

Links to the Mathematics B and C senior syllabuses

This document shows the links between the discretionary learning outcomes at Beyond Level 6 from the Years 1 to 10 Mathematics syllabus and the Mathematics B and C senior syllabuses. The identification of the links or articulation points could be useful for:

- Heads of Department of middle and later years of schooling in achieving consistency and continuity of planning
- students, parents/carers and guidance officers when selecting mathematics subjects in the senior years.

In summary, this document shows how:

- the overall intent of the Years 1 to 10 Mathematics and Mathematics B and C senior syllabuses are linked
- discretionary learning outcomes at Beyond Level 6 provide prerequisite knowledge for the Mathematics senior syllabus topics indicated (some examples of specific links are given for these topics).

Overall intent of the syllabuses

There are deliberate and clear links between the key learning area outcomes of the Years 1 to 10 Mathematics syllabus and the Rationale, Global Aims, General Objectives and the four broad contexts ('application', 'technology', 'initiative' and 'complexity') of the Mathematics B and C senior syllabuses. These are shown in Table 1.

Table 1: Links between the key learning area outcomes of the Years 1 to 10 Mathematics syllabus and the Mathematics B and C senior syllabuses

Key learning area outcomes of the Years 1 to 10 Mathematics syllabus	Links to the Mathematics B and C senior syllabuses
Students understand the nature of mathematics as a dynamic human endeavour, its relationship with other human endeavours and its contribution to society.	<p>The Rationale refers to the central nature of mathematics in major scientific and technological advances and its importance in a wide range of careers.</p> <p>The Global Aims state that students should have experienced diverse applications of mathematics. The Affective Objectives refer to the appreciation of 'the contribution of mathematics to human culture and progress'.</p> <p>The 'application' context provides students with the opportunity to recognise the usefulness of mathematics in situations that range from life-related to pure abstraction.</p>
<p>Students interpret and apply underlying properties and relationships that characterise and connect aspects of mathematics.</p> <p>They identify and analyse information, think and reason inductively, deductively and intuitively to solve problems, and make and justify decisions.</p>	<p>The general objectives of 'modelling and problem solving' and 'communication and justification' involve students in interpreting, applying, identifying and analysing as well as justifying decisions; these learning experiences are within and across the four contexts — 'application', 'technology', 'initiative' and 'complexity'.</p>
Students create mathematical models, reason inventively, analyse options and consider the consequences and implications of decisions.	<p>The general objective of 'modelling and problem solving' involves students in representing situations as models, identifying the assumptions and variables of models, forming models and interpreting results, and exploring the limitations and strengths of models. The general objective 'communication and justification' requires students to 'develop logical arguments and support conclusions and propositions'.</p>

Key learning area outcomes of the Years 1 to 10 Mathematics syllabus	Links to the Mathematics B and C senior syllabuses
Students pose and solve mathematical problems using a variety of information-gathering, processing and management techniques and technologies.	The context of 'technology' requires students to engage in a range of technological tools from pen and paper to measuring instruments, from tables to graphics calculators and computers. The context of 'complexity' requires students to engage in a range of tasks from simple, single-step tasks to complex tasks that depend on the nature of the concepts involved or the number of ideas or techniques to be sequenced.
Students use the concise language of mathematics, verbal and symbolic, when communicating observations and ideas, and engaging in substantive conversations about mathematics.	The 'communication' aspect of the general objective 'communication and justification' involves students in communicating ideas and information using mathematical terms and symbols in a variety of forms (oral, written, symbolic, pictorial and graphical) for different audiences.
Students collaborate and cooperate, challenge the reasoning and perspectives of others as appropriate and contribute mathematical learning to investigations involving a range and balance of situations from life-related to purely mathematical.	The 'problem solving' and 'investigation' aspects of the general objective 'modelling and problem solving' involve students in clarifying and analysing problems, and selecting, using and developing problem-solving strategies that are in life-related situations within the 'application' context.
Students reflect on, evaluate and apply their mathematical learning to their personal and working lives, and make informed decisions about the future.	The 'justification' aspect of the general objective involves students in such activities as developing substantiated arguments to support conclusions, recognising when results are valid improbable/improbable/implausible/based on flawed assumptions. Insightful and creative solutions can be explored within the 'initiative' context.

Syllabus links

The links between the discretionary learning outcomes at Beyond Level 6 in the Years 1 to 10 Mathematics syllabus and associated topics in the Mathematics B and C senior syllabuses are shown in Table 2.

Table 2: Links between the discretionary learning outcomes at Beyond Level 6 in the Years 1 to 10 Mathematics syllabus and associated topics in the Mathematics B and C senior syllabuses

Years 1 to 10 Mathematics discretionary learning outcomes: Beyond Level 6	Mathematics B topics	Mathematics B examples of specific links	Mathematics C topics	Mathematics C examples of specific links
<p>Strand: Number Topic: Number concepts</p> <p>N DB 6.1a Students interpret and use the various sets of real numbers and integer and unit fractional powers.</p>	<p>Introduction to functions Rates of change Periodic functions and applications Exponential and logarithmic functions and applications Optimisation using derivatives Introduction to integration Applied statistical analysis</p>	<ul style="list-style-type: none"> • domain and range • practical applications of quadratic functions, the reciprocal function, inverse variation • index laws • solutions of equations involving indices • rules for differentiation and integration • derivatives of exponential and log functions for • limit of sum as definite integral • types of variables and data • concept of continuous random variable 	<p>Introduction to groups Real and complex number systems Matrices and applications Calculus Structures and patterns</p>	<ul style="list-style-type: none"> • structure of the real and complex number systems • applications of matrices • applications using calculus • sum to infinity of a geometric progression • sequences and series • finite differences
<p>Strand: Number Topic: Number concepts</p> <p>N DB 6.1b Students make informed decisions regarding earning, spending and saving money, with reference to schedules of government and business charges.</p>	<p>While this outcome provides important life skills and useful contexts such as 'application' for learning experiences, it does not provide prerequisite knowledge for particular topics in the Mathematics B and C senior syllabuses.</p>			

<p>Strand: Number Topic: Addition and subtraction</p> <p>N DB 6.2 Students identify and solve addition and subtraction problems involving real numbers using a range of computation methods and strategies.</p>	<p>Introduction to functions Rates of change Periodic functions and applications Exponential and logarithmic functions and applications Optimisation using derivatives Introduction to integration Applied statistical analysis</p>	<ul style="list-style-type: none"> practical applications of functions including quadratics simultaneous equations evaluation of derivative definitions and applications of periodic functions definitions and applications of exponential and logarithmic functions applications of derivatives and integrals notion of standard deviation 	<p>Introduction to groups Real and complex number systems Matrices and applications Vectors and applications Calculus Structures and patterns</p>	<ul style="list-style-type: none"> simple manipulation of surds operations with complex numbers powers of complex numbers addition and subtraction of matrices and vectors sequences and series
<p>Strand: Number Topic: Multiplication and division</p> <p>NDB 6.3a Students multiply and divide rational numbers and calculate rates of change from graphs.</p>	<p><i>This outcome is fundamental to all topics.</i> Introduction to functions Rates of change Periodic functions and applications Exponential and logarithmic functions and applications Optimisation using derivatives Introduction to integration Applied statistical analysis</p>	<p><i>This outcome is fundamental to all topics.</i> Introduction to groups Real and complex number systems Matrices and applications Vectors and applications Calculus Structures and patterns</p>		
<p>N DB 6.3b Students identify and solve multiplication problems involving real numbers using a range of computation methods and strategies.</p>	<p>Introduction to functions Rates of change Periodic functions and applications Exponential and logarithmic functions and applications Optimisation using derivatives Introduction to integration</p>	<ul style="list-style-type: none"> practical applications of functions including quadratics applications of periodic, exponential and logarithmic functions applications of derivatives and integrals 	<p><i>This outcome is fundamental to all topics.</i> Introduction to groups Real and complex number systems Matrices and applications Vectors and applications Calculus Structures and patterns</p>	

Years 1 to 10 Mathematics discretionary learning outcomes: Beyond Level 6	Mathematics B topics	Mathematics B examples of specific links	Mathematics C topics	Mathematics C examples of specific links
<p>Strand: Patterns and Algebra Topic: Patterns and functions</p> <p>PA DB 6. 1a Students interpret and model trends in data and solve problems by using graphs, formulae and equations.</p>	<p><i>This outcome is fundamental to all topics.</i></p> <p>Introduction to functions Rates of change Periodic functions and applications Exponential and logarithmic functions and applications Optimisation using derivatives Introduction to integration Applied statistical analysis</p>	<p><i>This outcome is fundamental to all topics.</i></p> <p>Introduction to groups Real and complex number systems Matrices and applications Vectors and applications Calculus Structures and patterns</p>	<p><i>This outcome is fundamental to all topics.</i></p> <p>Introduction to groups Real and complex number systems Matrices and applications Vectors and applications Calculus Structures and patterns</p>	<p><i>This outcome is fundamental to all topics.</i></p> <p>Introduction to groups Real and complex number systems Matrices and applications Vectors and applications Calculus Structures and patterns</p>
<p>PA DB 6. 1b Students identify and interpret the properties of various families of functions.</p>	<p>Introduction to functions Rates of change Periodic functions and applications Exponential and logarithmic functions and applications Optimisation using derivatives Introduction to integration Applied statistical analysis</p>	<ul style="list-style-type: none"> relationships between graphs and general shapes of graphs (including polynomial, reciprocal, exponential, logarithmic, periodic functions) interpretation of derivative as gradient relationship between graph of function and derivative of that function practical applications of integrals compound interest 	<p>Calculus Structures and patterns</p>	<ul style="list-style-type: none"> life-related applications of simple, linear, first order differential equations with constant coefficients solution of simple, linear, first order differential equations with constant coefficients purely mathematical and life-related applications of arithmetic and geometric progressions
<p>PA DB 6. 1c Students specify the domain of a function using inequality symbols.</p>	<p>Introduction to functions Rates of change Periodic functions and applications Exponential and logarithmic functions and applications Optimisation using derivatives Introduction to integration Applied statistical analysis</p>	<ul style="list-style-type: none"> probability distributions and the normal model concepts of function, domain and range practical applications of equation solving using normal tables 	<p>Real and complex number systems Calculus Structures and patterns</p>	<ul style="list-style-type: none"> find domain for integers modulo n determine whether solutions are real or complex find functions for displacement, velocity and acceleration solve differential equations explore number sequences, e.g. arithmetic and geometric progressions, finite differences identify variables, parameters and constraints

<p>Strand: Patterns and Algebra Topic: Equivalence and equations <i>PA DB 6.2 Students manipulate expressions and solve equations including simultaneous equations and quadratic equations.</i></p>	<p><i>This outcome is fundamental to the topics listed</i> Introduction to functions Rates of change Periodic functions and applications Exponential and logarithmic functions and applications Optimisation using derivatives Introduction to integration</p>	<p><i>This outcome is fundamental to the topics.</i> Introduction to groups Matrices and applications Real and complex number systems Vectors and applications Calculus Structures and patterns</p>	
<p>Strand: Measurement Topic: Length, mass, area and volume <i>M DB 6.1a Students use combinations of procedures and formulae to solve multi-step problems.</i></p>	<p>Introduction to functions Rates of change Optimisation using derivatives Introduction to integration</p>	<p>Vectors and applications</p>	<p>• application of vectors</p>
<p><i>M DB 6.1b Students apply trigonometric ratios to particular situations involving triangles.</i></p>	<p>Introduction to functions Rates of change Periodic functions and applications Optimisation using derivatives</p>	<p>Real and complex number systems Vectors and applications Calculus Structures and patterns</p>	<ul style="list-style-type: none"> • operations with complex numbers using standard trigonometric identities • calculation of the angle between two vectors • applications of vectors • applications of calculus • applications of structures and patterns
<p>Strand: Measurement Topic: Time <i>No discretionary learning outcome at this level.</i></p>			

Years 1 to 10 Mathematics discretionary learning outcomes: Beyond Level 6	Mathematics B topics	Mathematics B examples of specific links	Mathematics C topics	Mathematics C examples of specific links
<p>Strand: Chance and Data Topic: Chance</p> <p><i>Students design simulations and use addition and multiplication properties to assist in finding probabilities.</i></p>	<p>Introduction to functions Applied statistical analysis</p>	<ul style="list-style-type: none"> • tables and graphs as representations of functions and relations • relative frequencies to estimate probabilities • probability distribution • expected value for discrete and continuous variables • identification of the binomial situation 	<p>Matrices and applications Structures and patterns</p>	<ul style="list-style-type: none"> • investigate transition probability matrices • permutations and combinations
<p>Strand: Chance and Data Topic: Data</p> <p><i>CD DB 6.2 Students interpret box and whisker plots and use them to compare sets of data.</i></p>	<p>Introduction to functions Applied statistical analysis</p>	<ul style="list-style-type: none"> • tables and graphs as representations of functions and relations • choice, use and interpretation of appropriate plots • use of graphical displays and summary statistics in describing key features of data, particularly in comparing data sets • concept of picture estimate of probability distribution 		
<p>Strand: Space Topic: Shape and line</p> <p><i>S DB 6.1 Students use deductive reasoning to establish theorems associated with circles and quadrilaterals.</i></p>	<p>Introduction to functions Rates of change Periodic functions and applications Exponential and logarithmic functions and applications Optimisation using derivatives Introduction to integration Applied statistical analysis</p>	<ul style="list-style-type: none"> • deductive reasoning essential to develop across all topics particularly within the criterion of 'communication and justification' • specific applications of circles and quadrilaterals occur in the 'Optimisation using derivatives' topic • sine and cosine rules 	<p>Introduction to groups Real and complex numbers Vectors and applications Structures and patterns Matrices and applications</p>	<ul style="list-style-type: none"> • investigate groups formed by geometric properties • proof by mathematical induction • geometric representation of complex numbers • use of transformational matrices
<p>Strand: Space Topic: Location, direction and movement</p> <p><i>S DB 6.2 Students analyse simple network diagrams to determine optimal pathways in a system.</i></p>	<p><i>This outcome does not provide prerequisite knowledge for particular topics in Mathematics B and C senior syllabuses.</i></p>			