



Mathematics

Directions for Syllabus Development

Consultation Report

October 2014

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1 Background information

The Board of Studies, Teaching and Educational Standards NSW (BOSTES) began its syllabus development process for Stage 6 Mathematics following state and territory education ministers' endorsement of the senior secondary Australian curriculum for English, Mathematics, Science and History as the agreed and common base for development of state and territory senior secondary courses. BOSTES has determined that there will be a need to modify, reorder and supplement the Australian curriculum content in order to maintain the breadth and current high standards of NSW curriculum.

In NSW, BOSTES develops syllabuses approved by the Minister for Education for use by all NSW schools. As part of the syllabus development process of BOSTES, broad directions are proposed to inform future development of syllabuses.

BOSTES conducted consultation from 11 August to 21 September 2014 to engage stakeholders and to seek their feedback on the proposed directions for the Mathematics syllabuses. The consultation program consisted of:

- a meeting of the Years 11–12 Mathematics Board Curriculum Committee on 10 September 2014
- afternoon teacher meetings at
 - North Ryde on 2 September 2014
 - Argenton on 3 September 2014
- a targeted teacher meeting to review the Life Skills syllabuses at BOSTES on 8 September 2014
- an online survey on the BOSTES website for the period 11 August to 21 September 2014
- written submissions from
 - Association of Independent Schools of NSW
 - Catholic Education Office Sydney
 - Catholic Education Office Wollongong
 - Mathematical Association of NSW
 - NSW Department of Education and Communities
 - NSW Teachers Federation
 - University of NSW, School of Mathematics and Statistics
 - Brigidine College St Ives, Mathematics Department
 - SHORE School, Mathematics Department
 - St Joseph's Catholic High School Albion Park, Mathematics Faculty
 - Ms Geraldine Gray, State Coordinator, Special Learning Needs, Catholic Education Commission NSW
 - Assistant Professor Bree Jimenez, School of Education, University of North Carolina
 - Ms Wendy Minnis, Learning Support teacher, Arthur Phillip High School
 - Mr Brian Mitchell, retired mathematics teacher and current mathematics tutor
 - Ms Tessa Wigmore, Head Teacher Mathematics, St Ives High School
- a meeting of the BOSTES Student Advisory Group on 28 August 2014. Due to the diverse range of subjects studied by members of this group, the meeting focused more broadly on the Higher School Certificate.

Professional associations and schooling sectors conducted a range of activities during the consultation period to inform feedback to BOSTES.

2 Executive summary

Introduction

The *Mathematics Directions for Syllabus Development Consultation Report* ('Consultation Report') provides a description of the consultation process and a summary and analysis of feedback received. The Consultation Report includes feedback affirming the proposed directions, key matters raised and proposed actions for syllabus development.

The Consultation Report presents data and findings gathered through 105 survey responses, 16 written submissions, a Board Curriculum Committee meeting and three teacher meetings.

Respondents were largely supportive of the proposed directions, while offering comments and suggestions about content to be included or excluded, examination length and level of difficulty, structure of the suite of courses and naming of courses, relationship between courses and their examinations, inclusivity for students with disabilities, formula sheets, contributions of mathematics courses to the Australian Tertiary Admission Rank (ATAR), the role and use of technology and university prerequisites. Often there was a similar number of respondents opposing a particular idea to the number of respondents suggesting it.

Key matters

The issues to emerge from consultation included:

- the amount of course content for the available teaching time, and the need for topic areas to be removed or reduced to make way for any new content
- the need to consider the Mathematics General 1 course for Board Developed status with a Higher School Certificate (HSC) examination and a unique Preliminary Course
- the need to consider structural changes to the Mathematics ('2 Unit') course and examination with a view to arresting the falling candidature for the course
- the need to consider the length of the Mathematics Extension 1 examination and whether Extension students should be required to sit two HSC examination papers
- the need to review the Stage 6 Mathematics Life Skills course to ensure it meets the needs of students, provides an appropriate progression from Stage 5 and aligns with the regular Stage 6 Mathematics courses where appropriate.

Proposed actions in response to consultation feedback

The following actions are proposed in relation to the key matters:

- the level of content will be closely monitored, with Mathematics General 2 and ('2 Unit') having a net reduction in content
- consideration will be given to renaming the Mathematics courses in line with naming conventions for English courses
- the status of the Mathematics General 1 course (including a possible name change) will be reviewed and consideration given to making it a Board Developed course with an optional HSC examination. A separate Preliminary course will be considered in the development of the Draft Writing Brief
- different approaches to the structure of the Mathematics ('2 Unit') HSC examination will be considered in order to appropriately accommodate Mathematics ('2 Unit') only candidates and Mathematics Extension 1 candidates
- consideration will be given to all Extension students continuing to sit two HSC examination papers
- the length of examinations for mathematics courses will be considered
- the rationale, outcomes and content of the Stage 6 Mathematics Life Skills course will be reviewed to better meet the needs of the students for whom the course is intended, as well as

provide an appropriate progression from Stage 5 Life Skills outcomes and content and alignment with the regular Stage 6 Mathematics courses where appropriate.

A summary of key matters and proposed actions is contained in section 4 of this report.

3 Summary of respondents

Stakeholder and teacher consultation meetings

One Board Curriculum Committee (BCC) and three teacher meetings

BCC members	10
Teachers	105

Online survey respondents

105 online survey responses

Government sector	44
Catholic sector	11
Independent sector	50
Other	0

Response from:

Principal	1
School Executive	42
Teacher	47
Parent	0
Student	12
Other	3

Individuals identifying as:

an Aboriginal person	0
a Torres Strait Islander person	0
an Aboriginal and Torres Strait Islander person	0

Number of people contributing to the response:

1	88
2	0
3	7
4	0
5	1
6 or more	9

4 Summary of key matters raised and proposed actions

Key matters raised for directions for syllabus development for Mathematics from the consultation process	Summary of actions
<p>Course content Many respondents commented that there is an excessive amount of content in the various mathematics courses, and in the Mathematics General and Mathematics ('2 Unit') courses in particular. This issue will become more important if new topic areas are included in the new Stage 6 mathematics courses.</p>	<p>The amount of course content prescribed for each of the revised courses will be carefully monitored. Existing topic areas will be removed or reduced in order to allow for the inclusion of any new topic areas.</p> <p>The revised Mathematics General and Mathematics ('2 Unit') courses will contain less content than the courses, in order that topic areas can be studied in more depth.</p> <p>Consideration will be given to renaming the mathematics courses in line with naming conventions for English courses.</p>
<p>Status of the revised Mathematics General 1 course Many respondents commented that the revised Mathematics General 1 course should have a separate Preliminary course (ie not in common with that for the revised Mathematics General 2 course), and that the Mathematics General 1 course units (two) should count as Board Developed units and be available for inclusion in the calculation of a student's Australian Tertiary Admission Rank (ATAR).</p>	<p>The status of the revised Mathematics General 1 course will be reviewed, with consideration given to making it a Board Developed course with an HSC examination that is optional for students of the course.</p> <p>A separate Mathematics General 1 Preliminary course to that for the revised Mathematics General 2 course will be considered in the development of the Draft Writing Brief.</p>
<p>Revision of the current Mathematics ('2 Unit') course and HSC examination Many respondents commented on a number of issues in relation to the current Mathematics ('2 Unit') course: the level of difficulty of the course compared to that of the current Mathematics General 2 course (and to the level of difficulty of 2-unit courses in other learning areas); the fall in the ('2 Unit') course candidature due to many students opting to study the easier Mathematics General 2 course with a view to ATAR-rank maximisation and then having a lower level of success with mathematics-related degrees at university; the level of difficulty of the HSC examination given that Mathematics Extension 1 (only) students form part of the current candidature.</p>	<p>The revised Mathematics ('2 Unit') course will contain a number of topic areas in common with the Mathematics General 2 course to assist student movement between the courses. The Mathematics ('2 Unit') HSC examination will contain a number of questions in common with the Mathematics General 2 HSC examination. This will allow meaningful comparisons to be made between student performances in the two courses.</p> <p>Different approaches to the structure of the Mathematics HSC examinations will be considered in order to appropriately accommodate Mathematics ('2 Unit') candidates and Mathematics Extension 1 candidates.</p>

Key matters raised for directions for syllabus development for Mathematics from the consultation process	Summary of actions
<p>Length and candidature of Mathematics Extension 1 and Mathematics Extension 2 HSC examinations</p> <p>Respondents had different views regarding the appropriate length of the HSC examinations for Mathematics Extension 1 and Mathematics Extension 2, and as to whether Mathematics Extension 1 (only) and/or Mathematics Extension 2 candidates should be required to sit two HSC mathematics examinations.</p>	<p>The duration of the Mathematics Extension 1 and Extension 2 examinations will be considered in the development of HSC examination specifications.</p> <p>Consideration will be given to all Extension students continuing to sit two HSC examinations for mathematics courses.</p>
<p>Students with special education needs</p> <p>The Mathematics Life Skills course should be revised and aligned more closely with the content and structure of the regular mathematics courses.</p>	<p>The rationale, outcomes and content of the Stage 6 Mathematics Life Skills course will be reviewed to better meet the needs of the students for whom the course is intended, as well as provide an appropriate progression from Stage 5 Life Skills outcomes and content and alignment with the regular Stage 6 courses where appropriate.</p>

5 Analysis

5.1 Stage 6 Preliminary Mathematics General, HSC Mathematics General 1 and HSC Mathematics General 2

5.1.1 Proposed directions for syllabus content

Summary

Respondents were largely supportive of the proposed directions for the Mathematics General courses, and agreed that minimal change only is required to syllabus content. There was concern about the amount of content in the current courses and the level of difficulty of the Preliminary Mathematics General course, particularly for those students who had studied to Stage 5.1 level in Year 10. There were various suggestions as to which topic areas in the courses could be reduced/removed and which topic areas should be retained. There was also concern about the relevance of particular content in the Mathematics General courses, particularly in HSC Mathematics General 1, for students who may not finish Year 12, or who will study at TAFE or move into a trade after the HSC.

Feedback affirming the proposed directions for syllabus content

Feedback	Source/s
Over 65% of survey respondents indicated that they agree or strongly agree with the proposed directions.	Survey x 70

Matters raised and action taken

Matters Raised	Source/s	Proposed Action
Preliminary course The revised Mathematics General 1 course should have a separate Preliminary course as the current common Preliminary course for the HSC Mathematics General 1 and 2 courses is too difficult for lower-ability students (typically those who have studied to Stage 5.1 level in Year 10) and does not extend students who have studied to 5.2.	Argenton (CM), North Ryde (CM), BCC, AIS, CEO Sydney, MANSW, DEC, Submission 2, Submission 9, Survey x 9	A separate Preliminary course to that for the revised Mathematics General 2 course will be considered for the revised Mathematics General 1 course in the development of the Draft Writing Brief.
The current common Preliminary course does not extend students who have studied to 5.2.	AIS	The revised Mathematics ('2 Unit') course will contain a number of topic areas in common with the revised Mathematics General 2 course to assist student movement between the courses (and to allow meaningful comparisons to be made between student performance in the two courses).
There should be common topics in the revised Preliminary Mathematics General course and the revised Mathematics ('2 Unit') course to facilitate students changing courses during Year 11.	Argenton (CM), BCC	
There should be electives in the Preliminary Mathematics General course, with the requirement that these electives be studied in order to progress to the HSC Mathematics General 2 course.	Survey x 1	

Matters Raised	Source/s	Proposed Action
<p>Course content There is an excessive amount of content in the current Mathematics General courses. This should be reduced, particularly if any new topic areas are to be included, in order to remove repetition within the Mathematics General courses and between Stage 5 and Stage 6 Mathematics.</p>	<p>Argenton (CM), North Ryde (CM), BCC, CEO Sydney, MANSW, DEC, Submission 2, Submission 3, Submission 9, Survey x 34</p>	<p>The amount of course content prescribed for each of the revised courses will be carefully monitored. Existing topic areas will be removed or reduced in order to allow for the inclusion of any new topic areas.</p>
<p>Content within the current HSC Mathematics General 1 course is not relevant or engaging for students. The course content needs to be competency-based and/or linked to TAFE/trades/apprenticeships, with literacy and numeracy skills embedded.</p>	<p>Argenton (CM), North Ryde (CM), BCC, Submission 9, Survey x 9</p>	<p>Content will be reviewed for relevance and opportunities for depth of learning.</p>
<p>Nomenclature The revised courses should be renamed to avoid confusion with the current NSW Mathematics General courses, the previous NSW General Mathematics course and the General Mathematics course for the Australian curriculum. This would also allow alignment with the suite of senior NSW English courses.</p>	<p>Argenton (CM), AIS, MANSW, Survey x 5</p>	<p>Consideration will be given to renaming the mathematics suite of courses in line with the naming conventions for the English courses.</p>
<p>Accessibility of content for English as an Additional Language or Dialect (EAL/D) learners Some students are inappropriately placed in Mathematics Life Skills. The language of the revised courses must be accessible to students whose first language is not English, with explicit support provided for the teaching of relevant mathematical language.</p>	<p>BCC, AIS, DEC</p>	<p>The content will be reviewed to ensure it is accessible for EAL/D learners. Additional support materials to develop students' mathematical literacy will be considered.</p>
<p>Support materials Support materials in relation to the Focus Studies are needed, including advice on when to teach the Focus Studies and how to link them with the other syllabus content.</p>	<p>North Ryde (CM), BCC, Survey x 2</p>	<p>Additional support materials will be considered throughout the syllabus development process.</p>
<p>Maintenance of the HSC Mathematics General 2 course in its current form The HSC Mathematics General 2 course is meeting the needs of its students and should not be changed.</p>	<p>Survey x 2</p>	<p>The revised Mathematics General 2 course will contain less content than the current Mathematics General 2 course to promote depth of learning.</p>

5.1.2 Proposed directions for assessment and examination specifications

Summary

Respondents were largely supportive of the proposed directions with regard to assessment and examination specifications. Significant feedback was received in relation to the current status of the HSC Mathematics General 1 course as a Content Endorsed Course (CEC). Some respondents believe that this status should be maintained, while a larger number believe that the course should be given Board Developed status, and be available for inclusion in the calculation of a student's ATAR. Some suggestions were made about how this could be accomplished.

Feedback affirming the proposed directions for assessment and examination specifications

Feedback	Source/s
Over 70% of survey respondents indicated that they agree or strongly agree with the proposed directions.	Survey x 77

Matters raised and action taken

Matters Raised	Source/s	Proposed Action
<p>Status of the HSC Mathematics General 1 course The revised HSC Mathematics General 1 course should have Board Developed status, with an optional HSC examination so that the two units of the course can contribute towards the calculation of a student's ATAR.</p>	Argenton (CM), North Ryde (CM), BCC, LSM, MANSW, DEC, Submission 2, Submission 9, Survey x 11	The status of the revised Mathematics General 1 course will be reviewed with consideration given to making it a Board Developed course with an HSC examination that is optional for students of the course. For students sitting the examination, the two units of study would be available for inclusion in the calculation of the student's ATAR.
The revised Mathematics General 1 course should be given Board Developed status in order to contribute to a student's HSC pattern of study, but with no HSC examination. This aligns with the status of the English Studies course.	Argenton (CM), North Ryde (CM), AIS, CEO Sydney, Submission 5, Survey x 7	
The revised HSC Mathematics General 1 course should remain as a CEC.	North Ryde (CM), Submission 3, Survey x 1	

The following matters raised in relation to assessment and examination specifications will be further considered throughout the syllabus development process.

Matters Raised	Source/s
<p>Literacy requirements of recent General Mathematics HSC examinations The General Mathematics HSC examinations in recent years have required an increased level of literacy skills.</p>	North Ryde (CM), BCC, Survey x 6

Matters Raised	Source/s
<p>Examination of the Focus Studies in the HSC examination for the revised Mathematics General 2 course The Focus Studies should be tested in their own separate section of the HSC examination for the revised Mathematics General 2 course, and students could be given the option of choosing which Focus Studies they answer in the examination.</p>	<p>Argenton (CM), North Ryde (CM), Survey x 1</p>
<p>Investigation as part of internal assessment for revised Preliminary Mathematics General Course The Preliminary Mathematics General course should have a compulsory investigation component for internal assessment purposes.</p>	<p>Survey x 1</p>

5.2 Stage 6 Preliminary Mathematics ('2 Unit') and HSC Mathematics ('2 Unit')

5.2.1 Proposed directions for syllabus content

Summary

The majority of respondents indicated agreement with the proposed directions. There is support for an overall reduction in the amount of content in the Mathematics ('2 Unit') course to allow a focus on the deeper understanding of concepts. There is agreement among respondents of the need to address the falling candidature in the course via exploration of the reasons for the drift to Mathematics General 2 or away from the study of mathematics in the senior years altogether. However, there are significant differences in the views of respondents as to the actions that would successfully arrest this drift. There is also concern among respondents as to the naming of the course, the content to be included or reduced/removed, and whether students who have studied to Stage 5.2 level only in Year 10 are adequately prepared to complete the Mathematics ('2 Unit') course successfully.

Feedback affirming the proposed directions for syllabus content

Feedback	Source/s
Over 70% of survey respondents indicated that they agree or strongly agree with the proposed directions.	Survey x 75

Matters raised and action taken

Matters Raised	Source/s	Proposed Action
<p>Breadth and depth of course content There is an excessive amount of content in the current Mathematics ('2 Unit') course. This should be reduced, particularly if any new topic areas are to be included.</p> <p>There should be fewer topics in the course that are studied in more depth to allow students to develop greater mastery of the content and so feel more prepared for the HSC examination.</p>	Argenton (CM), North Ryde (CM), BCC, MANSW, DEC, TF, Submission 2, Submission 9, Survey x 19	The amount of course content prescribed for the revised Mathematics ('2 Unit') course will be carefully monitored. Existing topic areas will be removed or reduced in order to allow for the inclusion of any new topic areas.
<p>Nomenclature There should be a new name for the 'Mathematics' course, but not ('2 Unit') as this will cause confusion with the Mathematics General courses, which are also 2-unit courses. The course should be renamed Mathematics Advanced to align with the nomenclature used in the English learning area.</p>	Argenton (CM), North Ryde (CM), BCC, CEO Wollongong, MANSW, DEC, Submission 2, Submission 9, Survey x 14	Consideration will be given to renaming the mathematics suite of courses in line with the naming conventions for the English courses.
<p>The study of Statistics There should be no study of Statistics in the course, or the depth of study should be minimal, in order to retain appropriate rigour in the study of algebra and calculus.</p>	Argenton (CM), North Ryde (CM), DEC, Submission 1, Submission 3, Survey x 4	The inclusion of content relating to Statistics will be considered in the development of the Draft Writing Brief and the draft syllabus.

Matters Raised	Source/s	Proposed Action
<p>Prerequisite entry The course should have Stage 5.3 as the minimum entry point as students who have studied to Stage 5.2 level find the content too difficult.</p>	<p>Argenton (CM), North Ryde (CM), BCC, Survey x 3</p>	<p>Advice regarding prerequisite study for the revised Mathematics ('2 Unit') course will be considered in the development of the Draft Writing Brief.</p>
<p>Common content with Mathematics General 2 There should be common content (perhaps in the study of Statistics) with Mathematics General 2 to arrest the drift down, assist with students who change to Mathematics General 2 part of the way through the course, and to allow students in both courses to be placed on a common performance scale (as occurs with English Standard and English Advanced).</p> <p>Students who move from Mathematics ('2 Unit') to Mathematics General 2 part of the way through their senior mathematics study have difficulty because the content and approach of the courses are quite different.</p>	<p>Argenton (CM), North Ryde (CM), BCC, DEC, Survey x 5</p>	<p>The revised Mathematics ('2 Unit') course will contain a number of topic areas in common with the revised Mathematics General 2 course to assist student movement between the courses. In turn the Mathematics ('2 Unit') HSC examination will contain a number of questions in common with the Mathematics General 2 HSC examination. This will allow meaningful comparisons to be made between student performances in the two courses.</p>
<p>Separate '2 Unit' course for Mathematics Extension 1 students There should be a separate '2 Unit' course for Mathematics Extension 1 students. The '2 Unit' only course could then be made less rigorous.</p>	<p>North Ryde (CM), BCC</p>	<p>Course structures and requirements will be considered during the development of the Draft Writing Briefs.</p>

5.2.2 Proposed directions for assessment and examination specifications

Summary

Respondents indicated that they are generally supportive of the proposed directions. While the different pathways for Mathematics ('2 Unit') only students, and for students who study to Mathematics Extension 1 level, within the HSC examination for the revised Mathematics ('2 Unit') course are supported by a small number of respondents, a similar number expressed concerns. There is also disagreement as to the length of the HSC examination for the revised Mathematics ('2 Unit') course. However, there is agreement among respondents that the Mathematics ('2 Unit') HSC examination has become too difficult for a large number of ('2 Unit') only students.

Feedback affirming the proposed directions for assessment and examination specifications

Feedback	Source/s
Over 60% of survey respondents indicated that they agree or strongly agree with the proposed directions.	Survey x 67
Different pathways for Mathematics ('2 Unit') only students, and for students who study to Mathematics Extension 1 level, within the HSC examination for the revised Mathematics ('2 Unit') course are supported.	North Ryde (CM), CEO Sydney, Survey x 6

Matters raised and action taken

Matters Raised	Source/s	Proposed Action
<p>Common questions in the HSC examinations for the revised Mathematics ('2 Unit') and Mathematics General 2 courses</p> <p>The HSC examinations for the revised Mathematics ('2 Unit') and Mathematics General 2 courses should contain common questions to help place students on the same scale (as for English Standard and English Advanced), and to help stop the drift from Mathematics ('2 Unit') to Mathematics General 2.</p>	<p>Argentton (CM), North Ryde (CM), BCC, DEC, TF, Survey x 2</p>	<p>The revised Mathematics ('2 Unit') course will contain a number of topic areas in common with the revised Mathematics General 2 course to assist student movement between the courses, and in turn the Mathematics ('2 Unit') HSC examination will contain a number of questions in common with the Mathematics General 2 HSC examination. This will allow meaningful comparisons to be made between students' performance in the two courses.</p>

The following matters raised in relation to assessment and examination specifications will be further considered throughout the syllabus development process.

Matters Raised	Source/s
<p>Examination duration The duration of the examination should remain at three hours so that the course is not seen to be of lesser stature than other 2-unit courses with three-hour examinations, and so as not to introduce the ‘speededness’ factor present in the Mathematics Extension examinations.</p>	<p>Argenton (CM), North Ryde (CM), DEC, Survey x 4</p>
<p>Examination rigour The Mathematics (‘2 Unit’) examination has become too difficult for reasonably competent (‘2 Unit’) only students in recent years, and the literacy demands have increased.</p>	<p>North Ryde (CM), Submission 4, Survey x 19</p>
<p>HSC examination pathways Different pathways within the HSC examination for the revised Mathematics (‘2 Unit’) course is not fair for Mathematics Extension 1 students, and accelerants would not be accommodated by this structure.</p> <p>There should be separate HSC examination papers for the revised Mathematics (‘2 Unit’) and Mathematics Extension 1 courses. If there are to be separate pathways within the (‘2 Unit’) paper, the structure of the paper needs to be carefully considered so that students, in particular EAL/D learners, do not get confused about choosing between the pathways.</p>	<p>North Ryde (CM), CEO Wollongong, DEC, Submission 4, Survey x 7</p>
<p>Common performance scale for Mathematics (‘2 Unit’) and Mathematics General 2 The reporting of student performance on the Mathematics (‘2 Unit’) and Mathematics General 2 courses should be on a common scale, as for English Standard and English Advanced.</p>	<p>BCC, Survey x 1</p>
<p>Reasoning and Communication component weighting The Reasoning and Communication internal assessment component weighting should return to 20% since questions targeting this component are difficult to write, and the HSC examination does not reflect the current 50% weighting.</p>	<p>North Ryde (CM)</p>
<p>Internal assessment of HSC course There should be a personal interest project for the internal assessment of the HSC course.</p>	<p>BCC</p>
<p>Number of HSC examination papers As for English Standard and English Advanced, there should be two (shorter) HSC examinations for the Mathematics (‘2 Unit’) course.</p>	<p>Survey x 1</p>

5.3 Stage 6 Preliminary Mathematics Extension 1 and HSC Mathematics Extension 1

5.3.1 Proposed directions for syllabus content

Summary

The majority of respondents indicated agreement with the proposed directions. It was clearly expressed that the overall amount of content in the course should not be increased, with some respondents suggesting that the revised Mathematics Extension 1 course should be entirely separate from the Mathematics ('2 unit') course. As with other senior mathematics courses there are various suggestions as to which topics should be removed and which topics should be retained. There are conflicting views as to the level of inclusion of content relating to Statistics in the course.

Feedback affirming the proposed directions for syllabus content

Feedback	Source/s
Over 65% of survey respondents indicated that they agree or strongly agree with the proposed directions.	Survey x 69

Matters raised and action taken

Matters Raised	Source/s	Proposed Action
<p>Course content If new content is to be included in the revised Mathematics Extension 1 course, at least an equal amount of current content needs to be removed.</p>	North Ryde (CM), BCC, Survey x 6	The amount of course content prescribed for the revised Mathematics Extension 1 course will be carefully monitored. Existing topic areas will be removed or reduced in order to allow the inclusion of any new topic areas.
The course content needs to be carefully reviewed, including to ensure appropriate rigour is maintained. This could include removing or minimising the study of Statistics, removing the study of Circle Geometry and including the study of Vectors.	North Ryde (CM), BCC, Submission 1, Survey x 9	
<p>Discrete course The Mathematics Extension 1 course should be a course in its own right, rather than an add-on to the ('2 Unit') course.</p>	North Ryde (CM), CEO Sydney, Survey x 1	Course structures and requirements will be considered during the development of the Draft Writing Briefs.
<p>Nomenclature There should be a new name for the revised Mathematics Extension 1 course.</p>	Argenton (CM), CEO Wollongong, MANSW, Survey x 1	In accordance with the BOSTES approach to naming Extension courses across the HSC program, the names Mathematics Extension 1 and Mathematics Extension 2 will be retained for the revised Mathematics Extension courses.

5.3.2 Proposed directions for assessment and examination specifications

Summary

Respondents were generally supportive of the proposed directions. As in the case of the Mathematics ('2 Unit') HSC examination, there was disagreement as to the appropriate duration of the examination.

Feedback affirming the proposed directions for assessment and examination specifications

Feedback	Source/s
Over 65% of survey respondents indicated that they agree or strongly agree with the proposed directions.	Survey x 71
A substantial number of respondents indicated their support for the proposal that the HSC examination for the revised Mathematics Extension 1 course be of two and a half hours duration.	Argenton (CM), North Ryde (CM), BCC, AIS, CEO Sydney, Survey x 11

Matters raised and action taken

The following matters raised in relation to assessment and examination specifications will be further considered throughout the syllabus development process.

Matters Raised	Source/s
<p>Examination duration The HSC examination for Mathematics Extension 1 should be of three hours duration and could test the harder ('2 Unit') questions rather than having these questions in the ('2 Unit') examination. This would give students appropriate time to demonstrate their level of knowledge, skills and understanding.</p>	Argenton (CM), North Ryde (CM), Survey x 1
The duration of the examination should remain at two hours. Any increase in the length of the paper would mean an increase in total examination time for Mathematics Extension 2 students.	North Ryde (CM), Survey x 5
<p>Examination paper As with the ('2 Unit') examination, there should not be harder questions at the end of the paper designed for Mathematics Extension 2 students.</p>	Survey x 1
<p>Internal assessment There should be an investigation for HSC course internal assessment purposes.</p>	Survey x 1

5.4 Stage 6 Preliminary Mathematics Extension 2 and HSC Mathematics Extension 2

5.4.1 Proposed directions for syllabus content

Summary

While only a small number of respondents commented on the Mathematics Extension 2 course, the majority of respondents indicated that they agree with the proposed directions. It was clearly expressed that the overall amount of content in the course should not be increased, with respondents stating that the Mathematics Extension 2 course is already a very full course for the short amount of time available for teaching it. As with other senior mathematics courses there were various suggestions regarding the topics to remove and those to retain. There were conflicting views as to the level of inclusion of content relating to Statistics in the course. Some support was also provided for retaining the course as it is.

Feedback affirming the proposed directions for syllabus content

Feedback	Source/s
Over 55% of survey respondents indicated that they agree or strongly agree with the proposed directions.	Survey x 59

Matters raised and action taken

Matters Raised	Source/s	Proposed Action
<p>Course content If new content is to be included in the revised Mathematics Extension 2 course, at least an equal amount of current content needs to be removed. The course is already very full and has to be taught in a very short time.</p>	North Ryde (CM), BCC, Survey x 12	The amount of course content prescribed for the revised Mathematics Extension 2 course will be carefully monitored. Existing topic areas will be removed or reduced in order to allow the inclusion of any new topic areas.
The Mathematics Extension 2 course should remain as a very rigorous course for the most able students.	Survey x 2	
There should be no study of Statistics introduced into the Mathematics Extension 2 course.	North Ryde (CM), Survey x 2	
<p>Nomenclature There should be a new name for the revised Mathematics Extension 2 course.</p>	Argenton (CM), CEO Wollongong, MANSW, Survey x 1	In accordance with the BOSTES approach to naming Extension courses across the HSC program, the names Mathematics Extension 1 and Mathematics Extension 2 will be retained for the revised Mathematics Extension courses.

5.4.2 Proposed directions for assessment and examination specifications

Summary

While there were fewer respondents commenting on the Mathematics Extension 2 course, respondents were generally supportive of the proposed directions. Some suggestions were made regarding the content of the HSC examination paper and the internal assessment components.

Feedback affirming the proposed directions for assessment and examination specifications

Feedback	Source/s
Almost 60% of survey respondents indicated that they agree or strongly agree with the proposed directions.	Survey x 62
There was support to maintain the duration of the Mathematics Extension 2 HSC examination at three hours.	Argenton (CM), Survey x 2

Matters raised and action taken

The following matters raised in relation to assessment and examination specifications will be further considered throughout the syllabus development process.

Matters Raised	Source/s
Internal assessment There should be an investigation for internal assessment purposes.	BCC, Survey x 2
The Reasoning and Communication internal assessment component should have a smaller weighting.	Survey x 2
Examination duration The current duration of the HSC examination (three hours) does not represent sufficient time for students to adequately complete the paper.	BCC, Survey x 1
Examination pathways Mathematics Extension 2 students should be allowed to sit the ('2 Unit') HSC examination so that they can count the units in their ATAR calculation.	Survey x 1
Types of questions The Mathematics Extension 2 HSC examination should have a number of extended response question options from which students can select.	Survey x 1

5.5 Stage 6 Mathematics Life Skills

Proposed directions for syllabus content

Summary

While there were significantly fewer respondents who commented on the Life Skills course, respondents were generally in favour of such a course remaining in the suite of mathematics courses. Aligning Life Skills outcomes and content with the revised Mathematics General 1 course received strong support, though it was noted the Mathematics General 1 course currently requires a high level of literacy. Advice for teachers in relation to making adjustments to teaching, learning and assessment for students with special education needs and providing an appropriate progression from Stage 5 Life Skills outcomes and content was also supported.

Feedback affirming the proposed directions for syllabus content

Feedback	Source/s
48 of 51 survey respondents indicated that they agree or strongly agree with the proposed directions.	Survey x 48

Matters raised and action taken

Matters Raised	Source/s	Proposed Action
<p>Integration of course content Mathematics Life Skills content should be aligned with the regular course content (the Mathematics General 1 course was suggested as the most appropriate, although the literacy requirements of this course are currently too high).</p>	Argenton (CM), BCC, LSM, AIS, Submission 5, Submission 6, Submission 7, Survey x 1	The Life Skills outcomes and content will be reviewed to provide access to mathematics learning for students with a disability on the same basis as students without a disability.
Provide alternative measures of achievement through the development of broad, flexible Life Skills outcomes that can provide access points to regular content.	AIS, Submission 5, Submission 6,	
<p>Rationale A specific Life Skills rationale should be written for the revised mathematics course.</p>	AIS, Submission 5	A rationale specific to the Mathematics Life Skills course will be developed.
<p>Continuum of learning There should be a progression described from the K–10 syllabus.</p>	BCC, Survey x 1	Life Skills outcomes and content are developed from Years 7–12. A progression from Stage 5 Life Skills outcomes and content will be considered.

Matters Raised	Source/s	Proposed Action
<p>Competency-based learning There should be a shift in the Life Skills course to competency-based learning as for the VET courses, with learning to occur in real-life contexts.</p>	CEO Sydney	The scope of content will be considered in the development of the Draft Writing Brief.
<p>Financial literacy The Life Skills course should have a strong focus on financial literacy, particularly through the use of technology (online calculators, etc).</p>	Survey x 1	

5.6 Additional comments for Mathematics

Summary

Many respondents provided feedback in relation to multiple senior mathematics courses. Respondents supported the current structure for the suite of courses and were generally positive about the inclusion of Statistics study in the calculus-based courses. There were many suggestions made in relation to arresting the declining numbers of students studying higher-level mathematics courses, structure of the syllabuses, examination structures, contributions of the courses to the ATAR, and the number and type of assessment tasks.

Feedback affirming the proposed directions

Feedback	Source/s
The existing structure for the suite of senior mathematics courses should be retained.	North Ryde (CM), TF, Submission 1, Submission 2, Submission 8, Survey x 14
The study of Statistics should be included in the calculus-based courses.	Argenton (CM), North Ryde (CM), BCC, CEO Wollongong, DEC, Submission 1, Submission 4, Submission 9, Survey x 17
Modelling/applications topics should be included in all of the senior mathematics courses.	Argenton (CM), North Ryde (CM), BCC, DEC, Submission 1, Survey x 7
The current level of rigour of the calculus-based mathematics courses needs to be retained.	Survey x 7

Matters raised and action taken

Matters Raised	Source/s	Proposed Action
Amount of course content The senior mathematics courses are already full or overfull in terms of content, and teachers struggle to finish courses within the allotted time.	CEO Wollongong, DEC, TF, Submission 3, Submission 9, Survey x 15	The amount of course content prescribed for the revised mathematics courses will be carefully monitored. Existing topic areas will be removed or reduced in order to allow the inclusion of any new topic areas.
Critical thinking and problem-solving All of the revised senior mathematics courses should encourage thinking and problem-solving rather than mere formula memorisation. They should be innovative and creative.	BCC, AIS, DEC, Submission 1, Survey x 9	The course content will be reviewed during the development of the Draft Writing Briefs and the draft syllabuses.

Matters Raised	Source/s	Proposed Action
<p>Access for the diversity of learners Stage 6 mathematics courses should provide flexibility to cater for the full range of students.</p> <p>Clear and direct reference to the requirement for teachers to provide adjustments to learning experiences and assessment practices for students with special education needs should be made in all senior mathematics courses.</p> <p>A provision for students not wishing to obtain an ATAR but still undertake the study of mathematics in Stage 6 was also considered.</p>	<p>LSM, AIS, Submission 5, Survey x 1</p>	<p>Course requirements will be considered in the development of the Draft Writing Briefs to provide greater flexibility for teachers to meet the full range of learners.</p>
<p>Continuum of learning There is still a considerable gap between Mathematics General 2 and the ('2 Unit') course, both in terms of content difficulty and ATAR contributions. Students 'play the ATAR game' by doing the easier Mathematics General 2 course in order to achieve a higher ATAR rank, and schools discourage students from studying ('2 Unit') only. Students then have less success with STEM degrees at university.</p> <p>('2 Unit') students who move to Mathematics General 2 have a lot to catch up on and also have to deal with a very different approach to their mathematics learning.</p>	<p>Argenton (CM), North Ryde (CM), BCC, MANSW, DEC, Submission 2, Submission 4, Survey x 13</p>	<p>The continuum of learning between Stage 5 and Stage 6 mathematics, and across Stage 6 mathematics courses, will be considered during the development of the Draft Writing Briefs.</p>
<p>The senior mathematics syllabuses should contain a clear continuum of learning from K–12, cross-curriculum content and language support, as in the current K–10 Mathematics Syllabus. The language support in particular would assist EAL/D learners. The wording of the internal assessment components should also be changed to match the Working Mathematically components in the K–10 Mathematics Syllabus.</p>	<p>North Ryde (CM), BCC, MANSW, DEC, Survey x 1</p>	

Matters Raised	Source/s	Proposed Action
<p>Unit structures and course provision Rather than introducing Statistics topics into the calculus-based courses, there should instead be a 1-unit or 2-unit course in Statistics. A 1-unit course would benefit students who study Extension mathematics in terms of their total units studied.</p>	<p>North Ryde (CM), Survey x 2</p>	<p>For further consideration by BOSTES.</p>
<p>There should be four units of calculus-based mathematics available in Year 11, as there is in Victoria.</p>	<p>North Ryde (CM), Survey x 1</p>	
<p>BOSTES should return to requiring students to complete 11 Preliminary Year units and 11 HSC Year units – the current system discriminates against Mathematics Extension 1 students.</p>	<p>North Ryde (CM)</p>	
<p>Mathematics should be a compulsory area of study for the HSC. It is vital for today's society.</p>	<p>Argenton (CM), North Ryde (CM), BCC, Survey x 2</p>	
<p>HSC examinations There should be discrete HSC examinations for each of the senior mathematics courses, particularly in the case of ('2 Unit'). The papers could then be written to better meet the needs of the respective candidatures.</p>	<p>Argenton (CM), North Ryde (CM), BCC, AIS, CEO Sydney, MANSW, Submission 1, Submission 3, Submission 9, Survey x 6</p>	<p>The Mathematics ('2 Unit') HSC examination will contain a number of questions in common with the Mathematics General 2 HSC examination. This will allow meaningful comparisons to be made between student performances in the two courses.</p> <p>Other matters raised in relation to assessment and examination specifications will be further considered throughout the syllabus development process.</p>
<p>The ('2 Unit') paper should not be used to differentiate between ('2 Unit') only and Mathematics Extension 1 students. More ('2 Unit') only students should be able to receive a Band 6 HSC result. A separate set of performance band descriptors should be written for the performance of ('2 Unit') only students.</p>	<p>Argenton (CM), North Ryde (CM), BCC, MANSW, Submission 1, Submission 2, Survey x 12</p>	
<p>There should be common questions in pairs of papers eg common questions between the Mathematics General 2 and ('2 Unit') papers, between the ('2 Unit') and Mathematics Extension 1 papers, and between the Mathematics Extension 1 and Mathematics Extension 2 papers.</p>	<p>Argenton (CM), North Ryde (CM), BCC, MANSW, DEC, TF, Survey x 1</p>	
<p>Extension 2 students should be the only students required to sit two HSC mathematics examinations.</p>	<p>Submission 3, Submission 9</p>	
<p>All examinations for the senior mathematics courses should include a non-calculator section.</p>	<p>AIS</p>	
<p>Acceptable abbreviations for use in answering geometry questions in HSC examinations should be published to remove confusion for students and teachers.</p>	<p>MANSW</p>	
<p>BOSTES should stop setting overly difficult HSC examinations in all senior mathematics courses.</p>	<p>Survey x 2</p>	

Matters Raised	Source/s	Proposed Action
<p>Examination support materials For each examination in each of the senior mathematics courses an appropriate formula sheet should be provided.</p>	<p>North Ryde (CM), BCC, AIS, MANSW, DEC, Survey x 6</p>	<p>Formula sheets will be developed for each examination.</p>
<p>Candidates should be allowed to take a page of pre-prepared notes into their HSC mathematics examinations.</p>	<p>North Ryde (CM), MANSW</p>	<p>Other support materials will be considered throughout the syllabus development process.</p>
<p>Specimen HSC examination papers should be published at the same time as the draft syllabuses.</p>	<p>MANSW</p>	
<p>Technology Decisions on allowable technology use in HSC mathematics examinations should be made prior to the commencement of syllabus writing.</p>	<p>Argenton (CM), North Ryde (CM), MANSW, DEC, Survey x 1</p>	<p>Review of assessment and examination specifications will occur throughout the syllabus development process.</p>
<p>Technology more sophisticated than a scientific calculator should be allowed in HSC mathematics examinations.</p>	<p>Argenton (CM), North Ryde (CM), MANSW, Survey x 9</p>	
<p>All HSC mathematics examinations should contain a technology-free section.</p>	<p>North Ryde (CM), MANSW, Survey x 1</p>	
<p>Examination questions There should be no multiple-choice questions in HSC examinations for the calculus-based mathematics courses.</p>	<p>North Ryde (CM), BCC, DEC, Survey x 8</p>	<p>Review of assessment and examination specifications will occur throughout the syllabus development process.</p>
<p>Multiple-choice questions in all HSC mathematics examinations currently involve too much work for only 1 mark, and there are too many of them.</p>	<p>North Ryde (CM), BCC, Survey x 5</p>	
<p>Internal assessment Modelling topics and Focus Studies should be internally assessed via a project.</p>	<p>North Ryde (CM), BCC</p>	
<p>There should be no internally assessed projects for the senior mathematics courses due to the possibility of assistance from tutors, family members or friends.</p>	<p>TF, Survey x 1</p>	
<p>Arresting the drift from higher mathematics courses</p> <ul style="list-style-type: none"> • BOSTES should not report the number of Band 6s in Mathematics General 2 to the media, but should report the number of notional Band 6s for Mathematics Extension 2 students. • The highest ATAR rank for Mathematics General 1 should be capped at the median Mathematics General 2 mark, and the highest ATAR rank for Mathematics General 2 should be capped to the median Mathematics ('2 Unit') mark. • There should be four assessment tasks for each 2unit course, a maximum of six tasks for a Mathematics Extension 1 student, and a maximum of eight tasks for a Mathematics Extension 2 student. 	<p>MANSW</p>	<p>For further consideration by the BOSTES</p> <p>Noted for consideration in the development of HSC course internal assessment requirements.</p>

Matters Raised	Source/s	Proposed Action
<p>Course candidature The decline in total candidature of the HSC Mathematics ('2 Unit') course and the under-representation of females in Mathematics ('2 Unit'), Mathematics Extension 1 and Mathematics Extension 2 requires consideration.</p>	<p>AIS</p>	<p>For further consideration by BOSTES.</p>
<p>Online numeracy assessment Students who leave school before completing their HSC Year should be required to sit an online numeracy proficiency assessment at any time after they turn 17.</p>	<p>MANSW</p>	
<p>University prerequisites Universities should return to requiring prerequisites so that students can make informed choices about their mathematics study subjects in the senior years.</p>	<p>North Ryde (CM), Submission 2, Submission 3, Survey x 2</p>	
<p>The ATAR and UAC BOSTES should work with the Universities Admissions Centre (UAC) to make the ATAR equitable for ('2 Unit') only students, and to properly recognise the degree of difficulty of the calculus-based mathematics courses.</p>	<p>Argenton (CM), North Ryde (CM), BCC, MANSW, Survey x 3</p>	
<p>Professional learning Support and funding for professional learning will be needed, especially in relation to new content areas. Resources, support documents and sample assessment items should be provided.</p>	<p>BCC, CEO Wollongong, DEC, TF, Survey x 4</p>	<p>BOSTES will develop a range of support materials, especially in relation to new content areas, to assist teachers in the initial implementation of the revised courses. Following 'syllabus handover' this responsibility will move to the education sectors.</p>

6 Quantitative analysis of survey responses

(Note: due to rounding, some percentages may not total 100%)

Survey Item	Number of Responses	Strongly agree		Agree		Disagree		Strongly Disagree		Non response	
		N	%	n	%	n	%	n	%	n	%
	105										
The proposed Stage 6 Mathematics courses provide flexibility to meet the needs of the diversity of learners.	105	14	13.3	62	59.0	20	19.0	5	4.8	4	3.8
The proposed revisions of the Preliminary Mathematics General, HSC Mathematics General 1 and HSC Mathematics General 2 syllabus content are appropriate.	105	12	11.4	58	55.2	19	18.1	8	7.6	8	7.6
The proposal to retain the current assessment and examination specifications for HSC Mathematics General 1 and HSC Mathematics General 2 is appropriate.	105	17	16.2	60	57.1	11	10.5	6	5.7	11	10.5
The proposed revisions of the Mathematics ('2 Unit') syllabus content are appropriate.	105	14	13.3	61	58.1	16	15.2	3	2.9	11	10.5
The proposed revisions of the assessment and examination specifications for Mathematics ('2 Unit') are appropriate.	105	12	11.4	55	52.4	19	18.1	10	9.5	9	8.6
The proposed revisions of the Mathematics Extension 1 syllabus content are appropriate.	105	12	11.4	57	54.3	13	12.4	6	5.7	17	16.2
The proposed revisions of the assessment and examination specifications for Mathematics Extension 1 are appropriate.	105	14	13.3	57	54.3	12	11.4	7	6.7	15	14.3
The proposed revisions of the Mathematics Extension 2 syllabus content are appropriate.	105	10	9.5	49	46.7	13	12.4	7	6.7	26	24.8
The proposal to retain the current assessment and examination specifications for Mathematics Extension 2 is appropriate.	105	15	14.3	47	44.8	13	12.4	6	5.7	24	22.9
The proposed revisions of the Mathematics Life Skills syllabus content are appropriate.	105	5	4.8	43	41.0	0	0	3	2.9	54	51.4

7 Respondents

7.1 Consultation meetings

Teacher meetings

(code: CM)

Venue	Date	Number of participants
North Ryde	2 September 2014	75
Argenton	3 September 2014	23

Board Curriculum Committee (BCC) meeting at BOSTES on 10 September 2014

(code: BCC)

Name	Organisation
Professor John Mack	Chair of the Committee
Ms Praneetha Singh	Association of Independent Schools of NSW
Ms Amanda Wilson	Catholic Education Commission NSW
Ms Cathie Renfrew	Council of Catholic School Parents, NSW & ACT
Mr John Raftery	NSW/ACT Independent Education Union
Mr John Cairns	NSW Chapter of the Australian Association of Special Education
Ms Nagla Jebeile	NSW Department of Education and Communities
Ms Zdena Pethers	NSW Department of Education and Communities
Mr Terrence Moriarty	NSW Teachers Federation
Ms Lynne Openshaw	Professional Teachers' Council NSW

Targeted teacher meeting: Life Skills

(code: LSM)

Venue	Date	Number of participants
BOSTES	8 September 2014	7

7.2 Written submissions

Organisations, groups and individuals	Code
Association of Independent Schools of NSW	AIS
Catholic Education Office Sydney	CEO Sydney
Catholic Education Office Wollongong	CEO Wollongong
Mathematical Association of NSW	MANSW
NSW Department of Education and Communities	DEC
NSW Teachers Federation	TF
University of NSW, School of Mathematics and Statistics	Submission 1
Brigidine College St Ives, Mathematics Department	Submission 2
SHORE School, Mathematics Department	Submission 3
St Joseph's Catholic High School Albion Park, Mathematics Faculty	Submission 4
Ms Geraldine Gray, State Coordinator, Special Learning Needs, Catholic Education Commission NSW	Submission 5
Assistant Professor Bree Jimenez, School of Education, University of North Carolina	Submission 6
Ms Wendy Minnis, Learning Support teacher, Arthur Phillip High School	Submission 7
Mr Brian Mitchell, retired mathematics teacher and current mathematics tutor	Submission 8
Ms Tessa Wigmore, Head Teacher Mathematics, St Ives High School	Submission 9