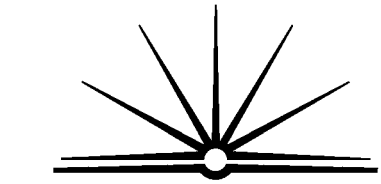

Mathematics

Years K to 10

(incorporating Years K–6 and Years 7–10)

Writing Brief

2001

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Contents

1. Writing Brief

1. Writing Brief

Preparation of a writing brief takes place in Phase 2 of the Board of Studies' syllabus development process.

1.1 Purpose

The writing brief provides the proposed blueprint for the new K—6 and 7—10 syllabuses. Following consultation, the writing brief will be finalised to provide the detailed blueprints for the development of the syllabuses, against which the final syllabuses will be judged.

The final syllabus documents will be developed during Phase 3 of the syllabus development process.

1.2 Structure

The writing brief is structured according to the elements of the syllabuses (see Section 4).

The writing brief covers all the Years from Kindergarten to Year 10 to enable communication of the development of mathematical ideas across the range of learning in the compulsory years of schooling.

1.3 For your information

Sections 1 to 3 of this document provide essential background reading on the development of the writing brief. Section 4 and Section 5 provide details of the proposed elements of the Mathematics Years K to 10 syllabuses. In Sections 3, 4, 5, 6 and 7 the following icon is used to assist your reading and response:

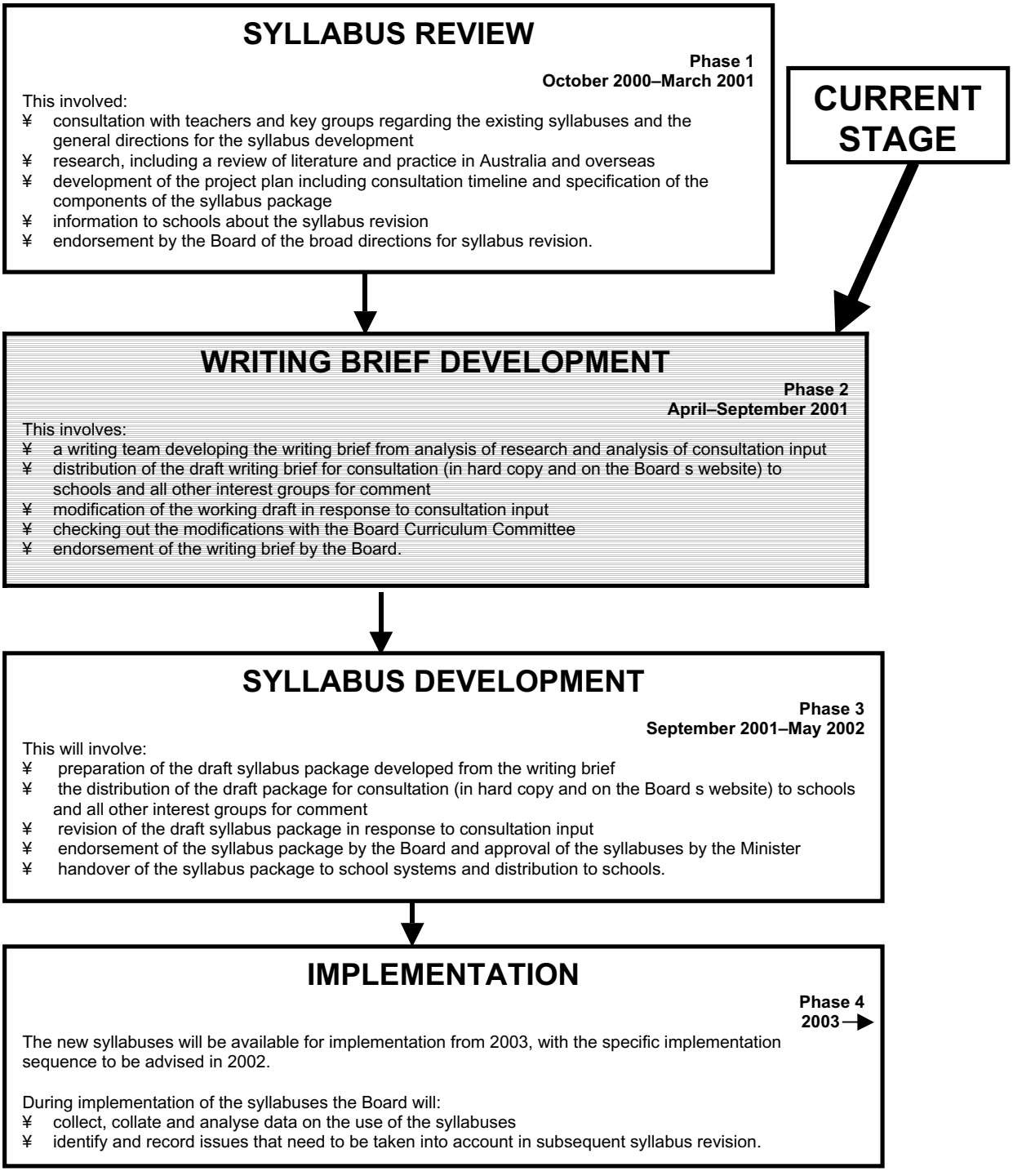
i **For your information**	*This icon indicates general information, usually in the nature of definitions or other items, that assists in reading or understanding the information contained in the brief.*

2. Mathematics Years K to 10 Syllabus Development Process

2. Mathematics Years K to 10 Syllabus Development Process

Syllabuses in NSW are developed in accordance with the Board of Studies syllabus development process. This process is detailed in the Board s *Syllabus Development Process*, which is available on the Board s website.

For the development of the Mathematics syllabuses the first phase, Syllabus Review, is now complete. This phase involved several key activities including a literature review, oral and written submissions, surveys of a sample of 100 schools, a symposium, and an *Aboriginal Students and Numeracy* forum.



2.1 Timeline for the development of the syllabus package for Mathematics

A syllabus package will be developed for use by teachers in accordance with:

- the Board s *Syllabus Development Process*, a copy of which is available on the Board s website;
- the syllabus development plan and timeline for the Mathematics Years K to 10 Syllabuses approved by the Board of Studies on 10 October 2000, details of which are set out below. Details of the timeline were published in Board Bulletin vol. 9, no. 8, 2000, and in subsequent bulletins; and
- the Board s *K–10 Curriculum Framework*, a draft copy of which is available on the Board s website.

Steps in the syllabus development process	Date
Syllabus Review:	
• Literature Review	Nov 2000 — Jan 2001
• Oral Submissions	5—6 December 2000
• *Aboriginal Students and Numeracy* Discussion Forum	20 February 2001
• Symposium	24 February 2001
• Written Submissions and Surveys from Schools	9 March 2001
Writing Brief Development:	
• Preparation of Draft Writing Brief and Survey	March — July 2001
• Consultation (5 weeks)	23 July — 24 August 2001
• Development of Consultation Report and Revision of Draft Writing Brief	August — September 2001
Syllabus Development:	
• Development of the Draft Syllabuses and Survey	Sept — December 2001
• Consultation (5 weeks)	28 Jan — 4 March 2002
• Development of Consultation Report and Revision of Draft Syllabuses	March — May 2002
• Distribution of Syllabuses	May 2002
• Development and Distribution of Specimen Paper and Marking Guidelines	(Date to be determined)
Note: Support Documents The nature of proposed support documents is presented in Section 6 of this writing brief.	

2.2 K–10 Curriculum Framework

The Board of Studies is developing a K—10 curriculum framework to ensure continuity, coherence and consistency across Years K to10. The framework provides a purpose statement, broad learning outcomes and principles that guide learning for all students attending schools in NSW. It provides a basis for decision-making about what students are to learn, how learning will take place and how it will be assessed.

The Board of Studies will use the framework to guide syllabus review and development. Syllabuses are to be consistent with and build upon the requirements of the framework.

The draft *K–10 Curriculum Framework* is available on the Board s website at www.boardofstudies.nsw.edu.au. Extracts are attached as Appendix 2.

This syllabus will be developed in accordance with the guidelines detailed in the framework.

3. Background Information

3. Background Information

3.1 Government directions for the development of the Mathematics Years K to 10 syllabuses

The current *Mathematics Syllabus Years 7–8* was developed in 1987 and implemented in 1988. The current *Mathematics K–6 Syllabus* was released in 1989. Since then, major revisions of mathematics courses for Stage 5 and Stage 6 have occurred. The NSW Government committed to the development of new Mathematics Years K to 10 syllabuses in its Education and Training Plan for 1999—2003. This commitment was restated in the Minister's announcement on the review of the Years 7 to 10 curriculum in July 2000.

The Board of Studies initiated the revision of Years K to 10 Mathematics to ensure that there is continuity of theory, knowledge and understanding through all Mathematics syllabuses in NSW. The simultaneous undertaking of the review and development of the Years K to 6 and Years 7 to 10 syllabuses gives maximum opportunity to ensure continuity in the Years K to 10 Mathematics curriculum. The syllabuses will be designed to meet the needs of all students in the compulsory years of schooling and prepare students for the study of courses in Mathematics, and other courses, in the New Higher School Certificate.

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For your Information

3.2 Scope of the Mathematics syllabus review and development

The Board of Studies endorsed a syllabus review of Mathematics Years K—10 on 10 October 2000. The key features of the review phase approved by the Board included:

- the establishment of two Board Curriculum Committees for Mathematics, Years K—6 and Years 7—10, to monitor the syllabus development process and to provide advice throughout the project
- a review of relevant literature, incorporating an analysis of curriculum and syllabuses nationally and internationally
- organisation of a variety of other data collection processes.

Following the review of the current syllabuses, the Board endorsed the broad directions for the development of the *Mathematics Years K to 10 Syllabus Writing Brief* on 27 March 2001. These broad directions are drawn from:

- the literature review
- oral submissions
- surveys
- written submissions
- a discussion forum
- a symposium
- additional data including surveys of students, further written submissions, and further surveys from schools.

The broad directions endorsed by the Board need to be considered in the context of the *K–10 Curriculum Framework*, especially the purpose, principles and broad learning outcomes.

The broad directions are attached as Appendix 1.

4. Mathematics Years K to 10 Syllabus Elements

4. Mathematics Years K to 10 Syllabus Elements

For your information

This section of the writing brief is structured to address the elements of the syllabuses:

- Rationale for Mathematics in Years K to 10
- Aim
- Mathematics Years K to 10 Objectives
- Content Organisation
- The Relationship between Mathematics and Numeracy
- K—10 Mathematics Scope and Continuum
- Outcomes for Early Stage 1 to Stage 5
- Content for Early Stage 1 to Stage 5
- Cross-curriculum Content
- Prior-to-school Learning and Stage Statements
- Assessment
- Glossary

4.1 Rationale for Mathematics in Years K to 10

For your information

The **rationale** *describes the nature of the subject in broad terms. It explains the place and purpose of the subject in the curriculum.*

The purpose and principles of the Draft K—10 Curriculum Framework *are reflected in this rationale. The purpose and principles of the* Draft K—10 Curriculum Framework *along with the broad learning outcomes are attached as Appendix 2.*

Mathematics involves the study of patterns and relationships and provides a powerful, precise and concise means of communication that is intended to challenge, refine and extend the body of collected knowledge and skills. It involves observation, representation, investigation and comparison of patterns and relationships in social and physical phenomena and is of itself a valuable pursuit. At a fundamental level, it is concerned with practical applications in many branches of human activity. It is also a creative activity involving abstraction and generalisation. As such it has been integral to scientific and technological advances in many fields of endeavour including medicine, commerce, industry, economics, science, engineering, and the arts.

Mathematics is significant in our society, in the cultural heritage of our own and other societies, in the workplace, and in our everyday experiences. Its study provides opportunities for students to learn to describe and analyse patterns and relationships, accurately calculate both mentally and in written form, estimate, measure, solve problems, reason, predict, and interpret and communicate information presented numerically, statistically, algebraically, and diagrammatically.

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Students need to be able to appreciate the use of mathematics in particular situations and to make judgements about the most appropriate mathematics to apply. To participate fully in society they need to develop the capacity to critically evaluate ideas and arguments that involve mathematical concepts or that are presented in a mathematical form. Well-developed interpretive skills, the ability to make informed decisions, and the ability to apply mathematics in a variety of contexts are essential components of students preparation for life in the twenty-first century. The development of language skills in mathematics is essential to enable all students to engage effectively.

Additionally, students will have the opportunity to develop an appreciation of mathematics and its applications in their everyday lives and in the worlds of science, technology, commerce, the arts and employment. The study of the subject enables students to develop a positive self-concept as learners of mathematics, obtain enjoyment from applying mathematics, and become self-motivated learners through inquiry and active participation in challenging and engaging learning experiences.

4.2 Aim

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For your information

The **aim** *states the overall purpose of the syllabuses. It indicates the educational benefits that are intended to accrue for students who satisfactorily complete programs of study based on the syllabuses.*

The aim of Mathematics in Years K to 10 is to develop students' mathematical thinking, understanding, competence and confidence in the application of mathematics, the promotion of their creativity, enjoyment and appreciation of the subject, and their preparation for life-long learning.

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For your information

4.3 Mathematics Years K to 10 Objectives

Objectives *provide more specific statements of the intent of the 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, skills and understanding, values and attitudes fundamental to the Key Learning Area/subject. They act as organisers of the intended outcomes. The same objectives may apply across Stages in a Key Learning Area/subject.*

Knowledge, skills and understanding

Students will develop knowledge, skills and understanding:

- through inquiry, application of problem-solving strategies, communication, reasoning and reflection
- in mental and written computation and numerical reasoning
- in patterning, generalisation and algebraic reasoning
- in identifying and quantifying the attributes of shapes and objects and applying measurement strategies
- in spatial visualisation and geometric reasoning
- in collecting, representing, analysing and evaluating information.

Values and attitudes

Students will:

- appreciate mathematics as an essential and relevant part of life
- show interest and enjoyment in inquiry and the pursuit of mathematical knowledge, skills and understanding
- demonstrate confidence in applying mathematical knowledge, skills and understanding to everyday situations and the solution of everyday problems
- develop and demonstrate perseverance in undertaking mathematical challenges
- recognise that mathematics has been developed in many cultures in response to human needs.

4.4 Content Organisation

For your information

The **Content Organisation** *section describes how the syllabus content is to be organised.*

The syllabus content is presented from Early Stage 1 to Stage 5 Extension. Students learn at different rates and in different ways. Some students are capable of learning at a faster rate and are able to work beyond the Stage identified with their chronological age. Other students require more time to meet the outcomes for a particular Stage. The presentation of content in Stages is designed to enable teachers to plan teaching programs to meet the needs of particular students.

The diversity of students' needs is apparent in all Stages of schooling. In order to meet students' vocational and other learning needs beyond the compulsory years, a variety of mathematical learning experiences is required in Years 9 and 10. The arrangement of content into Stage 5 and Stage 5 Extension acknowledges the wide range of achievement of students in mathematics as they enter the last two years of their compulsory years of schooling. Stage 5 content is designed to meet the needs of students who have achieved Stage 4 outcomes. Stage 5 Extension content is designed for students who have achieved Stage 5 outcomes and provides opportunities for such students to maximise the development of their mathematical knowledge, skills and understanding in preparation for the range of courses offered in Stage 6.

It is proposed that the syllabus content for Mathematics in Years K to 10 be structured using the six strands:

- Working Mathematically
- Number
- Patterns and Algebra
- Measurement
- Space and Geometry
- Data.

These strands contain the essential knowledge, skills and understanding for the study of Mathematics in the compulsory years of schooling. The Working Mathematically strand incorporates mathematical processes considered to be essential for developing, using and applying mathematics. While this strand has a set of separate outcomes, it will be integrated into the content of each of the other five strands in the syllabuses.

Strands, Substrands and Topics

Strands are used as organisers of mathematical processes and content to assist teachers with programming, planning, assessment and reporting. Strands are

further organised into either processes, substrands or topics.

Working Mathematically incorporates five key processes that span the K–10 range. In Early Stage 1 to Stage 3, the other five strands (content strands) contain substrands to further assist with the process of planning for learning. It should be noted that Mathematics is a body of knowledge and that links between strands and substrands will be made explicit in syllabus support documents. In Stage 4 to Stage 5 Extension, the five content strands are organised into topic areas.

The following table summarises the organisational structure for Mathematics from Early Stage 1 to Stage 5 Extension. The substrands for Early Stage 1 to Stage 3 are the same and have been included as one column.

Strand	Early Stage 1 to Stage 3	Stage 4	Stage 5	Stage 5 Extension
Working Mathematically (five processes)	Questioning Applying Strategies Communicating Reasoning Reflecting	Questioning Applying Strategies Communicating Reasoning Reflecting	Questioning Applying Strategies Communicating Reasoning Reflecting	Questioning Applying Strategies Communicating Reasoning Reflecting
Number	Number Sense Addition and Subtraction Multiplication and Division Fractions and Decimals Language of Chance	Integers Fractions, Decimals and Percentages Applications of Number Probability	Rational Numbers Consumer Arithmetic Probability	Real Numbers Probability
Patterns and Algebra	Number Patterns	Algebraic Techniques Linear Relationships	Algebraic Techniques Linear Relationships Non-Linear Relationships	Algebraic Techniques Linear Relationships Non-Linear Relationships # Curve Sketching # Functions and Logarithms
Measurement	Length and Area Volume and Capacity Mass Time	Perimeter and Area Surface Area and Volume Time	Perimeter and Area Surface Area and Volume Trigonometry	Perimeter, Area, Surface Area and Volume Trigonometry
Space and Geometry	Three-Dimensional Space Two-Dimensional Space Position	Angles Properties of Shapes Properties of Solids	Angles Properties of Shapes Deductive Geometry	Angles Properties of Shapes Deductive Geometry # Circle Geometry
Data	Data Handling and Representation	Data Representation Data Analysis	Data Representation Data Analysis and Evaluation	(# optional topics - further preparation for the Mathematics Extension courses in Stage 6)

Working Mathematically

Working Mathematically incorporates important processes that include asking questions, applying strategies (including the use of technology) in a variety of situations, analysing and evaluating mathematical problems, and reflecting on the effectiveness of the strategies used. Working Mathematically provides opportunities for students to engage in genuine Mathematical activity and to develop the skills to become flexible and creative problem solvers. Solving non-routine and challenging problems is a significant aspect of mathematical learning. Teaching through problems that are relevant to the students encourages improved attitudes to mathematics and an appreciation of its importance to society.

Within the strand Working Mathematically, five key processes have been identified and are elaborated below:

- questioning — students ask questions in relation to mathematical situations and their mathematical experiences
- applying strategies — students develop, select and use a range of strategies, including the use of technology, in solving problems
- communicating — students develop and use appropriate language and representations to formulate and express mathematical ideas
- reasoning — students develop and use processes for exploring relationships, checking solutions and giving reasons to support their conclusions
- reflecting — students reflect on their experiences to make connections with existing knowledge and understanding.

Number

Numbers are used in mathematics to quantify and describe the world. In Early Stage 1 to Stage 3, all substrands of the Number strand are developed through the use of visualisation, estimation and the development of strong mental strategies set in meaningful contexts. Formal algorithms are introduced after students have gained a firm understanding of basic concepts, and have developed mental strategies for computing with two-digit and three-digit numbers.

The Number strand for Early Stage 1 to Stage 3 is organised into five substrands. The substrand Number Sense includes counting strategies, number relationships, and the concept of place value. Place value concepts should be developed in the context of using mental strategies and other informal algorithms, rather than being taught separately from, and in advance of, computation with two-digit and three-digit numbers. The operations are paired in the substrands Addition and Subtraction, and Multiplication and Division, to emphasise the importance of developing awareness of the inverse relationships between these operations. In Stage 3, students are introduced to addition and subtraction of fractions, and multiplication of fractions by whole numbers, in the context of real situations.

The substrand Language of Chance has been included from Early Stage 1 to enable the development of understanding of chance concepts from an early age.

In Stage 4, Stage 5 and Stage 5 Extension, Number encompasses a more comprehensive examination of the rational numbers, the irrational numbers, and

probability. These topics are intended to extend students' understanding of the relationships between numbers and to prepare them for further number exploration in Stage 6.

Estimation is a skill that should be practised throughout the Years from K to 10. Students need to be encouraged to evaluate solutions in relation to the context of the question. In addition, it is critical for students to decide whether it is more appropriate to use mental, pen-and-paper or calculator strategies when solving problems.

Patterns and Algebra

The Patterns and Algebra strand extends from Early Stage 1 to Stage 5 Extension. In the early years, students explore number and pre-algebra concepts by pattern making, and discussing, generalising and recording their observations. These ideas are not new and are contained in the Number strand of the current *Mathematics K–6 Syllabus* (1989). Separating these concepts into a new Patterns and Algebra strand is intended to demonstrate the connections between these early understandings and the algebra concepts that follow.

A more abstract approach to Algebra is used in Stage 4, Stage 5 and Stage 5 Extension. This incorporates linear and non-linear relationships and graphing of relationships on the number plane. In these Stages, Algebra has strong links with each of the other strands in situations that are to be generalised symbolically.

Measurement

Measurement enables the identification and quantification of attributes of objects so that they can be compared and ordered. In the Measurement strand in Early Stage 1 to Stage 3, the development of measurement concepts progresses through several processes. There is a need for identification of a particular attribute, use of informal units for measuring the attribute, realisation that there is a need for a formal unit, and finally application of this knowledge in a variety of contexts. Choosing the appropriate attribute, and unit of measurement, and determining the degree of accuracy required is critical to the development of understanding. Approximation skills play an important role in developing understanding since all measurements are approximations. Estimation skills are essential particularly in situations where it is not convenient or necessary to use measuring devices. Further work with surface area and volume is considered in Stage 4, Stage 5 and Stage 5 Extension, with trigonometry introduced in Stage 5.

Space and Geometry

In Early Stage 1 to Stage 3, the Space and Geometry strand includes the exploration of two-dimensional shapes and three-dimensional objects as well as the concepts of position and location. In Stage 4, Stage 5 and Stage 5 Extension, a more formal approach is developed as students are able to deal with more abstract concepts related to spatial reasoning.

This strand supports the development of spatial visualisation. An important and critical development for students is to be able to visualise, recognise and draw shapes that are embedded, or in a different orientation, in a diagram, as well as to be able to describe the features and properties of a variety of two-dimensional shapes and three-dimensional objects.

Data

The Data strand extends from Early Stage 1 to Stage 5, and includes the collection, organisation, display and analysis of data. Early experiences are based on real-life contexts using concrete materials. This leads to data collection methods and the display of data in a variety of ways. Students are encouraged to ask questions relevant to their experiences and interests and to design ways of investigating their questions. Students should be aware of the extensive use of statistics in society. Print and Internet materials are useful sources of data that can be analysed and evaluated. Tools such as spreadsheets and other software packages may be used where appropriate to organise, display and analyse data.

Additional Content

Optional topics, referred to as Additional Content, will be included in the syllabuses. These topics are not prescriptive and not essential for future Mathematics learning. The purpose of the Additional Content is to provide further opportunities to enrich, broaden and extend students' learning.

The following table contains possible topics for inclusion in the syllabuses as *Additional Content*. Such topics could be used by teachers to stimulate students interest in other areas of mathematics not considered to be essential learning: that is, these topics are not required as prerequisite knowledge for other topics in the K to 12 Mathematics curriculum.

Stage 2	Stage 3	Stage 4	Stage 5	Stage 5 Extension
Further patterns on hundreds charts including multiples of 11, 12, and 15 Paper folding	Exploration of numbers such as perfect and amicable numbers The history of the calendar The history of other measuring devices such as sundials Tessellations Codes Knots Platonic solids Long division (not multiples of 10) History of measurement in Australia Other measurement systems	Set theory Number bases other than 10 Platonic solids Further tessellations (including semi-regular tessellations) Networks Topology Archaic calculating methods Construction of magic squares	Unusual units of measurement Mathematics of Small Business Surveying and navigation Mathematics involving handicrafts Fractals Cube root formula Golden section Golden mean construction Algorithm for finding square roots Logic puzzles	Number theory Finite differences

4.5 The Relationship between Mathematics and Numeracy

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For your information

The Relationship between Mathematics and Numeracy *details the particular relationship between Mathematics and Numeracy and the special responsibility of Mathematics teachers for aspects of Numeracy beyond those required of all K-10 teachers.*

To be numerate is to use mathematics effectively to meet the general demands of life at home and at work, and for participation in community and civic life. Numeracy incorporates the disposition to use numerical, spatial, graphical, statistical and algebraic concepts and skills in a variety of contexts. It involves interpreting, applying and communicating mathematical information in a range of practical situations.

Mathematics involves using more abstract skills than the everyday skills required for being numerate. While mathematics involves dealing with an increasingly large body of content at a more and more abstract level, numeracy on the whole requires the use of less abstract skills and the application of these skills in practical contexts. The skills of numeracy are a subset of the skills of mathematics but they are applied in a wider context than just mathematics.

Teachers of mathematics play a key role in the development of numeracy by providing students with opportunities to choose, use, evaluate and communicate mathematical ideas in a range of situations. Through engaging with a variety of applications of mathematics to real-world situations and problems in other subjects, students' numeracy and underlying mathematical understanding will be enriched.

4.6 K–10 Mathematics Scope and Continuum

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For your information

The **K–10 Mathematics Scope and Continuum** *provides an overview of the continuum of learning in Mathematics from Kindergarten to Year 10.*

Consultation during Phase 1 of the syllabus development process suggested that the current *Years 7-8 Mathematics Syllabus* repeats a significant amount of content identified for Stages 2 and 3 and does not provide sufficient opportunity for extending the full range of students. For some students, this results in a revisiting of content that may not contribute to further development of their mathematical knowledge, skills and understanding. To address this issue a continuum of mathematical learning has been developed.

Under current arrangements in Years 9 and 10, content is arranged into Advanced, Intermediate and Standard courses. The Advanced course is studied by more able students and contains and extends the content from the Intermediate course. To cater for the needs of these students, most of the current extension material from the Advanced course has been placed in Stage 5 Extension in the continuum. It is envisaged that these students would progress more quickly through the earlier Stages so that they would be able to spend more time on the content of Stage 5 and Stage 5 Extension.

Currently, another group of students study the Standard course in Years 9 and 10. The Standard course introduces little new content, but repeats much of the Stage 4 content by presenting it in different contexts, or *themes*. One approach to meeting the needs of this group of students is to modify the rate of progress through the content, ensuring that they develop sound understanding. This means that they might not learn all of the content described for Stage 5 by the end of the compulsory years of schooling. Another approach is to meet the needs of individual students within mixed-ability classes. A support document will present content through a set of themes to assist teachers in presenting this content to such students.

Purpose of the K-10 Mathematics Scope and Continuum

The K-10 Mathematics Scope and Continuum (pp 26-30) is an overview of essential content in the proposed strands: Working Mathematically, Number, Patterns and Algebra, Measurement, Space and Geometry, and Data. The Working Mathematically strand is written as outcomes whereas the other strands contain content statements. The Scope and Continuum shows the development of the five processes in the Working Mathematically strand from Early Stage 1 to Stage 5 Extension.

The concepts in each of the other five strands are developed across the Stages to show how understanding in the early years needs to precede understanding in later years. In this way, the Scope and Continuum provides a picture of the sequence of learning for particular concepts in mathematics and links content typically taught in primary mathematics classrooms with content that is typically taught in secondary mathematics classrooms. It illustrates assumptions about prior learning and indicates pathways for further learning.

Structure of the Scope and Continuum

The Scope and Continuum presents a developmental framework of mathematics

learning from Early Stage 1 to Stage 5 Extension. The content presented in any particular Stage represents the knowledge, skills and understanding that is to be achieved by a typical student by the end of that Stage. It needs to be acknowledged that students learn at different rates and in different ways, so that there will be students who have not achieved the outcomes for the Stage prior to that identified with their chronological age. Teachers will need to identify these students and to plan learning experiences that provide opportunities for the development of understanding of concepts and the correction of misconceptions. Each Stage builds upon the knowledge, skills and understanding developed in previous Stages.

Teachers will need to assess each student's understanding across the strands before planning further learning experiences. In this way it will be possible to build on what students already know. It is recommended that teachers should not take action to progress students to the next Stage of learning for a concept until they have clearly demonstrated understanding at the current Stage. It should be recognised that students may be at different stages in different strands (eg a student may be working in Stage 3 Number and Stage 4 Space). Teaching programs should be designed to meet the range of students needs and to support progress at a rate that is appropriate for the development of conceptual understanding. More able students within a class can progress to the next Stage or be provided with alternative enrichment opportunities through the Additional Content.

It is not intended that the Scope and Continuum be used as a checklist of teaching ideas. Rather, a variety of rich learning experiences needs to be planned and presented to students to maximise opportunities for sound understanding of all concepts. Students need appropriate time to explore, experiment and engage with the underpinning concepts and principles of what they are to learn. In addition, when planning for the next stage of development, review of earlier learning is critical to support the learning of more complex ideas.

Meeting the needs of Students in Stage 5

The current course arrangements in Stage 5 lead to three standards which are reflected in the proposed K-10 Mathematics Scope and Continuum. Three standards of knowledge and understanding at the end of Year 10 can be catered for through the provision of three defined courses or pathways of learning; each leading to a standard that would be reflected in reporting for the School Certificate. In addition these standards would provide articulation with Stage 6 courses and establish the development of sound numeracy skills deemed suitable for the end of the compulsory years of schooling.

These pathways need to build upon the learning of Stage 4 content. Since not all students achieve Stage 4 outcomes at the same time, it would be more appropriate to have a structure that allows three, or more, pathways to be commenced earlier or later depending on the achievement of Stage 4 outcomes.

The K-10 Mathematics Scope and Continuum provides teachers with an overview of content and outcomes and sets out a continuum of learning. It acknowledges that students learn at different rates and in different ways and will develop their understanding of concepts at different times. As important as the three or more endpoints for Year 10 are, it is also important to ensure that students develop a sound understanding of the Stage 4 outcomes. Currently, the Years 7-8 course is presented to students until the end of Year 8. Students then begin a Years 9-10 course at the beginning of Year 9. This issue needs to be addressed in the revised syllabus as much as the issue of acknowledging different exit points for year 10. As a

result it is possible to envisage at least three scenarios across Years 7 to 10.

When students enter Year 7, some may not have achieved the Stage 3 outcomes and in some cases, the Stage 2 outcomes. These differences need to be acknowledged and learning experiences need to be planned to support the development of knowledge, skills and understanding at these Stages before progression to Stage 4 content. This preparation may take most of Year 7 so that these students would not commence working towards the Stage 4 standard until Year 8. Flexibility in the delivery of pathways of learning would enable students to spend more time developing and consolidating an understanding of the Stage 4 content. These students could then work towards achievement of a specified subset of outcomes for Stage 5 in preparation for the General Mathematics Preliminary course.

Another group of students would have achieved most of the Stage 3 outcomes when they begin Year 7 and might take two years to achieve the Stage 4 outcomes. This group would then spend two years working towards achievement of the Stage 5 outcomes and the identified middle standard of achievement. They would typically study the General Mathematics course in Stage 6, although, with additional support, they could undertake the Mathematics course.

At the commencement of Year 7, other students will have achieved the Stage 3 outcomes and possibly some of the Stage 4 outcomes. These students may achieve the outcomes for Stage 4 within twelve or eighteen months and be ready to commence Stage 5 outcomes as well as Stage 5 Extension outcomes. This pathway would typically lead students to the attainment of the highest standard by the end of Year 10, preparing them for the more challenging Mathematics, Mathematics Extension 1 and Mathematics Extension 2 courses.

School Certificate Credentialling for Students with Special Needs in Stage 5 provides Stage 5 Life Skills courses in each Key Learning Area. The intention of the Stage 5 Life Skills provision is to provide teachers with the opportunity to design integrated teaching/learning programs for students with special education needs which enable them to meet the curriculum requirements for the award of a School Certificate.

In providing Life Skills courses, the Board recognises that for some students, the majority of whom will be students with an intellectual disability, regular Board Developed courses might not provide sufficient scope for the development of an appropriate program of study. The review of Life Skills courses for students in Years 7-10 in each Key Learning Area, including Mathematics, will be undertaken in conjunction with the review and development of all Years 7-10 syllabuses. A revision of the Mathematics Life Skills course will take into account the structure and content of K-10 Mathematics.

The K–10 Mathematics Scope and Continuum

The K—10 Mathematics Scope and Continuum is presented on the next five pages. The first table is an overview of the Working Mathematically strand and is presented in outcomes to show the progression of knowledge, skills and understanding from Early Stage 1 to Stage 5 Extension.

The subsequent tables contain the content for the remaining five strands, Number, Patterns and Algebra, Measurement, Space and Geometry, and Data. These tables present proposed sequences of learning for particular concepts in the mathematics curriculum across the Stages from Early Stage 1 to Stage 5 Extension and are presented as content statements.

K-10 MATHEMATICS SCOPE AND CONTINUUM

Working Mathematically (written in outcomes):

Process	Early Stage 1	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5	Stage 5 Extension
Questioning Students ask questions in relation to mathematical situations and their mathematical experiences	Asks mathematical questions about everyday situations	Asks questions about mathematics when using materials in practical situations	Poses questions or problems in relation to mathematical situations	Extends mathematical tasks by asking what if questions	Formulates a question or problem derived from real-world situations that can be explored using mathematics	Poses follow-up questions arising from a problem s solution or mathematical enquiry	Makes, refines and tests conjectures
Applying Strategies Students develop, select and use a range of strategies, including the use of technology, to explore, and develop solutions in solving problems	Explores mathematical questions using objects, actions and/or trial and error	Explores basic mathematical concepts using pictures, imagery and available technology	Determines and applies appropriate techniques, either mental, written, calculator or computer, in the solution of problems	Selects and uses appropriate problem-solving strategies and technology in undertaking investigations	Analyses a real-life situation in mathematical terms, systematically posing and solving problems using technology where appropriate	Uses appropriate problem-solving strategies which include selecting and organising key information and identifying and working on related problems	Solves problems using a range of strategies including modelling and deductive reasoning
Communicating Students develop and use appropriate language and representations to formulate and express mathematical ideas	Describes mathematical situations using everyday language, actions, materials, symbols and drawings	Describes mathematical situations and methods using everyday language, actions, materials, diagrams and symbols	Uses some mathematical terminology to describe or represent a mathematical situation	Describes and represents a mathematical situation in a variety of ways using mathematical terminology and some conventions	Uses terminology, notations, algebraic symbols, diagrams, text and tables to communicate mathematical ideas	Uses appropriate mathematical language, and algebraic and other notations in written, oral or graphical form	Uses and interprets formal definitions when explaining solutions and/or conjectures
Reasoning Students develop and use processes for exploring relationships, checking solutions and giving reasons to support their conclusions	Checks answers to mathematical questions by repeating the processes	Explains how the answer to a mathematical question was obtained	Checks the reasonableness of an answer to a problem using an alternative method	Gives a valid reason for supporting one possible solution over another	Compares the strengths and weaknesses of different strategies and solutions	Uses mathematical arguments to reach conclusions and justify generalisations	Uses deductive reasoning in presenting arguments and formal proofs
Reflecting Students reflect on their experiences to make connections with existing knowledge and understanding	Describes recent mathematical learning	Explains changes in mathematical approach as a result of experiences	Reflects on whether a method of solution for a problem can be improved or linked to other experiences	Applies a familiar solution method to new problems	Links concepts and processes within and between mathematical contexts	Reflects on the relationships between mathematical ideas and how mathematics is applied in everyday situations including retail and employment, and other subject areas	Understands interconnections between mathematical ideas and how they build on one another to produce a coherent whole

Note: For the shaded process, Applying Strategies, a sample set of indicators has been written for Early Stage 1 to Stage 3 and is presented on page 32.

Note: the remainder of the Scope and Continuum is written as content statements.

	Early Stage 1	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5	Stage 5 Extension
NUMBER	Develop forward and backward number word sequences Count (with materials),compare and order numbers to at least 30 Read, represent and record numbers to at least 20	Count, read, represent and record numbers to at least 1000 Compare and order numbers to 1000	Count, read, represent and record numbers to at least 10 000 Compare and order (using the symbols < and >) numbers to 10 000	Count, read, write, compare, and order numbers to 100 000 000 Compare to other counting systems (eg Roman) Explore numbers less than zero on the number line	Explore other counting systems Perform operations with directed numbers		
	Visualise numbers and their combinations from pictorial representations (ie the ten frame)	Count forwards and backwards by 10, on and off the decade Develop mental facility with number facts, combinations, sequences for 2, 5, 10; explore odd and even numbers	Count forwards and backwards by 100 and 10, on and off the decade Develop mental facility with multiples of numbers up to 10 Find factors and squares of numbers	Recall number facts Examine primes and composites	Investigate groups of positive whole numbers Express a number as a product of primes		
	Combine, partition, group and share using materials - informal recording	Develop strategies for addition and subtraction including counting-on and counting-back; develop strategies other than counting-by-ones; use various strategies on the number line Develop multiplication and division strategies Use informal recordings	Add, subtract, multiply and divide using estimation, mental strategies, materials and written forms (focus on 1-digit operators for multiplication and division) Develop formal algorithms for addition and subtraction Identify and use place value to thousands Use decimal numbers that are linked to real contexts	Add, subtract, multiply and divide with whole numbers using estimation, mental computation strategies, and formal algorithms (for multiplication limit operator to 2-digit numbers, for division limit operations to multiples of 10) Extend place value with decimals	Simplify expressions (including those with grouping symbols) using order of operations Find squares/related square roots; cubes/related cube roots Use index notation and express decimal numbers in expanded notation	Develop the index laws arithmetically Express numbers in scientific notation (positive and negative powers of 10) Round numbers to a specified number of significant figures (relate to measurement contexts)	
	Recognise and describe fractions as part of a whole unit that arise from everyday contexts	Explore fractions using words, materials and diagrams (linked to everyday situations)	Recognise, compare and represent commonly used fractions and related decimals Recognise percentages in everyday contexts	Represent simple fractions as decimals and percentages Add and subtract simple fractions and decimals Multiply and divide decimals by whole numbers arising from everyday situations Multiply fractions by whole numbers arising from everyday situations Find simple percentages of quantities	Perform operations with fractions, decimals and mixed numbers Solve a variety of problems involving percentages Write and use ratios and rates	Apply rational number concepts Convert rates from one set of units to another	Explore the system of real numbers Perform operations with surds Generate and describe exponential relationships Solve problems involving variation
	Use the language of money in everyday contexts	Establish the face value of money Sort, order, classify and count money Perform simple money calculations	Examine equivalent denominations of money Perform simple calculations including finding change and rounding	Apply the four operations to money	Solve consumer arithmetic problems (commission, discount, simple interest, compound interest using tables of values, earning money)	Solve further consumer arithmetic problems including problems involving compound interest, depreciation, successive discounts	

	Discuss fairness in everyday situations	Discuss the likelihood of everyday events - possible/impossible, certain/uncertain	List and count all possible outcomes of a simple single-stage experiment Discuss likelihood of a single-stage event occurring	Assign numerical values to the likelihood of simple events occurring and order on the number line	Determine the probability of simple events; solve simple probability problems; recognise complementary events	Determine relative frequencies and theoretical probabilities	Solve probability problems involving compound events

	Early Stage 1	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5	Stage 5 Extension
PATTERNS AND ALGEBRA	Recognise, describe, make and continue simple number and shape patterns using materials	Extend or supply missing elements for number patterns	Generate number patterns using a variety of strategies and describe the processes used	Represent, analyse, and generalise a variety of patterns using tables, graphs and words	Use algebraic expressions to describe patterns Simplify algebraic expressions; substitute into algebraic expressions and formulae; expand and factorise algebraic expressions	Solve non-routine problems by generalising the solution symbolically; compare and contrast different methods of solution Solve simultaneous equations	Relate algebra to physical phenomena, modelling and rates of change Solve literal equations, and inequations Find binomial products Factorise monic quadratic expressions Solve quadratic equations by factorising, completing the square or using the quadratic formula
	Use the language of equality (the same as/equal to/=)	Explore equivalent number statements (eg 3+4 = 4+3)	Investigate related number statements using inverse operations Establish equivalence by completing a number sentence with a missing number	Construct, verify and complete number sentences (equations) involving the four operations with a variety of numbers	Solve simple linear equations a and word problems using algebra Examine number plane and ordered pairs Determine midpoints, distance using Pythagoras theorem, from diagrams Graph relations Use index notation with pronumerals (positive integral indices only)	Solve equations and graph functions Use distance, gradient and midpoint formulae Explore everyday graphs and parabolas Use index notation (for square and cube roots) and the index laws	Determine the equations of straight lines from given information Graph cubics, hyperbolas and circles # Curve sketching and polynomials # Functions and logarithms

These topics are optional but should be considered for students preparing to study the Extension courses in Stage 6.

	Early Stage 1	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5	Stage 5 Extension
MEASUREMENT	Identify the attribute for length, area, volume (capacity), mass Use everyday language for the above attributes Compare directly and order two objects for length, area, capacity and mass - record comparison informally	Use informal units to estimate compare, order and record length, area, volume, capacity and mass for two or more objects Recognise the need for a formal unit of length	Recognise the need for formal units for area, volume, and mass Estimate, compare, measure and record using mm, cm and m for length; square centimetres and square metres for area; litre and millilitre for capacity; kg and g for mass Convert between m and cm Read simple linear scales including thermometers Measure the perimeter of 2D shapes	Choose and use the appropriate measuring device and unit for a task and establish the need for kilometres, square kilometres, hectares, cubic centimetres and cubic metres, tonne Convert between mm, cm, m, km; g, kg, tonne; ml. L; square m and hectare Find perimeter and area of squares, rectangles, triangles and develop formulae in words Estimate, compare and measure the volume of right prisms in cubic centimetres and cubic metres using materials Recognise relationships in volume/capacity (cubic centimetres and millilitres)	Describe the limit of accuracy of measuring instruments Convert metric units of volume and area Develop formulae and find the area and perimeter of a variety of polygons Find areas of simple composite figures Apply Pythagoras' theorem Investigate area and circumference of circles and the volume of cylinders Find surface area and volume of rectangular prisms Explore the relationship between the volume and mass of water	Find areas and perimeters of more complex composite figures Find surface area of cylinders Apply formulae for volume of pyramids, cones, spheres	Apply formulae for surface area of pyramids, cones and spheres
	Use everyday language for time	Compare the duration of two or more events Locate and sequence events in time by referring to calendars and reading clocks (hour and half-hour)	Compare, sequence and order time using digital and analog notation Read clocks to the minute using am/pm notation Compare time units (second, minute, hour, day, week, month, year) Read and interpret simple timetables, timelines and calendars	Construct timelines and simple timetables including 24-hour time Convert between time units Investigate Australian time zones and daylight saving	Construct and interpret complex timetables and timelines Use international time zones to compare times	Use trigonometry to find sides and angles in right-angled triangles Solve problems involving angles of elevation, angles of depression, and bearings	Determine the exact trigonometric ratios for 30…, 45…, 60… Apply relationships in trigonometry - complementary angles and sin and cos in terms of tan Determine trigonometric ratios for obtuse angles Explore trigonometry with non-right-angled triangles: sine rule, cosine rule and area rule Sketch sine and cosine curves

	Early Stage 1	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5	Stage 5 Extension
SPACE AND GEOMETRY	Explore and sort 3D objects and 2D shapes in terms of their size and shape using everyday language	Describe, group, classify and name simple 3D objects and 2D shapes presented in different orientations Make models of and draw 3D objects Recognise 3D objects from 2D representations in pictures, diagrams Explore cross sections of 3D objects	Classify and use formal names for 3D objects and 2D shapes Investigate properties of 3D objects and 2D shapes Make and draw prisms, pyramids, and cylinders	Make models of 3D objects Investigate common nets Make isometric drawings Classify, construct, describe and compare properties of common 2D shapes	Determine properties of 3D objects Classify, and determine properties of: - angles - triangles - quadrilaterals Identify parts of the circle	Describe further properties of quadrilaterals including diagonal properties Establish angle properties of polygons	Construct proofs of geometrical relationships involving triangles and quadrilaterals Examine proofs of Pythagoras theorem
	Make 3D and 2D patterns by finding the next shape or a missing shape Explore the symmetry of shapes	Make patterns using flips, slides, turns and tessellations Create 2D shapes Find and use lines of symmetry	Describe and create tessellations	Make simple enlargements and reductions of 2D shapes Interpret simple scales on plans Explore rotational symmetry	Investigate similar figures and interpret and construct scale drawings Identify congruent figures	Identify similar triangles and describe their properties Apply tests for congruent triangles	Explore and use further similarity and congruence relationships
	Draw straight and curved lines	Recognise corners as angles Compare angles by superposition	Recognise openings and slopes as angles; use informal measurement Recognise parallel lines	Recognise rotation as angles; appreciate the need for a formal unit and measure angles to 360…	Construct parallel and perpendicular lines and determine associated angle relationships Complete simple numerical exercises based on geometric properties	Use simple deductive reasoning in numerical and non-numerical problems	# Circle geometry- chord properties of circles; angle properties of circles; tangents and secants; and proofs using circle theorems
	Use everyday language for position Give and follow simple directions	Describe the position of objects and represent position using diagrams Give and follow directions (including N, S, E, and W)	Use simple maps and informal grids to represent position and follow routes Use compass directions (eg NE)	Read maps and street directories	Interpret true bearings (eg 130^0)		
DATA	Use pictures and objects as symbols to organise data that is collected from the students and their surroundings Interpret information from data displays	Gather and organise data using concrete materials and pictorial representation Display and interpret data using concrete materials and create graphs using pictorial representation	Gather and organise data using tables and column graphs Display and interpret data using tables, column and picture graphs	Read and interpret picture, simple line, pie (sector), divided bar graphs with scales Draw column, picture, line and divided bar graphs (using scales) Collect, represent and evaluate a set of data Sequence data and determine middle (median) and average (mean) scores	Draw, read and interpret graphs (line, sector, travel, step and conversion graphs, dot plots and stem-and-leaf plots), tables and charts Construct frequency tables Distinguish between types of variables; Use sampling and census; Identify misrepresentation of data Make predictions from samples and diagrams Analyse data using mean, mode, median and range	Construct and interpret box-and-whisker plots Construct frequency tables for grouped data Determine cumulative frequency Determine the upper and lower quartiles of a set of scores Find the standard deviation of a set of scores	

4.7 Outcomes for Early Stage 1 to Stage 5

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For your information

Syllabus **outcomes** *express the specific intended student learning that results from the teaching of the syllabus. They are derived from the objectives and content of the syllabus. Outcomes provide clear statements of the knowledge, skills and understanding expected to be gained by most students as a result of effective teaching and learning of a Key Learning Area/subject by the end of a Stage.*

In this section of the writing brief, a sample set of outcomes for Early Stage 1 to Stage 5 Extension is presented in the table on page 32. These outcomes relate to particular concepts that form a developmental sequence across the Scope and Continuum.

The proposed outcomes for the Working Mathematically strand were presented on page 26.

Sample Outcomes for Early Stage 1 to Stage 5 Extension

Strand Substrand/Topic	Early Stage 1	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5	Stage 5 Extension
Number: Fractions and Decimals Fractions, Decimals and Percentages Rational Numbers	Describes part(s) of a whole in everyday contexts	Describes and models fractions occurring in everyday situations	Compares and represents commonly used fractions and related decimals and percentages	Compares, orders and calculates with decimals, simple fractions (multiplying by whole numbers that occur in everyday situations) and simple percentages	Performs operations with fractions, mixed numbers, decimals and percentages and applies these in consumer, ratio and rate contexts	Selects and uses appropriate rational number concepts in a range of contexts	Selects and uses appropriate rational number concepts in a range of contexts
Measurement: Length and Area Perimeter, Area, and Surface Area	Sorts and describes objects in terms of length and area	Estimates, measures, compares, orders and records lengths, distances and areas using informal units; estimates and measures lengths to the nearest metre and centimetre	Estimates, compares, orders, measures and records lengths and distances in millimetres, centimetres and metres and the area of surfaces in square centimetres and square metres	Estimates, measures (where feasible) and records lengths and distances in metric units from millimetres to kilometres and area in square centimetres, square metres and hectares	Measures lengths describing the degree of accuracy and uses formulae and Pythagoras' theorem in calculating perimeter and area of figures composed of quadrilaterals, triangles and circles	Finds areas and perimeters of complex composite figures	Applies formulae for finding surface areas of pyramids, cones and spheres
Data: Data Handling Data Representation, Data Analysis and Evaluation	Uses pictures and objects as symbols to organise and interpret simple data displays	Gathers, organises, displays and interprets data using concrete materials and picture graphs	Gathers, organises, displays and interprets data using tables and column graphs	Gathers, organises, displays, and reads and interprets data and graphs with scales of many-to-one correspondence	Constructs, reads and interprets graphs, tables and charts, and analyses data using mean, mode, median and range	Uses appropriate statistical processes and techniques to organise, display, analyse and evaluate data	
Measurement Trigonometry						Applies trigonometry to problems including situations involving angles of elevation and depression and bearings	Applies trigonometric relationships, sine rule, cosine rule and area rule in problem solving

Note: Some of the cells in the table are shaded because there is no content for that concept at that particular Stage.

Past practice in the development of Board syllabuses for Years K to 6 has been to provide indicators to support teachers in their planning, programming and assessment of outcomes. This practice has been maintained for Early Stage 1 to Stage 3 in the development of the new syllabuses.

A sample set of indicators for each of the outcomes for the *Applying Strategies* process contained in the Working Mathematically strand is presented below for Early Stage 1 to Stage 3. *Applying Strategies* involves students developing, selecting and using a range of strategies, including the use of technology, to explore, and develop solutions to problems.

Early Stage 1
Explores mathematical questions using objects, actions and/or trial and error
- makes and describes patterns using a variety of objects
- compares two masses by pushing, pulling and hefting
- divides the class into groups to work out how many in each group

Stage 1
Explores basic mathematical concepts using pictures, imagery and available technology
- draws a picture to represent the information in the question
- imagines a group of objects and mentally takes away objects to work out how many are left
- compares the mass of objects using a balance beam

Stage 2
Determines and applies appropriate techniques, either mental, written, calculator or computer, in the solution of problems
- uses 'bridging the decades' for addition and subtraction tasks
- uses a table to represent collected data

Stage 3
Selects and uses appropriate problem-solving strategies and technology in undertaking investigations
- develops a systematic recording method when the number of options becomes large
- breaks a problem down into a series of simpler problems
- uses a stopwatch to time events where accuracy is important

4.8 Content for Early Stage 1 to Stage 5

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For your information

Content *describes the knowledge, skills, understanding and values to be studied and developed by students over a Stage or Stages in a syllabus and the development of processes of learning so that students are encouraged to be effective learners.*

Content will be expressed in syllabuses in the form of:
- *Students learn about*
- *Students learn to.*

In this syllabus, 'students learn about' represents the mathematical content to be addressed. 'Students learn to' incorporates the purpose for learning the mathematics relevant to the outcome and examples of the types of questions and experiences that reflect applications of the content.

A sample of proposed outcomes and content statements is listed below for a subsection of each of the strands Number, Measurement, and Data. Proposed content is described for the purpose of consultation and examples are for illustrative purposes only.

Strand:	Number	**Substrand :**	Fractions and Decimals

Early Stage 1 Outcome:
Describes part(s) of a whole in everyday contexts

Students learn about	**Students learn to**
• describing equal parts • dividing an object into equal parts eg cutting a piece of fruit into halves • using the terms one-half and one-quarter in everyday situations	• use fraction language in real-life situations eg one-half of the cake is eaten • show fractions of objects using drawings eg half a pizza, a quarter of a muesli bar • describe how to make equal parts eg how to cut a sandwich into halves or quarters

Stage 1 Outcome:
Describes and models fractions occurring in everyday situations

Students learn about	**Students learn to**
• dividing a group of objects into equal parts • dividing a whole into equal parts (representing fractions as part of a group eg 2 out of 10 counters are red) • using fraction notation (1/2, 1/4, 1/3)	• use fraction language in number, patterning and algebra, measurement, space and geometry, and data contexts eg the half-hour, one-quarter of the class • relate fractions to everyday contexts eg age, half-hour television programs • communicate fraction ideas to others using fraction notation • visualise a fraction as equal parts

Stage 2 Outcome:
Compares and represents commonly used fractions and related decimals and percentages

Students learn about

- interpreting the numerator and denominator of a fraction
- comparing and ordering fractions with the same denominator
- calculating unit fractions of a collection of objects including 1/2, 1/3, 1/4, 1/5, 1/8, 1/10
- finding equivalent fractions for halves and tenths
- representing and using the terms tenths and hundredths
- demonstrating equivalence between, and comparing and ordering, tenths and hundredths
- expressing tenths and hundredths as decimals
- interpreting decimal notation for tenths and hundredths
- comparing and ordering decimals with the same number of decimal places (to 2 decimal places)
- representing and recording whole numbers, tenths, hundredths as fractions and decimals
- adding and subtracting decimals with the same number of decimal places (to 2 decimal places)
- describing the meaning of a percentage eg 7% means 7 out of 100
- recognising that the symbol % means percent
- comparing and ordering percentages

Students learn to

- communicate an understanding of fractions, decimals and percentages using fraction terminology eg 3/4 is the same as three out of four and three-quarters
- pose questions about a collection of items eg after surveying the class, ask what fraction of the class are wearing sneakers?
- solve problems involving everyday contexts eg if one-third of the class are going to the computer room, how many students will that be?
- apply decimals to money contexts including addition and subtraction
- interpret a calculator display in the context of the problem eg 2.6 means $2.60
- interpret the everyday use of fractions, decimals and the % sign eg advertisements
- apply decimal knowledge to record measurements eg 123 cm = 1.23 m
- check using an alternative method whether an answer is reasonable eg 1/2 is the same as 0.5 and 5/10 by using a number line or calculator

Stage 3 Outcome:
Compares, orders and calculates with decimals, simple fractions (multiplying by whole numbers that occur in everyday situations) and simple percentages

Students learn about

- finding equivalent fractions derived from everyday situations
- adding and subtracting fractions
- multiplying simple fractions by whole numbers arising from everyday situations, using concrete or diagrammatic representations
- adding and subtracting decimals with a different number of decimal places
- multiplying and dividing decimals by whole numbers in everyday contexts eg money, measurement
- expressing equivalence of common fractions, decimals and percentages eg 0.25 = 25/100 = 1/4 = 25%
- calculating simple percentages (10%, 25%, 50%, 75%) of quantities

Students learn to

- use mental strategies to convert between fractions and percentages to estimate discounts
- solve problems involving simple proportions eg a recipe for 8 people requires 3 cups of sugar, so for 4 people it requires $1\frac{1}{2}$ cups
- interpret fractions, decimals and percentages in everyday situations eg decide whether a 1.25 L bottle holds more than a 600 mL bottle; recognise that a 40% discount is more than a 25% discount
- use estimation to check whether an answer is reasonable
- recognise fractions in everyday situations, eg 45 mins = $\frac{3}{4}$ hr

Strand: Number **Topic (7-10):** Fractions, Decimals and Percentages

Stage 4 Outcome:

Performs operations with fractions, mixed numbers, decimals and percentages and applies these in consumer, ratio and rate contexts

Students learn about

- determining equivalent fractions
- adding, subtracting, multiplying and dividing fractions, mixed numbers and decimals
- calculating fractions, decimals and percentages of quantities
- converting between fractions, decimals and percentages
- ordering fractions, decimals and percentages
- calculating ratios of quantities
- sharing quantities in a given ratio
- recognising and using rate notation

Students learn to

- choose the appropriate equivalent form for mental computation eg $12\frac{1}{2}$ % of \$40 is 1/8 of \$40
- question the reasonableness of statements eg the size of the average family is 2.3
- interpret a calculator display in formulating a solution to a problem, by appropriately rounding a decimal
- solve a variety of real-life problems including problems involving consumer arithmetic, ratios and rates
- evaluate best buys and special offers eg discounts
- interpret descriptions of products that involve fractions, decimals, percentages or ratios eg on labels of the contents of packages
- use fraction, decimal and percentage notation and concepts in a range of contexts, including other subject areas
- apply fraction concepts in simplifying algebraic expressions

Stage 5 Outcome:

Selects and uses appropriate rational number concepts in a range of contexts

Students learn about

- representing rational numbers in decimal form
- writing recurring decimals in fraction form
- using scientific notation to represent rational numbers
- converting rates to different units

Students learn to

- assess the effect of truncating or rounding decimals during calculations
- determine an appropriate level of accuracy for a solution depending on the context
- compare the cost of purchasing using different methods of payment eg cash, lay-by, buying on terms, loan
- communicate and/or interpret technical information using scientific notation
- use rational numbers in problems involving compound interest, depreciation and successive discounts
- apply ratio and rates in a range of problem solving situations eg population growth, exchange rates for money, pricing scales
- analyse different forms of payment for work eg wages, salary, piecework, commission and overtime
- compare gross and net earnings eg calculate net earnings considering deductions such as taxation and superannuation

Stage 5 Extension Outcome:

Selects and uses appropriate rational number concepts in a range of contexts

Students learn about

- using significant figures

Students learn to

- relate significant figures to the level of accuracy of measurements

Strand:	Measurement	**Substrand:**	Length and Area

Early Stage 1 Outcome:
Sorts and describes objects in terms of length and area

Students learn about	Students learn to
• identifying objects that are longer/shorter than themselves or another object • comparing and ordering two or more items in terms of length by direct comparison • using everyday language to describe and compare length eg long, longer, high, higher • identifying and describing the surface of familiar objects by looking and touching • comparing two shapes directly by handling, superposing, cutting and pasting • using everyday language to describe and compare area eg surface inside a shape, edge, bigger than, smaller than • recording lengths and areas informally	• describe objects in terms of length using language, actions, materials, and drawings • solve problems of length and area in everyday situations eg which leaf is bigger?; which snake is longer? • ask mathematical questions in everyday situations eg which tower is taller? • use the term 'area' in everyday contexts eg 'wet area'

Stage 1 Outcome:
Estimates, measures, compares, orders and records lengths, distances and areas using informal units; estimates and measures lengths to the nearest metre and centimetre

Students learn about	Students learn to
• comparing, ordering and recording lengths and distances using the same informal units • measuring lengths using informal units ensuring alignment of ends • recording measurements informally • estimating, measuring and recording lengths and distances using centimetres and metres • measuring and comparing areas using different informal units • measuring, comparing and ordering areas using the same informal units • measuring areas using informal units ensuring alignment, no gaps or overlays	• choose an appropriate informal unit eg length of a book could be measured in blocks, counters or fingers • recognise the limitations of informal units for measuring and comparing • apply estimation and measurement strategies to find lengths and distances in the environment eg find the shortest distance to the playground, determine whether the tallest person has the longest arm reach, estimate whether certain objects will fit into a pencil case • ask questions about measurement situations eg is there any relationship between height and arm length? • find the distance around objects eg the circumference of a garbage bin • explain answers and processes used to solve everyday problems eg selecting the best envelope size for a letter; determining how many hopscotch grids could be painted in a section of the playground; deciding how many cars would fit in the carpark • select appropriate shapes to improve the accuracy of area measures eg squares are better than circles

Stage 2 Outcome:
Estimates, compares, orders, measures and records lengths and distances in millimetres, centimetres and metres and the area of surfaces in square centimetres and square metres

Students learn about	Students learn to
• estimating, measuring and recording lengths and distances to the nearest millimetre • converting between mm, cm, m eg 123 cm = 1 m 23 cm • writing measurements in centimetres and metres and in decimal notation eg 3 m 56 cm = 3.56 m • identifying perimeter • estimating and measuring the perimeter of two-dimensional shapes • estimating and measuring around irregular objects eg tree trunks, garden edges • recording measurements using the standard abbreviations of mm, cm, m • estimating, measuring and recording the area of regular and irregular two-dimensional shapes by overlaying and counting squares on grids • identifying a square centimetre • estimating, measuring and recording the area of regular and irregular shapes using square centimetres • identifying a square metre • comparing and ordering areas • estimating, measuring and recording larger areas using the square metre	• compare lengths, heights and distances eg in athletics events such as the long jump and the high jump • interpret linear scales eg on thermometers, rulers • compare areas of shapes eg playground sizes • communicate measurement results using appropriate notation • solve problems using appropriate measuring devices and units of measure eg measure the height of a friend in cm and m • interpret measurements in the context of the problem • distinguish between perimeter and area • solve real-life problems involving length eg find the length of wire needed to make a basketball ring • estimate length in metres and centimetres using references in everyday life eg my arm span is approximately one metre

Stage 3 Outcome:
Estimates, measures (where feasible) and records lengths and distances in metric units from millimetres to kilometres and area in square centimetres, square metres and hectares

Students learn about	Students learn to
• identifying the kilometre as a measure of distance • estimating, measuring and recording measurements in mm, cm, m and km • recording measurements using decimal notation • converting between units of length • explaining the relationship between length, breadth and area of squares and rectangles • explaining the relationship between base, perpendicular height and area of triangles • finding the area of squares, rectangles and triangles using formulae in words • identifying hectares and square kilometres as units for measuring area • converting between square metres and hectares • reading and interpreting scales on maps and simple scale drawings	• interpret measurements in the context of the problem eg the distance from Sydney to Brisbane in kilometres not square kilometres • solve problems using appropriate measuring devices and units of measure • construct plans to find areas • interpret measurements on simple plans • interpret scales on maps • apply measurement skills to everyday situations eg determine the area of the school; estimate and find the perimeter of the school grounds for fencing • use familiar lengths (eg pace) to estimate lengths and distances eg use their own pace to estimate the length of the playground • extend mathematical tasks by asking what if questions eg if I change the dimensions of a rectangle but keep the perimeter the same, will the area change?

Strand: Measurement **Topic (7-10):** Perimeter, Area, and Surface Area

Stage 4 Outcome:
Measures lengths describing the degree of accuracy and uses formulae and Pythagoras' theorem in calculating perimeter and area of figures composed of quadrilaterals, triangles and circles

Students learn about

- determining the limit of accuracy of measures
- choosing appropriate units of length and area measure and converting between metric units (eg 1 cm^2 = 100 mm^2)
- deriving formulae for area and perimeter of rectangles and area and circumference of circles
- calculating the area of figures composed of triangles and rectangles
- identifying the hypotenuse in a right-angled triangle
- establishing the relationship between the lengths of the sides of a right-angled triangle
- researching the historical and cultural aspects of the Pythagorean triad
- researching the history of pi

Students learn to

- measure to an appropriate degree of accuracy for a given task
- apply the formula for area of a rectangle to finding area of triangles, parallelograms, kites, trapeziums, and develop formulae where appropriate
- compare the strengths and weaknesses of different strategies for finding the area of composite figures
- apply area formulae to finding surface area of rectangular prisms
- apply area formulae and Pythagoras theorem to a range of practical situations including those involving scale drawings and coordinate geometry
- apply measurement concepts and skills when posing and solving problems in real-life situations eg sport, decorating, furnishing, dressmaking and carpentry
- estimate measures by referring to known measures eg a metre is about half the height of a doorway

Stage 5 Outcome:
Finds areas and perimeters of complex composite figures

Students learn about

- justifying and applying formulae for finding areas, lengths and perimeters of common quadrilaterals (parallelogram, rhombus, trapezium, kite)
- calculating areas and perimeters of composite figures that include triangles, quadrilaterals and circles

Students learn to

- apply area formulae to find the area of complex composite figures and the surface area of cylinders and composite solids
- formulate questions or problems that can be explored using measurement skills in analysing a practical situation
- deduce the maximum area that can be enclosed by a given perimeter

Stage 5 Extension Outcome:
Applies formulae for finding surface areas of pyramids, cones and spheres

Students learn about

- using formulae to find the surface area of spheres and cones

Students learn to

- apply area formulae to find the surface area of cylinders and pyramids, and where appropriate develop formulae
- formulate questions or problems that can be explored using measurement skills in analysing a practical situation

Strand:	Data	**Substrand :**	Data Handling

Early Stage 1 Outcome :
Uses pictures and objects as symbols to organise and interpret simple data displays

Students learn about
- collecting data about particular aspects of their lives
- sorting groups by an attribute
- using counting to compare groups
- organising pictures or objects into data displays
- making comparison statements about collections

Students learn to
- classify and sequence a group of objects eg leaves, fruit
- use pictures and objects to display collected data
- interpret information to answer questions eg more children have dogs than cats for pets

Stage 1 Outcome:
Gathers, organises, displays and interprets data using concrete materials and picture graphs

Students learn about
- collecting data to answer questions
- recording data using concrete materials, tally marks, words, symbols and calculators
- organising data by grouping into categories
- displaying data in a picture graph (where one picture represents one item)

Students learn to
- use information to answer questions about their environment eg favourite television program
- display data to communicate information
- interpret simple picture graphs constructed by others
- compare picture graphs to describe similarities and differences

Stage 2 Outcome:
Gathers, organises, displays and interprets data using tables and column graphs

Students learn about
- planning and collecting data
- using grouped tally marks
- organising data into lists and tables
- making simple vertical column graphs using a scale showing one-to-one correspondence
- using a title, axis labels and axis scales on graphs

Students learn to
- answer questions about their environment using displayed data
- interpret data presented in tables and column graphs
- compare the results of surveys
- use appropriate terminology eg axis, column graph, title, table
- pose appropriate questions while designing a survey

Stage 3 Outcome:
Gathers, organises, displays, and reads and interprets data and graphs with scales of many-to-one correspondence

Students learn about
- planning, designing, collecting and displaying data
- interpreting and constructing picture graphs with keys where many-to-one correspondence is used
- reading, interpreting and constructing column graphs using a scaled vertical axis
- reading, interpreting and constructing divided bar graphs
- reading and interpreting pie charts (sector graphs)
- reading, interpreting and constructing line graphs
- calculating middle and average scores for sequenced data sets

Students learn to
- evaluate information presented in tabular or graphical form, including from the media and other subject areas
- use collected data to make decisions eg food to be sold at the school canteen
- interpret statistics from a variety of contexts eg sport
- choose the appropriate type of graph to display data

Strand: Data **Topic (7-10):** Data Representation, Data Analysis and Evaluation

Stage 4 Outcome:
Constructs, reads and interprets graphs, tables and charts, and analyses data using mean, mode, median and range

Students learn about	Students learn to
• constructing, reading and interpreting graphs including line, sector, travel, step, and conversion graphs, dot plots and stem-and-leaf plots • constructing frequency tables, histograms and polygons • collecting data for a variety of variables (discrete and continuous data) • identifying situations that require a sample or a census • making predictions from graphs • analysing data using mean, mode, median and range	• evaluate information presented in tabular or graphical form from a variety of sources and other subject areas • analyse data to determine cases of misrepresentation • predict trends from graphs eg line graphs for population growth, temperature • interpret statements (eg through the media) related to measures of central tendency of a data set eg median house price • determine the most appropriate measure of central tendency for particular circumstances eg whether the mean or the median is more appropriate to provide an indication of the annual salaries of employees in a company

Stage 5 Outcome:
Uses appropriate statistical processes and techniques to organise, display, analyse and evaluate data

Students learn about	Students learn to
• determining cumulative frequency • constructing cumulative frequency histograms and ogives • constructing frequency tables and histograms for grouped data • calculating five number summaries of data (median, upper and lower quartiles, upper and lower extremes) • constructing and interpreting box-and-whisker plots • summarising and interpreting data using a variety of measures of location (mean, mode, median) and spread (range, standard deviation) • finding standard deviation using a calculator	• interpret and critique a range of displays of data (as found in the media and other sources) • determine the most appropriate form in which to display data graphically • recognise displays of data in which the data has been misrepresented eg in advertisements, media reports • draw informal conclusions based on sample data, appreciating that summary statistics may vary from sample to sample • apply statistical methods to analyse and display data in their work in other subjects • identify the distinctive features of data as evident from graphs and summary statistics eg outliers, clusters of scores and the shape of the distribution • undertake statistical investigations by planning, organising, analysing and evaluating data • critically review surveys, polls and reports and use published information to assist in the development of informed opinions and arguments eg about logging forests • investigate the role of statistics in shaping and describing aspects of public life eg in describing and influencing consumer tastes in developing public policy

Note: The following content sample relates to trigonometry, a topic in Stage 5 and Stage 5 Extension only.

Strand:	Measurement	**Topic (7-10):** Trigonometry

Stage 5 Outcome:
Applies trigonometry to problems including situations involving angles of elevation and depression and bearings

Students learn about

- identifying the hypotenuse, and the adjacent and opposite sides for a given angle in a right-angled triangle
- defining the sine, cosine and tangent ratios for angles in right-angled triangles
- demonstrating that the ratio of corresponding sides in right-angled triangles (such as opposite to adjacent) is constant for equal angles
- using trigonometric notation
- using calculators to find angles (in degrees and minutes) given trigonometric ratios
- using trigonometry to find unknown angles or sides in right-angled triangles
- identifying angles of elevation and depression
- drawing appropriate diagrams for problems involving three-figure bearings

Students learn to

- apply trigonometry to solve problems involving angles of elevation and depression and three-figure bearings
- formulate questions or problems that can be explored using trigonometry
- compare the strategy of using accurate scale drawing with the strategy of using trigonometry in solving particular problems

Stage 5 Extension Outcome:
Applies trigonometric relationships, sine rule, cosine rule and area rule in problem solving

Students learn about

- determining the exact trigonometric ratios for 30°, 45°, 60°
- establishing and using the relationship between the sine and cosine ratio of complementary angles
- expressing the tangent ratio in terms of the sine and cosine ratios
- finding trigonometric ratios for obtuse angles
- finding acute and/or obtuse angles, given a trigonometric ratio
- sketching sine and cosine curves for angles between 0° and 180° (graphics calculator or computer software might be used if available)
- deriving the sine rule, the cosine rule and the rule for finding the area of a triangle

Students learn to

- find unknown angles or sides in non-right-angled triangles
- find areas of triangles and other figures (eg regular hexagon) using trigonometric formulae
- select and use appropriate trigonometric ratios and formulae to solve problems including situations involving more than one triangle
- analyse a practical situation, posing questions to examine using trigonometry eg surveying, navigation
- link sine, cosine and area rules to other relationships or formulae when one of the angles in the triangle is 90° eg cosine rule and Pythagoras theorem

4.9 Cross-curriculum Content

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For your information

The Board of Studies is developing cross-curriculum content requirements to be included in the outcomes and content of syllabuses. The identified content will be incorporated appropriately in the Mathematics Years K to 10 syllabuses ensuring that it does not undermine or overwhelm subject integrity.

This content will be drawn from the following areas:

Information Communication Technologies
Key Competencies
Literacy
Numeracy
Work and Employment.

4.10 Prior-to-school Learning and Stage Statements

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For your information

Stage statements describe what students typically know and can do as a consequence of having undertaken the syllabus content prescribed for the Stage.

Prior-to-school Learning

Teachers need to acknowledge the learning that occurs prior to school. They should assess understanding, and plan appropriate learning experiences for their students. Children start developing mathematical understanding well before they start school since mathematics is a part of everyday life. In addition, many children will have participated in playgroup, child care and pre-school programs. It is important that teachers acknowledge the learning which students bring to school and make connections with the mathematical understanding they have acquired.

As children engage in daily life they construct a range of mathematical understandings. These are often enhanced by planned mathematical experiences in prior-to-school settings. Such understanding may include the development of number recognition, number representation and oral counting sequences, spatial awareness and shape recognition. In addition, vocabulary development is evident as students begin to acquire everyday language associated with length, volume, mass, time and position. Teachers need to become familiar with children s existing mathematical understanding as they commence school to ensure that programming is designed to meet the needs of individual students.

Early Stage 1 outcomes may not be the most appropriate starting point for all children. Some children will be ready to focus on these outcomes whereas others will need to develop more basic mathematical concepts. Still others may demonstrate understanding beyond Early Stage 1. The movement into Early Stage 1 should be seen as a continuum of mathematical learning. To ensure this continuum is maintained, teachers need to base their planning on the evaluation of current understanding related to all of the strands.

Stage Statements

Early Stage 1

Students who have achieved Early Stage 1 outcomes show a growing awareness of the many purposes of mathematics in their daily lives. They pose and solve simple problems using concrete materials, mental strategies and technology and can check their answers by repeating the process. They describe mathematical situations and reflect on their learning using everyday language, actions, materials and drawings.

Students count, order, represent and record numbers in a variety of forms using objects, words and numerals. They compare, combine and separate groups and share collections of objects, describing their actions in everyday language. Students visualise numbers and combinations from pictorial representations. They recognise and describe fractions as part of a whole.

Students use the language of equality and discuss fairness in everyday situations. They extend or complete simple patterns involving shapes, colours, objects or numbers and explain their reasoning.

Students identify the attributes of length, area, volume and mass and can directly compare and order objects. They manipulate objects and materials and describe their shape, size, position and other features using everyday language. Students gather information about themselves or their environment and can organise this information with materials or pictures.

Stage 1

Students who have achieved Stage 1 outcomes recognise the mathematical features in their environment. They ask questions and explore basic mathematical concepts using imagery, pictures and available technology. They describe mathematical situations and explain how answers were obtained. They explain changes in their mathematical approach as a result of their experiences.

Students count, represent, compare and order numbers and represent fractions encountered in everyday settings, using words, materials and diagrams. They employ a range of mental strategies to estimate, calculate and solve simple number problems involving the four operations. They are developing mental facility with number facts, combinations and sequences. Students are familiar with the face value of notes and coins and can sort, order, classify, count and perform simple monetary calculations. They discuss the likelihood of everyday events using terms such as possible, impossible, certain and uncertain. Students extend and complete number patterns and explore equivalent number statements.

Students can measure using informal units to compare and order objects. They have an understanding of the centimetre and metre and can use these units to measure lengths and distances with rulers. They are able to discuss and compare masses, areas and capacities, sequence events using calendars, and read clocks to the half-hour.

Students visualise, classify, recognise, name and describe the parts of two-dimensional shapes and three-dimensional objects and make models of them. They create 2D shapes and make patterns using flip, slides and turns. They can find and use lines of symmetry. They describe the position of objects in the immediate environment, in models and in pictures, and can represent position using diagrams. They collect data for specific purposes and organise it using simple tables and column graphs. They are able to interpret graphs to answer simple questions.

Stage 2

Students who have achieved Stage 2 outcomes demonstrate their problem-solving skills in using a range of strategies to deal with simple spatial, measurement and numerical problems. They pose questions about mathematical situations, apply appropriate problem-solving techniques and technology and check whether their solutions are reasonable. They reflect on whether a method of solution can be improved and link their learning to other experiences. They use estimation and employ mental strategies to interpret mathematical situations.

Students count, order and compare numbers and solve mathematical problems using mental strategies, materials or written forms. They demonstrate mental facility with multiples of numbers up to 10 and find factors and squares. They have developed formal algorithms for addition and subtraction. Students recognise, compare and represent commonly used fractions and related decimals and can recognise percentages in everyday contexts. Students determine equivalent denominations of money and perform simple calculations, including the calculating of change. They are able to list all possible outcomes of a single-stage experiment, create patterns using a variety of strategies and investigate related number statements.

Students can use measurement units including millimetres, square centimetres, square metres, litres, millilitres, kilograms and grams and can estimate and measure to the nearest unit. They record their findings using standard abbreviations. Students can read simple linear scales including thermometers. They are able to read, compare, sequence and order time using both digital and analog clocks. They are aware of the relationships between time units and read and interpret calendars and simple timetables.

Students are able to identify, classify and describe both two-dimensional shapes and three-dimensional objects using appropriate mathematical terminology. They can measure the perimeter of two-dimensional shapes. They make and draw prisms, pyramids and cylinders and investigate their properties. Students create and describe tessellations, parallel lines, and are aware of angles in the environment and can measure them using informal units. They are able to describe position using grid locations and compass directions. Students can gather, organise and interpret information to answer a specific question they have posed, presenting the information in tables, picture graphs and column graphs.

Stage 3

Students who have achieved Stage 3 outcomes extend mathematical investigations using appropriate problem-solving strategies, including the use of technology. They use correct terminology, formal algorithms and other conventions when representing mathematical situations and give valid reasons for solutions to problems. They are able to apply a familiar solution method to new problems. They appreciate that mathematics involves observing, representing and generalising patterns and relationships.

Their number skills enable them to solve a wide range of problems using the four operations and to interpret their solutions in the context of a problem. They will have recall of number facts and examine prime and composite numbers. Students recognise and use the relationships between common fractions, decimal fractions and percentages. They add and subtract decimals and simple fractions. Students multiply and divide decimals by whole numbers, multiply fractions by whole numbers using diagrams and models in the context of everyday situations, and find simple percentages of quantities. Students present, analyse and generalise patterns using tables, graphs, words and numbers. Students can assign numerical values to the likelihood of simple events occurring and order them on the number line.

Students choose and use the appropriate device and unit for measuring.

They convert units of measure and record in decimal notation. They can construct and read simple timetables involving 24-hour time and interpret Australian time zones. Students read maps and street directories. They construct, describe and compare the properties of three-dimensional objects and two-dimensional shapes using strategies such as recognising symmetry and measuring angles and lengths. They draw three-dimensional objects using isometric paper and are able to enlarge and reduce shapes and interpret simple scales on plans. They gather, organise, display, read, and interpret data and make judgements in relation to these data. Students can read and interpret picture, simple line, pie and divided bar graphs with scales. They can arrange data to find the middle score and average score.

Stage 4

Students who have achieved Stage 4 outcomes use mathematical terminology, algebraic notation, diagrams, text and tables to communicate mathematical ideas and are able to link concepts and processes within and between mathematical contexts. They apply their mathematical skills and understanding in analysing real-life situations and in systematically formulating questions or problems that they then explore and solve using technology where appropriate. In solving particular problems, they compare the strengths and weaknesses of different strategies and solutions.

Students operate competently with directed numbers, fractions, percentages, mixed numbers and decimals and apply these in a range of practical contexts, including consumer problems related to earning money, commission, discounts, simple interest and compound interest calculations using a table of values. They are familiar with the concepts of ratio, rates and the probability of simple and complementary events and apply these when solving problems. They explore prime numbers, squares and related square roots, cubes and related cube roots, special groups of positive whole numbers and other counting systems.

Extending and generalising number patterns leads students into an understanding of the use of pronumerals and the language of algebra, including the use of index notation. Students simplify algebraic expressions, substitute into algebraic expressions and formulae, and expand and factorise algebraic expressions. They are able to solve simple linear equations and word problems using algebra. They develop tables of values from simple relationships and illustrate these relationships on the number plane. They are able to find midpoints of intervals on the number plane and use Pythagoras theorem to calculate the distance between two points.

They apply formulae to find areas and perimeters of a variety of polygons, circles, and composite figures; the surface area and volume of rectangular prisms; and the volume of cylinders. Students are able to describe the limit of accuracy of their measures. They examine world time zones and apply their understandings to constructing and interpreting complex timetables and timelines.

Their knowledge of the properties of two-dimensional and three-dimensional geometrical figures, angles, parallel lines, perpendicular lines, congruent figures, similar figures and scale drawings enables them to solve numerical exercises involving simple deduction. When working with data, students construct and interpret line, sector, travel, step and conversion graphs; dot

plots; stem-and-leaf plots; and frequency tables. In analysing data, they consider both discrete and continuous variables, sampling versus census, possible misrepresentation of data, and prediction, and calculate the mean, mode, median and range.

Stage 5

Students who have achieved Stage 5 outcomes use mathematical arguments to reach conclusions and justify generalisations, extend inquiries by posing follow-up questions and apply their mathematics in other subject areas, employment and consumer situations. When communicating mathematical ideas, they use mathematical language, algebraic and other notations in written, oral and graphical forms.

Students apply their knowledge of percentages, fractions and decimals to problems involving conversion of rates and consumer situations related to compound interest, depreciation and successive discounts. They are able to express numbers in scientific notation using both positive and negative powers of ten, and round numbers to a specified number of significant figures.

In algebra, students solve non-routine problems by generalising the solution; they apply index laws (including indices for square and cube roots), solve equations and simultaneous equations. On the number plane, they draw graphs of relations and functions, including the parabola. Formulas are used to find distance, gradient and midpoint.

Students extend their skills in measurement to calculations of the area and perimeter of complex composite figures, the volume of pyramids, cones and spheres and the surface area of cylinders. They apply right-angled trigonometry to practical situations including problems involving bearings and angles of elevation and depression. In geometry, they use deductive reasoning in numerical and non-numerical questions drawing on their knowledge of the properties of similar and congruent triangles, the angle properties of polygons and the properties of quadrilaterals, including diagonal properties.

Their statistical skills are extended to include determining cumulative frequency, relative frequency and theoretical probability, constructing box-and-whisker plots, and frequency tables for grouped data. Their analysis of data includes determining upper and lower quartiles and standard deviation.

Stage 5 Extension

Students who have achieved Stage 5 Extension outcomes make, refine and test conjectures, solve problems using a range of strategies, including mathematical modelling, and use deductive reasoning in presenting arguments and formal proofs. They use and interpret formal definitions and connect mathematical ideas within and across topics.

Students calculate the probability of compound events, operate with irrational numbers, solve problems involving variation and extend their knowledge of the number system to include all real numbers.

Students relate algebra to physical phenomena, modelling and rates of change. Algebraic skills are extended to finding binomial products, factorizing quadratic equations, solving literal equations, inequations, and quadratic equations. They generate, describe and graph equations of straight lines, cubics, hyperbolas, circles and exponential functions.

They use formulae for calculating the surface areas of pyramids, cones and spheres.

In trigonometry they determine exact trigonometric ratios for 30¡, 45¡ and 60¡, extend trigonometric ratios to obtuse angles, sketch sine and cosine curves and use the sine and cosine rules for finding unknown angles and/or sides in non-right-angled triangles.

Students use a wide range of geometrical facts and relationships to prove general statements in geometry, extending the concepts of similarity and congruence to a more generalised application. Deductive geometry investigations include the proof of Pythagoras theorem, and properties of quadrilaterals.

4.11 Assessment

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For your information

The *K–10 Curriculum Framework* should be taken into account in the development of assessment materials and advice for Mathematics Years K to 10.

The *K–10 Curriculum Framework* will:

- require the inclusion of Stage outcomes in syllabuses as the basis of a K—10 standards framework
- require the establishment of clear links between syllabus content and outcomes
- require the development of exemplar assessment tasks and annotated samples of student work (from Early Stage 1 to Stage 5 Extension)
- require the development of marking guidelines for Stages 4 and 5 in order to give greater attention to content and performance standards at each Stage
- require the development of support materials and advice to assist teachers to monitor student progress and report the performance standards to students, parents and other teachers.

Assessment and reporting advice in the Mathematics Years K to 10 syllabuses will focus on improving learning and will guide the development of practical assessment and reporting strategies. Clearly articulated standards will assist teachers to plan more effectively so that teaching, learning and assessment become concurrent and integrated classroom activities.

The syllabuses will establish standards that specify the expected learning and quality of student achievement at a point in time, typically the end of a Stage, when the majority of students should demonstrate achievement of the outcomes to some level. This approach is based on the premise that learning is developmental, and that Stages represent convenient points along a continuum to describe milestones of progress. The standards will consist of content standards described through the Stage outcomes and content and performance standards demonstrated through work samples and other support materials.

The articulation of standards in the syllabuses will enable teaching programs to directly reflect the prior achievements of students and the teaching and learning opportunities that are seen to be necessary for students to continue to progress towards higher standards.

The syllabuses and support materials will give schools the tools they need to report to their communities in consistent ways within a K—10 standards framework and will assist with the communication of information about student achievement in the Years 6—7 and the Years 10—11 transition points.

The syllabus and support materials in Stages 4 and 5 will provide graded descriptions of the standards to be achieved at the end of each Stage in the form of Stage statements written in 3 to 5 levels, or in the form of performance descriptions in Stage 5. These statements will represent a

snapshot of various levels of student performance as they demonstrate outcomes in integrated and holistic ways. Descriptions of performance associated with the reporting for the Board s credentials at the end of Stage 5 will also be provided.
The syllabuses and support materials will:

- provide ways for teachers and others to understand the continuity and developmental sequence of learning in mathematics
- assist teachers to make judgements about, and to report, students performances and levels of achievement using performance standards. Information from external assessments will be included in Stage 5
- assist teachers to determine the next steps in learning to ensure each student s progress.

Principles and procedures for the development of assessment and reporting materials will be provided to writers.

Consultation undertaken in Phase 1 of the syllabus development process has yielded the following recommendations which should be taken into account in the development of assessment tasks.

Assessment should be:

- integrated with the curriculum and should reflect the variety and scope of balanced learning activities in mathematics across the strands
- used to identify progress and/or achievement in mathematics learning in relation to the standards (from Early Stage 1 to Stage 5 Extension) and be listed as a component of the syllabus package
- diagnostic, formative and summative to inform teaching and learning and allow for peer-assessment and self-assessment.

Assessment tasks that can be used to identify progress and achievement in mathematics in relation to the standards should be developed as part of the syllabus package.

5. Glossary

5. Glossary

For your information

The **Glossary** *explains terms that will assist teachers in the interpretation of the Years K to 10 Mathematics syllabuses. Section 1 defines terms used in syllabuses for K–10. Section 2 defines subject-specific terms.*

5.1 Syllabus terminology

Content

Content describes the knowledge, skills, understanding and values to be studied and developed by students over a Stage or Stages in a syllabus and the development of processes of learning so that students are encouraged to be effective learners. Therefore, content will generally be expressed in syllabuses in the form of:

- Students learn to
- Students learn about

Syllabuses will highlight essential knowledge, skills and understanding (that directly contribute to the learning outcomes described in the curriculum framework as essential for all students to achieve) along with additional content that will broaden and extend students learning.

Course Performance Descriptors

Course performance descriptors are sets of statements published by the Board of Studies. They describe the main features of a typical student s performance at different levels of achievement measured against the syllabus objectives and outcomes for a course. They are used to determine a student s School Certificate grade.

Cross-curriculum Content Statements

Cross-curriculum content statements will assist the embedding of cross-curriculum content into syllabuses. They are linked to the broad learning outcomes of the *K–10 Curriculum Framework*. The statements have been developed to determine where the cross-curriculum content is most appropriately incorporated into individual syllabuses without undermining or overwhelming subject integrity.

Indicators

Indicators exemplify the range of behaviours that contribute to achievement of outcomes. Indicators assist teachers in monitoring student progress within a Stage. They also assist teachers in making on-balance judgements about the achievement of outcomes.

K–10 Scope and Continuum Statements

Scope and continuum statements describe the parameters of a subject.

K—10 scope and continuum statements will be provided for each syllabus developed for Stages 1—5. The statements will clearly state the assumed sequences of learning in previous, current and subsequent Stages. The statements will be based on Stages, demonstrating the breadth of the learning within the Stage as well as the sequence of learning from Stage to Stage.

For some secondary subjects that do not have continuity of study, the statements will indicate the assumed prior learning, including links with other subject areas, upon which the subject builds.

Outcomes

Syllabus outcomes express the specifically intended student learning that will result from the teaching of the syllabus. They are derived from the objectives and content of the syllabus. They provide clear statements of the knowledge, skills and understanding expected to be gained by most students as a result of effective teaching and learning of a KLA/subject by the end of a Stage. They also describe the values and attitudes expected to be developed by students.

Stages

The K—12 curriculum is organised into six Stages. Each Stage is typically linked to the Years of schooling set out below. It is recognised, however, that some students will achieve the Stage outcomes earlier in their schooling and others will not achieve them until later in their schooling.

Early Stage 1: Kindergarten

Stage 1:	Years 1—2	Stage 4: Years 7—8
Stage 2:	Years 3—4	Stage 5: Years 9—10
Stage 3:	Years 5—6	Stage 6: Years 11—12.

Stage Statements

All K—10 syllabuses will contain Stage statements for each syllabus Stage. Stage statements describe what students typically know, understand and are able to do as a consequence of having undertaken the associated syllabus content.

Standards

The term standards refers to:

- the knowledge, skills and understanding expected to be learned by students as a result of studying a subject — the *content standards*
- the levels of achievement of the knowledge, skills and understanding — the *performance standards*.

Both *content standards* and *performance standards* are based on the aims, objectives, outcomes and content of a course. Together they specify what is to be learned and how well it is to be achieved.

Content standards specify what students are expected to know, understand and be able to do as a result of studying a course. Teacher understanding of *content standards* comes from their consideration of the aims, objectives, outcomes and content of the syllabus.

Performance standards are the different levels of achievement demonstrated by students.
Teacher understanding of standards comes from the set of aims, objectives, outcomes and content in each syllabus together with:

- the performance descriptions that summarise the different levels of performance of the course outcomes at each Stage
- annotated samples of student work developed from Stage-specific assessment tasks (including the School Certificate tests at Stage 5) and marking guidelines.

Subject

A subject is a name given to a defined area of knowledge. There may be several courses offered in a subject.

Syllabus

A document that describes for a Key Learning Area or a course of study what students are expected to learn in terms of aims, objectives, outcomes, content and assessment requirements.

A **syllabus package** includes a syllabus document with additional information on assessment and examination, and support material.

5.2 Mathematics Subject Terminology

Amicable numbers: A pair of numbers, each of which is equal to the sum of all the divisors of the other except the number itself, eg 220 and 284
1+2+4+5+10+11+20+22+44+55+110 = 284
1+2+4+71+142 = 220

Column graph: A graph that uses vertical bars of different heights to represent different amounts.

Divided bar graph: A single bar divided into segments that is used to show how a total is divided proportionally into its component parts.

Equivalent fractions: Fractions that can be reduced to the same basic fraction; ie fractions that have the same value, eg 1/2 = 2/4 = 3/6 = 4/8.

Formal algorithm: A procedure or set of prescribed steps for finding the solution to a problem.

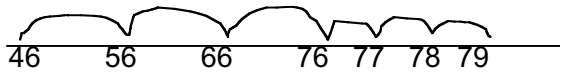
Forward and backward number word sequences: Number words said in sequence (not only increasing or decreasing by one) *eg one, two, three, four …; ten, twenty, thirty, forty ….*

Fraction notation: Representation of numbers in the form a/b where a and b are whole numbers and b is not equal to zero.

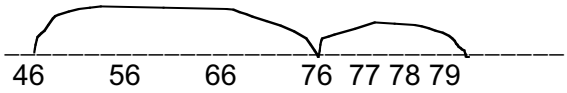
Inverse operation: The operation that reverses the action of the original operation. Addition and subtraction, multiplication and division are inverse operations.

Jump strategy on a number line: An addition or subtraction strategy in which the student places the first number on an open number line and then counts forward or backwards firstly by tens and then by ones to perform a calculation. The number of jumps will reduce with increased understanding, eg 46 + 33

Method 1:



Method 2:



Language of equality: Words such as 'equals' and 'the same as' and the symbol =, which express that two numbers are of the same value, or that two quantities are of the same measure or that two expressions are equivalent.

Line graph: A graph in which information is represented through plotting and joining points with a line or line segments, and meaning can be attached to the points between the plotted points, eg temperature and population trends may be represented using line graphs. (If no meaning can be attached to the points between the plotted points then a column graph would be a more suitable form of representation.)

Linear scale: A scale where equal quantities are represented by equal divisions, eg ruler, thermometer.

Mean: The average of a collection of numbers or set of scores.

Median: The middle term in a set of scores when arranged in order of size. If there is an even number of scores, the median is the average of the two middle scores, eg for the scores 3,3,6,8,9, the median is 6;
for 5,7,9,9, the median is (7+9)/2= 8.

Mental facility: The ability to use a variety of strategies to calculate mentally.

Mode: The score which occurs most often in a set of scores, eg for the scores 1,2,3,3,4,4,4,5, the mode is 4.

Number sense: The ability to use an understanding of number concepts and operations in flexible ways to make mathematical judgements and to develop useful strategies for handling numbers and operations.

On and off the decade: Counting 'on the decade' — counting from a multiple of 10, eg 40, 50, 60. Counting 'off the decade' — counting from a number which is not a multiple of 10, eg 47, 57, 67 .

Partitioning: An arithmetic strategy (a precursor of subtraction) involving the separation of a small number into two parts, eg 6 may be partitioned into 5 + 1, 4 + 2 etc .

Perfect number: A whole number that is the sum of all of its divisors except itself eg 6= 1+2+3
28= 1+2+4+7+14

Pie chart (or sector graph): A graph consisting of a circle divided into sectors (’pieces of pie’) showing how a particular quantity is divided.

Platonic solids: The five kinds of regular polyhedron — cube, regular tetrahedron, regular octahedron, regular dodecahedron, regular icosahedron.

Related denominators: Denominators of fractions that are related multiples. The fractions 1/2, 1/4, 1/8 have the related denominators 2, 4, 8.

Rotational symmetry: A shape is said to have rotational or ’turning’ symmetry if a tracing of the shape after a part of a turn about a point matches the original shape.

Superposition: The placing of one figure upon another so that the two figures coincide.

Visualise: To recreate and manipulate images mentally.

Volume: The measure of the three-dimensional space enclosed within, or occupied by, a solid.

Word formula: The expression of a relationship in words only, eg ’For a rectangle, area equals length multiplied by breadth’.

6. Support Documents

6. Support Documents

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For your information

It is proposed that several support documents be produced to assist teachers with the implementation of the new syllabuses.

For Years K to 6, these might include:
- teaching and learning units
- annotated work samples
- assessment tasks
- a Principal s package.

A proforma for teaching and learning units for Years K to 6 Mathematics is presented on page 59 and a sample teaching and learning unit is presented on page 60.

For Years 7 to 10, the support documents might include:
- teaching and learning units and thematic units of work
- assessment tasks
- annotated work samples
- program overviews for particular groups of students
- Stage performance descriptors.

A proforma for teaching and learning units for Years 7 to 10 Mathematics is presented on page 61 and a sample teaching and learning unit is presented on page 62.

For Years K to 10, the support documents might also include:
- support materials for students with special education needs in Mathematics.

For parents, the support documents might include:
- an information package outlining key aspects of the new syllabuses.

Proforma for Years K to 6 Teaching and Learning Units

<table>
<tr><td colspan="2">STAGE/STRAND/SUBSTRAND</td><td colspan="2">SYLLABUS REFERENCE</td></tr>
<tr><td colspan="2">OUTCOME
Specific statement of knowledge, skills and understanding to be demonstrated by most students by the end of the Stage.

INDICATORS
Statements of the behaviour that students might display as they work towards achievement of the outcome.</td><td colspan="2">WORKING MATHEMATICALLY OUTCOME/S
Specific statement/s of the processes to be demonstrated by most students by the end of the Stage. May include one or more of the outcomes for the Stage.
Provides a focus for teaching and learning.

INDICATORS
Statements of the behaviour that students might display as they work towards achievement of the outcome/s.</td></tr>
<tr><td>CONTENT
Students learn about:
The content to be addressed in order for students to achieve the outcome for the substrand.</td><td colspan="2">CONTENT
Students learn to:
Provides an indication of the purpose for learning the mathematics relevant to the outcome as well as examples of the types of questions and experiences that reflect applications of the content.</td><td>TEACHERS' NOTES
Important teaching points and considerations for the successful implementation of the unit, including cultural, historical and social considerations.</td></tr>
<tr><td colspan="2">LINKS
Suggested links to other strands and other subjects.

TECHNOLOGY
Technology that could be used in support of the teaching/learning unit.</td><td colspan="2">LANGUAGE/LITERACY
Relevant vocabulary which should be introduced and used in teaching and learning activities.
Samples of student and teacher language.
Important language and literacy considerations.</td></tr>
<tr><td colspan="2">SAMPLE ACTIVITIES
Suggested strategies, including the use of technology, by which students may achieve the stated outcome.</td><td colspan="2">These strategies should be used selectively to suit individual student needs. They are by no means an exhaustive list of activities for the teaching/learning unit.</td></tr>
<tr><td colspan="2">RESOURCES
A list of suggested materials for the implementation of activities.</td><td colspan="2">ASSESSMENT
Opportunities for the collection of work samples from the sample activities are indicated by *.</td></tr>
</table>

Sample Teaching and Learning Unit for Fractions and Decimals in Stage 2

<table>
<tr><td colspan="2">Stage 2 FRACTIONS AND DECIMALS</td><td colspan="2">SYLLABUS REFERENCE</td></tr>
<tr><td colspan="2">OUTCOME
Compares and represents commonly used fractions and related decimals and percentages.

INDICATORS
For example, a student
• records fractions using a/b form
• gives equivalent fractions for halves
• finds fraction representations in the environment
• places fractions with the same denominator in ascending and descending order.</td><td colspan="2">WORKING MATHEMATICALLY OUTCOME/S
Communicating: uses some mathematical terminology to describe or represent a mathematical situation.

INDICATORS
For example, a student
• uses a drawing to represent a fraction of either a whole or a collection
• uses the language of fractions, eg three out of four, 3/4.</td></tr>
<tr><td>CONTENT
Students learn about
• interpreting the numerator and denominator of a fraction
• comparing and ordering fractions with the same denominator
• finding equivalent fractions for halves</td><td colspan="2">Students learn to
• communicate an understanding of fractions using fraction terminology
• pose questions about a collection of items
• solve problems involving everyday contexts
• interpret everyday use of fractions.</td><td>TEACHERS' NOTES
• use the words one-fourth to establish the relationship to the whole, along with one-third, one-fifth, one-eighth, one-tenth, two-fifths, three-quarters. The alternative name quarter can then be introduced.
• use linear or rectangular regions in preference to circular representations to establish fraction concepts when students are making the fraction drawings or divisions themselves.</td></tr>
<tr><td colspan="2">LINKS
Measurement, Money, Data, Patterning and Algebra</td><td colspan="2">LANGUAGE/LITERACY
1 fourth, 1 quarter, equal parts, one out of four, part, whole</td></tr>
<tr><td colspan="2">SAMPLE ACTIVITIES
Numerator and Denominator
Students work in pairs using two sets of contrasting, coloured cards. One set has the numbers 1 to 5 written on them and these are the numerators. The other set has the numbers 6 to 10 written on them and these are the denominators.
Place sets of cards face down. A student turns the top cards from each set to reveal both numbers that can be used to form a fraction. The student says the fraction (eg 4 out of 10), and then records it using words, drawings and symbols. The other student then does the next fraction.

Comparing and ordering
Four sets of cards will be needed, one with the fractions (eg 1/8 to 7/8) written on them, the other three will have the words, the shaded fraction regions and the shaded part of a collection to correspond with the first set. The cards will be distributed to all students who must then find class members with the same fraction. They form a team . Teams then get in order in terms of the size of their fractions.</td><td colspan="2">*Real life
Students find pictures of collections in magazines, brochures, the internet etc and then describe them using fraction language and symbols, eg four out of five cats are black, 4/5.

Renaming
Groups of students brainstorm and record on butchers paper different names for one whole, eg 6 sixths, 3 out of 3, 4 quarters, 10/10, or a drawing showing all of a whole or all of a collection. Discuss together. Model a drawing of a representation of 1/2. Give each group 4 cards on which they are to draw different representations of 1/2 (either as part of a whole or collection). Display and discuss.
* On another occasion students individually record their own representations of 1/2 in pictures, symbols and words and reflect on their learning.

Clothes Line
Provide a line of string, pegs and large cards representing fractions with the same denominator. Invite students to choose a card and place it in the appropriate place on the clothes line.</td></tr>
<tr><td colspan="2">RESOURCES
Dice, numeral cards, magazines, brochures, butchers paper, string and pegs.</td><td colspan="2">ASSESSMENT
Opportunities for the collection of work samples from the sample activities are indicated by *.</td></tr>
</table>

Proforma for Years 7 to 10 Teaching and Learning Units

<table>
<tr><td>STAGE/STRAND:
TOPIC:</td><td>SYLLABUS REFERENCE</td></tr>
<tr><td>OUTCOME
Specific statement of knowledge, skills and understanding to be demonstrated by most students by the end of the Stage.

WORKING MATHEMATICALLY OUTCOME/S
Specific statement/s of the processes to be demonstrated by most students by the end of the Stage. May include one or more of the outcomes for the Stage.
Provides a focus for teaching and learning.</td><td>LANGUAGE/LITERACY
Relevant vocabulary and language considerations that need to be addressed in teaching/learning activities.

TECHNOLOGY
Technology that could be used in support of the teaching/learning unit.</td></tr>
<tr><td>CONTENT — Students learn about:
The content to be addressed in order for students to achieve the outcome for the topic.</td><td>CONTENT - Students learn to:
Provides an indication of the purpose for learning the mathematics relevant to the outcome as well as examples of the types of questions and experiences that reflect applications of the content.</td></tr>
<tr><td>SAMPLE ACTIVITIES
Suggested activities that support student engagement with the topic.
These strategies should be used selectively to suit individual student needs.
Activities may also address cultural, historical and social considerations.</td><td>ASSESSMENT IDEAS AND GOOD QUESTIONS
Suggested assessment strategies and good questions that enable students to demonstrate understanding of the topic.</td></tr>
<tr><td>RESOURCES
Additional materials and references to support planning and preparation for this topic.</td><td>LINKS
Suggested links to other strands and other subjects.</td></tr>
</table>

Sample Teaching and Learning Unit for Trigonometry in Stage 5

<table>
<tr><td>STAGE/STRAND: Stage 5 Measurement
TOPIC: Trigonometry</td><td>SYLLABUS REFERENCE</td></tr>
<tr><td>OUTCOME
Applies trigonometry to problems including situations involving angles of elevation and depression, and bearings.

WORKING MATHEMATICALLY OUTCOME
Communicating — uses appropriate mathematical language, and algebraic and other notations in written, oral or graphical form.</td><td>LANGUAGE/LITERACY
hypotenuse, trigonometry, elevation, depression, cosine, sine, tangent
Interpretation of word problems is critical. Students frequently experience difficulty drawing the appropriate diagram to match the information in the question.
TECHNOLOGY
Cabri-geometry can be used to explore similar triangles and ratios of sides.</td></tr>
<tr><td>CONTENT — Students learn about
identifying the hypotenuse, and the adjacent and opposite sides for a given angle in a right-angled triangle
defining the sine, cosine and tangent ratios for angles in right-angled triangles
demonstrating that the ratio of corresponding sides in right-angled triangles (such as opposite to adjacent) is constant for equal angles
using trigonometric notation
using calculators to find angles (in degrees and minutes) given trigonometric ratios
using trigonometry to find unknown angles or sides in right-angled triangles
identifying angles of elevation and depression
drawing appropriate diagrams for problems involving three-figure bearings.</td><td>CONTENT — Students learn to
apply trigonometry to solve problems involving angles of elevation and depression and three-figure bearings
formulate questions or problems that can be explored using trigonometry
compare the strategy of using accurate scale drawing with the strategy of using trigonometry in solving particular problems.</td></tr>
<tr><td>SAMPLE ACTIVITIES
investigate the ratios of the sides of similar right-angled triangles
find the value of the sine, cosine and tangent ratios for angles in right-angled triangles
use calculators to find cos 25°, tan 57.5°, sin 62°5’
relate the tangent ratio to slope, eg for a water ski jump where the horizontal distance is 8 m and the vertical rise is 3 m
use a compass to obtain three-figure bearings for objects from a set point in the playground
historical investigation of trigonometry.</td><td>ASSESSMENT IDEAS AND GOOD QUESTIONS
Use rich tasks that include open-ended questions
match a series of right-angled triangles to a set of written problems
write a problem to match a particular diagram.</td></tr>
<tr><td>RESOURCES</td><td>LINKS
geometry similar triangles
measurement Pythagoras’ theorem</td></tr>
</table>

7. Further Advice to Writers

7. Further Advice to Writers

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For your information

The following advice for the development of the syllabuses is derived from consultation undertaken in Phase 1 of the syllabus development process and should be taken into account in the development of the syllabuses and support documents.

Recommendations suggest that in the final syllabuses and support documents, there is a need to provide:

- advice regarding use of the Scope and Continuum to plan teaching and learning that focuses on individual student's needs
- links between strands and within strands in the mathematics syllabuses in order to emphasise the relationships between mathematical concepts, and to consolidate knowledge, skills and understanding
- links between mathematical content and content in other subjects studied by students
- problem-solving tasks in each of the teaching and learning units that actively engage the learner and enable opportunities for working mathematically to occur
- tasks that will provide opportunities for students to work cooperatively with others, discussing and sharing ideas, questioning and justifying their actions, solutions and conclusions through mathematical reasoning and argument
- advice regarding appropriate strategies that could provide opportunities for student reflection
- tasks that enable review of content from earlier Stages to support the consolidation of knowledge, skills and understanding and to provide a foundation for the ongoing development of the sequence of topics
- detail regarding the literacy demands inherent in the teaching and learning of mathematical concepts and skills
- opportunities to support the development of mental computation, estimation and visualisation in all strands
- reference to, and activities that acknowledge, the range of cultural, historical and social contexts in which mathematics is set, including the Australian context and the knowledge of Indigenous peoples
- advice regarding the use of appropriate technology
- applications to real-life contexts.

8. Appendices

8.1 Appendix 1

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For your information

Broad Directions for the Writing Brief – endorsed by the Board of Studies on 27 March 2001.

Note: *The Board of Studies endorsed these Broad Directions on 27 March 2001. They reflect the consultation undertaken in Phase 1 of the syllabus development process and inform the development of Section 4 of this draft writing brief, which is subject to consultation. The broad directions are not subject to consultation.*

Broad Directions for the Writing Brief:

- That as an initial task of the writing brief stage, a K—10 Mathematics continuum that includes content (knowledge, skills and understanding) be developed that maps key concept development and enrichment opportunities across the Stages (from Early Stage 1 to Stage 5).
- That within this continuum, the development of key concepts (big ideas) be established that explicitly outlines a scope and sequence of content and outcomes (Early Stage 1 to Stage 5). That the data and background from Count Me In Too and Counting On , as well as other programs, be used as key resources to inform the development of the continuum.
- That a principle informing the development of the continuum and writing briefs be that teachers should have ready access to the content and outcomes across K—10 (Early Stage 1 to Stage 5) in order to support the specific learning needs of individual students.
- That the continuum incorporate and clearly articulate knowledge, skills and understanding considered essential for students in the compulsory years and provide the basis for monitoring the mathematics achievement of students in these years.
- That in the development of the continuum, appropriate standards be set for students to undertake mathematics learning in Stage 6. There should be no lowering of standards K—10.
- That in the development of the continuum, revisiting of content from an earlier Stage be set at a higher conceptual level.
- That, as a principle, the development of content for Mathematics K—10, enable more in-depth teaching/learning in mathematics.
- That in the revision of the K—6 syllabus, greater emphasis be given to the development of skills and understandings in the areas of rational number, mental computation, number sense and data from the earliest years of schooling.
- That understanding about probability be linked to the use of chance concepts in everyday situations and to the language contexts of learners, as well as the content of other KLAs (where appropriate).
- That as part of mathematics learning K—10, students should develop knowledge and understanding of a range of historical, cultural and social contexts in which mathematics is set. This will include Australian contexts and the mathematical knowledge of Indigenous peoples.
- That assessment tasks that can be used to identify progress and/or

achievement in mathematics learning in relation to the standards (from Early Stage 1 to Stage 5) be listed as a component of the syllabus package.

- That the content be organised according to a small number of strands K—8/10 (eg Number [and Algebra]; Measurement and Data; Space/Geometry), while at the same time ensuring that appropriate connections are drawn across strands. It is recommended that Working Mathematically be integrated into the other strands.
- That in developing the continuum, due consideration be given to the relative status of the strands in terms of the scope of content to be included in each Stage.
- That information about the knowledge, skills and understanding that students bring from prior-to-school settings be articulated to assist teachers in identifying where students are located on the learning continuum on entry to school.
- That advice on the literacy demands of mathematics learning be incorporated into the writing briefs where appropriate. Such advice should include both conventional language to be used as well as specialised mathematical language that students require.
- That mathematical terminology be applied consistently across K—10 and be based on clear definitions.
- That the numeracy/mathematical demands of other KLAs/subjects be identified and explicit reference be made/linkages be drawn to these K—10.
- That the appropriate use of technology (calculators, computers etc.) and capabilities be systematically included across K—10 Mathematics.
- That the development of the syllabus package for teachers ensure that the user-friendly characteristics of the current documents are retained.
- That a small set of values and attitudes outcomes be developed for K—10, emphasising an appreciation of mathematics and the development of positive attitudes towards mathematics learning.
- That the writing briefs should briefly describe the extent, nature and scheduled release dates of support material to be developed for each syllabus document. This material should include Stage statements, indicators, annotated student work samples and associated assessment tasks, and other support materials for teachers, parents and principals (in the case of primary schools).

8.2 Appendix 2

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For your information

K–10 CURRICULUM FRAMEWORK (extract)
The full document can be found on the Board of Studies website: www.boardofstudies.nsw.edu.au

2.1 K–10 CURRICULUM PURPOSE STATEMENT

The New South Wales Board of Studies K—10 syllabuses and curriculum requirements are developed to provide educational opportunities that:

- engage and challenge all students to maximise their individual talents and capabilities for life-long learning
- enable all students to develop a positive self-concept and the capacity to establish and maintain safe, healthy and rewarding lives
- prepare all students to participate effectively and responsibly in the society in which they will live taking account of moral, ethical and spiritual considerations
- encourage and enable all students to enjoy learning and to be self-motivated, reflective and competent learners who can take part actively in further study, work or training.

2.2 BROAD LEARNING OUTCOMES

The broad learning outcomes represent a set of knowledge, skills, understanding, values and attitudes that are essential for all students if they are to succeed in and beyond schooling. Achievement of these outcomes will result from the learning opportunities provided through the mandatory curriculum requirements and the Board syllabuses. The achievement of these broad learning outcomes will not be measured directly. They will be measured through the assessment of student achievement in particular Key Learning Areas/subjects.

Each Board syllabus will describe how learning in the Key Learning Area or subject will contribute to the purpose of the K—10 curriculum and how learning will assist students to achieve the broad learning outcomes.

Students will:

- understand, develop and communicate ideas and information
- access, analyse, evaluate and use information from a variety of sources
- work collaboratively with others to achieve individual and collective goals
- possess the knowledge and skills necessary to maintain a safe and healthy lifestyle
- understand and appreciate the physical, biological and technological world and make responsible and informed decisions in relation to their world
- understand and appreciate social, cultural, geographical and historical contexts and participate as active and informed citizens
- express themselves through creative activity and engage with the artistic, cultural and intellectual work of others
- understand and apply a variety of analytical and creative techniques to solve problems
- understand, interpret and apply concepts related to numerical and spatial patterns, structures and relationships
- be productive, creative and confident in the use of technology,

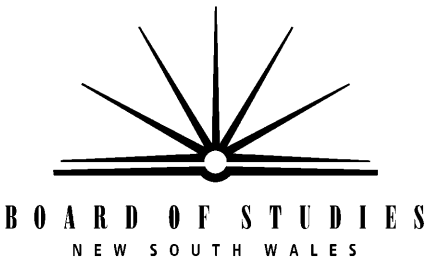
understanding the impact of technology on society
- understand the work environment and be equipped with the knowledge, skills and understanding to evaluate potential career options and pathways
- develop a system of personal values based on their understanding of moral, ethical and spiritual matters.

2.3 PRINCIPLES TO GUIDE THE DEVELOPMENT AND IMPLEMENTATION OF SYLLABUSES

The principles will guide the development of Board of Studies curriculum requirements and syllabuses and will also guide the implementation of syllabuses by schools and school authorities.

The Board of Studies curriculum requirements and syllabuses will:

- enable all students to engage in, take responsibility for, and continue their own learning
- establish a core set of knowledge, skills, understanding and values to which all students are entitled
- establish explicit standards that enable recognition of student achievement and planning for further learning
- be inclusive of all students attending schools in New South Wales
- enable teachers, schools and school authorities to decide how to maximise student learning.



Mathematics Years K to 10
Draft Writing Brief
Consultation Report

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Table of Contents

1 Introduction

1.1 Background to the Revision

The current *Mathematics Syllabus Years 7–8* was developed in 1987 and implemented in 1988. The current *Mathematics K–6 Syllabus* was released in 1989. Since then, major revisions of mathematics courses for Stage 5 and Stage 6 have occurred. The NSW Government committed to the development of new Mathematics Years K to 10 syllabuses in its Education and Training Plan for 1999–2003. This commitment was restated in the Minister for Education and Training's announcement on the review of the Years 7 to 10 curriculum in July 2000.

The Board of Studies initiated the revision of Mathematics Years K to 10 to ensure that there is continuity of theory, knowledge and understanding through all Mathematics syllabuses in NSW. The simultaneous undertaking of the review and development of the Years K to 6 and Years 7 to 10 syllabuses gives maximum opportunity to ensure continuity in the Mathematics Years K to 10 curriculum. The syllabuses will be designed to meet the needs of all students in the compulsory years of schooling and prepare students for the study of courses in Mathematics, and other courses, in the New Higher School Certificate.

K-10 Curriculum Framework

The Board of Studies is developing a K–10 curriculum framework to ensure continuity, coherence and consistency across Years K–10. The framework provides a purpose statement, broad learning outcomes, and principles that guide learning for all students attending schools in NSW. It provides a basis for decision-making about what students are to learn, how learning will take place and how it will be assessed.

The Board of Studies will use the framework to guide syllabus review and development. Syllabuses are to be consistent with and build upon the requirements of the framework.

Research

The Office of the Board of Studies commissioned and published a literature review of national and international research undertaken in the last five years in Mathematics as a discipline and in Mathematics education. This was published on the Board's website.

1.2 Timeline

Steps in the Syllabus Development Process	Dates
1. Review, Consultation and Research The review, consultation and research was used to inform the development of the Draft Writing Brief.	October 2000 – March 2001
2. Writing Brief Development This involved: • preparation of a Draft Writing Brief by a project team, taking into account information from consultation and research undertaken during the previous phase • widespread consultation on the Draft Writing Brief, involving: teachers; key groups, including professional associations and school systems and the Mathematics Board Curriculum Committees • modification of the Draft Writing Brief in response to consultation feedback • submission to the Board of the Draft Writing Brief consultation report, Board Curriculum Committees recommendation, and revised Draft Writing Brief for endorsement.	April – September 2001
3. Syllabus Development This will involve: • preparation of draft syllabuses by a project team in accordance with the endorsed writing brief • distribution of the draft syllabuses for consultation (via the Internet and printed copies) to: teachers key groups, including professional associations and school systems Mathematics Board Curriculum Committees • revision of the draft syllabuses in response to consultation feedback • submission of the revised draft syllabuses to the Mathematics Board Curriculum Committees for recommendation to the Board • submission of the revised draft syllabuses to the Board for endorsement • submission of the final syllabuses to the Minister for approval.	September – April 2002
4. Handover and Implementation This will involve: • editing, design, layout and printing of the approved syllabuses • briefings with school authorities and 'handover' of the syllabuses • distribution of the syllabuses to schools.	May 2002

1.3 Broad Directions informing the development of the Draft Writing Brief

The broad directions for the development of the Mathematics Years K to 10 Draft Writing Brief were identified through the Syllabus Review phase of syllabus development for Mathematics Years K to 10. They were endorsed by the Board of Studies on March 27 2001. These directions informed the development of the Draft Writing Brief for Mathematics Years K to 10 and are reproduced below:

- That as an initial task of the writing brief stage, a K–10 Mathematics continuum that includes content (knowledge, skills and understanding) be developed that maps key concept development and enrichment opportunities across the Stages (from Early Stage 1 to Stage 5).
- That within this continuum, the development of key concepts ('big ideas') be established that explicitly outlines a scope and sequence of content and outcomes (Early Stage 1 to Stage 5). That the data and background from 'Count Me In Too' and 'Counting On', as well as other programs, be used as key resources to inform the development of the continuum.
- That a principle informing the development of the continuum and writing briefs be that teachers should have ready access to the content and outcomes across K–10 (Early Stage 1 to Stage 5) in order to support the specific learning needs of individual students.
- That the continuum incorporate and clearly articulate knowledge, skills and understanding considered essential for students in the compulsory years and provide the basis for monitoring the mathematics achievement of students in these years.
- That in the development of the continuum, appropriate standards be set for students to undertake mathematics learning in Stage 6. There should be no lowering of standards K–10.
- That in the development of the continuum, revisiting of content from an earlier Stage be set at a higher conceptual level.
- That, as a principle, the development of content for Mathematics K–10, enable more in-depth teaching/learning in mathematics.
- That in the revision of the K–6 syllabus, greater emphasis be given to the development of skills and understandings in the areas of rational number, mental computation, number sense and data from the earliest years of schooling.
- That understanding about probability be linked to the use of chance concepts in everyday situations and to the language contexts of learners, as well as the content of other KLAs (where appropriate).
- That as part of mathematics learning K–10, students should develop knowledge and understanding of a range of historical, cultural and social contexts in which mathematics is set. This will include Australian contexts and the mathematical knowledge of Indigenous peoples.
- That assessment tasks that can be used to identify progress and/or achievement in mathematics learning in relation to the standards (from Early Stage 1 to Stage 5) be listed as a component of the syllabus package.
- That the content be organised according to a small number of strands K–8/10 (eg Number [and Algebra]; Measurement and Data; Space/Geometry), while at the same time ensuring that appropriate connections are drawn across strands. It is recommended that Working Mathematically be integrated into the other strands.

- That in developing the continuum, due consideration be given to the relative status of the strands in terms of the scope of content to be included in each Stage.
- That information about the knowledge, skills and understanding that students bring from prior-to-school settings be articulated to assist teachers in identifying where students are located on the learning continuum on entry to school.
- That advice on the literacy demands of mathematics learning be incorporated into the writing briefs where appropriate. Such advice should include both conventional language to be used as well as specialised mathematical language that students require.
- That mathematical terminology be applied consistently across K–10 and be based on clear definitions.
- That the numeracy/mathematical demands of other KLAs/subjects be identified and explicit reference be made/linkages be drawn to these K–10.
- That the appropriate use of technology (calculators, computers etc.) and capabilities be systematically included across Mathematics K–10.
- That the development of the syllabus package for teachers ensure that the 'user-friendly' characteristics of the current documents are retained.
- That a small set of values and attitudes outcomes be developed for K–10, emphasising an appreciation of mathematics and the development of positive attitudes towards mathematics learning.
- That the writing briefs should briefly describe the extent, nature and scheduled release dates of support material to be developed for each syllabus document. This material should include Stage statements, indicators, annotated student work samples and associated assessment tasks, and other support materials for teachers, parents and principals (in the case of primary schools).

1.4 The Development of the Draft Writing Brief

A project team was formed comprising a curriculum officer, an assessment officer and publications personnel under the joint direction of the Inspector Mathematics and the Inspector Primary Education. For the development of the Draft Writing Brief contract writers were required. Advertisements were placed in the *Board Bulletin* calling for expressions of interest from experienced writers of syllabus material. Applicants were placed on a register of writers. From this register, a list of writers with appropriate expertise was drawn up and a project team was chosen.

The project team developed the Draft Writing Brief from April to July 2001 using analysis of the findings of a literature review, surveys, oral and written submissions, a discussion forum, a symposium and other consultation and research.

The development of the writing brief for the Mathematics Years K to 10 syllabuses involved writers working at the Office of the Board of Studies over a period of thirteen weeks. The Draft Writing Brief was completed by 13 July 2001 in preparation for publication and distribution for the designated consultation period 23 July-24 August 2001.

2 Consultation Methodology

Consultation on the Mathematics Years K to 10 Draft Writing Brief involved a combination of quantitative and qualitative methodology.

2.1 Data Collection

The Mathematics Years K to 10 Draft Writing Brief and the accompanying survey were published on the Board's website and distributed for consultation to schools, key groups and individuals.

Surveys

The Mathematics Years K to 10 Draft Writing Brief was accompanied by a survey (Appendix A) that allowed for a judgement on a 4 point Likert scale, as well as extended comment, on each section of the Draft Writing Brief. Surveys were sent to all schools, the Board's consultative network, Mathematics academics, Mathematics Education academics, teacher unions, professional associations and parent and community organisations. The survey enabled the gathering of a large cross-section of quantitative data and qualitative comment.

A total of **250** survey responses was received by 27 August 2001. **Of these 250 responses, approximately 60% were from groups rather than individuals and approximately 70% were from primary schools or primary teachers**. The option was provided to respond to surveys by email, online or in hard copy. A further set of 15 responses were submitted that did not address the survey questions specifically but provided a range of comments on particular aspects of the Draft Writing Brief.

The results of these surveys were tabulated and analysed in relation to both the qualitative and quantitative material in the survey responses as well as the strengths and weaknesses of the Draft Writing Brief identified by the respondents. The consultation report incorporates the quantitative data and analysis and key qualitative comments.

Focus Groups

During the consultation period, focus groups of teachers were held in different regions across the state. A profile of teachers that represented a range of experience was sent to Board of Studies Liaison Officers (Appendix B). Contact was then made with a variety of schools across systems and sectors to identify participants. There were **43 secondary Mathematics teachers, 7 central school teachers** and **43 primary teachers** consulted. The purpose was to obtain feedback on the Mathematics Years K to 10 Draft Writing Brief by conducting a discussion based on a series of questions. (Appendix C).

Focus groups were held at:

Region	Location	Date
South Coast	Batemans Bay	Monday 6 August 2001
North West	Moree	Wednesday 8 August 2001
Metropolitan North West/South West	Parramatta	Thursday 9 August 2001
Riverina	Griffith	Tuesday 14 August 2001
Metropolitan East/North	Board of Studies	Wednesday 15 August 2001
Hunter	Newcastle	Tuesday 21 August 2001

The meetings were chaired by Board of Studies Liaison Officers and attended by Board officers who listened to the discussion, recorded participants' comments and were available to offer comment where a point of clarification was required.

One member of the group, as well as an Officer of the Board of Studies, recorded comments and wrote summaries of the proceedings. These were compared, altered where necessary and confirmed by participants.

Key group and individual responses

Key groups and individuals were invited to respond to the Draft Writing Briefs (Appendix D). The following key groups and individuals responded to the Draft Writing Brief.

Key Groups
Aboriginal Education Consultative Group (NSW)
Association of Heads of Independent Schools of Australia
Catholic Education Office, Parramatta
Catholic Education Office, Wollongong
Department of Education and Training
Early Childhood Education Council
Federation of Parents and Citizens Associations
NSW Federation of School and Community Organisations
Junior School Heads' Association of Australia
Mathematical Association of New South Wales
OTEN, Distance Education - Learning Materials Production Primary
Statistical Society of NSW
Individuals/Groups
Assoc Prof Mike Mitchelmore, Dr Joanne Mulligan, Dr Lynne Outhred – Australian Centre for Educational Studies, Macquarie University
Professor Garth Gaudry, Dr David Tacon, Dr Peter Brown - The University of New South Wales

2.2 Data Analysis

A summary of key recommendations was written for each of the focus group meetings based on a synthesis of participants' comments. These were distributed to participants to confirm that they represented an accurate summary of the main issues raised at the meeting. These recommendations were then incorporated into the Consultation Report.

The data collected from the surveys was analysed in two ways. The quantitative data from the Likert items was entered into a spreadsheet in order to collate and summarise the results. The qualitative responses to the surveys were read by Board Officers and project team members to synthesise the main issues, prepare the commentary and to select representative quotes for each section of the Draft Writing Brief. Surveys were also read by representatives from the Mathematics K-6 and 7-10 Board Curriculum Committees.

Key group and individual responses were read by Board Officers and project team members to determine key issues and finalise the main recommendations. Recommendations and comments were incorporated into the report where appropriate. Section 3 of the Consultation Report contains the Consultation Findings. These were prepared by the project team for Mathematics Years K to 10. It incorporates the reports of:

- the analysis of the surveys
- the teacher focus group responses
- key group and individual responses.

3 Consultation Findings

3.1 Key Findings of the Consultation

Overall Response

There has been a positive overall reaction to the Draft Writing Brief and this is evidenced in the analysis of survey responses, key group and individual responses (including professional associations), and the teacher focus groups. In particular, there was general endorsement of the:

- construction of the Rationale, Aim and Objectives
- organisation of content into a strand/substrand structure
- presentation of content for Early Stage 1 to Stage 5 Extension in a Scope and Continuum so that all teachers can see the overall sequencing of concepts
- inclusion of five processes in the Working Mathematically strand
- presentation of content into 'learn about' and 'learn to' statements
- recognition of prior-to-school learning and the inclusion of Stage Statements in the Syllabuses
- inclusion of Stage 4 content and outcomes in the Years K-6 Syllabus and the inclusion of at least Stage 3 content and outcomes in the Years 7-10 Syllabus.

The overall positive response to the document is reflected in the following comments:

> *… the K-10 Scope and Continuum provides teachers with an overview of content and outcomes and reinforces the concept of a continuum of learning … the document portrays mathematics teaching and learning as being achievable, accessible, useful and interesting and students are portrayed as self-motivated learners … a more effective transition from Stage 3 to Stage 4 will address concerns that repetitions in some topics are reduced.* **DET**

> *As a working draft, the document has much to recommend it. It is seen to be a positive move to coordinate the primary and secondary syllabus areas to structure both the content and process outcomes in a clear, sequential manner. The display of the Scope and Continuum is valuable and should appear in such a summary form in all syllabus documents.* **MANSW**

> *We feel that the document is well organised and clear, that the sequence is appropriate and the content suited to the various stages described. The overall structure is good, and the purpose of the continuum for K-10 strongly supported.* **AHISA**

> *I believe the changes outlined are long overdue. My staff are not totally pleased with the proposed structure though. Any change which requires the students to think more in my book is a welcome change.* **Survey - Mathematics Head Teacher**

I think the document is WONDERFUL. It needs some fine tuning and we need to learn from past mistakes in delivery. I am very excited and can hardly wait for its release.
Survey - Government Primary Assistant Principal

It is about time we had the connection between primary and secondary.
Focus Group - Batemans Bay

It lifts boundaries, provides more opportunities, challenges us as teachers, particularly the more traditional teachers. Teachers will find this challenging in several areas eg teaching algorithms later. There will need to be more professional help. I think this is very exciting. **Focus Group - Parramatta**

While there was consistent overall endorsement of the Draft Writing Brief several issues of concern were raised. These included:

- some changes to the placement of content in particular Stages
- the type and range of suggested topics in the Additional Content
- appropriate recognition of the significant number of students currently studying the Standard course in Stage 5
- the perceived removal of the three course structure for Stage 5 and, in particular, the extent to which the structure meets the needs of lower-ability students
- the lack of information about the assessment of students in Stage 5 linked to School Certificate testing and credentialling
- Stage Statements that do not encompass the great majority of students in each Stage
- the need for the development of an extensive glossary for the final syllabuses
- limited acknowledgment of the importance of valuing mathematical knowledge acquired in other contexts
- a lack of focus on the importance of supporting students in their acquisition of the oral and written language skills needed to demonstrate achievement of outcomes.

Retention of Three Courses in Stage 5 Mathematics

An overwhelming number of secondary responses to the Draft Writing Brief requested that the three courses of study in Stage 5 Mathematics be retained. Teachers stated that offering three courses was the best arrangement to cater for the diverse needs of students in Years 9 and 10 and to prepare them for future study of Mathematics in Stage 6. It was suggested that the continuation of this arrangement would ensure the retention of high standards in Mathematics, consistency of course offerings in schools in New South Wales, and the provision of a clearly articulated set of standards for students to aim to achieve.

The current course arrangements lead to three standards which are reflected in the proposed K-10 Mathematics Scope and Continuum. Three standards of knowledge and understanding at the end of Year 10 can be catered for through the provision of three defined courses or pathways of learning; each leading to a standard that would be reflected in reporting for the School Certificate. In addition these standards would provide articulation with Stage 6 courses and establish the development of sound numeracy skills deemed suitable for the end of the compulsory years of schooling.

These pathways need to build upon the learning of Stage 4 content. Since not all students achieve Stage 4 outcomes at the same time, it would be more appropriate to have a structure that allows three, or more, pathways to be commenced earlier or later depending on the achievement of Stage 4 outcomes.

The K-10 Mathematics Scope and Continuum provides teachers with an overview of content and outcomes and sets out a continuum of learning. It acknowledges that students learn at different rates and in different ways and will develop their understanding of concepts at different times. Important as the three or more endpoints for Year 10 are, it is also important to ensure that students develop a sound understanding of the Stage 4 outcomes. Currently, the Years 7-8 course is presented to students until the end of Year 8. Students then begin a Years 9-10 course at the beginning of Year 9. This issue needs to be addressed in the revised syllabus as much as the issue of acknowledging different exit points for year 10. As a result it is possible to envisage at least three scenarios across Years 7 to 10.

When students enter Year 7, some may not have achieved the Stage 3 outcomes and in some cases, the Stage 2 outcomes. These differences need to be acknowledged and learning experiences need to be planned to support the development of knowledge, skills and understanding at these Stages before progression to Stage 4 content. This preparation may take most of Year 7 so that these students would not commence working towards the Stage 4 standard until Year 8. Flexibility in the delivery of pathways of learning would enable students to spend more time developing and consolidating an understanding of the Stage 4 content. These students could then work towards achievement of a specified subset of outcomes for Stage 5 in preparation for the General Mathematics Preliminary course.

Another group of students would have achieved most of the Stage 3 outcomes when they begin Year 7 and might take two years to achieve the Stage 4 outcomes. This group would then spend two years working towards achievement of the Stage 5 outcomes and the identified middle standard of achievement. They would typically study the General Mathematics course in Stage 6, although, with additional support, they could undertake the Mathematics course.

At the commencement of Year 7, other students will have achieved the Stage 3 outcomes and possibly some of the Stage 4 outcomes. These students may achieve the outcomes for Stage 4 within twelve or eighteen months and be ready to commence Stage 5 outcomes as well as Stage 5 Extension outcomes. This pathway would typically lead students to the attainment of the highest standard by the end of Year 10; preparing them for the more challenging Mathematics, Mathematics Extension 1 and Mathematics Extension 2 courses.

3.2 Summary of Key Issues and Actions

This section lists key issues and actions and indicates the sources of concern in relation to each issue.

Key to Abbreviations

AECG	Aboriginal Education Consultative Group, NSW
AHISA	Association of Heads of Independent Schools of Australia
BCC	Board Curriculum Committee
CEOP	Catholic Education Office, Parramatta
CEOW	Catholic Education Office, Wollongong
DET	Department of Education and Training
ECEC	Early Childhood Education Council
FOSCO	NSW Federation of School and Community Organisations
JSHAA	Junior School Heads' Association of Australia
MANSW	Mathematical Association of New South Wales
MAQ	Associate Professor Mike Mitchelmore, Dr Joanne Mulligan, Dr Lynne Outhred
OTEN	OTEN, Distance Education - Learning Materials Production Primary
PC	Federation of Parents and Citizens' Associations
SS	Statistical Society (NSW)
TFG	Teacher Focus Groups
UNSW	Professor Garth Gaudry, Dr David Tacon, Dr Peter Brown

Key Issues Identified in the Draft Writing Brief		
ISSUE	**SOURCE**	**ACTION**
Focus of the Document The presentation of the Draft Writing Brief gives an impression of the syllabuses as content-driven with not enough focus on the student, learning for understanding, or the important role of the teacher.	PC MAQ Surveys	Syllabus writers will ensure that there is a focus on the student, learning for understanding and the role of the teacher in draft syllabuses and support documents.
Developing Knowledge and Understanding The need to emphasise understanding of concepts and the importance of revisiting concepts to strengthen understanding and build new knowledge.	CEOP TFG Surveys	Information about developing understanding will be included in an introduction to the draft syllabuses.
Rationale, Aim and Objectives The Rationale, Aim and Objectives need to confirm the importance of developing knowledge and understanding that is meaningful and creative as well as useful and practical.	DET MANSW CEOP TFG Surveys	The Rationale, Aim and Objectives have been revised.
Working Mathematically The Working Mathematically processes need to be clearly integrated with the content in the final syllabuses to ensure the development of these processes across the Stages from Early Stage 1 to Stage 5.	BCC DET MANSW AHISA CEOP CEOW TFG Surveys	The Working Mathematically processes will be clearly integrated with the content in draft syllabuses and in the Teaching and Learning Units.
Students in Stage 5 who have not achieved Stage 4 outcomes The presentation of content for Stage 5 needs to encompass a meaningful and appropriate course for students who have not achieved Stage 3 and/or Stage 4 outcomes.	BCC DET MANSW UNSW CEOP CEOW TFG Surveys	A clearly articulated standard will be developed for inclusion in the draft syllabus to meet the needs of students in Stage 5 who have not achieved Stage 3 and/or Stage 4 outcomes. In the draft syllabus, there will need to be an emphasis on the use of the Scope and Continuum to describe differential outcomes. In addition, there is a need to establish reasonable expectations of students by the end of the compulsory years of schooling.
Stage 5 Courses Clearly delineated courses must be developed for Stage 5 to ensure consistency, continuity and coherence of knowledge/understanding for all.	BCC DET MANSW UNSW CEOP TFG Surveys	Three pathways, or courses of learning, will be developed for inclusion in the draft syllabus.

Credentialling Credentialling and the role of the School Certificate Test must be clarified for all students who will be studying mathematics until the end of the compulsory years of schooling.	DET MANSW CEOW TFG Surveys	Clarification will be provided in the draft syllabus.
Presentation of Content in the Syllabus The presentation of content must be clear and provided in a user-friendly format for ease of use by teachers.	BCC DET MANSW CEOP CEOW TFG Surveys	For Years 7-10, the syllabus content will be presented in a clear and user-friendly manner. For Years K-6, the syllabus will be consistent with recently developed Board syllabuses.
Cross-curriculum Content The cross-curriculum content needs to be developed for the draft syllabuses to include links with, and numeracy demands of, other KLAs.	BCC DET MANSW PC CEOP CEOW MAQ TFG Surveys	Cross-curriculum material will be developed by syllabus writers. The links with, and numeracy demands in, other KLAs, will be presented in the Teaching and Learning Units.
Standards The standards need to be clearly articulated for each Stage, for teachers, parents and students.	BCC CEOP CEOW OTEN TFG Surveys	The standards in terms of outcomes and content will be clearly articulated in the draft syllabus. Curriculum standards and performance standards will need to be aligned.
Stage Statements The Stage Statements need to describe the achievements of the great majority of students in each Stage.	CEOW CEOP TFG Surveys	Syllabus writers will consider the achievements of the majority of students and amend the Stage Statements accordingly.
Assessment Strategies Assessment strategies must be developed that will assist teachers in judging the achievements of students against the standards.	DET MANSW CEOP CEOW TFG Surveys	As indicated in the Draft Writing Brief, syllabus writers will develop assessment strategies.

Glossary An extensive glossary of terms needs to be developed for primary and secondary teachers.	BCC DET CEOP CEOW TFG Surveys	The draft syllabuses will include a glossary of new terms appropriate to the content in the new syllabuses.
Teaching and Learning Units Teaching and Learning Units need to be written to integrate outcomes, content, sample activities, language/literacy advice, use of technology, enrichment ideas, as well as links to other substrands, strands and Key Learning Areas.	DET MANSW CEOP CEOW TFG Surveys	Syllabus writers will develop Teaching and Learning Units that will incorporate these elements.
Support Documents The syllabuses need to be supplemented with a range of support materials to assist teachers with implementation. These need to include packages for secondary as well as primary Principals and parents.	BCC DET MANSW AHISA CEOP CEOW PC TFG Surveys	As indicated in the Draft Writing Brief, a range of Support Documents is to be developed that will enable the effective implementation of the new syllabuses and effective reporting. The extent of provision of Support Documents will be determined during the next phase of syllabus development. It is also anticipated that school authorities will provide support according to syllabus needs.
Range of Learning The Years K-6 syllabus should include Stage 4 content and outcomes and the Years 7-10 Syllabus should contain at least Stage 3 content and outcomes.	DET MANSW CEOP CEOW TFG Surveys	The syllabuses will incorporate these additional stages.

Key Issues related to Specific Sections of the Draft Writing Brief

Rationale		
A need to go beyond the application and enjoyment of Mathematics.	DET Surveys	Rationale amended to include reference to other aspects of the study of Mathematics.
It needs to be made clear that Mathematics has an intrinsic value and is worthy of pursuit in its own right.	DET Surveys	Rationale amended to include reference to the intrinsic value of Mathematics.
The 'arts' should be included with the other areas listed as fields of endeavour.	DET MANSW Surveys	Rationale amended to include reference to the 'arts'.
Aim		
Use of the term 'problem-solving situations' is limited and needs to be expanded to incorporate the full range of mathematical activity.	DET MANSW CEOP TFG Surveys	Aim amended to include a broader range of situations than just problem-solving.
The inclusion of additional references to further study and life skills should be considered.	TFG	Aim amended to include reference to further study and life skills.
Objectives		
The stem should include the words 'knowledge, skills and understanding'.	CEOP TFG Surveys	The stem of the Objectives amended to include 'knowledge, skills and understanding'.
There needs to be an additional Values and Attitudes objective that encompasses demonstrating perseverance.	DET MANSW	The objectives were amended to incorporate the suggested addition.
Content Organisation		
The naming of substrands/topics should be more consistent to reflect the continuity of study across the Stages.	BCC	Syllabus writers will examine the naming of substrands/topics to determine if a continuity of names is appropriate.
The inclusion of all of the primary stages from Early Stage 1 to Stage 3 in one column in the table on page 18 is inappropriate.	CEOP MAQ TFG Surveys	A statement has been added to the Draft Writing Brief to indicate that these Stages were presented in one column because they all have the same set of substrands.
The explanation of the role of the Additional Content in the curriculum is not clear.	TFG	The description of the Additional Content has been rewritten to clarify its purpose.

The Additional Content needs to be extended to include Early Stage 1 and Stage 1 as well as to include many more topics that would be motivating for students. The current selection is limited and not necessarily Stage appropriate.	BCC DET AHISA ECEC JSHAA CEOW TFG Surveys	Suggested topics from the Consultation have been added to the topic list. Syllabus writers will further develop this list.
The description of the Working Mathematically processes need to be adapted to include mathematical representations, exploring relationships, and creating and developing new ideas.	DET MANSW	Draft Writing Brief amended to include some suggestions. Syllabus writers will further consider the descriptions of the Working Mathematically processes, particularly reasoning and reflecting.
The nature of proof and mathematical reasoning should be explicit in Mathematics syllabuses.	BCC	Syllabus writers will consider the inclusion of specific reference to the nature of proof, logical reasoning, justification of solutions and the need to develop mathematical arguments.
Relationship between Mathematics and Numeracy		
The relationship between mathematics and numeracy is still not clear and needs further clarification.	BCC DET MANSW CEOP MAQ TFG Surveys	Writers will reconsider and rewrite the relationship between mathematics and numeracy.
The use of the notion of abstraction in this definition is problematic.	DET MANSW Surveys	Writers will address this issue in the development of the draft syllabuses.
K-10 Mathematics Scope and Continuum		
The proposed structure for Stage 5 does not adequately meet the needs of all students. A fixed set of courses written by the Board of Studies is needed.	BCC DET MANSW CEOP UNSW TFG Surveys	The syllabus writers will develop three pathways of learning.
The students who have not been catered for are those who typically study the Standard course in Years 9/10.	BCC DET MANSW CEOP UNSW TFG Surveys	The syllabus writers will develop a clear pathway of learning to ensure the needs of the Standard students in Stage 5 have been addressed.

The Scope and Continuum addresses the overlap between the current Years K-6 Syllabus and the Years 7-8 Syllabus. However, it will be necessary for primary schools to communicate students' achievements with high schools if the continuum is to be used effectively.	BCC DET MANSW TFG Surveys	While this is primarily an issue for school authorities, the syllabus support documents will provide advice regarding the communication of students' achievements between primary and secondary schools.
Credentialling in Year 10 must be addressed, particularly in relation to the School Certificate.	DET MANSW TFG Surveys	Credentialling procedures will be developed when the draft syllabus has been written.
Articulation with the Stage 6 courses is of concern and needs to be clearly explained. What will students do in Stage 6 if they have only achieved Stage 4 outcomes?	DET MANSW MAQ TFG Surveys	The syllabus writers will develop three pathways of learning to articulate with Stage 6 courses.
The amount of content in some of the Stages is of concern. In particular, the increase in Number for Early Stage 1, Stage 1 and Stage 2, and the increase in difficulty level of Stage 4 and Stage 5.	CEOW TFG Surveys	The continuum has been amended to address some of these concerns. The syllabus writers will further examine the level of difficulty of each Stage as they develop the outcomes.
The movement of Number concepts to earlier Stages, particularly the number limits as well as the new focus on fractions, decimals and percentages, is of concern.	DET MANSW TFG Surveys	The continuum has been amended to accommodate some of the concerns related to Number concepts. The syllabus writers will further examine the development of number concepts across the Stages in consideration of current research.
Outcomes		
Fewer outcomes than is contained in the current *Outcomes and Indicators* document were considered desirable.	TFG Surveys	Syllabus writers will develop a smaller number of outcomes than is contained in the current Mathematics syllabuses.
The Working Mathematically outcomes need revision.	DET MANSW ECEC MAQ UNSW TFG Surveys	Some amendments have been made to the Working Mathematically outcomes. Syllabus writers will review the additional suggestions.
The integration of Working Mathematically with the other strands is necessary and must be explicit in the Teaching and Learning Units.	BCC AHISA	Syllabus writers will endeavour to integrate Working Mathematically with the other strands in the syllabuses .

The outcomes for Early Stage 1 should be written separately for each strand.	BCC DET MANSW CEOW ECEC TFG Surveys	In consultation on the draft syllabus, Early Stage 1 teachers need to be consulted to further clarify the need to have separate outcomes for each strand.
Content Sample		
Additional detail may need to be provided to enable teachers to program for the two years within each Stage.	DET MANSW	Syllabus writers will consider the inclusion of further advice.

Cross-curriculum Content		
Links between Mathematics and the other Key Learning Areas in both primary and secondary education must be incorporated into the syllabus.	MANSW MAQ TFG Surveys	These links with, and numeracy demands in, other KLAs, will be presented in the Teaching and Learning Units.
Inclusion of these areas should not add more content to the curriculum but should be integrated where appropriate.	TFG Surveys	The cross-curriculum content will be integrated into the syllabuses through the 'learn about' and 'learn to' statements.
Other areas are important and must be considered eg gender perspectives as well as the needs of Aboriginal and NESB students.	DET TFG CEOW Surveys	These areas will be addressed in the introduction to the syllabuses.
Prior-to-school Learning and Stage Statements		
The standards are too high for the typical student.	CEOW TFG Surveys	Syllabus writers will consider the levels for each Stage and rewrite the Stage Statements where necessary.
Assessment		
Advice about suitable assessment strategies needs to be provided.	CEOP TFG Surveys	Syllabus writers will provide advice about assessment strategies.
Course Performance Descriptors for Stage 5 are needed and should be written and presented for evaluation in the draft syllabus.	CEOW TFG Surveys	These will be written when the draft syllabus has been completed.
Assessment tasks should be included with the advice about suitable assessment.	TFG Surveys	Assessment tasks will be included in support documentation.

Credentialling of students needs to be addressed and communicated to teachers as soon as possible.	TFG Surveys	Credentialling procedures will be clarified in the draft syllabus.
Glossary		
Expand the subject-specific glossary to include many more of the terms used throughout the syllabus.	BCC CEOP TFG Surveys	The draft syllabuses will include a glossary of new terms appropriate to the content in the new syllabuses.
The glossary for the syllabus needs to be extensive with terms relating to both primary and secondary concepts.	BCC TFG Surveys	The draft syllabuses will include a glossary of new terms appropriate to the content in the new syllabuses.
Support Documents		
All suggested Support Documents were deemed necessary for the appropriate implementation of the new syllabuses.	DET MANSW AHISA JSHAA CEOP TFG Surveys	The extent of provision of Support Documents will be determined during the next phase of syllabus development.
Teaching and Learning Units were considered essential in both syllabuses and should be presented in a similar format for ease of access by both primary and secondary teachers.	BCC DET MANSW TFG Surveys	Teaching and Learning Units will be written to support implementation of the new syllabuses.
Teaching and Learning Units need to cover all content in a manageable fashion with several units addressing each outcome.	TFG Surveys	Noted
Advice about the language demands at particular Stages needs to be provided.	DET MANSW CEOP CEOW TFG Surveys	Noted

3.3 Specific Sections of the Draft Writing Brief

The quantitative and qualitative consultation is represented in two ways: survey analysis and commentary and representative quotes. The Survey Analysis section represents the breakdown of the results of the data gathered in response to the surveys on the Draft Writing Brief.

The Commentary and Representative Quotes section represents a summary account of the surveys and written submissions from key groups, individuals, organisations and teacher focus groups.

3.3.1 Rationale for Mathematics in Years K to 10

The Rationale describes the nature of the subject in broad terms. It explains the place and purpose of the subject in the curriculum.

Survey Analysis

a. Approval:	94%	Disapproval:	2%
b. Approval:	95%	Disapproval:	2%
c. Approval:	94%	Disapproval:	4%

Overview of Agree/Disagree levels with prompted statements, n=250 (100%)	Strongly Agree	Agree	Disagree	Strongly Disagree	Not Answered
1. The Rationale for Mathematics (p. 14)					
a. The Rationale reflects the purpose and principles of the *Draft K-10 Curriculum Framework*	26	68	2	0	4
b. The nature of Mathematics is adequately described in broad terms	31	64	2	0	3
c. The Rationale reflects a contemporary view of Mathematics	33	61	4	0	3

Commentary and Representative Quotes

Response to the Rationale was positive and included comments that it was concise and well written. Suggestions were made by several respondents for recommended changes to the Rationale. Examples of comments include:

> *Not necessarily only 'problem-solving situations' unless this is defined to include developments of techniques. Much of secondary education is the learning of processes and techniques, whether this be in maths or any other discipline. Not all secondary education must be immediately gratifying and enjoyable.*
> **Survey - Secondary Mathematics Coordinator.**

> *The Draft K-10 curriculum purpose statement comments on life-long learning, moral, ethical and spiritual considerations. I don't feel these are clearly addressed in the Rationale.* **Survey - NSW AECG**

> *The main thrust of the Rationale seems to be towards the utility of Mathematics, a thrust which is continued in the Aim. Yes, it's useful and yes, students must learn how to*

apply it and problem solve and so on. But that's not all that it's about. There needs to be, both in the Rationale and in the Aim, a comment which goes beyond the mere application of Mathematics and its enjoyment. The comment should incorporate elements of its development, its processes and its beauty.

Survey - Secondary Deputy Principal

Perhaps the dynamic and evolving nature of this thing we call mathematics, and its intrinsic underpinning of ways of thinking essential in the twenty-first century, could be teased out in the Rationale.

Survey - Secondary Mathematics Coordinator

Some concern was expressed about the appropriateness of the Rationale with the prevalence of negative attitudes towards mathematics and whether this can be changed given the focus on content in the Draft Writing Brief.

What is important is that students develop a positive self-concept as learners of mathematics. If kids are struggling then that will be linked to lack of enjoyment. To say that kids will develop a positive self-concept may be an issue. I don't see that happening. **Focus Group - Parramatta**

ISSUE	SOURCE	ACTION
A need to go beyond the application and enjoyment of Mathematics.	DET Surveys	Rationale amended to include reference to other aspects of the study of Mathematics.
It needs to be made clear that Mathematics has an intrinsic value and is worthy of pursuit in its own right.	DET Surveys	Rationale amended to include reference to the intrinsic value of Mathematics.
The 'arts' should be included with the other areas listed as fields of endeavour.	DET MANSW Surveys	Rationale amended to include reference to the 'arts'.
A means of ensuring that students will develop a positive self-concept.	TFG	The Rationale endorses the view that it is desirable for students to develop a positive self-concept.
Use of technology should be included in the Rationale.	DET TFG Surveys	Rationale includes reference to technology; however, the use of technology will be emphasised in the draft syllabuses.
The importance of the need to develop language skills to support mathematical learning.	DET	Rationale amended to include reference to the importance of developing language skills.

3.3.2 Aim

The Aim states the overall purpose of the syllabuses. It indicates the educational benefits that are intended to accrue for students who satisfactorily complete programs of study based on the syllabuses.

Survey Analysis Approval: 92% Disapproval: 6%

Overview of Agree/Disagree levels with prompted statements n=250 (100%)	Strongly Agree	Agree	Disagree	Strongly Disagree	Not Answered
2. The Aim (p. 15)					
The proposed Aim adequately describes the overall purpose of Mathematics in Years K to 10.	37	55	6	0	2

Commentary and Representative Quotes

The Aim was generally well received by respondents and was considered to be succinct and clear. However, there were suggestions to consider the inclusion of reference to preparation for further study and the provision of life skills. Some comments expressed concern about the notion of enjoyment and appreciation for lower-ability students.

> *You have written an Aim that is three-and-a-half lines and in that there is the mention of 'enjoyment and appreciation of mathematics'. There doesn't seem to be a lot of content in this draft writing brief that the lower-ability kids will enjoy.*
>
> **Focus Group - Parramatta**

ISSUE	SOURCE	ACTION
Use of the term 'problem-solving situations' is limited and needs to be expanded to incorporate the full range of mathematical activity.	DET MANSW CEOP TFG Surveys	Aim amended to include a broader range of situations than just problem-solving.
The inclusion of additional references to further study and life skills	TFG	Aim amended to include reference to further study and life skills.
Enjoyment and appreciation of mathematics, particularly for lower ability students.	TFG	The Aim promotes mathematics learning as a worthwhile endeavour.
The last paragraph of the Rationale should be moved to the Aim.	CEOP TFG	Noted. The aim is a single statement as indicated in the syllabus development model.

3.3.3 Mathematics Years K to 10 Objectives

Objectives provide more specific statements of the intent of the syllabus. They amplify the aim and provide direction to teachers on the teaching and learning process emerging from the syllabus.

Survey Analysis

a. Approval: 96% Disapproval: 3%
b. Approval: 93% Disapproval: 5%

Overview of Agree/Disagree levels with prompted statements n=250 (100%)	Strongly Agree	Agree	Disagree	Strongly Disagree	Not Answered
3. The Objectives (p. 16)					
a. The proposed objectives demonstrate the intention of the Mathematics Years K to 10 syllabuses	30	66	2	1	2
b. The proposed objectives clearly define the knowledge, skills and understanding and values and attitudes essential to Mathematics K-10	29	64	4	1	2

Commentary and Representative Quotes

Some respondents thought the objectives were a little unclear. A suggestion made by many respondents was to change the stem to include 'knowledge, skills and understanding'. In addition, use of the term 'students will' in the stem seems to suggest that this is to occur and may be unrealistic. Additional suggestions included the need to mention gender issues and the needs of ESL students. Also, the suggestion was made to include exploring and explaining mathematical ideas that would provide intrinsic motivation. The importance of technology and concrete materials could be included.

Others thought the Values and Attitudes objectives were appropriate.

> *I would say that these Values and Attitudes objectives are spot on. They are exactly what I am trying to do. Particularly regarding the Working Mathematically strand. This is exactly what we are trying to do.* **Focus Group - OBOS**

ISSUE	SOURCE	ACTION
The stem should include the words 'knowledge, skills and understanding'.	JSHAA CEOP TFG Surveys	The stem of the Objectives amended to include 'knowledge, skills and understanding'.
There needs to be an additional Values and Attitudes objective that encompasses demonstrating perseverance.	DET MANSW	The objectives were amended to incorporate the suggested addition.
Prediction and curiosity need to appear somewhere.	TFG	Syllabus writers to consider reference to prediction and curiosity.
An objective is needed that relates to the development of language skills and processes that are critical to the development of mathematical knowledge.	DET	The objectives include an indirect reference to language skills through communication.
Develop competence in a range of technologies.	CEOP CEOW TFG Surveys	The objectives have been amended to include reference to the use of technology.

3.3.4 Content Organisation

The Content Organisation section describes how the syllabus content is to be organised.

Survey Analysis

a. Approval:	91%	Disapproval:	7%
b. Approval:	89%	Disapproval:	9%
c. Approval:	82%	Disapproval:	15%

Overview of Agree/Disagree levels with prompted statements n=250 (100%)	Strongly Agree	Agree	Disagree	Strongly Disagree	Not Answered
4. Content Organisation (pp 17-21)					
a. The proposed content organisation assists understanding of the way the study of Mathematics for Early Stage 1 to Stage 5 Extension is structured	32	59	5	2	2
b. The proposed strands assist in illustrating the organisation of learning from Early Stage 1 to Stage 5 Extension	33	56	7	2	2
c. The proposed Additional Content is appropriate to enrich, broaden and extend students' learning in the suggested stage	26	56	11	4	4

Commentary and Representative Quotes

Most respondents indicated that the proposed strands were appropriate, although there was some concern about the additional strands in Years K to 6 and whether this will represent an increase in the amount of content or the number of outcomes in the new Syllabus. Some suggested that Number Patterns should be included in the Number strand in the primary curriculum.

> *Patterning and Algebra in K-6, patterning is part of all strands, is this now given a higher profile? But, why is it taken out of Number when it is all about patterning?*
>
> **Focus Group - Batemans Bay**

Other respondents made specific comments about the Working Mathematically strand and whether it should be a separate strand.

> *We suggest too that there be included a statement to indicate the unified nature of Working Mathematically. The five processes form one whole cyclic way of thinking and acting and while each process or outcome can be emphasised separately, the overall aim of working mathematically is to reflect and to question, as strategies are used and reasoning brought to bear using mathematical terminology and notation, and to communicate and record methods and solutions*. **MANSW**

> *We have had lengthy discussions about the role of Working Mathematically. There are certainly aspects of Working Mathematically which underpin all of the strands, and this needs to be explicit in the syllabus documents and a reflection of the practice in classrooms around NSW. We also understand the importance of articulating these very*

important processes clearly to assist teachers in their thinking, and also to underpin assessment practices. Overall, we support Working Mathematically as a strand. **AHISA**

However, by stating Working Mathematically as a separate strand rather than a process or learning cycle to be used to teach the other strands it runs a strong risk of being misunderstood by teachers who will try (and fail) to teach it somewhat in isolation.
Survey - Government Primary School

I think Working Mathematically is a good thing. I found a lot of teachers leave problem solving until the end of the course. I like the way it will be integrated and the presentation of the outcomes in the table on page 26.
Focus Group - Griffith

From the perspective of K-6, the Working Mathematically strand is the best thing that has come in. I noticed that technology has been incorporated into the other processes and that is good. **Focus Group - OBOS**

The notion of Additional Content was met with considerable approval although many suggested that the selection of topics was limited and did not provide sufficient examples of suitable topics to extend and challenge students. The following is representative of teachers' comments.

I like the Additional Content, it is aimed to enrich and interest our better students rather than to 'do more work'. This work can be fun and use games-type activities rather than extra work. **Survey - Government Secondary School Teacher**

It is arrogant of us to think we have included all of the mathematical knowledge the kids would need. This broadening is wonderful and will allow for greater knowledge. I love this and I wish we had it years ago. They will go further and even do it at a deeper level.
Focus Group - Newcastle

Additional Content for Stages 2 and 3 - these are waffle. Some of the Stage 4 stuff is what we are looking at doing with Stage 3. What is listed here is not very useful. These topics could go a lot further. Perhaps consider some more Geometry for Stage 3.
Focus Group - OBOS

ISSUE	SOURCE	ACTION
The naming of substrands/topics should be more consistent to reflect the continuity of study across the Stages.	BCC	Syllabus writers will examine the naming of substrands/topics to determine if a continuity of names is appropriate.
The inclusion of all of the primary stages from Early Stage 1 to Stage 3 in one column in the table on page 18 is inappropriate.	CEOP ECEC MAQ TFG Surveys	A statement has been added to the Draft Writing Brief to indicate that these Stages were presented in one column because they all have the same set of substrands.
The explanation of the role of the Additional Content in the curriculum is not clear.	TFG	The description of the Additional Content has been rewritten to clarify its purpose.
The Additional Content needs to be extended to include Early Stage 1 and Stage 1 as well as to include many more topics that would be motivating for students. The current selection is limited and not necessarily Stage appropriate.	BCC DET AHISA ECEC JSHAA CEOW TFG Surveys	Suggested topics from the Consultation have been added to the topic list. Syllabus writers will further develop this list.
The description of the Working Mathematically processes needs to be adapted to include mathematical representations, exploring relationships, and creating and developing new ideas.	DET MANSW	Draft Writing Brief amended to include some suggestions. Syllabus writers will further consider the descriptions of the Working Mathematically processes, particularly reasoning and reflecting.
The nature of proof and mathematical reasoning should be explicit in Mathematics syllabuses.	BCC	Syllabus writers will consider the inclusion of specific reference to the nature of proof, logical reasoning, justification of solutions and the need to develop mathematical arguments.
Strand names may need to be reconsidered, particularly Patterning and Algebra.	UNSW TFG Surveys	Renamed strand Patterns and Algebra.
Patterning should be included in the Number strand in the primary syllabus.	TFG Surveys	The integration of strands and substrands will be described in the draft syllabuses with advice to develop students' number pattern knowledge while teaching the Number strand.
Chance and Data should form one strand to link the collection of data with representation and prediction.	AHISA MAQ TFG Surveys	Syllabus writers will further consider the placement of Chance during the writing of the draft syllabuses.
The Data strand does not clearly include graphs in the substrands.	TFG Surveys	Descriptions have been reworked to clearly include reference to graphs.

The omission of Temperature as a substrand is an issue and needs to be taught either in Mathematics or another Key Learning Area.	DET CEOW MAQ UNSW TFG Surveys	A more specific reference to the development of Temperature has been included in the Measurement strand.
It is unclear where some topics are placed in the primary curriculum with this arrangement of strands and substrands eg money, perimeter of shapes, and graphs.	CEOW TFG Surveys	The strands and substrands have been rewritten to include these topics.
Stage 3 Extension needs to be included to accommodate the needs of more able primary school students.	TFG OTEN Surveys	The Scope and Continuum is designed to encourage the development of knowledge to Stage 4 or to enrich and broaden students' experiences through the Additional Content.
The inclusion of Imaginary Numbers for students not planning to study Mathematics Extension 2 is questionable. It was suggested that it be removed and changed to an introduction appropriate for all students.	TFG Surveys	This topic has been deleted from the table of Additional Content since there was concern that it would be more appropriate to address this topic only in the Mathematics Extension 2 course.
Advice regarding the weighting of the strands and substrands needs to be provided for teachers.	TFG Surveys	Advice about the focus of particular topics in particular Stages will be provided in Syllabus documents.
Set Theory should be an element of the essential content rather than the Additional Content.	TFG Surveys	The inclusion of simple set theory will be considered by syllabus writers in the development of the draft syllabuses.
Some simple deductive reasoning in Geometry should be included in Stage 4.	TFG Surveys	Students could be encouraged to develop these skills if they have achieved the Stage 4 outcomes.
Working Mathematically needs to highlight the importance of language skills.	DET	Syllabus writers will address language skills in the Working Mathematically strand in the draft syllabuses.
The inclusion of Data in Stage 5 Extension should be considered.	SS Surveys	The Data included in the Draft Writing Brief in Stage 5 is considered appropriate and sufficient for the needs of Stage 5 Extension.
Extend fractions in Stage 3 to remove the limit on equivalent fractions.	AHISA TFG Surveys	The Draft Writing Brief has been amended to remove the limits on equivalent fractions.

3.3.5 The Relationship between Mathematics and Numeracy

Survey Analysis Approval: 85% Disapproval**:** 12%

Overview of Agree/Disagree levels with prompted statements n=250 (100%)	Strongly Agree	Agree	Disagree	Strongly Disagree	Not Answered
5. Relationship between Mathematics and Numeracy (p. 22) The proposed statement The Relationship between Mathematics and Numeracy clarifies the relationship between Mathematics and Numeracy for Years K to 10.	30	55	10	2	3

Commentary and Representative Quotes

Responses to this section were mixed. Many applauded the attempt to distinguish between Mathematics and Numeracy while others indicated that the distinction was unclear and/or unnecessary. Some respondents suggested the inclusion of a visual representation to demonstrate the relationship. Recommendations for changes included the following:

> *Mathematics uses symbolic notation, generalisations and symbolic manipulation. We agree that numeracy is a subset of Mathematics, but believe 'abstract skills' is not a term with meaning. We suggest that the section be rewritten as two sections. First, the relationship between Mathematics and Numeracy and the second outlining the special responsibility of teachers of Mathematics above that of all teachers for the imparting of numeracy skills.* **MANSW**

> *I welcome paragraph 1 for secondary teachers - that is good. Now that we have SNAP, we know that maths is across the curriculum. Paragraph 2 - some teachers may not know what 'a subset' means. Numeracy reflects a wider context than just mathematics - it is the responsibility of more teachers than just maths teachers.* **Focus Group - Griffith**

> *The second paragraph of this statement is quite weak in that it does not clearly show the link/relationship between Numeracy and Mathematics. The second and third sentences in this same paragraph also appear contradictory with the Rationale. Overall we do not believe that this statement clarifies the relationship between Numeracy and Mathematics well enough to support a clear understanding of the issues.* **Survey - CEO, Parramatta**

Several respondents expressed concern that there was not a similar statement about literacy.

> *I read this and I am more concerned about literacy in maths, not numeracy. Kids arrive in secondary and they feel uncomfortable about using mathematical words. The kids resist using the words. I am concerned that it becomes a natural thing to use the language of mathematics.* **Focus Group - OBOS**

ISSUE	SOURCE	ACTION
The relationship between mathematics and numeracy is still not clear and needs further clarification.	BCC DET MANSW CEOP MAQ TFG Surveys	Writers will reconsider and rewrite the relationship between mathematics and numeracy.
The use of the notion of abstraction in this definition is problematic.	DET MANSW Surveys	Writers will address this issue in the development of the draft syllabuses.
The implications of the inclusion of this in the syllabus for classroom teachers (including teachers of other KLAs in secondary schools).	TFG Surveys	Writers will provide advice for teachers to support a continued focus on developing students' numeracy skills.
A visual model should be used to demonstrate the relationship.	DET TFG Surveys	Writers will provide a visual model of the relationship.

3.3.6 K-10 Mathematics Scope and Continuum

The K-10 Mathematics Scope and Continuum provides an overview of the continuum of learning in Mathematics from Kindergarten to Year 10.

Survey Analysis

a.	Approval: 87%	Disapproval: 10%
b.	Approval: 85%	Disapproval: 10%
c.	Approval: 88%	Disapproval: 9%
d.	Approval: 76%	Disapproval: 12%
e.	Approval: 78%	Disapproval: 8%
f.	Approval: 78%	Disapproval: 9%
g.	Approval: 81%	Disapproval: 5%
h.	Approval: 80%	Disapproval: 5%
i.	Approval: 43%	Disapproval: 10%
j.	Approval: 41%	Disapproval: 12%
k.	Approval: 41%	Disapproval: 11%
l.	Approval: 44%	Disapproval: 9%
m.	Approval: 42%	Disapproval: 11%

Note:

There were a significant number of nil responses to items (i) to (m) in this section of the survey. Many primary school respondents chose not to comment on the Stage 4, Stage 5 and Stage 5 Extension questions.

Overview of Agree/Disagree levels with prompted statements n=250 (100%)	Strongly Agree	Agree	Disagree	Strongly Disagree	Not Answered
6. The K-10 Mathematics Scope and Continuum (pp 23-30)					
a. The proposed Working Mathematically Scope and Continuum assists in illustrating the development of mathematical processes.	27	60	8	2	3
b. The proposed strand organisers are appropriate for the K-10 Mathematics Scope and Continuum.	29	56	7	3	4
c. The presentation of the K-10 Mathematics Scope and Continuum is useful in providing an overview of Mathematics learning from Early Stage 1 to Stage 5 Extension.	37	51	6	3	3
d. The placement of content on the K-10 Mathematics Scope and Continuum for Number is appropriate for Early Stage 1 to Stage 3.	24	52	10	2	12
e. The placement of content on the K-10 Mathematics Scope and Continuum for Patterning and Algebra is appropriate for Early Stage 1 to Stage 3.	22	56	5	3	14
f. The placement of content on the K-10 Mathematics Scope and Continuum for Measurement is appropriate for Early Stage 1 to Stage 3.	20	58	7	2	14
g. The placement of content on the K-10 Mathematics Scope and Continuum for Space and Geometry is appropriate for Early Stage 1 to Stage 3.	21	60	3	2	14
h. The placement of content on the K-10 Mathematics Scope and Continuum for Data is appropriate for Early Stage 1 to Stage 3.	22	58	4	1	15
i. The placement of content on the K-10 Mathematics Scope and Continuum for Number is appropriate for Stage 4 to Stage 5 Extension.	12	31	7	3	46
j. The placement of content on the K-10 Mathematics Scope and Continuum for Patterning and Algebra is appropriate for Stage 4 to Stage 5 Extension.	12	29	8	4	48
k. The placement of content on the K-10 Mathematics Scope and Continuum for Measurement is appropriate for Stage 4 to Stage 5 Extension.	13	28	8	3	48
l. The placement of content on the K-10 Mathematics Scope and Continuum for Space and Geometry is appropriate for Stage 4 to Stage 5 Extension.	11	33	6	3	48
m. The placement of content on the K-10 Mathematics Scope and Continuum for Data is appropriate for Stage 4 to Stage 5 Extension.	10	32	8	3	47

Commentary and Representative Quotes

The K-10 Mathematics Scope and Continuum was viewed very positively by most respondents. It was seen as a useful way to present the content for all Stages from Early Stage 1 to Stage 5 Extension and showed the progression of learning from primary to secondary education. The inclusion of some of the Count Me In Too approaches was also acknowledged. The following is a sample of the positive responses:

> *As long as schools can set up classes which best suit the needs of their students the implementation should be fine. It is good to see a reduction in the amount of overlap, especially from Stage 3 to Stage 4.*
> **Survey - Government Central School Executive Teacher**

> *Impressed with the Continuum as it allows more efficient mapping of where students have come and are heading – well done!*
> **Survey - Non-government Primary school**

> *It would appear the syllabus is asking us to consider individual student needs and asking us to structure different groups within our school and classes. This created great debate on practicalities in the classroom. Support on managing this would be appreciated.* **Survey - Government Secondary school**

> *Count Me In Too is great and it has really shown me what the kids can do, particularly when we are not worrying about formal algorithms*. **Focus Group - Moree**

Objections were raised to some of the statements made in the background information to the Scope and Continuum. Several respondents and participants in the focus groups shared the following views.

> *It is wrong to state that '… currently only a small group of students study the Standard course in Years 9-10.' (p. 23) Statistics for the Campbelltown District are that the majority of schools have approximately 50% or more of their students studying the Standard course, some as high as 80%.*
> **Survey - group of Government Mathematics Head Teachers**

> *The statement is inaccurate. If you look at the percentages, this is inaccurate.*
> *We have five classes and there are always about two classes doing Standard Maths.*
> *There can be as many as 60% of the students doing Standard Maths in our area.*
> **Focus Group - Moree**

Some teachers felt that the needs of students in particular areas of the State were being ignored and needed to be addressed in the Syllabus. This included isolated areas as well as lower socio-economic areas in metropolitan settings.

There is a different situation from rural to metropolitan – the data is skewed. We are not addressing the needs of rural students … The content is not suitable. Access makes things easier in the city. We are expecting teachers to achieve the same outcomes with not the same input. There needs to be a focus in syllabus statements that addresses the differences. The kids leave because they feel like they are failing. **Focus Group - Moree**

More need for language development in early stages especially when considering Aboriginal students and students from NESB. **Survey - NSW AECG**

Some teachers had reservations about the implications of this Scope and Continuum for the current course structure in Stage 5. Several issues were raised regarding the design of school-based courses to meet the needs of individual students and the implications of this for School Certificate credentialling. In addition, it was felt that isolated, small schools with less experienced teachers would find this a difficult and time-consuming task. This is evidenced in the following:

Overall we like the thrust of the writing brief. There are some issues which need to be clarified such as credentialling for SC and minimum standards. Does a student still working at Stage 4 at the end of Year 10 receive a SC?
Survey - Government Secondary School

More clarification is needed regarding student entitlement. Who decides what students will be exposed to and what information (apart from professional judgement) will be needed to support program decisions? I strongly agree that the eradication of 3 rigid courses in Stage 5 is a wonderful idea, provided the issue of entitlement is settled. If it is acknowledged that some students will not achieve Stage 5 outcomes, will the School Certificate (or its replacement) acknowledge the lesser outcomes that have been achieved?
Survey - Government Secondary Mathematics Head Teacher.

Also … is this implying that there is no mandate for the content to be delivered (… two, three or more courses …)? Does this mean we could leave out chunks of content and cover some of the "additional content" instead to meet the individual needs of our students? If not, then what is the meaning of this statement? If so, what about meeting the requirement to sit for a School Certificate examination? What will be the specified core content that is mandatory for all (equity?!!).
Survey - group of Government School Mathematics Head Teachers

Students will be exiting with a Stage 5 qualification yet at many different points in their learning of Mathematics. This raises many issues for assessment and reporting. Students will be at different points on the Continuum so do we assess/report separately or together (so why not have the 3 separate courses prescribed?). Currently there are CPDs for Adv, Int, Stand with A to E in each, if not three courses then A to E for Stage 5

is limiting the range of CPDs between students, ensuring Es for weaker students and no rewards for working hard.
Survey - Non-government School Secondary Mathematics Executive Teacher

I am concerned about having to design our own courses. It is fine at a reasonably large school with more teachers able to share the load. What about the work load in a small school or for the inexperienced teacher? **Focus Group - Moree**

That is why I was wondering if the Board is looking at something for a Stage 5 exit credential that relates to being numerate. That would marry with the School Certificate. That could free teachers to work on the skills before the students exit rather than just spending two weeks on Surface Area and then two weeks on another topic. Then they don't learn anything. An alternative approach could mean that the kids might really learn something. **Focus Group - Newcastle**

Many secondary mathematics teachers were concerned about the Scope and Continuum because of what they perceived as the removal of three distinct courses for Stage 5. In particular, many comments expressed considerable concern for the group of students who currently study the Standard course. This is reflected in the following:

Currently the students working to achieve Stage 5 outcomes or beyond in Years 9 and 10 commit to a study of Intermediate or Advanced Mathematics. This commitment is registered with the BOS and serves as a strong motivation for each students to achieve the outcomes of the course and obtain a good School Certificate grade. If in future years there is only one School Certificate Mathematics course it will be more difficult to persuade students to attempt the extension work. It is essential that those who are to progress to Mathematics Extension in Years 11 and 12 undertake the Stage 5 Extension. It is a concern of our members that unless there is a BOS recognition many will not be motivated to do the extra quite challenging study required. This will have serious implications for Australia's future technical development. **MANSW**

We are extremely disappointed that the three courses that currently exist in Stage 5 have been removed from this writing brief. We do not accept the thinking that has gone into this decision. **CEOP**

I don't like the added flexibility. I think it is the responsibility of the Board to design courses for the kids. Teachers are too busy. Depending on the time you have available, the courses will range from very good to not so good and that will lead to a lowering of standards. The current three courses are very good. The introduction of two courses is too few. **Focus Group - OBOS**

I strongly believe that it is important to preserve the 3 distinct courses in Stage 5 at the Board level. This then provides conformity across the State when providing grades at

the end of Year 10. I think it is inappropriate to grade all students on one course. It is also inappropriate to grade students on school-developed programs.
Survey - Secondary School Executive Teacher.

We need three courses in Years 7-10. We also need some overlap to occur. One course will not address the needs of our students. Going back to one course is going back in the past. Leaving schools to split the courses will cause much confusion for students who are changing schools.
Survey - Non-government Secondary Mathematics Coordinator

I feel the lack of structure for Stage 5 would disadvantage weaker students and those who are less motivated. Some of the content does not link easily with Stage 6 General Maths. Time for developing assessment tasks would take time away from teaching. Clarification and help would be welcome re assessment procedures and implementation. **Survey (no further details provided)**

*We are very concerned as to how we will cater for the less able students. We have a large number of students who study the Standard Maths course and we are concerned that many of our students will not manage the content proposed in Stages 4 and 5***.**
Survey - Government Secondary School

PLEASE do not get rid of the 3 levels
- it allows differentiation of teaching different kids
- it allows for outstanding kids to get a higher qualification
- it allows for 'success' (emphasis not added) at a lower level, rather than just OK failure.
Survey - Secondary Executive Teacher

There is a definite need for a course similar in level to the current Stage 5 Standard course. Many students have the need for this level especially to achieve the Values and Attitudes statements on p. 16. This has also happened in Stage 6 with the removal of MIP, but a crucial difference is that Maths is, and I hope always will be, compulsory in Stage 5. There is a responsibility to provide a clear, detailed course for these students. This is the responsibility of the BOS, not individual schools.
Survey - Non-government Secondary Coordinator of Mathematics

The question of a fixed course structure in Stage 5 (p. 25) is most important. The Scope and Continuum may allow schools to develop their own courses, but it seems to me that this would lead to enormous duplication of effort in schools across the State. I do not know of any teachers currently teaching in Stage 5 who are dissatisfied with the current system of three-Board developed courses. I know many teachers who simply do not

have the time to develop multiple school-based courses. **Survey - Independent Secondary School Teacher**

The following is representative of those who expressed support for the new approach proposed in the Draft Writing Brief.

It should be noted that generally among secondary mathematics teachers there is a great deal of concern that this document will mean the end of levels in Stage 5. They have concerns that this will limit a school's ability to extend the able and provide appropriately for the weaker maths students.

This group feels that this perception is faulty and that the draft actually provides for potentially greater flexibility at a school level and does not restrict the options for streaming or specific course design to meet the needs of all students. The value of this new syllabus will be undermined unless some community education is undertaken to support it.

Survey - group of advisers in Curriculum and Mathematics, Independent sector

A number of respondents criticised the presentation of the K-10 Mathematics Scope and Continuum. This related to layout, with potential overcrowding; and what was considered unclear wording of some content statements. Some of the content statements were considered to be quite specific whereas others were considered to be very broad and general, requiring considerable time for concept development.

In the Number section, the four operations are bunched together, but this represents 12 months work. By separating these, it might signal to teachers how important they are. There is a lot of work to be covered in some of these content statements.

Focus Group - Batemans Bay

There seems to be a compartmentalisation of Number and Geometry. Where is the attempt to draw the threads together? We need to integrate the content.

Focus Group - Newcastle

Placement of content in some Stages, particularly where there was a movement of content, frequently elicited some concern. It was noted that there had been a request to reduce the amount of content in the Syllabus Review Phase and that this has not been addressed at this stage.

Moving content down in the Stages is an issue. Negative numbers in Stage 3 is going too far. I am sick of this push down. There always seems to be more content coming into the curriculum. Also, the need for automatic recall can take up so much class time.

Focus Group - Moree

I am worried about Number in Early Stage 1 to Stage 3 - everything has been pushed forward - there is no way the little ones will cope with that.

Focus Group - Parramatta

Most kids will achieve this but they will need more time. You have effectively pushed everything forward a Stage. We are setting kids up to fail. It is too high. The children are learning Number and they will not achieve this. It is a lot to ask of teachers with a high proportion of NESB students in their classrooms. **Focus Group - Parramatta**

Some teachers suggested that Fractions and Decimals in primary school should not have restrictions placed on equivalent fractions.

There needs to be more on equivalent fractions. I can't understand why there is a restriction placed on equivalent fractions. I think that is limiting. Also, multiplying a fraction by a whole number is OK but what about mixed numbers and improper fractions? **Focus Group – OBOS**

Some respondents were concerned that there was little change in the proposed syllabus.

My main concern is that nothing much has changed - most of the content in the old syllabuses is still there - just rearranged amongst the various stages. This means that much of the work that the 'average' student now finds difficult, if not completely beyond his/her capabilities, is still there.

Survey - Government Secondary Executive Teacher

Others expressed concern about the content focus of the Draft Writing Brief.

We are concerned by the content-driven nature of this writing brief; and the subsequent 'too advanced too soon' nature of this continuum. For the 'average' student to become 'competent' and 'confident' there needs to be time to practise and assimilate the learning. This brief does not allow time for this. We are also concerned that there is too much content to permit teachers to promote enjoyment and appreciation of mathematics — there is no time for 'fun' activities now and the syllabus does not allow any more time than the current one. **Survey -**

ISSUE	SOURCE	ACTION
The proposed structure for Stage 5 does not adequately meet the needs of all students. A fixed set of courses written by the Board of Studies is needed.	BCC DET MANSW CEOP UNSW TFG Surveys	The syllabus writers will develop three pathways of learning.
Three courses must be written for Stage 5.	MANSW CEOP UNSW TFG Surveys	The syllabus writers will develop three pathways of learning.
Course structure is unclear, particularly for less able students. Greater freedom to design school-based courses will lead to considerable diversity across the State, potentially leading to the lowering of standards.	DET MANSW UNSW TFG Surveys	The syllabus writers will develop three pathways of learning leading to three standards.
The students who have not been catered for are those who typically study the Standard course in Years 9/10.	BCC DET MANSW CEOP UNSW TFG Surveys	The syllabus writers will develop a clear pathway of learning to ensure the needs of the Standard students in Stage 5 have been addressed.
Placing content in columns with Stage headings seems to interfere with the notion of progression along a continuum of learning that may be sooner or later than chronological age development.	Surveys PC	Noted Content articulated for Stages is based on a continuum of typical progression.
The presentation of the Scope and Continuum as content statements suggests a focus on content rather than learning and understanding.	Surveys PC	The content statements provide a basis for the development of outcomes. The syllabuses will be presented to support a focus on learning and understanding.
Revisiting of concepts to strengthen and deepen knowledge and understanding is crucial.	MAQ Surveys PC	Syllabus writers will provide advice regarding the necessity to revisit concepts to strengthen and deepen knowledge and understanding.
The Scope and Continuum addresses the overlap between the current Years K-6 Syllabus and the Years 7-8 Syllabus. However, it will be necessary for primary schools to communicate students' achievements with high schools if the continuum is to be used effectively.	BCC DET MANSW TFG Surveys	While this is primarily an issue for school authorities, the syllabus support documents will provide advice regarding the communication of students' achievements between primary and high schools.
Progression to the next Stage should not occur until student learning has been consolidated and there have been ample opportunities to explore concepts in detail and in a variety of contexts.	CEOP TFG Surveys	Assessment advice will incorporate information about the achievement of outcomes at each Stage.
Not all concepts are well aligned. Some statements are too broad or not well phrased.	MACQ UNSW TFG Surveys	Some statements have been amended and others realigned. The syllabus writers will further alter the arrangement of content where necessary.

Assessment and reporting of groups of secondary students placed at multiple positions on the Continuum will be very difficult.	DET TFG Surveys	Advice regarding assessment and reporting will be provided in Support Documents.
Credentialling in Year 10 must be addressed, particularly in relation to the School Certificate.	DET MANSW TFG Surveys	Credentialling procedures will be developed when the draft syllabus has been written
The nature of the School Certificate Test and the preparation of students for this test if they have not achieved Stage 5 outcomes by the end of Year 10.	DET TFG Surveys	The School Certificate Test will be reviewed when the syllabus has been finalised.
Articulation with the Stage 6 courses is of concern and needs to be clearly explained. What will the students do in Stage 6 if they have only achieved Stage 4 outcomes?	DET MANSW MAQ TFG Surveys	The syllabus writers will develop three pathways of learning to articulate with Stage 6 courses.
The amount of content in some of the Stages is of concern. In particular, the increase in Number for Early Stage 1, Stage 1 and Stage 2, and the increase in difficulty level of Stage 4 and Stage 5.	CEOW TFG Surveys	The continuum has been amended to address some of these concerns. The syllabus writers will further examine the level of difficulty of each Stage as they develop the outcomes.
The movement of Number concepts to earlier Stages, particularly the number limits as well as the new focus on fractions, decimals and percentages is a concern.	DET MANSW TFG Surveys	The continuum has been amended to accommodate some of the concerns related to Number concepts. The syllabus writers will further examine the development of number concepts across the Stages in consideration with current research.
The placement of some content in particular Stages in the Scope and Continuum has been questioned.	DET MANSW MAQ UNSW TFG Surveys	Amendments have been made to the Scope and Continuum in several areas. Syllabus writers will further consider these aspects.
Despite a slight decrease in content in Stage 5 Extension there does not seem to be much difference to the expectations for these students.	TFG Surveys	Pathways may assist in addressing the issue of overcrowding in Stage 5 Extension.
The provision of clear information about the level/standard/depth to which a particular topics needs to be explored and examined.	TFG Surveys	Syllabus writers will describe the knowledge, skills and understanding for each Stage.
The suggestion in the introductory comments on page 23 that “a small number of students study the Standard course in Years 9 and 10” needs to be corrected.	DET MANSW TFG Surveys	The Draft Writing Brief has been amended to “another group of students study the Standard course in Years 9 and 10”.

3.3.7 Outcomes for Early Stage 1 to Stage 5

Syllabus outcomes express the specific intended student learning that results from the teaching of the syllabus. They are derived from the objectives and content of the syllabus.

Survey Analysis

a. Approval:	61%	Disapproval:	8%
b. Approval:	70%	Disapproval:	7%
c. Approval:	70%	Disapproval:	8%
d. Approval:	68%	Disapproval:	9%
e. Approval:	73%	Disapproval:	7%
f. Approval:	53%	Disapproval:	5%
g. Approval:	48%	Disapproval:	5%
h. Approval:	49%	Disapproval:	4%
i. Approval:	31%	Disapproval:	32%

Note:

There were a significant number of nil responses to items (f) to (h) in this section of the survey. Many primary school respondents chose not to comment on the Stage 4, Stage 5 and Stage 5 Extension questions. In addition, many of the secondary respondents did not answer the last item relating to the presentation of Early Stage 1 outcomes.

Overview of Agree/Disagree levels with prompted statements n = 250 (100%)	Strongly Agree	Agree	Disagree	Strongly Disagree	Not Answered
7. Outcomes for Early Stage 1 to Stage 5 (p. 2 , pp 31-33)					
a. The draft Working Mathematically Outcomes are appropriate for Early Stage 1 to Stage 5 Extension	16	45	6	2	31
b. The sample Outcomes for Early Stage 1 are appropriate	21	49	6	1	22
c. The sample Outcomes for Stage 1 are appropriate	21	49	6	2	21
d. The sample Outcomes for Stage 2 are appropriate	20	48	7	2	22
e. The sample Outcomes for Stage 3 are appropriate	24	49	5	2	20
f. The sample Outcomes for Stage 4 are appropriate	14	39	4	1	43
g. The sample Outcomes for Stage 5 are appropriate	10	38	4	1	45
h. The sample Outcomes for Stage 5 Extension are appropriate	11	38	3	1	47
i. Early Stage 1 Outcomes should be presented as an integrated set rather than written for the separate strands	11	20	17	15	37

Consultation and Representative Quotes

Teachers generally supported the sample outcomes. There was a mixed response to the proposal to present the Early Stage 1 outcomes in separate strands. There were requests to decrease the number of outcomes. The following indicates this:

Very appropriate outcomes for each stage. Preferable to keep Early Stage 1 outcomes written in the five strands rather than integrated as they are now.

Survey - Primary classroom Teacher

A general comment about content – the number of outcomes that are now (current K-6 Syllabus) *in the primary maths area is excessive. There need to be fewer. There are no guidelines about time and we would need to teach 10 hours per day. In primary, has any one sat down and added them up?* **Focus Group - Moree**

The Working Mathematically outcomes were generally accepted although there were some concerns about the level of difficulty at particular stages and reservations with keeping them separate.

It seems to me that the standard expected for Working Mathematically is higher than the rest of the content at each Stage. Some of the content seems to be a bit high but the expectations for Working Mathematically are definitely higher.

Focus Group - OBOS

Working Mathematically outcomes are clearly conveyed as a separate strand. I'm concerned by this as good teachers should be using them as an 'umbrella' which goes across each strand. A lot of work was done when the outcomes document presented Working Mathematically outcomes a few years ago. I would prefer to see T & D directed at getting teachers to program Working Mathematically outcomes with the other strands.

Survey - Government Primary School Assistant Principal

Further advice was provided to support the transmission of information about students' achievements.

*We need a proforma for outcomes reporting so that it is consistent across the State. This will enable high schools to know which Stage all the students are at from each feeder primary school***. Survey - Government Secondary School**

ISSUE	SOURCE	ACTION
A smaller number of outcomes than is contained in the current *Outcomes and Indicators* document was considered desirable.	TFG Surveys	Syllabus writers will develop a smaller number of outcomes than is contained in the current Mathematics syllabuses.
The Working Mathematically outcomes need revision.	DET MANSW ECEC MAQ UNSW TFG Surveys	Some amendments have been made to the Working Mathematically outcomes. Syllabus writers will review the additional suggestions.
The integration of Working Mathematically with the other strands is necessary and must be explicit in the Teaching and Learning Units.	BCC AHISA	Syllabus writers will endeavour to integrate Working Mathematically with the other strands in the syllabuses.
The outcomes need to clearly written.	BCC Surveys	Syllabus writers will ensure that the outcomes will be written clearly for teachers. Support materials will include information to report student achievement to parents.
The outcomes for Early Stage 1 should be written separately for each strand.	BCC DET MANSW CEOW TFG Surveys	In consultation on the draft syllabus, Early Stage 1 teachers need to be consulted to further clarify the need to have separate outcomes for each strand.

3.3.8 The Content Sample for Early Stage 1 to Stage 5

Content describes the knowledge, skills, understanding and values to be studied and developed by students over a Stage or Stages in a syllabus and the development of the processes of learning so that students are encouraged to be effective learners.

8.1 Survey Analysis

a. Approval:	74%	Disapproval:	7%
b. Approval:	75%	Disapproval:	6%
c. Approval:	72%	Disapproval:	9%
d. Approval:	76%	Disapproval:	8%
e. Approval:	51%	Disapproval:	5%
f. Approval:	48%	Disapproval:	6%
g. Approval:	48%	Disapproval:	5%

8.2 Survey Analysis

a. Approval:	69%	Disapproval:	11%
b. Approval:	46%	Disapproval:	10%

Overview of Agree/Disagree levels with prompted statements n=250 (100%)	Strongly Agree	Agree	Disagree	Strongly Disagree	Not Answered
8. The Content Sample for Early Stage 1 to Stage 5 (pp 34-42)					
8.1					
a. The proposed Content sample for Early Stage 1 is appropriate	24	50	5	2	18
b. The proposed Content sample for Stage 1 is appropriate	23	52	4	2	19
c. The proposed Content sample for Stage 2 is appropriate	22	50	7	2	19
d. The proposed Content sample for Stage 3 is appropriate	24	52	6	2	16
e. The proposed Content sample for Stage 4 is appropriate	13	38	4	1	44
f. The proposed Content sample for Stage 5 is appropriate	13	35	5	1	46
g. The proposed Content sample for Stage 5 Extension is appropriate	12	36	4	1	47
8.2					
a. The proposed level of detail and presentation of the Content sample is sufficient to develop learning and teaching programs for Early Stage 1 to Stage 3	21	48	9	2	20
b. The proposed level of detail and presentation of the Content sample is sufficient to develop learning and teaching programs for Stage 4 to Stage 5 Extension	10	36	8	2	45

Note:

There were a significant number of nil responses to items 8.1 (e) to (g) and 8.2 (b) in this section of the survey. Many primary school respondents chose not to comment on the Stage 4, Stage 5 and Stage 5 Extension questions.

Commentary and Representative Quotes

There was concern that this presentation of content did not provide enough detail for teachers to program.

> *There would not be enough detail for inexperienced teachers to develop a teaching sequence for two years work. Teachers would appreciate the provision of teaching and learning units, particularly for Early Stage 1 to Stage 3, showing connections with other KLAs. The present primary Mathematics Syllabus could be adapted to provide detail.* **MANSW**

Analysis of data indicated that most supported the organisation of content into 'learn about' and 'learn to' statements. This is evidenced in the following:

> *The sections are very clearly written – they give explicit descriptions of student activity – some staff may need examples of tasks as is current in the K-6 Syllabus.*
> **Survey - Government Primary Executive Teacher**

> *It seems to be knowledge and how you apply it. There is no point having knowledge unless you know how to apply it.* **Focus Group - Batemans Bay**

Some respondents did not like the 'learn about' and 'learn to' statements since this was viewed as adding another layer of information that might be better communicated as indicators.

> *The 'learn about' and 'learn to' are not very helpful for mathematics. There seems to be little distinction.* **MANSW**

> *It is more confusing if we have 'learn about/learn to' as well as indicators.*
> **Focus Group - Moree**

Several respondents mentioned indicators. Some suggesting that they should be written for all Stages. This is indicated in the next response:

> *While I recognise that secondary teachers usually have a background in mathematics teaching (if not Mathematics itself) and can, in the main, do without indicators, I wonder what demands we place on primary teachers (like my wife!) by specifying indicators, thereby making them implicitly compulsory. On the other hand, if this is indeed a K-10 continuum, then indicators should be included for all (or not at all).*
> **Survey - Secondary School Deputy Principal**

ISSUE	SOURCE	ACTION
Additional detail may need to be provided to enable teachers to program for the two years within a Stage.	DET MANSW	Syllabus writers will consider the inclusion of further advice.
The 'learn to' statements seem to be the same as indicators. It would seem unnecessary to have both.	TFG Surveys	Syllabus writers will examine the presentation of content.
For consistency, indicators should be included in the Years 7-10 Syllabus as well as the Years K-6 Syllabus.	DET CEOW TFG Surveys	Noted. Indicators are used to elaborate the outcomes in K to 6 syllabuses.
Teaching strategies and the use of appropriate technology should be incorporated into the syllabus.	TFG Surveys	Syllabus writers will provide advice about appropriate teaching strategies and the use of technology in sample Teaching and Learning Units.

3.3.9 Cross-curriculum Content

The Board of Studies is developing cross-curriculum requirements to be included in the outcomes and content of syllabuses.

Survey Analysis Approval: 74% Disapproval: 12%

Overview of Agree Disagree levels with prompted statements n=250 (100%)	Strongly Agree	Agree	Disagree	Strongly Disagree	Not Answered
9. Cross-curriculum Content (p. 43). The proposed areas of Cross-curriculum Content are appropriate for inclusion in the Mathematics Years K to 10 Syllabuses	20	54	9	3	14

Commentary and Representative Quotes

Many respondents indicated that there was not enough information contained in this section to allow an evaluation of the proposal. Concern was expressed about the addition of more content to an already full curriculum. Links with other Key Learning Areas were considered to be essential and should be included in syllabus documents.

> *We also believe that the various subject syllabuses need to make explicit the links in content and process across all BOS subjects. This is particularly necessary in the core subject areas and any links should be highlighted. In secondary schools where most subjects have been taught by specialists, teachers are often unaware of other disciplines' content and requirements. This cross referencing is essential for Mathematics because so many of the numeracy skills expected and used in other subjects are probably better first taught in a Mathematic class.* **MANSW**

> *Linkages – can we have cross-KLA links?*
> *Cultural links could be included here as well.*
> *Aboriginal perspectives are needed as well as Life Skills*. **Focus Group - Moree**

ISSUE	SOURCE	ACTION
Cross-curriculum content requirements must be examined by the BOS so that there is close coordination with other syllabus developments.	DET MANSW	Noted.
Links between Mathematics and the other Key Learning Areas in both primary and secondary education must be incorporated into the syllabus.	MANSW MAQ TFG Surveys	The links with, and numeracy demands in other KLAs, will be presented in the sample Teaching and Learning Units.
Inclusion of these areas should not add more content to the curriculum but should be integrated where appropriate.	TFG Surveys	The cross-curriculum content will be integrated into the syllabuses through the 'learn about' and 'learn to' statements.
Other areas are important and must be considered eg gender perspectives as well as the needs of Aboriginal and NESB students.	DET TFG CEOW	These areas will be addressed in the introduction to the syllabuses.
The area of Key Competencies is unclear and needs to be explained.	TFG Surveys	The consultation indicated that K-6 teachers are yet to develop an understanding of the nature of the Key Competencies.

3.3.10 Mathematics Learning from Prior-to-school to Stage 5 Extension

Stage statements describe what students typically know and can do as a consequence of having undertaken the syllabus content prescribed for the Stage.

Survey Analysis

a. Approval:	81%	Disapproval:	2%
b. Approval:	77%	Disapproval:	4%
c. Approval:	77%	Disapproval:	4%
d. Approval:	74%	Disapproval:	4%
e. Approval:	74%	Disapproval:	5%
f. Approval:	46%	Disapproval:	4%
g. Approval:	44%	Disapproval:	5%
h. Approval:	45%	Disapproval:	4%

Overview of Agree/Disagree levels with prompted statements n=250 (100%)	Strongly Agree	Agree	Disagree	Strongly Disagree	Not Answered
10. Mathematics learning from Prior-to-school to Stage 5 Extension (pp 44-49)					
a. The Stage Statements adequately explain the breadth of student learning in Mathematics	23	58	2	0	17
b. The relevant Stage Statement adequately describes what a student should typically know and do in Early Stage 1 Mathematics	22	55	4	0	19
c. The relevant Stage Statement adequately describes what a student should typically know and do in Stage 1 Mathematics	21	56	4	0	19
d. The relevant Stage Statement adequately describes what a student should typically know and do in Stage 2 Mathematics	20	54	4	0	20
e. The relevant Stage Statement adequately describes what a student should typically know and do in Stage 3 Mathematics	20	54	5	0	20
f. The relevant Stage Statement adequately describes what a student should typically know and do in Stage 4 Mathematics	10	36	3	1	50
g. The relevant Stage Statement adequately describes what a student should typically know and do in Stage 5 Mathematics	10	34	4	1	51
h. The relevant Stage Statement adequately describes what a student should typically know and do in Stage 5 Extension Mathematics	10	35	4	0	51

Note:

There were a significant number of nil responses to items (f) to (h) in this section of the survey. Many primary school respondents chose not to comment on the Stage 4, Stage 5 and Stage 5 Extension questions.

Commentary and Representative Quotes

This section was also well received. The inclusion of Prior-to-school learning was considered valuable although some teachers were concerned that not all students have had these experiences and would therefore have difficulty meeting the Early Stage 1 outcomes by the end of Kindergarten.

Most respondents agreed that a general statement of achievement for each Stage was appropriate; however, many indicated that these statements were setting the standard too high for the typical student. Concern about the setting of appropriate standards was evidenced in the following:

> *The bar seems to be set too high. In Stage 5 they have to meet quadratics and functions and that is hard.* **Focus Group - Batemans Bay**

> *Stage 2 seems to have content explosion. What do we do with students with prior-to-school learning that exceeds Early Stage 1?* **Survey - Independent Primary School**

> *Any attempt to describe the total mathematical experiences of a two-year period in a few paragraphs seems to be very limiting. These statements appear to be a summary of the outcomes achieved by students at each stage, but I would be very disappointed if they explained 'breadth of student learning'. One student's learning may well have considerably more depth and breadth than that of another student who has achieved exactly the same outcomes within the Stage. If a subject is well taught, then achievement should surely be open-ended, with outcomes only indicating the minimum level that is acceptable at a particular Stage.*
> **Survey - Independent Secondary Head Teacher**

The presentation of the Stage Statements was considered too wordy by some with a recommendation to either summarise, use dot point format or highlighting of key words.

> *This could be more helpful if there were dot points. Wouldn't mind if there was more here. Some of these sentences could be expanded. Make them less dense. Less experienced teachers will use these more and more to understand what happens in the Stages. Parents would find it more useful.* **Focus Group - Moree**

ISSUE	SOURCE	ACTION
The standards are too high for the typical student.	CEOW TFG Surveys	Syllabus writers will consider the levels for each Stage and rewrite the Stage Statements where necessary.
These statements are very wordy and difficult to read. Point form may make them more readable.	TFG Surveys	Syllabus writers will consider presentation and rewrite the Stage Statements.
The statements do not reveal the breadth and depth of learning that can occur in each Stage.	Surveys	Noted. However, this is not the purpose of Stage Statements.

3.3.11 Assessment

Survey Analysis Approval: 73% Disapproval: 14%

Overview of Agree/Disagree levels with prompted statements n= 250 (100%)	Strongly Agree	Agree	Disagree	Strongly Disagree	Not Answered
11 Assessment (p. 50)					
The information about Assessment assists in understanding the ways standards will be established and student achievement assessed and reported	14	59	12	2	13

Commentary and Representative Quotes

This section received criticism for its lack of specificity. Many suggestions were made about advice that would be more useful to teachers. This is represented in the following:

We do not believe that there has been a clear articulation of how standards will be established in mathematics. The information about Assessment lacks specificity which makes it difficult to agree with this statement. **Survey - CEO Parramatta**

Where are the guidelines, the assessment strategies, the processes? If we use assessment to find where the kids are we need a lot more advice. We need to be provided with a lot more information. **Focus Group - Moree**

Performance descriptors for all Stages of the Syllabus would be useful and would give teachers more assistance with assessing students.
Survey - Government Primary School

The comments made about 'clearly articulated standards' are important. They must be clear. The linkages between 6-7 are very important. Will standards be written such that they are appropriate to be used for tracking individual student achievement? Please!
Survey - Government Primary School

Our greatest problem is that transition stage from Year 6 to Year 7. Students are not assessed as individual learners but as a cohort of students whose abilities may not have reached the expectations of Stage 3 outcomes when entering Year 7. From my experience most Year 7 students begin at Stage 4 without any prior feedback from where their students were at the end of Year 6. The gaps widen when parts of learning are missed. Students need to be plotted on a continuum of learning according to stage development and this should pass with the student from Year 6 to year 7.
Survey - Government Primary Executive Teacher

Assessment of outcomes achieved in primary school should be sent to Year 7 teachers for continuity of teaching. Teachers of Year 7 will know the work covered and outcomes

achieved by individuals and will be able to compare with Stage 3 outcomes and content. Students should begin Year 7 at which ever Stage they have reached.

Survey - Government Primary School

Several respondents raised many issues including credentialling and course performance descriptors.

The grades awarded by the school, however, are for the particular course undertaken. Each course has particular Course Performance Descriptors. The Draft Writing Brief states that Course Performance Descriptors will be used for School Certificate reporting but it would be difficult to span the Stage outcomes from Stage 4 to Stage 5 Extension. It is important that these Performance descriptors be written and included as part of the syllabus package so that teachers have an opportunity to comment before the final syllabus is implemented. **MANSW**

Will a student be awarded a grade/level when they complete a Stage?
Will task format/policy/notification etc currently used in Stage 6 become the norm for Stages 4 to 5 Extension?
Support documents will need to be thorough.
Time frame to establish standards needs to be published.

Survey - Government Central School Executive Teacher

ISSUE	SOURCE	ACTION
Advice about suitable assessment strategies needs to be provided.	CEOP TFG Surveys	Syllabus writers will provide advice about assessment strategies.
Course Performance Descriptors for Stage 5 are needed and should be written and presented for evaluation in the draft syllabus.	CEOW TFG Surveys	These will be written when the draft syllabus has been completed.
Assessment tasks should be included with the advice about suitable assessment.	TFG Surveys	Assessment tasks will be included in support documentation.
Credentialling of students needs to be addressed and communicated to teachers as soon as possible.	TFG Surveys	Credentialling procedures will be developed when the draft syllabus has been completed.
Acknowledgment of the role of the External tests should be made in the document eg Basic Skills and SNAP	CEOP TFG Surveys	Reference to external assessment programs will be included in the draft syllabus.
A reporting proforma should be developed by the Board to assist teachers with reporting students' achievements in a consistent manner. This could then be used to communicate information from primary schools to high schools.	BCC TFG Surveys	Noted. The development of support material for reporting student achievement will be included in the syllabus package.

3.3.12 Glossary

The Glossary explains terms that will assist teachers in the interpretation of the Years K to 10 Mathematics syllabuses.

Survey Analysis

Approval: 84% Disapproval: 6%

Overview of Agree/Disagree levels with prompted statements n= 250 (100%)	Strongly Agree	Agree	Disagree	Strongly Disagree	Not Answered
12. Glossary (pp 52-56)					
a. The subject-specific terms in the Glossary are clearly defined	24	60	6	0	9

Commentary and Representative Quotes

The provision of the Glossary was well received but there were many suggestions about expanding the list to include most of the terminology met in the study of mathematics in Years K to 10. Advice suggested making it suitable for use by parents as well as teachers and students. Others indicated that a good Mathematics dictionary would be sufficient.

> *May be you should develop a common glossary that is comprehensive.*
>
> **Focus Group - Parramatta**

> *In general, we need a glossary of mathematical instructions as well. For example, it would be useful to have a list of words included: find, show, prove, evaluate etc. Then kids can't say that they don't know what you mean.* **Focus Group - OBOS**

ISSUE	SOURCE	ACTION
Expand the subject-specific glossary to include many more of the terms used throughout the syllabus.	BCC CEOP TFG Surveys	The draft syllabuses will include a glossary of new terms appropriate to the content in the new syllabuses .
The glossary for the syllabus needs to be extensive with terms relating to both primary and secondary concepts.	BCC TFG Surveys	The draft syllabuses will include a glossary of new terms appropriate to the content in the new syllabuses .

3.3.13 Support Documents

Survey Analysis

a. Approval:	91%	Disapproval:	0%
b. Approval:	84%	Disapproval:	2%
c. Approval:	84%	Disapproval:	3%
d. Approval:	85%	Disapproval:	1%
e. Approval:	62%	Disapproval:	1%
f. Approval:	44%	Disapproval:	20%
g. Approval:	63%	Disapproval:	1%
h. Approval:	62%	Disapproval:	1%
i. Approval:	63%	Disapproval:	0%
j. Approval:	61%	Disapproval:	2%

Overview of Agree / Disagree levels with prompted statements n=250 (100%)	Strongly Agree	Agree	Disagree	Strongly Disagree	Not Answered
13. Support Documents (pp 58-63)					
a. A support document for students with special education needs will assist in developing appropriate programs to meet student needs	53	38	0	0	8
b. **(K-6)** Teaching and learning units should form part of a support document	63	21	2	0	13
c. **(K-6)** Annotated work samples should be included in a support document to demonstrate syllabus standards	62	22	3	0	13
d. **(K-6)** The range of student performance illustrated by assessment tasks and work samples should form part of a support document	60	25	1	0	13
e. **(7-10)** Teaching and learning units should form part of a support document	47	15	1	0	36
f. **(7-10)** The organisation of content in thematic units would assist implementation	24	20	13	7	36
g. **(7-10)** Annotated work samples should be included in a support document to demonstrate syllabus standards	46	17	1	0	36
h. **(7-10)** the proposed inclusion of program overviews for particular groups of students would assist implementation	39	23	1	0	37
i. **(7-10)** The range of student performance illustrated by assessment tasks and work samples should form part of a support document	46	17	0	0	37
j. **(7-10)** The inclusion of Stage performance descriptors would assist in representing the various levels of student performance	41	20	1	1	37

Note:

There were a significant number of nil responses to items (e) to (j) in this section of the survey. Many primary school respondents chose not to comment on the questions relating to Years 7-10 questions.

Commentary and Representative Quotes

The majority of respondents agreed that considerable support materials will need to be developed to assist teachers with the implementation of a new syllabus. In particular, the following comments reveal additional requests:

> *Will there be a section on language in the new syllabus? I spend considerable time on the language of maths. In the old syllabus there was a section on language. I think we need some advice about language in mathematics that includes appropriate language for each Stage.* **Focus Group - Moree**

> *Proformas need to include a blank box at the beginning of indicators, content, activities etc for registration as well as a blank area at the bottom for teacher's notes etc would be helpful or for additional activities. Please make them as user friendly as possible.*
> **Survey - Government Primary School**

The use of technology was mentioned in many responses. The document was criticised for its lack of reference to technology in most sections. Teachers are seeking advice and recommendations about the appropriate use of particular technologies at particular Stages in students' mathematical learning.

> *Technologies appropriate for the teaching and learning of mathematics at all Stages need to be investigated. Support materials (detailed) must link outcomes to content, teaching strategies, student work samples and alternate assessment tasks for each Stage must be a part of each syllabus.*
> **Survey - Government Secondary Classroom Teacher**

> *Will people have to use particular types of technology eg spreadsheets? Will it be mandatory?* **Focus Group - Moree**

There was a mixed response to the offer to include thematic units in the Years 7-10 Support Documents.

> *Themes are a waste of time. Students generally dislike doing them and teachers dislike using them. Too much time is spent teaching about the bush to get to the knowledge and skills. It does not demonstrate context as all themes are contrived and viewed by students as contrived.*
> **Survey - Government Central School Secondary Executive Teacher**

The Teaching and Learning Units were well received, however, there were additional recommendations.

> *The general feeling conveyed by teachers is that the practical 'teaching/learning' units are the essence of a useful document – user friendly activities. Teachers remember when the 1989 (K-6) Syllabus arrived and the overwhelming response which was extremely positive. NO ONE wants to see this 'useful' approach lost or compromised in*

any way – no condensing of units into token representations of what they were initially. **Survey - Government Primary School**.

Why not organise the teaching and learning unit to promote Working Mathematically? Use the cycle QACRR (questioning, applying strategies, communicating, reasoning, reflecting). This gives teachers a sound framework on which to design other lessons to promote maths learning. **Survey - Government Primary School**

A call for substantial Training and Development was contained in many responses.

The success of the new syllabus is dependent upon both the provision of appropriate support for teachers both as documents and training. If the appropriate levels of training and development are not included with this package then its success will be limited. **Survey - Government Secondary School**

Overall I think it is excellent. It is very good to see Stage 4 for Year 7 developed so that Stage 3 work is not repeated. The additional units are an excellent idea to extend children laterally without impinging on stage work for the next year. This keeps active students interested in maths without boredom setting in. Discussion with other members of staff concluded that they are worried about the extra content and if adequate inservice will be given when the document is implemented. **Survey - Government Primary School Teacher**

ISSUE	SOURCE	ACTION
All suggested Support Documents were deemed necessary for the appropriate implementation of the new syllabuses.	DET MANSW AHISA JSHAA CEOP TFG Surveys	The extent of provision of Support Documents will be determined during the next phase of syllabus development.
Teaching and Learning Units were considered essential in both syllabuses and should be presented in a similar format for ease of access by both primary and secondary teachers.	BCC DET MANSW TFG Surveys	Teaching and Learning units will be written to support implementation of the new syllabuses.
Teaching and Learning Units need to cover all content in a manageable fashion with several units addressing each outcome.	TFG Surveys	Noted.
The presentation of content in thematic units for Years 7-10 is useful.	BCC	Draft units will be presented to teachers for evaluation during the development of the draft syllabus.
Advice about the language demands at particular Stages needs to be provided.	DET MANSW CEOP CEOW TFG Surveys	Noted.
Teachers should have ready access to all materials. This could be presented on the website or on CD ROM.	TFG Surveys	Noted.
Programming advice is desirable with the syllabus produced electronically in Word for ease of downloading into programs.	TFG Surveys	Noted.
Advice for multi-stage teaching was considered essential.	TFG	Examples of multi-stage units will be developed by syllabus writers.
Gifted and Talented students need to be catered for with advice for classroom teachers.	BCC TFG	Teaching and Learning units will contain enrichment suggestions.
Information about the importance of language in mathematics must be provided in the syllabus or in support documents.	TFG Surveys	Noted.
Program overviews should be provided to assist teachers in both primary and secondary.	TFG Surveys	Noted.
A principals' package for secondary should be considered as well as a Mathematics Coordinators' package.	TFG Surveys	Noted.
A parents' package should be developed so that parents are informed of the changes to syllabuses.	BCC Surveys	Noted.
The Scope and Continuum should be printed in poster format to be used to display in classrooms and in staffrooms.	Surveys	Noted.
A summary of the key changes should be written to enable ready communication of the impact of the new syllabuses.	TFG Surveys	Noted.

3.3.14 Syllabus Documents

Survey Analysis

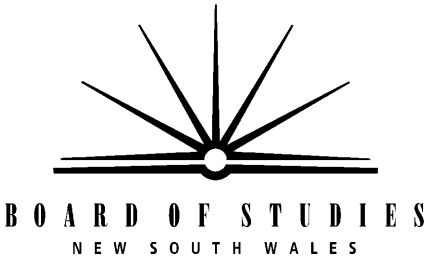
14.1 Approval: 85% Disapproval: 3%
14.2 Approval: 76% Disapproval: 1%

Overview of Agree/Disagree levels with prompted statements n=250 (100%)	Strongly Agree	Agree	Disagree	Strongly Disagree	Not Answered
14. Syllabus Documents					
14.1 Years K-6 Syllabus Document					
The Mathematics K-6 syllabus should include Stage 4 outcomes and content to assist in programming to meet the needs of all students	57	28	2	1	12
14.2 Years 7-10 Syllabus Document					
The Mathematics Years 7-10 syllabus should include Stage 3 outcomes and content to assist in programming to meet the needs of all students	58	18	0	1	23

Commentary and Representative Quotes

There was significant support for the inclusion of additional stages in each of the syllabuses.

ISSUE	SOURCE	ACTION
The Years K-6 syllabus should include Stage 4 outcomes and content.	DET MANSW CEOP CEOW TFG Surveys	The syllabuses will incorporate these additional Stages.
The Years 7-10 syllabus should contain Stage 3 and Stage 2 outcomes and content.	DET MANSW CEOP CEOW TFG Surveys	The syllabuses will incorporate these additional Stages.



Mathematics Years K to 10
Draft Writing Brief

APPENDICES to the
DRAFT CONSULTATION REPORT

August 2001

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Appendices

Appendix A

BOARD OF STUDIES
NEW SOUTH WALES

MATHEMATICS

Years K to 10

Draft Writing Brief Survey

(Incorporating K–6 and 7–10)

July 2001

Consultation period

23 July 2001 – 24 August 2001

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Survey on the Mathematics Years K to 10 Draft Writing Brief

Introduction

The purpose of this survey is to obtain detailed comments from **individuals** and **systems/organisations** on the Mathematics Years K to 10 draft writing brief.

Please comment on both the strengths and the weaknesses of the document.

i
For your *information*

Comments made by you and others will be taken into account when the draft writing brief is modified.

The final version of the writing brief will provide directions to writers of the syllabuses for Mathematics in Years K to 10.

Schools, teachers and other interested people and organisations can respond to the consultation document in one of three ways:

(1) Written response on the survey form which accompanies the draft writing brief. Please forward the completed survey to:

The Mathematics Administrative Officer
Office of the Board of Studies NSW
GPO Box 5300
SYDNEY 2001

OR

Fax: 9367 8476

OR

(2) Email survey response to johnson@boardofstudies.nsw.edu.au

OR

(3) On-line survey response through the Board's website.

The Board's website address is:

www.boardofstudies.nsw.edu.au

The consultation period is 23 July to 24 August 2001 inclusive.

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Survey Section A: General Information

Please circle the NUMBER corresponding to the most appropriate response.

1. This response is from

an individual	1
a school	2
a system	3
an organisation	4

Please specify which school/system/organisation

_____

Number of persons contributing to the response _____

2. Type of school/system/organisation in which you work or for whom you are responding

Primary School	1	Parent Group	7
Secondary School	2	Community Group	8
TAFE College	3	Business/Industry Group	9
University	4	Other (please specify)	10
Statewide Organisation	5		
Branch of an Organisation	6		

3. If the response is from a school

a) type of school

b) size of school

Government primary school	1	Fewer than 20 students	1
Government central school	2	20-50	2
Government secondary school	3	50–150	3
Non-government (systemic) school K–6	4	150–300	4
Non-government (systemic) school K–10/12	5	300–600	5
Non-government (systemic) school 7–12	6	600–1000	6
Independent school K–6	7	More than 1000	7
Independent school K–10/12	8	Other (please specify)	8
Independent school 7–12	9		

c) nature of school **(You may circle more than one)**

Significant representation of Aboriginal and/or Torres Strait Islander students	1	Academically Selective School	4
High percentage of students with language backgrounds other than English	2	Priority School Funding	5
Special School/SSP	3	Other (please specify)	6

d) location of school

Metropolitan area	1
Non-metropolitan town/city	2
Rural area	3
Other (please specify)	4

4. For individual responses only

a) Position

School-based		**Non-school-based**	
Classroom teacher	1	Consultant (system/sector)	7
Executive (teaching)	2	Consultant (private)	8
Executive (non-teaching)	3	Tertiary educator	9
Principal	4	Tertiary subject specialist	10
Specialist (eg librarian, ESL, STLD, RFF, careers)	5	Parent	11
Other (please specify)	6	Other (please specify)	12

b) Total number of years teaching

Have not taught	1
Up to 3 years	2
4–9 years	3
10–15 years	4
16–25 years	5
26 + years	6

Survey Section B: Draft Writing Brief

Please **circle the appropriate number** and provide comments.

Key **1** **Strongly Agree**
2 **Agree**
3 **Disagree**
4 **Strongly Disagree**

1. The Rationale for Mathematics in section 4.1 (p 14).

	Strongly Agree	Agree	Disagree	Strongly Disagree
a. The **Rationale** reflects the purpose and principles of the *Draft K–10 Curriculum Framework*	1	2	3	4
b. The nature of Mathematics is adequately described in broad terms	1	2	3	4
c. The **Rationale** reflects a contemporary view of Mathematics	1	2	3	4

Comment:

2. The **Aim** in section 4.2 (p 15).

	Strongly Agree	Agree	Disagree	Strongly Disagree
The proposed **Aim** adequately describes the overall purpose of Mathematics in Years K to 10	1	2	3	4

Comment:

3. The **Objectives** in section 4.3 (p 16).

	Strongly Agree	Agree	Disagree	Strongly Disagree
a. The proposed **Objectives** demonstrate the intention of the Mathematics Years K to 10 syllabuses	1	2	3	4
b. The proposed **Objectives** clearly define the knowledge, skills and understanding and values and attitudes essential to Mathematics K–10	1	2	3	4

Comment:

4. The **Content Organisation** in section 4.4 (pp 17-21).

	Strongly Agree	**Agree**	**Disagree**	**Strongly Disagree**
a. The proposed **Content Organisation** assists understanding of the way the study of Mathematics for Early Stage 1 to Stage 5 Extension is structured	1	2	3	4
a. The proposed **strands** assist in illustrating the organisation of learning from Early Stage 1 to Stage 5 Extension	1	2	3	4
c. The proposed **additional content** is appropriate to enrich, broaden and extend students' learning in the suggested stage	1	2	3	4

Comment:

5. The Relationship between Mathematics and Numeracy in section 4.5 (p 22).

	Strongly Agree	Agree	Disagree	Strongly Disagree
The proposed statement **The Relationship between Mathematics and Numeracy** clarifies the relationship between Mathematics and Numeracy for Years K to 10	1	2	3	4

Comment:

6. The **K–10 Mathematics Scope and Continuum** in section 4.6 (pp 23-30).

	Strongly Agree	Agree	Disagree	Strongly Disagree
a. The proposed **Working Mathematically Scope and Continuum** assists in illustrating the development of mathematical processes	1	2	3	4
b. The proposed strand organisers are appropriate for the **K–10 Mathematics Scope and Continuum**	1	2	3	4
c. The **presentation of the K–10 Mathematics Scope and Continuum** is useful in providing an overview of Mathematics learning from Early Stage 1 to Stage 5 Extension	1	2	3	4

Comment:

	Strongly Agree	Agree	Disagree	Strongly Disagree
d. The placement of content on the **K–10 Mathematics Scope and Continuum** for **Number** is appropriate for Early Stage 1 to Stage 3	1	2	3	4
e. The placement of content on the **K–10 Mathematics Scope and Continuum** for **Patterning and Algebra** is appropriate for Early Stage 1 to Stage 3	1	2	3	4
f. The placement of content on the **K–10 Mathematics Scope and Continuum** for **Measurement** is appropriate for Early Stage 1 to Stage 3	1	2	3	4
g. The placement of content on the **K–10 Mathematics Scope and Continuum** for **Space and Geometry** is appropriate for Early Stage 1 to Stage 3	1	2	3	4
h. The placement of content on the **K–10 Mathematics Scope and Continuum** for **Data** is appropriate for Early Stage 1 to Stage 3	1	2	3	4

Comment:

	Strongly Agree	Agree	Disagree	Strongly Disagree
i. The placement of content on the **K–10 Mathematics Scope and Continuum** for **Number** is appropriate for Stage 4 to Stage 5 Extension	1	2	3	4
j. The placement of content on the **K–10 Mathematics Scope and Continuum** for **Patterning and Algebra** is appropriate for Stage 4 to Stage 5 Extension	1	2	3	4
k. The placement of content on the **K–10 Mathematics Scope and Continuum** for **Measurement** is appropriate for Stage 4 to Stage 5 Extension	1	2	3	4
l. The placement of content on the **K–10 Mathematics Scope and Continuum** for **Space and Geometry** is appropriate for Stage 4 to Stage 5 Extension	1	2	3	4
m. The placement of content on the **K–10 Mathematics Scope and Continuum** for **Data** is appropriate for Stage 4 to Stage 5 Extension	1	2	3	4

Comment:

7. Outcomes for Early Stage 1 to Stage 5.

	Strongly Agree	Agree	Disagree	Strongly Disagree
a. The **draft Working Mathematically Outcomes** are appropriate for Early Stage 1 to Stage 5 Extension (p 26)	1	2	3	4

Sample outcomes for Stage 1 to Stage 5 Extension in section 4.7 (pp 31-33).

b. The sample **Outcomes** for Early Stage 1 are appropriate	1	2	3	4
c. The sample **Outcomes** for Stage 1 are appropriate	1	2	3	4
d. The sample **Outcomes** for Stage 2 are appropriate	1	2	3	4
e. The sample **Outcomes** for Stage 3 are appropriate	1	2	3	4
f. The sample **Outcomes** for Stage 4 are appropriate	1	2	3	4
g. The sample **Outcomes** for Stage 5 are appropriate	1	2	3	4
h. The sample **Outcomes** for Stage 5 Extension are appropriate	1	2	3	4
i. **Early Stage 1 Outcomes** should be presented as an integrated set rather than written for the separate strands	1	2	3	4

Comment:

8. The **Content** sample for Early Stage 1 to Stage 5 in section 4.8 (pp 34-42).

8.1

	Strongly Agree	Agree	Disagree	Strongly Disagree
a. The proposed **Content** sample for Early Stage 1 is appropriate	1	2	3	4
b. The proposed **Content** sample for Stage 1 is appropriate	1	2	3	4
c. The proposed **Content** sample for Stage 2 is appropriate	1	2	3	4
d. The proposed **Content** sample for Stage 3 is appropriate	1	2	3	4
e. The proposed **Content** sample for Stage 4 is appropriate	1	2	3	4
f. The proposed **Content** sample for Stage 5 is appropriate	1	2	3	4
g. The proposed **Content** sample for Stage 5 Extension is appropriate	1	2	3	4

Comment:

8.2

	Strongly Agree	Agree	Disagree	Strongly Disagree
a. The proposed level of **detail** and **presentation** of the **Content** sample is sufficient to develop learning and teaching programs for Early Stage 1 to Stage 3	1	2	3	4
b. The proposed level of **detail** and **presentation** of the **Content** sample is sufficient to develop learning and teaching programs for Stage 4 to Stage 5 Extension	1	2	3	4

Comment:

9. Cross-curriculum Content in section 4.9 (p 43).

	Strongly Agree	Agree	Disagree	Strongly Disagree
The proposed **areas of Cross-curriculum Content** are appropriate for inclusion in the Mathematics Years K to 10 syllabuses	1	2	3	4

Comment:

10. Mathematics Learning from Prior-to-school to Stage 5 Extension in section 4.10 (pp 44-49).

	Strongly Agree	Agree	Disagree	Strongly Disagree
a. The **Stage Statements** adequately explain the breadth of student learning in Mathematics	1	2	3	4
b. The relevant **Stage Statement** adequately describes what a student should typically know and do in Early Stage 1 Mathematics	1	2	3	4
c. The relevant **Stage Statement** adequately describes what a student should typically know and do in Stage 1 Mathematics	1	2	3	4
d. The relevant **Stage Statement** adequately describes what a student should typically know and do in Stage 2 Mathematics	1	2	3	4
e. The relevant **Stage Statement** adequately describes what a student should typically know and do in Stage 3 Mathematics	1	2	3	4
f. The relevant **Stage Statement** adequately describes what a student should typically know and do in Stage 4 Mathematics	1	2	3	4
g. The relevant **Stage Statement** adequately describes what a student should typically know and do in Stage 5 Mathematics	1	2	3	4
h. The relevant **Stage Statement** adequately describes what a student should typically know and do in Stage 5 Extension Mathematics	1	2	3	4

Comment:

11. Assessment in section 4.11 (p 50).

	Strongly Agree	Agree	Disagree	Strongly Disagree
The information about **Assessment** assists in understanding the ways standards will be established and student achievement assessed and reported	1	2	3	4

Comment:

What other **Assessment** advice should be provided for the Mathematics Years K to 10 syllabuses?

12. *Glossary* ***in section 5 (pp 52-56).***

	Strongly Agree	Agree	Disagree	Strongly Disagree
a. The subject-specific terms in the **Glossary** are clearly defined	1	2	3	4

Comment:

Are there other subject-specific terms used in the draft writing brief that need to be included in the **Glossary**?

13. Support Documents in section 6 (pp 58-63).

K–10 Support Document

	Strongly Agree	Agree	Disagree	Strongly Disagree
a. A support document for students with special education needs will assist in developing appropriate programs to meet student needs	1	2	3	4

K–6 Support Documents

b. Teaching and learning units should form part of a support document	1	2	3	4
c. Annotated work samples should be included in a support document to demonstrate syllabus standards	1	2	3	4
d. The range of student performance illustrated by assessment tasks and work samples should form part of a support document	1	2	3	4

Comment:

7–10 Support Documents

e. Teaching and learning units should form part of a support document	1	2	3	4
f. The organisation of content in thematic units would assist implementation	1	2	3	4
g. Annotated work samples should be included in a support document to demonstrate syllabus standards	1	2	3	4
h. The proposed inclusion of program overviews for particular groups of students would assist implementation	1	2	3	4
i. The range of student performance illustrated by assessment tasks and work samples should form part of a support document	1	2	3	4
j. The inclusion of Stage performance descriptors would assist in representing the various levels of student performance	1	2	3	4

Comment:

14. Syllabus documents

14.1 K–6 syllabus document

	Strongly Agree	Agree	Disagree	Strongly Disagree
The Mathematics K–6 syllabus should include Stage 4 outcomes and content to assist in programming to meet the needs of all students	1	2	3	4

14.2 7–10 syllabus document

	Strongly Agree	Agree	Disagree	Strongly Disagree
The Mathematics Years 7–10 syllabus should include Stage 3 outcomes and content to assist in programming to meet the needs of all students	1	2	3	4

General Comments

15. Please provide any further comments you would care to make on the draft writing brief.

Appendix B

Focus Group Composition

There were 99 teachers who attended the focus groups - 43 secondary teachers, 7 central school teachers, 43 primary school teachers and 6 DET consultants.

South Coast (Batemans Bay)

Monday, 6 August 2001 - 2-4pm

	Name	School
1.	Margaret Deighton	Bega High School
2.	Tony Koch	Braidwood Central School
3.	Sally Davey	Braidwood Central School
4.	Helen Wimmer	Huskisson Public School
5.	Lyn McCullagh	Milton Public School
6.	Keith Hartmann	Moruya High School
7.	Paul Davies	Carroll College
8.	Terry Young	St Bernard's Primary School
9.	Jason Harrison	St Bernard's Primary School
10.	Jacqui Heffernan	St Bernard's Primary School
11.	Gwen Johnson	St Mary's Star of the Sea, Milton
12.	Gary Norris	St Mary's Star of the Sea, Milton
13.	John Harnett	St Marys Public School (Moruya)
14.	Shirley Macleay	St Marys Public School (Moruya)
15.	Rob Rowland	Ulladulla High School
16.	George Betsis	Ulladulla High School
17.	Inta Long	DET

North West (Moree)

Wednesday, 8 August 2001 - 2-4pm

	Name	School
1.	Karen Jaegers	St Philomena's School
2.	Marianne Bunt	Boggabilla Central School
3.	Dorothy Lean	Rowena Public School
4.	Deborah Dixon	Goodooga Central School
5.	Andrew Pinelli	St Josephs School
6.	Annabel Doust	Narrabri High School
7.	Evelyn Nix	Narrabri High School
8.	Dharmendra Singh	Walgett High School
9.	Richard Clarke	Moree Technology High School
10.	Ruth Armstrong	Courallie High School
11.	Nigel Brito	DET

Met North West (Parramatta)

Thursday, 9 August 2001 - 4-6pm

	Name	School
1.	Trevor Edwards	Asquith Girls High School
2.	Elizabeth Amvrazis	Arthur Phillip High School
3.	Kylie Bull	Marayong South Public School
4.	Naomi Doherty	Oxley Park Public School
5.	Fiona Gale	Castle Hill Public School
6.	Peter McFarland	Parramatta High School
7.	Greg Wearne	James Ruse Agricultural High School
8.	Gina Kelly	St Marys Primary School, Georges Hall
9.	Kate Chapple	Quakers Hill Primary School
10.	Paul Rochfort	Christ Catholic College
11.	Marie Kobler	Winston Heights Public School
12.	Jenny Tomkins	Wentworthville Public School
13.	Megan Ireland	Westmead Public School
14.	David Stitt	Glendenning Public School
15.	Peter Rundle	Barker College
16.	Greg Lodge	Bankstown North Public School
17.	Vicki Zacharia	Quakers Hill High School
18.	Lindsay Warton	Model Farms High School
19.	Terry Gainey	Castle Hill High School
20.	Elizabeth Smart	Oakhill Drive Public School
21.	John Ford	Oakhill Drive Public School
22.	Brett Pangus	DET

Riverina (Griffith)

Tuesday, 14 August 2001 - 2-4pm

	Name	School
1.	Julie Kenny	Barellan Central School
2.	Evelina Blanco	Catholic High School
3.	Mary Martin	Griffith High School
4.	Lyn Wood	Griffith Public School
5.	Trevor Thompson	Hillston Central School
6.	Damien Bush	Leeton High School
7.	Sue Piggot	Naradhan Public School
8.	Joy Norrie	Narrandera Public School
9.	Christi Carroll	St Frances De Sales College
10.	Helen Mulholland	St Mary's Primary School
11.	Anne Friedlieb	St Patrick's Primary School
12.	Greg Press	Yanco Agricultural High School
13.	Carolyn Seal	Barellan Central School
14.	Jason Brain	Wade High School
15.	Leslie Casey	DET, Griffith

Met East and Met North (OBOS)

Wednesday, 15 August 2001 - 4-6pm

	Name	School
1.	Karen Ahearn	Abbotsleigh Junior School
2.	Greg Bamford	Concord High School
3.	Walter Bourke	St Pius X, Chatswood
4.	Ann Christopher	St Keiran's, Manly Vale
5.	Anita Guin	St George Christian School
6.	Anne Hastings	Kambala Girls School
7.	Janet Hong	PLC Junior School
8.	Chris Horley	St George Girls High School
9.	Andrew Langdon	Marist College, North Shore
10.	Geoff McLauchlan	Sydney Girls High School
11.	Loretto Muratore	St Vincent's School, Ashfield
12.	Karen Parrish	Mercy College, Chatswood
13.	Sue Stewart	Kingsgrove High School
14.	Tony Van Ravenstein	Our Lady of the Sacred Heart, Kensington
15.	Anne Verrender	St Patrick's School, Kogarah
16.	K Wallace	The Forest High School
17.	David Watt	Christian Brothers Lewisham

Hunter (Newcastle)

Tuesday, 21 August 2001 - 4-6pm

	Name	School
1.	Liz Baird	Hunter Valley Grammar School
2.	Mike Clapper	Hunter Valley Grammar School
3.	Margaret Finucane	Hunter Valley Grammar School
4.	Kim Sweeny	Cessnock East Public School
5.	Sue Winsor	King Street Public School
6.	Helen Shepherd	Kotara High School
7.	John Setz	Kotara High School
8.	Dianne Stewart	Kotara South Public School
9.	Leanne Wilson	DET, Maitland
10.	Peter Lobb	Merewether Public School
11.	Narelle Ryall	Minmi Public School
12.	Sue Turrell	DET, Newcastle
13.	Sue Gandy	Tenambit Public School
14.	Prue Dickson	Tighes Hill Public School
15.	Susan Wynn	West Wallsend High School
16.	Alison Tiplady	Woodberry Public School
17.	Wendy Tan	King Street Public School

Appendix C

Focus Group Questions and Prompts

1. Rationale
What comments do you have about the proposed Rationale? (p 14)

- Is the nature of the subject adequately described?
- Do you have any other comments?

2. Aim
What comments do you have about the proposed Aim? (p 15)

- Does it adequately describe the overall purpose of Mathematics?
- Do you have any other comments?

3. Objectives
What comments do you have about the proposed Objectives? (p 16)

- Are the objectives appropriate for all Mathematics students in Years K to 10?
- Do you have any other comments?

4. Content Organisation
What comments do you have about the proposed Content Organisation? (pp 17-21)

- Are the strands, as described, useful organisers for the study of Mathematics?
- Are the substrands appropriate?
- Does the content organisation help to understand the way in which the Mathematics K-6 and 7-10 Syllabuses will be structured?
- Are the topics included in the Additional Content appropriate for the suggested Stage? Are there other topics that should be included in the Additional Content?
- Do you have any other comments?

5. Relationship between Mathematics and Numeracy
What comments do you have about the proposed relationship between Mathematics and Numeracy? (p 22)

- Has this statement clarified the relationship between Mathematics and Numeracy?
- Do you have any other comments?

6. K-10 Mathematics Scope and Continuum
What comments do you have about the proposed K-10 Mathematics Scope and Continuum? (pp 23-30)

- Does the scope and continuum for each strand clearly show the development of content across the Stages from K to 10?
- Does the Scope and Continuum clearly articulate the knowledge, skills and understanding considered essential for students in the compulsory years?
- The proposed continuum is designed to provide flexibility for teachers to develop any number of courses that will meet the needs of all students. Comment.
- Do you have any other comments?

7. Outcomes for Early Stage 1 to Stage 5
What comments do you have about the proposed outcomes for Working Mathematically? (p 26) for Early Stage 1 to Stage 5 Extension? (pp 31-33)

- Are the outcomes appropriate for each Stage?
- Should Early Stage 1 outcomes be integrated rather than written separately for the five strands?
- Do you have any other comments?

8. Content Sample

What comments do you have about the Content sample for Early Stage 1 to Stage 5 Extension? (pp 34-42)

- Is the specified content appropriate for each Stage?
- Is the level of content too specific? Not specific enough?
- Is there sufficient detail in the 'students learn about' and 'students learn to' in order for you to program for effective learning?
- Do the suggestions in 'students learn to' provide assistance in applying the Working Mathematically outcomes?
- Do you have any other comments?

9. Cross-curriculum Content

What comments do you have about the proposed Cross-curriculum Content (p 43)?

- Are the areas specified the appropriate areas for inclusion in the proposed Mathematics Years K to 10 Syllabus?
- Do you have any other comments?

10. Mathematics Learning from Prior-to-school to Stage 5

What comments do you have about the proposed Stage Statements? (pp 44-49)

- Do the Stage statements adequately explain the breadth of student learning in Mathematics?
- Do you have any other comments?

11. Assessment

What comments do you have about the assessment section of the draft writing brief? (p 50)

- Does the information about assessment assist in understanding the way standards will be assessed and reported?
- What advice should be provided to inform the development of assessment material for the Mathematics K to 10 syllabuses?
- Do you have any other comments?

12. Glossary

What comments do you have about the proposed Mathematics subject terminology? (pp 52-56)

- Are the subject specific terms clearly defined?
- Are there other terms, useful in relation to the subject Mathematics, that should be defined in the glossary?

13. Support Documents

What comments do you have about the proposed Support Documents? (pp 58-63)

- Will the proposed support documents meet the needs of teachers?

- Should the teaching and learning units form part of a support document for K-6? 7-10?
- What other documents would be useful?

14. Syllabus Documents

What comments do you have about the Syllabus Documents?

- Should the K-6 Syllabus include Stage 4 outcomes and content?
- Should the 7-10 Syllabus include Stage 3 outcomes and content? Stage 2 outcomes and content?

15. What is your overall evaluation of the Draft Writing Brief?

Appendix D

Mathematics Consultation and Generic Consultation
Key Individuals and Groups Invited to Respond

Mathematics Consultation Network:

Group	Contact	Organisation Name
Academic	Prof. Sue Willis	Monash University
	Prof. John Mack	University of Sydney
	Assoc. Prof. Bob Perry	University of Western Sydney
	Assoc. Prof. Di Siemon	Royal Melbourne Institute of Technology
	Prof. John Pegg	University of New England
	Prof. Garth Gaudry	University of New South Wales
	Assoc Prof. Mike Mitchelmore	Macquarie University
	Dr Bob Wright	Southern Cross University
	Dr Kay Owens	University of Western Sydney
	Assoc. Prof. Beth Southwell	University of Western Sydney
DET	Dr K Boston	Director General
	Mr Lindsay Wasson	Director, Curriculum Support
	Mr Ray Gillies	Director, Priority Schools Program
	Mr Ian Hamilton	Director, Learning Materials Production Centre
Professional Associations	Ms Margaret Bigelow	Mathematical Association of NSW
	Ms Pam Shaw	Statistical Society of NSW
	Ms Terri Kamaz	Professional Teachers Council
	Ms Suzanne Ziems	Early Childhood Council of NSW
	Mr Ian Thompson	Australian Association of Special Educ.
Parents Associations	Ms Beverley Baker	Federation of P&C Associations
	Mr David York	NSW Parents Council
	Mr Roger O'Sullivan	Council of Catholic School Parents
	Ms Julie Collins	NSW Federation of School Comm. Organ.
	Ms Barbara Luelf	Isolated Parents

Generic Consultation List:

Sector	Contact Person/Organisation
School Authorities	Dr K. Boston Director General Department of Education and Training GPO Box 33 SYDNEY NSW 2001
	Mr Lindsay Wasson Director Curriculum Support Department of Education and Training GPO Box 33 SYDNEY NSW 2001
	Mr Ray Gillies Director Priority Schools Program Department of Education and Training Level 14, 1 Oxford St DARLINGHURST NSW 2010
	Mr Ian Hamilton Director Learning Materials Production Centre Department of Education and Training 51 Wentworth Rd STRATHFIELD NSW 2135
	Dr Brian Croke Executive Director Catholic Education Commission Catholic Education Office PO Box A169 SYDNEY SOUTH 2000
	Catholic Diocesan Offices See attached list
	Reverend Dr Lindsay Stoddart Anglican Education Commission Level 2 St Andrews House 474 Kent Street SYDNEY NSW 2000
	Mr Terry Chapman Association of Independent Schools Level 4 99 York Street SYDNEY NSW 2000
	Rev. Bob Frisken Christian Community Schools PO Box 159 WENTWORTHVILLE NSW 2145
	Christian Parent Controlled Schools Ltd. PO Box 7000 BLACKTOWN NSW 2148

Sector	Contact Person/Organisation
	Dr Nemuni Tausere Seventh Day Adventist Church Education Department Locked Bag 2014 WAHROONGA NSW 2076
Principals' Associations	Ms Larissa Treskin President Secondary Principals' Council Burwood Girls High School Queen Street CROYDON NSW 2132
	Mr John McMillan President Primary Principals' Association Denistone East Public School Lovell Road EASTWOOD 2122
	Ms Carolyn Hummerston President Primary Executive Council PO Box 577 LEICHHARDT NSW 2040
	Allen Green Heads of Independent Coeducational School Newcastle Grammar School PO Box 680 NEWCASTLE NSW 2300
	Ms Jillian Moore Association of Heads of Independent Girls Schools Pymble Ladies College Avon Road PYMBLE NSW 2073
	Ms Jenny Allum Asociation of Heads of Independent Schools of Australia SCEGGS Darlinghurst Forbes St DARLINGHURST NSW 2010
	Mr Gary Brown Association of Junior Heads of Independent Schools Mosman Church of England Preparation School 75 Shadforth St MOSMAN NSW 2088
	Mr Allan Coman Catholic Secondary Principals Stella Maris College 52 Eurobin Avenue MANLY NSW 2095

Sector	Contact Person/Organisation
Academic	Head, Faculty of Education University of Western Sydney, Macarthur PO Box 555 CAMPBELLTOWN NSW 2560
	Head of Teaching and Educational Studies University of Western Sydney, Nepean PO Box 10 KINGSWOOD NSW 2747
	Head, Faculty of Education The University of Newcastle Box 5 Hunter Building University of Newcastle CALLAGHAN NSW 2308
	Head, School of Education The University of Wollongong Northfields Ave WOLLONGONG NSW 2522
	Head, School of Education University of New South Wales SYDNEY NSW 2052
	Head, Faculty of Education, Health and Professional Studies The University of New England ARMIDALE NSW 2351
	Head, School of Education Southern Cross University PO Box 157 LISMORE NSW 2480
	Head, Faculty of Education University of Technology PO Box 123 BROADWAY NSW 2007
	Head, Faculty of Education The University of Sydney A35 – Education Building The University of Sydney NSW 2006
	Head, Faculty of Education Charles Sturt University BATHURST NSW 2795
	Head, School of Education Charles Sturt University Wagga Wagga Campus PO Box 588 WAGGA WAGGA NSW 2678

Sector	Contact Person/Organisation
Academic	Head, School of Mathematics University of Western Sydney, Macarthur PO Box 555 CAMPBELLTOWN NSW 2560
	Head of Mathematics University of Western Sydney, Nepean PO Box 10 KINGSWOOD NSW 2747
	Head, School of Mathematics The University of Newcastle Box 5 Hunter Building University of Newcastle CALLAGHAN NSW 2308
	Head, School of Mathematics The University of Wollongong Northfields Ave WOLLONGONG NSW 2522
	Head, School of Mathematics University of New South Wales SYDNEY NSW 2052
	Head, School of Mathematics The University of New England ARMIDALE NSW 2351
	Head, School of Mathematics Southern Cross University PO Box 157 LISMORE NSW 2480
	Head, School of Mathematics University of Technology PO Box 123 BROADWAY NSW 2007
	Head, School of Mathematics The University of Sydney A35 – Education Building The University of Sydney NSW 2006
	Head, School of Mathematics Charles Sturt University BATHURST NSW 2795
	Head, School of Mathematics Charles Sturt University Wagga Wagga Campus PO Box 588 WAGGA WAGGA NSW 2678

Sector	Contact Person/Organisation
	Head, Division of Early Childhood and Education Macquarie University Balaclava Road NORTH RYDE NSW 2109
	Mr Andrew Stanton Universities Admission Centre (UAC) Locked Bag 500 LIDCOMBE NSW 2141
	Mr Robin Shreeve Deputy Director General TAFE Department of Education and Training 35 Bridge Street GPO 33 SYDNEY NSW 2001
Unions	Ms Sue Simpson President New South Wales Teachers Federation 23 –33 Mary Street SURRY HILLS NSW 2010
	Ms Adrienne Van Gelder President Independent Education Union GPO Box 116 SYDNEY 2001
Employer Associations	Mr Gary Brack NSW Employers' Federation PO Box A750 SYDNEY SOUTH 1235
	Ms Sandra Moait President Labor Council of NSW Level 10, 337 Sussex Street SYDNEY NSW 2001
	NSW Chamber of Commerce Ms Katie Lahey GPO Box 4280 SYDNEY NSW 2001
	Joint Industry Training Advisory Board PO Box 6322 BAULKHAM HILLS BUSINESS CENTRE NSW 2153
	Australian Industry Group Mr Ian McMaugh 51 Walker Street NORTH SYDNEY NSW 2060

Sector	Contact Person/Organisation
Community and other key groups	Mr Charles Davison President Aboriginal Education Consultative Group 37 Cavendish Street STANMORE NSW 2048
	Mr Sandy Grant/ Ms Janice Fewin Australian Publishers Association Suite 60, 89 Jones Road ULTIMO NSW 2007
Organisations working with youth-at-risk –	Mr Bill Crews Exodus Foundation 180 Liverpool Road ASHFIELD NSW 2131
	Ms Doreen Wainer Ethnic Affairs Commission 164 – 174 Liverpool Rd ASHFIELD NSW 2131
	Ethnic Communities' Council of NSW 221 Cope Street WATERLOO NSW 2017

- Schools and TAFEs
- Directors, Diocesan Catholic Education Offices
- Superintendents, DET District Offices