

## Mathematics

### School Certificate grading

Schools are responsible for awarding each student studying Mathematics a grade (A10, A9, B8, B7, C6, C5, D4, D3 or E2) to summarise the student's achievement in the course at the end of Stage 5. The grade awarded is reported on the student's School Certificate record of achievement.

From 2006, teachers will use these Stage 5 course performance descriptors to determine School Certificate grades for Mathematics. The descriptors have been developed from the Board's general performance descriptors, and provide a more complete description of typical performance in this course at each grade level.

### Determining School Certificate grades

Teachers should follow their school's procedures for the allocation of School Certificate grades.

During the course teachers collect information on the achievement of each student. To allocate a grade to a student at the end of the course teachers make a judgement as to which grade descriptor best describes the achievement of that student.

Values and attitudes are an integral part of learning. However, information on students' values and attitudes is not to be used in determining grades.

### Assessment activities

In developing and selecting assessment activities for the purpose of determining School Certificate grades, teachers will use a range of different assessment activities or tasks. The assessment activities should reflect the relative emphasis the school's programs place on the various aspects of the course.

Where activities or tasks are scheduled throughout a course, greater weight for grading purposes would generally be given to those activities or tasks undertaken towards the end of the course. There are different ways of organising the teaching/learning program for a course. The scheduling of assessment activities and the weightings applied should reflect the

school's organisation of the course. Students should be given the opportunity to demonstrate their maximum level of achievement relative to the course performance descriptors.

### Applying the course performance descriptors

Teachers should use their professional judgement in applying the course performance descriptors. It is not intended that the course performance descriptors represent a checklist, or provide a comprehensive description of student performance at each grade level. The course performance descriptors for Mathematics have been written to reflect the three pathways described in the *Mathematics Years 7–10 Syllabus* (2003). The descriptor that provides the best overall description of the student's achievement will determine the grade awarded.

Teachers should interpret the course performance descriptors in terms of standards that can be achieved by School Certificate students within the bounds of the course.

The samples of student work that are provided on the Assessment Resource Centre website, clarify the standards described in the course performance descriptors. They illustrate the quality of work typically produced by students who receive each grade.

### Assessment for learning

Assessment for learning is described in detail in the assessment section of the Mathematics syllabus. It involves using assessment activities or tasks as a regular part of the teaching and learning process to clarify students' understanding of concepts, to remedy their misconceptions, and to support their further learning and the development of deeper understanding.

All assessment activities can be used to support learning, and to provide feedback to students that enables them to actively monitor and evaluate their own learning.

## Stage 5 Course Performance Descriptors – Mathematics

### Areas for Assessment

**Working mathematically**  
**Number**  
**Patterns and algebra**  
**Data**  
**Measurement**  
**Space and geometry**

Knowledge, skills and understanding:

- developed 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 collecting, representing, analysing and evaluating information
- in identifying and quantifying attributes of shapes and objects and applying measurement strategies
- in spatial visualisation and geometric reasoning.

Grade E2	Grade D3	Grade D4	Grade C5	Grade C6
<p>A student performing at this grade uses, with guidance, standard procedures to solve simple familiar problems; identifies simple mathematical relationships.</p> <p><i>The student typically:</i></p> <ul style="list-style-type: none"> <li>• uses given diagrams, graphs and formulae to solve simple problems involving perimeter, area and volume, and coordinate geometry</li> <li>• simplifies and substitutes into simple algebraic expressions and solves simple linear equations</li> <li>• determines properties of triangles and quadrilaterals</li> <li>• uses a calculator to find approximations of trigonometric ratios of given angles measured in degrees</li> <li>• constructs frequency tables for ungrouped data.</li> </ul>	<p>A student performing at this grade uses standard procedures to solve simple familiar problems; communicates mathematical ideas using some mathematical language; may identify the strength/weakness of a particular strategy.</p> <p><i>The student typically:</i></p> <ul style="list-style-type: none"> <li>• solves simple consumer arithmetic problems involving earning and spending money and, given the formula, calculates simple interest</li> <li>• completes a table of values to graph simple linear relationships</li> <li>• applies geometrical properties to solve simple numerical problems</li> <li>• expresses trigonometric ratios for angles in right-angled triangles in terms of an unknown side and a given side</li> <li>• simplifies arithmetic and simple algebraic expressions involving positive integral indices.</li> </ul>	<p>A student performing at this grade selects and uses standard procedures to solve simple familiar problems; communicates mathematical ideas using some mathematical language, notations and diagrams; explains and verifies simple mathematical relationships.</p> <p><i>The student typically:</i></p> <ul style="list-style-type: none"> <li>• uses diagrams to solve simple coordinate geometry problems</li> <li>• graphs simple linear and non-linear relationships by constructing a table of values and using an appropriate scale</li> <li>• calculates probabilities for simple events using the formula</li> <li>• finds the perimeter and area of simple composite figures and, given diagrams, uses trigonometry to find sides and angles in right-angled triangles</li> <li>• constructs tables and graphs for grouped data.</li> </ul>	<p>A student performing at this grade uses appropriate strategies, often with the assistance of given diagrams and formulae, to solve simple familiar problems; explains mathematical ideas using mathematical language, notations and diagrams; uses some mathematical arguments to reach conclusions.</p> <p><i>The student typically:</i></p> <ul style="list-style-type: none"> <li>• uses given formulae to find midpoint, distance and gradient and uses given graphs to solve simple linear simultaneous equations</li> <li>• draws and interprets simple graphs of physical phenomena</li> <li>• calculates compound interest using repetition of the formula for simple interest</li> <li>• applies results related to the angle sum for polygons to solve simple numerical problems</li> <li>• solves simple word problems in trigonometry.</li> </ul>	<p>A student performing at this grade uses appropriate strategies to solve familiar multi-step problems; uses appropriate mathematical language, notations and diagrams; uses some appropriate mathematical arguments to reach and justify conclusions.</p> <p><i>The student typically:</i></p> <ul style="list-style-type: none"> <li>• simplifies algebraic expressions involving fractions and indices</li> <li>• expands and factorises simple algebraic expressions and solves simple quadratic equations</li> <li>• uses formulae to calculate the volume of pyramids, cones and spheres, and the surface area of cylinders</li> <li>• uses simple deductive reasoning in solving numerical problems in different geometrical contexts, and applies tests for proving that triangles are congruent</li> <li>• determines the upper and lower quartiles of a set of scores and uses a calculator to find the standard deviation of a set of scores.</li> </ul>

<b>Grade B7</b>	<b>Grade B8</b>	<b>Grade A9</b>	<b>Grade A10</b>
<p>A student performing at this grade selects and uses appropriate strategies to solve familiar multi-step problems; uses appropriate mathematical language and notations in written, oral and/or graphical form; uses appropriate mathematical arguments to reach and justify conclusions; often requires guidance to determine the most efficient methods.</p> <p><i>The student typically:</i></p> <ul style="list-style-type: none"> <li>• applies compound interest and depreciation formulae to consumer situations, and calculates the result of successive discounts</li> <li>• draws and interprets graphs including simple parabolas and hyperbolas</li> <li>• calculates surface area and volume of simple composite solids, and solves trigonometry problems involving bearings and angles measured in degrees and minutes</li> <li>• solves linear inequalities and simple simultaneous linear equations using an analytical method</li> <li>• analyses data using the interquartile range and standard deviation.</li> </ul>	<p>A student performing at this grade selects and uses appropriate strategies to solve familiar and some unfamiliar multi-step problems; uses formal definitions when explaining solutions; uses some deductive reasoning in presenting mathematical arguments; may require some guidance to determine the most efficient methods.</p> <p><i>The student typically:</i></p> <ul style="list-style-type: none"> <li>• solves simple probability problems involving two-stage events</li> <li>• calculates surface area of pyramids, cones and spheres</li> <li>• constructs geometrical arguments to prove a general geometrical result, giving reasons</li> <li>• graphs simple regions, draws and interprets a variety of graphs, and applies coordinate geometry techniques to solve problems</li> <li>• expands binomial products and factorises quadratic expressions.</li> </ul>	<p>A student performing at this grade selects and uses efficient strategies to solve unfamiliar multi-step problems; uses formal definitions and generalisations when explaining solutions; uses deductive reasoning in presenting mathematical arguments and formal proofs.</p> <p><i>The student typically:</i></p> <ul style="list-style-type: none"> <li>• performs operations with both surds and indices in numerical and algebraic contexts</li> <li>• uses trigonometry to solve practical problems involving non-right-angled triangles</li> <li>• analyses and describes graphs of physical phenomena</li> <li>• constructs geometrical arguments and formal proofs of geometrical relationships</li> <li>• uses analytical methods to solve linear, quadratic and simultaneous equations, including simultaneous equations involving a first degree equation and a second degree equation.</li> </ul>	<p>A student performing at this grade consistently selects efficient strategies and uses them accurately to solve unfamiliar multi-step problems; uses and interprets formal definitions and generalisations when explaining solutions; uses deductive reasoning in presenting clear and concise mathematical arguments and formal proofs; synthesises mathematical techniques, results and ideas across the course.</p> <p><i>The student typically:</i></p> <ul style="list-style-type: none"> <li>• interprets and solves probability problems involving compound events</li> <li>• solves problems involving surface area of pyramids, cones and spheres, and applies similarity relationships for area and volume</li> <li>• uses analytical and graphical techniques to solve problems involving quadratic equations, simultaneous equations or inequalities</li> <li>• manipulates algebraic expressions, equations and inequalities, with consideration given to restrictions on the values of variables</li> <li>• applies relevant theorems and properties to deduce further geometrical relationships involving triangles and quadrilaterals.</li> </ul>

## General performance descriptors

The general performance descriptors describe performance at each of five grade levels:

- A** The student has an extensive knowledge and understanding of the content and can readily apply this knowledge. In addition, the student has achieved a very high level of competence in the processes and skills and can apply these skills to new situations.
- B** The student has a thorough knowledge and understanding of the content and a high level of competence in the processes and skills. In addition, the student is able to apply this knowledge and these skills to most situations.
- C** The student has a sound knowledge and understanding of the main areas of content and has achieved an adequate level of competence in the processes and skills.
- D** The student has a basic knowledge and understanding of the content and has achieved a limited level of competence in the processes and skills.
- E** The student has an elementary knowledge and understanding in few areas of the content and has achieved very limited competence in some of the processes and skills.

## Areas for assessment

The areas for assessment for Mathematics provide a framework for structuring an assessment program, and may be used for reporting student achievement. They are derived from the course objectives, and are linked to the course outcomes. They can be used as organisers for assessment of student achievement.

Good assessment practice involves designing quality assessment activities that enable students to demonstrate their achievements. Teachers can use the areas for assessment when designing an assessment

activity, to ensure it is assessing performance in relation to a grouping of outcomes.

In designing the assessment schedule for a course, teachers may find it useful to map each planned assessment activity to one or more of the areas for assessment. This allows teachers to ensure that assessment can occur across the year in a manageable way. The table below gives an example of how this planning could be done.

### Sample Assessment Activities (with weightings)

Sample Areas for Assessment	Document Study* 10%	Oral Report* 20%	Common Test* 35%	Research Project* 35%
Knowledge and understanding*	✓	✓	✓	
Investigating and researching*	✓			✓
Communicating*	✓	✓	✓	✓
Interpreting data*		✓	✓	✓
Problem solving*		✓	✓	

\* These sample areas for assessment and activities are provided for illustrative purposes only.

## Resources and further information

The *Assessment Resource Centre* is a section of the Board of Studies' website that contains resources that have been developed by the Board to support teachers in the awarding of grades for the School Certificate from 2006. For most Stage 5 courses, there are assessment activities, and work samples that illustrate the standard of work associated with each grade.

The *Mathematics Years 7–10 Syllabus* (2003) contains information on assessment (page 192) – including the principles of assessment for learning – and provides a detailed list of assessment strategies (page 195) that are suitable for Mathematics. It is available on the Board's website at [www.boardofstudies.nsw.edu.au/syllabus\\_sc/index.html](http://www.boardofstudies.nsw.edu.au/syllabus_sc/index.html)

The *Assessment for Learning in a Standards-referenced Framework – Mathematics* CD-ROM contains a variety of material, including assessment activities for Mathematics with annotated work samples. Copies of this CD-ROM were provided to all schools, and are available from Shop Online (<http://shop.bos.nsw.edu.au>).

Inquiries about the use of these course performance descriptors should be directed to the Assessment and Reporting branch at the Office of the Board of Studies on (02) 9367 8371, or by email to [CustomerLiaison@boardofstudies.nsw.edu.au](mailto:CustomerLiaison@boardofstudies.nsw.edu.au)