li> </ul>   |
| 1.4.2 determine whether an estimate or an accurate time measurement is needed in everyday situations   | <ul style="list-style-type: none"> <li>discuss the level of accuracy required for travel, cooking a meal, paying bills, timing a fitness exercise, administering medication to a pet</li> </ul>  |
| 1.4.3 choose which tool and/or unit is appropriate for measuring or stating a time in common everyday contexts   | <ul style="list-style-type: none"> <li>choose a timing device/instrument for situations, such as fitness routines, cooking, bus and train timetables</li> </ul>  |
| 1.4.4 develop and use a sense of duration of standard time units: seconds, minutes, hours, days, weeks and months to estimate and compare time   | <ul style="list-style-type: none"> <li>use a clock, watch or stopwatch to measure short time periods; use timetables, TV programs and calendars for a sense of time in minutes and hours, days, weeks and months</li> </ul>                |
| 1.4.5 read and use digital and analogue watches, clocks (12-hour time only), and stopwatches   | <ul style="list-style-type: none"> <li>use a clock for cooking, and a stopwatch for fitness programs</li> </ul>  |
| 1.4.6 read and use various forms of calendars and timetables   | <ul style="list-style-type: none"> <li>use a calendar for the next due payment. Read and use bus and train timetables to get to work</li> </ul>  |
| 1.4.7 compare units of time to say how long events take, or to order events in time  | <ul style="list-style-type: none"> <li>produce a timeline for planning an event, prepare a program in table form for administering a pet's medication or treatment over a number of weeks</li> </ul>                                       |
| 1.4.8 understand and use the relationship between <ul style="list-style-type: none"> <li>seconds and minutes</li> <li>minutes and hours</li> <li>hours and days</li> <li>days, weeks and months</li> </ul> | <ul style="list-style-type: none"> <li>discuss situations, such as minutes and seconds for sporting records; hours and days for casual work or administering medication; days, weeks and months for planning for a future event</li> </ul> |
| 1.4.9 read, write and interpret commonly used expressions of time located in various texts and media   | <ul style="list-style-type: none"> <li>read 07-12-2013 and compare the different ways the same date is represented (by country or software package)</li> </ul>   |

| Content descriptions  | Examples  |
|---|---|
| 1.4.10 use addition and subtraction to solve simple problems involving elapsed time in situations involving calendars and timetables with one type of time unit | <ul style="list-style-type: none"><li>• use a calendar to work out how much time before the next repayment; calculate the elapsed time between 1.50 pm and 2.15 pm; use a timeline for planning an event</li></ul>  |
| 1.4.11 determine whether an answer is reasonable, given the context of the problem  | <ul style="list-style-type: none"><li>• determine whether the time planned for catching a train or bus, and the duration of the trip, is reasonable to meet a deadline, or for the time available</li></ul>   |
| 1.4.12 communicate information (oral and written) about time using language and symbols consistent with the context   | <ul style="list-style-type: none"><li>• communicate instructions on prescriptions; for example, “take two tablets twice a day for three days”, or “take 3mL three times a day,.” or “The next payment is due in three weeks’ time on the 07-12-2013.”</li></ul> |

## Content area 1.5: Data, graphs and tables

This content area focuses on the extraction of information from, and the interpretation of, various simple forms of data representation used in everyday contexts. Students also need opportunities to collect meaningful data and to represent this in simple tables and graphs. Teachers should choose data representations where the contexts are relevant and meaningful to their students and ensure that the numbers and scales used provide opportunities for students to consolidate their understanding of number as described in previous content areas. For this reason, teachers may choose to integrate content descriptors from this content area with those in other content areas.

| Content descriptions  | Examples  |
|---|---|
| 1.5.1 identify and describe the purpose of simple tables and graphs, involving whole numbers, in everyday contexts  | <ul style="list-style-type: none"> <li>discuss the common use of graphs and tables to represent data and information from everyday life and work</li> </ul>   |
| 1.5.2 describe the purpose of the key features, conventions and symbols of tables and graphs found in various texts and media from everyday life and work   | <ul style="list-style-type: none"> <li>discuss the key features, conventions and symbols of graphs on utility invoices and tables in a hardware catalogue</li> </ul>  |
| 1.5.3 read and interpret information from a range of simple data displays from real life contexts (involving whole numbers), including lists, one and two-way tables, column/bar and line graphs, venn and arrow/network diagrams | <ul style="list-style-type: none"> <li>interpret the information from a table in a hardware catalogue; graphs on utility invoices; a diagram showing flight paths</li> </ul>  |
| 1.5.4 collect and record data in one-way and two-way tables   | <ul style="list-style-type: none"> <li>collect and record data in simple one-way and two-way tables which the student could use to help make decisions in their personal life; for example, dosage and frequency information for two or more medications</li> </ul> |
| 1.5.5 construct vertical and horizontal column/bar graphs and line graphs (including both measurement and frequency graphs), using simple scales labelled with whole numbers  | <ul style="list-style-type: none"> <li>construct graphs using data from the growth of plants over time, daily temperature, or hours of casual work per week for a group of students</li> </ul>  |
| 1.5.6 determine whether interpretations from tables and graphs are reasonable for the context   | <ul style="list-style-type: none"> <li>discuss answers to questions about the information in a feed chart which is based on the weight of a pet, or a graph showing road accident statistics,</li> </ul>  |
| 1.5.7 communicate information and conclusions from graphs and tables consistent with the language of the context  | <ul style="list-style-type: none"> <li>using language such as, “My dog is more than 12 months old and weighs between 10 and 15kg, so his feed should not exceed 235g per day”</li> </ul>  |

## Unit 2

### Unit description

This unit provides students with the mathematical knowledge, understanding and skills relating to fractions and decimals, solving problems relating to multiplication and division, perimeter, area and volume and qualitative probability from everyday contexts. Teachers are encouraged to apply the content of this unit in contexts which are meaningful and of interest to their students. The number formats for this unit are whole numbers, money, fractions and decimals.

This unit includes five content areas.

2.1: Understanding fractions and decimals

2.2: Multiplication and division with whole numbers and money

2.3: Metric relationships

2.4: Perimeter, area and volume

2.5: The probability of everyday events

### Learning outcomes

By the end of this unit, and within a range of everyday life and work contexts, students will:

- understand the meaning and magnitude of unit fractions and familiar non-unit fractions and decimals
- choose multiplication and division to solve problems in a range of everyday situations with whole numbers and money
- appropriately choose from, and use a range of, strategies to efficiently and accurately multiply and divide whole numbers and quantities of money
- understand and use prefixes and decimal relationships between commonly used units of metric measurement
- estimate and measure perimeter and area of rectangular shapes, and volume of rectangular prisms, in familiar practical situations
- identify, describe and compare familiar and common chance events.



## Unit content

This unit includes the knowledge, understandings and skills described below.

### Content area 2.1: Understanding fractions and decimals

The focus of this content area is the development of student understanding of the meaning of fractional and decimal numbers. This content area provides opportunities for students to come to understand that fractions can be thought of as quantities which represent parts of single items, continuous quantities and collections; and that different fractions can represent the same quantity. Students should also understand that our whole number place value system can be extended to include decimal numbers between whole numbers. They need to know that fractions and decimals can be used to name the same quantity in different ways, and be able to use this understanding to compare the magnitude of fractional and decimal numbers.

Operating and calculating with fractions are considered in Unit 3.

| Content descriptions  | Examples  |
|---|---|
| 2.1.1 identify and describe the purpose of fractions in various texts and media from everyday life and work<br><br>2.1.2 identify and describe the purpose of decimals in various texts and media from everyday life and work   | <ul style="list-style-type: none"> <li>discuss references in recipes, sport, such as quarter and half time, tools or fittings for plumbing or electrical applications</li> <li>discuss the use of decimals in money, interest rates, sporting scores, such as gymnastics or diving, measurement of dimensions</li> </ul>  |
| <b>Fractions</b><br>2.1.3 read, write and count with fractions, including unit and common non-unit fractions<br><br>2.1.4 understand the meaning and magnitude of commonly used fractions, and compare and order them<br><br>2.1.5 understand the link between unit fractions and division; for example, finding $\frac{1}{4}$ of a quantity is the same as dividing by 4 | <ul style="list-style-type: none"> <li>work with fractions such as <math>\frac{1}{2}</math>, <math>\frac{1}{3}</math> and <math>\frac{1}{4}</math>, in contexts such as cooking and partial hours in time sheets</li> <li>partition a variety of objects, regions, lengths, capacity/volume, mass, time, and money, into two or more equal parts, naming and labelling the parts with unit fractions (<math>\frac{1}{2}</math>, <math>\frac{1}{4}</math>, <math>\frac{1}{3}</math>, <math>\frac{1}{5}</math>, <math>\frac{1}{10}</math>, ...) and common non-unit fractions (<math>\frac{2}{5}</math>, <math>\frac{2}{3}</math>, <math>\frac{3}{4}</math>, <math>\frac{3}{10}</math>, ...)</li> <li>show that <math>\frac{1}{4}</math> of one quantity or object may be more than <math>\frac{1}{3}</math> of a different quantity or object; compare different sized unit fractions in relation to the same whole; for example, a length of fabric or a quantity of an ingredient</li> <li>use division of a collection, object or shape by 2, 3, 4, 5 and 10 to demonstrate <math>\frac{1}{2}</math>, <math>\frac{1}{3}</math>, <math>\frac{1}{4}</math>, <math>\frac{1}{5}</math> and <math>\frac{1}{10}</math></li> </ul> |

| Content descriptions   | Examples  |
|--|---|
| <p>2.1.6 use readily visualised equivalent fractions to compare and order the size of fractions</p>  | <ul style="list-style-type: none"> <li>use objects, regions, lengths, capacity/volume, mass, time, and money to model, compare and represent the equivalence of fractions with related denominators by redividing the whole; for example, <math>\frac{1}{2}, \frac{2}{4}, \frac{4}{8}, \frac{50}{100}</math>, or <math>\frac{1}{5}, \frac{2}{10}, \frac{20}{100}</math></li> <li>demonstrate the connection between common fractions, such as when halving a recipe; for example, half of a half cup quantity is a quarter of a cup</li> </ul>  |
| <p><b>Decimals</b></p> <p>2.1.7 extend whole number place value to the right of the units place to understand decimal numbers as between consecutive whole numbers</p> <p>2.1.8 use place value to understand the meaning and magnitude of commonly used decimal numbers</p> <p>2.1.9 use patterns in the number system to read, write, count with and order familiar decimal numbers in everyday contexts involving money and measurements</p> <p><b>Connecting Fractions and Decimals</b></p> <p>2.1.10 recognise that fractions and decimals are used to name the same quantity in different ways</p> <p>2.1.11 make connections between commonly used fractions and decimals to name the same quantity in different ways</p> | <ul style="list-style-type: none"> <li>use objects, collections, grids and lines to show that 1 can be divided into ten parts with each called 0.1, and each of these parts can be divided into ten parts which we call 0.01</li> <li>use collections, grids and lines to partition into decimal parts; consider the meaning of decimal quantities on price labels and docket; for example, deli meat, fruit and vegetables</li> <li>read 1.05 on a calculator as one dollar and five cents, read 1.05 m and 1.5 m, saying, "One point zero five metres and one point five metres", knowing that 1.5 m is larger than 1.05 m</li> <li>identify instances in the media, catalogues or brochures where fractions and decimals are interchangeable</li> <li>use objects, diagrams, collections, and measuring scales to demonstrate the connection between decimals and fractions, such as <math>\frac{1}{10}</math> and 0.1, <math>\frac{1}{2}</math> and 0.5, <math>\frac{1}{4}</math> and 0.25</li> </ul> |
| <p>2.1.12 determine and explain whether the magnitude of a fraction or decimal is reasonable within everyday contexts</p>  | <ul style="list-style-type: none"> <li>discuss the reasonableness of estimated fractional and decimal amounts, such as <math>\frac{1}{3}</math> cup in cooking, or 0.4 m in garden measurements</li> </ul>  |

## Content area 2.2: Multiplication and division with whole numbers and money

Students must understand when and why multiplication and division are used as well as how to carry out calculations associated with these operations. They need to choose multiplication and division, even when no obvious verbal clues are provided in the problem situation or context. While the full range of problem types which involve multiplication and division includes multiplicative comparisons, scales, rates and ratios, this content area demands only an understanding of multiplication as 'repeated groups', and division as both 'grouping and sharing'. Students also need to understand the inverse relationship between multiplication and division, and to use this relationship to assist in calculations and problem solving.

While students need to apply multiplication and division to a wide range of problem situations, they also need to make decisions about the accuracy of the answer required and the reasonableness of their solution. In this content area, students should become confident in their capacity to correctly and efficiently carry out multiplication and division calculations with whole numbers and money that may arise in their personal life and work. They should therefore develop, practise and maintain mental calculation strategies, using informal jottings if required, estimation techniques, and effective use of a calculator. Students should be supported to flexibly generate, recall and extend basic multiplication and division facts.

It is intended that students will consider these ideas as they are applied to problem situations in contexts relevant to them.

As teachers discuss the mathematical ideas outlined in the content descriptors, it is important that the teacher makes explicit, and models the mathematical thinking process, which involves:

- interpreting the task and the key information
- choosing the mathematics which could help to complete the task
- applying their existing mathematical knowledge and strategies to obtain a solution
- interpreting the results in relation to the context
- communicating the solution to the problem as required

While students are not expected to independently use this process at this point, this will be expected in Unit 4.

| Content descriptions   | Examples  |
|--|---|
| 2.2.1 determine whether an estimation or an exact answer is needed in everyday situations  | <ul style="list-style-type: none"> <li>• discuss situations such as the total pay for the hours worked, or the total length of wood required for building bookshelves</li> </ul>  |
| 2.2.2 choose when it is appropriate to use multiplication or division to solve a range of everyday problems; for example, repeated equal groups, arrays, area, volume and simple rates | <ul style="list-style-type: none"> <li>• present repeated group situations and ask students to choose which operation to use; for example, if there are 8 lamingtons per box, how many               <ul style="list-style-type: none"> <li>▪ lamingtons in 12 boxes?</li> <li>▪ boxes are needed for 56 lamingtons?</li> </ul> </li> </ul> |

| Content descriptions   | Examples   |
|--|--|
| 2.2.3 understand and use the inverse relationship between multiplication and division to assist in mental calculation  | <ul style="list-style-type: none"> <li>use arrays, such as when planting seedlings, to demonstrate that if, for example, 56 seedlings are represented as 7 rows of 8, <math>56 \div 8</math> must mean there are 7 rows of seedlings, with 8 in each row</li> </ul>          |
| 2.2.4 understand, recall, use and extend basic multiplication and division facts to facilitate mental calculation  | <ul style="list-style-type: none"> <li>use an array to show that <math>12 \times 7</math> is <math>10 \times 7</math> plus <math>2 \times 7</math> when applying a rate of \$7/hour for 12 hours</li> </ul>  |
| 2.2.5 use mental calculation strategies, with informal jottings to keep track if required, to solve everyday problems involving multiplication and division, with simple whole numbers | <ul style="list-style-type: none"> <li>calculate the total length of fencing that is <math>320 \times 4</math> by writing 1200, then 80, and mentally adding; calculate the cost for each item, given the price of several items; for example, \$3.50 for 5 items</li> </ul> |
| 2.2.6 use a calculator/spreadsheet efficiently and appropriately when more complex (unfriendly) numbers or tasks are involved  | <ul style="list-style-type: none"> <li>record the number of hours of casual work over the week or fortnight and use a calculator or spreadsheet to determine the expected gross pay</li> </ul>   |
| 2.2.7 use estimation strategies, including rounding, when an exact answer is not required  | <ul style="list-style-type: none"> <li>determine an approximate amount of money required for purchasing multiples of items from a catalogue, such as when catering for a barbecue for a group of friends</li> </ul>  |
| 2.2.8 interpret remainders resulting from division in relation to the context  | <ul style="list-style-type: none"> <li>discuss situations such as the number of cars needed to transport 17 people, 4 cars not 3 cars and two people left over</li> </ul>  |
| 2.2.9 determine whether an answer is reasonable by using estimation and the context of the problem   | <ul style="list-style-type: none"> <li>discuss and describe the solution to a practical problem such as, "11.8 m of timber to build the bookshelves. The cost of wood is \$15/metre, so the total cost is <math>\\$15 \times 12 = \\$180</math>."</li> </ul>                 |
| 2.2.10 communicate solutions (oral and written) using language and symbols consistent with the context   |  |

### Content area 2 3: Metric relationships

This content area brings together student understandings of whole, fractional and decimal numbers, with their understanding of length, mass and capacity measurement. The mathematics of this content area could be integrated into, or developed alongside, the other previous related mathematics. A sound grasp of whole number and decimal place value, including an understanding of the multiplicative patterns in our number system, is fundamental to developing a deeper understanding of our metric measurement system. Likewise, students need to be able to link their fraction understanding with their decimal understanding in order to be able to move flexibly between equivalent forms when they are dealing with metric units.

Fundamental to the metric system and the decimal system is the idea that each place is ten times bigger as you move to the left across the places, or ten times smaller as you move to the right. The metric system uses prefix names to denote the size of a unit in relation to the base unit of the attribute. The prefix names are consistent across the different attributes. For example, the prefix 'milli' means one thousandth, whether it is a millimetre, a millilitre or a milligram. The metric measurement system is built on these ideas, which is why it is so useful. Memorising the metric 'facts' is therefore not needed in the same way as with the imperial system, which is not built on consistent naming of, or relationships between, units and subunits across the attributes.

| Content descriptions   | Examples  |
|--|---|
| 2.3.1 identify and describe the purpose of commonly used metric units within various everyday contexts   | <ul style="list-style-type: none"> <li>identify instances in the media, catalogues or brochures where metric units occur</li> </ul>   |
| 2.3.2 use prefix names of measurement units to work out the relationship with the base units: metre, gram and litre. For example milli means a thousandth, kilo means times by a thousand  | <ul style="list-style-type: none"> <li>categorise and discuss the names of known standard units to explore relationships in metric measures. For example, how are kilometres and metres similar to kilograms and grams?</li> </ul>  |
| 2.3.3 link decimal place value and the prefix names of metric units to read, write, compare and order length, mass and capacity measurement  | <ul style="list-style-type: none"> <li>explore the measurements on a variety of items and labels which involve prefixes of centimetres and metres, grams and kilograms, or millilitres and litres, and compare and order them</li> </ul>  |
| 2.3.4 use place value understanding to convert from one unit to another; that is, 250 mm = 25 cm   | <ul style="list-style-type: none"> <li>use rulers and measuring tapes to show that if 1 centimetre is 10 millimetres, then 6 cm is 60 mm, and if one metre is 100 centimetres, then 50 cm is 500 mm; use measuring jugs and cups to show if 1 litre is 1000 mL, then 4 litres is 4000 mL</li> </ul> |
| 2.3.5 use relationships between decimals and fractions to convert from one unit to another; for example, 1500 mm is 1.5 m because 1000 = 1 metre and 500 is half a metre. (Note: perimeter, area and volume all use length measures) | <ul style="list-style-type: none"> <li>demonstrate how, for a 250 mL cup measure, four cups make a litre, and therefore 1 cup is <math>\frac{1}{4}</math> of a litre, which is 0.25 litre, so 250 mL is 0.25 of a litre</li> </ul>  |
| 2.3.6 communicate measurements using units appropriate to the context  | <ul style="list-style-type: none"> <li>discuss and write appropriate units for a variety of measurement situations, such as purchasing timber where no units are mentioned but are assumed</li> </ul>   |

## Content area 2.4: Perimeter, area and volume

Superficial understanding and rote application of measurement formulas are of little use in the solution of authentic problems, or in providing the foundation for further learning. This unit therefore focuses on parallel development of the:

- understanding of the attributes of perimeter, area and volume
- standard units used to measure these attributes
- relationships between these attributes that are summarised as measurement formulas
- application of the operations in calculations involving these attributes

| Content descriptions   | Examples   |
|--|--|
| 2.4.1 identify and describe the purpose of perimeter, area and volume measures in everyday life and work   | <ul style="list-style-type: none"> <li>• discuss situations such as floor coverings, land area, landscape supplies, rainwater tanks, applying fertiliser</li> </ul>  |
| 2.4.2 determine whether an estimate or an accurate perimeter, area and volume measurement is needed in everyday situations   | <ul style="list-style-type: none"> <li>• discuss the level of accuracy needed in situations such as landscaping and house painting</li> </ul>  |
| 2.4.3 calculate perimeter by adding length measurements and connect this to the formulae   | <ul style="list-style-type: none"> <li>• measure and add the dimensions of a rectangular and non-rectangular garden bed to determine the amount of concrete edging or fencing required</li> </ul>  |
| 2.4.4 measure area (including irregular shapes) by counting squares, and volume by counting cubes  | <ul style="list-style-type: none"> <li>• use one square metre units to measure areas of large rectangular and non-rectangular shapes; for example, a floor space, recognising that a 1 m square can be cut and rearranged; rearrange a number of cubes or boxes and discuss the volume (space taken up) which results from the different arrangements</li> </ul> |
| 2.4.5 connect the idea of counting squares for area with the formula of $A = l \times w$   | <ul style="list-style-type: none"> <li>• discuss strategies to count the number of square units in area calculations involved in floor coverings, painting walls or gardening</li> </ul>   |
| 2.4.6 connect the idea of counting cubes for volume with the formula of $V = h \times l \times w$  | <ul style="list-style-type: none"> <li>• discuss strategies such as visualising repeated layers of stacked cartons</li> </ul>  |
| 2.4.7 use perimeter and area formula for shapes based on rectangles, and volume formula for shapes based on rectangular prisms   | <ul style="list-style-type: none"> <li>• use situations such as the amount of edging for a rectangular garden, area of brick paving and lawn, load capacity of a trailer</li> </ul>  |
| 2.4.8 develop and use a sense of size of commonly used standard area and volume units; for example: <ul style="list-style-type: none"> <li>▪ 1 square centimetre (<math>1 \text{ cm}^2</math>), 1 square metre (<math>1 \text{ m}^2</math>),</li> <li>▪ 1 cubic centimetre (<math>1 \text{ cm}^3</math>), 1 cubic metre (<math>1 \text{ m}^3</math>) to estimate in familiar situations</li> </ul> | <ul style="list-style-type: none"> <li>• estimate a square centimetre, square metre, cubic centimetre and a cubic metre within the classroom. Verify using rulers or measuring tapes</li> </ul>  |

| Content descriptions   | Examples   |
|--|--|
| 2.4.9 estimate perimeter, area and volume in practical situations using familiar standard units and rounding<br><br>2.4.10 choose which standard perimeter, area or volume unit is appropriate for the context | <ul style="list-style-type: none"><li>estimate and verify the perimeter of a swimming pool for fencing; the area of a path for bricking paving; and the volume of a tank</li></ul>   |
| 2.4.11 determine whether an answer is reasonable for the context of the problem<br><br>2.4.12 communicate solutions (oral and written), using language and symbols consistent with the context                 | <ul style="list-style-type: none"><li>discuss the reasonableness of an estimate or calculation result for the perimeter of a swimming pool for fencing; the area of a path for bricking paving; and the volume of a rectangular tank</li></ul> |

## Content area 2.5: The probability of everyday events

Elements of chance are encountered in many aspects of everyday life. These range from predictions of the likelihood of rain, the gender of a new baby, and the possibility of success in games and sports.

The emphasis of this content area is for students to recognise the element of chance in familiar daily activities, and to use this knowledge to make appropriate decisions. The use of percentages, decimal and fractional numbers to quantify chance is considered in Unit 4.

| Content descriptions  | Examples  |
|---|---|
| 2.5.1 identify and describe situations which involve the element of chance in everyday life and work                                  | <ul style="list-style-type: none"> <li>identify and discuss situations such as games, weather, sport, Lotto, raffles, gender</li> </ul>   |
| 2.5.2 describe the likelihood of everyday chance events using terms such as certain, likely, equally likely, fifty/fifty, impossible  | <ul style="list-style-type: none"> <li>discuss likelihood in relation to weather, selection for a sports team or a committee, a lottery or raffle, how often a six is thrown on a die</li> </ul>                        |
| 2.5.3 compare and order chance events from least likely to most likely, providing reasoning from personal experience or based on data | <ul style="list-style-type: none"> <li>discuss the predictability of the weather based on collected data. For example, temperature or rainfall</li> </ul>   |
| 2.5.4 recognise and use the element of chance to make decisions in everyday life and work   | <ul style="list-style-type: none"> <li>use rainfall/temperature data to give advice on the best time to hold an outdoor event; conduct a footy tipping competition and discuss the outcomes after each round</li> </ul> |
| 2.5.5 explain decisions (oral and written) based on likelihood of events  | <ul style="list-style-type: none"> <li>make reference to likelihood to justify the decision made for the best time to hold an outdoor event; or choices made in a football tipping contest</li> </ul>                   |



## School-based assessment

The *Western Australian Certificate of Education (WACE) Manual* contains essential information on principles, policies and procedures for school-based assessment that needs to be read in conjunction with this syllabus.

Teachers design school-based assessment tasks to meet the needs of students. The table below provides details of the assessment types for the Mathematics Foundation Year 11 syllabus and the weighting for each assessment type.

### Assessment table – Year 11

| Type of assessment   | Weighting |
|--|-----------|
| <p><b>Response</b></p> <p>Students respond to ongoing assessment using their knowledge of mathematical skills, content, terminology and procedures of the course.</p> <p>Responses can be in written or oral form.</p> <p>Evidence can include: observation checklists, quizzes and tests (with and without calculator).</p> <p>It is advisable that students be given some practice in multiple choice questions.</p>   | 50%       |
| <p><b>Practical applications</b></p> <p>Students are required to practically apply mathematics understandings and skills through using the mathematical thinking process (below) to develop solutions or arrive at conclusions to real world tasks.</p> <ul style="list-style-type: none"> <li>• interpret the task and gather the key information</li> <li>• identify the mathematics which could help to complete the task</li> <li>• analyse information and data from a variety of sources</li> <li>• apply their existing mathematical knowledge and strategies to obtain a solution</li> <li>• verify the reasonableness of the solution</li> <li>• communicate findings in a systematic and concise manner</li> </ul> <p>The process can include written work, spreadsheets, pictures, diagrams, tables or graphs, media, photographs, video, and models created by the student.</p> <p>Note:</p> <ul style="list-style-type: none"> <li>• a minimum of three practical applications must be included for each unit</li> <li>• practical applications are of short duration and involve a limited number of familiar, scaffolded steps</li> </ul> | 50%       |

The assessment outline must:

- include a set of assessment tasks
- include a general description of each task
- indicate the unit content to be assessed
- indicate a weighting for each task and each assessment type

- include the approximate timing of each task (for example, the week the task is conducted, or the issue and submission dates for an extended task).

In the assessment outline for the pair of units, each assessment type must be included. In the assessment outline where a single unit is being studied, each assessment type must be included.

The set of assessment tasks must provide a representative sampling of the content for Unit 1 and Unit 2.

The level of independence demonstrated by a student to complete a response or practical application task is a key component of the grade descriptions of the Mathematics Foundation course. As such, teachers may choose to assign additional marks to these assessment tasks, to reflect the level of independence demonstrated by the student in the task completion. This will assist the teacher to prepare a final ranked list of student achievement, from which grades are determined.

Assessment tasks not administered under test/controlled conditions require appropriate validation/authentication processes.

## Grading

Schools report student achievement in terms of the following grades:

| Grade | Interpretation           |
|-------|--------------------------|
| A     | Excellent achievement    |
| B     | High achievement         |
| C     | Satisfactory achievement |
| D     | Limited achievement      |
| E     | Very low achievement     |

The teacher prepares a ranked list and assigns the student a grade for the pair of units (or for a unit where only one unit is being studied). The grade is based on the student's overall performance as judged by reference to a set of pre-determined standards. These standards are defined by grade descriptions and annotated work samples. The grade descriptions for the Mathematics Foundation Year 11 syllabus are provided in Appendix 1.

To be assigned a grade, a student must have had the opportunity to complete the education program, including the assessment program (unless the school accepts that there are exceptional and justifiable circumstances).

Refer to the *WACE Manual* for further information about the use of a ranked list in the process of assigning grades.

## Appendix 1 – Grade descriptions Year 11

|   |  |
|---|--|
| A | <p><b>Interpret the tasks and choose the maths</b></p> <p>Mostly independently, in familiar and some unfamiliar tasks involving a limited number of concepts from across the breadth of content areas, identifies and organises the relevant information; determines the level of accuracy required and chooses and plans to use methods to carry out tasks.</p> |
|   | <p><b>Apply mathematical knowledge to obtain a solution</b></p> <p>Independently, uses mental, written and technological calculation strategies and mathematical processes that are consistently efficient and appropriate, resulting in accurate solutions for familiar tasks.</p>  |
|   | <p><b>Interpret and communicate</b></p> <p>Mostly independently, in familiar tasks involving a limited number of concepts from across the breadth of content areas, communicates results that demonstrate links between mathematical language and the context of the task and uses language appropriate to context and audience.</p>                             |
| B | <p><b>Interpret the tasks and choose the maths</b></p> <p>Sometimes independently, in familiar tasks involving a limited number of concepts from across the breadth of content areas, identifies and organises the relevant information; determines the level of accuracy required and chooses and plans to use methods to carry out tasks.</p>                  |
|   | <p><b>Apply mathematical knowledge to obtain a solution</b></p> <p>Mostly independently uses mental, written and technological calculation strategies and mathematical processes that are mostly efficient and appropriate, resulting in mostly accurate solutions for familiar tasks.</p>   |
|   | <p><b>Interpret and communicate</b></p> <p>Sometimes independently, in familiar tasks involving a limited number of concepts from across the breadth of content areas, communicates results that sometimes demonstrate links between mathematical language and the context of the task and using language appropriate to context and audience.</p>               |
| C | <p><b>Interpret the tasks and choose the maths</b></p> <p>With support, including scaffolding, in familiar tasks, involving a single concept from across the breadth of content areas, identifies and organises the relevant information; determines the level of accuracy required and chooses and plans to use methods to carry out tasks.</p>                 |
|   | <p><b>Apply mathematical knowledge to obtain a solution</b></p> <p>Sometimes independently, uses mental, written and technological calculation strategies and mathematical processes that are sometimes efficient and appropriate, resulting in mostly accurate solutions for familiar tasks.</p>  |
|   | <p><b>Interpret and communicate</b></p> <p>With support, in familiar tasks involving a single concept from across the breadth of content areas, communicates mathematics results using language and representation appropriate to context and audience.</p>  |

|   |  |
|---|--|
| D | <b>Interpret the tasks and choose the maths</b><br>With support, in routine and practised tasks involving a single concept from across the breadth of content areas, identifies and organises the relevant information; determines the level of accuracy required and chooses and plans to use methods to carry out tasks. |
|   | <b>Apply mathematical knowledge to obtain a solution</b><br>With support, in routine and practised tasks, uses mental, written and technological calculation strategies and mathematical processes.  |
|   | <b>Interpret and communicate</b><br>With support, in routine and practised tasks involving a single concept, communicates mathematics results, sometimes using language and representation appropriate to context and audience.  |
| E | Does not meet the requirements of a D grade and/or has completed insufficient assessment tasks to be assigned a higher grade.  |

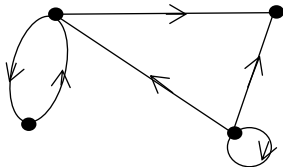
## Appendix 2 – Glossary

### Array

Situation where multiplication or division is involved. For example, a garden includes three rows with five plants in each row. There are  $3 \times 5$  plants altogether.

### Arrow/network diagram

Diagrams which represent relationships or connecting paths, such as for rail or air routes



### Basic addition facts

Sums to  $10 + 10$

For example, if  $2 + 3 = 5$  and  $6 + 8 = 14$ , then  $26 + 38 = 50 + 14 = 64$

### Basic multiplication facts

Products to  $10 \times 10$ . For example, if  $3 \times 4 = 12$ , then  $3 \times 8 = 2 \times 12 = 24$ ; and if  $4 \times 7 = 28$  then  $280 \div 7 = 40$

### Capacity

The amount of a liquid or other pourable substance a container can (or does) hold.

### Combining quantities

Problems where you have to consider two static quantities, either separately or combined, and which are solved using addition and subtraction. For example, if I buy a loaf of bread for \$3.50 and a litre of milk for \$2.25, how much do I pay? Or, I buy a loaf of bread for \$3.50. How much change do I get from \$10?

### Comparing the difference

Problems which involve how many more/less or how much more/less. These problems are solved using addition and subtraction. For example, the first player chosen is 167 cm in height and the second is 186 cm. How much taller is the second player? Or, the first player chosen is 167 cm in height. The next person chosen needs to be at least 25 cm taller. How tall does the next person need to be?

### Frequency graph



A form of column or bar graph which shows the frequency of categorical data.

**Informal units**

Units which are not part of a standardised system of units. For example, an informal unit for length could be hand spans. Informal units are sometimes referred to as non-standard units.

**Inverse relationship - addition and subtraction**

The part-part-whole relationship shows how addition and subtraction are related, with subtraction being the inverse of addition.

**Inverse relation – Multiplication and division.**

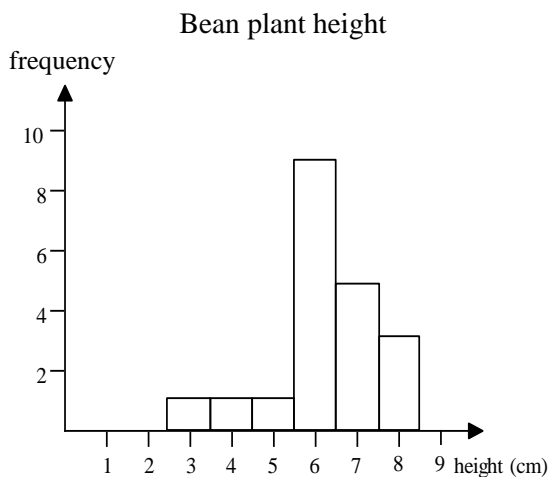
Part –part– whole relationship

$$6 \times 7 = 42 \text{ and } 7 \times 6 = 42$$

$$42 \div 7 = 6 \text{ and } 42 \div 6 = 7$$

**Mass**

In this course mass is used interchangeably for measures of weight.

**Measurement graph**

A simple histogram involving continuous measurement data.

**Non unit fraction**

A fraction whose numerator is greater than 1. For example  $\frac{2}{3}$  or  $\frac{3}{4}$

**Part-part-whole model -addition and subtraction**

Any quantity, while being thought of as a whole, can also be thought of as composed of parts. That is

|    |    |                                   |
|----|----|-----------------------------------|
| 29 | 13 | $29 + 13 = 42$ and $13 + 29 = 42$ |
| 42 |    |                                   |

If the whole quantity is unknown, addition is required. If one of the other quantities is unknown, subtraction is required.

**Partitioning**

Separating a number into parts to assist in calculation. For example,  $136 + 323$  can be partitioned into  $100 + 30 + 6 + 300 + 20 + 3$  and  $400 + 50 + 9 = 459$

**Place value of whole numbers**

Numbers are based on powers of ten, with the initial ones, tens and hundreds being repeated. The space in 346 427 signals the cyclical process in speech

|                     |                    |                 |                |               |              |
|---------------------|--------------------|-----------------|----------------|---------------|--------------|
| hundreds            | tens               | ones            | hundreds       | tens          | ones         |
| thousands           |                    |                 | ones           |               |              |
| 3                   | 4                  | 6               | 4              | 2             | 7            |
| $3 \times 100\ 000$ | $4 \times 10\ 000$ | $6 \times 1000$ | $4 \times 100$ | $2 \times 10$ | $7 \times 1$ |

**Place value – decimals**

Numbers are based on powers of ten and parts of one.

|                |               |              |                |                 |                  |
|----------------|---------------|--------------|----------------|-----------------|------------------|
| hundreds       | tens          | ones         | tenths         | hundredths      | thousandths      |
| ones           |               |              | fractions      |                 |                  |
| 4              | 2             | 7            | 3              | 5               | 2                |
| $4 \times 100$ | $2 \times 10$ | $7 \times 1$ | $\frac{3}{10}$ | $\frac{5}{100}$ | $\frac{2}{1000}$ |

**Repeated equal groups**

Situations where multiplication or division is involved. For example, if one shelf in a cupboard is 620 mm long, then three shelves (groups) would require  $620 + 620 + 620 = 1860$  mm of timber.

**Simple rate**

Used in situations such as hourly rate of pay, or price per kilogram.

**Unit fraction**

A simple fraction whose numerator is 1. For example  $\frac{1}{3}$  or  $\frac{1}{4}$

**Venn diagram**

Used to represent data that have overlapping categories.

