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

Mathematics Essential General Course Year 12

Selected Unit 3 syllabus content for the

Externally set task 2019

This document is an extract from the *Mathematics Essentials General 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 2019 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, 2019 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 skills and understanding to solve problems related to measurement, scales, plans and models, drawing and interpreting graphs and data collection. Students use the mathematical thinking process and apply the statistical investigation process. Teachers are encouraged to apply the content of the four topics in this unit: Measurement; Scales, plans and models; Graphs in practical situations; and Data collection, in a context which is meaningful and of interest to the students. A variety of approaches could be used to achieve this purpose. Possible contexts for this unit are Construction and design, and Medicine.

It is assumed that an extensive range of technological applications and techniques will be used in teaching this unit. The ability to choose when, and when not, to use some form of technology, and the ability to work flexibly with technology, are important skills.

The number formats for the unit are positive and negative numbers, decimals, fractions, percentages, rates, ratios, square and cubic numbers written with powers and square roots.

Learning outcomes

By the end of this unit, students:

- understand the concepts and techniques used in measurement, scales, plans and models, graphs and data collection
- apply reasoning skills and solve practical problems in measurement, scales, plans and models, graphs and data collection
- communicate their arguments and strategies when solving mathematical and statistical problems using appropriate mathematical or statistical language
- interpret mathematical and statistical information and ascertain the reasonableness of their solutions to problems.

Unit content

An understanding of the Year 11 content is assumed knowledge for students in Year 12.

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

Topic 3.1: Measurement (15 hours)

Linear measure

3.1.1 extend the calculation of perimeters to include polygons, circles and composites of familiar shapes

Area measure

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

Examples in context – Area measure:

- calculating surface area of various buildings to compare costs of external painting

Volume and capacity

3.1.6 recognise relations between volume and capacity, recognising that $1\ cm^3 = 1\ mL$ and $1\ m^3 = 1\ kL$

3.1.7 calculate the volume and capacity of cylinders, pyramids and spheres

Examples in context – Volume and capacity:

- interpreting dosages for children and adults from dosage panels on medicines, given age or weight
- calculating and interpreting dosages for children from adults' medication using various formulas (Fried, Young, Clark) in millilitres
- comparing the capacity of rainwater tanks

Topic 3.2: Scales, plans and models (15 hours)

Geometry

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

Interpret scale drawings

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

Creating 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

Three dimensional objects

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

Right-angled triangles (no bearings)

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

Examples in context – Scales, plans and models:

- drawing scale diagrams of everyday two-dimensional shapes
- interpreting common symbols and abbreviations used on house plans
- using the scale on a plan to calculate actual external or internal dimensions, the lengths of the house and the dimensions of particular rooms
- using technology to translate two-dimensional house plans into three-dimensional building
- creating landscape designs using technology

Topic 3.3: Graphs in practical situations (10 hours)

Cartesian plane

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

Using graphs

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

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

Examples in context – Graphs in practical situations:

- interpreting graphs showing growth ranges for children (height or weight or head circumference versus age)
- interpreting hourly hospital charts showing temperature and pulse
- interpreting graphs showing life expectancy with different variables

Topic 3.4: Data collection (15 hours)

Census

3.4.1 investigate the procedure for conducting a census

3.4.2 investigate the advantages and disadvantages of conducting a census

Surveys

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

Simple survey procedure

3.4.6 identify the target population to be surveyed

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

Sources of 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

Bivariate scatterplots

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)

Trend lines

3.4.14 identify the dependent and independent variable

3.4.15 fit a trend line by eye

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

Examples in context:

- analysing data obtained from medical sources, including bivariate data
- analysing and interpreting tables and graphs that compare body ratios, such as hip height versus stride length, foot length versus height