Year 10 standard elaborations — Australian Curriculum: Mathematics

Purpose

The standard elaborations (SEs) provide additional clarity when using the Australian Curriculum achievement standard to make judgments on a five-point scale. They promote and support:

- aligning curriculum, assessment and reporting, connecting curriculum and evidence in assessment, so that what is assessed relates directly to what students have had the opportunity to learn
- continuing skill development from one year of schooling to another
- making judgments on a five-point scale based on evidence of learning in a folio of student work
- developing task-specific standards and grading guides.

Structure

The SEs are developed using the **Australian Curriculum achievement standard**. In Years 7 to 10, the Mathematics SEs have been organised using the **proficiency strands**. Performance is frequently represented in terms of complexity and familiarity of the standard being assessed. Across the elaborations this is described according to:
A — unfamiliar, B — complex familiar, C — simple familiar, D — some simple familiar, E — partial, isolated and obvious.

The Mathematics achievement standard describes the learning expected of students at each year level. Teachers use the achievement standard during and at the end of a period of teaching to make on-balance judgments about the quality of learning students demonstrate.

In Queensland the achievement standard represents the **C standard** — a sound level of knowledge and understanding of the content, and application of skills. The SEs are presented in a **matrix**. The discernible differences or degrees of quality associated with the five-point scale are highlighted to identify the characteristics of student work on which teacher judgments are made. Terms are described in the Notes section following the matrix.

Year 10 Australian Curriculum: Mathematics achievement standard
By the end of Year 10, students recognise the connection between simple and compound interest. They solve problems involving linear equations and inequalities. They make the connections between algebraic and graphical representations of relations. Students solve surface area and volume problems relating to composite solids. They recognise the relationships between parallel and perpendicular lines. Students apply deductive reasoning to proofs and numerical exercises involving plane shapes. They compare data sets by referring to the shapes of the various data displays. They describe bivariate data where the independent variable is time. Students describe statistical relationships between two continuous variables. They evaluate statistical reports. Students expand binomial expressions and factorise monic quadratic expressions. They find unknown values after substitution into formulas. They perform the four operations with simple algebraic fractions. Students solve simple quadratic equations and pairs of simultaneous equations. They use triangle and angle properties to prove congruence and similarity. Students use trigonometry to calculate unknown angles in right-angled triangles. Students list outcomes for multi-step chance experiments and assign probabilities for these experiments. They calculate quartiles and inter-quartile ranges.

Source	Australian Curriculum, Assessment and Reporting Authority (ACARA), *Australian Curriculum Version 8 Mathematics for Foundation–10*, www.australiancurriculum.edu.au/Mathematics/Curriculum/F-10

Year 10 Mathematics standard elaborations

		A	B	C	D	E
		The folio of a student's work has the following characteristics:				
Understanding and fluency	**Conceptual understanding**	connection and description of mathematical concepts and relationships in unfamiliar situations	connection and description of mathematical concepts and relationships in complex familiar situations	recognition and identification of mathematical concepts and relationships in simple familiar situations	some identification of simple mathematical concepts	statements about obvious mathematical concepts
	Procedural fluency	recall and use of facts, definitions, technologies and procedures to find solutions in unfamiliar situations	recall and use of facts, definitions, technologies and procedures to find solutions in complex familiar situations	recall and use of facts, definitions, technologies and procedures to find solutions in simple familiar situations	some recall and use of facts, definitions, technologies and simple procedures	partial recall of facts, definitions or simple procedures
	Mathematical language and symbols	effective and clear use of appropriate mathematical terminology, diagrams, conventions and symbols	consistent use of appropriate mathematical terminology, diagrams, conventions and symbols	use of appropriate mathematical terminology, diagrams, conventions and symbols	use of aspects of mathematical terminology, diagrams and symbols	use of everyday language

		A	B	C	D	E
Problem-solving and reasoning	**Problem-solving approaches**	systematic application of relevant problem-solving approaches to investigate unfamiliar situations	application of relevant problem-solving approaches to investigate complex familiar situations	application of problem-solving approaches to investigate simple familiar situations	some selection and application of problem-solving approaches in simple familiar situations	partial selection of problem-solving approaches
	Mathematical modelling	development of mathematical models and representations in unfamiliar situations	development of mathematical models and representations in complex familiar situations	development of mathematical models and representations in simple familiar situations	statements about simple mathematical models and representations	isolated statements about given mathematical models and representations
	Reasoning and justification	clear explanation of mathematical thinking and reasoning, including logical justification of choices made, evaluation of strategies used, proofs formulated and conclusions reached	explanation of mathematical thinking and reasoning, including reasons for choices made, strategies used, proofs formulated and conclusions reached	description of mathematical thinking and reasoning, including discussion of choices made, strategies used, proofs formulated and conclusions reached	statements about choices made, strategies used and conclusions reached	isolated statements about given strategies or conclusions

Key	shading emphasises the qualities that discriminate between the A–E descriptors

Notes

Australian Curriculum common dimensions

The SEs describe the qualities of achievement in the two dimensions common to all Australian Curriculum learning area achievement standards — understanding and skills.

Dimension	Description
understanding	the concepts underpinning and connecting knowledge in a learning area, related to a student's ability to appropriately select and apply knowledge to solve problems in that learning area
skills	the specific techniques, strategies and processes in a learning area

Terms used in Year 10 Mathematics SEs

The following terms are used in the Year 10 Mathematics SEs. Definitions are drawn from the ACARA Australian Curriculum Mathematics glossary (www.australiancurriculum.edu.au/f-10-curriculum/mathematics/glossary) and from other sources to ensure consistent understanding.

Term	Description
accuracy; accurate	consistent with a standard, rule, convention or known fact
application; apply	use or employ in a particular situation
appropriate	fitting, suitable to the context
aspects	particular parts or features
clarity; clear	easy to perceive, understand or interpret, without ambiguity
comparison; compare	estimate, measure or note how things are similar or dissimilar
complex familiar	students are required to choose and apply procedures in a situation involving a number of elements, components or steps in a context that has been a focus of prior learning
conceptual understanding	connection, description, recognition and identification of mathematical concepts and relationships; in Year 10, examples include: *Number and algebra* • applying the four operations to algebraic fractions • making the connection between equations of relations and their graphs • understanding the relationship between factorisation and expansion • exploring the method of completing the square to factorise quadratic expressions and solve quadratic equations • representing word problems with simple, linear equations and inequalities • associating the solution of simultaneous equations with the coordinates of the intersection of their corresponding graphs • comparing simple and compound interest in financial contexts *Measurement and geometry* • distinguishing between a practical demonstration and a proof, e.g. demonstrating triangles are congruent by placing them on top of each other, as compared to using congruence tests to establish that triangles are congruent

Term	Description
	• using authentic situations to apply knowledge and understanding of surface area and volume *Statistics and probability* • determining probabilities of two- and three-step experiments • recognising that an event can be dependent on another event and that this will affect the way its probability is calculated
connection; connect	establish a link
consistent	regular in occurrence; in agreement and not self-contradictory
description; descriptive; describe	give an account of characteristics or features
discussion; discuss	talk or write about a topic, taking in to account different issues or ideas
effective	meeting the assigned purpose in a considered and/or efficient manner to produce a desired or intended result
evaluation; evaluate	examine and judge the merit or significance of something
explanation; explanatory; explain	provide additional information that demonstrates understanding of reasoning and/or application
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; in Year 10, *fluency* is represented in the valued features of *procedural fluency* and *mathematical language and symbols*
given	known or provided
identification; identify	establish or indicate who or what someone or something is
investigate	plan, collect and interpret data/information and draw conclusions about
isolation; isolated	unconnected; set apart
justification; justify	show how an argument or conclusion is right or reasonable
logic; logical	sequence of sound reasoning

Term	Description
mathematical language and symbols	use of appropriate mathematical terminology, diagrams, conventions and symbols; in Year 10, examples include: *Number and algebra* • direct proportion, rate, integer, indices, simplify, factorise, product, quotient • evaluate, scientific notation • quadratic, inequality, exponential • simple interest, compound interest, interest rate • Cartesian plane, midpoint, gradient, linear, non-linear, parabola • using function notation to describe and sketch functions *Measurement and geometry* • composite solid, surface area, volume, net, capacity • similarity, transformation, congruence, parallel, perpendicular • elevation, depression • communicating a proof using a sequence of logically connected statements *Statistics and probability* • census, survey, variable, secondary data, histogram, stem-and-leaf plot, bivariate numerical data, representative data • population, frequency, sample, event, dependent, independent
mathematical modelling	depicting a situation that expresses relationships using mathematical concepts and language; in Year 10, examples include: • drawing, interpreting and analysing graphs of physical phenomena • constructing and interpreting data displays representing bivariate data over time • sketching and interpreting a variety of non-linear relationships • investigating the use of polynomials to model real world situations, such as projectile motion or cost analysis in economics
obvious	evident; apparent
partial	incomplete, half-done, unfinished
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; in Year 10, *problem-solving* is represented in the valued features of *problem-solving approaches* and *mathematical modelling*

Term	Description
problem-solving approaches	use of problem-solving approaches to investigate situations; in Year 10, examples include: • posing a question • making choices when designing investigations • interpreting mathematical or real-life situations • determining the evidence needed to support a conclusion or hypothesis • formulating a plan • selecting and applying appropriate algebraic techniques to operate with algebraic expressions • using algebraic and graphical techniques to find solutions to simultaneous equations and inequalities • investigating and determining the volumes and surface areas of composite solids by considering the individual solids from which they are constructed • applying Pythagoras's theorem and trigonometry to problems in surveying and design • using geometry software to investigate geometrical figures • investigating the shape of data sets • generalising mathematical ideas and techniques to analyse, interpret, evaluate and solve problems • using a variety of techniques to solve quadratic equations, including grouping, completing the square, the quadratic formula and choosing two integers with the required product and sum • using lines of best fit to make predictions and predicting what might happen beyond known data values • using arrays and tree diagrams to determine probabilities • verifying that answers are reasonable
procedural fluency	recall and use of facts, definitions, technologies and procedures to find solutions in Year 10, examples include: *Number and algebra* • finding unknowns in formulas after substitution • factorising and expanding algebraic expressions • using the index laws to simplify products and quotients of algebraic fractions • using a range of strategies to solve equations • sketching graphs of parabolas, circles and exponential functions • calculating compound interest *Measurement and geometry* • stating definitions for plane shapes • using formulas to find the surface areas and volumes of pyramids, right cones, spheres and related composite solids • finding solutions to right-angle triangle problems using the sine, cosine and tangent ratios *Statistics and probability* • calculating quartiles and inter-quartile ranges • calculating the mean and standard deviation
range	covers the scope of relevant situations or elements; in Year 10, the *range* of situations and problems included simple familiar, simple unfamiliar, complex familiar and unfamiliar

Term	Description
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; in Year 10, *reasoning* is represented in the valued features of *reasoning and justification* and *mathematical modelling*
reasoning and justification	description and explanation of mathematical thinking and reasoning, including discussion, justification and evaluation of choices made, strategies used, proofs formulated and conclusions reached; in Year 10, examples include: • formulating geometric proofs involving congruence and similarity • deducing properties of geometric figures • using deductive reasoning in presenting arguments and formal proofs • performing a sequence of steps to determine an unknown angle giving a justification in moving from one step to the next • using and interpreting formal definitions and generalisations when explaining solutions and/or conjectures • using lines of best fit to identify relationships • interpreting and evaluating media statements • interpreting and comparing data sets • using the mean and standard deviation to compare two sets of data
reasons; reasoned	logical and sound; presented with justification
recall	remember information, ideas or experiences
recognition; recognise	to be aware of, or acknowledge
relevant	connected to the matter in hand
represent	use words, images, symbols or signs to convey meaning
simple familiar	students are required to choose and apply procedures in a situation involving few elements, components or steps, and in a context that has been a focus of prior learning
statement; state	a sentence or assertion
systematic	methodical, organised and logical
thorough	demonstrating depth and breadth, inclusive of relevant detail
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; in Year 10, *understanding* is represented in the valued features of *conceptual understanding* and *mathematical language and symbols*

Term	Description
unfamiliar	students are required to choose and apply procedures in a situation involving a number of elements, components or steps in a context in which students have had limited prior experience
use; **use of**	to operate or put into effect