Mathematics Foundation Course Year 12

Selected Unit 3 syllabus content for the

Externally set task 2021

This document is an extract from the *Mathematics Foundation Course Year 12 syllabus*, featuring all of the content for Unit 3. The content that has been highlighted in the document is the content on which the Externally set task (EST) for 2021 will be based.

All students enrolled in the course are required to complete an EST. The EST is an assessment task which is set by the Authority and distributed to schools for administering to students. The EST will be administered in schools during Term 2, 2021 under standard test conditions. The EST will take 50 minutes.

The EST will be marked by teachers in each school using a marking key provided by the Authority. The EST is included in the assessment table in the syllabus as a separate assessment type with a weighting of 15% for the pair of units.

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

Content descriptions		Examples
		■ 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
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
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	• 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
3.3.4	choose between mental, calculator or spreadsheet to solve problems in practical contexts	

Content descriptions	Examples

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"
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?"

Content descriptions	Examples
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
 	
3.4.10 convert between digital and analogue time
 	
3.4.11 read and use various forms of more complex calendars and timetables with both12- and 24-hour time
 	
3.4.12 use various written forms of time to record events; for example, timesheets
 	
3.4.13 compare and order time events
 	
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
 	
3.4.15 solve simple problems involving elapsed time in situations involving combinations of time units
	• record and test class reaction times, fitness levels, recovery times, using stop watches
	
	• convert a digital TV or cinema guide to analogue
	• interpret timetables for bus, train and ferry, tides or sunrise and sunset. Read and interpret calendars for gardening
	• use given times in tabular or single result form to organise a ranked list of competitors based on time taken to finish an event
	• organise competitors for a semi-final competition based on times obtained by athletes in an event
	• record time sheets to the nearest quarter or half hour and calculate gross pay expected
	
	• 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

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° 3.4.19 use a thermometer or digital readout; for example, to measure and compare temperatures to the nearest degree Celsius	• discuss how temperature is important in situations such as the safety of frozen foods and settings for domestic fridges; temperature for storage of chemicals • compare thermometers used for different purposes- digital thermometers and fever scans for body temperature, weather thermometers, thermometers used in cooking

Content descriptions	Examples
3.4.20 read, write and interpret temperatures to the nearest degree Celsius, using the symbol for degrees (°) 3.4.21 calculate changes in temperature, including difference between maximum and minimum temperatures	• 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 • 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