PROGRAMME OUTLINE
MATHEMATICS ESSENTIALS – YEAR 12: 2021
UNIT 3 AND UNIT 4

Term	Week.Lesson	Topic and Key Teaching Points	Syllabus Content	Assessments
Throughout the unit, students apply the Mathematical Thinking Process to real-world problems • 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 existing mathematical knowledge and strategies to obtain a solution • verify the reasonableness of the solution • communicate findings in a systematic and concise manner.				
1	**1.2-1.4** (3 h)	**Linear measure** • The perimeter of polygons and circles and composites of familiar shapes. • Solve practical problems involving perimeter.	3.1.1 extend the calculation of perimeters to include polygons, circles and composites of familiar shapes	
1	**2.1-3.1** (5 h)	**Area measure** • The area of parallelograms, trapeziums, circles and semi-circles. • The area of composite figures using decomposition into familiar shapes. • Surface area of cubes, rectangular and triangular prisms, spheres and cylinders using nets where appropriate. • Solve practical problems involving area and surface area, including composite solids.	3.1.2 calculate areas of parallelograms, trapeziums, circles and semi-circles 3.1.3 determine the area of composite figures by decomposition into familiar shapes 3.1.4 determine the surface area of familiar solids, including, cubes, rectangular and triangular prisms, spheres and cylinders 3.1.5 use addition of the area of the faces of solids to determine the surface area of composite solids	
1	**3.2-4.2** (5 h)	**Volume and capacity** • The volume and capacity of cylinders, pyramids and spheres.	3.1.6 recognise relations between volume and capacity, recognising that 1 cm^3 = 1 mL and 1 m^3 = 1 kL	**Practical Application 1** **(Week 4)**

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		• The relationship between cubic centimetres and millilitres, cubic metres and kilolitres. • Solve problems involving volume and capacity.	3.1.7 calculate the volume and capacity of cylinders, pyramids and spheres	
1	4.3-5.1 (3 h)	**Geometry and three-dimensional objects** • Interpret two dimensional representations of three-dimensional objects and elevation views of models. • Sketch elevation views of different models.	3.2.1 recognise the properties of common two-dimensional geometric shapes and three-dimensional solids 3.2.2 interpret different forms of two-dimensional representations of three-dimensional objects, including nets and perspective diagrams 3.2.3 use terminology of geometric shapes; for example, point, line, angle, diagonal, edge, curve, face and vertex, parallel and perpendicular 3.2.9 interpret plans and elevation views of models 3.2.10 sketch elevation views of different models 3.2.11 interpret diagrams of three-dimensional objects	
1	5.1-6.2 (6 h)	**Interpret and create scale drawings** • Interpret scale drawings from practical situations and determine actual measurements. • Construct scale drawings by hand and by using appropriate software/technology. • Solve practical problems involving estimation and comparison of quantities, materials and costs using	3.2.4 interpret commonly used symbols and abbreviations in scale drawings 3.2.5 determine actual measurements of angle, perimeters and areas from scale drawings 3.2.6 estimate and compare quantities, materials and costs using actual measurements from scale drawings, for example using measurements for packaging, clothes, painting, bricklaying and landscaping	

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		actual measurements from scale drawings.	3.2.7 understand and apply drawing conventions of scale drawings, such as scales in ratio, dimensions and labelling 3.2.8 construct scale drawings by hand and by using appropriate software/technology	
1	6.2-7.3 (6 h)	**Right-angled triangles** • Apply Pythagoras' Theorem and trigonometric ratios to solve problems in practical, two-dimensional views, including problems involving angles of depression and elevation.	3.2.12 apply Pythagoras' theorem to solve problems in practical two-dimensional views 3.2.13 apply the tangent ratio to determine unknown angles and sides in right-angled triangles 3.2.14 work with the concepts of angle of elevation and angle of depression 3.2.15 apply the cosine and sine ratios to determine unknown angles and sides in right-angle triangles 3.2.16 solve problems involving trigonometric ratios in practical two-dimensional views	
1	7.4-8.4 (5 h)	**Cartesian plane** • Interpret and plot points on a two-dimensional Cartesian plane. • Generate tables and graph co-ordinates for linear functions from practical situations. • Interpret, use and draw graphs from practical situations, including travel graphs, time series and conversion graphs. • Describe trends in time series data.	3.3.1 demonstrate familiarity with Cartesian co-ordinates in two dimensions by plotting points on the Cartesian plane 3.3.2 generate tables of values for linear functions drawn from practical contexts 3.3.3 graph linear functions drawn from practical contexts with pencil and paper and with graphing software	**Test 1** **(Week 9)**

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			3.3.4 interpret and use graphs in practical situations, including travel graphs, time series and conversion graphs 3.3.5 draw graphs from given data to represent practical situations 3.3.6 describe trend as increasing or decreasing for time series data	
	9	**Catch Up**	Catch up on Lessons lost to Parent-Teacher Interviews and Consolidation of EST content	
2	1.2-2.1 (4 h)	**Using graphs in practical situations** • Describe, determine and use the features of linear functions from practical situations; rate of change, vertical intercept, point of intersection, 'break-even' point. • Solve practical problems involving linear relationships.	3.3.7 identify the rate of change of the dependent variable, relating it to the difference pattern in a table and the slope of an associated line drawn from practical contexts 3.3.8 determine and describe the significance of the vertical intercept in practical situations 3.3.9 use the rate of change and the initial value to determine the linear relationship in practical situations 3.3.10 interpret the point of intersection and other important features of given graphs of two linear functions drawn from practical contexts; for example, the 'break-even' point	**Test 2** **(Week 2)**
2	2.2-3.1 (4 h)	**EST Revision Lessons** Mathematical Thinking Process: Students can… • 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	Revision for the EST which will take place in a single lesson, likely to be in Week 3 but will be confirmed closer to the date. See highlighted syllabus points above, and Mathematical Thinking Process to the left, for content to be assessed in task.	

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		• apply existing mathematical knowledge and strategies to obtain a solution • verify the reasonableness of the solution • communicate findings in a systematic and concise manner.		
Students apply the Statistical Investigation Process to real-world tasks • clarify the problem and pose one or more questions that can be answered with data • design and implement a plan to collect or obtain appropriate data • select and apply appropriate graphical or numerical techniques to analyse the data • interpret the results of this analysis and relate the interpretation to the original question communicate findings in a systematic and concise manner.				
2	3.2-5.2 (8 h)	**Data collection** • Investigate the conducting of a census or survey, with reference to the target population. • Investigate methods of sampling • Interpret results from surveys, including those in the media.	3.4.1 investigate the procedure for conducting a census 3.4.2 investigate the advantages and disadvantages of conducting a census 3.4.3 understand the purpose of sampling to provide an estimate of population values when a census is not used 3.4.4 investigate the different kinds of samples, for example, systematic samples, self-selected samples, simple random samples 3.4.5 recognise the advantages and disadvantages of these kinds of samples; for example, comparing simple random samples with self-selected samples 3.4.6 identify the target population to be surveyed	**EST (TBA, likely Week 3)**

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			3.4.7 investigate questionnaire design principles; for example, simple language, unambiguous questions, consideration of number of choices, issues of privacy and ethics, freedom from bias 3.4.8 describe the faults in the collection of data process 3.4.9 describe sources of error in surveys; for example, sampling error and measurement error 3.4.10 describe possible misrepresentation of the results of a survey due to the unreliability of generalising the survey findings to the entire population, for example, because of limited sample size or chance variation between samples 3.4.11 describe errors and misrepresentation of the results of a survey, including examples of media misrepresentations of surveys and the manipulation of data to serve different purposes	
2	5.3-7.2 (8 h)	**Bivariate scatterplots** • Patterns and features of bivariate data, including dependent and independent variables and their association. • Trend lines by eye, • relationships between variables and predictions by interpolation and extrapolation.	3.4.12 describe the patterns and features of bivariate data 3.4.13 describe the association between two numerical variables in terms of direction (positive/negative), form (linear/non-linear) and strength(strong/moderate/weak) 3.4.14 identify the dependent and independent variable 3.4.15 fit a trend line by eye	**Statistical Investigation 1** **(Week 7)**

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			3.4.16 interpret relationships in terms of the variables, for example, describe trend as increasing or decreasing 3.4.17 use the trend line to make predictions, both by interpolation and extrapolation 3.4.18 recognise the dangers of extrapolation 3.4.19 distinguish between causality and association through examples	
2	8.1-10.3 (11 h)	**Probability** • Language of probability and numerical expressions using fractions, decimals, ratios and percentages • The law of large numbers and the relationship of relative frequency to probability. • Experiments and sample spaces which represent practical situations. • Applications of probability for decision making, predicting proportions and number or outcomes that are likely to occur.	4.1.1 interpret commonly used probability statements, including 'possible', 'probable', 'likely', 'certain' 4.1.2 describe ways of expressing probabilities formally using fractions, decimals, ratios and percentages 4.1.4 recognise that the repetition of chance events is likely to produce different results 4.1.5 recognise the law of large numbers and identify relative frequency as probability 4.1.7 construct a sample space for an experiment which represents a practical situation 4.1.8 use a sample space to determine the probability of outcomes for an experiment 4.1.9 use arrays or tree diagrams to determine the outcomes and the probabilities for experiments	

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			4.1.10 identify situations in real-life contexts where probability is used for decision making 4.1.11 determine and use probabilities (relative frequencies) from given data to predict proportions and the number of outcomes that are likely to occur	
2-3	10.4-1.4 (7 h)	**Simple probabilities in practical situations** • Simulations using technology.	4.1.3 perform simulations of experiments using technology 4.1.6 identify factors that may cause the simulation to no longer model the real world event	**Test 3** **(Term 2 Week 11)** **Statistical Inv. 2** **(Term 3 Week 2)**
3	2.1-3.3 (7 h)	**Earth geometry** • Methods of locating positions on the earth's surface given latitude and longitude; global positioning system, globe, atlas and digital technologies. • Calculations of distance between two places on Earth on same longitude using arc length formula. • Distance between two places on Earth using technology. • Solve practical problems involving the location of and distance	4.2.1 locate positions on the earth's surface given latitude and longitude using a range of methods; for example, a global positioning system (GPS), a globe, an atlas and digital technologies 4.2.2 use the arc length formula to calculate distances between two places on Earth on the same longitude 4.2.3 determine distances between two places on Earth using appropriate technology	

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		between positions on the Earth's surface		
3	3.4-5.3 (8 h)	**Time** • Link between longitude and time • Problems involving time zones in Australia and neighbouring nations, Greenwich Mean Time and International Date Line, time differences, travel involving time zone changes.	4.2.4 understand the link between longitude and time 4.2.5 solve problems involving time zones in Australia and neighbouring nations making any necessary allowances for daylight saving 4.2.6 solve problems involving Greenwich Mean Time and the International Date Line 4.2.7 determine time differences between two places on Earth 4.2.8 solve problems associated with time zones; for example, internet and phone usage 4.2.9 solve problems relating to travelling east and west, incorporating time zone changes	**Test 4** **(Week 6)**
3	5.4-6.2 (3 h)	**Compounding relationships** • Real-life, compounding situations expressed as a recurrence relationship; compound interest, population growth. • Solve practical problems involving compounding situations.	4.3.1 review the principles of simple interest 4.3.2 understand the concept of compound interest as a recurrence relation 4.3.3 consider similar problems involving compounding; for example, population growth	
3	6.3-8.2 (8 h)	**Compounding loans and investments** • Future values and total interest, numerical and graphical comparison between simple interest and compound interest loans and investments.	4.3.4 use technology to calculate the future value of a compound interest loan or investment and the total interest paid or earned 4.3.5 use technology to compare, numerically and graphically, the growth of simple interest and compound interest loans and investments	

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		• Effects of change of interest rate and number of compounding periods. • Solve practical problems involving compounding loans and investments	4.3.6 use technology to investigate the effect of changing the interest rate and the number of compounding periods on the future value of a loan or investment	
3	8.3-9.4 (6 h)	**Reducing balance loans** • Use technology and a recurrence relation to model a reducing balance loan. • Effect of interest rates and repayment amount when repaying a loan. • Solve practical problems involving reducing balance loans.	4.3.7 use technology and a recurrence relation to model a reducing balance loan 4.3.8 investigate the effect of the interest rate and repayment amount on the time taken to repay a loan	**Practical Application 2** **(Week 9 - 10)**
3	10	**Finishing In-Class Assessment**	Finalising final in-class assessment	