

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

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## 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.



**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>

**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 10 Mathematics standard elaborations

		A	B	C	D	E
<b>The folio of student work contains evidence of the following:</b>						
<b>Mathematical proficiencies</b>	<b>Understanding</b>	accurate and <b>consistent</b> identification, representation, description and connection of mathematical concepts and relationships in <b>complex unfamiliar</b> , complex familiar, and simple familiar situations	<b>accurate</b> identification, representation, description and connection of mathematical concepts and relationships in <b>complex familiar</b> and simple familiar situations	identification, representation, description and connection of mathematical concepts and relationships in simple familiar situations	<b>partial</b> identification, representation and description of mathematical concepts and relationships in <b>some</b> simple familiar situations	<b>fragmented</b> identification, representation and description of mathematical concepts and relationships in <b>isolated and obvious</b> situations
	<b>Fluency</b>	choice, use and application of <b>comprehensive</b> facts, definitions, and procedures to find solutions in <b>complex unfamiliar</b> , complex familiar, and simple familiar situations	choice, use and application of <b>effective</b> facts, definitions, and procedures to find solutions in <b>complex familiar</b> and simple familiar situations	choice, use and application of facts, definitions, and procedures to find solutions in simple familiar situations	choice and use of <b>partial</b> facts, definitions, and procedures to find solutions in <b>some</b> simple familiar situations	choice and use of <b>fragmented</b> facts, definitions and procedures to find solutions in <b>isolated and obvious</b> situations
	<b>Reasoning</b>	<b>comprehensive</b> explanation of mathematical thinking, strategies used, and conclusions reached in <b>complex unfamiliar</b> , complex familiar, and simple familiar situations	<b>detailed</b> explanation of mathematical thinking, strategies used, and conclusions reached in <b>complex familiar</b> and simple familiar situations	explanation of mathematical thinking, strategies used, and conclusions reached in simple familiar situations	<b>partial</b> explanation of mathematical thinking, strategies used, and conclusions reached in <b>some</b> simple familiar situations	<b>fragmented</b> explanation of mathematical thinking, strategies used, and conclusions reached in <b>isolated and obvious</b> situations
	<b>Problem-solving</b>	<b>purposeful</b> use of problem-solving approaches to find solutions to problems.	<b>effective</b> use of problem-solving approaches to find solutions to problems.	use of problem-solving approaches to find solutions to problems.	<b>partial</b> use of problem-solving approaches <b>to make progress towards</b> finding solutions to problems.	<b>fragmented</b> 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 the effect of approximations of real numbers in repeated calculations.	<b>Number</b> <ul style="list-style-type: none"> <li>recognise the effect of using approximations of real numbers in repeated calculations and compare the results when using exact representations AC9M10N01</li> </ul>	Understanding	<ul style="list-style-type: none"> <li>recognising the effect of approximations of real numbers in repeated calculations</li> </ul>
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.	<b>Algebra</b> <ul style="list-style-type: none"> <li>expand, factorise and simplify expressions and solve equations algebraically, applying exponent laws involving products, quotients and powers of variables, and the distributive property AC9M10A01</li> </ul>	Fluency	<ul style="list-style-type: none"> <li>solving problems involving growth and decay in financial and other applied situations</li> <li>applying linear, quadratic and exponential functions as appropriate</li> <li>solving related equations, numerically and graphically</li> </ul>
		Problem-solving	<ul style="list-style-type: none"> <li>using mathematical modelling to solve problems</li> </ul>

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
	<ul style="list-style-type: none"> <li>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</li> </ul>		
Students make and test conjectures involving functions and relations using digital tools.	<b>Algebra</b> <ul style="list-style-type: none"> <li>experiment with functions and relations using digital tools, making and testing conjectures and generalising emerging patterns AC9M10A05</li> </ul>	Reasoning	<ul style="list-style-type: none"> <li>making and testing conjectures involving functions and relations using digital tools</li> </ul>
They solve problems involving simultaneous linear equations and linear inequalities in 2 variables graphically and justify solutions.	<b>Algebra</b> <ul style="list-style-type: none"> <li>solve linear inequalities and simultaneous linear equations in 2 variables; interpret solutions graphically and communicate solutions in terms of the situation AC9M10A02</li> </ul>	Fluency	<ul style="list-style-type: none"> <li>solving problems involving               <ul style="list-style-type: none"> <li>simultaneous linear equations in 2 variables graphically</li> <li>linear inequalities in 2 variables graphically</li> </ul> </li> </ul>
		Reasoning	<ul style="list-style-type: none"> <li>justifying solutions from problems involving               <ul style="list-style-type: none"> <li>simultaneous linear equations in 2 variables graphically</li> <li>linear inequalities in 2 variables graphically</li> </ul> </li> </ul>
Students interpret and use logarithmic scales representing small or large quantities or change in applied contexts.	<b>Measurement</b> <ul style="list-style-type: none"> <li>interpret and use logarithmic scales in applied contexts involving small and large quantities and change AC9M10M02</li> </ul>	Understanding	<ul style="list-style-type: none"> <li>interpreting logarithmic scales representing small or large quantities or change in applied contexts</li> </ul>
		Fluency	<ul style="list-style-type: none"> <li>using logarithmic scales representing small or large quantities or change in applied contexts</li> </ul>

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 solve measurement problems involving surface area and volume of composite objects.	<b>Measurement</b> <ul style="list-style-type: none"> <li>• solve problems involving the surface area and volume of composite objects using appropriate units AC9M10M01</li> </ul>	Fluency	<ul style="list-style-type: none"> <li>• solving measurement problems involving <ul style="list-style-type: none"> <li>– surface area of composite objects</li> <li>– volume of composite objects</li> </ul> </li> </ul>
Students apply Pythagoras' theorem and trigonometry to solve practical problems involving right-angled triangles.	<b>Measurement</b> <ul style="list-style-type: none"> <li>• solve practical problems applying Pythagoras' theorem and trigonometry of right-angled triangles, including problems involving direction and angles of elevation and depression AC9M10M03</li> </ul>	Fluency	<ul style="list-style-type: none"> <li>• solving practical problems involving right-angled triangles by applying Pythagoras' theorem and trigonometry</li> </ul>
They identify the impact of measurement errors on the accuracy of results.	<b>Measurement</b> <ul style="list-style-type: none"> <li>• identify the impact of measurement errors on the accuracy of results in practical contexts AC9M10M04</li> </ul>	Understanding	<ul style="list-style-type: none"> <li>• identifying the impact of measurement errors on the accuracy of results</li> </ul>
Students use mathematical modelling to solve practical problems involving proportion and scaling, evaluating and modifying models, and reporting assumptions, methods and findings.	<b>Measurement</b> <ul style="list-style-type: none"> <li>• 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</li> </ul>	Fluency	<ul style="list-style-type: none"> <li>• solving practical problems involving proportion and scaling</li> </ul>
		Reasoning	<ul style="list-style-type: none"> <li>• evaluating and modifying mathematical models</li> <li>• reporting assumptions, methods and findings of mathematical models</li> </ul>
		Problem-solving	<ul style="list-style-type: none"> <li>• using mathematical modelling to solve practical problems</li> </ul>

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 use deductive reasoning, theorems and algorithms to solve spatial problems.	<p><b>Space</b></p> <ul style="list-style-type: none"> <li>• apply deductive reasoning to proofs involving shapes in the plane and use theorems to solve spatial problems AC9M10SP01</li> <li>• design, test and refine solutions to spatial problems using algorithms and digital tools; communicate and justify solutions AC9M10SP03</li> </ul>	Problem-solving	<ul style="list-style-type: none"> <li>• using deductive reasoning, theorems and algorithms to solve spatial problems</li> </ul>
Students interpret networks used to represent practical situations and describe connectedness.	<p><b>Space</b></p> <ul style="list-style-type: none"> <li>• interpret networks and network diagrams used to represent relationships in practical situations and describe connectedness AC9M10SP02</li> </ul>	Understanding	<ul style="list-style-type: none"> <li>• interpreting networks used to represent practical situations</li> <li>• describing connectedness of the network</li> </ul>
They plan and conduct statistical investigations involving bivariate data.	<p><b>Statistics</b></p> <ul style="list-style-type: none"> <li>• construct scatterplots and comment on the association between the 2 numerical variables in terms of strength, direction and linearity AC9M10ST03</li> <li>• construct two-way tables and discuss possible relationship between categorical variables AC9M10ST04</li> <li>• plan and conduct statistical investigations of situations that involve bivariate data; evaluate and report findings with consideration of limitations of any inferences AC9M10ST05</li> </ul>	Problem-solving	<ul style="list-style-type: none"> <li>• planning and conducting statistical investigations involving bivariate data</li> </ul>

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 represent the distribution of data involving 2 variables, using tables and scatter plots, and comment on possible association.	<b>Statistics</b> <ul style="list-style-type: none"> <li>construct scatterplots and comment on the association between the 2 numerical variables in terms of strength, direction and linearity AC9M10ST03</li> <li>construct two-way tables and discuss possible relationship between categorical variables AC9M10ST04</li> </ul>	Understanding	<ul style="list-style-type: none"> <li>representing the distribution of data involving 2 variables</li> </ul>
		Fluency	<ul style="list-style-type: none"> <li>using tables and scatter plots</li> </ul>
		Reasoning	<ul style="list-style-type: none"> <li>commenting on possible association between 2 numerical variables</li> </ul>
They analyse inferences and conclusions in the media, noting potential sources of bias.	<b>Statistics</b> <ul style="list-style-type: none"> <li>analyse claims, inferences and conclusions of statistical reports in the media, including ethical considerations and identification of potential sources of bias AC9M10ST01</li> </ul>	Reasoning	<ul style="list-style-type: none"> <li>analysing inferences and conclusions in the media, noting potential sources of bias</li> </ul>
Students compare the distribution of continuous numerical data using various displays, and discuss distributions in terms of centre, spread, shape and outliers.	<b>Statistics</b> <ul style="list-style-type: none"> <li>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</li> <li>construct scatterplots and comment on the association between the 2 numerical variables in terms of strength, direction and linearity AC9M10ST03</li> </ul>	Reasoning	<ul style="list-style-type: none"> <li>comparing the distribution of continuous numerical data using various displays</li> <li>discussing distributions in terms of centre, spread, shape and outliers</li> </ul>



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 apply conditional probability to solve problems involving compound events.	<p><b>Probability</b></p> <ul style="list-style-type: none"> <li>• use the language of “if ... then”, “given”, “of”, “knowing that” to describe and interpret situations involving conditional probability AC9M10P01</li> <li>• design and conduct repeated chance experiments and simulations using digital tools to model conditional probability and interpret results AC9M10P02</li> </ul>	Fluency	<ul style="list-style-type: none"> <li>• applying conditional probability to solve problems involving compound events</li> </ul>
Students design and conduct simulations involving conditional probability, using digital tools.	<p><b>Probability</b></p> <ul style="list-style-type: none"> <li>• design and conduct repeated chance experiments and simulations using digital tools to model conditional probability and interpret results AC9M10P02</li> </ul>	Problem-solving	<ul style="list-style-type: none"> <li>• designing and conducting simulations involving conditional probability, using digital tools</li> </ul>

Table 2: Key terms used in Mathematics SEs

Term	Description
Simple familiar	<p>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:</p> <ul style="list-style-type: none"> <li>relationships and interactions are obvious and have few elements; and</li> <li>all of the information to solve the problem is identifiable; that is               <ul style="list-style-type: none"> <li>– the required procedure is clear from the way the problem is posed, or</li> <li>– in a context that has been a focus of prior learning.</li> </ul> </li> </ul> <p>Students are not required to interpret, clarify and analyse problems to develop responses.</p>
Complex familiar	<p>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:</p> <ul style="list-style-type: none"> <li>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</li> <li>all of the information to solve the problem is identifiable; that is               <ul style="list-style-type: none"> <li>– the required procedure is clear from the way the problem is posed, or</li> <li>– in a context that has been a focus of prior learning.</li> </ul> </li> </ul> <p>Some interpretation, clarification and analysis will be required to develop responses.</p> <p>Creating complex familiar examples may include making changes to the:</p> <ul style="list-style-type: none"> <li>number of steps required to solve the problem/situation</li> <li>changes to increments, benchmarks or scale</li> <li>number of attributes considered.</li> </ul>
Complex unfamiliar	<p>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:</p> <ul style="list-style-type: none"> <li>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</li> <li>all the information to solve the problem is not immediately identifiable; that is               <ul style="list-style-type: none"> <li>– the required procedure is not clear from the way the problem is posed, and</li> <li>– in a context in which students have had limited prior experience.</li> </ul> </li> </ul> <p>Students interpret, clarify and analyse problems to develop responses.</p> <p>Creating unfamiliar examples may include making changes to the:</p> <ul style="list-style-type: none"> <li>context for application, e.g. financial, measurement, spatial or statistical</li> <li>type of representation, e.g. physical, visual or symbolic</li> <li>orientation of representation, e.g. horizontal or vertical</li> <li>merge of subject matter/concepts from across different strands.</li> </ul>

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