Year 9 Mathematics

Australian Curriculum in Queensland

March 2013 (amended April 2015)

Queensland Government
Queensland Studies Authority

www.qsa.qld.edu.au
Queensland Studies Authority

150258

Amendments notice: April 2015

Accessing current QCAA resources

Resources referred to in this document may have been updated or replaced.

Please always check the QCAA website for the most current resources to support the implementation of the Australian Curriculum: Mathematics: www.qcaa.qld.edu.au/13656.html.

Summary of amendments, April 2015

- Section 2.2.1 Year 9 standards elaborations
  Table 4: The Year 9 standards elaborations removed; replaced with link to updated standards elaborations on the QCAA website; subsequent tables renumbered.
- Appendix 1: Mathematics standards elaborations terms table removed.
  Updated term definitions are available as part of the standards elaborations web documents.
- Table of contents updated.

Year 9 Mathematics — Australian Curriculum in Queensland

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Contents

1. Overview

Year 9 Mathematics: Australian Curriculum in Queensland provides an overview of the Australian Curriculum learning area within the context of a Kindergarten to Year 12 approach. It supports teachers' capacity by providing clarity about the focus of teaching and learning and the development of assessment to determine the quality of student learning. It maintains flexibility for schools to design curriculum that suits their specific contexts and scope for school authorities and school priorities to inform practice.

This document includes:

Curriculum requirements	Advice, guidelines and resources
Rationale	Planning teaching and learning
Aims	Standards elaborations, A to E
Australian Curriculum content	Assessment advice and guidelines
Achievement standards	Reporting advice and guidelines
Requirements are taken directly from the Australian Curriculum: Mathematics (v4.1) developed by the Australian Curriculum, Assessment and Reporting Authority (ACARA). This material is presented in blue text. Links to Australian Curriculum support materials are also provided where appropriate.	Advice, guidelines and resources are based on the Australian Curriculum Year level descriptions and organisation sections. They have been developed by the Queensland Studies Authority (QSA) to assist teachers in their planning and assessment and include links to Queensland-developed supporting resources, exemplars and templates.

1.1 Rationale

Learning mathematics creates opportunities for and enriches the lives of all Australians. The Australian Curriculum: Mathematics provides students with essential mathematical skills and knowledge in Number and Algebra, Measurement and Geometry, and Statistics and Probability. It develops the numeracy capabilities that all students need in their personal, work and civic life, and provides the fundamentals on which mathematical specialties and professional applications of mathematics are built.

Mathematics has its own value and beauty and the Australian Curriculum: Mathematics aims to instil in students an appreciation of the elegance and power of mathematical reasoning. Mathematical ideas have evolved across all cultures over thousands of years, and are constantly developing. Digital technologies are facilitating this expansion of ideas and providing access to new tools for continuing mathematical exploration and invention. The curriculum focuses on developing increasingly sophisticated and refined mathematical understanding, fluency, logical reasoning, analytical thought and problem-solving skills. These capabilities enable students to respond to familiar and unfamiliar situations by employing mathematical strategies to make informed decisions and solve problems efficiently.

The Australian Curriculum: Mathematics ensures that the links between the various components of mathematics, as well as the relationship between mathematics and other disciplines, are made clear. Mathematics is composed of multiple but interrelated and interdependent concepts and systems which students apply beyond the mathematics classroom. In science, for example, understanding sources of error and their impact on the confidence of conclusions is vital, as is the use of mathematical models in other disciplines.

In geography, interpretation of data underpins the study of human populations and their physical environments; in history, students need to be able to imagine timelines and time frames to reconcile related events; and in English, deriving quantitative and spatial information is an important aspect of making meaning of texts.

The curriculum anticipates that schools will ensure all students benefit from access to the power of mathematical reasoning and learn to apply their mathematical understanding creatively and efficiently. The mathematics curriculum provides students with carefully paced, in-depth study of critical skills and concepts. It encourages teachers to help students become self-motivated, confident learners through inquiry and active participation in challenging and engaging experiences.

1.2 Aims

The Australian Curriculum: Mathematics aims to ensure that students:

- are confident, creative users and communicators of mathematics, able to investigate, represent and interpret situations in their personal and work lives and as active citizens
- develop an increasingly sophisticated understanding of mathematical concepts and fluency with processes, and are able to pose and solve problems and reason in Number and Algebra, Measurement and Geometry, and Statistics and Probability
- recognise connections between the areas of mathematics and other disciplines and appreciate mathematics as an accessible and enjoyable discipline to study.

1.3 Mathematics in Queensland K–12

The K–12 curriculum in Queensland is aligned to the goals for Australian schooling, as expressed in the *Melbourne Declaration on Educational Goals for Young Australians*[*]. These goals are:

- Goal 1 — Australian schooling promotes equity and excellence
- Goal 2 — All young Australians become:
  - successful learners
  - confident and creative individuals
  - active and informed citizens.

To achieve these goals, the declaration commits to the development of a world-class curriculum that will enable every student to develop:

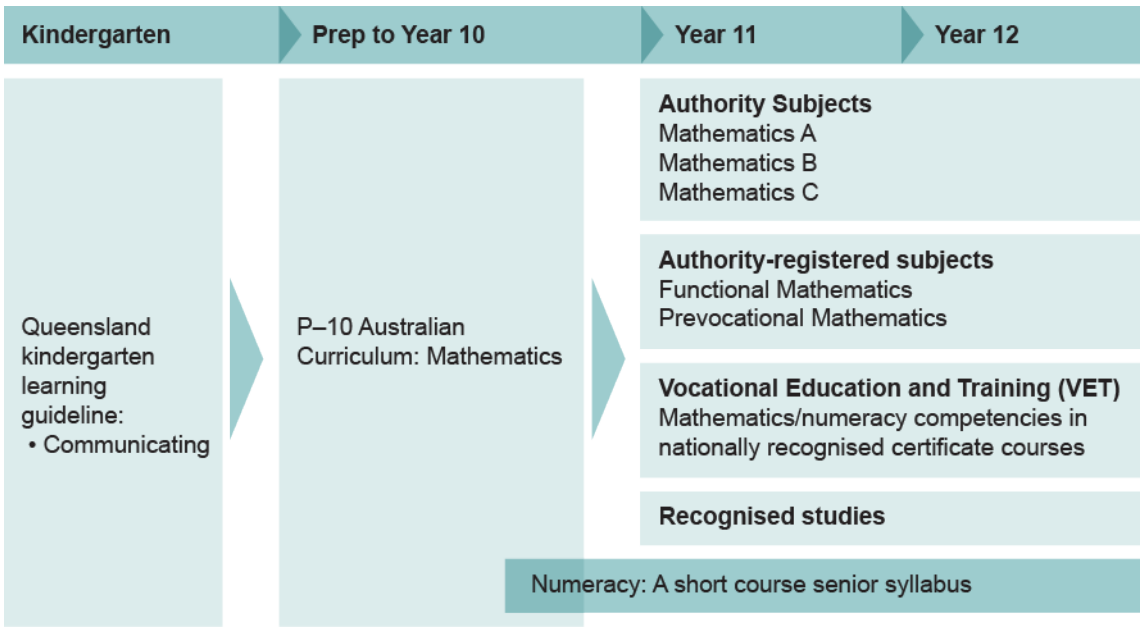
- a solid foundation of understanding, skills and values on which further learning and adult life can be built
- deep knowledge, understanding, skills and values that will enable advanced learning and an ability to create new ideas and translate them into practical applications
- general capabilities that underpin flexible and analytical thinking, a capacity to work with others and an ability to move across subject disciplines to develop new expertise.

There is an expectation that students will have learning opportunities in Australian Curriculum: Mathematics across P–10.

* Ministerial Council on Education, Employment, Training and Youth Affairs 2008, Melbourne Declaration on Educational Goals for Young Australians, viewed October 2012, <www.curriculum.edu.au/verve/_resources/National_Declaration_on_the_Educational_Goals_for_Young_Australians.pdf>.

Figure 1 below shows the progression of the Mathematics learning area K–12 in Queensland, and includes the *Queensland kindergarten learning guideline*, the Prep to Year 10 Australian Curriculum and the current Queensland senior secondary courses.

Figure 1: K–12 Mathematics Curriculum



2. Curriculum

The Australian Curriculum sets out what all young people should be taught through the specification of curriculum content and achievement standards.

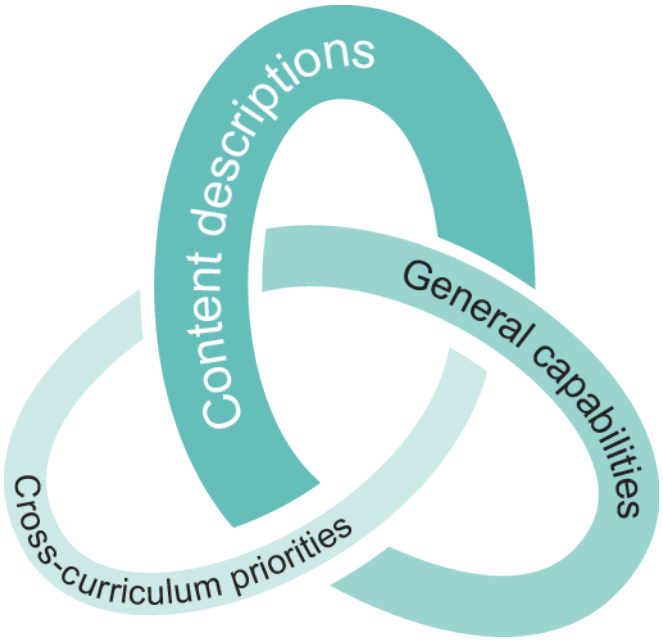
The Australian Curriculum content and achievement standards are the mandatory aspects of the Australian Curriculum.

2.1 Australian Curriculum content

The Australian Curriculum content has three components: content descriptions (section 2.1.1), general capabilities (section 2.1.2) and cross-curriculum priorities (section 2.1.3).

Schools design their programs to give students opportunities to develop their knowledge, understanding and skills in each of the three components.

Figure 2: Three components of the Australian Curriculum: Mathematics



Content descriptions: Disciplinary learning (section 2.1.1)

The Australian Curriculum: Mathematics is organised around the interaction of three content strands and four proficiency strands:

- **content strands**: Number and Algebra, Measurement and Geometry, and Statistics and Probability. They describe what is to be taught and learnt
- **sub-strands**: a sequence of development of concepts through and across year levels within the content strands
- **proficiency strands**: Understanding, Fluency, Problem Solving, and Reasoning. They describe how content is explored or developed, that is, the thinking and doing of Mathematics.

Content elaborations: illustrate and exemplify content. These elaborations are not a requirement for the teaching of the Australian Curriculum.

Cross-curriculum priorities: Contemporary issues (section 2.1.3)

The three cross-curriculum priorities provide contexts for learning:

- **Aboriginal and Torres Strait Islander histories and cultures** — to gain a deeper understanding of, and appreciation for, Aboriginal and Torres Strait Islander histories and cultures and the impact they have had, and continue to have, on our world
- **Asia and Australia's engagement with Asia** — to develop a better understanding and appreciation of Australia's economic, political and cultural interconnections to Asia
- **Sustainability** — to develop an appreciation for more sustainable patterns of living, and to build capacities for thinking, valuing and acting that are necessary to create a more sustainable future.

General capabilities: Essential 21st-century skills (section 2.1.2)

These seven capabilities can be divided into two groups:

- **capabilities that support students to be successful learners** — Literacy, Numeracy, Information and communication technology (ICT) capability, and Critical and creative thinking
- **capabilities that develop ways of being, behaving and learning to live with others** — Personal and social capability, Ethical understanding and Intercultural understanding.

2.1.1 Australian Curriculum: Mathematics Year 9 content descriptions

The content descriptions at each year level set out the knowledge, understanding, skills and processes that teachers are expected to teach and students are expected to learn. They do not prescribe approaches to teaching.

In Mathematics, the content descriptions are organised using three strands: *Number and Algebra, Measurement and Geometry,* and *Statistics and Probability*.

Content descriptions are grouped into sub-strands to illustrate the clarity and sequence of development of concepts through and across the year levels. They support the ability to see the connections across strands and the sequential development of concepts from Prep to Year 10.

Table 1: Strands and sub-strands

Number and Algebra	Measurement and Geometry	Statistics and Probability
Number and place value (F–8)	Using units of measurement (F–10)	Chance (1–10)
Fractions and decimals (1–6)	Shape (F–7)	Data representation and interpretation (F–10)
Real numbers (7–10)	Geometric reasoning (3–10)	
Money and financial mathematics (1–10)	Location and transformation (F–7)	
Patterns and algebra (F–10)	Pythagoras and trigonometry (9–10)	
Linear and non-linear relationships (8–10)		

Australian Curriculum: Mathematics Year 9 strands, sub-strands and content descriptions

Number and Algebra	Measurement and Geometry	Statistics and Probability
Real numbers	**Using units of measurement**	**Chance**
Solve problems involving direct proportion. Explore the relationship between graphs and equations corresponding to simple rate problems (ACMNA208)	Calculate the areas of composite shapes (ACMMG216)	List all outcomes for two-step chance experiments, both with and without replacement using tree diagrams or arrays. Assign probabilities to outcomes and determine probabilities for events (ACMSP225)
	Calculate the surface area and volume of cylinders and solve related problems (ACMMG217)	
Apply index laws to numerical expressions with integer indices (ACMNA209)	Solve problems involving the surface area and volume of right prisms (ACMMG218)	Calculate relative frequencies from given or collected data to estimate probabilities of events involving 'and' or 'or' (ACMSP226)
Express numbers in scientific notation (ACMNA210)	Investigate very small and very large time scales and intervals (ACMMG219)	
Money and financial mathematics	**Geometric reasoning**	Investigate reports of surveys in digital media and elsewhere for information on how data were obtained to estimate population means and medians (ACMSP227)
Solve problems involving simple interest (ACMNA211)	Use the enlargement transformation to explain similarity and develop the conditions for triangles to be similar (ACMMG220)	
Patterns and algebra		**Data representation and interpretation**
Extend and apply the index laws to variables, using positive integer indices and the zero index (ACMNA212)	Solve problems using ratio and scale factors in similar figures (ACMMG221)	Identify everyday questions and issues involving at least one numerical and at least one categorical variable, and collect data directly and from secondary sources (ACMSP228)
Apply the distributive law to the expansion of algebraic expressions, including binomials, and collect like terms where appropriate (ACMNA213)	**Pythagoras and trigonometry**	
	Investigate Pythagoras' Theorem and its application to solving simple problems involving right angled triangles (ACMMG222)	Construct back-to-back stem-and-leaf plots and histograms and describe data, using terms including 'skewed', 'symmetric' and 'bi modal' (ACMSP282)
Linear and non-linear relationships	Use similarity to investigate the constancy of the sine, cosine and tangent ratios for a given angle in right-angled triangles (ACMMG223)	
Find the distance between two points located on a Cartesian plane using a range of strategies, including graphing software (ACMNA214)		Compare data displays using mean, median and range to describe and interpret numerical data sets in terms of location (centre) and spread (ACMSP283)
	Apply trigonometry to solve right-angled triangle problems (ACMMG224)	

Number and Algebra	Measurement and Geometry	Statistics and Probability
Find the midpoint and gradient of a line segment (interval) on the Cartesian plane using a range of strategies, including graphing software (ACMNA294)		
Sketch linear graphs using the coordinates of two points and solve linear equations (ACMNA215)		
Graph simple non-linear relations with and without the use of digital technologies and solve simple related equations (ACMNA296) †		

Content elaborations

Content elaborations illustrate and exemplify content and assist teachers in developing a common understanding of the content descriptions. The elaborations are *not a requirement* for the teaching of the Australian Curriculum. They are not individualised teaching points intended to be taught to all students.

† Codes included with the Australian Curriculum content descriptions relate to hyperlinks into the Australian Curriculum website <www.australiancurriculum.edu.au/Mathematics/Curriculum/F-10>. Each unique identifier provides the user with the content description, content elaboration, and links to general capabilities, cross-curriculum priorities and modes.

2.1.2 General capabilities

The general capabilities are embedded in the content descriptions. The seven capabilities can be divided into two broad groups. These broad groups include capabilities that:

- support students to be successful learners: Literacy, Numeracy, Information and communication technology (ICT) capability, and Critical and creative thinking
- develop ways of being, behaving and learning to live with others: Personal and social capability, Ethical understanding and Intercultural understanding.

Each of the general capabilities can be relevant to teaching and learning in Mathematics and explicit teaching of the capabilities should be incorporated in teaching and learning activities where appropriate.

See also: www.australiancurriculum.edu.au/GeneralCapabilities/Overview/General-capabilities-in-the-Australian-Curriculum

Australian Curriculum Numeracy learning continuum

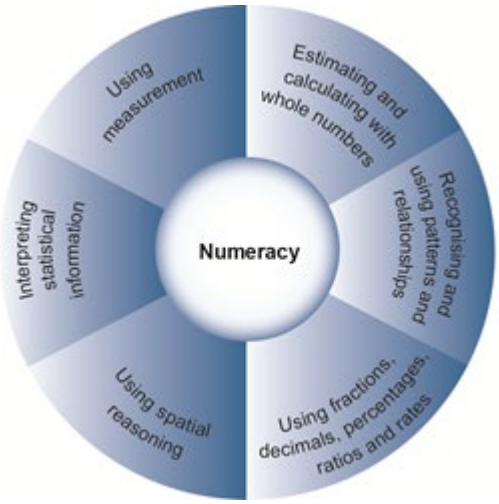
The Numeracy learning continuum is organised into six interrelated elements:

- Estimating and calculating with whole numbers
- Recognising and using patterns and relationships
- Using fractions, decimals, percentages, ratios and rates
- Using spatial reasoning
- Interpreting statistical information
- Using measurement

These elements are drawn from the strands of the Australian Curriculum: Mathematics as shown in the table below:

Numeracy continuum	Australian Curriculum: Mathematics
Estimating and calculating with whole numbers	Number and Algebra Measurement and Geometry
Recognising and using patterns and relationships	Number and Algebra Statistics and Probability
Using fractions, decimals, percentages, ratios and rates	Number and Algebra Measurement and Geometry
Using spatial reasoning	Measurement and Geometry
Interpreting statistical information	Statistics and Probability
Using measurement	Measurement and Geometry

The diagram below sets out these elements.



From: www.australiancurriculum.edu.au/GeneralCapabilities/Numeracy/Organising-elements/Organising-elements

See also:
www.australiancurriculum.edu.au/GeneralCapabilities/Numeracy/Introduction/Introduction

P–10 Numeracy Indicators

The QSA P–10 Numeracy Indicators are aligned to the Australian Curriculum (v4.1) and informed by data from Queensland performance on national assessment. The Indicators are organised as Year level descriptions and provide specific detail to support planning for, and monitoring of, students' numeracy knowledge, understanding and skills across the learning areas. For further information, see: www.qsa.qld.edu.au/17929.html.

Table 2: General capabilities that support students to be successful learners are embedded in the Mathematics content descriptions where appropriate.

	Definition	In Mathematics	Links
Literacy	Students become literate as they develop the knowledge, skills and dispositions to interpret and use language confidently for learning and communicating in and out of school and for participating effectively in society. Literacy involves students in listening to, reading, viewing, speaking, writing and creating oral, print, visual and digital texts, and using and modifying language for different purposes in a range of contexts.	Literacy is an important aspect of mathematics. Students develop literacy in mathematics as they learn the vocabulary associated with number, space, measurement and mathematical concepts and processes. This vocabulary includes synonyms (minus, subtract), technical terminology (digits, lowest common denominator), passive voice (If 7 is taken from 10) and common words with specific meanings in a mathematical context (angle, area). They develop the ability to create and interpret a range of texts typical of Mathematics ranging from calendars and maps to complex data displays. Students use literacy to understand and interpret word problems and instructions that contain the particular language features of mathematics. They use literacy to pose and answer questions, engage in mathematical problem solving, and to discuss, produce and explain solutions.	ACARA Literacy capability continua www.australiancurriculum.edu.au/GeneralCapabilities/Literacy/Introduction/Introduction QSA Literacy Indicators www.qsa.qld.edu.au/17929.html
Numeracy	Students become numerate as they develop the knowledge and skills to use mathematics confidently across all learning areas at school and in their lives more broadly. Numeracy involves students in recognising and understanding the role of mathematics in the world and having the dispositions and capacities to use mathematical knowledge and skills purposefully.	Mathematics has a central role in the development of numeracy in a manner that is more explicit and foregrounded than is the case in other learning areas. It is important that the Mathematics curriculum provides the opportunity to apply mathematical understanding and skills in context, both in other learning areas and in real world contexts. A particularly important context for the application of *Number and Algebra* is financial mathematics. In *Measurement and Geometry*, there is an opportunity to apply understanding to design. The twenty-first century world is information driven, and through *Statistics and Probability* students can interpret data and make informed judgments about events involving chance.	ACARA Numeracy capability continua www.australiancurriculum.edu.au/GeneralCapabilities/Numeracy/Introduction/Introduction QSA Numeracy Indicators www.qsa.qld.edu.au/17929.html

	Definition	In Mathematics	Links
ICT capability	Students develop ICT capability as they learn to use ICT effectively and appropriately to access, create and communicate information and ideas, solve problems and work collaboratively in all learning areas at school, and in their lives beyond school. ICT capability involves students in learning to make the most of the technologies available to them, adapting to new ways of doing things as technologies evolve and limiting the risks to themselves and others in a digital environment.	Students develop ICT capability when they investigate, create and communicate mathematical ideas and concepts using fast, automated, interactive and multimodal technologies. They employ their ICT capability to perform calculations, draw graphs, collect, manage, analyse and interpret data; share and exchange information and ideas and investigate and model concepts and relationships. Digital technologies, such as spreadsheets, dynamic geometry software and computer algebra software, can engage students and promote understanding of key concepts.	ACARA ICT capability continua www.australiancurriculum.edu.au/GeneralCapabilities/Information-and-Communication-Technology-capability/Introduction/Introduction
Critical and creative thinking	Students develop capability in critical and creative thinking as they learn to generate and evaluate knowledge, clarify concepts and ideas, seek possibilities, consider alternatives and solve problems. Critical and creative thinking are integral to activities that require students to think broadly and deeply using skills, behaviours and dispositions such as reason, logic, resourcefulness, imagination and innovation in all learning areas at school and in their lives beyond school.	Students develop critical and creative thinking as they learn to generate and evaluate knowledge, ideas and possibilities, and use them when seeking solutions. Engaging students in reasoning and thinking about solutions to problems and the strategies needed to find these solutions are core parts of the Mathematics curriculum. Students are encouraged to be critical thinkers when justifying their choice of a calculation strategy or identifying relevant questions during a statistical investigation. They are encouraged to look for alternative ways to approach mathematical problems, for example, identifying when a problem is similar to a previous one, drawing diagrams or simplifying a problem to control some variables.	ACARA Critical and creative thinking capability continua www.australiancurriculum.edu.au/GeneralCapabilities/Critical-and-creative-thinking/Introduction/Introduction

Table 3: General capabilities that develop ways of being, behaving and learning to live with others are embedded in the Mathematics content descriptions where appropriate.

	Definition	In Mathematics	Links
Personal and social capability	Students develop personal and social capability as they learn to understand themselves and others, and manage their relationships, lives, work and learning more effectively. The personal and social capability involves students in a range of practices including recognising and regulating emotions, developing empathy for and understanding of others, establishing positive relationships, making responsible decisions, working effectively in teams and handling challenging situations constructively.	Students develop and use personal and social capability as they apply mathematical skills in a range of personal and social contexts. This may be through activities that relate learning to their own lives and communities, such as time management, budgeting and financial management, and understanding statistics in everyday contexts. The Mathematics curriculum enhances the development of students' personal and social capabilities by providing opportunities for initiative taking, decision making, communicating their processes and findings, and working independently and collaboratively in the Mathematics classroom.	ACARA Personal and social capability continua www.australiancurriculum.edu.au/GeneralCapabilities/Personal-and-social-capability/Introduction/Introduction

	Definition	In Mathematics	Links
Ethical understanding	Students develop the capability to behave ethically as they identify and investigate the nature of ethical concepts, values, character traits and principles, and understand how reasoning can assist ethical judgment. Ethical understanding involves students in building a strong personal and socially oriented ethical outlook that helps them to manage context, conflict and uncertainty, and to develop an awareness of the influence that their values and behaviour have on others.	There are opportunities in the Mathematics curriculum to explore, develop and apply ethical understanding in a range of contexts, for example through analysing data and statistics; seeking intentional and accidental distortions; finding inappropriate comparisons and misleading scales when exploring the importance of fair comparison; and interrogating financial claims and sources.	ACARA Ethical understanding capability continua www.australiancurriculum.edu.au/GeneralCapabilities/Ethical-understanding/Introduction/Introduction
Intercultural understanding	Students develop intercultural understanding as they learn to value their own cultures, languages and beliefs, and those of others. They come to understand how personal, group and national identities are shaped, and the variable and changing nature of culture. The capability involves students in learning about and engaging with diverse cultures in ways that recognise commonalities and differences, create connections with others and cultivate mutual respect.	Intercultural understanding can be enhanced in Mathematics when students are exposed to a range of cultural traditions. Students learn to understand that mathematical expressions use universal symbols, while mathematical knowledge has its origin in many cultures. Students realise that proficiencies such as understanding, fluency, reasoning and problem solving are not culture or language specific, but that mathematical reasoning and understanding can find different expression in different cultures and languages. New technologies and digital learning environments provide interactive contexts for exploring mathematical problems from a range of cultural perspectives and within diverse cultural contexts. Students can apply mathematical thinking to identify and resolve issues related to living with diversity.	ACARA Intercultural understanding capability continua www.australiancurriculum.edu.au/GeneralCapabilities/Intercultural-understanding/Introduction/Introduction

2.1.3 Cross-curriculum priorities

The Australian Curriculum gives special attention to three cross-curriculum priorities about which young Australians should learn in all learning areas. The priorities provide contexts for learning. The three priorities are Aboriginal and Torres Strait Islander histories and cultures, Asia and Australia's engagement with Asia, and Sustainability.

Aboriginal and Torres Strait Islander histories and cultures	Asia and Australia's engagement with Asia	Sustainability
The Aboriginal and Torres Strait Islander priority provides opportunities for all learners to deepen their knowledge of Australia by engaging with the world's oldest continuous living cultures. This knowledge and understanding will enrich their ability to participate positively in the ongoing development of Australia. The Australian Curriculum: Mathematics values Aboriginal and Torres Strait Islander histories and cultures. It provides opportunities for students to appreciate that Aboriginal and Torres Strait Islander societies have sophisticated applications of mathematical concepts. Students will explore connections between representations of number and pattern and how they relate to aspects of Aboriginal and Torres Strait Islander cultures. They will investigate time, place, relationships and measurement concepts in Aboriginal and Torres Strait Islander contexts. Students will deepen their understanding of the lives of Aboriginal and Torres Strait Islander Peoples through the application and evaluation of statistical data.	In the Australian Curriculum: Mathematics, the priority of Asia and Australia's engagement with Asia provides rich and engaging contexts for developing students' mathematical knowledge, skills and understanding. The Australian Curriculum: Mathematics provides opportunities for students to learn about the understandings and applications of Mathematics in Asia. Mathematicians from Asia continue to contribute to the ongoing development of Mathematics. In this learning area, students develop mathematical understanding in fields such as number, patterns, measurement, symmetry and statistics by drawing on knowledge of and examples from the Asia region. These could include calculation, money, art, architecture, design and travel. Investigations involving data collection, representation and analysis can be used to examine issues pertinent to the Asia region.	In the Australian Curriculum: Mathematics, the priority of sustainability provides rich, engaging and authentic contexts for developing students' abilities in number and algebra, measurement and geometry, and statistics and probability. The Australian Curriculum: Mathematics provides opportunities for students to develop the proficiencies of problem solving and reasoning essential for the exploration of sustainability issues and their solutions. Mathematical understandings and skills are necessary to measure, monitor and quantify change in social, economic and ecological systems over time. Statistical analysis enables prediction of probable futures based on findings and helps inform decision making and actions that will lead to preferred futures. In this learning area, students can observe, record and organise data collected from primary sources over time and analyse data relating to issues of sustainability from secondary sources. They can apply spatial reasoning, measurement, estimation, calculation and comparison to gauge local ecosystem health and can cost proposed actions for sustainability.
For further information and resources to support planning to include the cross-curriculum priority Aboriginal and Torres Strait Islander histories and cultures, see: www.qsa.qld.edu.au/downloads/aust_curric/ac_ccp_atsi_cultures_maths.pdf	For further information and resources to support planning to include the cross-curriculum priority Asia and Australia's engagement with Asia, see: www.asiaeducation.edu.au/aust_curr_strategy_landing_page.html	For further information and resources to support planning to include the cross-curriculum priority Sustainability, see: www.australiancurriculum.edu.au/CrossCurriculumPriorities

2.2 Achievement standards

The Australian Curriculum is standards-based.

The Australian Curriculum achievement standards are a mandatory aspect of the Australian Curriculum for schools to implement.

The Australian Curriculum achievement standards are organised as Understanding and Skills and describe a broad sequence of expected learning, across P–10. The achievement standard emphasises the depth of conceptual understanding, the sophistication of skills and the ability to apply essential knowledge students typically demonstrate *at the end of each teaching and learning year*. The achievement standard should be read in conjunction with the content descriptions.

Figure 3: By the end of Year 9, students are expected to typically know and be able to do the following:

Understanding dimension	
By the end of Year 9, students solve problems involving simple interest. They interpret ratio and scale factors in similar figures. Students explain similarity of triangles. They recognise the connections between similarity and the trigonometric ratios. Students compare techniques for collecting data in primary and secondary sources. They make sense of the position of the mean and median in skewed, symmetric and bi-modal displays to describe and interpret data.	The Understanding dimension relates to concepts underpinning and connecting knowledge in a learning area and to the ability to appropriately select and apply knowledge to solve problems in that learning area.
Skills dimension	
Students apply the index laws to numbers and express numbers in scientific notation. They expand binomial expressions. They find the distance between two points on the Cartesian plane and the gradient and midpoint of a line segment. They sketch linear and non-linear relations. Students calculate areas of shapes and the volume and surface area of right prisms and cylinders. They use Pythagoras' Theorem and trigonometry to find unknown sides of right-angled triangles. Students calculate relative frequencies to estimate probabilities, list outcomes for two-step experiments and assign probabilities for those outcomes. They construct histograms and back-to-back stem-and-leaf plots.	The Skills dimension relates to the specific techniques, strategies and processes in a learning area.

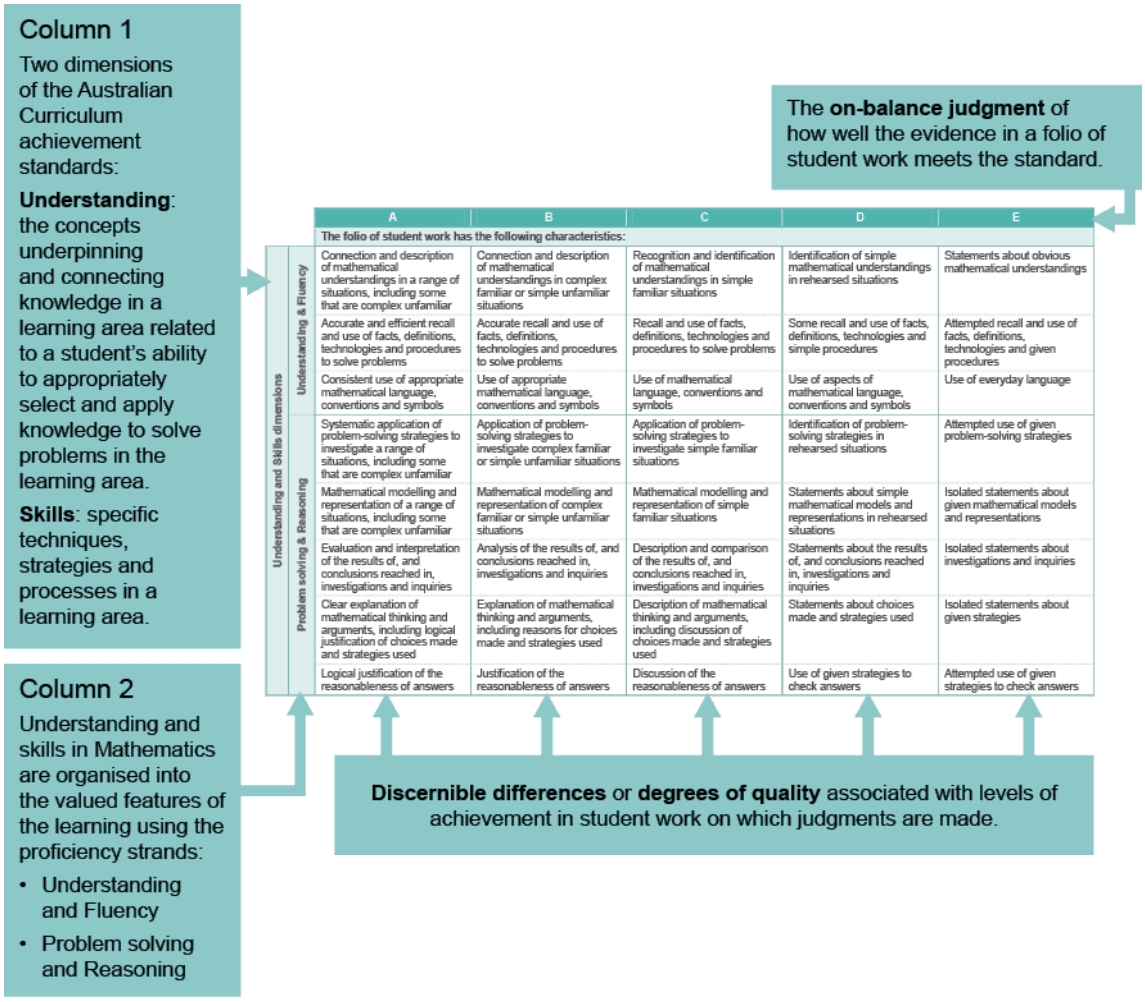
2.2.1 Year 9 standard elaborations

The Year 9 standard elaborations provide a basis for judging *how well* students have demonstrated what they know, understand and can do using the Australian Curriculum achievement standard. It is a resource to assist teachers to make consistent and comparable evidence-based A to E judgments. The standard elaborations should be used in conjunction with the Australian Curriculum achievement standard and content descriptions for the relevant year level.

Teachers can use the standard elaborations to:

- match the evidence of learning in a folio or collection of student work gathered over the reporting period to determine how well a student has achieved against the achievement standard on a five-point scale (See section 4)
- inform the development of an assessment program and individual assessments (See section 3.3)
- inform the development of task-specific standards (See sections 3.4 and 3.5)

The structure of the Mathematics standard elaborations



Amendment: April 2015

Standards elaborations have been updated and are available from the QCAA website in both Word and PDF formats: www.qcaa.qld.edu.au/27953.html.

2.3 Planning in the Mathematics learning area

Schools plan their curriculum and assessment using the Australian Curriculum content descriptions and achievement standards.

Curriculum and assessment planning within schools occurs at three levels:

- Whole school plan
  www.qsa.qld.edu.au/downloads/p_10/ac_plan_implementing.pdf
- Year level plan / Multiple year level plan
  www.qsa.qld.edu.au/downloads/p_10/ac_p10_year_level_planning.pdf
  www.qsa.qld.edu.au/downloads/p_10/ac_p10_multi_year_level_plan.pdf
- Unit overview / Unit overview planning for multiple year levels
  www.qsa.qld.edu.au/downloads/p_10/ac_p10_unit_overview_planning.pdf
  www.qsa.qld.edu.au/downloads/p_10/ac_p10_multi_unit_overview_plan.pdf

For planning templates and Year 9 Mathematics exemplar year and unit plans, see:
www.qsa.qld.edu.au/yr9-maths-resources.html

2.3.1 Time allocation

Indicative time allocations support schools in planning teaching and learning experiences using the Australian Curriculum: Mathematics. Schools may decide to timetable more hours for a learning area.

The indicative time allocations are presented as two sets of minimum hours per year that provide reasonable flexibility. In Year 9, the minimum number of hours for teaching, learning and assessment per year for the Australian Curriculum: Mathematics is:

- at least 111 hours per year where there are 37 teaching weeks available in the year
- at least 120 hours per year where there are 40 teaching weeks available in the year.

See www.qsa.qld.edu.au/downloads/early_middle/ac_time_alloc_entitlement_advice.pdf

2.3.2 Principles for effective planning

The principles that underpin effective curriculum and assessment planning include:

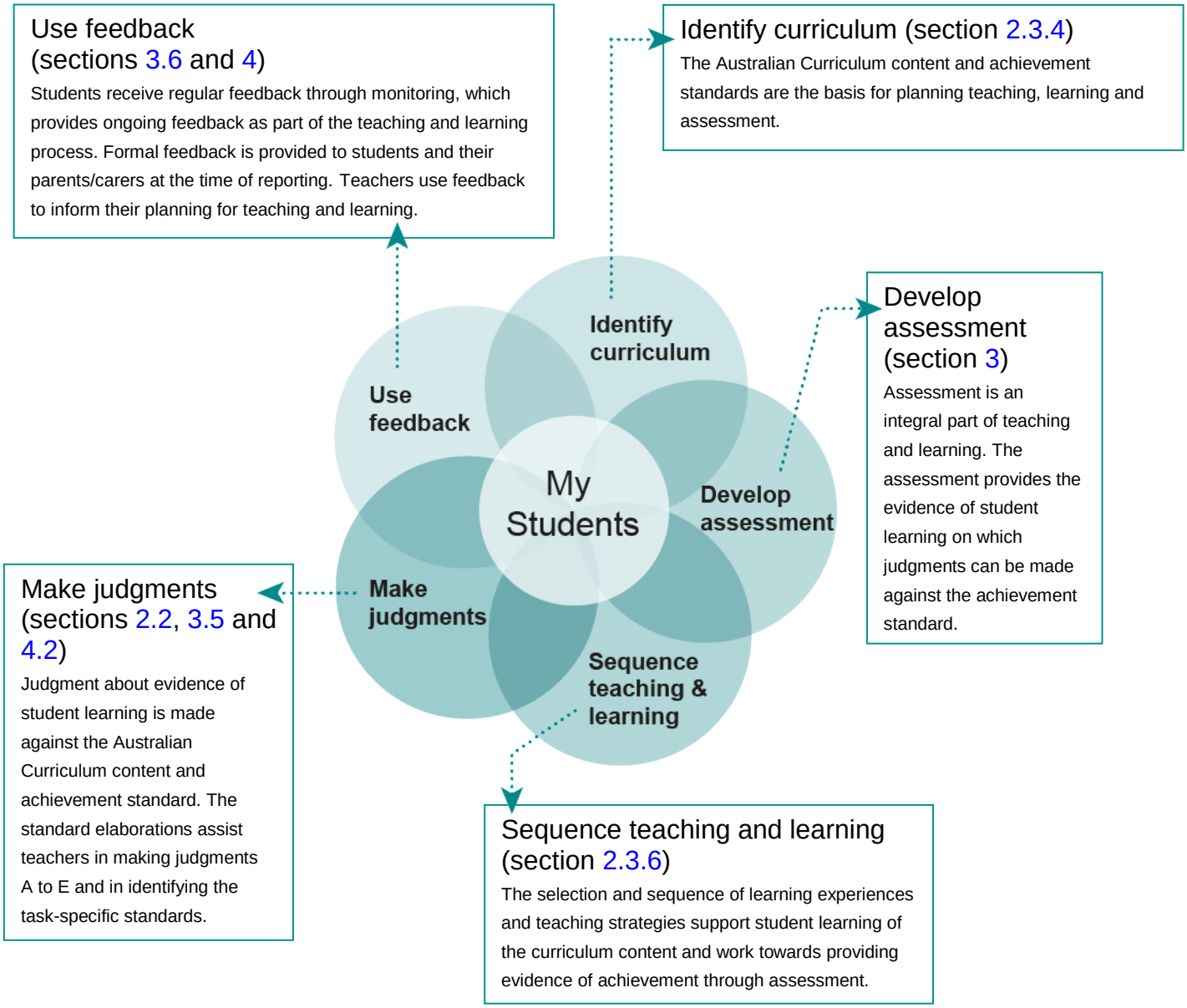
- High expectations for all students — High student expectations are built on differentiation of teaching and learning for all students in single and multiple year-level contexts.
- Alignment of teaching and learning, and assessment and reporting — Curriculum and assessment planning is thoughtful and ensures that all parts are connected. Plans are reviewed regularly to inform future planning, teaching, learning and assessment.
- Standards- and school-based assessment for learning — Teachers use standards to build a shared understanding of the qualities found in student work, and to communicate student achievement to students, parents/carers and the system.
- Balance of informed prescription and teacher professional judgment — Teachers exercise their professional judgment and make decisions about teaching and learning in their school within the context of the Australian Curriculum and system and sector priorities.

2.3.3 Elements of effective planning for alignment

Curriculum and assessment planning is guided by five interdependent elements of professional practice. These five elements can be used in any sequence but all should be considered:

- Identify curriculum
- Develop assessment
- Sequence teaching and learning
- Make judgments
- Use feedback

Figure 4: The five elements for effective curriculum and assessment planning



Planning that considers these five elements strengthens alignment and ensures that:

- what is taught informs how it is taught, how students are assessed and how the learning is reported
- what is assessed relates directly to what students have had an opportunity to learn
- specific feedback, based on what has been learnt and assessed, provides a basis for decisions about continuous improvement in teaching and learning
- what is reported to students, parents/carers and other teachers aligns with what has been learnt.

2.3.4 Identifying curriculum

Year 9 Mathematics teaching and learning programs are developed from the:

- Year 9 Australian Curriculum: Mathematics content descriptions to:
  - determine the scope of learning and ensure all required learning is included
  - identify relevant general capabilities
  - determine appropriate contexts for teaching and learning, including the cross-curriculum priorities
- Year 9 Australian Curriculum: Mathematics achievement standard to identify the expected and valued qualities of student work.

When planning a teaching and learning program, consider:

- What am I required to teach?
- What should students have the opportunity to learn?
- What are the expected and valued qualities of student work?

2.3.5 Developing assessment

Assessment provides the evidence of learning. An assessment program is planned at the same time as the teaching and learning program and is developed using the content descriptions and achievement standard.

When developing assessment, consider:

- What evidence of student learning do I need to collect?
- How and when will I collect the evidence of student learning?

See section 3 for advice about developing an assessment program.

2.3.6 Sequencing teaching and learning

Learning experiences and teaching strategies are selected and sequenced to support active engagement in learning and to provide opportunities for students to engage with all aspects of the curriculum content to develop their understanding and skills.

When sequencing teaching and learning, consider:

- How will I sequence teaching strategies and learning experiences to cover the curriculum content, ensure depth of learning and support student success in the assessment?
- How do I include opportunities for all my students to learn?

Build on concepts, skills and processes; challenge and engage students

The content descriptions are organised in strands and sub-strands in order to ensure that learning is appropriately ordered and that unnecessary repetition is avoided. However, a concept or skill introduced at one year level may be revisited, strengthened and extended at later year levels as needed. This organisation illustrates the clarity and sequence of development of concepts through and across the year levels and supports the ability to see the connections across strands and the sequential development of concepts from Prep to Year 10.

In Mathematics, challenging problems can be posed using basic age-appropriate content. Acceleration by using content beyond students' year level may not be the best way to extend proficient mathematicians. Choosing engaging experiences as contexts for a variety of tasks assists in making Mathematics inclusive, and these tasks can be effectively differentiated both for students experiencing difficulty and those who complete tasks easily. The proficiency strands apply expectations of the range and nature of how mathematical content is enacted, and can help focus teaching.

Proficiency strands

The proficiency strands describe the actions in which students can engage when learning and using the content. While not all proficiency strands apply to every content description, they indicate the breadth of mathematical actions that teachers can emphasise.

Understanding

Students build a robust knowledge of adaptable and transferable mathematical concepts. They make connections between related concepts and progressively apply the familiar to develop new ideas. They develop an understanding of the relationship between the 'why' and the 'how' of mathematics. Students build understanding when they connect related ideas, when they represent concepts in different ways, when they identify commonalities and differences between aspects of content, when they describe their thinking mathematically and when they interpret mathematical information.

Fluency

Students develop skills in choosing appropriate procedures, carrying out procedures flexibly, accurately, efficiently and appropriately, and recalling factual knowledge and concepts readily. Students are fluent when they calculate answers efficiently, when they recognise robust ways of answering questions, when they choose appropriate methods and approximations, when they recall definitions and regularly use facts, and when they can manipulate expressions and equations to find solutions.

Problem Solving

Students develop the ability to make choices, interpret, formulate, model and investigate problem situations, and communicate solutions effectively. Students formulate and solve problems when they use mathematics to represent unfamiliar or meaningful situations, when they design investigations and plan their approaches, when they apply their existing strategies to seek solutions, and when they verify that their answers are reasonable.

Reasoning

Students develop an increasingly sophisticated capacity for logical thought and actions, such as analysing, proving, evaluating, explaining, inferring, justifying and generalising. Students are reasoning mathematically when they explain their thinking, when they deduce and justify strategies used and conclusions reached, when they adapt the known to the unknown, when they transfer learning from one context to another, when they prove that something is true or false and when they compare and contrast related ideas and explain their choices.

The relationship between the content and proficiency strands

The content strands describe the 'what' that is to be taught and learnt while the proficiency strands describe the 'how' of the way content is explored or developed i.e. the thinking and doing of mathematics. Each of the 'content descriptions' in the mathematics includes terms related to understanding, fluency, problem solving or reasoning. In this way, proficiency strands describe how students interact with the content i.e. they describe how the mathematical content strands are enacted via mathematical behaviours. They provide the language to build in the developmental aspects of the learning of mathematics.

Include the general capabilities

The general capabilities are relevant to teaching and learning in Mathematics, and explicit teaching of the capabilities should be incorporated in teaching and learning activities where appropriate. Section 2.1.2 outlines how the general capabilities are an integral part of a Mathematics program.

Embed meaningful contexts

Schools develop learning contexts to suit the content to be taught and their students' interests and learning needs. It is important to actively engage students in learning that is relevant and of interest to them. The focus or context for learning should connect with issues of personal or social relevance to students. The cross-curriculum priorities provide rich and engaging contexts and should be incorporated where appropriate. (See section 2.1.3 for information about the priorities).

Year 9 should include opportunities to:

- describe the relationship between graphs and equations, simplify a range of algebraic expressions, explain the use of relative frequencies to estimate probabilities and the use of the trigonometric ratios for right-angle triangles
- apply the index laws to expressions with integer indices, express numbers in scientific notation, list outcomes for experiments and develop familiarity with calculations involving the Cartesian plane and calculate areas of shapes and surface areas of prisms
- formulate, and model practical situations involving surface areas and volumes of right prisms, apply ratio and scale factors to similar figures, solve problems involving right-angle trigonometry, and collect data from secondary sources to investigate an issue
- follow mathematical arguments, evaluate media reports and use statistical knowledge to clarify situations, develop strategies in investigating similarity and sketch linear graphs.

2.3.7 Educational equity

Equity means fair treatment of all. In developing teaching, learning and assessment programs, teachers provide opportunities for all students to demonstrate what they know and what they can do.

See the QSA *Equity statement*:
www.qsa.qld.edu.au/downloads/approach/qsa_equity_statement.pdf

Catering for diversity

Schools and school sectors determine which students require special provisions, applying principles of participation and equity. Consideration should be given to:

- adjustments and supports for students who have been identified as having specific educational requirements to make participation possible in all or part of the teaching and learning experiences and assessments
- interpreter or educational devices (e.g. pictures, electronic whiteboards, interactive devices) to assist students for whom English is not their first language and who are assessed as not achieving a reading level appropriate to complete the assessment.

In exceptional circumstances, the school, in consultation with staff and parents/carers, may make decisions about the level of student engagement with a particular assessment, according to school sector policy.

Inclusive strategies

Adjustments to teaching, learning and assessment can be grouped into five broad areas: *timing, scheduling, setting, presentation* and *response*.

Teachers consider the inclusive strategies to make adjustments to teaching and learning experiences and assessments to enable all students to demonstrate their knowledge, skills or competencies.

The inclusive strategies should be considered in combination when planning, developing and documenting the adjustment of learning experiences and assessment. For example, when planning an assessment, the teacher may need to consider adjusting the timing, setting, presentation and response to ensure the student is given the opportunities to demonstrate their learning.

Evaluating the use and effectiveness of any adjustment is necessary to ensure meaningful student participation and achievement.

Further information and resources about inclusive strategies, see:
www.qsa.qld.edu.au/18307.html

English as an Additional Language or Dialect

Further information and resources about English as an Additional Language or Dialect, see:

- Overview and EAL/D Learning Progression
  www.acara.edu.au/verve/_resources/English_as_an_Additional_Language_or_Dialect_Teacher_Resource_05_06_12.pdf
- Annotated content descriptions: English Foundation to Year 10
  www.acara.edu.au/verve/_resources/EALD_Learning_Area_Annotations_English_Revised_06_05_12.pdf

3. Assessment

Assessment is an integral part of teaching and learning. It is the purposeful collection of evidence about students' achievements. An awareness of what learning is assessed and how it is assessed helps both students and parents/carers develop an understanding of what is valued and where to focus attention.

Assessment is used for a variety of purposes, but its most important use is in supporting student learning.

Sufficient and suitable evidence is collected to enable fair judgments to be made about student learning. Once the evidence is collected and analysed, it is summarised and presented in ways that are meaningful and useful to:

- help students achieve the highest standards they can
- promote, assist and improve teaching and learning
- build a shared understanding of the qualities of student work and communicate meaningful information about students' progress and achievements to students, teachers, parents/carers and the system.

See Appendix 2: Principles of assessment.

3.1 Standards-based assessment

The Australian Curriculum is standards-based (see section 2.2).

Teacher judgment is guided by achievement standards that are fixed reference points used to describe what is valued as important for young people to know, understand and do. The standards describe the expected qualities of student work and give a common frame of reference and a shared language to describe student achievement.

Standards-based assessment is an integral part of the teaching and learning process that is planned and ongoing.

3.2 School-based assessment

School-based assessment involves individual teachers or groups of teachers making informed decisions about what evidence of learning will be collected at suitable intervals as part of the teaching and learning program.

School-based assessment puts teachers' professional knowledge and practice at the centre of aligning what is taught, how it is taught, how student learning is assessed and how learning is reported.

3.3 Developing an assessment program

An assessment program is planned at the same time as the teaching and learning program and is developed using the achievement standard and the content descriptions.

A planned assessment program will:

- guide and support targeted teaching and learning
- ensure students have opportunities to demonstrate the depth and breadth of their learning in all aspects of the achievement standard
- provide regular feedback to students about how they can improve their learning
- clarify future teaching and learning needs
- ensure teachers have sufficient evidence of learning to make defensible on-balance judgments about the quality of students' work against the standard.

Table 4: Types and purposes of assessment that may be included in an assessment program

Diagnostic assessment	**Assessment *for* learning**
Provides opportunities to use assessment to determine the nature of students' learning as a basis for providing feedback or intervention, e.g. literacy and numeracy indicators	Enables teachers to use information about student progress to inform their teaching, e.g. using feedback from a previous unit to inform learning in the current unit
Formative assessment	**Assessment *as* learning**
Focuses on monitoring to improve student learning, e.g. practising an assessment technique	Enables students to reflect on and monitor their own progress to inform their future learning goals, e.g. opportunities to reflect on an inquiry process
Summative assessment	**Assessment *of* learning**
Indicates standards achieved at particular points for reporting purposes, e.g. an assessment that contributes to a reported result	Assists teachers to use evidence of student learning to assess student achievement against standards, e.g. the assessments contained in the targeted folio for reporting

The assessment program includes:

- a range and balance of assessment categories, techniques and conditions appropriate for the learning area, the year level, the school context and the student cohort
- opportunities for students to become familiar with the assessment techniques and for teachers to monitor student achievement and provide feedback to students.

The planned assessment program takes into account systemic assessment: in Year 9, students are required to do the National Assessment Program — Literacy and Numeracy (NAPLAN). For further information about NAPLAN, see www.qsa.qld.edu.au/8017.html.

For fact sheets about assessment for learning, see:

- Assessment for learning — A new perspective
  www.qsa.qld.edu.au/downloads/p_10/as_afl_new_perspective.doc
- Assessment for learning — Improving assessment pedagogy
  www.qsa.qld.edu.au/downloads/p_10/as_afl_improv_pedagogy.doc
- Assessment for learning — School improvement
  www.qsa.qld.edu.au/downloads/p_10/as_afl_school_improve.doc

- Assessment for learning — Student achievement
  www.qsa.qld.edu.au/downloads/p_10/as_afl_student_achieve.doc
- Assessment for learning — Inclusive practice
  www.qsa.qld.edu.au/downloads/p_10/as_afl_inclusive_practice.doc
- Assessment for learning — Developing student understanding
  www.qsa.qld.edu.au/downloads/p_10/as_afl_dev_stud_understand.doc

3.4 Year 9 Mathematics assessment folio

The planned assessment program specifies the evidence of learning that is summative assessment or assessment *of* learning and when it will be collected. This collection of student responses to assessments makes up a targeted assessment folio.

The targeted assessment folio contains sufficient evidence of learning on which to make a defensible on-balance judgment A to E (or equivalent five-point scale) about how well the evidence of student learning matches the standard for the reporting period. (See section 4.2 for advice and information about making an on-balance judgment on a folio of work).

A Year 9 Mathematics assessment folio includes student responses that demonstrate achievement in a range and balance of assessments designed to assess the identified knowledge, understandings and skills in the content and achievement standard.

Table 5: Range and balance

Range Range is informed by:	**and**	**Balance** Balance is achieved by including:
· content descriptions		· all aspects of the curriculum content across the three strands — Number and Algebra, Measurement and Geometry, and Statistics and Probability
· assessment categories: – written – spoken/signed – multimodal		· all aspects of the Australian Curriculum achievement standard: Understanding and Skills
· assessment techniques (section 3.4.1): – modelling and problem-solving task – mathematical investigation – supervised assessment – collection of work		· a variety of assessment categories, techniques and conditions.
· assessment conditions (section 3.4.2): – supervised – open.		

An example of an assessment program for Year 9 Mathematics is in the Year 9 exemplar year plan: www.qsa.qld.edu.au/downloads/p_10/ac_maths_yr9_plan.doc.

The Year 9 standard elaborations (section 2.2.1) identify the valued features in the content descriptions and the achievement standard for Australian Curriculum: Mathematics. Teachers can use the standard elaborations to ensure their assessment program includes opportunities for students to demonstrate their achievement in *all* aspects of the curriculum content and achievement standard for the full A to E range by the end of the year.

3.4.1 Assessment techniques, formats and categories

The following table provides information and examples about assessment techniques, formats and categories for developing a range and balance within an assessment program.

Table 6: Assessment techniques, formats and categories

Technique: Modelling and problem-solving task	**Technique: Mathematical investigation**	**Technique: Supervised assessment**	**Technique: Collection of work**
Purpose			
This technique is used to assess students' abilities to respond to a specific task or issue that highlights a real-life application of Mathematics.	This technique is used to assess students' abilities to respond to an authentic challenge or a researchable context or situation.	This technique is used to assess student responses that are produced independently, under supervision and in a set time frame. A supervised assessment ensures there is no question about student authorship.	This technique is used to assess student responses to a series of focused tasks relating to a single cohesive context.
Description			
A modelling and problem-solving task may require a response that involves mathematical language, appropriate calculations, tables of data, graphs and diagrams. When completing the modelling and problem-solving task, students may: · analyse information and data · process information · interpret and synthesise data · explain relationships to develop and support mathematical arguments · reflect on and evaluate data, propositions, results and conclusions · communicate ideas.	A mathematical investigation should be conducted over an extended time frame. Challenges, contexts or situations could include: · mathematical experiments · field activities · case studies · feasibility studies · proposals to a company or organisation.	Supervised assessment items will be in response to questions or statements. Questions or statements are typically unseen. If seen, teachers must ensure the purpose of this technique is not compromised. Stimulus materials may also be used. They may be seen or unseen. Unseen questions, statements or stimulus materials should not be copied from information or texts that students have previously been exposed to or have directly used in class.	Examples of presentation formats for a collection of work include: · worked solutions to mathematical problems · labelled diagrams · written explanations · graphs and tables · journal entries · reports on short practical activities · mathematical analyses of real-world scenarios · summaries and analyses of mathematics and statistics in newspaper or magazine articles · oral, electronic or multimodal presentations.

Format			
The presentation format of a modelling and problem-solving task will typically be written and should be supported by the appropriate use of data, calculations, diagrams, flowcharts, tables and graphics. Examples of modelling and problem-solving task presentation formats include: · oral, electronic or multimodal presentations · computer-generated simulations · virtual models using computer software · construction of 2-D or 3-D models.	The presentation format of a mathematical investigation will typically be written and should be supported by the appropriate use of data, calculations, diagrams, flowcharts, tables and graphics. Examples of mathematical investigation presentation formats include: · reports · brochures · journals · graphic organisers · oral, electronic or multimodal presentations · computer-generated simulations · virtual models using computer software · construction of 2-D or 3-D models · blogs and wikis · podcasts and short videos · peer and self-reflections.	Examples of supervised assessment presentation formats include: · questions – Items may also include multiple-choice, single-word, true/false or sentence answers. These types of questions are useful for assessing content knowledge and are difficult to construct if trying to elicit meaningful high-order cognitive responses. · prose – Items may include responses to stimulus activities that require ▪ explanations longer than one sentence ▪ responses to seen or unseen stimulus materials · practical exercises and calculations – Items may require students to ▪ construct, use, interpret or analyse primary or secondary data, graphs, tables or diagrams ▪ apply algorithms or demonstrate mathematical calculations and problem-solving.	The presentation format of a collection of work will typically be written and should be supported by the appropriate use of calculations, diagrams, flowcharts, data, tables and graphics.
Categories			
Responses can be written, spoken/signed or multimodal (integrate visual, print and/or audio features).			

3.4.2 Assessment conditions

The following table provides information and examples about assessment conditions including suggested lengths for developing a range and balance within an assessment program.

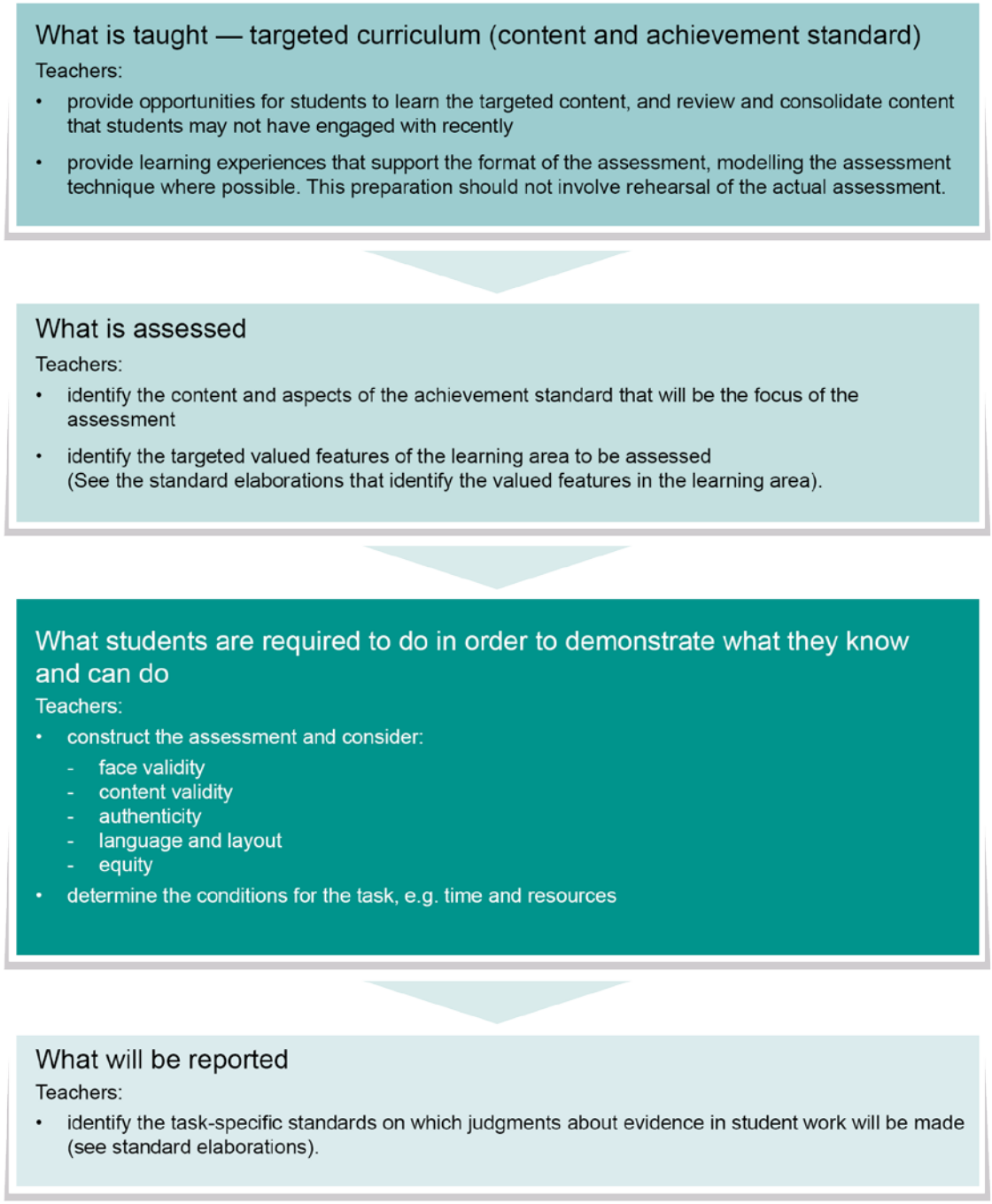
Table 7: Assessment conditions

Open conditions	Supervised conditions
A modelling and problem-solving task or mathematical investigation can be: · undertaken individually and/or in groups · prepared in class time and/or in students' own time. **Ensuring authenticity** When using open conditions, teachers should ensure that students' work is their own, particularly where students have access to electronic resources or when they are preparing collaborative assessments. Methods teachers can use to monitor that students' work is their own include requesting that students: · submit plans and drafts of their work · produce and maintain documentation that charts the development of responses · acknowledge resources used. **Suggested lengths:** · written responses 200–800 words* · spoken/signed or multimodal responses 3–5 minutes*	Supervised assessment items will typically: · be undertaken individually · be held under test/exam conditions · allow perusal time, if required · allow time to check for student understanding of instructions · use stimulus materials that are succinct enough to allow students to engage with them in the time provided. (If stimulus materials are lengthy, they may need to be given to students prior to the administration of the supervised assessment) · be completed in one uninterrupted supervised session or a number of supervised sessions. **Suggested lengths:** · 45–90 mins · up to 400 words*
*The length of student responses should be considered in the context of the assessment. Longer responses do not necessarily provide better quality evidence of achievement.	

3.4.3 Developing assessments

When developing assessment, teachers construct assessments that show the alignment between what has been taught (curriculum), how it is taught (pedagogy), how students are assessed and how the learning is reported. Figure 5 below shows the process of alignment.

Figure 5: Aligning assessment



“Working the assessment” to confirm the alignment

The following checklist assists and supports schools with reviewing and evaluating their assessments.

Figure 6: Assessment evaluation checklist

Check the assessment for:	
Face validity The extent to which an assessment appears to assess (on face value) what it intends to assess.	· Identify the specific content descriptions and aspects of the achievement standard being assessed to determine what is being assessed. · Consider whether student responses to the assessment will provide evidence of learning for the intended curriculum.
Content validity The extent to which the assessment measures what it claims to measure (either the subject-matter content or behaviour).	· Review the assessment to determine what is valued in the assessment. · Check that it is clear what students are expected to know and be able to do to complete this assessment. · Ensure students will be able to demonstrate the full range of standards A to E in their responses to the assessment. For example, does the assessment require sufficient depth and breadth of the targeted knowledge, understanding and skills; does it encourage students to demonstrate a range of thinking skills? · Use the standard elaborations to confirm that the assessment provides opportunities for students to demonstrate their achievement in particular targeted aspects of the curriculum content and achievement standard.
Authenticity The extent to which students will find the assessment engaging.	· Use an appropriate and meaningful context to engage students. · Ensure the assessment is pitched appropriately for the year level.
Language and layout The extent to which the assessment clearly communicates to students what is needed for producing their best performance.	· Identify specific terms students are required to know and consider whether students are likely to understand the terms or not. · Check the level of language required to interpret the assessment and consider how well students will be able to understand what the assessment requires them to do. · Consider the clarity of the instructions, cues, format, diagrams, illustrations and graphics and how well they assist students to understand what they are required to do.
Equity The extent to which the assessment provides opportunities for all students to demonstrate what they know and can do.	· Check for any cultural, gender or social references and stereotypes. · List aspects of the task that might need adjusting for verified students. (See section 2.3.7.) Note that adjustments to the task should not impact on judgments made about student achievement.

Note: When students undertake assessment in a group or team, the assessment must be designed so that teachers can validly assess the work of individual students and not apply a judgment of the group processes and outcome to all individuals.

See the following:

- Designing good assessment (video)
  www.qsa.qld.edu.au/19788.html
- Assessment instrument — multiple-choice responses
  www.qsa.qld.edu.au/downloads/p_10/as_ai_multiple_choice.doc
- Scaffolding — supporting student performance
  www.qsa.qld.edu.au/downloads/p_10/as_scaffolding.doc
- Thinking like an assessor vs activity designer
  www.qsa.qld.edu.au/downloads/p_10/as_assessor_vs_designer.doc
- Sample assessments:
  www.qsa.qld.edu.au/yr9-maths-resources.html

3.5 Making judgments

When making judgments about the evidence in student work, teachers are advised to use task-specific standards. Task-specific standards give teachers:

- a tool for directly matching the evidence of learning in the student response to the standards
- a focal point for discussing student responses
- a tool to help provide feedback to students.

Task-specific standards are not a checklist; rather they are a guide that:

- highlights the valued features that are being targeted in the assessment and the qualities that will inform the overall judgment
- specifies particular *targeted aspects* of the curriculum content and achievement standard — the alignment between the valued feature, the task-specific descriptor and the assessment must be obvious and strong
- clarifies the curriculum expectations for learning at each of the five grades (A–E) and shows the connections between what students are expected to know and do, and how their responses will be judged
- allows teachers to make consistent and comparable on-balance judgments about student work by matching the qualities of student responses with the descriptors
- supports evidence-based discussions to help students gain a better understanding of how they can critique their own responses and achievements and identify the qualities needed to improve
- increases the likelihood of students communicating confidently about their achievement with teachers and parents/carers and asking relevant questions about their own progress
- encourages and provides the basis for conversations among teachers, students and parents/carers about the quality of student work and curriculum expectations and related standards.

The standard elaborations (section 2.2.1) are a resource that can be used to inform the development of task-specific standards.

Task-specific standards can be prepared as a matrix or continua.

See templates with features shown for:

- Continua
  www.qsa.qld.edu.au/downloads/p_10/ac_maths_tss_continua.dot
- Matrix
  www.qsa.qld.edu.au/downloads/p_10/ac_maths_tss_matrix.dot

3.6 Using feedback

Feedback is defined as the process of seeking and interpreting evidence for use by students and their teachers to decide where the students are in their learning, where they need to go and how best to get there.

Feedback gathered throughout the teaching and learning cycle informs future teaching learning and assessment. Its purpose is to recognise, encourage and improve student learning.

Assessment feedback is most helpful if the specific elements of the content (knowledge, understanding and skills) are identified and specific suggestions are provided. The standard elaborations provide a resource for developing specific feedback to students about the valued features in the content and achievement standards.

Assessment alone will not contribute to improved learning. It is what teachers and students do with assessment and other available information that makes a difference.

See:

- Seeking and providing feedback
  www.qsa.qld.edu.au/downloads/p_10/as_feedback_about.doc
- About feedback
  www.qsa.qld.edu.au/downloads/p_10/as_feedback_provide.doc

4. Reporting

Schools are required to provide parents/carers with plain-language reports twice a year. In most schools, this takes place at the end of each semester. The report must:

- be readily understandable and give an accurate and objective assessment of the student's progress and achievement
- include a judgment of the student's achievement reported as A, B, C, D or E (or equivalent five-point scale), clearly defined against the Australian Curriculum achievement standards.

4.1 Reporting standards

The reporting standards are summary statements that succinctly describe typical performance at each of the five levels (A–E) for the two dimensions of the Australian Curriculum achievement standards — understanding (including knowledge) and application of skills for the purpose of reporting twice-yearly.

Table 8: Reporting standards

A	B	C	D	E
Evidence in a student's work typically demonstrates a **very high level** of knowledge and understanding of the content (facts, concepts, and procedures), and application of skills.	Evidence in a student's work typically demonstrates a **high level** of knowledge and understanding of the content (facts, concepts, and procedures), and application of skills.	Evidence in a student's work typically demonstrates a **sound level** of knowledge and understanding of the content (facts, concepts, and procedures), and application of skills.	Evidence in a student's work typically demonstrates a **limited level** of knowledge and understanding of the content (facts, concepts and procedures), and application of skills.	Evidence in a student's work typically demonstrates a **very limited level** of knowledge and understanding of the content (facts, concepts and procedures), and application of skills.

The key purpose of reporting student achievement and progress is to improve student learning. The following principles underpin reporting school-based, standards-based assessment:

- Alignment of teaching, learning, assessment and reporting: what is taught (curriculum) must inform how it is taught (pedagogy), how students are assessed (assessment) and how the learning is reported. (See section 2)
- A collection of evidence or folio of student work: summative judgments for reporting purposes are based on a planned and targeted selection of evidence of student learning collected over the reporting period. (See section 3)
- On-balance judgments: professional decisions made by teachers about the overall quality of a student's work in a range of assessments that best matches the valued features of a learning area described in the achievement standards *at the time of reporting*.

- Moderation: Making consistent judgments about students' achievements within and between schools occurs when teachers develop shared understandings of the curriculum content and achievement standards. Moderation provides students and their parents/carers with confidence that the awarded grades are an accurate judgment of achievement and that the report is meaningful, professional and consistent.

Student achievement is reported against the Australian Curriculum achievement standard for the year level they are taught.

Teachers make reasonable adjustments during the cycle of teaching, learning and assessment to support the learning of students with disabilities, for example adjustments to presentation, response, timing, scheduling and location. In most instances, the required curriculum content, achievement and reporting standards will be used for these students. (See section 2.3.7 for inclusivity materials.)

School sectors and schools make decisions following negotiation with parents/carers about the provision of modified or accelerated learning and assessment programs to meet the learning needs of some students. Reporting achievement for these students should clearly indicate the year level of the curriculum content and the achievement standards against which judgments about student achievement have been made.

Achievement in a learning area is only one source of information on student achievement and progress. Schools may report on other important aspects of student engagement at school separate from achievement in a learning area such as:

- student participation and skills in school-based extracurricular activities
- student attributes such as effort, punctuality, and social and behavioural skills
- student attendance
- other school or system priorities.

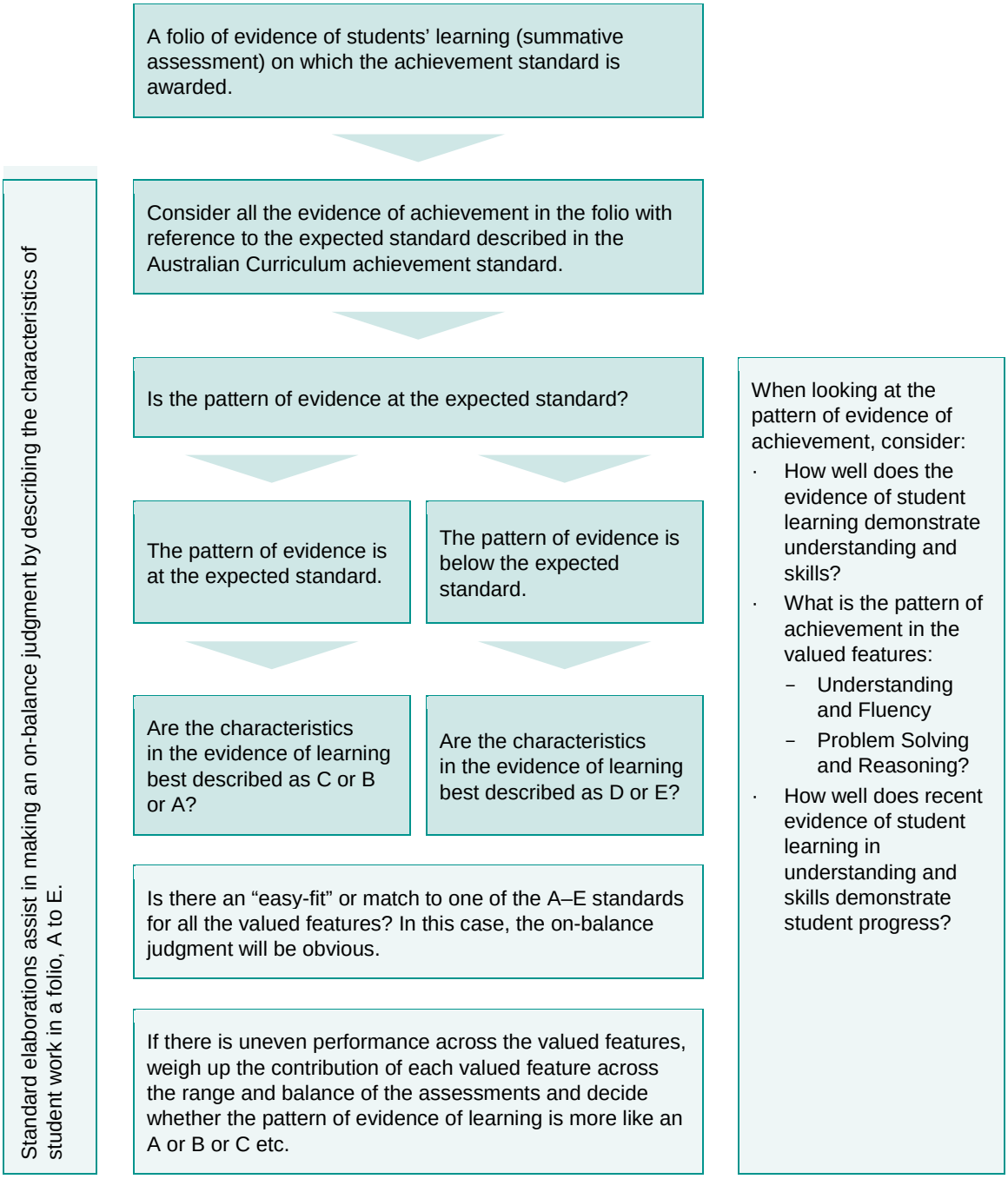
4.2 Making an on-balance judgment on a folio

By the end of the year, a planned and targeted assessment program will result in an assessment folio of evidence of students' learning (summative assessment) on which the overall standard is awarded.

The range and balance of assessment in the folio ensures there is sufficient evidence of achievement in both dimensions of the Australian Curriculum achievement standard — Understanding and Skills — to make an on-balance judgment for reporting.

An on-balance judgment involves a teacher, or a group of teachers, making a professional decision about how the pattern of evidence in the folio best matches the standards.

Figure 7: On-balance judgments



An on-balance judgment does not involve averaging grades across different assessments or “ticking” every box. Rather it is a professional judgment that considers all the evidence of achievement in the folio.

The standard elaborations assist in making the on-balance decision. The elaborations describes *how well* on a five-point scale students have demonstrated what they know, understand and can do using the Australian Curriculum achievement standard. The standard elaborations assist teachers to make consistent and comparable evidence-based A to E judgments about the patterns of evidence in a folio of work. They provide transparency about how decisions about grades are made, and for conversations among teachers, students and parents/carers about the qualities in student work matched to the valued features in the curriculum expectations and the standards.

4.2.1 Making an on-balance judgment for mid-year reporting

For mid-year reporting, the on-balance judgment is based on the pattern of evidence of student achievement and progress *at the time of reporting* and in relation to what has been taught and assessed during the reporting period.

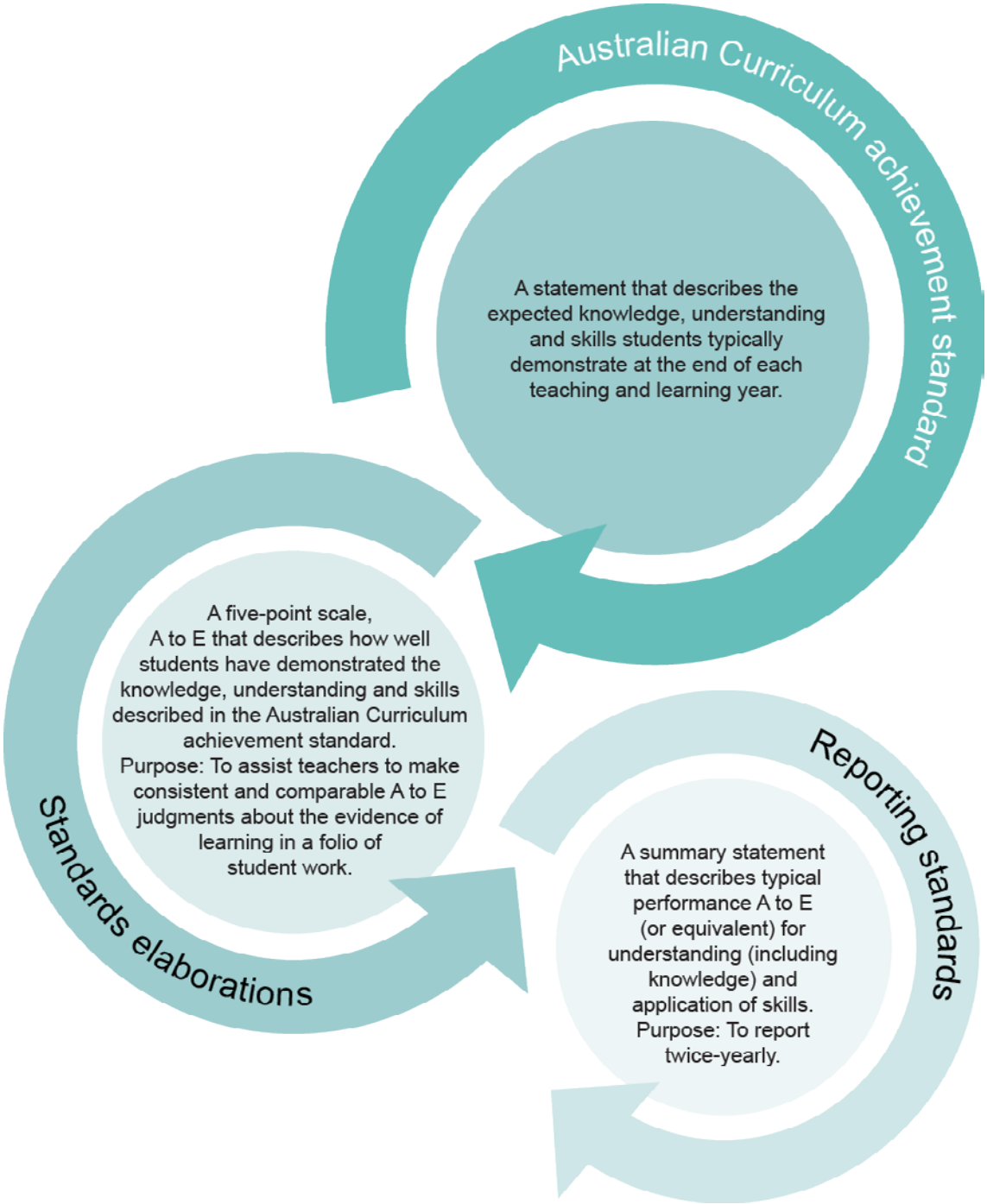
The application of the Australian Curriculum achievement standard during the year requires a judgment based on matching qualities in student work rather than checking coverage.

The standard elaborations assist in making an on-balance judgment for mid-year reporting.

The process for assessing and making judgments about student achievement may be assisted by progressively recording student achievement for each assessment on a student profile or similar.

4.2.2 Applying the Australian Curriculum achievement standards

Figure 8: The relationship between the Australian Curriculum achievement standard, standards elaborations and the reporting standards.



4.3 Moderation

The achievement standards guide teacher judgment about how well students have achieved. The most effective way to build consistent and comparable on-balance teacher judgment is through planned activities when teachers — in a partnership or team situation — engage in focused professional dialogue to discuss and analyse the quality of student work, compare their judgments about student achievement and determine the match between the evidence in student work and standards. This process is known as moderation.

Professional dialogue increases teachers' awareness about the variety of ways in which students may respond to the assessment and the types of evidence that may be available to support teacher judgments. In this way, teachers gain valuable insights about how the standards can be demonstrated in student work. They build a shared understanding about the match of evidence to standards, enhancing classroom practice and supporting the alignment of curriculum and assessment.

Moderation provides students and their parents/carers with confidence that the standards awarded are defensible judgments of achievement and that the report is meaningful, professional and consistent.

See the following fact sheets for more information:

- Consistency of judgments — Calibration model
  www.qsa.qld.edu.au/downloads/p_10/as_coj_calibration.doc
- Consistency of judgments — Conferencing model
  www.qsa.qld.edu.au/downloads/p_10/as_coj_conferencing.doc
- Consistency of judgments — Expert model
  www.qsa.qld.edu.au/downloads/p_10/as_coj_expert.doc

See also the suggested approaches to moderation in the Year level plan:
www.qsa.qld.edu.au/downloads/p_10/ac_maths_yr9_plan.doc

Appendix 1: Glossary

Curriculum

For definitions of terms used by ACARA in the development of the Australian Curriculum: Mathematics, see: www.australiancurriculum.edu.au/Mathematics/Glossary.

Term	Description
Curriculum	The Australian Curriculum sets out what all young people should be taught through the specification of curriculum content and achievement standards. Curriculum content has three components: disciplinary learning, general capabilities and cross-curriculum priorities.
Content strand	The three strands in Mathematics are: Number and Algebra, Measurement and Geometry, and Statistics and Probability. They describe what is to be taught and learnt.
Proficiency strand	The four proficiency strands are: Understanding, Fluency, Problem Solving, and Reasoning. They describe how content is explored or developed, that is, the thinking and doing of Mathematics.
Sub-strand	Each strand is organised by sub-strands to illustrate the clarity and sequence of development of concepts through and across the year levels. They support the ability to see the connections across strands and the sequential development of concepts from Foundation to Year 10.
Content elaboration	An example provided to illustrate and exemplify content. Elaborations are not a requirement for the teaching of the Australian Curriculum.

Assessment

Term	Description
Assessment	The purposeful and systematic collection of evidence about students' achievements.
Assessment task	A tool or instrument to gather evidence of students' achievement.

Mathematics standards elaborations

The standards elaborations for Mathematics have been developed from the proficiency strands *Understanding*, *Fluency*, *Problem Solving* and *Reasoning*.

Proficiency	Description
Understanding	Students build a robust knowledge of adaptable and transferable mathematical concepts. They make connections between related concepts and progressively apply the familiar to develop new ideas. They develop an understanding of the relationship between the 'why' and the 'how' of mathematics. Students build understanding when they connect related ideas, when they represent concepts in different ways, when they identify commonalities and differences between aspects of content, when they describe their thinking mathematically and when they interpret mathematical information.
Fluency	Students develop skills in choosing appropriate procedures, carrying out procedures flexibly, accurately, efficiently and appropriately, and recalling factual knowledge and concepts readily. Students are fluent when they calculate answers efficiently, when they recognise robust ways of answering questions, when they choose appropriate methods and approximations, when they recall definitions and regularly use facts, and when they can manipulate expressions and equations to find solutions.
Problem solving	Students develop the ability to make choices, interpret, formulate, model and investigate problem situations, and communicate solutions effectively. Students formulate and solve problems when they use mathematics to represent unfamiliar or meaningful situations, when they design investigations and plan their approaches, when they apply their existing strategies to seek solutions, and when they verify that their answers are reasonable.
Reasoning	Students develop an increasingly sophisticated capacity for logical thought and actions, such as analysing, proving, evaluating, explaining, inferring, justifying and generalising. Students are reasoning mathematically when they explain their thinking, when they deduce and justify strategies used and conclusions reached, when they adapt the known to the unknown, when they transfer learning from one context to another, when they prove that something is true or false and when they compare and contrast related ideas and explain their choices.

Appendix 2: Principles of assessment

The following principles were developed to inform the policy context of the national curriculum and provide a basis on which local decisions about specific approaches to assessment can be built.

1. The main purposes of assessment are to inform teaching, improve learning and report on the achievement of standards.
2. Assessment is underpinned by principles of equity and excellence. It takes account of the diverse needs of students and contexts of education, and the goal of promoting equity and excellence in Australian schooling.
3. Assessment is aligned with curriculum, pedagogy and reporting. Quality assessment has curricular and instructional validity — what is taught informs what is assessed, and what is assessed informs what is reported.
4. Assessment aligned with curriculum, pedagogy and reporting includes assessment of deep knowledge of core concepts within and across the disciplines, problem solving, collaboration, analysis, synthesis and critical thinking.
5. Assessment involves collecting evidence about expected learning as the basis for judgments about the achieved quality of that learning. Quality is judged with reference to published standards and is based on evidence.
6. Assessment evidence should come from a range of assessment activities. The assessment activity is selected because of its relevance to the knowledge, skills and understanding to be assessed, and the purpose of the assessment.
7. Information collected through assessment activities is sufficient and suitable to enable defensible judgments to be made. To show the depth and breadth of the student learning, evidence of student learning is compiled over time. Standards are reviewed periodically and adjusted according to evidence to facilitate continuous improvement.
8. Approaches to assessment are consistent with and responsive to local and jurisdictional policies, priorities and contexts. It is important that schools have the freedom and support to develop quality assessment practices and programs that suit their particular circumstances and those of the students they are assessing.
9. Assessment practices and reporting are transparent. It is important that there is professional and public confidence in the processes used, the information obtained and the decisions made.

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