Year 10 standard elaborations — Australian Curriculum v9.0: Mathematics

Purpose

The standards elaborations (SEs) have been designed to support teachers to connect curriculum to evidence in assessment so that students are assessed on what they have had the opportunity to learn. The SEs can be used to:

- make consistent and comparable judgments, on a five-point scale, about the evidence of learning in a folio of student work across a year/band

- develop task-specific standards (or marking guides) for individual assessment tasks

- quality assure planning documents to ensure coverage of the achievement standard across a year/band.

Structure

The SEs have been developed using the Australian Curriculum achievement standard. The achievement standard for Mathematics describes what students are expected to know and be able to do at the end of each year. Teachers use the SEs to inform the development of assessment tasks and to make on-balance judgments about the qualities in student work that demonstrate the depth and breadth of their learning.

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 where the discernible differences and/or degrees of quality between each performance level are highlighted. Teachers match these discernible differences and/or degrees of quality to characteristics of student work to make judgments across a five-point scale. Terms are described in the Notes section following the matrix.

For all Queensland schools

Year 10 Australian Curriculum: Mathematics achievement standard

By the end of Year 10, students recognise the effect of approximations of real numbers in repeated calculations. They use mathematical modelling to solve problems involving growth and decay in financial and other applied situations, applying linear, quadratic and exponential functions as appropriate, and solve related equations, numerically and graphically. Students make and test conjectures involving functions and relations using digital tools. They solve problems involving simultaneous linear equations and linear inequalities in 2 variables graphically and justify solutions.

Students interpret and use logarithmic scales representing small or large quantities or change in applied contexts. They solve measurement problems involving surface area and volume of composite objects. Students apply Pythagoras' theorem and trigonometry to solve practical problems involving right-angled triangles. They identify the impact of measurement errors on the accuracy of results. Students use mathematical modelling to solve practical problems involving proportion and scaling, evaluating and modifying models, and reporting assumptions, methods and findings. They use deductive reasoning, theorems and algorithms to solve spatial problems. Students interpret networks used to represent practical situations and describe connectedness.

They plan and conduct statistical investigations involving bivariate data. Students represent the distribution of data involving 2 variables, using tables and scatter plots, and comment on possible association. They analyse inferences and conclusions in the media, noting potential sources of bias. Students compare the distribution of continuous numerical data using various displays, and discuss distributions in terms of centre, spread, shape and outliers. They apply conditional probability to solve problems involving compound events. Students design and conduct simulations involving conditional probability, using digital tools.

Source: Australian Curriculum, Assessment and Reporting Authority (ACARA), *Australian Curriculum Version 9.0 Mathematics for Foundation–10*
https://v9.australiancurriculum.edu.au/f-10-curriculum/learning-areas/mathematics/year-10?view=quick&detailed-content-descriptions=0&hide-ccp=0&hide-gc=0&side-by-side=1&strands-start-index=0&subjects-start-index=0

Year 10 Mathematics standard elaborations

		A	B	C	D	E
		The folio of student work contains evidence of the following:				
Mathematical proficiencies	**Understanding**	• accurate and consistent identification, representation, description and connection of mathematical concepts and relationships • in complex unfamiliar, complex familiar, and simple familiar situations, identification, representation, description and connection of mathematical concepts and relationships	• accurate identification, representation, description and connection of mathematical concepts and relationships • in complex familiar and simple familiar situations, identification, representation, description and connection of mathematical concepts and relationships	• identification, representation, description and connection of mathematical concepts and relationships • in simple familiar situations, identification, representation, description and connection of mathematical concepts and relationships	• partial identification, representation and description of mathematical concepts and relationships • in some simple familiar situations, identification, representation, description and connection of mathematical concepts and relationships	• fragmented identification, representation and description of mathematical concepts and relationships • in isolated and obvious situations, identification, representation, description and connection of mathematical concepts and relationships
	Fluency	• choice, use and application of comprehensive facts, definitions, and procedures to find solutions • in complex unfamiliar, complex familiar, and simple familiar situations, choice, use and application of facts, definitions, and procedures to find solutions	• choice, use and application of effective facts, definitions, and procedures to find solutions • in complex familiar and simple familiar situations, choice, use and application of facts, definitions, and procedures to find solutions	• choice, use and application of facts, definitions, and procedures to find solutions • in simple familiar situations, choice, use and application of facts, definitions, and procedures to find solutions	• choice and use of partial facts, definitions, and procedures to find solutions • in some simple familiar situations, choice, use and application of facts, definitions, and procedures to find solutions	• choice and use of fragmented facts, definitions and procedures to find solutions • in isolated and obvious situations, choice, use and application of facts, definitions, and procedures to find solutions

		A	B	C	D	E
		The folio of student work contains evidence of the following:				
	Reasoning	• **comprehensive** explanation of mathematical thinking, strategies used, and conclusions reached • in **complex unfamiliar**, complex familiar, and simple familiar situations, explanation of mathematical thinking, strategies used, and conclusions reached	• **detailed** explanation of mathematical thinking, strategies used, and conclusions reached • in **complex familiar** and simple familiar situations, explanation of mathematical thinking, strategies used, and conclusions reached	• explanation of mathematical thinking, strategies used, and conclusions reached • in simple familiar situations, explanation of mathematical thinking, strategies used, and conclusions reached	• **partial** explanation of mathematical thinking, strategies used, and conclusions reached • in **some** simple familiar situations, explanation of mathematical thinking, strategies used, and conclusions reached	• **fragmented** explanation of mathematical thinking, strategies used, and conclusions reached • in **isolated and obvious** situations, explanation of mathematical thinking, strategies used, and conclusions reached
	Problem-solving	• **purposeful** use of problem-solving approaches to find solutions to problems.	• **effective** use of problem-solving approaches to find solutions to problems.	• use of problem-solving approaches to find solutions to problems.	• **partial** use of problem-solving approaches **to make progress towards** finding solutions to problems.	• **fragmented** use of problem-solving approaches to make progress towards finding solutions to problems.

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

Notes

The SEs for Mathematics are organised using the four Mathematical proficiencies, Understanding, Fluency, Reasoning and Problem-solving. The proficiencies represent the actions students demonstrate when working mathematically. The proficiencies are embedded as verbs in the achievement standard and related content descriptions.

Table 1 shows how aspects of the Australian Curriculum achievement standard can be demonstrated as evidence (at the C standard) and related to the proficiencies.

In the Mathematics SEs, there are two types of qualifiers to describe performance across the five-point scale: those describing degrees of quality, and those describing degrees of difficulty. Table 2 describes degrees of difficulty, in terms of the complexity and familiarity of situations.

Tables 1 and 2 should be used in conjunction with the ACARA Australian Curriculum Mathematics glossary: https://v9.australiancurriculum.edu.au/content/dam/en/curriculum/ac-version-9/downloads/mathematics/mathematics-glossary-v9.docx

Table 1: Relationship between Australian Curriculum achievement standard and Mathematical proficiencies

Aspect of the achievement standard	Related content description/s	Examples of evidence	Mathematical proficiencies
Students recognise the effect of approximations of real numbers in repeated calculations.	**Number** • recognise the effect of using approximations of real numbers in repeated calculations and compare the results when using exact representations AC9M10N01	• recognising the effect of approximations of real numbers in repeated calculations	Understanding
They use mathematical modelling to solve problems involving growth and decay in financial and other applied situations, applying linear, quadratic and exponential functions as appropriate, and solve related equations, numerically and graphically.	**Algebra** • expand, factorise and simplify expressions and solve equations algebraically, applying exponent laws involving products, quotients and powers of variables, and the distributive property AC9M10A01 • use mathematical modelling to solve applied problems involving growth and decay, including financial contexts; formulate problems, choosing to apply linear, quadratic or exponential models; interpret solutions in terms of the situation; evaluate and modify models as necessary and report assumptions, methods and findings AC9M10A04	• solving problems involving growth and decay in financial and other applied situations • applying linear, quadratic and exponential functions as appropriate • solving related equations, numerically and graphically	Fluency
		• using mathematical modelling to solve problems	Problem-solving

Aspect of the achievement standard	Related content description/s	Examples of evidence	Mathematical proficiencies
Students make and test conjectures involving functions and relations using digital tools.	**Algebra** • experiment with functions and relations using digital tools, making and testing conjectures and generalising emerging patterns AC9M10A05	• making and testing conjectures involving functions and relations using digital tools	Reasoning

They solve problems involving simultaneous linear equations and linear inequalities in 2 variables graphically and justify solutions.	**Algebra**
	• solve linear inequalities and simultaneous linear equations in 2 variables; interpret solutions graphically and communicate solutions in terms of the situation AC9M10A02
		• solving problems involving
		  – simultaneous linear equations in 2 variables graphically
		  – linear inequalities in 2 variables graphically
			Fluency

		• justifying solutions from problems involving
		  – simultaneous linear equations in 2 variables graphically
		  – linear inequalities in 2 variables graphically
			Reasoning

Students interpret and use logarithmic scales representing small or large quantities or change in applied contexts.	**Measurement** • interpret and use logarithmic scales in applied contexts involving small and large quantities and change AC9M10M02	• interpreting logarithmic scales representing small or large quantities or change in applied contexts	Understanding
		• using logarithmic scales representing small or large quantities or change in applied contexts	Fluency

They solve measurement problems involving surface area and volume of composite objects.	**Measurement**
	• solve problems involving the surface area and volume of composite objects using appropriate units AC9M10M01
		• solving measurement problems involving
		  – surface area of composite objects
		  – volume of composite objects
			Fluency

Students apply Pythagoras' theorem and trigonometry to solve practical problems involving right-angled triangles.	**Measurement** • solve practical problems applying Pythagoras' theorem and trigonometry of right-angled triangles, including problems involving direction and angles of elevation and depression AC9M10M03	• solving practical problems involving right-angled triangles by applying Pythagoras' theorem and trigonometry	Fluency

Aspect of the achievement standard	Related content description/s	Examples of evidence	Mathematical proficiencies
They identify the impact of measurement errors on the accuracy of results.	**Measurement** • identify the impact of measurement errors on the accuracy of results in practical contexts AC9M10M04	• identifying the impact of measurement errors on the accuracy of results	Understanding
Students use mathematical modelling to solve practical problems involving proportion and scaling, evaluating and modifying models, and reporting assumptions, methods and findings.	**Measurement** • use mathematical modelling to solve practical problems involving proportion and scaling of objects; formulate problems and interpret solutions in terms of the situation; evaluate and modify models as necessary, and report assumptions, methods and findings AC9M10M05	• solving practical problems involving proportion and scaling	Fluency
		• evaluating and modifying mathematical models • reporting assumptions, methods and findings of mathematical models	Reasoning
		• using mathematical modelling to solve practical problems	Problem-solving
They use deductive reasoning, theorems and algorithms to solve spatial problems.	**Space** • apply deductive reasoning to proofs involving shapes in the plane and use theorems to solve spatial problems AC9M10SP01 • design, test and refine solutions to spatial problems using algorithms and digital tools; communicate and justify solutions AC9M10SP03	• using deductive reasoning	Reasoning
		• using theorems and algorithms to solve spatial problems	Problem-solving
Students interpret networks used to represent practical situations and describe connectedness.	**Space** • interpret networks and network diagrams used to represent relationships in practical situations and describe connectedness AC9M10SP02	• interpreting networks used to represent practical situations • describing connectedness of the network	Understanding

Aspect of the achievement standard	Related content description/s	Examples of evidence	Mathematical proficiencies
They plan and conduct statistical investigations involving bivariate data.	**Statistics** • construct scatterplots and comment on the association between the 2 numerical variables in terms of strength, direction and linearity AC9M10ST03 • construct two-way tables and discuss possible relationship between categorical variables AC9M10ST04 • plan and conduct statistical investigations of situations that involve bivariate data; evaluate and report findings with consideration of limitations of any inferences AC9M10ST05	• planning and conducting statistical investigations involving bivariate data	Problem-solving
Students represent the distribution of data involving 2 variables, using tables and scatter plots, and comment on possible association.	**Statistics** • construct scatterplots and comment on the association between the 2 numerical variables in terms of strength, direction and linearity AC9M10ST03 • construct two-way tables and discuss possible relationship between categorical variables AC9M10ST04	• representing the distribution of data involving 2 variables	Understanding
		• using tables and scatter plots	Fluency
		• commenting on possible association between 2 numerical variables	Reasoning
They analyse inferences and conclusions in the media, noting potential sources of bias.	**Statistics** • analyse claims, inferences and conclusions of statistical reports in the media, including ethical considerations and identification of potential sources of bias AC9M10ST01	• analysing inferences and conclusions in the media, noting potential sources of bias	Reasoning
Students compare the distribution of continuous numerical data using various displays, and discuss distributions in terms of centre, spread, shape and outliers.	**Statistics** • compare data distributions for continuous numerical variables using appropriate data displays including boxplots; discuss the shapes of these distributions in terms of centre, spread, shape and outliers in the context of the data AC9M10ST02 • construct scatterplots and comment on the association between the 2 numerical variables in terms of strength, direction and linearity AC9M10ST03	• comparing the distribution of continuous numerical data using various displays • discussing distributions in terms of centre, spread, shape and outliers	Reasoning

Aspect of the achievement standard	Related content description/s	Examples of evidence	Mathematical proficiencies
They apply conditional probability to solve problems involving compound events.	**Probability** • use the language of "if ... then", "given", "of", "knowing that" to describe and interpret situations involving conditional probability AC9M10P01 • design and conduct repeated chance experiments and simulations using digital tools to model conditional probability and interpret results AC9M10P02	• applying conditional probability to solve problems involving compound events	Fluency
Students design and conduct simulations involving conditional probability, using digital tools.	**Probability** • design and conduct repeated chance experiments and simulations using digital tools to model conditional probability and interpret results AC9M10P02	• designing and conducting simulations involving conditional probability, using digital tools	Problem-solving

Table 2: Key terms used in Mathematics SEs

Term	Description

Simple familiar	In questions of this degree of difficulty, students respond to situations where:
	• relationships and interactions are obvious and have few elements; and
	• all of the information to solve the problem is identifiable, that is
	  – the required procedure is clear from the way the problem is posed, or
	  – in a context that has been a focus of prior learning.
	Students are not required to interpret, clarify and analyse problems to develop responses.

Complex familiar	In questions of this degree of difficulty, students respond to situations where:
	• relationships and interactions have a number of elements, such that connections are made with subject matter within and/or across the strands of mathematics; and
	• all of the information to solve the problem is identifiable, that is
	  – the required procedure is clear from the way the problem is posed, or
	  – in a context that has been a focus of prior learning.
	Some interpretation, clarification and analysis will be required to develop responses.
	Shifting the level of complexity may include making changes to the:
	• amount of scaffolding
	• number of steps required to solve the problem/situation
	• changes to increments, benchmarks or scales on axes
	• number of attributes considered.

Complex unfamiliar	In questions of this degree of difficulty, students respond to situations where:
	• relationships and interactions have a number of elements, such that connections are made with subject matter within and/or across the strands of mathematics; and
	• all the information to solve the problem is not immediately identifiable, that is
	  – the required procedure is not clear from the way the problem is posed, and
	  – in a context in which students have had limited prior experience.
	Students interpret, clarify and analyse problems to develop responses.
	Shifting the level of familiarity may include making changes to the:
	• context for application, e.g. financial, measurement, spatial or statistical
	• type of representation, e.g. physical, visual or symbolic
	• orientation of representation, e.g. horizontal or vertical
	• merge of subject matter/concepts from across different strands.