Year 8 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 during and at the end of a teaching period to make on-balance judgments about the qualities in student work that demonstrate the depth and breadth of their learning.

The Mathematics SEs have been organised using the Mathematical proficiencies. Performance across the five-point scale is frequently described in terms of complexity and familiarity of the standards descriptor being assessed. Across the standards elaborations in Year 7 to Year 10, this is described using: A — complex unfamiliar, B — complex familiar, C — simple familiar, D — some simple familiar, E — isolated and obvious.

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.

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For all Queensland schools

Year 8 Australian Curriculum: Mathematics achievement standard

By the end of Year 8, students recognise irrational numbers and terminating or recurring decimals. They apply the exponent laws to calculations with numbers involving positive integer exponents. Students solve problems involving the 4 operations with integers and positive rational numbers. They use mathematical modelling to solve practical problems involving ratios, percentages and rates in measurement and financial contexts. Students apply algebraic properties to rearrange, expand and factorise linear expressions. They graph linear relations and solve linear equations with rational solutions and one-variable inequalities, graphically and algebraically. Students use mathematical modelling to solve problems using linear relations, interpreting and reviewing the model in context. They make and test conjectures involving linear relations using digital tools.

Students use appropriate metric units when solving measurement problems involving the perimeter and area of composite shapes, and volume of right prisms. They use Pythagoras' theorem to solve measurement problems involving unknown lengths of right-angle triangles. Students use formulas to solve problems involving the area and circumference of circles. They solve problems of duration involving 12- and 24-hour cycles across multiple time zones. Students use 3 dimensions to locate and describe position. They identify conditions for congruency and similarity in shapes and create and test algorithms designed to test for congruency and similarity. Students apply the properties of quadrilaterals to solve problems.

They conduct statistical investigations and explain the implications of obtaining data through sampling. Students analyse and describe the distribution of data. They compare the variation in distributions of random samples of the same and different size from a given population with respect to shape, measures of central tendency and range. Students represent the possible combinations of 2 events with tables and diagrams, and determine related probabilities to solve practical problems. They conduct experiments and simulations using digital tools to determine related probabilities of compound events.

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-8?view=quick&detailed-content-descriptions=0&hide-ccp=0&hide-gc=0&side-by-side=1&strands-start-index=0&subjects-start-index=0

Note: The Mathematics SEs are organised by the Mathematical proficiencies. The proficiencies represent the actions students demonstrate when working mathematically. The proficiencies are embedded as verbs in the achievement standard and related content descriptions. For further information about the connections between the achievement standard aspects and the standard elaborations see Table 1 on page 4.

Year 8 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	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 in simple familiar situations	partial identification, representation and description of mathematical concepts and relationships in some simple familiar situations	fragmented identification, representation and description of mathematical concepts and relationships in isolated and obvious situations
	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 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 in simple familiar situations	choice and use of partial facts, definitions, and procedures to find solutions in some simple familiar situations	choice and use of fragmented facts, definitions and procedures to find solutions in isolated and obvious situations
	Reasoning	comprehensive explanation of mathematical thinking, strategies used, and conclusions reached in complex unfamiliar, complex familiar, and simple familiar situations	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 in simple familiar situations	partial explanation of mathematical thinking, strategies used, and conclusions reached in some simple familiar situations	fragmented explanation of mathematical thinking, strategies used, and conclusions reached in isolated and obvious situations
	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 Mathematical proficiencies. The Mathematical proficiencies include Understanding, Fluency, Reasoning and Problem-solving. The Mathematical proficiencies represent the valued features or assessable elements.

For a specific assessment task, the standard elaborations description (in the previous table) can be modified to include task-specific content. Task-specific content can be drawn from an aspect of the achievement standard and the related content description/s which are aligned to the Mathematical proficiencies being assessed. Table 1 provides examples of how content can be related to the standard elaborations valued features for task-specific marking guides at a C standard.

Table 2 helps clarify key terms from the standard descriptors in the Mathematics SEs and 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: Examples of how content can be related to the SE valued features for task-specific marking guides at a C standard

Aspect of the achievement standard	Related content description/s	SE valued features (Mathematical proficiencies)	Examples of how content can be related to the SE valued features
Students recognise irrational numbers and terminating or recurring decimals.	**Number** • recognise irrational numbers in applied contexts, including square roots and π AC9M8N01 • recognise terminating and recurring decimals, using digital tools as appropriate AC9M8N03 **Measurement** • solve problems involving the circumference and area of a circle using formulas and appropriate units AC9M8M03	Understanding	• recognising irrational numbers and terminating or recurring decimals
They apply the exponent laws to calculations with numbers involving positive integer exponents.	**Number** • establish and apply the exponent laws with positive integer exponents and the zero-exponent, using exponent notation with numbers AC9M8N02	Fluency	• applying the exponent laws to calculations with numbers involving positive integer exponents

Aspect of the achievement standard	Related content description/s	SE valued features (Mathematical proficiencies)	Examples of how content can be related to the SE valued features
Students solve problems involving the 4 operations with integers and positive rational numbers.	**Number** • use the 4 operations with integers and with rational numbers, choosing and using efficient strategies and digital tools where appropriate AC9M8N04	Fluency	• solving problems involving the 4 operations with integers and positive rational numbers
They use mathematical modelling to solve practical problems involving ratios, percentages and rates in measurement and financial contexts.	**Number** • use the 4 operations with integers and with rational numbers, choosing and using efficient strategies and digital tools where appropriate AC9M8N04 • use mathematical modelling to solve practical problems involving rational numbers and percentages, including financial contexts; formulate problems, choosing efficient calculation strategies and using digital tools where appropriate; interpret and communicate solutions in terms of the situation, reviewing the appropriateness of the model AC9M8N05 **Measurement** • recognise and use rates to solve problems involving the comparison of 2 related quantities of different units of measure AC9M8M05 • use mathematical modelling to solve practical problems involving ratios and rates, including financial contexts; formulate problems; interpret and communicate solutions in terms of the situation, reviewing the appropriateness of the model AC9M8M07	Fluency	• solving practical problems involving ratios, percentages and rates in measurement and financial contexts
		Problem-solving	• using mathematical modelling to solve practical problems

Aspect of the achievement standard	Related content description/s	SE valued features (Mathematical proficiencies)	Examples of how content can be related to the SE valued features
Students apply algebraic properties to rearrange, expand and factorise linear expressions.	**Algebra** • create, expand, factorise, rearrange and simplify linear expressions, applying the associative, commutative, identity, distributive and inverse properties AC9M8A01	Fluency	• applying algebraic properties to – rearrange linear expressions – expand linear expressions – factorise linear expressions
They graph linear relations and solve linear equations with rational solutions and one-variable inequalities, graphically and algebraically.	**Algebra** • graph linear relations on the Cartesian plane using digital tools where appropriate; solve linear equations and one-variable inequalities using graphical and algebraic techniques; verify solutions by substitution AC9M8A02	Fluency	• graphing linear relations • solving linear equations with rational solutions and one-variable inequalities, graphically and algebraically
Students use mathematical modelling to solve problems using linear relations, interpreting and reviewing the model in context.	**Algebra** • create, expand, factorise, rearrange and simplify linear expressions, applying the associative, commutative, identity, distributive and inverse properties AC9M8A01 • graph linear relations on the Cartesian plane using digital tools where appropriate; solve linear equations and one-variable inequalities using graphical and	Fluency	• solving problems using linear relations
		Problem-solving	• using mathematical modelling to solve problems

Aspect of the achievement standard	Related content description/s	SE valued features (Mathematical proficiencies)	Examples of how content can be related to the SE valued features
	algebraic techniques; verify solutions by substitution AC9M8A02 • use mathematical modelling to solve applied problems involving linear relations, including financial contexts; formulate problems with linear functions, choosing a representation; interpret and communicate solutions in terms of the situation, reviewing the appropriateness of the model AC9M8A03	Reasoning	• interpreting and reviewing mathematical models in context of linear relations
They make and test conjectures involving linear relations using digital tools.	**Algebra** • graph linear relations on the Cartesian plane using digital tools where appropriate; solve linear equations and one-variable inequalities using graphical and algebraic techniques; verify solutions by substitution AC9M8A02 **Measurement** • experiment with linear functions and relations using digital tools, making and testing conjectures and generalising emerging patterns AC9M8A04	Reasoning	• making and testing conjectures involving linear relations using digital tools

Aspect of the achievement standard	Related content description/s	SE valued features (Mathematical proficiencies)	Examples of how content can be related to the SE valued features

Students use appropriate metric units when solving measurement problems involving the perimeter and area of composite shapes, and volume of right prisms.	**Measurement**
	• solve problems involving the area and perimeter of irregular and composite shapes using appropriate units AC9M8M01
	• solve problems involving the volume and capacity of right prisms using appropriate units AC9M8M02
	• use the 4 operations with integers and with rational numbers, choosing and using efficient strategies and digital tools where appropriate AC9M8N04
		Fluency	• using appropriate metric units when solving measurement problems involving the
			  – perimeter of composite shapes
			  – area of composite shapes
			  – volume of right prisms

They use Pythagoras' theorem to solve measurement problems involving unknown lengths of right-angle triangles.	**Measurement** • use Pythagoras' theorem to solve problems involving the side lengths of right-angled triangles AC9M8M06	Fluency	• using Pythagoras' theorem to solve measurement problems involving unknown lengths of right-angle triangles

Students use formulas to solve problems involving the area and circumference of circles.	**Measurement**
	• solve problems involving the circumference and area of a circle using formulas and appropriate units AC9M8M03
	Number
	• use the 4 operations with integers and with rational numbers, choosing and using efficient strategies and digital tools where appropriate AC9M8N04
		Fluency	• using formulas to solve problems involving the
			  – area of circles
			  – circumference of circles

They solve problems of duration involving 12- and 24-hour cycles across multiple time zones.	**Measurement** • solve problems involving duration, including using 12- and 24-hour time across multiple time zones AC9M8M04	Fluency	• solving problems of duration involving 12- and 24-hour cycles across multiple time zones

Aspect of the achievement standard	Related content description/s	SE valued features (Mathematical proficiencies)	Examples of how content can be related to the SE valued features
Students use 3 dimensions to locate and describe position.	**Space** • describe the position and location of objects in 3 dimensions in different ways, including using a three dimensional coordinate system with the use of dynamic geometric software and other digital tools AC9M8SP03	Understanding	• describing position and location using 3 dimensions
They identify conditions for congruency and similarity in shapes and create and test algorithms designed to test for congruency and similarity.	**Space** • identify the conditions for congruence and similarity of triangles and explain the conditions for other sets of common shapes to be congruent or similar, including those formed by transformations AC9M8SP01 • design, create and test algorithms involving a sequence of steps and decisions that identify congruency or similarity of shapes, and describe how the algorithm works AC9M8SP04	Understanding	• identifying conditions for congruency in shapes • identifying conditions for similarity in shapes
		Problem-solving	• creating and testing algorithms designed to test for congruency and similarity
Students apply the properties of quadrilaterals to solve problems.	**Space** • establish properties of quadrilaterals using congruent triangles and angle properties, and solve related problems explaining reasoning AC9M8SP02	Fluency	• applying the properties of quadrilaterals to solve problems

Aspect of the achievement standard	Related content description/s	SE valued features (Mathematical proficiencies)	Examples of how content can be related to the SE valued features
They conduct statistical investigations and explain the implications of obtaining data through sampling.	**Statistics** • investigate techniques for data collection including census, sampling, experiment and observation, and explain the practicalities and implications of obtaining data through these techniques AC9M8ST01 • analyse and report on the distribution of data from primary and secondary sources using random and non-random sampling techniques to select and study samples AC9M8ST02 • compare variations in distributions and proportions obtained from random samples of the same size drawn from a population and recognise the effect of sample size on this variation AC9M8ST03 • plan and conduct statistical investigations involving samples of a population; use ethical and fair methods to make inferences about the population and report findings, acknowledging uncertainty AC9M8ST04	Reasoning	• explaining the implications of obtaining data through sampling
		Problem-solving	• conducting statistical investigations
Students analyse and describe the distribution of data.	**Statistics** • analyse and report on the distribution of data from primary and secondary sources using random and non-random sampling techniques to select and study samples AC9M8ST02	Reasoning	• analysing and describing the distribution of data

Aspect of the achievement standard	Related content description/s	SE valued features (Mathematical proficiencies)	Examples of how content can be related to the SE valued features
They compare the variation in distributions of random samples of the same and different size from a given population with respect to shape, measures of central tendency and range.	**Statistics** • compare variations in distributions and proportions obtained from random samples of the same size drawn from a population and recognise the effect of sample size on this variation AC9M8ST03	Reasoning	• comparing the variation in distributions of random samples of the same and different size from a given population with respect to shape, measures of central tendency and range
Students represent the possible combinations of 2 events with tables and diagrams, and determine related probabilities to solve practical problems.	**Probability** • recognise that complementary events have a combined probability of one; use this relationship to calculate probabilities in applied contexts AC9M8P01 • determine all possible combinations for 2 events, using two way tables, tree diagrams and Venn diagrams, and use these to determine probabilities of specific outcomes in practical situations AC9M8P02	Understanding	• representing the possible combinations of 2 events with tables and diagrams • determining related probabilities to solve practical problems
They conduct experiments and simulations using digital tools to determine related probabilities of compound events.	**Probability** • recognise that complementary events have a combined probability of one; use this relationship to calculate probabilities in applied contexts AC9M8P01	Understanding	• determining related probabilities of compound events
		Problem-solving	• conducting experiments and simulations using digital tools

Aspect of the achievement standard	Related content description/s	SE valued features (Mathematical proficiencies)	Examples of how content can be related to the SE valued features
	• determine all possible combinations for 2 events, using two way tables, tree diagrams and Venn diagrams, and use these to determine probabilities of specific outcomes in practical situations AC9M8P02 • conduct repeated chance experiments and simulations, using digital tools to determine probabilities for compound events, and describe results AC9M8P03		

Table 2: Key terms used in Mathematics SEs

Term	Description
Simple familiar	Problems of this degree of difficulty require students to demonstrate knowledge and understanding of the subject matter and application of skills in a situation 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	Problems of this degree of difficulty require students to demonstrate knowledge and understanding of the subject matter and application of skills in a situation 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. Creating complex familiar examples may include making changes to the: • number of steps required to solve the problem/situation • changes to increments, benchmarks or scale • number of attributes considered.
Complex unfamiliar	Problems of this degree of difficulty require students to demonstrate knowledge and understanding of the subject matter and application of skills in a situation 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. Creating unfamiliar examples 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.