TABLE OF OBJECTIVES AND OUTCOMES – CONTINUUM OF LEARNING IN MATHEMATICS K–10

Working Mathematically

Students:

- develop understanding and fluency in mathematics through inquiry, exploring and connecting mathematical concepts, choosing and applying problem-solving skills and mathematical techniques, communication and reasoning

Early Stage 1 outcomes	Stage 1 outcomes	Stage 2 outcomes	Stage 3 outcomes	Stage 4 outcomes	Stage 5.1 outcomes	Stage 5.2 outcomes	Stage 5.3 outcomes
A student:	A student:	A student:	A student:	A student:	A student:	A student:	A student:
Communicating MAe-1WM describes mathematical situations using everyday language, actions, materials and informal recordings	***Communicating*** MA1-1WM describes mathematical situations and methods using everyday and some mathematical language, actions, materials, diagrams and symbols	***Communicating*** MA2-1WM uses appropriate terminology to describe, and symbols to represent, mathematical ideas	***Communicating*** MA3-1WM describes and represents mathematical situations in a variety of ways using mathematical terminology and some conventions	***Communicating*** MA4-1WM communicates and connects mathematical ideas using appropriate terminology, diagrams and symbols	***Communicating*** MA5.1-1WM uses appropriate terminology, diagrams and symbols in mathematical contexts	***Communicating*** MA5.2-1WM selects appropriate notations and conventions to communicate mathematical ideas and solutions	***Communicating*** MA5.3-1WM uses and interprets formal definitions and generalisations when explaining solutions and/or conjectures
Problem Solving MAe-2WM uses objects, actions, technology and/or trial and error to explore mathematical problems	***Problem Solving*** MA1-2WM uses objects, diagrams and technology to explore mathematical problems	***Problem Solving*** MA2-2WM selects and uses appropriate mental or written strategies, or technology, to solve problems	***Problem Solving*** MA3-2WM selects and applies appropriate problem-solving strategies, including the use of digital technologies, in undertaking investigations	***Problem Solving*** MA4-2WM applies appropriate mathematical techniques to solve problems	***Problem Solving*** MA5.1-2WM selects and uses appropriate strategies to solve problems	***Problem Solving*** MA5.2-2WM interprets mathematical or real-life situations, systematically applying appropriate strategies to solve problems	***Problem Solving*** MA5.3-2WM generalises mathematical ideas and techniques to analyse and solve problems efficiently
Reasoning MAe-3WM uses concrete materials and/or pictorial representations to support conclusions	***Reasoning*** MA1-3WM supports conclusions by explaining or demonstrating how answers were obtained	***Reasoning*** MA2-3WM checks the accuracy of a statement and explains the reasoning used	***Reasoning*** MA3-3WM gives a valid reason for supporting one possible solution over another	***Reasoning*** MA4-3WM recognises and explains mathematical relationships using reasoning	***Reasoning*** MA5.1-3WM provides reasoning to support conclusions that are appropriate to the context	***Reasoning*** MA5.2-3WM constructs arguments to prove and justify results	***Reasoning*** MA5.3-3WM uses deductive reasoning in presenting arguments and formal proofs

MATHEMATICS LEARNING IN STAGE 5

Intended Stage 6 Board Developed Course and recommended Stage 5 content (minimum)

Preliminary Mathematics General/ HSC Mathematics General 2	Mathematics ('2 Unit')	Mathematics Extension 1
◊	§	#
(substrands identified by ◊)	(substrands identified by §)	(optional substrands identified by #)

Number and Algebra

Students:

- develop efficient strategies for numerical calculation, recognise patterns, describe relationships and apply algebraic techniques and generalisation

Early Stage 1 outcomes	Stage 1 outcomes	Stage 2 outcomes	Stage 3 outcomes	Stage 4 outcomes	Stage 5.1 outcomes	Stage 5.2 outcomes	Stage 5.3 outcomes
A student:	A student:	A student:	A student:	A student:	A student:	A student:	A student:
Whole Numbers MAe-4NA counts to 30, and orders, reads and represents numbers in the range 0 to 20	***Whole Numbers*** MA1-4NA applies place value, informally, to count, order, read and represent two- and three-digit numbers	***Whole Numbers*** MA2-4NA applies place value to order, read and represent numbers of up to five digits	***Whole Numbers*** MA3-4NA orders, reads and represents integers of any size and describes properties of whole numbers				
Addition and Subtraction MAe-5NA combines, separates and compares collections of objects, describes using everyday language, and records using informal methods	***Addition and Subtraction*** MA1-5NA uses a range of strategies and informal recording methods for addition and subtraction involving one- and two-digit numbers	***Addition and Subtraction*** MA2-5NA uses mental and written strategies for addition and subtraction involving two-, three-, four- and five-digit numbers	***Addition and Subtraction*** MA3-5NA selects and applies appropriate strategies for addition and subtraction with counting numbers of any size	***Computation with Integers*** MA4-4NA compares, orders and calculates with integers, applying a range of strategies to aid computation			
Multiplication and Division MAe-6NA groups, shares and counts collections of objects, describes using everyday language, and records using informal methods	***Multiplication and Division*** MA1-6NA uses a range of mental strategies and concrete materials for multiplication and division	***Multiplication and Division*** MA2-6NA uses mental and informal written strategies for multiplication and division	***Multiplication and Division*** MA3-6NA selects and applies appropriate strategies for multiplication and division, and applies the order of operations to calculations involving more than one operation				
Fractions and Decimals MAe-7NA describes two equal parts as halves	***Fractions and Decimals*** MA1-7NA represents and models halves, quarters and eighths	***Fractions and Decimals*** MA2-7NA represents, models and compares commonly used fractions and decimals	***Fractions, Decimals and Percentages*** MA3-7NA compares, orders and calculates with fractions, decimals and percentages	***Fractions, Decimals and Percentages*** MA4-5NA operates with fractions, decimals and percentages			
				Financial Mathematics MA4-6NA solves financial problems involving purchasing goods	***Financial Mathematics*** MA5.1-4NA solves financial problems involving earning, spending and investing money	***Financial Mathematics ◊*** MA5.2-4NA solves financial problems involving compound interest	
				Ratios and Rates MA4-7NA operates with ratios and rates, and explores their graphical representation		***Ratios and Rates*** MA5.2-5NA recognises direct and indirect proportion, and solves problems involving direct proportion	***Ratios and Rates*** MA5.3-4NA draws, interprets and analyses graphs of physical phenomena
Patterns and Algebra MAe-8NA recognises, describes and continues repeating patterns	***Patterns and Algebra*** MA1-8NA creates, represents and continues a variety of patterns with numbers and objects	***Patterns and Algebra*** MA2-8NA generalises properties of odd and even numbers, generates number patterns, and completes simple number sentences by calculating missing values	***Patterns and Algebra*** MA3-8NA analyses and creates geometric and number patterns, constructs and completes number sentences, and locates points on the Cartesian plane	***Algebraic Techniques*** MA4-8NA generalises number properties to operate with algebraic expressions		***Algebraic Techniques*** MA5.2-6NA simplifies algebraic fractions, and expands and factorises quadratic expressions	***Algebraic Techniques §*** MA5.3-5NA selects and applies appropriate algebraic techniques to operate with algebraic expressions
				Indices MA4-9NA operates with positive-integer and zero indices of numerical bases	***Indices*** MA5.1-5NA operates with algebraic expressions involving positive-integer and zero indices, and establishes the meaning of negative indices for numerical bases	***Indices*** MA5.2-7NA applies index laws to operate with algebraic expressions involving integer indices	***Surds and Indices §*** MA5.3-6NA performs operations with surds and indices
				Equations MA4-10NA uses algebraic techniques to solve simple linear and quadratic equations		***Equations*** MA5.2-8NA solves linear and simple quadratic equations, linear inequalities and linear simultaneous equations, using analytical and graphical techniques	***Equations §*** MA5.3-7NA solves complex linear, quadratic, simple cubic and simultaneous equations, and rearranges literal equations

Early Stage 1 outcomes	Stage 1 outcomes	Stage 2 outcomes	Stage 3 outcomes	Stage 4 outcomes	Stage 5.1 outcomes	Stage 5.2 outcomes	Stage 5.3 outcomes
A student:	A student:	A student:	A student:	A student:	A student:	A student:	A student:
				Linear Relationships MA4-11NA creates and displays number patterns; graphs and analyses linear relationships; and performs transformations on the Cartesian plane	***Linear Relationships*** MA5.1-6NA determines the midpoint, gradient and length of an interval, and graphs linear relationships	***Linear Relationships*** MA5.2-9NA uses the gradient-intercept form to interpret and graph linear relationships	***Linear Relationships §*** MA5.3-8NA uses formulas to find midpoint, gradient and distance on the Cartesian plane, and applies standard forms of the equation of a straight line
					Non-Linear Relationships MA5.1-7NA graphs simple non-linear relationships	***Non-Linear Relationships ◊*** MA5.2-10NA connects algebraic and graphical representations of simple non-linear relationships	***Non-Linear Relationships §*** MA5.3-9NA sketches and interprets a variety of non-linear relationships
							Polynomials # MA5.3-10NA recognises, describes and sketches polynomials, and applies the factor and remainder theorems to solve problems
							Logarithms # MA5.3-11NA uses the definition of a logarithm to establish and apply the laws of logarithms
							Functions and Other Graphs # MA5.3-12NA uses function notation to describe and sketch functions

Measurement and Geometry

Students:

- identify, visualise and quantify measures and the attributes of shapes and objects, and explore measurement concepts and geometric relationships, applying formulas, strategies and geometric reasoning in the solution of problems

Early Stage 1 outcomes	Stage 1 outcomes	Stage 2 outcomes	Stage 3 outcomes	Stage 4 outcomes	Stage 5.1 outcomes	Stage 5.2 outcomes	Stage 5.3 outcomes
A student:	A student:	A student:	A student:	A student:	A student:	A student:	A student:
Length MAe-9MG describes and compares lengths and distances using everyday language	***Length*** MA1-9MG measures, records, compares and estimates lengths and distances using uniform informal units, metres and centimetres	***Length*** MA2-9MG measures, records, compares and estimates lengths, distances and perimeters in metres, centimetres and millimetres, and measures, compares and records temperatures	***Length*** MA3-9MG selects and uses the appropriate unit and device to measure lengths and distances, calculates perimeters, and converts between units of length	***Length*** MA4-12MG calculates the perimeters of plane shapes and the circumferences of circles			
Area MAe-10MG describes and compares areas using everyday language	***Area*** MA1-10MG measures, records, compares and estimates areas using uniform informal units	***Area*** MA2-10MG measures, records, compares and estimates areas using square centimetres and square metres	***Area*** MA3-10MG selects and uses the appropriate unit to calculate areas, including areas of squares, rectangles and triangles	***Area*** MA4-13MG uses formulas to calculate the areas of quadrilaterals and circles, and converts between units of area	***Area and Surface Area*** MA5.1-8MG calculates the areas of composite shapes, and the surface areas of rectangular and triangular prisms	***Area and Surface Area*** MA5.2-11MG calculates the surface areas of right prisms, cylinders and related composite solids	***Area and Surface Area*** MA5.3-13MG applies formulas to find the surface areas of right pyramids, right cones, spheres and related composite solids
Volume and Capacity MAe-11MG describes and compares the capacities of containers and the volumes of objects or substances using everyday language	***Volume and Capacity*** MA1-11MG measures, records, compares and estimates volumes and capacities using uniform informal units	***Volume and Capacity*** MA2-11MG measures, records, compares and estimates volumes and capacities using litres, millilitres and cubic centimetres	***Volume and Capacity*** MA3-11MG selects and uses the appropriate unit to estimate, measure and calculate volumes and capacities, and converts between units of capacity	***Volume*** MA4-14MG uses formulas to calculate the volumes of prisms and cylinders, and converts between units of volume		***Volume*** MA5.2-12MG applies formulas to calculate the volumes of composite solids composed of right prisms and cylinders	***Volume*** MA5.3-14MG applies formulas to find the volumes of right pyramids, right cones, spheres and related composite solids
Mass MAe-12MG describes and compares the masses of objects using everyday language	***Mass*** MA1-12MG measures, records, compares and estimates the masses of objects using uniform informal units	***Mass*** MA2-12MG measures, records, compares and estimates the masses of objects using kilograms and grams	***Mass*** MA3-12MG selects and uses the appropriate unit and device to measure the masses of objects, and converts between units of mass				
Time MAe-13MG sequences events, uses everyday language to describe the durations of events, and reads hour time on clocks	***Time*** MA1-13MG describes, compares and orders durations of events, and reads half- and quarter-hour time	***Time*** MA2-13MG reads and records time in one-minute intervals and converts between hours, minutes and seconds	***Time*** MA3-13MG uses 24-hour time and am and pm notation in real-life situations, and constructs timelines	***Time*** MA4-15MG performs calculations of time that involve mixed units, and interprets time zones	***Numbers of Any Magnitude*** MA5.1-9MG interprets very small and very large units of measurement, uses scientific notation, and rounds to significant figures		
				Right-Angled Triangles (Pythagoras) MA4-16MG applies Pythagoras' theorem to calculate side lengths in right-angled triangles, and solves related problems	***Right-Angled Triangles (Trigonometry)*** MA5.1-10MG applies trigonometry, given diagrams, to solve problems, including problems involving angles of elevation and depression	***Right-Angled Triangles (Trigonometry) ◊*** MA5.2-13MG applies trigonometry to solve problems, including problems involving bearings	***Trigonometry and Pythagoras' Theorem §*** MA5.3-15MG applies Pythagoras' theorem, trigonometric relationships, the sine rule, the cosine rule and the area rule to solve problems, including problems involving three dimensions
Three-Dimensional Space MAe-14MG manipulates, sorts and represents three-dimensional objects and describes them using everyday language	***Three-Dimensional Space*** MA1-14MG sorts, describes, represents and recognises familiar three-dimensional objects, including cones, cubes, cylinders, spheres and prisms	***Three-Dimensional Space*** MA2-14MG makes, compares, sketches and names three-dimensional objects, including prisms, pyramids, cylinders, cones and spheres, and describes their features	***Three-Dimensional Space*** MA3-14MG identifies three-dimensional objects, including prisms and pyramids, on the basis of their properties, and visualises, sketches and constructs them given drawings of different views				
Two-Dimensional Space MAe-15MG manipulates, sorts and describes representations of two-dimensional shapes, including circles, triangles, squares and rectangles, using everyday language	***Two-Dimensional Space*** MA1-15MG manipulates, sorts, represents, describes and explores two-dimensional shapes, including quadrilaterals, pentagons, hexagons and octagons	***Two-Dimensional Space*** MA2-15MG manipulates, identifies and sketches two-dimensional shapes, including special quadrilaterals, and describes their features	***Two-Dimensional Space*** MA3-15MG manipulates, classifies and draws two-dimensional shapes, including equilateral, isosceles and scalene triangles, and describes their properties	***Properties of Geometrical Figures*** MA4-17MG classifies, describes and uses the properties of triangles and quadrilaterals, and determines congruent triangles to find unknown side lengths and angles	***Properties of Geometrical Figures*** MA5.1-11MG describes and applies the properties of similar figures and scale drawings	***Properties of Geometrical Figures*** MA5.2-14MG calculates the angle sum of any polygon and uses minimum conditions to prove triangles are congruent or similar	***Properties of Geometrical Figures §*** MA5.3-16MG proves triangles are similar, and uses formal geometric reasoning to establish properties of triangles and quadrilaterals

Early Stage 1 outcomes	Stage 1 outcomes	Stage 2 outcomes	Stage 3 outcomes	Stage 4 outcomes	Stage 5.1 outcomes	Stage 5.2 outcomes	Stage 5.3 outcomes
A student:	A student:	A student:	A student:	A student:	A student:	A student:	A student:
		Angles MA2-16MG identifies, describes, compares and classifies angles	***Angles*** MA3-16MG measures and constructs angles, and applies angle relationships to find unknown angles	***Angle Relationships*** MA4-18MG identifies and uses angle relationships, including those related to transversals on sets of parallel lines			
Position MAe-16MG describes position and gives and follows simple directions using everyday language	***Position*** MA1-16MG represents and describes the positions of objects in everyday situations and on maps	***Position*** MA2-17MG uses simple maps and grids to represent position and follow routes, including using compass directions	***Position*** MA3-17MG locates and describes position on maps using a grid-reference system				
							Circle Geometry # MA5.3-17MG applies deductive reasoning to prove circle theorems and to solve related problems

Statistics and Probability

Students:

- collect, represent, analyse, interpret and evaluate data, assign and use probabilities, and make sound judgements

Early Stage 1 outcomes	Stage 1 outcomes	Stage 2 outcomes	Stage 3 outcomes	Stage 4 outcomes	Stage 5.1 outcomes	Stage 5.2 outcomes	Stage 5.3 outcomes
A student:	A student:	A student:	A student:	A student:	A student:	A student:	A student:
Data MAe-17SP represents data and interprets data displays made from objects	***Data*** MA1-17SP gathers and organises data, displays data in lists, tables and picture graphs, and interprets the results	***Data*** MA2-18SP selects appropriate methods to collect data, and constructs, compares, interprets and evaluates data displays, including tables, picture graphs and column graphs	***Data*** MA3-18SP uses appropriate methods to collect data and constructs, interprets and evaluates data displays, including dot plots, line graphs and two-way tables	***Data Collection and Representation*** MA4-19SP collects, represents and interprets single sets of data, using appropriate statistical displays			
				Single Variable Data Analysis MA4-20SP analyses single sets of data using measures of location, and range	***Single Variable Data Analysis*** MA5.1-12SP uses statistical displays to compare sets of data, and evaluates statistical claims made in the media	***Single Variable Data Analysis*** ◊ MA5.2-15SP uses quartiles and box plots to compare sets of data, and evaluates sources of data	***Single Variable Data Analysis*** MA5.3-18SP uses standard deviation to analyse data
						Bivariate Data Analysis MA5.2-16SP investigates relationships between two statistical variables, including their relationship over time	***Bivariate Data Analysis*** MA5.3-19SP investigates the relationship between numerical variables using lines of best fit, and explores how data is used to inform decision-making processes
	Chance MA1-18SP recognises and describes the element of chance in everyday events	***Chance*** MA2-19SP describes and compares chance events in social and experimental contexts	***Chance*** MA3-19SP conducts chance experiments and assigns probabilities as values between 0 and 1 to describe their outcomes	***Probability*** MA4-21SP represents probabilities of simple and compound events	***Probability*** MA5.1-13SP calculates relative frequencies to estimate probabilities of simple and compound events	***Probability*** MA5.2-17SP describes and calculates probabilities in multi-step chance experiments	