Year 9 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 9 Australian Curriculum: Mathematics achievement standard
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 from 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. 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.

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 9 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 and conclusions reached	explanation of mathematical thinking and reasoning, including reasons for choices made, strategies used and conclusions reached	description of mathematical thinking and reasoning, including discussion of choices made, strategies used 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 9 Mathematics SEs

The following terms are used in the Year 9 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 9, examples include: *Number and algebra* • making connections between visual, tabular and graphical representations of rate • recognising patterns and describing relationships such as that between graphs and equations • making connections between the factorised and expanded forms of binomials *Measurement and geometry* • identifying, visualising and quantifying measures and the attributes of shapes and objects, such as similarity and the trigonometric ratios • exploring measurement concepts and geometric relationships, such as the use of the trigonometric ratios for right-angle triangles • making connections between Pythagoras's theorem and the distance between two points • making connections between the net of a three-dimensional object and surface area

Term	Description
	Statistics and probability • describing, analysing, and interpreting data • explaining the use of relative frequencies to estimate probabilities • making a connection between the question posed and statistics needed • making connections between histograms, column graphs and stem-and-leaf plots
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
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; in mathematics this could include showing working to justify a response
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 9, *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 9, examples include: *Number and algebra* • direct proportion, rate, integer, indices, simply, evaluate, scientific notation • simple interest, interest rate • Cartesian plane, midpoint, gradient, linear, non-linear, parabola *Measurement and geometry* • composite shape, surface area, volume, net, capacity • similarity, transformation, congruence *Statistics and probability* • census, survey, variable, secondary data, histogram, stem-and-leaf plot • population, frequency, sample, event, dependent, independent
mathematical modelling	depicting a situation that expresses relationships using mathematical concepts and language; in Year 9, examples include: • identifying direct proportion in real-life contexts by sketching graphs • graphing parabolas and circles • modelling practical situations involving surface areas and volumes of right prisms • visualising and sketching rectangular and triangular prisms and their nets • constructing data displays
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 9, *problem-solving* is represented in the valued features of *problem-solving approaches* and *mathematical modelling*
problem-solving approaches	use of problem-solving approaches to investigate situations; in Year 9, 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 • sketching linear graphs • applying ratio and scale factors and using trigonometry to solve problems • collecting and organising data from secondary sources to investigate an issue • using stem-and-leaf plots to compare two like sets of data • generalising mathematical ideas and techniques to analyse, interpret, evaluate and solve problems • verifying that answers are reasonable

Term	Description
procedural fluency	recall and use of facts, definitions, technologies and procedures to find solutions in Year 9, examples include: *Number and algebra* • developing efficient strategies for numerical calculation • applying the index laws to expressions with integer indices • simplifying algebraic expressions • expressing numbers in scientific notation *Measurement and geometry* • developing familiarity with calculations involving the Cartesian plane • calculating areas of shapes and surface areas of prisms *Statistics and probability* • listing outcomes for chance experiments • constructing histograms with and without technologies
range	covers the scope of relevant situations or elements; in Year 9, the *range* of situations and problems included simple familiar, simple unfamiliar, complex familiar and unfamiliar
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 9, *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 9, examples include: • following mathematical arguments • constructing arguments to prove and justify results • providing reasoning to support conclusions that are appropriate to the context • evaluating media reports • using statistical knowledge to clarify situations
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

Term	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; in Year 9, *understanding* is represented in the valued features of *conceptual understanding* and *mathematical language and symbols*
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