MATHEMATICS

Foundation course
Year 12 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 ourrespect to Elders past and present.

Content

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 a focus on 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 (AIT) (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.

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 'rate' 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 summarise 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 software 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 Mathematics Foundation mainly include the application of mathematical skills for their decision-making, lifelong 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. This 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 Year 12 syllabus is divided into two units which are delivered as a pair. The notional time for the pair of units is 110 class contact hours.

Unit 3

This unit provides students with the mathematical knowledge, understanding and skills relating to percentages and the link to fractions and decimals and the solving of problems relating to the four operations using whole number, fractions and decimals. Location, time and temperature, and shape and its relationship to design, are also covered in this unit.

Unit 4

This unit provides students with the mathematical knowledge, understanding and skills relating to rates and ratios, and the connection between statistics and probability. The collection of mathematical concepts and thinking processes encountered in this and previous units culminates in the solving of comprehensive real life problems encountered in personal, workplace and community contexts.

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 essential 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
3	55	All content is core	3.1: The four operations: whole numbers and money 3.2: Percentages linked with fractions and decimals 3.3: The four operations: fractions and decimals 3.4: Location, time and temperature 3.5: Space and design
4	55	All content is core	4.1: Rates and ratios 4.2: Statistics and probability 4.3: Application of the Mathematical Thinking Process

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 contexts

- Numeracy for work contexts

- Numeracy for community contexts

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

Unit 3

Unit description

This unit provides students with the mathematical knowledge, understanding and skills relating to percentages and the link to fractions and decimals, and the solving of problems relating to the four operations using whole number, fractions and decimals. Location, time and temperature, and shape and its relationship to design, are also covered in this unit.

This unit includes five content areas.

3.1: The four operations: whole numbers and money

3.2: Percentages linked with fractions and decimals

3.3: The four operations: fractions and decimals

3.4: Location, time and temperature

3.5: Space and design

Learning outcomes

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

- choose addition, subtraction, multiplication or division to solve everyday problems involving whole numbers, money, familiar fractions and decimals

- use efficient calculation strategies (including mental, calculator and spreadsheet) to solve everyday problems involving whole numbers, money, familiar fractions and decimals

- understand and use straightforward percentages in familiar situations

- read and use 12 and 24 hour time, time tables, Celsius temperature scales, and simple maps and plans

- identify, draw and interpret 2D shapes, diagrams and drawings of 3D objects used in everyday situations

- identify and construct simple 3D shapes encountered in everyday situations.

Unit content

An understanding of the Year 11 content is assumed knowledge for students in Year 12. It is recommended that students studying Unit 3 and Unit 4 have completed Unit 1 and Unit 2.

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

Content area 3.1: The four operations: whole numbers and money

Students should learn to apply the four operations of addition, subtraction, multiplication and division to a wide range of everyday, familiar problem situations, as well as develop the skills necessary to select operations and procedures and judge the reasonableness of their results. They need to maintain and consolidate their techniques for mental arithmetic, estimation, calculator use and spreadsheet work so that they become confident of their capacity to deal with everyday computational situations correctly and efficiently.

The focus of this unit is developing student understanding of the meaning, use and connections between the four operations in order to solve everyday problems involving whole numbers and money in a variety of different everyday situations. The ability to choose the correct operation to solve a problem in a given situation cannot be assumed and must be explicitly taught. This skill is independent of, and in addition to, the skills required to carry out calculations. Efficient and effective use of calculators and spreadsheets, as expected in the workplace, requires the interpretation of a situation and the choice of appropriate operations.

This content area also foregrounds the mathematical thinking process that has been modelled and integrated through Unit 1 and Unit 2.

This mathematical thinking process includes:

- interpreting the task and the key information

- choosing the mathematics

- using the mathematics

- interpreting the results in relation to the context

- communicating the solution to the problem as required.

In this unit, the mathematical thinking process needs to be taught explicitly, with students practising and using each of the steps as they learn to choose and use the four operations to solve everyday personal, community or workplace problems.

Content descriptions	Examples

3.1.1 plan to solve an everyday problem involving whole numbers and/or money by selecting:
▪ whether an estimation or accurate answer is needed
▪ the relevant numbers/information
▪ one or more of the four operations
▪ sequence of operations
▪ mental strategies (with jottings if needed), calculator or spreadsheet
	• provide a variety of problems, such as
	  ▪ total of a shopping list, including multiples of items, for lunch for a number of friends
	  ▪ determining the number of serves of food or drink from a catering quantity
	  ▪ saving for the bond on a rented unit
	  ▪ calculating the amount of money to save each fortnight over a two year period to purchase a car with a budget of $10 000
	  ▪ tracking a savings plan – how much have I saved, how much more do I need?
	  ▪ using a formula based on weight and age to determine the amount of medication required

Content descriptions	Examples
3.1.2 understand and use the relationships between the four operations to assist in calculations	• connect the value of a $10 000 car to saving 52 fortnightly amounts of $192. That is, 10 000 ÷ 52 is approximately $192, so savings will be 52 x $192
3.1.3 choose and use the appropriate operation to efficiently solve a problem on a calculator or spreadsheet	• choose subtraction and multiplication to determine the amount of money to still be saved after 15 fortnights; that is, $10\,000 - 15 \times \$192 = \$7120$
3.1.4 choose and use the appropriate operation and strategy to efficiently solve a problem mentally, using informal jottings to keep track if needed	• use an estimate of $200 for each fortnight, so the calculation for 26 fortnights involves 20 x 200 and • 6 x 200, which is 4000 + 1200, giving $5200 saved. 800 + 4000, which is 4800 more to be saved
3.1.5 determine the order of operations when solving problems involving multistep calculations	• determine how much more to save by multiplying the number of fortnights by the savings each fortnight, and subtract the result from $10 000
3.1.6 use properties of operations to anticipate the effect of operations on numbers	• 26 is 20 + 6, so if I multiply it by 200, I need to multiply by both 20 and 6, otherwise 20 + 6 x 200 is only 1220, which cannot be right
3.1.7 use estimation strategies, including rounding, when an accurate answer is not required	• estimate $200 for 25 fortnights for the approximate amount of money saved in one year
3.1.8 determine whether an answer is reasonable by using properties of operations, estimation and the context of the problem	• discuss the estimate that it would take one month less than two years to save $10 000 if $200 is saved each fortnight
3.1.9 communicate solutions and processes used to reach solutions (oral and written), using language and symbols consistent with the context	• to find out how many bottles of drink I need to buy I would divide 2000 mL by 250 mL, which would give 8 serves. 2000 ÷ 250 = 8. I am catering for 30 people so I need at least four bottles

Content area 3.2: Percentages linked with fractions and decimals

Percentages are frequently used in shopping, statistical and workplace contexts to compare quantities. Students need to learn to read, write, interpret and use percentages in familiar contexts. In this content area students develop an understanding of percent as a special type of fraction which shows a proportional relationship between two quantities, where the denominator is 100. The focus is on the link between fractions, decimals and percentages, so students develop the understanding that these three types of numbers can be used to name the same quantity in different ways. This content area draws on and consolidates students understanding of decimals and fractions developed in Unit 2.

Content descriptions	Examples
3.2.1 identify and describe the purpose of percentages in various texts and media from everyday life and work	• discuss the meaning of percentages in everyday materials; for example, newspaper articles, advertisements
3.2.2 recognise that percentages are a special form of fraction used to represent a proportion, and that 100% denotes the 'whole'	• use grids and collections to demonstrate the meaning of percentages as fractions of one hundred; for example, 50% is $\frac{50}{100}$; investigate the effects of the zoom facility, expressed in percentages, on the text display in a document
3.2.3 read, write, use and interpret common percentages; for example, 10%, 50%, 25%, 20%	• discuss percentages with respect to the whole; for example, what does 10%, 25%, 50%, 100% of the cost or size mean? • discuss percentages with respect to a proportion of a different whole; for example, that 25% of a large population may be more than 50% of a smaller population
3.2.4 make connections between everyday fractions, decimals and percentages to interpret and compare quantities	• discuss different number formats to represent the same proportion of a quantity; for example, 10% of the size is this much and is the same as $\frac{10}{100}$, $\frac{1}{10}$, 0.1 • use an equivalent form to rewrite advertisements or headlines that contain fractions or percentages
3.2.5 use the links between percentage, fractions and division to mentally solve simple percentage problems	• demonstrate and discuss calculations such as 20% of $250; that is, 20% is $\frac{1}{5}$, so I can divide 250 by 5 • use mental strategies, such as when calculating 25% of 36; that is, $\frac{1}{4}$ of 36, so halve 36, then halve again
3.2.6 use the % button efficiently on a calculator to work out a percentage of a quantity	• use the % key to determine percentages of amounts such as 15% of 35 metres, or 35% of $500

Content descriptions	Examples
3.2.7 use a spreadsheet to solve common percentage problems, such as bank interest	• use a spreadsheet to calculate the interest on the principal of a bank loan, such as for a car, for different amounts or interest rates
3.2.8 determine whether an answer to a percentage problem is reasonable by using estimation and the context of the problem	• decide that 4.75 m is a reasonable answer when calculating 15% of 35 metres, because 10% is 3.5 m and 20% is 7 m, whereas an answer of 47.5 m is not reasonable
3.2.9 communicate solutions (oral and written), using language and symbols consistent with the context	• use language such as fifteen percent of 35 metres is four point seven five metres, or write as 15% of 35 m is 4.75 m

Content area 3.3: The four operations: fractions and decimals

This content area draws on and extends students' understanding and knowledge built in previous content areas. Students will need to consolidate and use their understanding of the meaning and application of the four operations, coupled with their knowledge of calculation strategies with whole numbers and money, to develop their understanding of calculating with fractions and decimals. This includes the three different methods of calculation: mental (with informal jottings if needed), calculator and spreadsheet. Students learn to mentally calculate with fractions by drawing, visualising and partitioning familiar fractions, and counting backwards or forwards in fractional amounts. They learn to mentally calculate with decimals by using place value, basic facts and partitioning; that is, by extending the strategies they use to calculate with whole numbers and money. Students need opportunities to gain confidence with, and to choose appropriately between, all three methods of calculation to ensure they are prepared for the workplace and life beyond school.

A particular focus of this unit is building students' capacity to choose which of the four operations to use. Students find it more difficult to decide when the problems involve fractions and decimals. When whole numbers are involved, students can easily see multiplication problems as repeated addition, whereas when fractions or decimals are involved, this may no longer be obvious. For example, when working out the cost of 3kg of apples for $4 per kilo, this can be thought of as $4 repeated three times, whereas 0.3 kg of apples for $4 per kilo cannot be thought of in the same way.

As with other units in the Mathematics Foundation course, students need opportunities to reflect on the results of their problem solving to see if they make sense within the contexts in which they are working, and to communicate information both in oral and written forms.

Content descriptions	Examples
3.3.1 determine whether an estimation or accurate answer is needed in everyday contexts involving fractions and decimals	• identify situations which involve finding fractions of amounts, such as $\frac{1}{5}$ of $250 or 25% of 90 m, where varying degrees of accuracy may be needed • identify situations which involve decimals such as in measurement or money, where varying degrees of accuracy may be needed
3.3.2 choose to add, subtract, multiply or divide fractions and decimals to solve a range of everyday problems involving fractions and decimals (division by decimal values using a calculator, calculations with simple fractions to be multiplication of whole number values, for example $\frac{1}{5} \times \$250$)	• double or triple the ingredients in a recipe with fractional amounts • solve problems involving measurement, such as distance, perimeter, area, or weights • solve problems involving money such as purchasing • 0.3 kg of apples at $4 per kilo, wages, net pay after tax, fuel costs
3.3.3 choose between simple decimals and fraction equivalents to solve problems in practical contexts	

Content descriptions	Examples
3.3.4 choose between mental, calculator or spreadsheet to solve problems in practical contexts	• compare calculations using the fraction or decimal form, such as when finding 25% of 36 or 25% of 215 m discuss the ease of using the decimal equivalents, such as when dividing a 2 m length into $3\frac{1}{2}$ cm sections

3.3.5 mentally solve everyday problems with fractions and decimals
  ▪ add and subtract simple fractions mentally by visualising fractional parts and counting
  ▪ use place value, partitioning and basic facts to mentally add, subtract, multiply and divide simple decimal numbers
  ▪ use links between everyday fractions and decimals to assist mental calculations
	• systematically compare a number of sale and original retail prices to determine those with a 25% or 1/3 discount
	• $\frac{1}{4}$ of 84 is 21, so $\frac{3}{4}$ of 84 is 3 × 21, which is 63
	• 15% is 10% and 5%, so 15% of $90 is $9 and $4.50, which is $13.50
	• 0.25 is $\frac{1}{4}$ so 0.25 of 200, is $\frac{1}{4}$ of 200 or 200 ÷ 4
	• calculate the original amount when price was advertised as 50% off. That is, the original must be twice the reduced amount

3.3.6 use links between everyday fractions and decimals to solve problems with a calculator when more complex numbers are involved	• compare using 0.2 or $\frac{1}{5}$ (÷ 5) on a calculator when determining 20% of 215 m
3.3.7 use a spreadsheet to solve everyday problems involving fractions or decimals	• use a spreadsheet to convert a recipe for a Christmas cake in order to use a smaller or larger size cake tin; for example 0.3 or 1.5 of each ingredient
3.3.8 use properties of operations to anticipate the effect of operations on fractions or decimals	• know that multiplication by a number less than one makes smaller, so decide that 34 x $\frac{1}{2}$ cannot be 68
3.3.9 use estimation strategies, including rounding, when an accurate answer is not required	• each share of the accommodation cost of $1210 for • 6 people is $\frac{1}{6}$ of about $1200, which is close to $200
3.3.10 interpret decimal remainders from division calculations in relation to the context	• make decisions about situations, such as the number of buses needed to transport 37 people if there is a limit of 15 people for each bus
3.3.11 determine whether an answer is reasonable by using properties of operations, estimation and the context of the problem	• discuss situations where multiplication by a number less than one makes the result smaller, so decide that 34 x $\frac{1}{2}$ cannot be 68
3.3.12 communicate solutions (oral and written), using language and symbols consistent with the context	• when I calculate $340 x $\frac{1}{2}$, it is the same as when I share $340 between two people, which is $170 for each

Content area 3.4: Location, time and temperature

Location

In this content area students learn to use a range of conventions to read, create and interpret maps and plans commonly used within community and work environments. They use the points of the compass, both within their environment and on maps, to locate themselves and other items, and to work out which direction of travel is needed in order to go from one place to another. They learn to use simple scales to work out proximity and distances.

Time

Students further develop, consolidate and extend their understanding of time from Unit 1.5. They read everyday calendars and timetables, as well as digital and analogue time, including 24 hour time, and convert between these forms of read-outs. They also learn to convert between various units of time, such as from minutes to hours or vice versa, and to work out elapsed time. A focus is on reading and writing the various forms of time measurements seen in everyday life, such as in timesheets and transport timetables.

Temperature

Many workplace and domestic situations involve reading and using temperature scales. Temperature settings stated in recipes and temperatures provided in weather reports are usually given in relation to the Celsius scale. This content area focuses on developing student understanding of numbers used in relation to the Celsius scale.

Content descriptions	Examples
Location 3.4.1 locate and describe the purpose of maps and plans in everyday contexts	• discuss the common use of maps and plans to represent information from everyday life and work
3.4.2 read and interpret everyday maps and plans, (both printed and web-based) referring to labels, symbols, keys, distance, direction, coordinates and whole number scales	• find a local map online and use the scale to estimate the distance from home to landmarks such as station, hospital, school
3.4.3 place key features of known locations on maps and plans, attending to relative position and proximity	• use grid references on a given simple map to place various locations like town hall, bank, cinema • study a large tourist attraction site map
3.4.4 locate north, east, south and west on simple maps and within their environment	• use a compass, or compass application on a mobile phone, to draw a mud map showing various nearby locations • predict relative to their own position, the directions of objects in their classroom and outside, and check using a compass; for example, "I am about 20 big steps (metres) south of the tree"

Content descriptions	Examples
3.4.5 use simple maps to locate themselves and other items within an environment	• use a street directory to locate a position and describe the route to a familiar place; for example, locate own street and explain how to get to the local shops
3.4.6 use a simple map to work out distances, practical routes and directions from one location to another	• plan routes for practical purposes, accounting for local conditions; for example, "What is the best way to travel from A to B, passing by a service station?"
3.4.7 communicate information (oral and written) about location using language and symbols consistent with the context	• give and follow simple oral directions for moving between locations; for example, moving between school buildings, workplace or shopping centre
Time 3.4.8 identify and understand the importance of naming and recording a time, and working out how much time has elapsed within work and community life	• discuss the importance of timesheets for employers, such as large supermarket or food chains
3.4.9 read and use digital and analogue watches, clocks (including 24 hour time), and stopwatches	• record and test class reaction times, fitness levels, recovery times, using stop watches
3.4.10 convert between digital and analogue time	• convert a digital TV or cinema guide to analogue
3.4.11 read and use various forms of more complex calendars and timetables with both12- and 24-hour time	• interpret timetables for bus, train and ferry, tides or sunrise and sunset. Read and interpret calendars for gardening
3.4.12 use various written forms of time to record events; for example, timesheets	• use given times in tabular or single result form to organise a ranked list of competitors based on time taken to finish an event
3.4.13 compare and order time events	• organise competitors for a semi-final competition based on times obtained by athletes in an event
3.4.14 use the relationship between time units to convert one unit to another; for example, $1\frac{1}{2}$ minutes = 90 seconds, $2\frac{1}{4}$ hours = 135 minutes	• record time sheets to the nearest quarter or half hour and calculate gross pay expected
3.4.15 solve simple problems involving elapsed time in situations involving combinations of time units	• solve and complete practical tasks and problems involving times and dates and the addition and subtraction of hours and minutes; for example 4 hours 45 minutes + 3 hours 25 minutes = 7 hours 70 minutes = 8 hours 10 minutes

Content descriptions	Examples
3.4.16 communicate information (oral and written) about time using language and symbols consistent with the context	• describe and interpret various graphs and charts displaying power bills; water use over a certain period of time
Temperature 3.4.17 identify and describe the tools and units commonly used to measure temperature	• look at different devices that use temperature, including digital readouts on stoves, fridges, air conditioners, thermometers
3.4.18 develop a sense of how hot/cold, as compared to the Celsius unit; for example, today is hot, it must be more than 35°	• discuss how temperature is important in situations such as the safety of frozen foods and settings for domestic fridges; temperature for storage of chemicals
3.4.19 use a thermometer or digital readout; for example, to measure and compare temperatures to the nearest degree Celsius	• compare thermometers used for different purposes-digital thermometers and fever scans for body temperature, weather thermometers, thermometers used in cooking
3.4.20 read, write and interpret temperatures to the nearest degree Celsius, using the symbol for degrees (°)	• read and accurately record temperature from a variety of different devices both analogue and digital, and recognise whether they are in Fahrenheit or Celsius from the device or situation
3.4.21 calculate changes in temperature, including difference between maximum and minimum temperatures	• use a website to find and compare today's temperatures in different cities around the world
3.4.22 communicate information (oral and written) about temperature using language and symbols consistent with the context	• create tables to show weather data collected. Present data graphically using software such as Excel

Content area 3.5: Space and design

This content area helps students to develop an understanding of two dimensional and three dimensional shapes and how they are used and represented within everyday environments, including digital media. Students need many opportunities to interpret and draw two dimensional figures and diagrams. They also need to create or construct three dimensional objects from various forms of two dimensional drawings, and to draw three dimensional objects in different ways, including within a computer environment.

This module/unit should involve explicit teaching of the following literacy and numeracy skills in the context of the Mathematics Foundation course.

Content descriptions		Examples
3.5.1	identify essential attributes of, and name, common two and three dimensional shapes found in everyday contexts	• locate and discuss where, why and how shapes occur and/or are used for practical purposes; for example, packaging, road signs, sports grounds/arenas, furniture/cabinets, shape in buildings
3.5.2	classify and describe familiar 2D and 3D shapes found in the environment, according to their properties and function	• identify and name common uses of shapes in a familiar environment; for example, street signs, OSH signs, packaging, building and construction
3.5.3	draw (by hand and with computer software) simple 2D plans to show placement of objects in relation to one another	• draw a particular shape from an oral description; for example, draw a shape which has four straight sides the same length. Give a description of a shape or symbol /logo for someone else to draw
3.5.4	draw (by hand and with computer software) simple 3D objects using isometric, perspective, oblique and exploded drawings	• copy plans/pictures made of geometric shapes; for example, birds-eye view of a table setting; logos
3.5.5	match or construct simple 3D objects from various forms of drawings, including front, back and side views or 3D views	• match house plans to house photos giving reasons for the match • investigate various boxes used commercially as packaging and design and make own boxes, or from prepared templates
3.5.6	read and interpret plans, diagrams and simple scale drawings representing familiar real life shapes and objects	• use virtual software to design a space; for example, to place furniture/cabinets in a room/kitchen
3.5.7	identify and estimate common angles; for example, a full turn = 360° and right angles = 90°	• use a graphics package to create tessellations using a single shape and transformations (copy and paste the shape and flip or rotate)
3.5.8	communicate information (oral and written) about shape and design using language and symbols consistent with the context	• given a 3D packaging shape, identify constituent 2D shapes and compile a table of results

Unit 4

Unit description

This unit provides students with the mathematical knowledge, understanding and skills relating to rates and ratios, and the further development of their understanding of probability and the close link with statistics.

Students come to independently solve everyday problems which are met in personal, work and community contexts by integrating the thinking process and mathematics from content areas in previous units.

It is intended the content be integrated to encourage engagement and, at the same time, interest and meaning for the students. The combination of skills helps students see that mathematical skills are not isolated when applied in the real world, and provides opportunity for students to consolidate and enhance fluency for a range of skills.

This unit includes three content areas.

4.1: Rates and ratios

4.2: Statistics and probability

4.3: Application of the mathematical thinking process

Note: content area 4.3 should cover all three contexts: personal, work and community.

Learning outcomes

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

*   read, write and use simple rates and ratios in everyday contexts

*   use everyday language and simple numerical information to describe, compare and predict the outcomes of straight forward chance events

*   read and interpret simple tables, graphs and charts to draw conclusions and make inferences

*   recognise and apply functional numeracy concepts in practical situations, including personal, community and workplace contexts

*   use the mathematical decision making process to clarify, efficiently solve, mathematically represent, and effectively communicate, solutions in practical personal, community and workplace contexts.

Unit content

This unit builds on the content covered in Unit 3.

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

Content area 4.1: Rates and ratios

Rates and ratios are commonly used mathematical concepts. An understanding of speed, rates of pay, costs per kilogram, and the interpretation of instructions, expressed as a ratio, to make a certain mixture, all require a sound grasp of multiplication and division. Rates and ratios are used to show multiplicative relationships between two (or more) amounts. Rates show relationships between two amounts, such as kilometres and hours. For example, if we travel at 100 kilometres per hour, the number 100 denotes neither kilometres nor hours, but rather describes the relationship between kilometres and hours.

Ratios show proportional relationships between amounts and are commonly used when making everyday mixtures, such as cement or cordial. Ratios are also used to increase or decrease the size of mixtures, such as when a recipe is doubled, trebled or halved. In this unit, students learn to understand simple rates and ratios, and to read, write and use them in straightforward everyday contexts.

Content descriptions	Examples
4.1.1 identify common use of rates, such as km/h, cents/litre, $/kg or $/m, $/h	• identify and discuss situations such as wages, travel, application of paint, fuel consumption
4.1.2 identify common use of ratios in practical situations	• identify and discuss situations such as cooking, mixing cleaning products from concentrates, preparing concrete
4.1.3 determine whether an estimation or an accurate answer is needed in everyday contexts involving ratio and rates	• identify situations which involve rates and ratios, such as in cooking, mixing concentrates, travel, where varying degrees of accuracy may be needed
Rates 4.1.4 understand rates as relationships between two amounts in everyday contexts; for example, km/h	• relate the idea of a rate to situations such as determining how much it would cost for 3.5kg of apples if they are $3.99/kg • discuss doses of medication or feed amounts which are based on the weight of an animal
4.1.5 use repeated addition, multiplication or division to work out simple rates, such as litres per 100 kilometres, either mentally or with a calculator	• calculate how much diesel is needed for a 400 km trip if the vehicle averages 10.3 litres per 100 km. That is, 4 x 10 and 4 x 0.3, or 40 + 1.2, which is 41.2 litres • use a calculator to determine how far a 138 litre tank of petrol will last if the vehicle averages 13.6 L per 100 km. That is, $138 \div 13.6 = 10.15$, so 10.15 x 100 km is 1015 km
4.1.6 compare rates (such as dollars per kilo) to say which is the better buy	• compare different quantities, such as gardening supplies or paint

Content descriptions	Examples
Ratios 4.1.7 understand simple ratios as proportional relationships between two or more amounts	• measure quantities based on a given ratio. For example, of 1 part to 3 parts would be 1 cup sugar to 3 cups of flour • 1 in ten concentration means to add 1 litre of concentrate to 9 litres of water, 2 litres of concentrate to 18 litres of water, and so on
4.1.8 read, write and use simple ratios as fractions, percentages or numbers separated by a colon; that is 3:1, in practical contexts	• show that a mixture of 1 cup of sugar to 3 cups of flour is written as 1:3 and would result in a mixture of 4 cups. So the sugar is 1 cup out of the total 4 cups; in other words, $\frac{1}{4}$ of the total mixture
4.1.9 use ratio to interpret simple scales on maps and plans	• use simple ratios such as 1:100. That is, 1 cm represents 100 cm or 1 m, so 4 cm on the plan represents a 4 m length of the room
4.1.10 use simple ratios to make mixtures according to directions	• interpret a ratio of 1:9 to mean adding 1 litre of concentrate to 9 litres of water, or 2 litres of concentrate to 18 litres of water, and so on
4.1.11 use repeated addition, multiplication or division to increase or decrease amounts in practical situations involving ratios	• prepare smaller or larger quantities of recipes and chemical solutions, such as mixing cement or hair dyes
4.1.12 determine whether an answer is reasonable in situations involving rates and ratios	• decide that $14.00 is a reasonable amount to pay for 3.5 kg of apples at $3.99, because 3 kg would be about $12 and 4 kg would be about $16
4.1.13 communicate information (oral and written) about rates and ratio using language and symbols consistent with the context	• use written language, such as 13.6 L/ 100 km, or 1:3; and spoken language, such as "per kilo" or "the ratio is one to one hundred, which is one part to every one hundred parts"

Content area 4.2: Statistics and probability

In this content area, students further develop, consolidate and extend their understanding of probability from Unit 1. Probability is used in everyday contexts to describe and explain the measurement of chance events. Initially, students use words to describe probability — from *impossible* through to *certain* an event will occur — and anything in between. As students' understandings of chance develop, they progress to the use of numbers to describe the probability values on a continuum, with 0 meaning impossible, and 1 meaning certain to happen. Probability can be represented using percentages (0%–100%), decimals (0–1) or fractions (0–1).

Notions of probability are also closely linked with the foundations, applications and interpretations of statistics. Radio, television, newspapers and the internet bombard us with statistical information presented in tables, graphs and charts; for example, data on diabetes rates among different cultural groups. Adults need to be able to process and interpret this information effectively and efficiently, and to be aware of how data is sometimes manipulated in order to highlight a particular viewpoint. Study of data provides an excellent context for integration of a range of mathematics content.

Content descriptions	Examples
4.2.1 identify everyday events in which predictions are made, based on probability	• discuss situations such as games, weather, sport, Lotto, raffles, gender
4.2.2 identify and describe the use of statistics and various data displays in everyday contexts	• identify statistical information, such as occupational health and safety reports, sport, weather, real estate
Probability 4.2.3 understand that chance is measured on a scale of 0 to 1, with zero meaning impossible and 1 meaning certain to happen	• label a number line with 0, 0.5, and 1 and link to terms of likelihood • assign probability values from 0 to 1 in relation to familiar events, such as getting to work on time, winning Lotto, getting a ticket to a sought after event, getting a ticket to the grand final
4.2.4 place everyday terms for chance (certain, fifty/fifty, likely, impossible) on the 0 to 1 scale and relate them to fractions, decimals and percentages	
4.2.5 order outcomes from least likely to most likely, using simple fractions, decimals and percentages	• the chance of getting chosen for a committee is 3 out of 10, 0.3 or 30%, which is less chance than the 50% chance of getting a ticket to the grand final
4.2.6 describe, compare and interpret the likelihood of everyday chance events using routine fractions, decimals and percentages	• use and describe everyday events with fractions, decimals and percentages. For example, it rains on average for 6 days in September, so the chance of rain in September is $\frac{6}{30}$ or $\frac{1}{5}$ or 0.2 or 20%
4.2.7 predict the likelihood of familiar everyday events happening, based on past experience or data	• predict the likelihood of getting to work on time by car or public transport, winning division one in Lotto, or the maximum temperature exceeding 37°C in December

Content descriptions	Examples
Statistics 4.2.8 collect and organise familiar data, choosing an appropriate table, graph or chart to clearly represent the data set	• collect data of casual hours worked each day of the week by members of the class, and choose an appropriate recording sheet and graph to represent the data • conduct a survey on the brands of mobile phones used by students in the class
4.2.9 construct graphs and charts from simple everyday data, using a spreadsheet, with simple scales, axes and descriptive labels	• construct a graph showing the most popular brands of mobile phones used by students in the class • construct a graph showing maximum temperature for a particular month of the year
4.2.10 read and interpret simple tables and graphs, using reasoning to draw simple inferences from beyond the data	• interpret and make inferences from a graph showing information related to mobile phone usage, weather or living expenses
4.2.11 critically evaluate simple graphs for misleading information; for example, scale starting at 50 instead of 0	• discuss a variety of graphs which misrepresent information in advertising
4.2.12 understand and use three forms of average – mean, mode and median, in straightforward everyday contexts.	• discuss the use of mean, mode and median to summarise data as the 'average' or typical value • relate the shape of a graph to the mean, mode and median
4.2.13 determine whether a prediction or inference is reasonable in probability and statistics contexts	• use published data to verify the results of inferences about phone usage
4.2.14 communicate information (oral and written) about probability and statistics using language and symbols consistent with the context	• use expressions such as, "I can work out the most popular phone from the highest column on the graph. This is the mode"

Content area 4.3: Application of the mathematical thinking process

In this section, students learn to independently solve everyday problems in familiar practical contexts related to the three areas of personal, work and community. Students use the mathematical decision making process to solve these problems, drawing on content from the previous units.

This mathematical thinking process includes:

- interpreting the task and the key information

- choosing the mathematics

- using the mathematics

- interpreting the results in relation to the context

- communicating the solution to the problem as required.

The degree of modelling and scaffolding will be dependent on the students. While the goal is for students to learn to independently apply the mathematical thinking process by the end of the unit, some students may require explicit teaching of the mathematical thinking process, with students practising and using each of the steps. The choice of learning activities will depend on the interests and learning needs of students, and should be differentiated by the level of autonomy of the students. This may involve a series of short tasks or longer project tasks.

Content description

4.3.1 Integrate functional numeracy concepts to solve problems related to personal, work and community contexts

- extract the mathematical information from the context

- decide on what mathematics can represent and be used to solve the problem

- decide whether an estimate or an accurate answer is required

- choosing the appropriate mathematics to use

- complete the mathematical thinking/calculation

- reflect on the results to judge reasonableness in relation to the context

- represent and communicate the mathematical results using the language of the context

Examples of tasks

- expenditure and time management, including travel, related to starting a job

- budget for independent living

- annual cost for driving and maintaining a car

- decorating and furnishing a room within a budget

- plan for a leavers' party

- community event, such as a barbecue, fun run or fundraising event

- date and time for an event based on the predictability of the weather; for example, temperature or rainfall

- interstate or international trip, including fares, itinerary, accommodation

The learning program should provide opportunities to consolidate, practise, extend or possibly still come to understand, the mathematics from previous units. When addressing numeracy in personal, work and community contexts, the mathematics should include the following:

Content description	Personal	Work	Community
Numeration 4.3.2 read, write and compare whole numbers, fractions, decimals and percentages	✓	✓	✓
Operations 4.3.3 understand and use the relationships between the four operations to assist in calculations	✓	✓	✓
4.3.4 choose the appropriate operation to efficiently solve a problem mentally, with a calculator or spreadsheet	✓	✓	✓
Time 4.3.5 tell the time and work out elapsed time using different time units	✓	✓	
4.3.6 calculate how to be on time	✓	✓	
4.3.7 read and use various forms of timetables	✓	✓	
Measurement 4.3.8 estimate, measure and calculate length, mass and capacity	✓		✓
4.3.9 use relationships between metric units to estimate, measure and calculate length, mass, capacity, perimeter, area and volume	✓		✓
Statistics and probability 4.3.10 read and interpret various tables, charts and graphs		✓	✓
Shape and location 4.3.11 read, interpret and draw various maps and plans	✓	✓	✓
4.3.12 construct simple 3D objects from plans		✓	✓

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 12 syllabus and the weighting for each assessment type.

Assessment table – Year 12

Type of assessment	Weighting
Response Students respond to ongoing assessment using their knowledge of mathematical skills, content, terminology and procedures of the course. Responses can be in written or oral form. Evidence can include: observation checklists, quizzes and tests (with and without calculator). It is advisable that students be given some practice in multiple choice questions.	40%

Practical applications
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.
• interpret the task and gather the key information
• identify the mathematics which could help to complete the task
• analyse information and data from a variety of sources
• apply their existing mathematical knowledge and strategies to obtain a solution
• verify the reasonableness of the solution
• communicate findings in a systematic and concise manner.
The process can include: written work, observation checklists, spreadsheets, pictures, diagrams, tables or graphs, media, photographs, video, and models created by the student.
Note:
• a minimum of three practical applications must be included for each unit
  ▪ for Unit 3 and content areas 4.1 and 4.2 from Unit 4, practical application tasks involve a limited number of familiar, scaffolded steps and are of short duration
  ▪ for content area 4.3 of Unit 4, students must complete two longer, less scaffolded practical applications involving an integration of concepts from either Personal, Work or Community contexts
	45%

Externally set task A written task or item or set of items of 50 minutes duration developed by the School Curriculum and Standards Authority and administered by the school.	15%

Teachers are required to use the assessment table to develop an assessment outline for the pair of units.

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).

All assessment types must be included in the assessment outline (see table for specifics).
The externally set task occurs once.

The set of assessment tasks must provide a representative sampling of the content for Unit 3 and Unit 4.

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.

Externally set task

All students enrolled in the Mathematics Foundation Year 12 course will complete the externally set task developed by the Authority. Schools are required to administer this task in Term 2 at a time prescribed by the Authority.

Externally set task design brief – Year 12

Time	50 minutes
Format	Written
	Conducted under invigilated conditions
	Typically between three and five questions
	Questions can require students to refer to source material
Content	The Authority informs schools during Term 3 of the previous year of the Unit 3 syllabus content on which the task will be based

Refer to the *WACE Manual* for further information.

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. 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 12 syllabus are provided in Appendix 1. They can also be accessed through the Guide to Grades link on the course page of the Authority website at www.scsa.wa.edu.au

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 12

<table>
<tr>
<td rowspan="3">A</td>
<td>

Interpret the tasks and choose the maths

Independently, in familiar tasks and with minimal clarification in unfamiliar tasks across a range of contexts, and involving more than one 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.
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<tr>
<td>

Apply mathematical knowledge to obtain a solution

Independently uses mental, written and technological calculation strategies and mathematical processes for multi-step tasks that are consistently efficient and appropriate, resulting in accurate solutions for familiar and unfamiliar tasks.
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<td>

Interpret and communicate

Independently, in familiar tasks and with minimal clarification in unfamiliar tasks involving more than one concept from across the breadth of content areas, clearly and comprehensively communicates mathematics results and uses language and representation appropriate to context and audience.
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<tr>
<td rowspan="3">B</td>
<td>

Interpret the tasks and choose the maths

Mostly independently in familiar tasks, and with clarification in some unfamiliar tasks involving more than one concept from across the breadth of content areas, identifies and organises the relevant information; determines the level of accuracy required; chooses and plans to use methods to carry out tasks.
</td>
</tr>
<tr>
<td>

Apply mathematical knowledge to obtain a solution

Independently uses mental, written and technological calculation strategies and mathematical processes for multi-step tasks that are mostly efficient and appropriate, resulting in accurate solutions for familiar and mostly accurate solutions for unfamiliar tasks
</td>
</tr>
<tr>
<td>

Interpret and communicate

Mostly independently, in familiar and some unfamiliar tasks involving more than one concept from across the breadth of content areas, communicates results demonstrating links between mathematical language and the context of the task and using language appropriate to context and audience.
</td>
</tr>
<tr>
<td rowspan="3">C</td>
<td>

Interpret the tasks and choose the maths

With some prompting or clarification, in familiar tasks, and support in unfamiliar tasks, sometimes involving more than one concept from across the breadth of content areas, identifies and organises the relevant information; determines the level of accuracy required; chooses and plans to use methods to carry out tasks.
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</tr>
<tr>
<td>

Apply mathematical knowledge to obtain a solution

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
</td>
</tr>
<tr>
<td>

Interpret and communicate

With some prompting or clarification, in familiar tasks involving more than one concept from across the breadth of content areas, communicates mathematical results using some language and representation appropriate to context and audience.
</td>
</tr>
</table>

D		**Interpret the tasks and choose the maths** With support in most tasks, identifies and organises the relevant information; determines the level of accuracy required; chooses and plans to use methods to carry out tasks.
		Apply mathematical knowledge to obtain a solution With support and prompting, in routine and practised tasks, uses mental, written and technological calculation strategies as well as mathematical processes that result in some accurate solutions for familiar tasks.
		Interpret and communicate With support in most tasks involving a limited number of concepts, 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

Basic addition facts

Sums to 10 + 10

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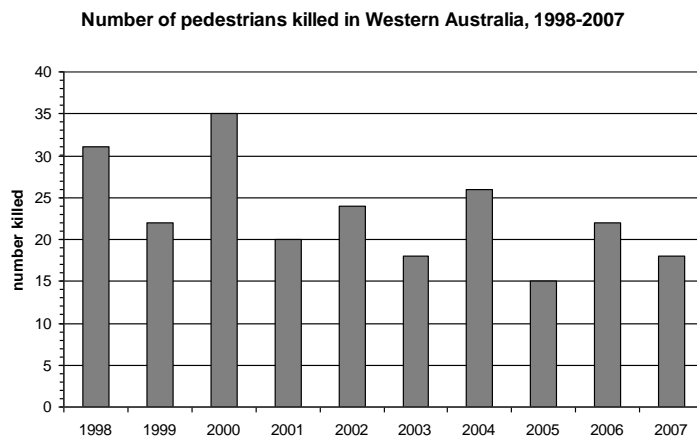
Basic multiplication facts

Products to 10 × 10. For example, if 3 x 4 = 12, then 3 x 8 = 2 x 12 = 24;

and if 4 x 7 = 28 then 280 ÷ 7 = 40

Capacity

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

Frequency graph

Number of pedestrians killed in Western Australia, 1998-2007

A form of column or bar graph which shows the frequency of categories of 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
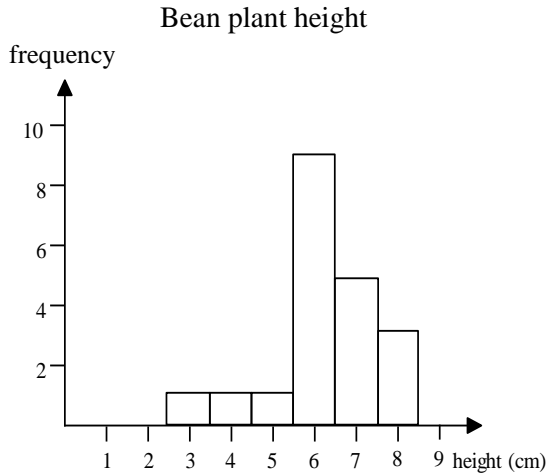
Part –part– whole relationship

$6 \times 7 = 42$ and $7 \times 6 = 42$

$42 \div 7 = 6$ and $42 \div 6 = 7$

Mass

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

Measurement graph

Bean plant height

A simple histogram involving continuous measurement data.

Mean

The arithmetic mean of a list of numbers is the sum of the data values divided by the number of values in the list.

In everyday language, the arithmetic mean is commonly called the average.

For example, for the following list of five numbers, 2, 3, 3, 6, 8, the mean equals

$$\frac{2+3+3+6+8}{5} = \frac{22}{5} = 4.4$$

Median

The median is the value in a set of ordered data values that divides the data into two parts of equal size. When there are an odd number of data values, the median is the middle value. When there is an even number of data values, the median is the average of the two central values.

Mode

The mode is the most frequently occurring value in a data set.

Non unit fraction

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

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

Percentage

A special form of fraction whose denominator is 100. It is used to denote a proportion; for example, 50% of a quantity.

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 × 100 000	4 × 10 000	6 × 1000	4 × 100	2 × 10	7 × 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 × 100	2 × 10	7 × 1	$\dfrac{3}{10}$	$\dfrac{5}{100}$	$\dfrac{2}{1000}$

Unit fraction

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