Australian Curriculum Year 10 Maths Sample assessment | Teacher guidelines

A future world record

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| **Assessment description** | **Category** |
| Students analyse data to determine how world records have changed over time and predict a future world record. They evaluate the reasonableness of their prediction and the limitations of the strategy. | Written |
| Technique |
| Supervised assessment |
| Context for assessment | Alignment |
| The assessment will involve the students writing a report to show how well they understand the mathematical ideas and concepts covered.  Students will use technology applications (including spreadsheets and graphing software) to analyse and present real-life data. They will generate a scatter plot to investigate and comment on relationships between sets of data.  Students will require access to appropriate technology and will need internet access if they wish to gather further data to assist with their evaluation of the strategy. | * Australian Curriculum 5.[1](http://www.australiancurriculum.edu.au/CurriculumHistory),  Year 10 Mathematics Australian Curriculum content and achievement standard ACARA — Australian Curriculum, Assessment and Reporting Authority, [www.australiancurriculum.edu.au](http://www.australiancurriculum.edu.au) * Year 10 Mathematics standard elaborations, [www.qsa.qld.edu.au/yr10-maths-resources.html](http://www.qsa.qld.edu.au/yr10-maths-resources.html) |
| Connections |
| This assessment can be used with the QSA Australian Curriculum resource titled  *Year 10 unit overview – Mathematics exemplar* (Mathematics and sport),available at: [www.qsa.qld.edu.au/yr10-maths-resources.html](http://www.qsa.qld.edu.au/yr10-maths-resources.html) |
| Definitions |
| See the Australian Curriculum glossary for technical terms used in this assessment: [www.qsa.qld.edu.au/yr10-maths-resources.html](http://www.qsa.qld.edu.au/yr10-maths-resources.html) |
| In this assessment | Assessment materials |
| Student booklet  Task-specific standards — continua  Task-specific standards — matrix  Assessment resource: Indicative A response  Teacher guidelines | Computer access for all students  Word processing and spreadsheet software  Internet access if further data is required to support discussion of results |

# Teacher guidelines

## Identify curriculum

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| Content descriptions to be taught | |
| Statistics and Probability | |
| Data representation and interpretation  Use scatter plots to investigate and comment on relationships between two numerical variables [(ACMSP251)](http://www.australiancurriculum.edu.au/Curriculum/ContentDescription/ACMSP251)  Investigate and describe [bivariate numerical data](http://www.australiancurriculum.edu.au/Glossary?a=M&t=Bivariate%20numerical%20data) where the [independent variable](http://www.australiancurriculum.edu.au/Glossary?a=M&t=Independent%20variable) is time [(ACMSP252)](http://www.australiancurriculum.edu.au/Curriculum/ContentDescription/ACMSP252)  **10A** Use information technologies to investigate [bivariate numerical data](http://www.australiancurriculum.edu.au/Glossary?a=M&t=Bivariate%20numerical%20data) sets. Where appropriate use a straight line to describe the relationship allowing for variation [(ACMSP279)](http://www.australiancurriculum.edu.au/Curriculum/ContentDescription/ACMSP279) | |
| General capabilities (GCs) and cross‑curriculum priorities (CCPs)  This assessment may provide opportunities to engage with the following GCs and CCPs. Refer also to the Resources tab on the Mathematics curriculum hub:  [www.qsa.qld.edu.au/yr10-maths-resources.html](http://www.qsa.qld.edu.au/yr10-maths-resources.html) | |
| Description: gc_literacy **Literacy**  Description: Description: gc_numeracy **Numeracy** | Description: gc_ict **ICT capability**  *Description: Description: gc_critical* **Critical and creative thinking** |
| Achievement standard  This assessment provides opportunities for students to demonstrate the following highlighted aspects. | |
| By the end of Year 10, students recognise the connection between simple and compound interest. They solve problems involving linear equations and inequalities. They make the connections between algebraic and graphical representations of relations. Students solve surface area and volume problems relating to composite solids. They recognise the relationships between parallel and perpendicular lines. Students apply deductive reasoning to proofs and numerical exercises involving plane shapes. They compare data sets by referring to the shapes of the various data displays. They describe bivariate data where the independent variable is time. Students describe statistical relationships between two continuous variables. They evaluate statistical reports.  Students expand binomial expressions and factorise monic quadratic expressions. They find unknown values after substitution into formulas. They perform the four operations with simple algebraic fractions. Students solve simple quadratic equations and pairs of simultaneous equations. They use triangle and angle properties to prove congruence and similarity. Students use trigonometry to calculate unknown angles in right-angled triangles. Students list outcomes for multi-step chance experiments and assign probabilities for these experiments. They calculate quartiles and inter-quartile ranges. | |
| Source: ACARA, The Australian Curriculum v5.1, [www.australiancurriculum.edu.au](http://www.australiancurriculum.edu.au) | |

## Sequence learning

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| **Suggested learning experiences** |
| This assessment leads on from the learning experiences outlined in the QSA’s Year 10 Mathematics unit overview. The knowledge, understanding and skills developed in the exemplar unit will prepare students to engage in this assessment.  See *Year 10 plan - Mathematics exemplar* (Exemplar unit: Mathematics and sport) [www.qsa.qld.edu.au/yr10-maths-resources.html](http://www.qsa.qld.edu.au/yr10-maths-resources.html). |
| Adjustments for needs of learners |
| To make adjustments, teachers refer to learning area content aligned to the student’s chronological age, personalise learning by emphasising alternate levels of content, general capabilities or cross‑curriculum priorities in relation to the chronological age learning area content. The emphasis placed on each area is informed by the student’s current level of learning and their strengths, goals and interests. Advice on the process of curriculum adjustment for all students and in particular for those with disability, gifted and talented or for whom English is an additional language or dialect are addressed in *Australian Curriculum — Student Diversity* materials.  For information to support students with diverse learning needs, see:   * Queensland Studies Authority materials for supporting students with diverse learning needs [www.qsa.qld.edu.au/10188.html](http://www.qsa.qld.edu.au/10188.html) * Australian Curriculum Student Diversity [www.australiancurriculum.edu.au/StudentDiversity/Overview](http://www.australiancurriculum.edu.au/StudentDiversity/Overview) * The *Melbourne Declaration* *on Educational Goals for Young Australians* [www.mceecdya.edu.au/mceecdya/melbourne\_declaration,25979.html](http://www.mceecdya.edu.au/mceecdya/melbourne_declaration,25979.html) * *Disability Standards for Education* <http://deewr.gov.au/disability-standards-education>. |

## Develop assessment

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| **Preparing for the assessment** |
| Learning experiences in preparation for the assessment could include:   * Use scatter plots to determine if a relationship is linear, i.e. by adding a line of best fit. * Write and solve linear equations using graph paper and technology (e.g. graphing calculators, spreadsheets). * Substitute values into formulas. * Use graphics calculators and spreadsheets to generate scatter plots, add trend lines, make predictions, etc. * Review rounding to two decimal places and three significant figures. * Convert time (mm:ss.00) into decimal notation or into seconds. * Examine exemplars of how to communicate mathematically (including mathematical language conventions and the use of equation writers in word processing software to write algebraic and statistical notation and symbols). |
| Implementing |
| * Allow sufficient time for students to complete assessment — additional time may be required if students wish to gather further data to assist with their discussion of the results. * Discuss requirements of task with the class. * Supervise students and assist with unpacking requirements of specific parts of the task as necessary. * Remind students to make use of appropriate conventions, symbols and mathematical language when writing their report. |

## Making judgments

When making judgments about the evidence in student responses to this assessment, teachers are advised to use the task-specific standards provided. The development of these task-specific standards has been informed by the Queensland Year 10 standard elaborations. See [www.qsa.qld.edu.au/yr10-maths-resources.html](http://www.qsa.qld.edu.au/yr10-maths-resources.html).

### The Queensland standard elaborations for Mathematics

The Queensland Year 10 Standard elaborations for Mathematics is a resource to assist teachers to make consistent and comparable evidence-based A to E (or equivalent) judgments. It should be used in conjunction with the Australian Curriculum achievement standard and content descriptions for the relevant year level.

The Queensland Year 10 Standard elaborations provide a basis for judging *how well* students have demonstrated what they know, understand and can do using the Australian Curriculum achievement standard.

The Australian Curriculum achievement standards dimensions of Understanding and Skills are used to organise the Queensland Mathematics standard elaborations. Understanding and Skills in Mathematics are organised as Understanding, Fluency, Problem solving and Reasoning

The valued features of Mathematics are drawn from the achievement standard and the content descriptions for Understanding and Skills are organised as:

* Mathematical understandings
* Recall and use of facts, definitions, technologies and procedures
* Use of mathematical language, conventions and symbols
* Use of problem solving strategies
* Modelling and representation
* Results and conclusions of investigations and inquiries
* Communication of mathematical thinking, choices and strategies.

#### Task-specific standards

Task-specific standards give teachers:

* a tool for directly matching the evidence of learning in the student response to the standards
* a focal point for discussing student responses
* a tool to help provide feedback to students.

Task-specific standards are not a checklist; rather they are a guide that:

* highlights the valued features that are being targeted in the assessment and the qualities that will inform the overall judgment
* specifies particular *targeted aspects* of the curriculum content and achievement standard
* aligns the valued feature, task-specific descriptor and assessment
* allows teachers to make consistent and comparable on-balance judgments about student work by matching the qualities of student responses with the descriptors
* clarifies the curriculum expectations for learning at each of the five grades (A–E or the early years equivalent)
* shows the connections between what students are expected to know and do, and how their responses will be judged and the qualities that will inform the overall judgment
* supports evidence-based discussions to help students gain a better understanding of how they can critique their own responses and achievements, and identify the qualities needed to improve
* encourages and provides the basis for conversations among teachers, students and parents/carers about the quality of student work and curriculum expectations and related standards.

#### Task-specific valued features

Task-specific valued features are the discrete aspects of the valued features of Mathematics targeted in a particular assessment and incorporated into the task-specific standards for that assessment. They are selected from the Queensland Mathematics standard elaborations valued features drawn from the Australian Curriculum achievement standard and content descriptions.

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| Task-specific valued features for this assessment | | | |
| The following identifies the valued features for this assessment and makes explicit the understandings and skills that students will have the opportunity to demonstrate. This ensures that the alignment between what is taught, what is assessed and what is reported is clear. | | | |
| Australian Curriculum achievement standard dimensions | Australian Curriculum proficiency strands | Queensland standard elaborations valued features | Task-specific valued features |
| Understanding and Skills | Understanding & Fluency | Recall and use of facts, definitions, technologies and procedures | Display of world record data as a scatter plot and representation of the relationship as a linear function. |
| Use of mathematical language, conventions and symbols | Use of appropriate language, conventions and symbols when graphing data, developing equations and providing explanations |
| Problem solving & Reasoning | Development of models and representations | Development and evaluation of a mathematical model to determine how world records have changed over time and to predict a future world record. |
| Discussion of mathematical thinking, choices and strategies | Use of mathematical argument to support a prediction.  Evaluation of the suitability of the strategy used to make a prediction. |

The task-specific standards for this assessment are provided in two models using the same task-specific valued features:

* a matrix
* a continua.

#### Matrix and Continua

Task-specific standards can be prepared as a matrix or continua. Both the continua and the matrix:

* use the Queensland standard elaborations to develop task-specific descriptors to convey expected qualities in student work — A to E or equivalent
* highlight the same valued features from the Queensland standard elaborations that are being targeted in the assessment and the qualities that will inform the overall judgment
* incorporate the same task-specific valued features i.e. make explicit the particular understanding / skills students have the opportunity to demonstrate for each selected valued feature
* provide a tool for directly matching the evidence of learning in the student response to the standards to make an on-balance judgment about student achievement
* assist teachers to make consistent and comparable evidence-based A to E or equivalent judgments.

##### Continua

The continua model of task-specific standards uses the dimensions of the Australian Curriculum achievement standard to organise task-specific valued features and standards as a number of reference points represented progressively along an A-E continuum. The task-specific valued features at each point are described holistically. The task-specific descriptors of the standard use the relevant degrees of quality described in the Queensland standard elaborations.

Teachers determine a position along each continuum that best matches the evidence in the students’ responses to make an on-balance judgment about student achievement on the task.

The continua model is a tool for making an overall on-balance judgment about the assessment and for providing feedback on task specific valued features.

##### Matrix

The matrix model of task-specific standards uses the structure of the Queensland standard elaborations to organise the task-specific valued features and standards A to E. The task-specific descriptors of the standard described in the matrix model use the same degrees of quality described in the Queensland standard elaborations.

Teachers make a judgment about the task-specific descriptor in the A to E (or equivalent) cell of the matrix that best matches the evidence in the students’ responses in order to make an on-balance judgment about how well the pattern of evidence meets the standard.

The matrix is a tool for making both overall on-balance judgments and analytic judgments about the assessment. Achievement in each valued feature of the Queensland standard elaboration targeted in the assessment can be recorded and feedback can be provided on the task-specific valued features.

## Use feedback

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| Feedback to students | This assessment provides opportunities to give feedback to students on how well they:   * generate a scatter plot and plotting a line of best fit: * converting times into decimal notation and rounding them, before using them for graphing * selecting the correct axes and scale for the independent and dependent variables, when using graph paper * manipulating scatter plots in spreadsheet software to best display the data * inputting work into spreadsheets/calculators * formulate a linear equation (10A): * using the graph to find the gradient and y-axis intercept to substitute into the equation of a straight line * inputting work into spreadsheets/calculators * check for reasonableness: * verifying the reasonableness of the solution by checking that the answer fits the question, e.g. by applying existing strategies, using a variety of techniques, estimation, working backward * discuss the results: * making links between results of the mathematical strategy, the assumptions made, the limitations of the strategy, and the plausibility of predictions back to the original question and life-related situations. |
| Resources | For guidance on providing feedback, see the professional development packages titled:   * *About feedback* [www.qsa.qld.edu.au/downloads/p\_10/as\_feedback\_about.doc](http://www.qsa.qld.edu.au/downloads/p_10/as_feedback_about.doc) * *Seeking and providing feedback* [www.qsa.qld.edu.au/downloads/p\_10/as\_feedback\_provide.doc](http://www.qsa.qld.edu.au/downloads/p_10/as_feedback_provide.doc). |