



Mathematics General Senior Years

Writing Brief

February 2016

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1. Introduction

In 2014, the Board of Studies, Teaching and Educational Standards NSW (BOSTES) commenced a review of NSW senior secondary syllabuses for English, Mathematics, Science and History learning areas to determine directions for the incorporation of the senior secondary Australian curriculum. BOSTES conducted consultation in August and September 2014 on proposed directions outlined in *NSW Senior Secondary Review & Evaluation: English, Mathematics, Science and History*.

The broad directions for each learning area, developed following consultation, were endorsed by BOSTES in December 2014 and are available in Appendix I of this writing brief.

The development of the *Mathematics General Senior Years Writing Brief* takes account of the broad directions and feedback gathered through consultation conducted in October and November 2015.

The purpose of the writing brief is to inform the directions for draft syllabus development. The writing brief is structured according to elements of a Senior Years syllabus. Each element includes proposed actions and key considerations for writers in the writing of the draft syllabus. These elements are:

- Rationale
- The place of the Senior Years Mathematics General Syllabus in the K–12 curriculum
- Aim
- Objectives
- Outcomes
- Course structure
- Content, including how Australian curriculum content may be incorporated
- Glossary.

The draft syllabus package will include the elements of a syllabus and Australian curriculum content identified with codes, learning across the curriculum content identified by icons, further information about meeting the diversity of learners, and internal and external assessment.

The draft syllabus for Mathematics General will be developed and available for consultation during 2016.

A summary of the BOSTES syllabus development process is available at <http://www.boardofstudies.nsw.edu.au/syllabuses/syllabus-development/>.

Diversity of learners

NSW senior secondary syllabuses will be inclusive of the learning needs of all students. The draft syllabuses will be designed to accommodate teaching approaches that support student diversity under the sections 'Students with special education needs', 'Gifted and talented students' and 'Students learning English as an additional language or dialect (EAL/D)'.

For example:

Special education needs

All students with special education needs are entitled to participate in and progress through the curriculum. Some students may require additional support or adjustments to teaching, learning and assessment activities. Adjustments are measures or actions taken in relation to teaching, learning and assessment that enable a student to access syllabus outcomes and content and demonstrate achievement of outcomes.

Most students with special education needs will undertake regular Board Developed courses and/or Board Endorsed courses. Students with special education needs can access Years 11 and 12 outcomes and content in a range of ways. They should choose the most appropriate courses for the HSC in keeping with their goals, interests and learning needs.

Students may engage with:

- syllabus outcomes and content with adjustments to teaching, learning and/or assessment activities
- selected outcomes and content appropriate to their learning needs
- selected Years 11–12 Life Skills outcomes and content appropriate to their learning needs provided in the Mathematics General Senior Years draft syllabus.

Australian curriculum

BOSTES began its syllabus development process for Stage 6 English, Mathematics, Science and History in 2014. This follows state and territory education Ministers' endorsement of senior secondary Australian curriculum in these learning areas as the agreed and common base for development of state and territory senior secondary courses. It was also agreed that states and territories would have the flexibility to integrate the approved senior secondary Australian curriculum as appropriate. The writing brief determines how Australian curriculum content can be modified, reordered and supplemented in each learning area, while remaining compatible with the NSW Senior Years assessment and examinations structures.

2. Mathematics General key

i for your information

The following codes will be used in the Mathematics General Senior Years draft syllabus.

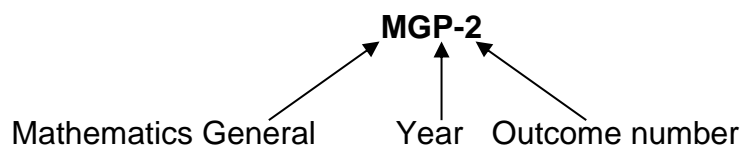
Outcome coding

Syllabus outcomes will be coded in a consistent way. The code identifies the subject, Year and outcome number.

Years of learning will be represented by the following codes:

Year	Code
Year 11	P
Year 12	H

In the Mathematics General syllabus, outcome codes indicate the subject, Year and outcome number. For example:



Coding of Australian curriculum content

Australian curriculum content descriptions included in the syllabus will be identified.

Actions for writers and key considerations

- Identify Australian curriculum content descriptions by using Australian curriculum codes.
- The code should appear in brackets at the end of each content description.

For example:

- calculate weekly or monthly wage from an annual salary, wages from an hourly rate including situations involving overtime and other allowances and earnings based on commission or piecework (ACMGM002)
- calculate payments based on government allowances and pensions (ACMGM003)
- prepare a personal budget for a given income taking into account fixed and discretionary spending (ACMGM004).

3. Rationale

i for your information

The rationale describes the distinctive nature of the subject and outlines its relationship to the contemporary world and current practice. It explains the place and purpose of the subject in the curriculum:

- why the subject exists
- the theoretical underpinnings
- what makes the subject distinctive
- why students would study the subject
- how it contributes to the purpose of the Senior Years curriculum
- how it prepares students for post-school pathways.

Proposed rationale for Mathematics General Senior Years

Mathematics is deeply embedded in modern society. From the numeracy skills required to manage personal finances, to devices and scales for measuring something of interest, to leading-edge technologies in the sciences and engineering, Mathematics provides the framework for interpreting, analysing and predicting, and the tools for effective participation in an increasingly complex society.

The need to interpret the large volumes of data made available through technology, draws on skills in logical thought and skills in checking claims and assumptions in a systematic way. Mathematics is the appropriate training ground for the development of these skills. The thinking required to further enhance the power and usefulness of technology in real-world applications requires advanced mathematical training. The rapid advances in technology experienced in recent years have driven, and been driven by, advances in the discipline of mathematics.

The development of mathematics throughout history has been catalysed by its utility in explaining real-world phenomena and its inherent beauty. In this way, the discipline has continued to evolve through a process of observation, conjecture, proof and application.

Effective participation in a changing society is enhanced by the development of mathematical competence in contextualised problem-solving. Experience in such problem-solving is gained by students gathering, analysing and interpreting mathematical information, and applying mathematics to model situations.

The opportunities for creative thinking, communication and contextualised problem-solving within the Mathematics General 2 and Mathematics General 1 courses assist students in finding solutions to a broad range of problems encountered in life, beyond secondary schooling.

The purpose of the courses is to provide an appropriate mathematical background for students who wish to enter occupations that require the use of a variety of mathematical and statistical techniques. As well as introducing some new mathematical content, the various focus studies within the courses give students the opportunity to apply, and develop further, the knowledge, skills and understanding initially developed in the various strands: Financial Mathematics, Data and Statistics, Measurement, Probability, and Algebra and Modelling. Through the focus studies, students develop the capacity to integrate their knowledge, skills and understanding across the strands, in contemporary contexts chosen for their ongoing relevance to the students' everyday lives and likely vocational pathways.


The Mathematics General 2 course has been constructed on the assumption that students have studied the content and achieved the outcomes of the *Mathematics K–10 Syllabus* up to and including the content and outcomes of Stage 5.1. Where possible, it is recommended that they experience at least some of the Stage 5.2 content, particularly the substrands Financial Mathematics, Non-Linear Relationships, Right-Angled Triangles (Trigonometry) and Single Variable Data Analysis, if not all of the content. The course provides students with the opportunity to develop an understanding of, and competence in, further aspects of mathematics through a large variety of real-world applications for a range of concurrent HSC studies such as in the life sciences, the humanities and business studies. The course also provides a strong foundation for vocational pathways, in the workforce and in further training, and for university courses in the humanities, nursing and paramedical sciences.

The Mathematics General 1 course has been constructed on the assumption that students have studied the content of the *Mathematics K–10 Syllabus* up to and including the content and outcomes of Stage 5.1. The course provides students with the opportunity to develop an understanding of, and competence in, further aspects of mathematics through a large variety of real-world applications for concurrent HSC studies, such as in vocational education and training courses, other practical-oriented courses and some humanities courses, and for vocational pathways, in the workforce or in further training.

Actions for writers and key considerations

- Clearly identify the possible pathways from Stage 5 to Senior Years as specified in the *Mathematics K–10 Syllabus*. For example, clarify the intention that Stage 5.1 should lead to a study of Mathematics General 1, and Stage 5.2 should lead to a study of Mathematics General 2.
- Include reference in the rationale to mathematical understanding, specifically fluency, communication, problem-solving, reasoning and understanding (as a reference to building on the Working Mathematically skills from Stage 5).
- Include a reference to the use of appropriate technology and preparing students for a technological society.
- Add detail to the rationale to indicate possible post-school pathways for both Mathematics General courses.
- Ensure that the rationale aligns with the direction and nature of the course.

4. The place of the Mathematics General Senior Years syllabus in the K–12 curriculum

 for your information

NSW syllabuses will include a diagram that illustrates how the syllabus relates to the learning pathways K–12. This section places the Senior Years syllabus in the K–12 curriculum as a whole.

This diagram will be included in the draft syllabus.

5. Aim

i for your information

In NSW syllabuses, the aim provides a statement(s) of the overall purpose of the syllabus. It indicates the general educational benefits for students from programs based on the syllabus.

The aim, objectives, outcomes and content of a syllabus are clearly linked and sequentially amplify details of the intention of the syllabus.

Proposed aim for Mathematics General Senior Years

The aim of the Mathematics General 1 course is to encourage students to:

- develop their understanding of mathematics and mathematical processes in a way that promotes confidence and fosters enjoyment
- develop their understanding of concepts and techniques drawn from mathematics and statistics
- develop their ability to solve applied problems using concepts and techniques drawn from mathematics and statistics
- acquire the skills needed to use technology such as calculators and computers effectively, recognise when such use may be inappropriate and be aware of limitations
- develop their capacity to communicate in a concise and systematic manner using appropriate mathematical and statistical language

The aim of the Mathematics General 2 course is to encourage students to:

- develop their understanding of mathematics and mathematical processes in a way that promotes confidence and fosters enjoyment
- develop their ability to solve applied problems using concepts and techniques drawn from mathematics and statistics
- acquire the skills needed to use technology such as calculators and computers effectively, recognise when such use may be inappropriate and be aware of limitations
- extend their capacity to communicate the results of a mathematical or statistical problem-solving activity in a concise and systematic manner using appropriate mathematical and statistical language
- take increasing responsibility for their own learning and the evaluation of their own mathematical development.

Actions for writers and key considerations

- Review the aims to ensure they present the overall purpose of the syllabus and are appropriate for each course.
- Review the aim to ensure consistency of length, detail and complexity with other senior syllabuses.

- Include reference in the aims to mathematical understanding, specifically fluency, communication, problem-solving, reasoning and understanding (as a reference to building on the Working Mathematically skills from Stage 5).

6. Objectives

i for your information

In NSW syllabuses, objectives provide specific statements of the intention of a syllabus. They amplify the aim and provide direction to teachers on the teaching and learning process emerging from the syllabus. They define, in broad terms, the knowledge, understanding, skills, values and attitudes to be developed through study in the subject. They act as organisers for the intended outcomes.

Proposed objectives for Mathematics General Senior Years

Knowledge, skills and understanding

Students:

- apply reasoning, and the use of appropriate language, in the evaluation and construction of arguments and the interpretation and use of models based on mathematical and statistical concepts
- use concepts and apply techniques to the solution of problems in algebra and modelling, measurement, financial mathematics, data and statistics, and probability
- use mathematical skills and techniques, aided by appropriate technology, to organise information and interpret practical situations
- interpret and communicate mathematics in a variety of written and verbal forms, including diagrams and statistical graphs.

Values and attitudes

Students:

- appreciate the relevance of mathematics.

Actions for writers and key considerations

- Review and amend the objectives to include aspects of technology and define the knowledge, understanding, skills, values and attitudes to be developed by the students.

7. Outcomes

i for your information

In NSW syllabuses, outcomes provide detail about what students are expected to achieve at the end of each Stage in relation to the objectives. They indicate the knowledge, understanding and skills expected to be gained by most students as a result of effective teaching and learning. They are derived from the objectives of the syllabus.

Proposed outcomes for Mathematics General Senior Years

Up to 10–12 outcomes will be developed during draft syllabus writing. The following table presents a sample of some of the proposed outcomes.

Objectives	Year 11 Mathematics General Outcomes	Year 12 Mathematics General 1 Outcomes	Year 12 Mathematics General 2 Outcomes
Students:	A student:	A student:	A student:
apply reasoning, and the use of appropriate language, in the evaluation and construction of arguments and the interpretation and use of models based on mathematical and statistical concepts	MGP-1 uses mathematics and statistics to compare alternative solutions to contextual problems MGP-2 represents information in symbolic, graphical and tabular form	MG1H-1 uses mathematics and statistics to evaluate and construct arguments in a range of familiar contexts MG1H-2 analyses representations of data in order to make predictions	MG2H-1 uses mathematics and statistics to evaluate and construct arguments in a range of familiar and unfamiliar contexts MG2H-2 analyses representations of data in order to make inferences, predictions and conclusions
use concepts and apply techniques to the solution of problems in algebra and modelling, measurement, financial mathematics, data and statistics, and probability	MGP-3 represents the relationships between changing quantities in algebraic and graphical form MGP-4 performs calculations in relation to two-dimensional and three-dimensional figures	MG1H-3 makes predictions about everyday situations based on simple mathematical models MG1H-4 analyses simple two-dimensional and three-dimensional models to solve practical problems	MG2H-3 makes predictions about situations based on mathematical models, including those involving cubic, hyperbolic or exponential functions MG2H-4 analyses two-dimensional and three-dimensional models to solve practical problems, including those involving spheres and non-right-angled triangles

Actions for writers and key considerations

- Review the course outcomes to include aspects of technology and define the knowledge, skills, understanding, values and attitudes to be developed by the students in each course.
- Investigate the idea of a separate set of outcomes of Working Mathematically skills, as in the K–10 Syllabus.
- Identify content of the Year 11 Mathematics General course required for completion of the Year 12 Mathematics General 1 course. Use the \diamond symbol to identify this content.

8. Course structure

i for your information

The following provides an outline of the Year 11 and Year 12 course structure for the Mathematics General Senior Years draft syllabus with indicative course hours and the arrangement of course content, along with outlining relationships between specific components and between core and options.

Proposed course structure for Mathematics General Senior Years

The current Year 11 Mathematics General, Year 12 Mathematics General 2 and Year 12 Mathematics General 1 courses are new senior courses that were implemented with Year 11 in 2013 and with Year 12 in 2014. For these reasons, it is proposed that these courses be retained, with revisions only as required in accordance with the evaluation of the Mathematics course.

	Mathematics General	Indicative hours
Year 11 course (120 hours)	The course is organised into strands and focus studies, with the strands and focus studies divided into topics. It is undertaken by all students intending to study either the Year 12 Mathematics General 2 course or the Year 12 Mathematics General 1 course.	
	Five Strands: <ul style="list-style-type: none"> • Financial Mathematics • Data and Statistics • Measurement • Probability • Algebra and Modelling 	80
	Two Focus Studies: <ul style="list-style-type: none"> • Mathematics and Communication • Mathematics and Driving 	40


Year 12 course (120 hours)	Mathematics General 1	Indicative hours
	The course is organised into the same strands as in the Year 11 Mathematics General course, with the strands and focus studies divided into topics.	
	Five Strands: <ul style="list-style-type: none"> • Financial Mathematics • Data and Statistics • Measurement • Probability • Algebra and Modelling 	80
	Four Focus Studies: <ul style="list-style-type: none"> • Mathematics and Design • Mathematics and Household Finance • Mathematics and the Human Body • Mathematics and Personal Resource Usage 	40
Year 12 course (120 hours)	Mathematics General 2	Indicative hours
	The course is organised into the same strands as in the Year 11 Mathematics General course, with the strands and focus studies divided into topics.	
	Five Strands: <ul style="list-style-type: none"> • Financial Mathematics • Data and Statistics • Measurement • Probability • Algebra and Modelling 	80
	Two Focus Studies: <ul style="list-style-type: none"> • Mathematics and Health • Mathematics and Resources 	40

Actions for writers and key considerations

- The overall structure of the course should be maintained, including the common Year 11 Mathematics General course.
- Consider each topic and reduce or remove some content, particularly in the 'Measurement' strands. Investigate the inclusion of some additional content such as bivariate data, growth and decay, matrices and networks.
- Overall, a net reduction in content should be achieved to provide opportunities for depth of learning.

- A significant amount of the common content between the Mathematics General 2 course and the Mathematics course should be built into the respective Year 11 courses. This could include topics from the ‘Data and Statistics’ strand.
- Include appropriate common content between the Year 12 Mathematics General 2 course and the Year 12 Mathematics course.
- Identify content of the Year 11 Mathematics General course that would be necessary for completing the Year 12 Mathematics General 1 course. Use the \diamond symbol to identify this content.

9. Content

 for your information

In NSW syllabuses for Senior Years, courses of study and educational programs are based on the outcomes of syllabuses. The content describes in more detail how the outcomes are to be interpreted and used, and the intended learning appropriate for each Year. In considering the intended learning, teachers will make decisions about the emphasis to be given to particular areas of content, and any adjustments required based on the needs, interests and abilities of their students.

Organisation of the content

The Mathematics General Senior Years draft syllabus will be organised as shown in the following pages.

Year 11 Mathematics General/Year 12 Mathematics General 1 Pathway

The following overview illustrates the structure of the Year 11 Mathematics General/Year 12 Mathematics General 1 pathway.

Year 11 Mathematics General Course*	Year 12 Mathematics General 1 Course (CEC)
<p>Strand: Financial Mathematics FM1 Earning and managing money FM2 Investing money FM3 Taxation</p> <p>Strand: Data and Statistics DS1 Statistics and society, data collection and sampling DS2 Displaying and interpreting single data sets DS3 Summary statistics</p> <p>Strand: Measurement MM1 Units of measurement and applications MM2 Applications of perimeter, area and volume MM3 Similarity of two-dimensional figures, right-angled triangles</p> <p>Strand: Probability PB1 Relative frequency and probability</p> <p>Strand: Algebra and Modelling AM1 Algebraic manipulation AM2 Interpreting linear relationships</p>	<p>Strand: Financial Mathematics FM4CEC Credit cards</p> <p>Strand: Data and Statistics DS4CEC Distributions DS5CEC Interpreting sets of data DS6CEC Working with statistics</p> <p>Strand: Measurement MM4CEC Further applications of area and volume</p> <p>Strand: Probability PB2CEC Multistage events and applications of probability</p> <p>Strand: Algebra and Modelling AM3CEC Further algebraic skills AM4CEC Modelling with functions</p>
<p>Focus Study: Mathematics and Communication FSCo1 Mobile phone plans FSCo2 Digital download and file storage</p> <p>Focus Study: Mathematics and Driving FSDr1 Costs of purchase and insurance FSDr2 Running costs and depreciation FSDr3 Safety</p>	<p>Focus Study: Mathematics and Design FSDe1CEC Scale drawings and house plans FSDe2CEC Design</p> <p>Focus Study: Mathematics and Household Finance FSHo1CEC Accommodation costs: buying and renting FSHo2CEC Costs of running a household, maintenance and repairs</p> <p>Focus Study: Mathematics and the Human Body FSHu1CEC Blood FSHu2CEC Body measurements FSHu3CEC Lung capacity</p> <p>Focus Study: Mathematics and Personal Resource Usage FSPe1CEC Water usage and collection FSPe2CEC Electricity FSPe3CEC Sustainability and energy-efficient housing</p>
<p>* The Year 11 Mathematics General course is undertaken by all students intending to study either the Year 12 Mathematics General 2 course or the Year 12 Mathematics General 1 course.</p>	

Year 11 Mathematics General/Year 12 Mathematics General 2 Pathway

The following overview illustrates the structure of the Year 11 Mathematics General/Year 12 Mathematics General 2 pathway.

Year 11 Mathematics General Course*	Year 12 Mathematics General 2 Course
<p>Strand: Financial Mathematics FM1 Earning and managing money FM2 Investing money FM3 Taxation</p> <p>Strand: Data and Statistics DS1 Statistics and society, data collection and sampling DS2 Displaying and interpreting single data sets DS3 Summary statistics</p> <p>Strand: Measurement MM1 Units of measurement and applications MM2 Applications of perimeter, area and volume MM3 Similarity of two-dimensional figures, right-angled triangles</p> <p>Strand: Probability PB1 Relative frequency and probability</p> <p>Strand: Algebra and Modelling AM1 Algebraic manipulation AM2 Interpreting linear relationships</p>	<p>Strand: Financial Mathematics FM4 Credit and borrowing FM5 Annuities and loan repayment</p> <p>Strand: Data and Statistics DS4 Interpreting sets of data DS5 The normal distribution DS6 Sampling and populations</p> <p>Strand: Measurement MM4 Further applications of area and volume MM5 Applications of trigonometry MM6 Spherical geometry</p> <p>Strand: Probability PB2 Multistage events and applications of probability</p> <p>Strand: Algebra and Modelling AM3 Further algebraic skills and techniques AM4 Modelling linear relationships AM5 Modelling non-linear relationships</p>
<p>Focus Study: Mathematics and Communication FSCo1 Mobile phone plans FSCo2 Digital download and file storage</p> <p>Focus Study: Mathematics and Driving FSDr1 Costs of purchase and insurance FSDr2 Running costs and depreciation FSDr3 Safety</p>	<p>Focus Study: Mathematics and Health FSHe1 Body measurements FSHe2 Medication FSHe3 Life expectancy</p> <p>Focus Study: Mathematics and Resources FSRe1 Water availability and usage FSRe2 Dams, land and catchment areas FSRe3 Energy and sustainability</p>
<p>* The Year 11 Mathematics General course is undertaken by all students intending to study either the Year 12 Mathematics General 2 course or the Year 12 Mathematics General 1 course.</p>	

Sample content pages for the Year 11 Mathematics General course:

(The Year 12 Mathematics General 2 and Mathematics General 1 courses will be organised using the same approach.)

Strand: Algebra and Modelling

Algebra involves the use of symbols to represent numbers or quantities and to express relationships. A mathematical model is a mathematical representation of a situation. All applications of mathematics are based on mathematical models. The study of Algebra and Modelling is important in developing students' reasoning skills and their ability to represent and solve problems.

In the Algebra and Modelling strand in the Year 11 Mathematics General course, students apply algebraic skills and techniques to interpret and use simple mathematical models of real situations.

The focus studies in the Year 11 course can be used to deliver some of the content of this strand in appropriate contexts or used to consolidate the skills developed in this strand.

Outcomes addressed

A student:

- MGP-1 uses mathematics and statistics to compare alternative solutions to contextual problems
- MGP-2 represents information in symbolic, graphical and tabular form
- MGP-3 represents the relationships between changing quantities in algebraic and graphical form
- MGP-9 uses appropriate technology to organise information from a limited range of practical and everyday contexts
- MGP-10 justifies a response to a given problem using appropriate mathematical terminology.

Content summary

- AM1 Algebraic manipulation
- AM2 Interpreting linear relationships

Prior learning

- Substituting into a formula to find an unknown
- Plotting of points to form a straight line graph

Use of technology

Students should learn to use appropriate technology as an effective support for mathematical activity. For example:

- to generate tables of values and the associated graph
- to create graphs of functions and to observe the effect on the graph of a function when parameters are changed
- to investigate the similarities and differences between the graphs of a variety of linear relationships.

AM2 Interpreting linear relationships































The principal focus of this topic is the graphing and interpretation of linear relationships in practical contexts.

Outcomes addressed

MGP-1, MGP-2, MGP-3, MGP-9, MGP-10

Content

Students:

- generate tables of values from a linear equation (ACMEM122)  
- graph linear functions with pencil and paper, and with technology, given an equation or a table of values (ACMGM040)  
- calculate the gradient of a straight line from a graph (ACMGM041) 
- determine the y-intercept for a given graph (ACMGM041) 
- identify independent and dependent variables in practical contexts  
- establish a meaning for the intercept on the vertical axis in a given context (ACMGM042) 
- sketch graphs of linear functions expressed in the form $y = mx + b$ without the use of tables (ACMGM040)  
- sketch the graphs of a pair of linear equations to find the point of intersection (ACMGM044)  
- find the solution of a pair of simultaneous linear equations from a given graph (ACMGM044) 
- solve practical problems using graphs of simultaneous linear equations (ACMGM044)   
- use stepwise linear functions to model and interpret practical situations, eg parking charges, taxi fares, tax payments and freight charges (ACMGM047)   
- use graphs to make conversions, eg Australian dollars to euros (ACMEM124)   
- use linear equations to model practical situations, eg simple interest (ACMEM125)   
- describe the limitations of linear models in practical contexts    

Actions for writers and key considerations

- Content is to be based on the structure and model of the sample content pages provided.
- Consider each topic and reduce or remove some content from each topic, including those in the 'Measurement' strands.
- Analyse and select Australian curriculum content, and modify, reorder and supplement to align and complement draft syllabus content as appropriate.
- Identify the Australian curriculum content descriptions by the Australian curriculum code. The code should appear in brackets at the end of each content description.
- Identify, by underlining, specific terms for inclusion in and links to a glossary.
- Appropriate and authentic opportunities to develop knowledge, understanding, skills, values and attitudes specific to learning across the curriculum areas should be identified by icons.
- Overall, a net reduction in content should be achieved to provide opportunities for depth of learning.
- Investigate the inclusion of some additional content such as bivariate data, growth and decay, matrices and networks.
- A 'Prior Learning' section should be included to identify the knowledge, skills and understanding that are assumed within the topic.
- Investigate the inclusion of other possible sections, such as 'Working Mathematically Skills' which identify aspects of communication, fluency, problem-solving, reasoning and understanding. These skills would build on the Stage 5 outcomes.
- Remove the digital download topic and review or remove the mobile phone plans topic from the 'Mathematics and Communication' focus study. Consider more relevant options such as event planning, to include the use of spreadsheets.
- Provide more direction for the focus studies, with some reduction in content and clearer guidelines on how the strands can be delivered through the focus studies.
- Identify content of the Year 11 Mathematics General course that would be necessary for completing the Year 12 Mathematics General 1 course. Use the \diamond symbol to identify this content.
- In order to cater for the diversity of learners, practical, real-world and culturally diverse applications need to be used and this should be reflected in the choice of content.

The section, 'Terminology', previously included in the content part of the syllabus, will now form a glossary in the syllabus, where each term is defined and explained.

- The majority of the sections, 'Considerations' and 'Suggested Applications', previously included as sections in the content part of the syllabus, will be included within support materials.

10. Learning across the curriculum

 for your information

NSW syllabuses provide a context within which to develop core skills, knowledge and understanding considered essential for the acquisition of effective, higher-order thinking skills that underpin successful participation in further education, work and everyday life including problem-solving, collaboration, self-management, communication and information technology skills.

BOSTES has described learning across the curriculum areas that are to be included in syllabuses. In Senior Years syllabuses, the identified areas will be embedded in the descriptions of content and identified by icons. Learning across the curriculum content, including the cross-curriculum priorities and general capabilities, assists students to achieve the broad learning outcomes defined in the BOSTES *Statement of Equity Principles*, the *Melbourne Declaration on Educational Goals for Young Australians (December 2008)* and in the Australian Government's *Core Skills for Work Developmental Framework (2013)*.

Knowledge, understanding, skills, values and attitudes derived from the learning across the curriculum areas will be included in BOSTES syllabuses, while ensuring that subject integrity is maintained.

Cross-curriculum priorities enable students to develop understanding about and address the contemporary issues they face.

The cross-curriculum priorities are:

- Aboriginal and Torres Strait Islander histories and cultures 🖐️
- Asia and Australia's engagement with Asia 🇦🇺
- Sustainability 🌱

General capabilities encompass the knowledge, skills, attitudes and behaviours to assist students to live and work successfully in the 21st century.

The general capabilities are:

- Critical and creative thinking ⚙️
- Ethical understanding ⚖️
- Information and communication technology capability 💻
- Intercultural understanding 🌐
- Literacy 📖
- Numeracy 📊
- Personal and social capability 👥

BOSTES syllabuses include other areas identified as important learning for all students:

- Civics and citizenship 🗳️
- Difference and diversity 🏳️
- Work and enterprise ⭐

Sample learning across the curriculum area for Mathematics General Senior Years

Critical and creative thinking

Critical and creative thinking are key to the development of mathematical understanding. Students use critical and creative thinking as they learn to generate and evaluate knowledge, ideas and possibilities, and when seeking new pathways or solutions. Mathematical reasoning and logical thought are fundamental elements of critical and creative thinking. They are integral to mathematical problem solving as students identify similarities and differences in mathematical situations and engage in reasoning and thinking about solutions to problems, and the strategies needed to find those solutions.

Critical and creative thinking are of fundamental importance in such aspects of the Mathematics curriculum as posing problems, modeling situations, justifying choices and strategies used, and giving reasons to explain mathematical ideas.


Actions for writers and key considerations

For each learning across the curriculum area develop a succinct statement that describes how the subject provides opportunities to develop knowledge, understanding, skills, values and attitudes related to the area and its reference. The statements below should be considered when writing these statements.

- *Aboriginal and Torres Strait Islander histories and cultures*: opportunities should be identified to use mathematics to consider cultures with relevant historical and contemporary data.
- *Asia and Australia's engagement with Asia*: opportunities should be identified to use mathematics to consider cultures with relevant historical and contemporary data.
- *Sustainability*: opportunities should be identified to consider where the mathematics of sustainability methods and data can be addressed.
- *Critical and Creative thinking*: the current proposed statement needs to be shortened and made more concise.
- *Ethical understanding*: opportunities should be identified to raise awareness of ethical issues, particularly in the strands of 'Data and Statistics', 'Probability' and 'Financial Mathematics'.
- *Information and communication technology capability*: students should learn to use appropriate technology as an effective support for mathematical activity throughout the syllabus. Opportunities should therefore be identified where a variety of appropriate technology can be used.
- *Intercultural understanding*: opportunities should be identified to raise awareness of intercultural issues, particularly in the strand of 'Data and Statistics'.
- *Literacy*: the communication, problem-solving, reasoning and understanding aspects of mathematics are strongly linked with literacy and therefore areas where developing these skills is a priority should be identified.

- *Numeracy*: a statement should be written to clearly state that numeracy is embedded throughout the syllabus and therefore will not be tagged individually, as in the K–10 syllabus.
- *Personal and social capability*: opportunities should be identified to develop student awareness of personal and social skills either through consideration of a particular topic or through opportunities for organised group work.
- *Civics and citizenship*: opportunities should be identified to raise awareness of civics and citizenship issues, particularly in the strand of ‘Financial Mathematics’.
- *Difference and diversity*: opportunities should be identified to raise awareness of difference and diversity issues, particularly in the strand of ‘Data and Statistics’.
- *Work and enterprise*: opportunities should be identified to raise awareness of work and enterprise issues, particularly in the strand of ‘Financial Mathematics’.

11. Senior Years Life Skills advice

 for your information

The Senior Years Life Skills outcomes and content are developed from the Senior Years objectives of the Mathematics General Senior Years draft syllabus.

Before deciding that a student should undertake a course based on Life Skills outcomes and content, consideration should be given to other ways of assisting the student to engage with the regular course outcomes. This assistance may include a range of adjustments to the teaching, learning and assessment activities of the Mathematics General Senior Years curriculum.

If the adjustments do not provide a student with sufficient access to some or all of the Senior Years outcomes, a decision can be explored for the student to undertake Life Skills outcomes and content. This decision should be made through the collaborative curriculum planning process involving the student and parent/carer and other significant individuals. School principals are responsible for the management of the collaborative curriculum planning process.

The following points need to be taken into consideration:

- students are not required to complete all Life Skills outcomes
- specific Life Skills outcomes should be selected on the basis that they meet the learning needs, strengths, goals and interests of each student
- outcomes may be demonstrated independently or with support.

12. Mathematics General Senior Years Life Skills outcomes

i for your information

Life Skills outcomes are presented alongside Senior Years outcomes below, and may be used to explore content related to each outcome.

The Life Skills outcomes can also be viewed as two outcomes tables:

- a table of Life Skills outcomes, which shows the syllabus objectives and all Life Skills outcomes
- a table of Life Skills and related syllabus outcomes, which shows the relationship between Life Skills and Senior Years outcomes.


Proposed Life Skills outcomes for Mathematics General Senior Years

<p>Objective</p> <p>Students:</p> <ul style="list-style-type: none"> • use concepts and apply techniques to the solution of problems in algebra and modelling, measurement, financial mathematics, data and statistics, and probability 		
<p>Life Skills outcome</p> <p>A student:</p>	<p>Year 11 outcome</p> <p>A student:</p>	<p>Year 12 outcomes</p> <p>A student:</p>
<p>MGLS-6 develops and applies financial decision-making skills</p>	<p>MGP-6 models financial situations relevant to the student's current life using appropriate tools</p>	<p>Mathematics General 1 MG1H-6 makes informed decisions about financial situations likely to be encountered post school</p> <p>Mathematics General 2 MG2H-6 makes informed decisions about financial situations, including annuities and loan repayments</p>

Actions for writers and key considerations

- Life Skills outcomes should be developed from the syllabus objectives.
- Outcomes should be aligned with the Mathematics General 1 course outcomes where appropriate.

13. Mathematics General Senior Years Life Skills content

 for your information

The Senior Years Life Skills outcomes and content provide the basis for developing a rigorous, relevant, accessible and meaningful age-appropriate program. Outcomes and content should be selected based on the learning needs, strengths, goals and interests of each student. Students are not required to complete all of the content to demonstrate achievement of an outcome.

Proposed Life Skills content for Mathematics General Senior Years

Outcome

MGLS-6













A student:






- develops and applies financial decision-making skills

Related Mathematics General Senior Years outcomes: MGP-6, MG2H-6, MG1H-6

Content

Students:

- compare the prices of identical or similar items to minimise outlay eg compare prices in two catalogues to get the best price 
- use the relationship between value of coins and notes and their purchasing power 
- use the relationship between value and price within a range of environments eg choose a \$100 blanket over a \$20 blanket because it will last longer 
- identify the functions and purpose of various financial institutions such as banks, credit unions and building societies eg hold money safely in savings accounts, lend money to buy items 
- use a savings account 
- identify the differences between credit, debit and balance 
- read and interpret bank statements 
- identify the various forms of credit available eg lay-by, hire purchase, credit card, store cards, personal loans 
- recognise the impact of interest, fees and charges on account balances 
- make appropriate financial decisions eg operate a credit card, buy an item on lay-by rather than use a credit card 
- determine the value of purchasing weekly transport tickets rather than five daily tickets 
- recognise the relationship between income and expenditure 

- recognise the need to manage money to achieve long and short-term goals  
  

Actions for writers and key considerations

- Life Skills content should be developed from the syllabus objectives.
- Content should be aligned with the Mathematics General 1 course content where appropriate.

14. Glossary


i for your information

One glossary will be developed for each Senior Years learning area. The glossary to be developed for the Mathematics General Senior Years draft syllabus will explain terms that will assist teachers in the interpretation of the subject. The glossary will be based on the NSW K–10 Mathematics glossary and Australian curriculum Senior Years Mathematics glossaries.

Actions for writers and key consideration

- Identify and underline words and/or terms additional to those in the K–10 Mathematics glossary in the content for inclusion in the Senior Years glossary.
- Consider the existing terminology list of each topic for appropriateness for inclusion in the glossary.

15. Assessment and reporting

 for your information

BOSTES continues to promote a standards-referenced approach to assessing and reporting student achievement in NSW, and the importance of assessment for, of and as learning as essential components of quality teaching and learning.

Information on assessment and reporting for the Year 11 and Year 12 courses will be reviewed and developed for draft syllabus consultation in 2016.

The information will include:

- mandatory components and weightings for school-based assessment of the Year 12 courses.
- HSC examination specifications which describe the format of the HSC examination program for Mathematics General 1 and General 2.

16. Appendix I

Broad directions from consultation

The following broad directions for syllabus development have been informed through consultation with stakeholders. These broad directions will guide the development of the NSW Mathematics Stage 6 syllabuses.

1. In the revision of the courses, consideration be given to how the courses provide flexibility to meet the needs of all students.
2. The content prescribed for each of the revised courses:
 - a. be carefully monitored to reflect the indicative time of the course. In the case of the revised Mathematics General courses and the revised Mathematics ('2 Unit') course, there should be a net reduction in content when compared to the respective current courses
 - b. be reviewed for relevance and opportunities for depth of learning.
3. The status of the revised Mathematics General 1 course be reviewed and consideration be given to:
 - a. making the course a Board Developed course with an optional HSC examination
 - b. developing a separate Preliminary course for the revised Mathematics General 1 course.
4. The nested structure of the current Mathematics ('2 Unit'), Mathematics Extension 1 and Mathematics Extension 2 courses be retained for the respective revised courses.
5. The inclusion of additional study of statistics be considered, while addressing implications in relation to the extent of relevant teacher expertise, professional development, future pathways of students, school mathematics staffing, and school timetabling.
6. In reviewing the content of the calculus-based courses, the appropriateness and relevance of the applications within the courses be explored, with a view to ensuring that they are contemporary and meet the needs of students.
7. The technology available for use by candidates in the mathematics HSC examinations be clarified in the development of the draft writing briefs.
8. The appropriateness of the current structures and durations of the HSC examinations for the senior mathematics courses be reviewed, with particular emphasis on the examination of '2 Unit'-only candidates.
9. An appropriate formula sheet be provided for each HSC mathematics examination.
10. In the development of course structures and HSC examinations for the revised Mathematics ('2 Unit') and Mathematics General 2 courses, consideration be given to student movement between the courses and the need to make meaningful comparisons of student performance.
11. The rationale, outcomes and content of the Mathematics Life Skills course be reviewed to better meet the needs of the students for whom the course is intended, as well as to provide an appropriate progression from Mathematics Life Skills Stage 5 outcomes and content and alignment with the regular mathematics Stage 6 courses where appropriate.
12. In the naming of the revised Mathematics Stage 6 courses, consideration be given to the nomenclature used for English Stage 6 courses.

17. Appendix II

Key matters raised during draft writing brief consultation and actions

Key matters	Actions
<p>Most students are choosing to study the Mathematics General 2 course rather than the Mathematics General 1 course in order to obtain an ATAR or to qualify for the award of an HSC.</p>	<p>The Year 11 and Year 12 Mathematics General 2 courses will be revised as necessary to achieve significant overlap with the Year 11 and Year 12 Mathematics courses.</p>
<p>Many students discontinue their study of Mathematics at the end of Year 10 due to the Year 11 Mathematics General course being perceived as too difficult for some students.</p>	<p>The Year 11 course will be revised to build on student knowledge from Mathematics Stage 5.1.</p>
<p>There is an imbalance between the contribution to the ATAR calculation of the Mathematics General 2 course compared to the Mathematics course.</p>	<p>The Mathematics General 2 HSC examination will contain a number of common questions (approximately 30 marks) with the HSC Mathematics examination.</p>
<p>The Mathematics General 1 course needs to link more strongly to vocational post-school pathways.</p>	<p>The Mathematics General 1 course will have Board Developed status and greater links to vocational post-school pathways.</p>