Tables showing which M1 Maths modules relate to each Queensland Years 11-12 General Mathematics topic

The syllabus element is in the left column and the relevant module is in the right column.

Unit 1 Topic 1 – Consumer Arithmetic	
Applications of rates, percentages and use of spreadsheets	
review definitions of rates and percentages	N1-2 Fraction Meanings N2-3 Rates
calculate weekly or monthly wages from an annual salary, and wages from an hourly rate, including situations involving overtime and other allowances and earnings based on commission or piecework	
calculate payments based on government allowances and pensions, such as youth allowances, unemployment, disability and study	
prepare a personal budget for a given income, taking into account fixed and discretionary spending	
compare prices and values using the unit cost method	
apply percentage increase or decrease in various contexts, e.g. determining the impact of inflation on costs and wages over time, calculating percentage mark-ups and discounts, calculating GST, calculating profit or loss in absolute and percentage terms, and calculating simple and compound interest	N2-2 Fractions of Numbers
use currency exchange rates to determine the cost in Australian dollars of purchasing a given amount of a foreign currency, such as US$1500, or the value of a given amount of foreign currency when converted to Australian dollars, such as the value of €2050 in Australian dollars	
calculate the dividend paid on a portfolio of shares, given the percentage dividend or dividend paid per share, for each share; and compare share values by calculating a price-to-earnings ratio	

use a spreadsheet to display examples of the above computations when multiple or repeated computations are required, e.g. preparing a wage sheet displaying the weekly earnings of workers in a fast-food store where hours of employment and hourly rates of pay may differ, preparing a budget or investigating the potential cost of owning and operating a car over a year.	S3-1 Spreadsheets

Unit 1 Topic 2 – Shape and Measurement	
Pythagoras' Theorem	
review Pythagoras' theorem and use it to solve practical problems in two dimensions and simple applications in three dimensions	M3-1 Pythagoras
Mensuration	
solve practical problems requiring the calculation of perimeters and areas of circles, sectors of circles, triangles, rectangles, trapeziums, parallelograms and composites	M1-4 Length, Area and Volume 1 M2-3 Length, Area and Volume 2 M3-4 Length, Area and Volume 3 M4-1 Length, Area and Volume 4
calculate the volumes and capacities of standard three-dimensional objects, including spheres, rectangular prisms, cylinders, cones, pyramids and composites in practical situations, such as the volume of water contained in a swimming pool	
calculate the surface areas of standard three-dimensional objects, e.g. spheres, rectangular prisms, cylinders, cones, pyramids and composites in practical situations, such as the surface area of a cylindrical food container	
Similar figures and scale factors	
review the conditions for similarity of two-dimensional figures, including similar triangles	G2-6 Congruence G3-1 Similarity
use the scale factor for two similar figures to solve linear scaling problems	
obtain measurements from scale drawings, such as maps or building plans, to solve problems	G2-1 Maps and Scales
obtain a scale factor and use it to solve scaling problems involving the calculation of the areas of similar figures, including the use of shadow sticks, calculating the height of trees, use of a clinometer	G2-1 Maps and Scales G2-6 Congruence G3-1 Similarity
obtain a scale factor and use it to solve scaling problems involving the calculation of surface areas and volumes of similar solids	

Unit 1 Topic 3 – Linear Equations and their Graphs	
Linear Equations	
identify and solve linear equations, including variables on both sides, fractions, non-integer solutions	A1-5 to A3-3
develop a linear equation from a description in words	A2-1 Writing Equations
Straight-line graphs and their applications	
construct straight-line graphs using $y = a + bx$ both with and without the aid of technology	A3-8 Linear Functions
determine the slope and intercepts of a straight-line graph from both its equation and its plot	
interpret, in context, the slope and intercept of a straight-line graph used to model and analyse a practical situation	
construct and analyse a straight-line graph to model a given linear relationship, such as modelling the cost of filling a fuel tank of a car against the number of litres of petrol required	
Simultaneous linear equations and their applications	
solve a pair of simultaneous linear equations in the format $y = mx + c$, using technology when appropriate; they must solve equations algebraically, graphically, by substitution and by the elimination method	A4-3 Simultaneous Equations - Linear
solve practical problems that involve finding the point of intersection of two straight-line graphs, such as determining the break-even point where cost and revenue are represented by linear equations	

Unit 2 Topic 1 – Applications of Trigonometry	
Applications of Trigonometry	
review the use of the trigonometric ratios to find the length of an unknown side or the size of an unknown angle in a right-angled triangle	M3-2 Trigonometry M5-4 Solving Triangles
• determine the area of a triangle given two sides and an included angle by using the rule area = ½ *bc* sinA, or given three sides by using Heron's rule A = $\sqrt{s(s-a)(s-b)(s-c)}$, where $s = (a+b+c)/2$, and solve related practical problems	
solve two-dimensional problems involving non-right-angled triangles using the sine rule (ambiguous case excluded) and the cosine rule	
solve two-dimensional practical problems involving the trigonometry of right-angled and non-rightangled triangles, including problems involving angles of elevation and depression and the use of true bearings	

Unit 2 Topic 2 – Algebra and Matrices	
Linear and non-linear relationships	
substitute numerical values into linear algebraic and simple non-linear algebraic expressions, and evaluate, e.g. order two polynomials, proportional, inversely proportional	A1-5 Substitution
find the value of the subject of the formula, given the values of the other pronumerals in the formula	
transpose linear equations and simple non-linear algebraic equations, e.g. order two polynomials, proportional, inversely proportional	A3-4 Rearranging Formulae
use a spreadsheet or an equivalent technology to construct a table of values from a formula, including two-by-two tables for formulas with two variable quantities, e.g. a table displaying the body mass index (BMI) of people with different weights and heights	S3-1 Spreadsheets
Matrices and matrix arithmetic	
use matrices for storing and displaying information that can be presented in rows and columns, e.g. tables, databases, links in social or road networks	
recognise different types of matrices (row matrix, column matrix (or vector matrix), square matrix, zero matrix, identity matrix) and determine the size of the matrix	
perform matrix addition, subtraction, and multiplication by a scalar	
perform matrix multiplication (manually up to a 3 x 3 but not limited to square matrices)	
determining the power of a matrix using technology with matrix arithmetic capabilities when appropriate	
use matrices, including matrix products and powers of matrices, to model and solve problems, e.g. costing or pricing problems, squaring a matrix to determine the number of ways pairs of people in a communication network can communicate with each other via a third person	

Unit 2 Topic 3 – Univariate Data Analysis	
Making sense of data relating to a single statistical variable	
define univariate data	S3-4 Data Types
classify statistical variables as categorical or numerical	
classify a categorical variable as ordinal or nominal and use tables and pie, bar and column charts to organise and display the data, e.g. ordinal: income level (high, medium, low); or nominal: place of birth (Australia, overseas)	
classify a numerical variable as discrete or continuous, e.g. discrete: the number of rooms in a house; or continuous: the temperature in degrees Celsius	
select, construct and justify an appropriate graphical display to describe the distribution of a numerical dataset, including dot plot, stem-and-leaf plot, column chart or histogram	S1-1 Data Displays 1 S3-2 Data Displays 2
describe the graphical displays in terms of the number of modes, shape (symmetric versus positively or negatively skewed), measures of centre and spread, and outliers and interpret this information in the context of the data	S6-1 Data Distributions
determine the mean, $\bar{x}$, and standard deviation (using technology) of a dataset and use statistics as measures of location and spread of a data distribution, being aware of the significance of the size of the standard deviation	S1-2 Data Summary S4-1 Quantiles and Spread
Comparing data for a numerical variable across two or more groups	
construct and use parallel box plots (including the use of the Q1 − 1.5 × IQR ≤ x ≤ Q3 + 1.5 × IQR criteria for identifying possible outliers) to compare datasets in terms of median, spread (IQR and range) and outliers to interpret and communicate the differences observed in the context of the data	S4-1 Quantiles and Spread
compare datasets using medians, means, IQRs, ranges or standard deviations for a single numerical variable, interpret the differences observed in the context of the data and report the findings in a systematic and concise manner	

Unit 3 Topic 1 – Bivariate Data Analysis	
Identifying and describing associations between two categorical variables	
define bivariate data	S4-3 Data Types
construct two-way frequency tables and determine the associated row and column sums and percentages	
use an appropriately percentaged two-way frequency table to identify patterns that suggest the presence of an association	

understand an association in terms of differences observed in percentages across categories in a systematic and concise manner, and interpret this in the context of the data	
Identifying and describing associations between two numerical variables	
construct a scatterplot to identify patterns in the data suggesting the presence of an association	S4-1 Linear Regression
understand an association between two numerical variables in terms of direction (positive/negative), form (linear) and strength (strong/moderate/weak)	
calculate and interpret the correlation coefficient (r) to quantify the strength of a linear association using Pearson's correlation coefficient	
Fitting a linear model to numerical data	
identify the response variable and the explanatory variable	S4-1 Linear Regression
use a scatterplot to identify the nature of the relationship between variables	
model a linear relationship by fitting a least-squares line to the data	
use a residual plot to assess the appropriateness of fitting a linear model to the data	
interpret the intercept and slope of the fitted line	S4-1 Linear Regression
use, not calculate, the coefficient of determination (R^2) to assess the strength of a linear association in terms of the explained variation	
use the equation of a fitted line to make predictions	
distinguish between interpolation and extrapolation when using the fitted line to make predictions, recognising the potential dangers of extrapolation	
Association and causation	
recognise that an observed association between two variables does not necessarily mean that there is a causal relationship between them	S4-1 Linear Regression
identify and communicate possible non-causal explanations for an association, including coincidence and confounding due to a common response to another variable	
solve practical problems by identifying, analysing and describing associations between two categorical variables or between two numerical variables	

Unit 3 Topic 2 – Time Series Analysis	
Describing and interpreting patterns in time series data	
construct time series plots	S3-4 Data Types
describe time series plots by identifying features such as trend (long-term direction), seasonality (systematic, calendar-related movements) and irregular fluctuations (unsystematic, short-term fluctuations), and recognise when there are outliers, e.g. one-off unanticipated events	
Analysing time series data	
smooth time series data by using a simple moving average, including the use of spreadsheets to implement this process	
calculate seasonal indices by using the average percentage method	
deseasonalise a time series by using a seasonal index, including the use of spreadsheets to implement this process	
fit a least-squares line to model long-term trends in time series data, using appropriate technology	
solve practical problems that involve the analysis of time series data	

Unit 3 Topic 3 – Growth and Decay in Sequences	
The arithmetic sequence	
use recursion to generate an arithmetic sequence	A6-2 Arithmetic Sequences
display the terms of an arithmetic sequence in both tabular and graphical form and demonstrate that arithmetic sequences can be used to model linear growth and decay in discrete situations	
use the rule for the n^{th} term using $t_n = t_1 + (n-1)d$, where t_n represents the n^{th} term of the sequence, t_1 = first term, n = term number and d = common difference of a particular arithmetic sequence from the pattern of the terms in an arithmetic sequence, and use this rule to make predictions	
use arithmetic sequences to model and analyse practical situations involving linear growth or decay, such as analysing a simple interest loan or investment, calculating a taxi fare based on the flag fall and the charge per kilometre, or calculating the value of an office photocopier at the end of each year using the straight-line method or the unit cost method of depreciation	

The geometric sequence	
use recursion to generate a geometric sequence	A6-3 Geometric Sequences
display the terms of a geometric sequence in both tabular and graphical form and demonstrate that geometric sequences can be used to model exponential growth and decay in discrete situations	
use the rule for the n^{th} term using $tn = t_1 r^{(n-1)}$ where t_n represents the n^{th} term of the sequence, t_1 = first term, n = term number and r = common ratio of a particular geometric sequence from the pattern of the terms in the sequence, and use this rule to make predictions	
use geometric sequences to model and analyse (numerically or graphically only) practical problems involving geometric growth and decay (logarithmic solutions not required), such as analysing a compound interest loan or investment, the growth of a bacterial population that doubles in size each hour or the decreasing height of the bounce of a ball at each bounce; or calculating the value of office furniture at the end of each year using the declining (reducing) balance method to depreciate.	

Unit 3 Topic 4 – Earth Geometry and Time Zones

Locations on the Earth	
define the meaning of great circles	
define the meaning of angles of latitude and longitude in relation to the equator and the prime meridian	G1-3 Position
locate positions on Earth's surface given latitude and longitude, e.g. using a globe, an atlas, GPS and other digital technologies	
state latitude and longitude for positions on Earth's surface and world maps (in degrees only)	
use a local area map to state the position of a given place in degrees and minutes, e.g. investigating the map of Australia and locating boundary positions for Aboriginal language groups, such as the Three Sisters in the Blue Mountains or the local area's Aboriginal land and the positions of boundaries	
calculate angular distance (in degrees and minutes) and distance (in kilometres) between two places on Earth on the same meridian using $D = 111.2 \times$ angular distance	
calculate angular distance (in degrees and minutes) and distance (in kilometres) between two places on Earth on the same parallel of latitude using $D = 111.2 \cos \theta \times$ angular distance	
calculate distances between two places on Earth, using appropriate technology	

Time Zones	
define Greenwich Mean Time (GMT), International Date Line and Coordinated Universal Time (UTC)	M2-2 Time 2
understand the link between longitude and time	
determine the number of degrees of longitude for a time difference of one hour	
solve problems involving time zones in Australia and in neighbouring nations, making any necessary allowances for daylight saving, including seasonal time systems used by Aboriginal peoples and Torres Strait Islander peoples	
solve problems involving GMT, International Date Line and UTC	
calculate time differences between two places on Earth	
solve problems associated with time zones, such as online purchasing, making phone calls overseas and broadcasting international events	
solve problems relating to travelling east and west incorporating time zone changes, such as preparing an itinerary for an overseas holiday with corresponding times	

Unit 4 Topic 1 – Loans, Investments and Annuities

Compound Interest Loans and Investments	
use a recurrence relation $A_{n+1} = rA_n$ to model a compound interest loan or investment, and investigate (numerically and graphically) the effect of the interest rate and the number of compounding periods on the future value of the loan or investment, e.g. payday loan	N4-1 Compound Interest S3-1 Spreadsheets
calculate the effective annual rate of interest and use the results to compare investment returns and cost of loans when interest is paid or charged daily, monthly, quarterly or six-monthly	N4-1 Compound Interest
solve problems involving compound interest loans or investments, e.g. determining the future value of a loan, the number of compounding periods for an investment to exceed a given value, the interest rate needed for an investment to exceed a given value	
Reducing balance loans (compound interest loans with periodic repayments)	
use a recurrence relation, $A_{n+1} = rA_n - R$ (where R = monthly repayment) to model a reducing balance loan and investigate (numerically or graphically) the effect of the interest rate and repayment amount on the time taken to repay the loan	S3-1 Spreadsheets
with the aid of appropriate technology, solve problems involving reducing balance loans, e.g. determining the monthly repayments required to pay off a housing loan	

Annuities and perpetuities (compound interest investments with periodic payments made from the investment)	
use a recurrence relation $A_{n+1} = rA_n + d$ to model an annuity and investigate (numerically or graphically) the effect of the amount invested, the interest rate, and the payment amount on the duration of the annuity	S3-1 Spreadsheets
solve problems involving annuities, including perpetuities as a special case, e.g. determining the amount to be invested in an annuity to provide a regular monthly income of a certain amount	

Unit 4 Topic 2 – Graphs and Networks	
Graphs, associated terminology and the adjacency matrix	
understand the meanings of the terms graph, edge, vertex, loop, degree of a vertex, subgraph, simple graph, complete graph, bipartite graph, directed graph (digraph), arc, weighted graph and network	
identify practical situations that can be represented by a network and construct such networks, e.g. trails connecting camp sites in a national park, a social network, a transport network with one-way streets, a food web, the results of a round-robin sporting competition	
construct an adjacency matrix from a given graph or digraph	
Planar graphs, paths and cycles	
understand the meaning of the terms planar graph and face	
apply Euler's formula, $v + f - e = 2$, to solve problems relating to planar graphs	
understand the meaning of the terms walk, trail, path, closed walk, closed trail, cycle, connected graph and bridge	
investigate and solve practical problems to determine the shortest path between two vertices in a weighted graph (by trial-and-error methods only)	
understand the meaning of the terms Eulerian graph, Eulerian trail, semi-Eulerian graph, semi-Eulerian trail and the conditions for their existence, and use these concepts to investigate and solve practical problems, e.g. the Königsberg bridge problem, planning a garbage bin collection route	
understand the meaning of the terms Hamiltonian graph and semi-Hamiltonian graph and use these concepts to investigate and solve practical problems (by trial-and-error methods only), e.g. planning a sightseeing tourist route around a city, the travelling-salesman problem	

Unit 4 Topic 3 – Networks and Decision Mathematics	
Trees and minimum connector problems	
understand the meaning of the terms tree and spanning tree	
identify practical examples	
identify a minimum spanning tree in a weighted connected graph, e.g. using Prim's algorithm	
use minimal spanning trees to solve minimal connector problems, e.g. minimising the length of cable needed to provide power from a single power station to substations in several towns	
Project planning and scheduling using critical path analysis (CPA)	
construct a network diagram to represent the durations and interdependencies of activities that must be completed during the project, e.g. preparing a meal	
use forward and backward scanning to determine the earliest starting time (EST) and latest starting times (LST) for each activity in the project	
use ESTs and LSTs to locate the critical path/s for the project	
use the critical path to determine the minimum time for a project to be completed	
calculate float times for non-critical activities	
Flow networks	
solve small-scale network flow problems including the use of the 'maximum-flow minimum-cut' theorem, e.g. determining the maximum volume of oil that can flow through a network of pipes from an oil storage tank to a terminal	
Assigning order and the Hungarian algorithm	
use a bipartite graph and its tabular or matrix form to represent an assignment/allocation problem, e.g. assigning four swimmers to the four places in a medley relay team to maximise the team's chances of winning	
determine the optimum assignment/s for small-scale problems by inspection, or by use of the Hungarian algorithm (3 × 3) for larger problems	