Data test (10%)
This sample has been compiled by the QCAA to assist and support teachers in planning and
developing assessment instruments for individual school settings.

Assessment objectives
This assessment instrument is used to determine student achievement in the following
objectives:

2. apply understanding of the reef and beyond or changes on the reef to given algebraic,
   visual or graphical representations of scientific relationships and data to determine unknown
   scientific quantities

3. analyse evidence about the reef and beyond or changes on the reef to identify trends,
   patterns, relationships, limitations or uncertainty in datasets

4. interpret evidence about the reef and beyond or changes on the reef to draw conclusions
   based on analysis of datasets.

Note: Objectives 1, 5, 6 and 7 are not assessed in this instrument.
<table>
<thead>
<tr>
<th>Subject</th>
<th>Marine Science</th>
<th>Instrument no.</th>
<th>IA1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technique</td>
<td>Data test</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unit</td>
<td>Unit 3: Marine systems — connections and change</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Topic</td>
<td>Not Specific</td>
<td></td>
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</tr>
</tbody>
</table>

### Conditions

<table>
<thead>
<tr>
<th>Response type</th>
<th>Short response</th>
<th>Supervised exam conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>60 minutes</td>
<td>Perusal 10 minutes</td>
</tr>
</tbody>
</table>
| Other         | • Length: up to 500 words in total, consisting of  
  - short responses, i.e. sentence or short paragraphs  
  - written paragraphs, 50–250 words per item  
  - other types of item responses, e.g. interpreting and calculating, should allow  
    students to complete the response in the set time  
• Queensland-approved graphics calculator permitted  
• Unseen stimulus |

### Instructions

Use the datasets to respond to the associated items in the spaces provided. Each item is associated with the dataset that immediately precedes it.

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Marks allocated</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data test</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Assessment objectives 2, 3, 4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Total**: 10
<table>
<thead>
<tr>
<th>Dataset</th>
<th>Item</th>
<th>Objective</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Apply understanding</td>
<td>Analyse evidence</td>
<td>Interpret evidence</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>2</td>
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<tr>
<td></td>
<td>6</td>
<td>2</td>
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<tr>
<td></td>
<td>7</td>
<td>2</td>
<td></td>
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</tr>
<tr>
<td>3</td>
<td>8</td>
<td>2</td>
<td></td>
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<tr>
<td></td>
<td>9</td>
<td>2</td>
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<tr>
<td></td>
<td>10</td>
<td>2</td>
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<tr>
<td>Total</td>
<td>6</td>
<td>6</td>
<td>8</td>
<td>20</td>
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</tr>
<tr>
<td>Percentage</td>
<td>30%</td>
<td>30%</td>
<td>40%</td>
<td>100%</td>
<td></td>
</tr>
</tbody>
</table>
Students used the colour chart in Figure 1 to record the health of different types of corals. On a scale of 1 (bleached) to 6 (healthy) the average coral colour score is plotted against temperature in Graph 1.

Source: https://www.coralwatch.org/web/guest;jsessionid=BE64714E7EA93A2FA3ECB9845DAE5BD
<table>
<thead>
<tr>
<th>Item 1 (apply understanding)</th>
<th>2 marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Determine the:</td>
<td></td>
</tr>
<tr>
<td>a. average colour score of a plate coral at 28.5 degrees Celsius (to 1 decimal place).</td>
<td></td>
</tr>
<tr>
<td>Answer:</td>
<td>(1 decimal place)</td>
</tr>
<tr>
<td>b. temperature at which soft coral has an average colour score of 2 (to 1 decimal place).</td>
<td>9°C</td>
</tr>
<tr>
<td>Answer:</td>
<td>(1 decimal place)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Item 2 (analyse evidence)</th>
<th>2 marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identify the relationship between coral colour score and temperature:</td>
<td></td>
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<tr>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Item 3 (interpret evidence)</th>
<th>2 marks</th>
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</thead>
<tbody>
<tr>
<td>Predict the relative bleaching of plate coral and boulder coral at 33 degrees Celsius. Give reasons for your prediction.</td>
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</tbody>
</table>
The growth rate of 3 different species of *Acropora* coral was measured in centimetres per year at two reef locations. Reef A was 50 metres from a dredged channel, reef B was 5 km from a dredged channel.

The growth rates measured are presented in the table below along with the calculated P-Values for the data sets for each coral species.

<table>
<thead>
<tr>
<th><em>Acropora</em> Sp.</th>
<th>Reef A Growth (cm per year)</th>
<th>Reef B Growth (cm per year)</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10</td>
<td>15</td>
<td>0.1</td>
</tr>
<tr>
<td>2</td>
<td>12</td>
<td>16</td>
<td>0.01</td>
</tr>
<tr>
<td>3</td>
<td>8</td>
<td>10</td>
<td>0.001</td>
</tr>
</tbody>
</table>

**Source:** University of Queensland

**Item 4 (apply understanding) 2 marks**

**Determine** which *Acropora Sp.* shows the least difference in growth rate between reef A and reef B. Give reasons for your answer

**Calculate** the difference in the average annual growth rate for all corals on Reef A and Reef B. Show your working.
<table>
<thead>
<tr>
<th>Item 5 (analyse evidence)</th>
<th>2 marks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Contrast</strong> the growth rate of the three <em>Acropora</em> species at Reef A and Reef B.</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Item 6 (interpret evidence)</th>
<th>2 marks</th>
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</thead>
<tbody>
<tr>
<td><strong>Infer</strong> from the table above what affect dredging has on species 1 and species 3. Give reasons for your answer.</td>
<td></td>
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<tr>
<td>Species 1.</td>
<td></td>
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<td></td>
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<tr>
<td>Species 3.</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Item 7 (interpret evidence)</th>
<th>2 marks</th>
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<tbody>
<tr>
<td><strong>Draw a conclusion</strong> about what the different P-Values show with regard to the effects of dredging on Species 2 and Species 3. Give reasons for your conclusion.</td>
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</table>
Item 8 (apply understanding) 2 marks

Calculate the following:

a. The % of all surveyed reefs that were severely bleached. Show your working.

Answer: ______________ %
b. The number of reefs not bleached in the Southern and Central Sectors.

<table>
<thead>
<tr>
<th>Item 9 (analyse evidence)</th>
<th>2 marks</th>
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</thead>
<tbody>
<tr>
<td><strong>Contrast</strong> the % of reefs severely bleached and not bleached across the 3 sectors.</td>
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</table>

<table>
<thead>
<tr>
<th>ITEM 10 (interpret evidence)</th>
<th>2 marks</th>
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</thead>
<tbody>
<tr>
<td><strong>Draw a conclusion</strong> about why the levels of severely bleached corals differ across the three survey regions. Give reasons for your conclusion.</td>
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</table>

END OF PAPER
## Instrument-specific marking guide (ISMG)

### Criterion: Data test

#### Assessment objectives

2. apply understanding of the reef and beyond or changes on the reef to given algebraic, visual or graphical representations of scientific relationships and data to determine unknown scientific quantities

3. analyse evidence about the reef and beyond or changes on the reef to identify trends, patterns, relationships, limitations or uncertainty in datasets

4. interpret evidence about the reef and beyond or changes on the reef to draw conclusions based on analysis of datasets

<table>
<thead>
<tr>
<th>The student work has the following characteristics:</th>
<th>Cut-off</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>• consistent demonstration, across a range of scenarios about the reef and beyond or changes on the reef, of</td>
<td></td>
<td></td>
</tr>
<tr>
<td>− selection and correct application of scientific concepts, theories, models and systems to predict outcomes, behaviours and implications</td>
<td>&gt; 90%</td>
<td>10</td>
</tr>
<tr>
<td>− correct calculation of quantities through the use of algebraic, visual and graphical representations of scientific relationships and data</td>
<td>&gt; 80%</td>
<td>9</td>
</tr>
<tr>
<td>− correct and appropriate use of analytical techniques to correctly identify trends, patterns, relationships, limitations and uncertainty</td>
<td></td>
<td></td>
</tr>
<tr>
<td>− correct interpretation of evidence to draw valid conclusions.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| • consistent demonstration, in scenarios about the reef and beyond or changes on the reef, of                          |          |       |
|   − selection and correct application of scientific concepts, theories, models and systems to predict outcomes, behaviours and implications | > 70%    | 8     |
|   − correct calculation of quantities through the use of algebraic, visual and graphical representations of scientific relationships and data | > 60%    | 7     |
|   − correct use of analytical techniques to correctly identify trends, patterns, relationships, limitations and uncertainty |          |       |
|   − correct interpretation of evidence to draw valid conclusions.                                                    |          |       |

| • adequate demonstration, in the reef and beyond or changes on the reef, of                                         |          |       |
|   − selection and correct application of scientific concepts, theories, models and systems to predict outcomes, behaviours and implications | > 50%    | 6     |
|   − correct calculation of quantities through the use of algebraic, visual and graphical representations of scientific relationships and data | > 40%    | 5     |
|   − correct use of analytical techniques to correctly identify trends, patterns, relationships, limitations and uncertainty |          |       |
|   − correct interpretation of evidence to draw valid conclusions.                                                  |          |       |

| • demonstration, in scenarios about the reef and beyond or changes on the reef, of elements of                        |          |       |
|   − selection and correct application of scientific concepts, theories, models and systems to predict outcomes, behaviours and implications | > 30%    | 4     |
- correct calculation of quantities through the use of algebraic, visual or graphical representations of scientific relationships or data
- correct use of analytical techniques to correctly identify trends, patterns, relationships, limitations or uncertainty
- correct interpretation of evidence to draw valid conclusions.

<table>
<thead>
<tr>
<th>The student work has the following characteristics:</th>
<th>Cut-off</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>• demonstration, in scenarios about the reef and beyond or changes on the reef, of elements of</td>
<td>&gt; 20%</td>
<td>3</td>
</tr>
<tr>
<td>- application of scientific concepts, theories, models or systems to predict outcomes, behaviours or implications</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- calculation of quantities through the use of algebraic or graphical representations of scientific relationships and data</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- use of analytical techniques to identify trends, patterns, relationships, limitations or uncertainty</td>
<td>&gt; 10%</td>
<td>2</td>
</tr>
<tr>
<td>- interpretation of evidence to draw conclusions.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• does not satisfy any of the descriptors above.</td>
<td>≤ 1%</td>
<td>0</td>
</tr>
</tbody>
</table>