Neap

Trial Examination 2022

QCE General Mathematics Units 1&2

Paper 2

SECTION 1

QUESTION 1   (6 marks)

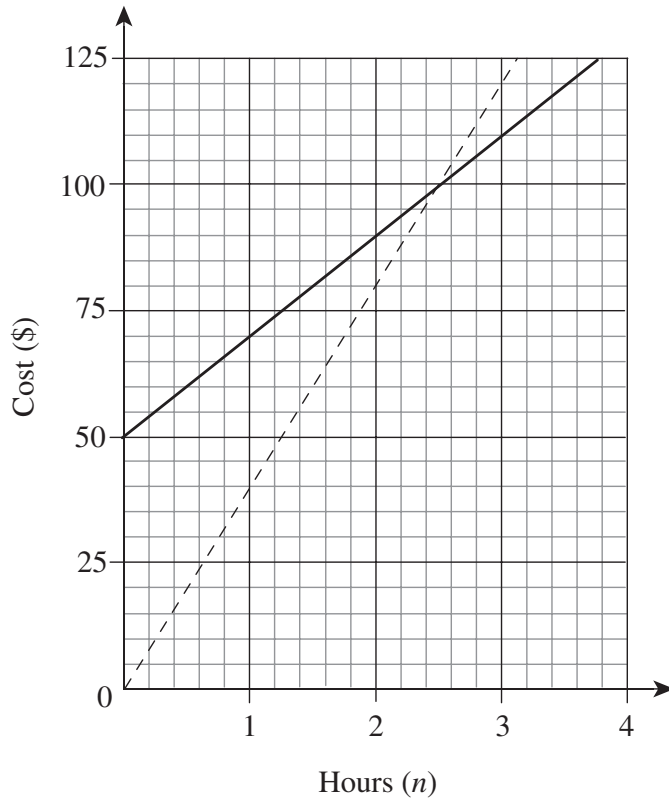a) $C = 50 + 20n$

[1 mark]
1 mark for stating the linear function for company ABC.

b) $C = 40n$

[1 mark]
1 mark for stating the linear function for company XYZ.

c)

[3 marks]
1 mark for giving hours (n) on the horizontal axis, cost ($) on the vertical axis and an evenly spaced, accurate scale.
1 mark for graphing company ABC with the correct y-intercept and slope.
1 mark for graphing company XYZ with the correct y-intercept and slope.
Note: Axes do not need to be labelled to receive full marks.

d)   At the point (2.5, 100) in the graph from part c), the two companies' costs are equal. It is, therefore, cheaper to hire company XYZ when the number of hours needed is less than 2.5 hours.

[1 mark]
1 mark for stating that company XYZ is cheaper to use when the number of hours needed is less than 2.5.
Note: Accept follow-through errors.

QUESTION 2   (5 marks)

a)   first $\begin{bmatrix} 7 \\ 5 \\ 3 \end{bmatrix}$
       second
       third

[1 mark]
1 mark for constructing a column matrix representing the points received.

b) $\begin{bmatrix} 39 & 39 & 47 \\ 33 & 61 & 48 \\ 51 & 25 & 40 \\ 45 & 43 & 33 \end{bmatrix} \times \begin{bmatrix} 7 \\ 5 \\ 3 \end{bmatrix} = \begin{bmatrix} 39 \times 7 + 39 \times 5 + 47 \times 3 \\ 33 \times 7 + 61 \times 5 + 48 \times 3 \\ 51 \times 7 + 25 \times 5 + 40 \times 3 \\ 45 \times 7 + 43 \times 5 + 33 \times 3 \end{bmatrix}$

$= \begin{bmatrix} 609 \\ 680 \\ 602 \\ 629 \end{bmatrix}$

Therefore, the Blue house earns the most points.

[4 marks]
1 mark for stating the matrix multiplication expression.
2 marks for calculating the total points for each school house using matrix multiplication.
Note: Deduct 1 mark for each incorrect element (maximum of 2 marks).
1 mark for stating the school house that earns the most points.

QUESTION 3   (4 marks)

0 0 0 1 1 2 3 3 4 7 | 9 11 13 14 15 17 22 23 31 46

minimum value = 0
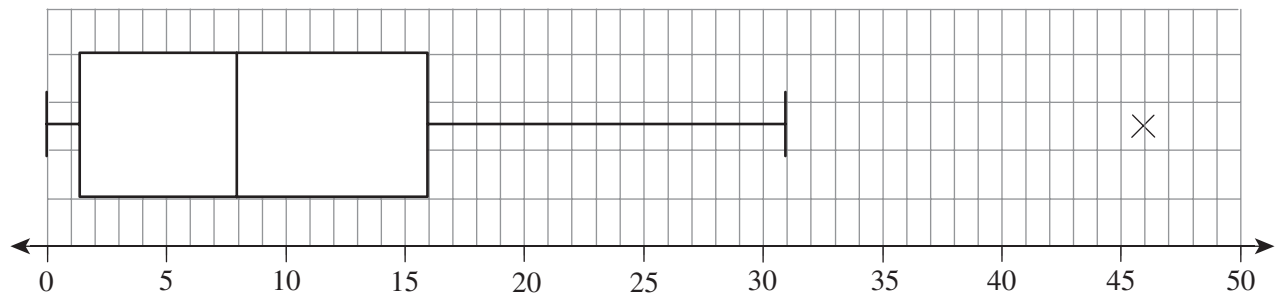
$Q_1 = 1.5$

median = 8

$Q_3 = 16$

maximum value = 46

$$IQR = 16 - 1.5$$
$$= 14.5$$

$$outliers = 1.5 - 1.5 \times 14.5 \leq x \leq 16 + 1.5 \times 14.5$$
$$= -20.25 \leq x \leq 37.75$$

Therefore, 46 is an outlier.

[4 marks]
1 mark for identifying the values of the five-number summary. Note: This may be implied in the box plot.
1 mark for calculating the outlier.
1 mark for identifying the outlier.
1 mark for constructing the box plot.
Note: Allow follow-through errors.

QUESTION 4   (5 marks)

As 1 cm^3 = 1 ml, the formula for volume can be used to determine the capacity of each container.

Volume of container A:

$V = \pi r^2 h$

$\quad = \pi \times (12.5)^2 \times 11$

$\quad = 5399.61 \text{ cm}^3$

Volume of container B:

$V = A h$

$\quad = 16 \times 11 \times 5$

$\quad = 880 \text{ cm}^3$

Number of containers with the dimensions of container B required:

$\dfrac{5399.61}{880} = 6.14$

Therefore, **7 containers are required.**

[5 marks]
1 mark for substituting the dimensions of container A into the formula
for the volume of a cylinder.
1 mark for calculating the volume of container A.
1 mark for calculating the volume of container B.
1 mark for determining how many times container B goes into container A.
1 mark for rounding up the answer to ensure that all the liquid in container A can be
held in containers with the dimensions of container B.

QUESTION 5   (6 marks)

Mean for class B (let B represent the mean of class B):

$$\frac{72 + B}{2} = 68$$

$$72 + B = 2 \times 68$$

$$B = 64$$

Missing value from class B:

$$\frac{23 + 72 + 81 + 56 + 48 + 80 + 83 + 45 + 92 + 66 + 57 + x}{12} = 64$$

$$\frac{703 + x}{12} = 64$$

$$703 + x = 768$$

$$x = 65$$

All results from class B placed in ascending order:

23   45   48   56   57   65   66   72   80   81   83   92

Therefore, the median is 65.5.

[6 marks]
2 marks for calculating the mean for class B.
1 mark for using the method of calculating the mean to determine the missing result.
1 mark for calculating the missing result from class B.
1 mark for ordering the results from class B to determine the median.
1 mark for determining the median for class B.
Note: Allow follow-through marks.

QUESTION 6   (6 marks)

The amount Otto had before the money compounded:

$A = 66\,888.25$

$P = ?$

$i = 2.5\%$ p.a.

$= \dfrac{\dfrac{2.5}{100}}{12}$

$= 0.002083333\ldots$

$n = 2 \text{ years} \times 12$

$= 24$

$$A = P(1+i)^n$$

$$66\,888.25 = P\left(1 + \frac{0.025}{12}\right)^{24}$$

$$\frac{66\,888.25}{\left(1 + \dfrac{0.025}{12}\right)^{24}} = P$$

$$P = 63\,629.38$$

Exchange rate:

$$\frac{63\,629.38}{35\,000} = 1.818$$

$\therefore$ GBP£1 = AUD\$1.818

Evaluating the reasonableness:

£35 000 × 1.818 = \$63 630 in \$AUD on arrival

Put in savings account:

$$A = 63\,630\left(1 + \frac{0.025}{12}\right)^{24}$$

$= \$66\,888.90$ at the end of two years (errors due to rounding)

OR

Exchange rates change frequently and interest rates in savings accounts could change multiple times over the two years.

[6 marks]
1 mark for determining the i and n values for the last two years.Note: This mark may be implied by subsequent working.
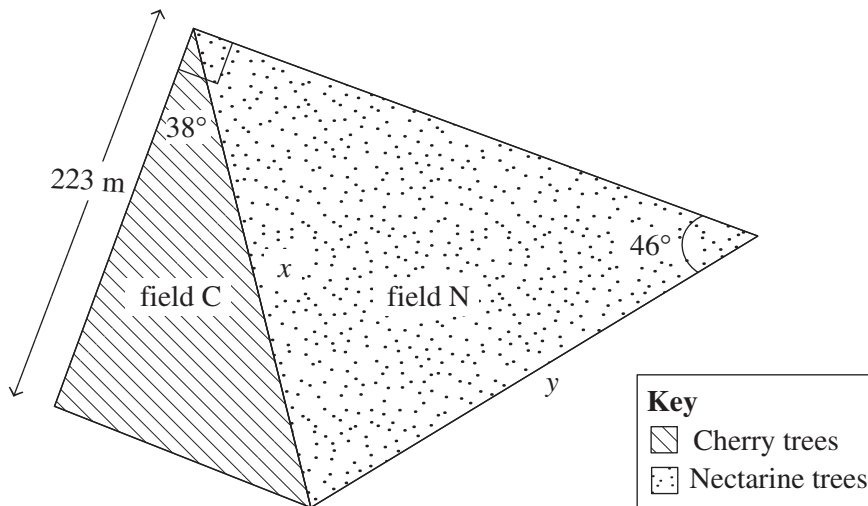*1 mark for selecting the compound interest formula.*
1 mark for determining the amount of money in Australian dollars before it was placed in the savings account.
2 marks for determining the exchange rate that was received when changing from British pounds to Australian dollars.
1 mark for evaluating the reasonableness of the solution.

QUESTION 7   (8 marks)

area of field C $= \dfrac{1458}{667}$

$= 2.1859$ hectares

$= 21\,859.1$ m^2

Common side length of both fields (x):

$$A = \frac{1}{2}bc\sin A$$

$$21\,859.1 = \frac{1}{2} \times 223 \times x \times \sin 38°$$

$$\frac{21\,859.1 \times 2}{223\sin 38°} = x$$

$$x = 318.43 \text{ m}$$

Top angle in field N:

$90° - 38° = 52°$

Missing angle in field N:

$180° - 52° - 46° = 82°$

Side length of one other side of field N (y):

$$\frac{y}{\sin 52°} = \frac{318.43}{\sin 46°}$$

$$y = \frac{318.43}{\sin 46°} \times \sin 52°$$

$$y = 348.83 \text{ m}$$

Area of field N:

$$A = \frac{1}{2} \times 318.43 \times 348.83 \times \sin 82°$$

$$= 54\,998.467 \text{ m}^2$$

Area of field N in hectares:

5.4998 hectares

Number of nectarine trees:
$5.4998 \times 919 = 5054$ trees

Yes, the farmer is correct as there is the space in field N to plant 5054 nectarine trees.

[8 marks]

1 mark for calculating the area of field C.

1 mark for using the area rule $\text{area} = \dfrac{1}{2} bc \sin A$.

1 mark for determining the common side length between the fields.

1 mark for determining the missing angle in field N.

1 mark for determining one of the other side lengths for field N.

1 mark for calculating the area of field N.

1 mark for calculating the number of nectarine trees that can be planted in field N.

1 mark for stating the farmer is correct.