**Purposes of assessment**

The purposes of assessment are to:

- promote, assist and improve student learning
- inform programs of teaching and learning
- provide information for those people — students, parents, teachers — who need to know about the progress and achievements of individual students to help them achieve to the best of their abilities
- provide information for the issuing of certificates of achievement
- provide information to those people who need to know how well groups of students are achieving (school authorities, the State Minister for Education and Training and the Arts, the Federal Minister for Education).

It is common practice to label assessment as being formative, diagnostic or summative, according to the major purpose of the assessment.

The major purpose of formative assessment is to help students attain higher levels of performance. The major purpose of diagnostic assessment is to determine the nature of students' learning, and then provide the appropriate feedback or intervention. The major purpose of summative assessment is to indicate the achievement status or standards achieved by students at a particular point in their schooling. It is geared towards reporting and certification.

**Syllabus requirements**

Teachers should ensure that assessment instruments are consistent with the requirements, techniques and conditions of the Mathematics A (2008) syllabus.

**Assessment instruments**

High-quality assessment instruments:

- have construct validity (the instruments actually assess what they were designed to assess)
- have face validity (they appear to assess what you believe they are intended to assess)
- give students clear and definite instructions
- are written in language suited to the reading capabilities of the students for whom the instruments are intended
- are clearly presented through appropriate choice of layout, cues, visual design, format and choice of words
- are used under clear, definite and specified conditions that are appropriate for all the students whose achievements are being assessed
- have clear criteria for making judgments about achievements (these criteria are shared with students before they are assessed)
- are used under conditions that allow optimal participation for all
- are inclusive of students’ diverse backgrounds
- allow students to demonstrate the breadth and depth of their achievements
- only involve the reproduction of gender, socioeconomic, ethnic or other cultural factors if careful consideration has determined that such reproduction is necessary.

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2 Assessment instruments are the actual tools used by schools and the QSA to gather information about student achievement, for example, recorded observation of a game of volleyball, write-up of a field trip to the local water catchment and storage area, a test of number facts, the Senior External Examination in Chinese, the 2006 QCS Test, the 2008 Year 4 English comparable assessment task.

Mathematics A (2008)

Sample assessment instrument and indicative responses

Supervised assessment

Compiled by the Queensland Studies Authority
April 2010

This assessment instrument is reproduced with the permission of Coomera Anglican College.

About this assessment instrument

The purpose of this document is to inform assessment practices of teachers in schools. For this reason, the assessment instrument is not presented in a way that would allow its immediate application in a school context. In particular, the assessment technique is presented in isolation from other information relevant to the implementation of the assessment. For further information about those aspects of the assessment not explained in this document, please refer to the assessment section of the syllabus.

This sample provides opportunities for students to demonstrate:

- accessing, selecting, applying and manipulating rules and formulas
- recalling, selecting and applying mathematical procedures in situations that are similar to situations already encountered
- using mathematical technology and geometrical instruments
- interpreting and using appropriate mathematical terminology, symbols and conventions
- organising and presenting information for different purposes and audiences, in a variety of representations
- analysing information displayed in a variety of presentations and translating information from one representation to another
- developing logical sequences within a response expressed in everyday language, mathematical language, or a combination of both, to justify conclusions, solutions or propositions

This sample assessment instrument is intended to be a guide to help teachers plan and develop assessment instruments for individual school settings.
Part A (Multiple choice — No working required)

Question 1
In the following right-angled triangle, which side represents the hypotenuse.

- (a) j
- (b) k
- (c) f

Question 2
Use your calculator to evaluate $9.3 \sin 63^\circ$ (correct to 3 decimal places).

- (a) 0.891
- (b) 0.890
- (c) 8.286
- (d) 8.287

Question 3
Find $\theta$ correct to the nearest degree, given that $\cos \theta = 0.173$.

- (a) 80°
- (b) 81°
- (c) 80.1°
- (d) 80.04°

Question 4
The number of people who are using a particular bus service are counted over a 2-week period. The data formed by this survey would best be described as:

- (a) Categorical and nominal data
- (b) Categorical and ordinal data
- (c) Numerical and discrete data
- (d) Numerical and continuous data
Question 5
The frequency polygon shows the scores of some Year 2 students on a spelling test. The most common number of errors is:

(a) 2  
(b) 5  
(c) 6  
(d) 11

Questions 6 and 7 refer to the box-and-whisker plot drawn below.

Question 6
The median of the data is:

(a) 20  
(b) 23  
(c) 35  
(d) 31

Question 7
The interquartile range of the data is:

(a) 23  
(b) 26  
(c) 5  
(d) 20 to 25
Question 8

The graph below shows the number of goals recorded by the local soccer team in its matches during the soccer season.

![Graph showing the number of goals recorded by the local soccer team.]

How many goals did the team score throughout the season?

(a) 33
(b) 5
(c) 16
(d) 37

Question 9

A distribution of six scores has a mean of 21. If the highest score increases by 6 points, the mean will be:

(a) 21
(b) 22
(c) 23
(d) 24

Question 10

The following table summarises the grades of 150 candidates in a mathematics test.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Number of candidates</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>30</td>
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<tr>
<td>B</td>
<td>50</td>
</tr>
<tr>
<td>C</td>
<td>40</td>
</tr>
<tr>
<td>D</td>
<td>20</td>
</tr>
<tr>
<td>E</td>
<td>10</td>
</tr>
</tbody>
</table>

Which statement below is correct?

(a) The median is C and the mode is B
(b) The median is C and the mode is C
(c) The median is B and the mode is C
(d) The median is B and the mode is B
Part B (Short response — Full working required)

Question 11
Use the formula $\text{base}^2 + \text{height}^2 = \text{hypotenuse}^2$ to find the height of the flagpole, correct to 1 decimal place.

![Flagpole Diagram](image)

Question 12
A ladder 5 metres long is leant up against a brick wall. Use the formula $\sin \theta = \frac{\text{opposite}}{\text{hypotenuse}}$ to find the height ($x$) the ladder reaches up the wall (correct to 1 decimal place).

![Ladder Diagram](image)

Question 13
Find the value of $x$ in the following diagram.

![Triangle Diagram](image)
Question 14
A tree casts a 3.6 m shadow when the sun's angle of elevation is 59°. Calculate the height of the tree, correct to the nearest metre.

Question 15
A carpenter needs to cut a right-angled wedge out of timber. The wedge has to be 25 centimetres long, and the sloping edge must be 28 centimetres. At what angle does the timber need to be cut?

Question 16
A roof truss has a pitch of 28° as illustrated. The altitude of this truss, AB, is given as \( x \) millimetres.

How much timber is required to build one roof truss, correct to the nearest millimetre?

Question 17
The following set of scores shows the results in a university chemistry examination.

\[
\begin{align*}
21 & \quad 45 & \quad 29 & \quad 27 & \quad 19 & \quad 35 & \quad 23 & \quad 58 & \quad 34 & \quad 27
\end{align*}
\]

Use the formula \( \text{mean} = \frac{\sum x}{n} \) to find the mean score. Answer to 2 decimal places.
**Question 18**

The data below give the time taken (in minutes) for each of 30 runners on a 10 km fun run. Prepare a stem-and-leaf diagram for the data.

<table>
<thead>
<tr>
<th>36</th>
<th>42</th>
<th>52</th>
<th>38</th>
<th>47</th>
<th>59</th>
<th>72</th>
<th>68</th>
<th>57</th>
<th>82</th>
</tr>
</thead>
<tbody>
<tr>
<td>66</td>
<td>75</td>
<td>45</td>
<td>42</td>
<td>55</td>
<td>38</td>
<td>42</td>
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<tr>
<td>42</td>
<td>58</td>
<td>40</td>
<td>41</td>
<td>47</td>
<td>53</td>
<td>68</td>
<td>43</td>
<td>39</td>
<td>48</td>
</tr>
</tbody>
</table>

**Question 19**

Researchers from the major petrol providers surveyed a random sample of Gold Coast residents about their preference for each of three types of petrol commonly found at service stations in the Gold Coast metropolitan area. The results have been summarised in the following two graphs.

(a) Explain why the columns for Eco petrol have different sizes in the two graphs.

(b) In recent advertising on the internet and television, those petrol companies promoting the sale of Regular petrol over other types used Graph 2 in their promotions instead of Graph 1. Explain why they did this.
Question 20
The stem-and-leaf plot shows the mass of 30 sailfish caught in a recent fishing competition.

(a) Use your graphics calculator to determine the five number summary for the data set.
(b) Using your five number summary, draw a box-and-whisker plot.

<table>
<thead>
<tr>
<th>Stem</th>
<th>Leaf</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>4 8 8</td>
</tr>
<tr>
<td>16</td>
<td>1 3 3 6 8</td>
</tr>
<tr>
<td>17</td>
<td>0 0 1 4 7 9 9 9</td>
</tr>
<tr>
<td>18</td>
<td>1 2 3 3 5 7 8 8 9</td>
</tr>
<tr>
<td>19</td>
<td>2 7 8</td>
</tr>
<tr>
<td>20</td>
<td>0 2</td>
</tr>
</tbody>
</table>

Question 21
A building plan has a scale of 1 : 100. What is the actual length of a wall that measures 36 millimetres on the plan.

Question 22
A map has a scale of 1 : 150000. What length on the map is represented by 34 kilometres, the distance from Coomera to Jacobs Well.

Question 23
The tiny animal illustrated below, called a chydorus, lives in freshwater ponds.

The length of the chydorus is measured from A to B. In the diagram, AB is 48 mm long. What is the length of the chydorus?
Instrument-specific criteria and standards

Schools draw instrument-specific criteria and standards from the syllabus dimensions and exit standards. Schools will make judgments about the match of qualities of student responses with the standards descriptors that are specific to the particular assessment instrument. While all syllabus exit descriptors might not be assessed in a single assessment instrument, across the course of study, opportunities to demonstrate all the syllabus dimensions and standards descriptors must be provided.

The assessment instrument presented in this document provides opportunities for the demonstration of the following criteria:

- Knowledge and procedures
- Communication and justification.

This document provides information about how the qualities of the indicative response match the relevant instrument-specific criteria and standards at standard A. The standard A descriptors are presented below. The complete set of instrument-specific criteria and standards is in the appendix.

<table>
<thead>
<tr>
<th>Standard A</th>
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<tbody>
<tr>
<td>Knowledge and procedures</td>
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<td>Communication and justification</td>
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<tr>
<td>Standard descriptors</td>
</tr>
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<td>----------------------------------------------------------</td>
</tr>
<tr>
<td>Use of given rules and formulas in simple rehearsed situations</td>
</tr>
<tr>
<td>Question 1</td>
</tr>
<tr>
<td>(a) - j</td>
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<td>Question 2</td>
</tr>
<tr>
<td>(c) 8.286</td>
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<tr>
<td>Question 3</td>
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<td>(a) 85°</td>
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<tr>
<td>Question 4</td>
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<tr>
<td>(c) numerical and discrete</td>
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<td>Question 5</td>
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<tr>
<td>(b) 5</td>
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<tr>
<td>Question 6</td>
</tr>
<tr>
<td>(b) 23</td>
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<td>Question 7</td>
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<td>(c) 5</td>
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<td>Standard descriptors</td>
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<tr>
<td>Use of rules and formulas in complex situations</td>
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<td></td>
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<tr>
<td>Use of rules and formulas in simple routine situations</td>
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<td>Use of given rules and formulas in simple rehearsed situations</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Use of mathematical terminology and conventions in simple rehearsed situations</td>
</tr>
</tbody>
</table>
|                     | \[
\begin{align*}
\text{base}^2 + \text{height}^2 &= \text{hypotenuse}^2 \\
2.4^2 + h^2 &= 7.9^2 \\
h^2 &= 7.9^2 - 2.4^2 \\
&= 56.65 \\
h &= 7.5 \text{m}
\end{align*}
\] |
|                     | Question 12 |
|                     | \[
\begin{align*}
\sin \theta &= \frac{\text{opp}}{\text{hyp}} \\
\sin 64^\circ &= \frac{x}{5} \\
x &= 5 \sin 64^\circ \\
&= 4.5 \text{m}.
\end{align*}
\] |
Standard descriptors | Indicative response A

**Use of rules and formulas in simple routine situations**

**Question 13**

\[ \tan \theta = \frac{opp}{adj} \]

\[ \tan 71 = \frac{x}{51} \]

\[ x = 51 \tan 71 \]

\[ = 148 \text{ mm} \]

**Question 14**

\[ \tan \theta = \frac{opp}{adj} \]

\[ \tan 59 = \frac{h}{3.6} \]

\[ h = 3.6 \tan 59 \]

\[ = 6 \text{ m} \]

**Question 15**

\[ \cos \theta = \frac{adj}{hyp} \]

\[ \cos \theta = \frac{58}{256} \]

\[ \theta = \cos^{-1} \left( \frac{58}{256} \right) \]

\[ = 36.7^\circ \]
Accurate and appropriate use of mathematical terminology in complex routine situations

Accurate use of rules and formulas in complex situations

Use of mathematical reasoning to develop logical sequences in complex routine situations using mathematical language

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**Indicative response A**

**Question 16**

![Diagram of a triangle with labels](image)

\[
\tan \theta = \frac{opp}{adj} \\
\tan 28 = \frac{3450}{x} \\
x = \frac{3450 \tan 28}{1} = 1834 \text{ mm}.
\]

\[
\cos \theta = \frac{adj}{hyp} \\
\cos 28 = \frac{60828}{h} \\
h = \frac{60828}{1} = 4813 \text{ mm}
\]

Total length = \(4813 + 6900 + 1834 = 18360 \text{ mm}\)
### Use of given rules and formulas in simple routine situations

**Question 17**

\[
\text{mean} = \frac{\sum x}{n}
\]

\[= \frac{318}{10} = 31.8\]

**Question 18**

<table>
<thead>
<tr>
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<th>Leaf</th>
</tr>
</thead>
<tbody>
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<td>7</td>
<td>25</td>
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<tr>
<td>8</td>
<td>2</td>
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</table>

**Key** 316 represents 36 minutes
<table>
<thead>
<tr>
<th>Standard descriptors</th>
<th>Indicative response A</th>
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<tr>
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<td>Accurate use of rules and formulas in complex situations</td>
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<td>Analysis and translation of information displayed from one representation to another in complex routine situations</td>
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<td>Use of rules and formulas in simple situations</td>
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</table>

**Question 19**

a) The vertical scale for graph 2 does not start at 0.

b) Graph 2 exaggerates the difference between regular petrol and the other types.

**Question 20**

```
lower 154
Q1 168
median 179
Q3 188
upper 202.
```

**Question 21**

```
Drawing length : actual length

\( \frac{1}{5} : 100 \)

\( 36 \text{ mm} : 36 \times 100 \text{ mm} \)

\( 36 \text{ mm} : 3600 \text{ mm} \)

\( 3600 \text{ mm} = 360 \text{ cm} \)

\( = 3.6 \text{ m} \)
```
<table>
<thead>
<tr>
<th>Standard descriptors</th>
<th>Indicative response A</th>
</tr>
</thead>
</table>
| Use of rules and formulas in complex situations | **Question 22**
Drawing length : actual length
\[ \frac{\text{1}}{\text{150 000}} \]
0.26 km : 34 km
3.6 cm : 340 000 cm
\[ 3.6 \text{ km} = 3 400 \text{ m} = 3 400 000 \text{ cm} \]
34 km is represented by 3.6 cm on the map |
| Accurate and appropriate use of mathematical terminology and conventions in complex routine situations |
| Accurate use of rules and formulas in complex situations | **Question 23**
Drawing length : actual length
\[ \frac{\text{160}}{\text{1}} \]
4.8 mm : 0.3 mm.
The actual length is 0.3 mm |
**Instrument-specific criteria and standards**

<table>
<thead>
<tr>
<th>Standard A</th>
<th>Standard B</th>
<th>Standard C</th>
<th>Standard D</th>
<th>Standard E</th>
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<td>routine situations</td>
<td>situations</td>
<td>situations</td>
</tr>
<tr>
<td></td>
<td>• use of mathematical reasoning</td>
<td>• use of mathematical reasoning</td>
<td>• development of logical sequences</td>
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<td></td>
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<td>to develop logical sequences in</td>
<td>in simple routine situations</td>
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<td>situations using everyday</td>
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<td>and/or mathematical language</td>
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<td>and/or mathematical language</td>
<td>translation of information</td>
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