Australian Curriculum Year 6 Mathematics Sample assessment | Teacher guidelines

Goal difference — the importance of zero

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| Assessment description | Category |
| Students will interpret data containing positive and negative numbers in sporting league tables. | Written |
| Technique |
| Mathematical investigation |
| Context for assessment | Alignment |
| Negative numbers are used in everyday situations. They are sometimes used to compare the progress of sporting teams through competitions. Students use tables that include positive and negative numbers to make judgments about how the teams are progressing. | * *Australian Curriculum v5.1*,  Year 6 Mathematics Australian Curriculum content and achievement standard, ACARA — Australian Curriculum, Assessment and Reporting Authority, [www.australiancurriculum.edu.au](http://www.australiancurriculum.edu.au) * *Year 6 standard elaborations — Australian Curriculum: Mathematics*, [www.qsa.qld.edu.au/yr6-maths-resources.html](http://www.qsa.qld.edu.au/yr6-maths-resources.html) |
| Connections |
| This assessment can be used with the QSA Australian Curriculum resource titled  *Year 6 unit overview – Mathematics exemplar* (The importance of zero),available at: [www.qsa.qld.edu.au/13647.html#16458](http://www.qsa.qld.edu.au/13647.html#16458)  Year 6 Mathematics resources [www.qsa.qld.edu.au/yr6-maths-resources.html](http://www.qsa.qld.edu.au/yr6-maths-resources.html) |
| Definitions |
| Refer to the Australian Curriculum definitions at [www.australiancurriculum.edu.au](http://www.australiancurriculum.edu.au)  and the Year 6 Mathematics standards elaborations glossary at [www.qsa.qld.edu.au/yr6-maths-resources.html](http://www.qsa.qld.edu.au/yr6-maths-resources.html) |
| In this assessment | |
| Teacher guidelines | |
| Student booklet | |
| Model response | |
| Task-specific standards — continua | |
| Task-specific standards — matrix | |

# Teacher guidelines

## Identify curriculum

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| Content descriptions to be taught | |
| Number and Algebra | Statistics and Probability |
| Number and place value   * Investigate everyday situations that use integers. Locate and represent these numbers on a number line [(ACMNA124)](http://www.australiancurriculum.edu.au/Curriculum/ContentDescription/ACMNA124) * Select and apply efficient mental and written strategies and appropriate digital technologies to solve problems involving all four operations with whole numbers [(ACMNA123)](http://www.australiancurriculum.edu.au/Curriculum/ContentDescription/ACMNA123) | Data representation and interpretation   * Interpret secondary data presented in digital media and elsewhere [(ACMSP148)](http://www.australiancurriculum.edu.au/Curriculum/ContentDescription/ACMSP148) |
| General capabilities (GCs)  This assessment may provide opportunities to engage with the following GCs. Refer also to the Resources tab on the Mathematics curriculum hub: [www.qsa.qld.edu.au/yr6-maths-resources.html](http://www.qsa.qld.edu.au/yr6-maths-resources.html) | |
| Description: gc_literacy Literacy  Description: Description: gc_numeracy Numeracy  Description: gc_ict ICT capability  Description: Description: gc_criticalCritical and creative thinking  Description: Description: gc_personal_social Personal and social capability | |
| Achievement standard  This assessment provides opportunities for students to demonstrate the following highlighted aspects. | |
| By the end of Year 6, students [recognise](http://www.australiancurriculum.edu.au/Glossary?a=&t=Recognise) the properties of prime, composite, square and triangular numbers. They [describe](http://www.australiancurriculum.edu.au/Glossary?a=&t=Describe) the use of integers in everyday contexts. They [solve](http://www.australiancurriculum.edu.au/Glossary?a=&t=Solve) problems involving all four operations with whole numbers. Students connect fractions, decimals and percentages as different representations of the same number. They [solve](http://www.australiancurriculum.edu.au/Glossary?a=&t=Solve) problems involving the addition and subtraction of related fractions. Students make connections between the powers of 10 and the multiplication and division of decimals. They [describe](http://www.australiancurriculum.edu.au/Glossary?a=&t=Describe) rules used in sequences involving whole numbers, fractions and decimals. Students connect decimal representations to the metric system and choose appropriate units of measurement to perform a calculation. They make connections between capacity and volume. They [solve](http://www.australiancurriculum.edu.au/Glossary?a=&t=Solve) problems involving length and area. They interpret timetables. Students [describe](http://www.australiancurriculum.edu.au/Glossary?a=&t=Describe) combinations of transformations. They [solve](http://www.australiancurriculum.edu.au/Glossary?a=&t=Solve) problems using the properties of angles. Students [compare](http://www.australiancurriculum.edu.au/Glossary?a=&t=Compare) observed and expected frequencies. They interpret and [compare](http://www.australiancurriculum.edu.au/Glossary?a=&t=Compare) a variety of data displays including those displays for two categorical variables. They [evaluate](http://www.australiancurriculum.edu.au/Glossary?a=&t=Evaluate) secondary data displayed in the media.  Students [locate](http://www.australiancurriculum.edu.au/Glossary?a=&t=Locate) fractions and integers on a number line. They calculate a simple fraction of a quantity. They add, subtract and multiply decimals and divide decimals where the result is rational. Students calculate common percentage discounts on sale items. They write correct number sentences using brackets and order of operations. Students [locate](http://www.australiancurriculum.edu.au/Glossary?a=&t=Locate) an ordered pair in any one of the four quadrants on the Cartesian plane. They construct simple prisms and pyramids. Students list and communicate probabilities using simple fractions, decimals and percentages. | |
| Source: ACARA, The Australian Curriculum v5.1, [www.australiancurriculum.edu.au/mathematics/Curriculum/F-10?y=6&s=NA&s=MG&s=SP&layout=1](http://www.australiancurriculum.edu.au/mathematics/Curriculum/F-10?y=6&s=NA&s=MG&s=SP&layout=1) | |

## Sequence learning

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| Suggested learning experiences |
| This assessment leads on from the learning experiences outlined in the QSA’s Year 6 Mathematics unit overview. The knowledge, understanding and skills developed in the exemplar unit will prepare children to engage in this assessment.  See Year 6 u*nit overview — Mathematics exemplar (The importance of zero)*, available at: [www.qsa.qld.edu.au/yr6-maths-resources.html](http://www.qsa.qld.edu.au/yr6-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* [www.ag.gov.au/RightsAndProtections/HumanRights/DisabilityStandards/Pages/Disabilitystandardsforeducation.aspx](http://www.ag.gov.au/RightsAndProtections/HumanRights/DisabilityStandards/Pages/Disabilitystandardsforeducation.aspx). |
| Resources |
| Online   * Mathematics and numeracy learning objects for the Australian Curriculum. National digital learning resources network, e.g. *Integer cruncher series* under Secondary> Number and Algebra, [www.ndlrn.edu.au/using\_the\_resources/australian\_curriculum\_resources/mathematics.html](http://www.ndlrn.edu.au/using_the_resources/australian_curriculum_resources/mathematics.html) * Negative number activities. BBC Skillswise, *Negative numbers*,  [www.bbc.co.uk/skillswise/topic/negative-numbers](http://www.bbc.co.uk/skillswise/topic/negative-numbers) * Negative number game. Cyberchase, *Space coupe to the rescue*,  <http://pbskids.org/cyberchase/games/negativenumbers> * Strategies for teaching numbers. Queensland Studies Authority, Mathematics (2004) support materials, *About number* under Information for teachers*,* [www.qsa.qld.edu.au/1184.html](http://www.qsa.qld.edu.au/1184.html)   Objects   * Pencil and eraser * Calculators * Notepaper and number lines for working |

## Develop assessment

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| Preparing for the assessment | |
| * Investigate integer sequences involving both positive and negative numbers and extend them upwards and downwards. * Experiment with the application of negative numbers. For example: * Place a giant number line on the floor or ground. Ask small groups to move forward and backwards from zero. Increase the complexity as understanding develops. * Develop fluency by playing a simple dice game: Player A adds their result on a number line, Player B subtracts. Track progress above and below zero. * Use vertical and horizontal number lines as representations of negative and positive numbers. For example: * Solve problems about a building elevator to determine its position on a number line, such as:  A building has 10 storeys above ground where the ground floor is zero. It also has 6 storeys below ground for parking. If I am on Floor 2 and I ride the elevator down 4 floors, which floor will I be on? * Leave a thermometer in the freezer until it shows below zero, then track its progress as it warms up from below to above zero. * Score games or competitions between two teams on a ‘point difference’ number line, with one team’s score adding and the other team’s subtracting. * Create tables to represent data sets and as a tool for data analysis and problem solving. * Develop and use mathematical vocabulary to explain and compare strategies. * Develop explanations and arguments that are based on multiple pieces of data or evidence,  e.g. ‘If ... then … because … as well as …’ * Use spreadsheets to create tables and to graph positive and negative data onto a line graph.  For example: * Make graphs depicting positive and negative temperatures. * Use a line graph to track a sporting team’s goal difference across a season, or the relative scores over time within a game. | |
| Implementing | |
| Section 1. League tables | |
| Focus question: *What does a league table show?* | |
| Student role   * In a class discussion, compare league tables for a range of sports and discuss the similarities and differences in the data they present. * Focus on Table 1 in the Student booklet (or other selected table) and explore how information about teams’ progress in the competition is presented. * In groups, check that each team’s goal difference result has been calculated correctly. * One student from each group reports back to the whole class on the accuracy of the goal difference results for the teams checked. They verbally explain the method they used to check the results. * Write examples that explain the importance of zero. | Teacher role   * Refer to the fictional example of a sporting competition included in the *Student booklet* or modify to use current data from a local competition or data that the students collect themselves throughout a season.   Any sporting competition that has points scored for and against will be suitable for finding the goals and points difference.   * Facilitate discussion of the discussion questions provided in Section 1. * Assist individuals in using calculators to explore options. * Facilitate the reporting session and discussion to identify the range of strategies used to find the goal difference. * Provide literacy support where necessary to enable students to demonstrate their mathematical knowledge and skills. |
| Section 2. Investigating a competition | |
| Focus question: *How are the teams performing so far?* | |
| Student role   * As a class, read Table 2: Interschool soccer competition results, and discuss what the table is showing. * Work individually to complete Table 3. | Teacher role   * Facilitate discussion on the draw for the interschool sporting competition in the Student booklet, or your own resource. * Ensure all students can read the table accurately. * Discuss the sample calculation: *Home and away results for All Saints*, to ensure students understand the process demonstrated. * Distribute notepaper or extra number lines for students to use to work out the totals. * Assist students who need literacy support. |
| Section 3. Interpreting data | |
| Focus question: *How does the table help us to compare teams?* | |
| Student role   * Working individually, analyse the data collected in Table 3 to explain team performance and predict future results. * In Q6, students complete a table which has headings provided to suggest a mode of analysis. * In Q7, students make their own choice about how to use the table. | Teacher role   * Encourage students to document their analysis and to use data to justify their solutions. There is no preferred strategy or answer to these questions. It is students’ reasoning and logical use of data that are being valued. * Provide literacy support where necessary to enable students to demonstrate their mathematical knowledge and skills. There are significant literacy demands in this section of the assessment. |

## Make 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 6 standard elaborations.   
See [www.qsa.qld.edu.au/yr6-maths-resources.html](http://www.qsa.qld.edu.au/yr6-maths-resources.html).

### The Queensland standard elaborations for Mathematics

The Queensland Year 6 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 Mathematics 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 and Problem solving & Reasoning.

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

* Number and place value
* Data representation and interpretation.

#### 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.

##### Task-specific valued features for this assessment

The following table 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.

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| Australian Curriculum achievement standard dimensions | Australian Curriculum Proficiency strands | Queensland standard elaborations valued features | Task-specific valued features |
| Understanding and Skills | Understanding &  Fluency | * Conceptual understanding * Procedural fluency | * Description of the role of zero. Location and representation of zero and positive and negative numbers on a number line (Q1 & 3) * Addition and subtraction of positive and negative numbers (Q2 & 6a) |
| Problem solving & Reasoning | * Problem solving approaches * Reasoning and justification | * Application of problem solving approaches to analyse positive and negative data in sporting tables (Q7a) * Explanations of mathematical thinking to justify conclusions (Q4, 5, 6b, 7b & 8) |

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 | Evaluate the information gathered from the assessment to inform teaching and learning strategies. Focus feedback on the student’s personal progress and the next steps in the learning journey.  Offer feedback that discusses:   * the importance of following the procedures outlined in the student booklet explicitly and in order * how their interpretation of results in Section 3 could contribute to  well-reasoned conclusions * how communication of conclusions could be more effective with clear mathematical language and representations.   The task-specific standards for this assessment can be used as a basis for providing feedback to students. |
| 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) |