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 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.



ACiQlv9.0

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

Year 8 Mathematics standard elaborations

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

	A	В	С	D	E
	The folio of student work contains evidence of the following:				
Reasoning	 <u>comprehensive</u> explanation of mathematical thinking, strategies used, and conclusions reached in <u>complex unfamiliar</u>, complex familiar, and simple familiar situations, explanation of mathematical thinking, strategies used, and conclusions reached 	 <u>detailed</u> explanation of mathematical thinking, strategies used, and conclusions reached in <u>complex familiar</u> 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 <u>some</u> simple familiar situations, explanation of mathematical thinking, strategies used, and conclusions reached 	 <u>fragmented</u> explanation of mathematical thinking, strategies used, and conclusions reached in <u>isolated and obvious</u> situations, explanation of mathematical thinking, strategies used, and conclusions reached
Problem- solving	 purposeful use of problem-solving approaches to find solutions to problems. 	 <u>effective</u> 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 fivepoint 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 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 AC0M8N03 	 recognising irrational numbers and terminating or recurring decimals 	Understanding
	Measurement		
	• solve problems involving the circumference and area of a circle using formulas and appropriate units AC9M8M03		
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 	• applying the exponent laws to calculations with numbers involving positive integer exponents	Fluency
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	• solving problems involving the 4 operations with integers and positive rational numbers	Fluency

Aspect of the achievement standard	Related content description/s	Examples of evidence	Mathematical proficiencies
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 	 solving practical problems involving ratios, percentages and rates in measurement and financial contexts using mathematical modelling to solve 	Fluency Problem-solving
		practical problems	
	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 		
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	 applying algebraic properties to rearrange linear expressions expand linear expressions factorise linear expressions 	Fluency
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	 graphing linear relations solving linear equations with rational solutions and one- variable inequalities, graphically and algebraically 	Fluency

Aspect of the achievement standard	Related content description/s	Examples of evidence	Mathematical proficiencies
Students use mathematical	Algebra • create, expand, factorise, rearrange and simplify linear expressions, applying the associative, commutative, identity, distributive and inverse properties AC9M8A01	 solving problems using linear relations 	Fluency
modelling to solve problems using linear relations, interpreting and reviewing the model in context.		 interpreting and reviewing mathematical models in context of linear relations 	Reasoning
	 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 	 using mathematical modelling to solve problems 	Problem-solving
	• 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		
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 	 making and testing conjectures involving linear relations using digital tools 	Reasoning
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 	 using appropriate metric units when solving measurement problems involving the perimeter of composite shapes area of composite shapes volume of right prisms 	Fluency

Aspect of the achievement standard	Related content description/s	Examples of evidence	Mathematical proficiencies
	numbers, choosing and using efficient strategies and digital tools where appropriate AC9M8N04		
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 	 using Pythagoras' theorem to solve measurement problems involving unknown lengths of right-angle triangles 	Fluency
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 	 using formulas to solve problems involving the area of circles circumference of circles 	Fluency
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 	 solving problems of duration involving 12- and 24-hour cycles across multiple time zones 	Fluency
Students use 3 dimensions to	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	describing position using 3 dimensions	Understanding
locate and describe position.		 locating objects using 3 dimensions 	Fluency
They identify conditions for congruency and similarity in shapes and create and test algorithms designed	 Space identify the conditions for congruence and similarity of triangles and explain the conditions for other sets of common shapes to be 	 identifying conditions for congruency in shapes identifying conditions for similarity in shapes 	Understanding
to test for congruency and similarity.	congruent or similar, including those formed by transformations AC9M8SP01	 creating and testing algorithms designed to test for congruency and similarity 	Problem-solving
	design, create and test algorithms involving a sequence of steps and decisions that identify congruency or similarity of		

Aspect of the achievement standard	Related content description/s	Examples of evidence	Mathematical proficiencies
	shapes, and describe how the algorithm works AC9M8SP04		
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 	• applying the properties of quadrilaterals to solve problems	Fluency
They conduct statistical investigations and explain the	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	 explaining the implications of obtaining data through sampling 	Reasoning
obtaining data through sampling.		 conducting statistical investigations 	Problem-solving
	• 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		
Students analyse	Statistics	 analysing and 	Reasoning
and describe the distribution of data.	• 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	describing the distribution of data	

Aspect of the achievement standard	Related content description/s	Examples of evidence	Mathematical proficiencies
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	 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 	Reasoning
Students represent the possible combinations of 2 events with tables	 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 	 representing the possible combinations of 2 events with tables and diagrams 	Understanding
and diagrams, and determine related probabilities to solve practical problems.		 determining related probabilities to solve practical problems 	Fluency
They conduct experiments and simulations using	Probabilityrecognise that complementary events have a combined	 determining related probabilities of compound events 	Fluency
digital tools to determine related probabilities of compound events.	 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 conduct repeated chance experiments and simulations, using digital tools to determine probabilities for compound events, and describe results AC9M8P03 	 conducting experiments and simulations 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. horizontal or vertical merge of subject matter/concepts from across different strands.

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