

Essential Mathematics 2019 v1.1

IA4 sample marking scheme

August 2022

Examination

This sample has been compiled by the QCAA to model one possible approach to allocating marks in an examination. It matches the examination mark allocations as specified in the syllabus (~80% simple familiar, ~10% complex familiar and ~10% complex unfamiliar) and ensures that a balance of the objectives are assessed.

Assessment objectives

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

1. select, recall and use facts, rules, definitions and procedures drawn from all Unit 4 topics
2. comprehend mathematical concepts and techniques drawn from all Unit 4 topics
3. communicate using mathematical, statistical and everyday language and conventions
4. evaluate the reasonableness of solutions
5. justify procedures and decisions by explaining mathematical reasoning
6. solve problems by applying mathematical concepts and techniques drawn from all Unit 4 topics.

Instrument-specific standards

| Foundational knowledge and problem-solving | Cut-off | Grade |
|---|---------|-----------|
| The student work has the following characteristics: | | |
| <ul style="list-style-type: none"> comprehensive selection, recall and use of simple and complex facts, rules, definitions and procedures; comprehension and clear communication of simple and complex mathematical concepts and techniques; evaluation of the reasonableness of solutions and use of mathematical reasoning to justify procedures and decisions; and proficient application of simple and complex mathematical concepts and techniques to solve problems. | > 80% | A |
| <ul style="list-style-type: none"> selection, recall and use of simple and some complex facts, rules, definitions and procedures; comprehension and communication of simple and some complex mathematical concepts and techniques; evaluation of the reasonableness of some solutions using mathematical reasoning; and application of simple and some complex mathematical concepts and techniques to solve problems. | > 60% | B |
| <ul style="list-style-type: none"> selection, recall and use of simple facts, rules, definitions and procedures; comprehension and communication of simple mathematical concepts and techniques; discussion of the reasonableness of solutions using mathematical reasoning; and application of simple mathematical concepts and techniques to solve problems. | > 40% | C* |
| <ul style="list-style-type: none"> some selection, recall and use of facts, rules, definitions and procedures; basic comprehension and communication of mathematical concepts and techniques; some discussion of the reasonableness of solutions; and inconsistent application of mathematical concepts and techniques. | > 20% | D |
| <ul style="list-style-type: none"> isolated and inaccurate selection, recall and use of facts, rules, definitions and procedures; disjointed and unclear communication of mathematical concepts and techniques; superficial discussion of the reasonableness of solutions. | ≥ 0% | E |

* Equivalent to > 50% for Part A simple questions only.

Task

See the IA4 sample assessment instrument: Examination (available on the [QCAA Portal](#)).

Sample marking scheme

| Criterion | Grade awarded |
|---|---------------|
| Foundational knowledge and problem-solving Assessment objectives 1, 2, 3, 4, 5, 6 | — |

The annotations are written descriptions of the expected response for each question and are related to the assessment objectives.

| | | | | | | | | | | | | |
|---|---|--|---|-------|---|---|--|------|---|---|-------|---|
| <p>Note: ✓ = $\frac{1}{2}$ mark</p> <p>1a. recall and use the Cartesian coordinate system for labelling the position of a point</p> <p>1b. communicate players' identities by labelling the points</p> <p>2. comprehend the use of a function that describes the relationship between taxi fare and distance recall and use substitution skills to solve a practical problem</p> | <h2>Marking scheme</h2> <h3>Part A: simple</h3> <h4>Question 1 (SF 3 marks)</h4> <p>a. C (5, 4) ✓✓ b.</p> <p>Coordinates for Adam (A) ✓✓ Coordinates for Ben (B) ✓✓</p> <h4>Question 2 (SF 2 marks)</h4> <table border="1"> <tbody> <tr> <td>total distance, D (km)</td> <td>0</td> <td>1</td> <td>2</td> <td>5</td> </tr> <tr> <td>total fare, C (\$)</td> <td>4 ✓✓</td> <td>6</td> <td>8</td> <td>14 ✓✓</td> </tr> </tbody> </table> <h4>Question 3 (SF 3 marks)</h4> <p>Person A: positive ✓ linear ✓ moderate ✓</p> <p>Person B: negative ✓ non-linear ✓ strong ✓</p> | total distance, D (km) | 0 | 1 | 2 | 5 | total fare, C (\$) | 4 ✓✓ | 6 | 8 | 14 ✓✓ | <p>3. select and recall definitions comprehend and communicate the association between two numerical variables, in terms of direction, form and strength, using mathematical language</p> |
| total distance, D (km) | 0 | 1 | 2 | 5 | | | | | | | | |
| total fare, C (\$) | 4 ✓✓ | 6 | 8 | 14 ✓✓ | | | | | | | | |

4a.

recall definitions to identify the dependent and independent variables

4b.

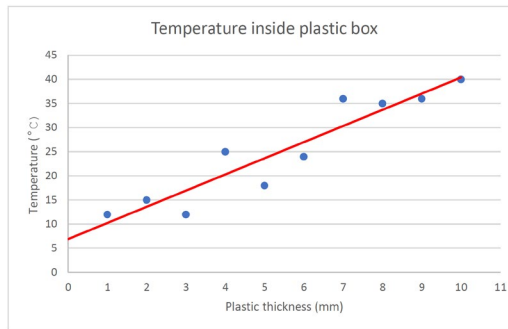
sketch of line is appropriately communicated, including use of ruler

use of procedure to appropriately place the line

Question 4 (SF 4 marks)

- a. Dependent: temperature ✓✓
Independent: plastic thickness ✓✓
- b.

✓✓
✓✓



Question 5 (SF 5 marks)

- a. Total students = 5000 ✓✓
P (student has one pet) = $\frac{784}{5000}$ ✓
= 0.1568 ✓
≈ 0.16 ✓
- b. Total students with fewer than two pets = 784 + 3790
= 4574 ✓✓
P (student has fewer than two pets) = $\frac{4574}{5000}$ ✓
= 0.9148 ✓
≈ 0.91 ✓

5.

recall and use definitions to determine total possible outcomes

use definition to determine each probability

use correct rounding to two decimal places

6a.

use procedure to list all possible outcomes of the experiment

communicate sample space appropriately

Question 6 (SF 6 marks)

a.

| | | |
|------------|------------|------------|
| Tails, A ✓ | Tails, B ✓ | Tails, C ✓ |
| Heads, A ✓ | Heads, B ✓ | Heads, C ✓ |

- b. i. P (Tails and A) = $\frac{1}{6}$ ✓✓
- ii. P (Heads and (B or C)) = $\frac{1}{6} + \frac{1}{6}$ ✓✓ = $\frac{2}{6}$ ✓ = $\frac{1}{3}$ ✓

6b.

use definition to determine total possible outcomes

use definition to determine each probability

7a.

use simple interest rule to determine total interest earned, including use of units

Question 7 (SF 4 marks)

- a. $I = Pin$
 $I = 500 \times 5 \times 0.075$ ✓✓
 $I = \$187.50$ ✓
- b. $A = 500 + 187.50$ ✓✓
 $A = \$687.50$ ✓
The most expensive dress Carrie could afford would be \$687.50. ✓

7b.

use definition to determine total amount in account

communicate cost of dress

8a.

communicate information by developing a tree diagram to show possible outcomes

8b.

use the tree diagram to determine the possible outcomes for the experiment

9a.

recall the use of line of best fit to make predictions by interpolation

9c.

recall and use facts about how to recognise the dangers of extrapolation

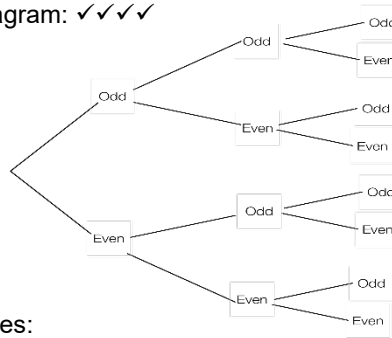
10.

select, recall and use procedures

comprehend the need to find distances of the suburbs from the Brisbane CBD

Question 8 (SF 5 marks)

a. Tree diagram: ✓✓✓✓



b. Outcomes:

EEE *OEE*
EEO *OEO*
EOE *OOE*
EOO *OOO* ✓✓

c. Number of favourable outcomes = 3 ✓✓

$$P(\text{exactly two odd numbers}) = \frac{3}{8} \quad \checkmark \checkmark$$

Part B: complex

Question 9 (CF 4 marks)

- a. i. Accept answers between 340–350 cm ✓✓
 ii. Accept answers between 6 min 20 s – 6 min 40 s ✓✓
- b. Reference is made to extrapolating the line of best fit, which extends to 13 minutes and shows that the prediction is reasonable. ✓✓
- c. The trend may not continue in the same pattern when the water goes lower than 100 cm; errors reading values at both intercepts; misreading data points on grid through extrapolation, etc. ✓✓

Question 10 (CU 4 marks)

The distances from the CBD to each of the six suburbs are measured using a ruler.

| Suburb | Distance from CBD (cm) | Median price (in million dollars) |
|-------------------|------------------------|-----------------------------------|
| Graceville | 4.1 | 1.3475 |
| Banyo | 6.1 | 0.8155 |
| Holland Park West | 3.7 | 1.1625 |
| Eight Mile Plains | 7.1 | 1.065 |
| Calamvale | 9.1 | 0.871 |
| Hendra | 3.8 | 1.5235 |

✓✓

8c.

recall and use rules and definitions to determine probability

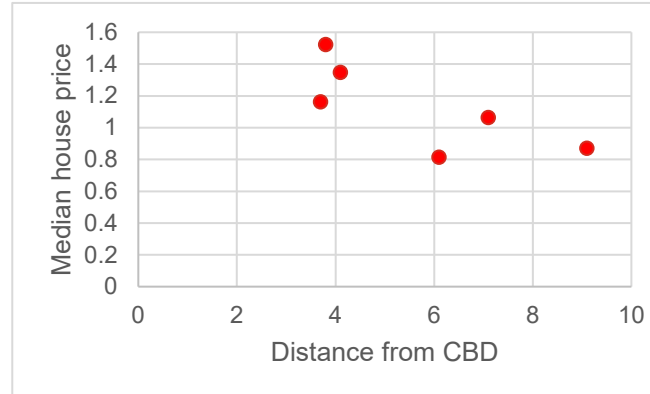
9b.

evaluate the reasonableness of the prediction by extrapolation

comprehend the need to compare distances and price data

The data is used to produce a scatterplot comparing distances from Brisbane CBD (in km) and median house prices for the six suburbs (in million dollars) as shown below.

communicate information by translating to an appropriate mathematical representation



communicate outcome of analysis

Students explain mathematical reasoning, referring to:

- the scatterplot, which indicates a moderately weak strength between median house prices and distances from the Brisbane CBD ✓
- the slight negative gradient/correlation, which indicates that house prices get cheaper as you move further away from the CBD; however, there is significant variation. ✓

evaluate the reasonableness of the statement

Students make a determination as to whether the statement is reasonable, e.g.:

justify decisions using descriptions that are associated with two numerical variables

- the real estate agent can be refuted, as there is not a strong correlation between median house prices and corresponding distances from the Brisbane CBD
- the statement is reasonable, as even though there is significant variation (a low correlation), it is negative, which indicates that, on average, the median price increases the closer a house is to the CBD. ✓✓



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