EXAMINATIONS COUNCIL OF ESWATINI
Eswatini General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

MATHEMATICS **6880/04**

Paper 4 Structured Questions (Extended) **October/November 2023**

2 hours 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Scientific calculator
Geometrical Instruments
Tracing paper (optional)

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name in the spaces provided.

Write in dark blue or black pen in the spaces provided on the Question paper.
You may use a soft pencil for any diagrams or graphs.
Do **not** use staples, paper clips, highlighters, glue or correction fluid.

Answer **all** questions.

All working should be clearly shown below that question.
The number of marks is given in brackets [ ] at the end of each question **or** part question.

Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures.
Give answers in degrees to one decimal place.

For π, use either your calculator value or 3.142.
The total of the marks for this paper is 120.

For Examiner's Use	
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Total	

This document consists of **17** printed pages and **3** blank pages.

1 Four number sequences are shown in the table.

1	2	3	4	...	n
3	2	1	0	...	a
4	9	16	25	...	b
7	11	17	25	...	c

Express a, b and c in terms of n.

Answer a = ...

b = ...

c = ... [5]

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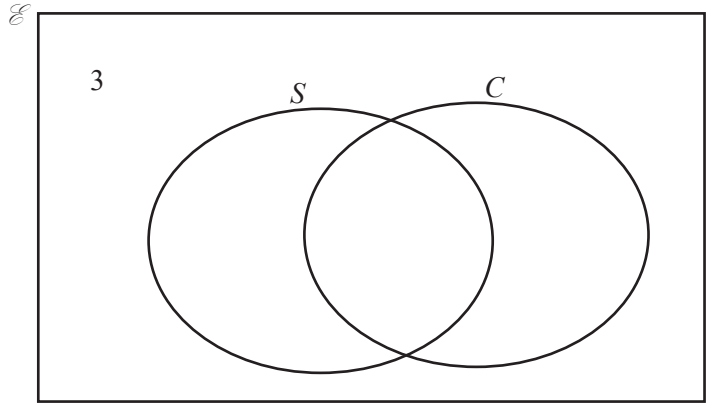
2 **(a)** A group of 30 people were asked which sport they liked.
16 of them liked soccer.
3 did not like any sport.
15 liked cricket.

(i) Complete the Venn diagram to illustrate this information.



[2]

(ii) State the number of people who liked exactly one sport.

Answer (a)(ii) ..... [1]

(iii) Use set symbols to describe the set of people who liked at least one sport.

Answer (a)(iii) ..... [2]

(b) List the elements of the set $\{x: x \text{ is a positive integer and } 3 \geq x\}$.

Answer (b) ..... [2]

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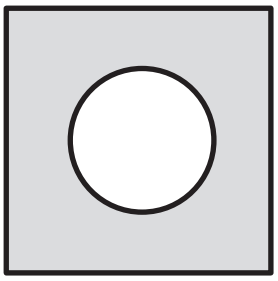
3 A prism is formed by removing a cylinder from a cuboid.
The cross section of the prism is a square with a circle removed, as shown.
Each side of the square is 5 cm and the radius of the circle is 2 cm.
The dimensions are given to the **nearest cm**.



(a) Calculate the value of the largest possible **cylindrical** area.

Answer (a) ..... cm^2 [3]

(b) The length of the prism is 1.87 m to the nearest cm.

Calculate the upper limit of the hollow volume.

Answer (b) ..... m^2 [3]

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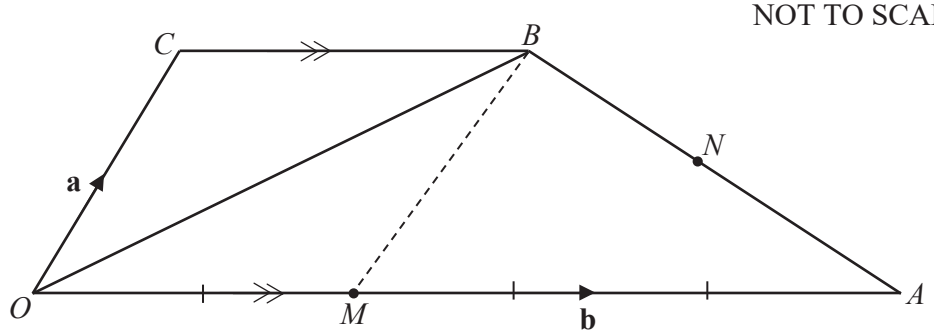
4 $OABC$ is a trapezium and O is the origin.

$\overrightarrow{OC} = \mathbf{a}$, $\overrightarrow{OA} = \mathbf{b}$ and $OM : MA = 2 : 3$.

$OM = CB$ and N is the midpoint of AB.

NOT TO SCALE



(a) Express in terms of **a** and/or **b**:

(i) $\overrightarrow{CB}$,

Answer (a)(i) ..... [1]

(ii) $\overrightarrow{OB}$,

Answer (a)(ii) ..... [1]

(iii) $\overrightarrow{AB}$,

Answer (a)(iii) ..... [2]

(iv) $\overrightarrow{MN}$.

Answer (a)(iv) ..... [2]

(b) Find the position vector of N.

Answer (b) ..... [2]

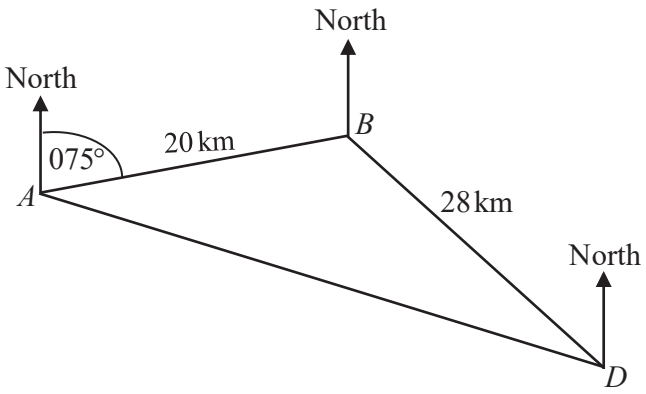
(c) P is on OA such that $= \overrightarrow{PN} \frac{3}{10}$ **b**.

Show that $\overrightarrow{PN}$ is parallel to $\overrightarrow{MB}$.

[2]

5 The diagram shows the positions of three schools, A, B and D.

D is south east of B.



NOT TO SCALE

(a) Find the bearing of

(i) school A from school B

Answer (a)(i) ..... ° [2]

(ii) school B from school D

Answer (a)(ii) ..... ° [3]

(b) Show that angle $ABD = 120°$.

[2]

(c) Calculate the direct distance from school A to school D.

Answer (c) ..... km [4]

(d) Calculate the area of triangle ABD.

Answer (d) ..... km^2 [2]

[Turn over

6 A fuel tank carries 20 000 litres of fuel.

(a) A cylindrical pipe is used to transfer the fuel from the tank.
The length of the pipe is 6 metres.
The diameter of the pipe is 0.15 metres.
Find the maximum amount of fuel that the pipe can hold at an instant.

Answer (a) ..... m^3 [3]

(b) All the fuel in the tank is transferred to **fill** a hemispherical reservoir at a rate of 5 litres per second.

[Volume of a sphere = $\frac{4}{3}\pi r^3$; Surface area of a sphere = $4\pi r^2$]

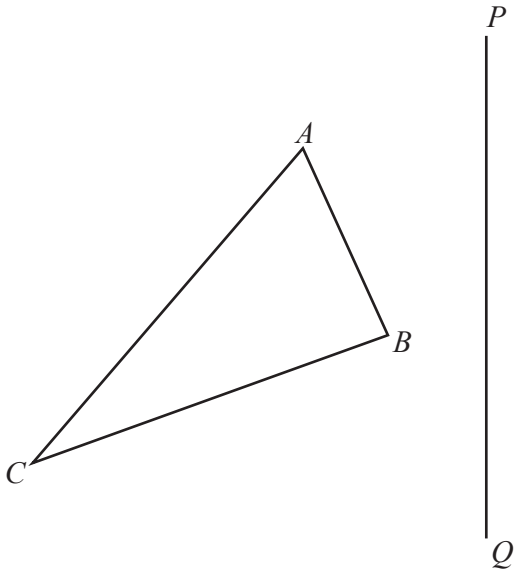
(i) Calculate the time taken to empty the tank.
Express your answer in hours and minutes to the nearest minute.

Answer (b)(i) t = ... hours ..... minutes [3]

(ii) Show that the radius of the hemispherical tank is 2.12 m correct to 3 significant figures.

Answer (b)(ii) ..... m [3]

7 Triangle ABC and the line PQ are shown below.



(a) Construct the image of triangle ABC after a reflection in line PQ.

Label the image PQR. [2]

(b) Construct the

(i) perpendicular bisector of side AC, [1]

(ii) bisector of angle BCA. [1]

8 The table shows the time, t minutes, that 100 learners took to travel to school.

Time taken (t mins)	$0 < t \leqslant 10$	$10 < t \leqslant 20$	$20 < t \leqslant 30$	$30 < t \leqslant 40$	$40 < t \leqslant 50$	$50 < t \leqslant 60$
Number of learners	7	12	15	30	25	11

(a) Write down the modal time interval.

Answer (a) ..... [1]

(b) Calculate an estimate of the mean time taken to travel to school.

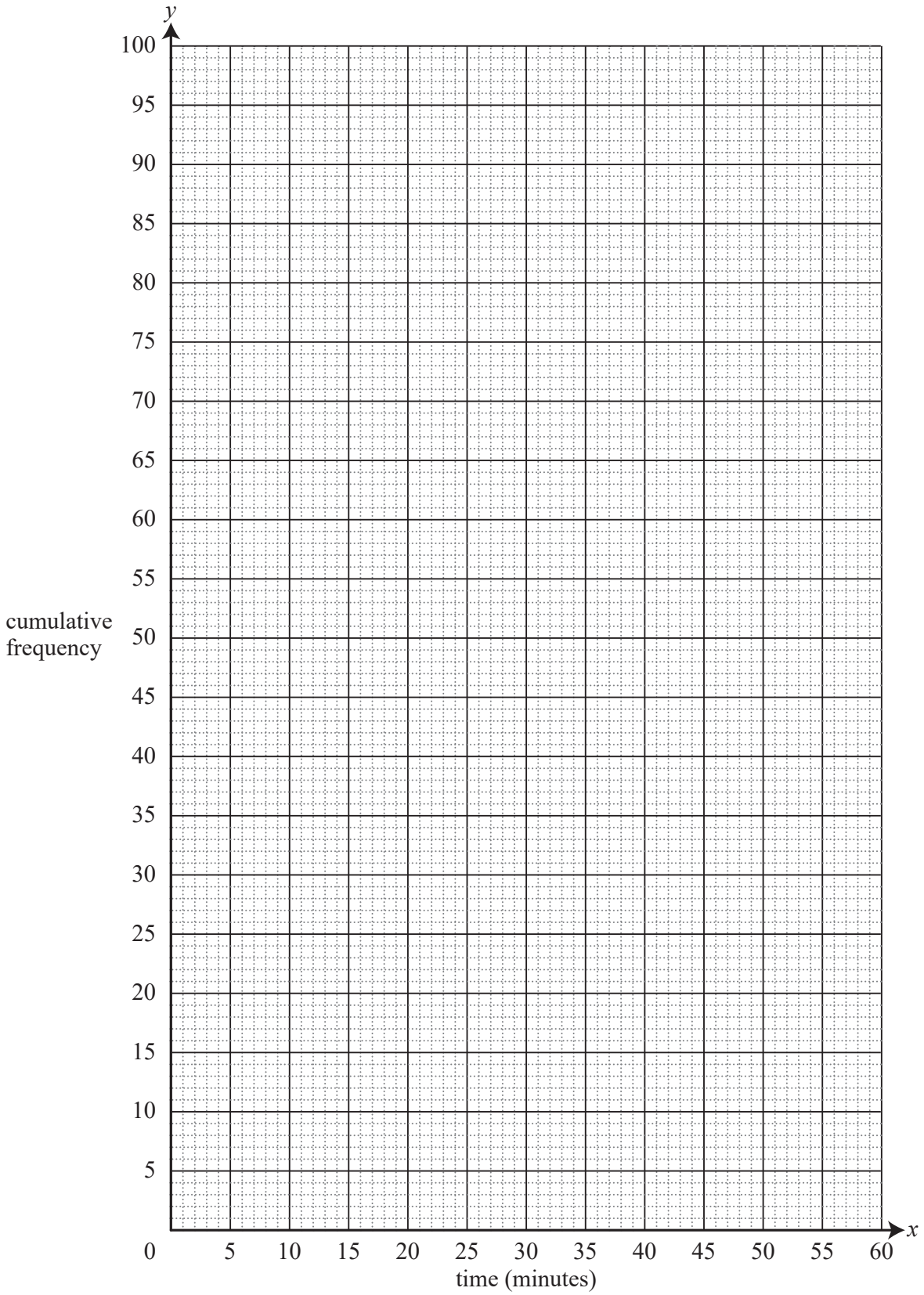
Answer (b) ..... minutes [4]

(c) Part of the information is represented in the cumulative frequency table.

Time taken (t mins)	$t \leqslant 10$	$t \leqslant 20$	$t \leqslant 30$	$t \leqslant 40$	$t \leqslant 50$	$t \leqslant 60$
Cumulative frequency	7	19				100

(i) Complete the cumulative frequency table. [2]

(ii) On the given grid opposite, draw a cumulative frequency curve to show this information.



[3]

(d) Use your graph to estimate the 60th percentile.

Answer (d) ..... [1]

(e) Find the number or learners more than 30 minutes to travel to school.

Answer (e) ..... [2]

9 The probability that it rains in Mbabane is $\frac{1}{3}$.

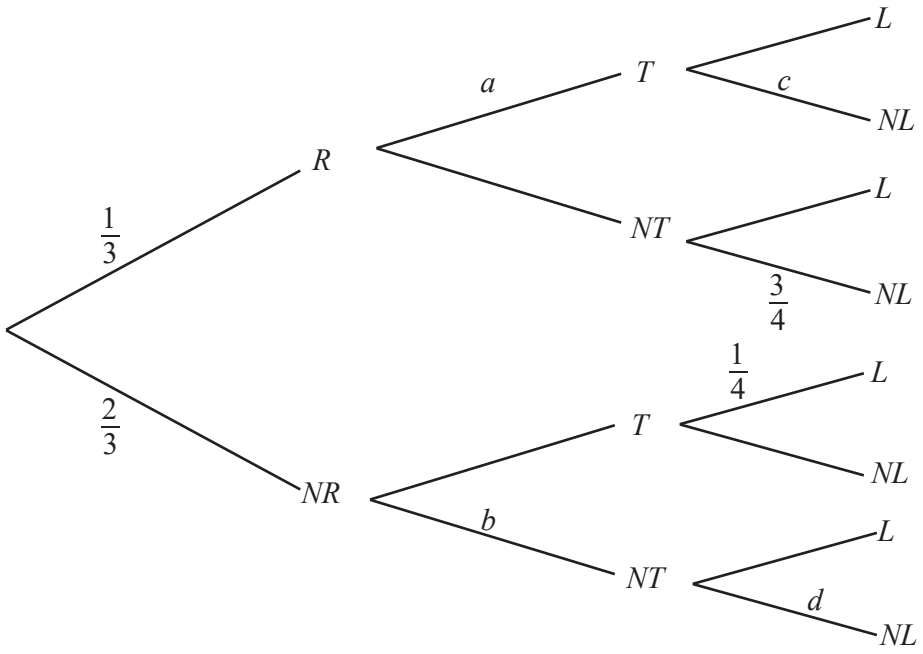
If it rains, the probability of heavy traffic is $\frac{3}{5}$.

If it does not rain, the probability of heavy traffic is $\frac{1}{4}$.

If it rains and the traffic is heavy, the probability that Musa arrives late at work is $\frac{4}{7}$.

If it does not rain and there is no heavy traffic, the probability that Musa arrives late is $\frac{1}{8}$.

Part of the information is shown in the tree diagram.



(a) Find the values of a, b, c and d.

Answer (a) a = ..., b = ..., c = ..., d = ... [4]

(b) Find the probability that it is **not** raining, there is heavy traffic and **Musa is not late**.

Answer (b) ..... [2]

(c) Find the probability that Musa arrives late.

Answer (c) ..... [3]

(d) Show that the probability that Musa arrived late at work one day and that it rained or there was heavy traffic on this day is $\frac{1}{30}$.

Answer (d) ..... [3]

[Turn over

10 **(a)** Express p in terms of q.

$$q = \frac{3p + 2}{p - 5}$$

Answer (a) p = ... [4]

(b) Solve $2x^2 - 3x = 2$.

Answer (b) x = ... or x = ... [3]

(c) Expand and simplify

$$(x + 2)^2(4x - 1).$$

Answer (c) ..... [3]

(d) Line l passes through point A (–2, –3) and point B (0, 7).

(i) Calculate the length of line segment AB.

Answer (d)(i) ..... [2]

(ii) Line p is perpendicular to line l passing through point A.

Find the equation of line p.

Answer (d)(ii) ..... [3]

11 You are given the two functions, $f(x) = 6 + x - x^2$ and $g(x) = 3x$.

(a) Find the value of

(i) g(4),

Answer (a)(i) ..... [1]

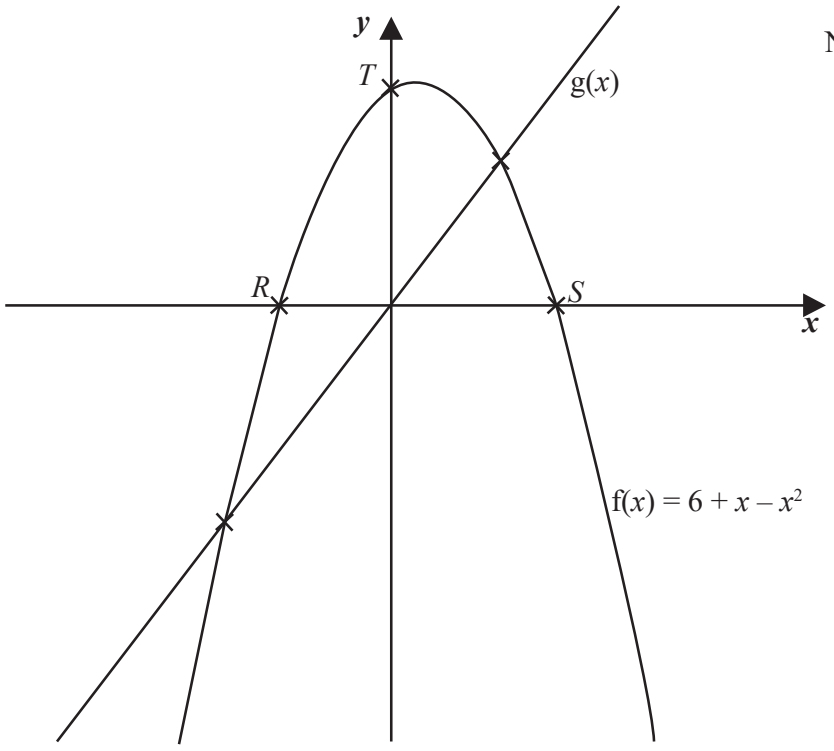
(ii) fg(3).

Answer (a)(ii) ..... [2]

(b) Find $g^{-1}g(x)$.

Answer (b) ..... [1]

(c) The diagram shows the graphs of $y = f(x)$ and $y = g(x)$.



NOT TO SCALE

(i) Write down the coordinates of *T*.

Answer (c)(i) *T* (,) [1]

(ii) Find the coordinates of R and S.

Answer (c)(ii) R (,) and S (,) [4]

(iii) Find the values of x at the points of intersection of the two graphs $f(x) = 6 + x - x^2$ and $g(x) = 3x$.

Answer (c)(iii) x = ... or x = ... [5]

(d) Calculate the greatest value of $f(x) = 6 + x - x^2$.

Answer (d) ..... [2]

12 **(a)** The graph of the function $f(x) = \frac{1}{3}x^3 - \frac{1}{2}x^2 - 12x$ is to be drawn.

(i) Find the derivative of $f(x)$.

Answer (a)(i) ..... [2]

(ii) Show that the point where $x = 4$ is a turning point.

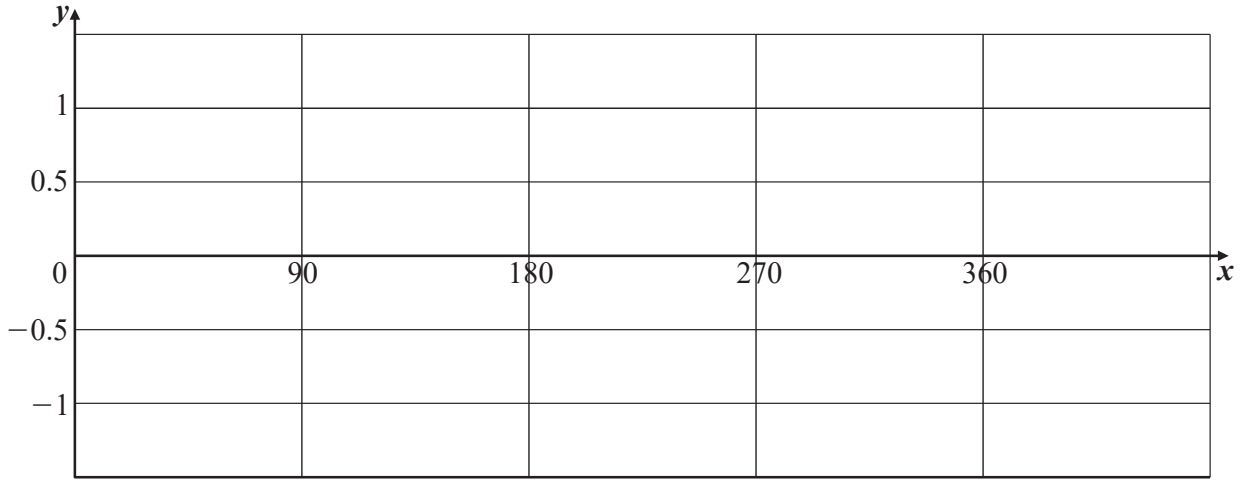
[1]

(iii) determine the nature of the turning point at $x = 4$.

Answer (a)(iii) ..... [2]

(b) $y = \sin x^o$.

(i) On the grid, sketch the graph of $y = \sin x$ for $0 \leq x \leq 360$.



[2]

(ii) State the range of values of x for which $y = \sin x$ is decreasing for the interval $0^o \leq x \leq 360^o$.

Answer (b)(ii) ..... [1]

(c) Solve the equation $2 \cos x° = \sqrt{3}$ for $0 \leq x \leq 360$.

Answer (c) x = ... and x = ... [2]

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