Background to changes to Stage 6 mathematics HSC assessment requirements and examination specifications

In December 2008, the Board of Studies, after consultation with teachers, parents and the broader community, decided on changes to HSC assessment and examination requirements. These changes began with the 2010 HSC cohort (see www.boardofstudies.nsw.edu.au/syllabus_hsc/exam-changes/). However, the four Stage 6 mathematics courses were not included in those changes. This was due to the fact that new Stage 6 mathematics syllabuses were being developed at the same time and broad consultation on the assessment and examination requirements for the new syllabuses had already taken place. The mathematics education community was therefore expecting ‘new look’ examinations for the 2011 HSC.

It is now appropriate to consider changes to the HSC assessment and examination requirements from the 2011 HSC year, given the Board’s decision in March 2009 to endorse the new Stage 6 mathematics syllabuses but not to implement the syllabuses due to the announcement of the development of the Australian mathematics curriculum. The 2011 timeline for the implementation of revised assessment and examination requirements is in accordance with the previously envisaged implementation of the revised syllabuses from Year 11 2010.

In October 2009, the Board advised that there were no changes to the syllabus content to be studied in 2010 or in 2011 for General Mathematics, Mathematics, Mathematics Extension 1 and Mathematics Extension 2. It also stated that there were no changes to the HSC assessment and examination requirements in 2010 and that ‘advice will be provided as soon as practicable in relation to developing revised HSC assessment and examination requirements for implementation with Year 12 2011, in response to the Board’s decision in December 2008 on changes to assessment and examination requirements across the HSC program’. The likelihood of changes for 2011 has since been flagged in presentations at conferences such as the Annual Conference of The Mathematical Association of NSW (MANSW).

Revised HSC assessment and examination requirements for the four current Stage 6 mathematics courses have now been developed for web-based consultation from 9 August to 10 September 2010. The proposed changes are consistent with the Board’s principles for developing assessment requirements and examination specifications, and also with the Board decisions of December 2008 regarding revised HSC assessment requirements and examination specifications.

These decisions included that:

- the duration of each examination be retained at its current length
- the introduction of objective items, or the increase in the number of objective items currently used in a particular examination, proposed for each course be accepted
- the components used as part of the assessment requirements will be based on a manageable set of objectives or groupings of outcomes.

The examination requirements for the two new General courses (Mathematics General 1 and Mathematics General 2) were well received in the consultation on the draft syllabuses. While there was some concern about the original proposal to include 20 marks of objective-response questions in the Mathematics Advanced HSC
examination, 10 marks of objective-response questions were generally viewed as acceptable in consultation on the new Mathematics Extension 1 and Mathematics Extension 2 courses, while indications were that, following resolution of differing opinions for the Mathematics Advanced course, at least 10 marks of objective-response questions would have been viewed as acceptable.

The benefits of revising the HSC assessment and examination requirements for the Stage 6 mathematics courses also include:

• addressing the broad direction of the Stage 6 Review and Development project: ‘That the appropriateness of the current processes for the examination of Stage 6 Mathematics courses be reviewed, with particular emphasis on the examination of Mathematics (‘2 Unit’)-only candidates’. In particular, perceptions about the level of difficulty and the ‘speed test’ nature of the calculus-based course examinations are addressed in the proposed changes

• implementing revised HSC assessment and examination requirements for the Stage 6 mathematics courses at this stage, with a view to using these models in NSW with the Australian Curriculum senior mathematics courses, will allow the implementation of the Australian Curriculum courses to focus primarily on the curriculum changes

• weighting the two key components of internal assessment of HSC mathematics courses equally. The suggested weightings for the ‘Concepts, skills and techniques’, and ‘Reasoning and communication’ components are each 50%. These weightings reflect the equal importance of these aspects of mathematics learning and will provide teachers with a natural framework and increased flexibility in the construction of assessment tasks

• emphasising the central place of reasoning and communication in all HSC mathematics courses. The revised weightings reflect the student learning benefits associated with a focus on reasoning and communication at a level appropriate to the objectives, outcomes and syllabus content of each of the four mathematics courses.

It is proposed that the assessment requirements and examination specifications for General Mathematics, Mathematics, Mathematics Extension 1 and Mathematics Extension 2 be revised as proposed in the new Stage 6 mathematics syllabuses endorsed by the Board, with the exception of the Mathematics examination specifications. It is proposed that, within the Mathematics examination specifications, the number of objective-response questions be reduced from the 20 originally proposed for consultation in 2008, to 10.

In particular, it is proposed that:

• the duration of each examination be retained at its current length

• the expectations of each examination (in terms of number of questions/total number of marks) be manageable for the examination’s duration

• objective-response items be introduced for the Mathematics, Mathematics Extension 1 and Mathematics Extension 2 HSC examinations

• assessment components used as part of the assessment requirements will be based on a manageable set of objectives or groupings of outcomes. These have been revised to be consistent with the current objectives and outcomes (see attached).
Consultation

While the extensive consultation on the new Stage 6 mathematics syllabuses developed in 2006 to 2008 included consultation on the assessment requirements and examination specifications, further consultation on these proposed changes will consist of:

- consultation via online survey on the Board’s website
- discussions with key stakeholders such as The Mathematical Association of NSW (MANSW) and school system representatives.

The consultation period is 9 August to 10 September 2010.
Proposed internal assessment requirements, components and weightings and HSC external examination specifications

General Mathematics

Internal assessment requirements, components and weightings

*Preliminary course*

The suggested internal assessment components and percentage weightings for the Preliminary General Mathematics course are set out below.

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
<th>Weighting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concepts, skills and techniques</td>
<td>Use of concepts, skills and techniques to solve mathematical problems in a wide range of practical contexts</td>
<td>50%</td>
</tr>
<tr>
<td>Reasoning and communication</td>
<td>Application of reasoning and communication in appropriate forms to construct mathematical arguments and to use and interpret mathematical models</td>
<td>50%</td>
</tr>
</tbody>
</table>

*HSC course*

The mandatory internal assessment components and percentage weightings for the HSC General Mathematics course are set out below.

Up to 30% of the internal assessment in General Mathematics may be based on the Preliminary course.

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
<th>Weighting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concepts, skills and techniques</td>
<td>Use of concepts, skills and techniques to solve mathematical problems in a wide range of practical contexts</td>
<td>50%</td>
</tr>
<tr>
<td>Reasoning and communication</td>
<td>Application of reasoning and communication in appropriate forms to construct mathematical arguments and to use and interpret mathematical models</td>
<td>50%</td>
</tr>
</tbody>
</table>

While the allocation of weightings to the various tasks set for the HSC course is left to individual schools, the percentages allocated to each assessment component must be maintained. For each component, the assessment may be spread over more than one task.
HSC external examination specifications

The General Mathematics HSC examination will consist of a written examination paper of 2½ hours duration (plus five minutes reading time) containing two sections with a total mark value of 100 marks. All questions in the examination are compulsory.

The examination will be based mainly on the HSC General Mathematics course and will focus on the course objectives and HSC outcomes. The Preliminary Mathematics General course will be assumed knowledge for this examination. Questions focusing on HSC General Mathematics outcomes may relate to knowledge, skills and understanding from the Preliminary General Mathematics course.

A formula sheet will be provided with the examination paper.

In addition to basic examination equipment, a pair of compasses, set squares, a protractor and a mathematical curve-drawing template may be used.

Calculators may be used.

Section I (25 marks)

• There will be objective-response questions to the value of 25 marks.

Section II (75 marks)

• There will be FIVE questions.

• All questions will be worth 15 marks.

• Each question will consist of a number of short-answer parts.

---

* Students may take into any mathematics examination a curve-drawing template, provided the template contains no printed formulas other than equations of simple curves (such as $y = x^2$) that may be drawn using the template.
Mathematics

Internal assessment requirements, components and weightings

Preliminary course

The suggested internal assessment components and percentage weightings for the Preliminary Mathematics course are set out below.

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
<th>Weighting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concepts, skills and techniques</td>
<td>Use of concepts, skills and techniques to solve mathematical problems in a wide range of theoretical and practical contexts</td>
<td>50%</td>
</tr>
<tr>
<td>Reasoning and communication</td>
<td>Application of reasoning and communication in appropriate forms to construct mathematical arguments and proofs and to interpret and use mathematical models</td>
<td>50%</td>
</tr>
</tbody>
</table>

HSC course

The mandatory internal assessment components and percentage weightings for the HSC Mathematics course are set out below.

Up to 20% of the internal assessment in Mathematics may be based on the Preliminary course.

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
<th>Weighting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concepts, skills and techniques</td>
<td>Use of concepts, skills and techniques to solve mathematical problems in a wide range of theoretical and practical contexts</td>
<td>50%</td>
</tr>
<tr>
<td>Reasoning and communication</td>
<td>Application of reasoning and communication in appropriate forms to construct mathematical arguments and proofs and to interpret and use mathematical models</td>
<td>50%</td>
</tr>
</tbody>
</table>

While the allocation of weightings to the various tasks set for the HSC course is left to individual schools, the percentages allocated to each assessment component must be maintained. For each component, the assessment may be spread over more than one task.
HSC external examination specifications

The Mathematics HSC examination will consist of a written examination paper of three hours duration (plus five minutes reading time) containing two sections with a total mark value of 100 marks. All questions in the examination are compulsory.

The examination will be based mainly on the HSC Mathematics course and will focus on the course objectives and HSC outcomes. The Preliminary Mathematics course will be assumed knowledge for this examination. Questions focusing on HSC Mathematics outcomes may relate to knowledge, skills and understanding from the Preliminary Mathematics course.

A formula sheet, including standard integrals, will be provided with the examination paper.

In addition to basic examination equipment, a pair of compasses, set squares, a protractor and a mathematical curve-drawing template may be used.

Board-approved calculators may be used.

Section I (10 marks)

• There will be objective-response questions to the value of 10 marks.

Section II (90 marks)

• There will be SIX questions.
• All questions will be worth 15 marks.
• Each question will consist of a number of short-answer parts.

* Students may take into any mathematics examination a curve-drawing template, provided the template contains no printed formulas other than equations of simple curves (such as y = x^2) that may be drawn using the template.
Mathematics Extension 1
Internal assessment requirements, components and weightings

Preliminary course
The suggested internal assessment components and percentage weightings for the Preliminary Mathematics Extension 1 course are set out below.

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
<th>Weighting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concepts, skills and techniques</td>
<td>Use of concepts, skills and techniques to solve mathematical problems in a wide range of theoretical and practical contexts</td>
<td>50%</td>
</tr>
<tr>
<td>Reasoning and communication</td>
<td>Application of reasoning and communication in appropriate forms to construct mathematical arguments and proofs and to interpret and use mathematical models</td>
<td>50%</td>
</tr>
</tbody>
</table>

HSC course
The mandatory internal assessment components and percentage weightings for the HSC Mathematics Extension 1 course are set out below.

Internal assessment for the Mathematics Extension 1 HSC course can be based on the whole of the Mathematics Extension 1 course (Preliminary and HSC courses). Assessment for this course should not begin until the school program of HSC assessments for other subjects begins (this is usually no earlier than Term 4 of Year 11).

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
<th>Weighting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concepts, skills and techniques</td>
<td>Use of concepts, skills and techniques to solve mathematical problems in a wide range of theoretical and practical contexts</td>
<td>50%</td>
</tr>
<tr>
<td>Reasoning and communication</td>
<td>Application of reasoning and communication in appropriate forms to construct mathematical arguments and proofs and to interpret and use mathematical models</td>
<td>50%</td>
</tr>
</tbody>
</table>

While the allocation of weightings to the various tasks set for the HSC course is left to individual schools, the percentages allocated to each assessment component must be maintained. For each component, the assessment may be spread over more than one task.
HSC external examination specifications

The Mathematics Extension 1 HSC examination will consist of a written examination paper of two hours duration (plus five minutes reading time) with a total mark value of 70 marks. All questions in the examination are compulsory.

The examination will be based mainly on the HSC Mathematics Extension 1 course and will focus on the course objectives and HSC outcomes. The Preliminary Mathematics Extension 1 and Mathematics courses will be assumed knowledge for this examination. Questions focusing on HSC Mathematics Extension 1 outcomes may relate to knowledge, skills and understanding from the Preliminary Mathematics Extension 1 and Mathematics courses.

A formula sheet, including standard integrals, will be provided with the examination paper.

In addition to basic examination equipment, a pair of compasses, set squares, a protractor and a mathematical curve-drawing template may be used.

Board-approved calculators may be used.

Section I

• There will be objective-response questions to the value of 10 marks.

Section II

• There will be FOUR questions.
• All questions will be worth 15 marks.
• Each question will consist of a number of short-answer parts.

---

*Students may take into any mathematics examination a curve-drawing template, provided the template contains no printed formulas other than equations of simple curves (such as \( y = x^2 \)) that may be drawn using the template.*
Mathematics Extension 2

Internal assessment requirements, components and weightings

HSC course

The mandatory internal assessment components and percentage weightings for the HSC Mathematics Extension 2 course are set out below.

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
<th>Weighting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concepts, skills and techniques</td>
<td>Use of concepts, skills and techniques to solve mathematical problems in a wide range of theoretical and practical contexts</td>
<td>50%</td>
</tr>
<tr>
<td>Reasoning and communication</td>
<td>Application of reasoning and communication in appropriate forms to construct mathematical arguments and proofs and to interpret and use mathematical models</td>
<td>50%</td>
</tr>
</tbody>
</table>

While the allocation of weightings to the various tasks set for the HSC course is left to individual schools, the percentages allocated to each assessment component must be maintained. For each component, the assessment may be spread over more than one task.
HSC external examination specifications

The Mathematics Extension 2 HSC examination will consist of a written examination paper of three hours duration (plus five minutes reading time) with a total mark value of 100 marks. All questions in the examination are compulsory.

The examination will be based mainly on the Mathematics Extension 2 course and will focus on the course objectives and outcomes. The Mathematics Extension 1 and Mathematics courses will be assumed knowledge for this examination. Questions focusing on Mathematics Extension 2 outcomes may relate to knowledge, skills and understanding from the Mathematics Extension 1 and Mathematics courses.

A formula sheet, including standard integrals, will be provided with the examination paper.

In addition to basic examination equipment, a pair of compasses, set squares, a protractor and a mathematical curve-drawing template may be used.

Board-approved calculators may be used.

Section I (10 marks)

• There will be objective-response questions to the value of 10 marks.

Section II (90 marks)

• There will be SIX questions.
• All questions will be worth 15 marks.
• Each question will consist of a number of short-answer parts.

* Students may take into any mathematics examination a curve-drawing template, provided the template contains no printed formulas other than equations of simple curves (such as $y = x^2$) that may be drawn using the template.