

Essential Mathematics 2019 v1.1

Unit 2 sample marking scheme

October 2021

Examination

This sample has been compiled by the QCAA to model one possible approach to allocating marks in an examination.

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 2 topics
2. comprehend mathematical concepts and techniques drawn from all Unit 2 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 2 topics.

Task

See Unit 2 sample assessment instrument: Examination (available on the [QCAA Portal](#)).

Sample marking scheme

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

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| <p>Note: ✓ = $\frac{1}{2}$ mark</p> <p>1. select, recall and use the concept of wage earning</p> <p>2. select, recall and use the concept of piece-work earning</p> <p>4. comprehend the concept of time between</p> <p>6. select, recall and use the speed formula</p> <p>comprehend the concept of average speed</p> | <h3>Marking scheme</h3> <h4>Part A: simple</h4> <p>Question 1 (SF 2 marks)</p> <p>Alex's earning = $\\$12.66 \times 38$ ✓✓</p> <p style="padding-left: 40px;">= $\\$481.08$ ✓✓</p> <p>Question 2 (SF 2 marks)</p> <p>Amount paid = $\frac{2400}{300} \times \\8 ✓✓</p> <p style="padding-left: 40px;">= $\\$64$ ✓✓</p> <p>Question 3 (SF 1 mark)</p> <p>2:45 pm ✓✓</p> <p>Question 4 (SF 1 mark)</p> <p>3 hours and 25 minutes ✓✓</p> <p>Question 5 (SF 2 marks)</p> <p>Perth time = Brisbane time (– 3 hours)</p> <p style="padding-left: 40px;">= 6:15 pm (– 3 hours) ✓✓</p> <p style="padding-left: 40px;">= 3:15 pm ✓✓</p> <p>Question 6 (SF 2 marks)</p> <p>Speed = $\frac{\text{Distance}}{\text{Time}}$</p> <p style="padding-left: 40px;">= $\frac{714}{8.5}$ ✓✓</p> <p style="padding-left: 40px;">= 84 km/hr ✓✓</p> | <p>3. comprehend the concept of time representation</p> <p>5. select, recall and use the concept of time notation</p> <p>comprehend the concept of time ahead</p> |
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7.
select, recall and
use percentages

comprehend the
concept of
commission

8.
comprehend the
concepts of target
population, sample
and census

10a.
comprehend the
need to calculate
how long the
energy will last

10b.
select and use the
conversion of
kilojoules to
calories including
rounding

11.
comprehend the
need to calculate
the real distance
from a scale factor
(using leading-digit
approximation)

12a.
describe sources of
error in surveys by
communicating in
everyday language

12b.
describe fault in the
process of
collecting data by
communicating in
everyday language

Question 7 (SF 2 marks)

$$\text{Commission} = 4.5\% \times \text{sales}$$

$$= 0.045 \times \$14\,790 \checkmark\checkmark$$

$$= \$665.55 \checkmark\checkmark$$

Question 8 (SF 2 marks)

- The shoppers in a grocery store $\checkmark\checkmark$
- Sampling $\checkmark\checkmark$

Question 9 (SF 1 mark)

27 minutes $\checkmark\checkmark$

Question 10 (SF 4 marks)

a. $\text{Time} = \frac{832}{104} \times 5 \checkmark\checkmark$
 $= 40 \text{ minutes } \checkmark\checkmark$

b. $\text{No. of calories} = \frac{832}{4 \cdot 184} \checkmark\checkmark$
 $= 198.85 \checkmark$
 $\approx 199 \text{ calories } \checkmark$

Question 11 (SF 3 marks)

$$\text{Actual distance} = \text{map distance} \times \text{scale factor}$$

$$= 7 \times 3\,000\,000 \checkmark\checkmark$$

$$= 21\,000\,000 \text{ cm } \checkmark\checkmark$$

$$= 210 \text{ km } \checkmark\checkmark$$

Question 12 (SF 4 marks)

- Two of: $\checkmark\checkmark\checkmark\checkmark$
 - Timeframe not given in the question, i.e. per day/per week
 - First 3 options are not mutually exclusive, e.g. up to 1 hour is also up to 2 hours
 - No option for answer between 3 and 4 hours
- 'A selection from the school roll' option allows for a random sample to be chosen from all students, across year levels and gender. $\checkmark\checkmark$
All other options have elements of bias in their sampling methods $\checkmark\checkmark$, that is, 'Your class' option has students who would be of similar ages, 'The athletics team' option has students who may have

9.
comprehend the
concept of digital
representation and
time difference

similar interests and 'The teachers' option is not even a student group.

Question 13 (SF 4 marks)

13a.
comprehend the need to calculate a quarter of income for food allowance

a. Food allowance = $\frac{1}{4} \times \text{net income}$

$$= \frac{1}{4} \times \$47\,944 \checkmark\checkmark$$

$$= \$11\,986 \checkmark\checkmark$$

13b.
select, recall and use the conversion of annual to weekly

b. Weekly food allowance = $\frac{\text{Annual allowance}}{52}$

$$= \frac{11\,986}{52} \checkmark\checkmark$$

$$= \$230.50 \checkmark\checkmark$$

14.
comprehend purpose of table and translate table information to an appropriate mathematical representation

Question 14 (SF 2 marks)

a. The trains depart from Central Station every 30 minutes. $\checkmark\checkmark$

b. The last train on Sunday from Helensvale is at 10:54 pm. $\checkmark\checkmark$

15a.
comprehend the need to calculate hourly rate

Question 15 (SF 6 marks)

a. Hourly rate = $\frac{\$1406}{38} \checkmark\checkmark$

$$= \$37 / \text{hour} \checkmark\checkmark$$

15b.
comprehend the need to calculate total earnings from different rates of pay

b. Ordinary hourly rate = \$37

$$\text{Time-and-a-half rate} = 1.5 \times \$37 \checkmark\checkmark$$

$$= \$55.50 \checkmark$$

$$\text{Overtime hours} = 2 (40 - 38) \checkmark$$

The carpenter will be paid 2 hours at time-and-a-half.

justify procedures by describing mathematical thinking

$$\text{Total pay} = \text{ordinary earnings} + \text{overtime earnings}$$

$$= \$1406 + 2 \times \$55.50 \checkmark\checkmark$$

$$= \$1406 + \$111$$

$$= \$1517 \checkmark\checkmark$$

16.
comprehend purpose of table and translate table information to an appropriate mathematical representation

Question 16 (SF 2 marks)

$$9:00 \rightarrow 13:00 = 4 \text{ hours} \checkmark$$

$$13:00 \rightarrow 18:00 = 5 \text{ hours} \checkmark$$

select and recall the need to calculate total number of hours

$$9 \text{ hours} - 30 \text{ minutes} = 8\frac{1}{2} \text{ hours} \checkmark\checkmark$$

Part B: complex

Question 17 (CF 5 marks)

17.

select, recall and use the concept of taxable income

comprehend the need to find combined incomes less deductions

comprehend purpose and translate table information to retrieve and calculate Medicare levy

justify decision by explaining mathematical reasoning

solve problem by making a decision to include the Medicare levy to the total tax

communicate finding in symbolic and everyday language

18.

comprehend complex concept of map scales to determine a straight-line distance

justify decision by explaining mathematical reasoning

evaluate the reasonableness of solutions based on parameters

solve problem by analysing the context of the problem and making a decision

a. Taxable income

= Gross income + other income – allowable deductions

$$= \$63\,720 + \$4560 - \$620 \checkmark$$

$$= \$67\,660 \checkmark$$

Medicare levy = $2\% \times$ Taxable income

$$= 0.02 \times \$67\,660 \checkmark$$

$$= \$1353.20 \checkmark$$

Tax on taxable income

$$= \$3572 + 0.325 \times (\$67\,660 - \$37\,000) \checkmark$$

$$= \$3572 + \$9964.50$$

$$= \$13\,536.50 \checkmark$$

Total tax payable

= Tax on taxable income + Medicare levy

$$= \$13\,536.50 + \$1353.20 \checkmark$$

$$= \$14\,889.70 \checkmark$$

Khuong will need to pay \$14 889.70 in tax based on his taxable income.

b. Khuong has already paid \$13 530.40 in PAYG tax, so he will have to pay:

$$\$14\,889.70 - \$13\,530.40 = \$1359.30 \checkmark \checkmark$$

Question 18 (CU 5 marks)

Approximate scale on map: 1.2 cm : 20 km \checkmark

Map distance = 14.1 cm \checkmark

$$\text{Real-life distance} = 14.1 \times \frac{20}{1.2} \approx 235 \text{ km } \checkmark \checkmark$$

Model **A**: Max distance = $75 \times 3 = 225 \text{ km } \checkmark$

Model **B**: Max speed = $\frac{235}{1.25} = 188 \text{ km/hr } \checkmark$

Max distance evaluated: $225 \text{ km} < 235 \text{ km } \checkmark$

Max speed evaluated: $188 \text{ km/hr} > 150 \text{ km/hr } \checkmark$

Based on the evaluations, neither of the models would qualify for the annual remote-controlled jet plane challenge \checkmark since maximum distance was less than total distance required and maximum speed was much higher than the specified speed. \checkmark

communicate information in symbolic and everyday language

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