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|  | Year 9 standard elaborations — Australian Curriculum: Mathematics |

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| Purpose | The standard elaborations (SEs) provide additional clarity when using the Australian Curriculum achievement standard to make judgments on a five‑point scale. They promote and support:* aligning curriculum, assessment and reporting, connecting curriculum and evidence in assessment, so that what is assessed relates directly to what students have had the opportunity to learn
* continuing skill development from one year of schooling to another
* making judgments on a five-point scale based on evidence of learning in a folio of student work
* developing task-specific standards and grading guides.
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| Structure | The SEs are developed using the **Australian Curriculum achievement standard**. In Years 7 to 10, the Mathematics SEs have been organised using the **proficiency strands**. Performance is frequently represented in terms of complexity and familiarity of the standard being assessed. Across the elaborations this is described according to: A — unfamiliar, B — complex familiar, C — simple familiar, D — some simple familiar, E — partial, isolated and obvious. The Mathematics achievement standard describes the learning expected of students at each year level. Teachers use the achievement standard during and at the end of a period of teaching to make on‑balance judgments about the quality of learning students demonstrate.In Queensland the achievement standard represents the **C standard** — a sound level of knowledge and understanding of the content, and application of skills. The SEs are presented in a **matrix**. The discernible differences or degrees of quality associated with the five-point scale are highlighted to identify the characteristics of student work on which teacher judgments are made. Terms are described in the Notes section following the matrix. |
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| Year 9 Australian Curriculum: Mathematics achievement standard |
| By the end of Year 9, students solve problems involving simple interest. They interpret ratio and scale factors in similar figures. Students explain similarity of triangles. They recognise the connections between similarity and the trigonometric ratios. Students compare techniques for collecting data from primary and secondary sources. They make sense of the position of the mean and median in skewed, symmetric and bi-modal displays to describe and interpret data.Students apply the index laws to numbers and express numbers in scientific notation. They expand binomial expressions. They find the distance between two points on the Cartesian plane and the gradient and midpoint of a line segment. They sketch linear and non-linear relations. Students calculate areas of shapes and the volume and surface area of right prisms and cylinders. They use Pythagoras’ Theorem and trigonometry to find unknown sides of right‑angled triangles. Students calculate relative frequencies to estimate probabilities, list outcomes for two-step experiments and assign probabilities for those outcomes. They construct histograms and back-to-back stem-and-leaf plots. |
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| **Source** | Australian Curriculum, Assessment and Reporting Authority (ACARA), Australian Curriculum Version 8 Mathematics for Foundation–10, [www.australiancurriculum.edu.au/Mathematics/Curriculum/F-10](http://www.australiancurriculum.edu.au/Mathematics/Curriculum/F-10) |

## Year 9 Mathematics standard elaborations

|  | A | B | C | D | E |
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|  | The folio of a student’s work has the following characteristics: |
| Understanding and fluency | Conceptual understanding | connection and description of mathematical concepts and relationships in unfamiliar situations | connection and description of mathematical concepts and relationships in complex familiar situations | recognition and identification of mathematical concepts and relationships in simple familiar situations | some identification of simple mathematical concepts  | statements about obvious mathematical concepts |
| Procedural fluency | recall and use of facts, definitions, technologies and procedures to find solutions in unfamiliar situations | recall and use of facts, definitions, technologies and procedures to find solutions in complex familiar situations | recall and use of facts, definitions, technologies and procedures to find solutions in simple familiar situations  | some recall and use of facts, definitions, technologies and simple procedures | partial recall of facts, definitions or simple procedures  |
| Mathematical language and symbols | effective and clear use of appropriate mathematical terminology, diagrams, conventions and symbols  | consistent use of appropriate mathematical terminology, diagrams, conventions and symbols  | use of appropriate mathematical terminology, diagrams, conventions and symbols  | use of aspects of mathematical terminology, diagrams and symbols  | use of everyday language |
| Problem-solving and reasoning | Problem-solving approaches | systematic application of relevant problem-solving approaches to investigate unfamiliar situations | application of relevant problem-solving approaches to investigate complex familiar situations | application of problem‑solving approaches to investigate simple familiar situations | some selection and application of problem‑solving approaches in simple familiar situations | partial selection of problem‑solving approaches  |
| Mathematical modelling | development of mathematical models and representations in unfamiliar situations | development of mathematical models and representations in complex familiar situations | development of mathematical models and representations in simple familiar situations | statements about simple mathematical models and representations  | isolated statements about given mathematical models and representations  |
| Reasoning and justification | clear explanation of mathematical thinking and reasoning, including logical justification of choices made, evaluation of strategies used and conclusions reached | explanation of mathematical thinking and reasoning, including reasons for choices made, strategies used and conclusions reached | description of mathematical thinking and reasoning, including discussion of choices made, strategies used and conclusions reached | statements about choices made, strategies used and conclusions reached | isolated statements about given strategies or conclusions |

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

## Notes

### Australian Curriculum common dimensions

The SEs describe the qualities of achievement in the two dimensions common to all Australian Curriculum learning area achievement standards — understanding and skills.

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| Dimension | Description |
| understanding | the concepts underpinning and connecting knowledge in a learning area, related to a student’s ability to appropriately select and apply knowledge to solve problems in that learning area |
| skills | the specific techniques, strategies and processes in a learning area |

### Terms used in Year 9 Mathematics SEs

The following terms are used in the Year 9 Mathematics SEs. Definitions are drawn from the ACARA Australian Curriculum Mathematics glossary ([www.australiancurriculum.edu.au/f-10-curriculum/mathematics/glossary](https://www.australiancurriculum.edu.au/f-10-curriculum/mathematics/glossary)) and from other sources to ensure consistent understanding.

| Term | Description |
| --- | --- |
| accuracy;accurate | consistent with a standard, rule, convention or known fact |
| application;apply | use or employ in a particular situation  |
| appropriate | fitting, suitable to the context  |
| aspects | particular parts or features |
| clarity;clear | easy to perceive, understand or interpret, without ambiguity |
| comparison;compare | estimate, measure or note how things are similar or dissimilar |
| complex familiar | students are required to choose and apply procedures in a situation involving a number of elements, components or steps in a context that has been a focus of prior learning |
| conceptual understanding | connection, description, recognition and identification of mathematical concepts and relationships; in Year 9, examples include: Number and algebra* making connections between visual, tabular and graphical representations of rate
* recognising patterns and describing relationships such as that between graphs and equations
* making connections between the factorised and expanded forms of binomials

Measurement and geometry* identifying, visualising and quantifying measures and the attributes of shapes and objects, such as similarity and the trigonometric ratios
* exploring measurement concepts and geometric relationships, such as the use of the trigonometric ratios for right-angle triangles
* making connections between Pythagoras’s theorem and the distance between two points
* making connections between the net of a three-dimensional object and surface area

Statistics and probability* describing, analysing, and interpreting data
* explaining the use of relative frequencies to estimate probabilities
* making a connection between the question posed and statistics needed
* making connections between histograms, column graphs and stem‑and-leaf plots
 |
| connection;connect | establish a link |
| consistent  | regular in occurrence; in agreement and not self-contradictory  |
| description;descriptive;describe | give an account of characteristics or features |
| discussion;discuss | talk or write about a topic, taking in to account different issues or ideas |
| effective | meeting the assigned purpose in a considered and/or efficient manner to produce a desired or intended  |
| evaluation;evaluate | examine and judge the merit or significance of something |
| explanation;explanatory;explain | provide additional information that demonstrates understanding of reasoning and/or application; in mathematics this could include showing working to justify a response |
| fluency | students develop skills in choosing appropriate procedures; carrying out procedures flexibly, accurately, efficiently and appropriately; and recalling factual knowledge and concepts readily;students are fluent when they calculate answers efficiently, when they recognise robust ways of answering questions, when they choose appropriate methods and approximations, when they recall definitions and regularly use facts, and when they can manipulate expressions and equations to find solutions; in Year 9, fluency is represented in the valued features of [*procedural fluency*](#procedural_fluency)and[*mathematical language and symbols*](#mathematical_language_and_symbols) |
| given | known or provided |
| identification;identify | establish or indicate who or what someone or something is |
| investigate | plan, collect and interpret data/information and draw conclusions about |
| isolation;isolated | unconnected; set apart |
| justification;justify | show how an argument or conclusion is right or reasonable |
| logic;logical | sequence of sound reasoning |
| mathematical language and symbols | use of appropriate mathematical terminology, diagrams, conventions and symbols; in Year 9, examples include: Number and algebra* direct proportion, rate, integer, indices, simply, evaluate, scientific notation
* simple interest, interest rate
* Cartesian plane, midpoint, gradient, linear, non-linear, parabola

Measurement and geometry* composite shape, surface area, volume, net, capacity
* similarity, transformation, congruence

Statistics and probability* census, survey, variable, secondary data, histogram, stem-and-leaf plot
* population, frequency, sample, event, dependent, independent
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| mathematical modelling | depicting a situation that expresses relationships using mathematical concepts and language; in Year 9, examples include: * identifying direct proportion in real-life contexts by sketching graphs
* graphing parabolas and circles
* modelling practical situations involving surface areas and volumes of right prisms
* visualising and sketching rectangular and triangular prisms and their nets
* constructing data displays
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| obvious | evident; apparent |
| partial | incomplete, half-done, unfinished |
| problem-solving | students develop the ability to make choices, interpret, formulate, model and investigate problem situations, and communicate solutions effectively;students formulate and solve problems when they use mathematics to represent unfamiliar or meaningful situations, when they design investigations and plan their approaches, when they apply their existing strategies to seek solutions, and when they verify that their answers are reasonable;in Year 9, problem-solving is represented in the valued features of [*problem-solving approaches*](#problem_solving_approaches) and[*mathematical modelling*](#mathematical_modelling) |
| problem-solving approaches | use of problem-solving approaches to investigate situations; in Year 9, examples include: * posing a question
* making choices when designing investigations
* interpreting mathematical or real-life situations
* determining the evidence needed to support a conclusion or hypothesis
* formulating a plan
* sketching linear graphs
* applying ratio and scale factors and using trigonometry to solve problems
* collecting and organising data from secondary sources to investigate an issue
* using stem-and-leaf plots to compare two like sets of data
* generalising mathematical ideas and techniques to analyse, interpret, evaluate and solve problems
* verifying that answers are reasonable
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| procedural fluency | recall and use of facts, definitions, technologies and procedures to find solutionsin Year 9, examples include: Number and algebra* developing efficient strategies for numerical calculation
* applying the index laws to expressions with integer indices
* simplifying algebraic expressions
* expressing numbers in scientific notation

Measurement and geometry* developing familiarity with calculations involving the Cartesian plane
* calculating areas of shapes and surface areas of prisms

Statistics and probability* listing outcomes for chance experiments
* constructing histograms with and without technologies
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| range | covers the scope of relevant situations or elements;in Year 9, the range of situations and problems included simple familiar, simple unfamiliar, complex familiar and unfamiliar |
| reasoning | students develop an increasingly sophisticated capacity for logical thought and actions, such as analysing, proving, evaluating, explaining, inferring, justifying and generalising;students are reasoning mathematically when they explain their thinking, when they deduce and justify strategies used and conclusions reached, when they adapt the known to the unknown, when they transfer learning from one context to another, when they prove that something is true or false and when they compare and contrast related ideas and explain their choices;in Year 9, reasoning is represented in the valued features of [*reasoning and justification*](#reasoning_and_justification) and[*mathematical modelling*](#mathematical_modelling) |
| reasoning and justification | description and explanation of mathematical thinking and reasoning, including discussion, justification and evaluation of choices made, strategies used, proofs formulated and conclusions reached;in Year 9, examples include: * following mathematical arguments
* constructing arguments to prove and justify results
* providing reasoning to support conclusions that are appropriate to the context
* evaluating media reports
* using statistical knowledge to clarify situations
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| reasons;reasoned | logical and sound; presented with justification |
| recall | remember information, ideas or experiences |
| recognition;recognise | to be aware of, or acknowledge |
| relevant | connected to the matter in hand |
| represent | use words, images, symbols or signs to convey meaning |
| simple familiar | students are required to choose and apply procedures in a situation involving few elements, components or steps, and in a context that has been a focus of prior learning |
| statement;state | a sentence or assertion |
| systematic  | methodical, organised and logical |
| understanding | students build a robust knowledge of adaptable and transferable mathematical concepts; they make connections between related concepts and progressively apply the familiar to develop new ideas; they develop an understanding of the relationship between the ‘why’ and the ‘how’ of mathematics; students build understanding when they connect related ideas, when they represent concepts in different ways, when they identify commonalities and differences between aspects of content, when they describe their thinking mathematically and when they interpret mathematical information;in Year 9, understanding is represented in the valued features of [*conceptual understanding*](#conceptual_understanding)and[*mathematical language and symbols*](#mathematical_language_and_symbols) |
| unfamiliar | students are required to choose and apply procedures in a situation involving a number of elements, components or steps in a context in which students have had limited prior experience  |
| use;use of | to operate or put into effect |