FORM TP 02025098

TEST CODE **01234020**

MAY/JUNE 2025

CARIBBEAN EXAMINATIONS COUNCIL

CARIBBEAN SECONDARY EDUCATION CERTIFICATE® EXAMINATION

MATHEMATICS

Paper 02 – General Proficiency

2 hours 40 minutes

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

1. This paper consists of TWO sections: I and II.
2. Section I has SEVEN questions and Section II has THREE questions.
3. Answer ALL questions, writing your answers in the spaces provided in this booklet.
4. Numerical answers that are non-exact should be given correct to 3 significant figures or 1 decimal place for angles in degrees unless a different level of accuracy is specified in the question.
5. Do NOT write in the margins.
6. All working MUST be clearly shown.
7. **A list of formulae is provided on page 4 of this booklet.**
8. If you need to rewrite any answer and there is not enough space to do so on the original page, you must use the extra page(s) provided at the back of this booklet. **Remember to draw a line through your original answer.**
9. **If you use the extra page(s), you MUST write the question number clearly in the box provided at the top of the extra page(s) and, where relevant, include the question part beside the answer.**
10. **Diagrams in this booklet are NOT drawn to scale, unless otherwise stated.**

Required Examination Materials

Electronic calculator
Geometry set

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

LIST OF FORMULAE

Volume of a prism: $V = Ah$ where A is the area of a cross-section and h is the perpendicular length.

Volume of a cylinder: $V = \pi r^2 h$ where r is the radius of the base and h is the perpendicular height.

Volume of a right pyramid: $V = \frac{1}{3}Ah$ where A is the area of the base and h is the perpendicular height.

Circumference: $C = 2\pi r$ where r is the radius of the circle.

Arc length: $S = \frac{\theta}{360} \times 2\pi r$ where θ is the angle subtended by the arc, measured in degrees.

Area of a circle: $A = \pi r^2$ where r is the radius of the circle.

Area of a sector: $A = \frac{\theta}{360} \times \pi r^2$ where θ is the angle of the sector, measured in degrees.

Area of a trapezium: $A = \frac{1}{2}(a + b)\,h$ where a and b are the lengths of the parallel sides and h is the perpendicular distance between the parallel sides.

Roots of quadratic equations: If $ax^2 + bx + c = 0$,

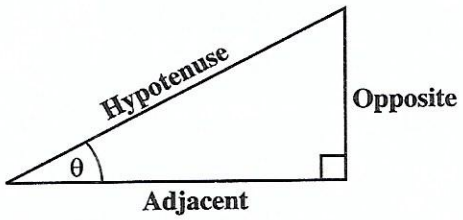
$$\text{then } x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Trigonometric ratios:

$$\sin\theta = \frac{\text{length of opposite side}}{\text{length of hypotenuse}}$$

$$\cos\theta = \frac{\text{length of adjacent side}}{\text{length of hypotenuse}}$$

$$\tan\theta = \frac{\text{length of opposite side}}{\text{length of adjacent side}}$$

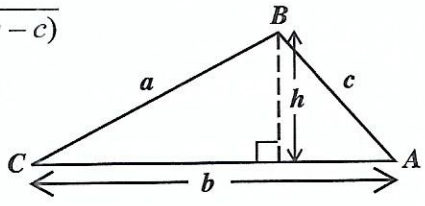


Area of a triangle: Area of $\Delta = \frac{1}{2}bh$ where b is the length of the base and h is the perpendicular height.

$$\text{Area of } \Delta ABC = \frac{1}{2}ab\sin C$$

$$\text{Area of } \Delta ABC = \sqrt{s(s-a)(s-b)(s-c)}$$

$$\text{where } s = \frac{a+b+c}{2}$$



Sine rule: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine rule: $a^2 = b^2 + c^2 - 2bc\cos A$

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SECTION I

Answer ALL questions.

All working MUST be clearly shown.

1. (a) Using a calculator, or otherwise, evaluate EACH of the following, giving your answers in EXACT form.

(i) $\left(\frac{3}{2}\right)^2 - 1 + 6$

.....

(1 mark)

(ii) $\left[2.1 \times \frac{10}{7}\right] + 12 \div 1\frac{3}{5}$

.....

(2 marks)

GO ON TO THE NEXT PAGE

(b) Maranda earns \$8 316 per month. She spends $\frac{4}{7}$ of her earnings on utility bills, food and personal items, and **saves the remainder**.

(i) What **percentage** of her monthly salary does she save?

.....

(1 mark)

(ii) The portion of her earnings spent on utility bills, food and personal items is divided in the ratio 5:3:4 respectively. Calculate the amount of money she spends on personal items.

.....

(2 marks)

(iii) Maranda saves the same amount of money each month. Show that her annual savings from her earnings is $42 768.

.....

(1 mark)

(iv) She invests the $42 768 in her credit union which pays compound interest of 5% per annum. What is the TOTAL interest earned after 2 years?

[The final amount, A, when principal, P, is invested compound interest at rate, r, for n number of years is given by $A = P\left[1 + \frac{r}{100}\right]^n$.]

.....

(2 marks)

Total 9 marks

GO ON TO THE NEXT PAGE

2. (a) Factorize, completely, EACH of the following expressions.

(i) $xy^2 - x^2y$

.....

(1 mark)

(ii) $3x^2 + x - 10$

.....

(2 marks)

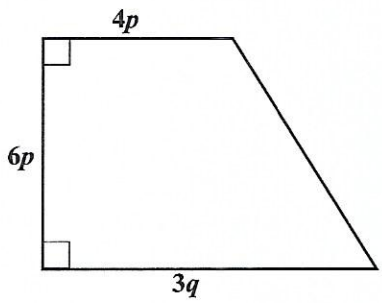
(b) Solve for n.

$$4^n \div 4^3 = \frac{1}{4}$$

.....

(2 marks)

(c) The lengths of three sides of a trapezium are shown on the diagram below. The area of the trapezium is 750 square units.



(i) Write down an expression in terms of p and q for the area of the trapezium.

.....

(1 mark)

(ii) Given that $q = 2p$, determine the value of p.

.....

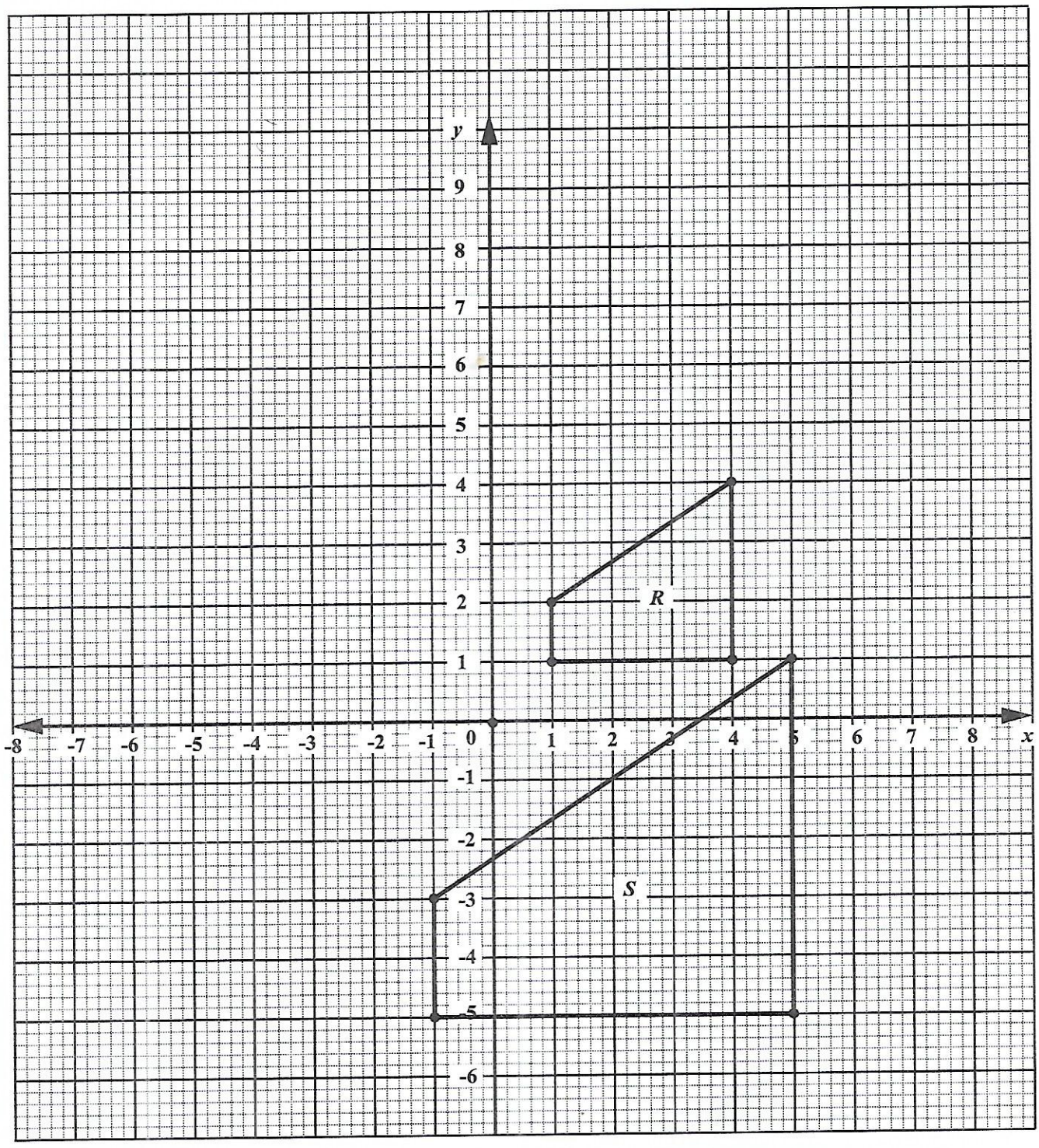
(3 marks)

Total 9 marks

3. (a) Using a ruler, a pencil and a pair of compasses, construct the triangle PQR, such that $PQ = 9$ cm, $\angle QPR = 60°$ and $PR = 12$ cm.

(3 marks)

(b) The diagram below shows two quadrilaterals, R and S, where S is the image of R under a transformation.



(i) Describe, fully, the **single** transformation that maps Quadrilateral R onto Quadrilateral S.

.....

.....

.....

.....

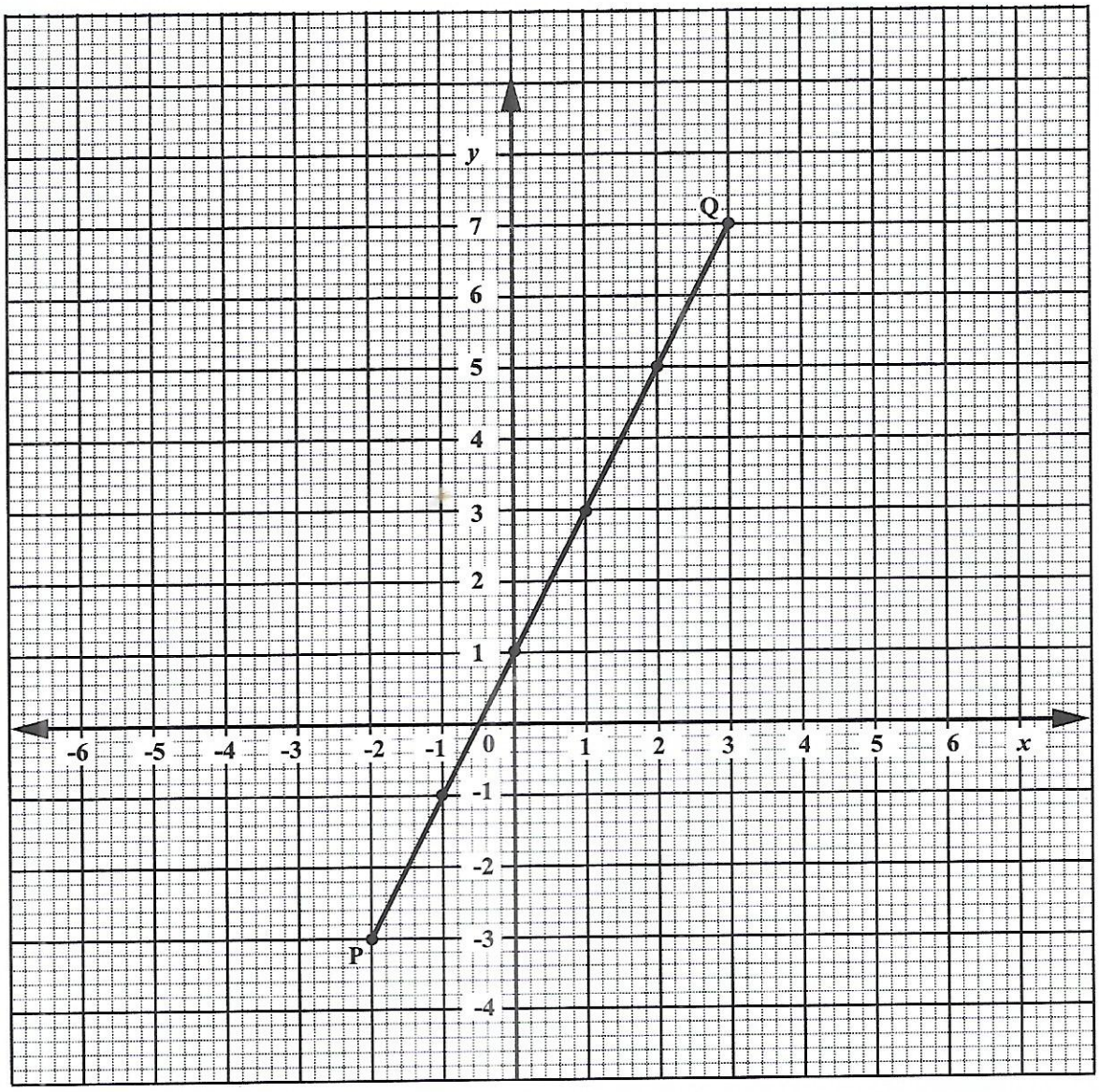
(3 marks)

(ii) On the grid **on page 12**, draw the image of Quadrilateral R when it is translated by the vector $\begin{pmatrix} -4 \\ 5 \end{pmatrix}$. Name the image T. **(1 mark)**

(iii) On the grid **on page 12**, draw the image of Quadrilateral R when it is rotated 180° about the origin. Name the image M. **(2 marks)**

Total 9 marks

4. (a) The graph below shows the straight line PQ.



(i) Find the gradient of the line PQ.

.....

(1 mark)

(ii) Write down the equation of the line through PQ in the form $y = mx + c$.

.....

(1 mark)

(b) Two functions, f and g, are defined as

$$f(x) = x^2 - 1 \text{ and } g(x) = 3x + 2.$$

Find

(i) $g(-6)$

.....

(1 mark)

(ii) the inverse function, $g^{-1}(x)$.

.....

(2 marks)

(iii) a) Show that $fg(x) = 3(3x + 1)(x + 1)$.

.....

(3 marks)

b) Hence, solve the equation $fg(x) = 0$.

.....

(1 mark)

Total 9 marks

5. Thirty students took a Mathematics test. The marks they scored are shown in the table below.

Mark	Tally	Frequency	Cumulative Frequency
1	|||	3	3
2	||||	4	7
3	𝍸 |||	8	
5	|||	3	18
7	|	1	19
8	𝍸 |	6	
10	𝍸	5	30

(a) Complete the Cumulative Frequency column in the table above. **(1 mark)**

(b) Using the information in the table above, determine the

(i) range

.....

(1 mark)

(ii) modal mark

.....

(1 mark)

(iii) median mark

.....

(2 marks)

GO ON TO THE NEXT PAGE

(iv) mean mark.

.....

(2 marks)

(c) The following two-way table shows the gender distribution of the students' performance on the Mathematics test.

	Male	**Female**	**Total**
Pass	4	8	12
Fail	5	13	18
Total	9	21	30

(i) A student is chosen at random. Find the probability that the student is a female who failed the test.

.....

(1 mark)

(ii) A male student is chosen at random. What is the probability that he passed the test?

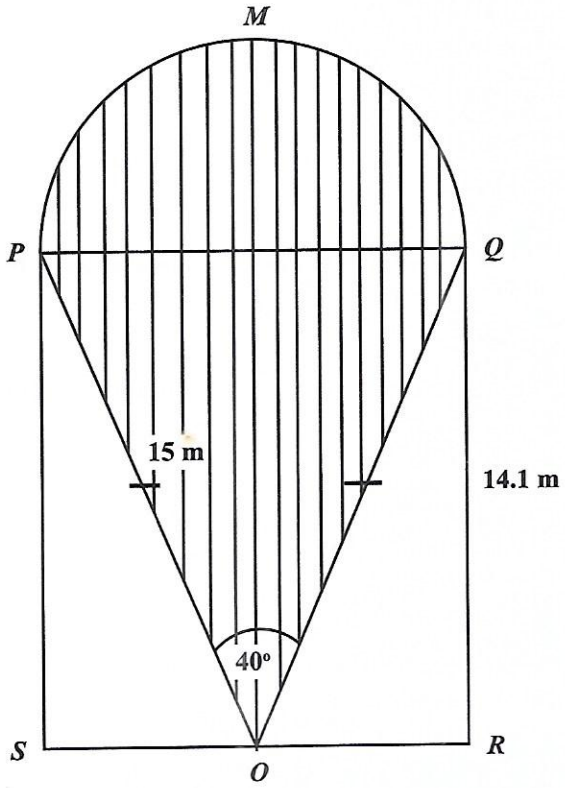
.....

(1 mark)

Total 9 marks

6. *PMQROS* is the cross-section of a play area in a park. *PQRS* is a rectangle and *PMQ* is a semi-circle. *O* is the mid-point of *RS*. $OP = OQ = 15$ m and Angle $POQ = 40°$.

Use $\pi = \frac{22}{7}$.



(a) (i) Determine the value of Angle *OPQ*.

.....

(1 mark)

(ii) Calculate the length of *OR*.

.....

(2 marks)

GO ON TO THE NEXT PAGE

(b) Calculate the area of the shaded portion of the diagram.

.....

(3 marks)

(c) Find the perimeter of the cross-section *PMQROS*.

.....

(3 marks)

Total 9 marks

GO ON TO THE NEXT PAGE

7. A sequence of figures is made up of regular pentagons, using sticks of unit length. The first three figures in the sequence are shown below. The vertices in each figure are marked with dots.

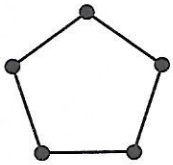


Figure 1

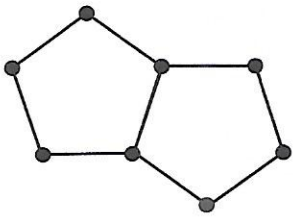


Figure 2

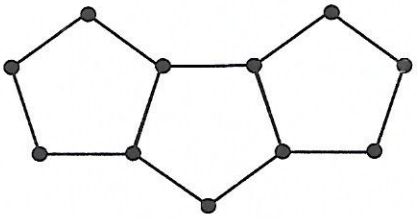


Figure 3

(a) An incomplete diagram of Figure 4 of the sequence is shown below. Complete Figure 4 by adding more sticks and dots.

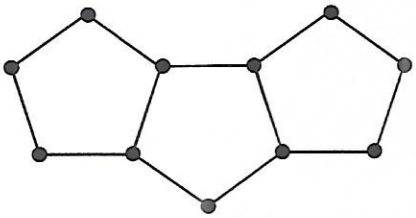


Figure 4

(2 marks)

(b) Study the pattern of numbers in each row of the table below. Each row relates to one of the figures in the sequence of figures shown **on page 22**. Some rows have not been included in the table.

Complete the rows corresponding to (i), (ii) and (iii) in the table below.

Figure	Number of Sticks (S)	Number of Dots (D)
1	5	5
2	9	8
3	13	11
⋮	⋮	⋮
20		
	169	
n		

(i) **(2 marks)**

(ii) **(2 marks)**

(iii) **(2 marks)**

(c) Write an equation in S, D and n to show the relationship between the number of sticks, S, and the number of dots, D, for Figure n.

.....

(2 marks)

Total 10 marks

GO ON TO THE NEXT PAGE

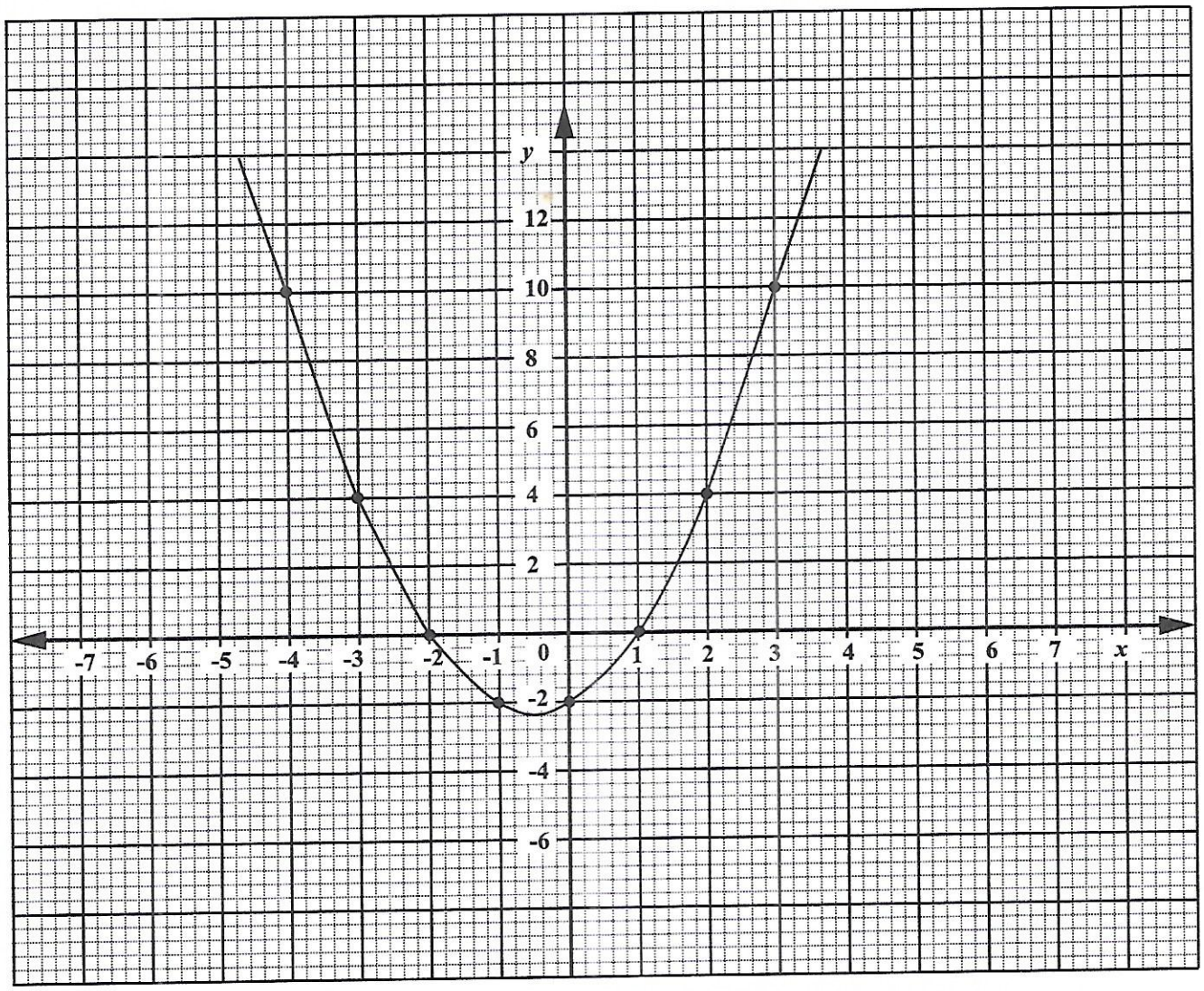
SECTION II

Answer ALL questions.

ALL working MUST be clearly shown.

ALGEBRA, RELATIONS, FUNCTIONS AND GRAPHS

8. (a) The following diagram shows the graph of the function $y = x^2 + x - 2$.



(i) From the graph, state the

a) roots of the function

.....

(1 mark)

b) coordinates of the y-intercept of the function

.....

(1 mark)

c) minimum value of the function

.....

(1 mark)

d) equation of the axis of symmetry of the function.

.....

(1 mark)

(b) (i) On the same pair of axes **on page 24**, draw and label the line $y = 2x + 4$.

(2 marks)

(ii) Using your graphs, determine the solutions to the following pair of simultaneous equations.

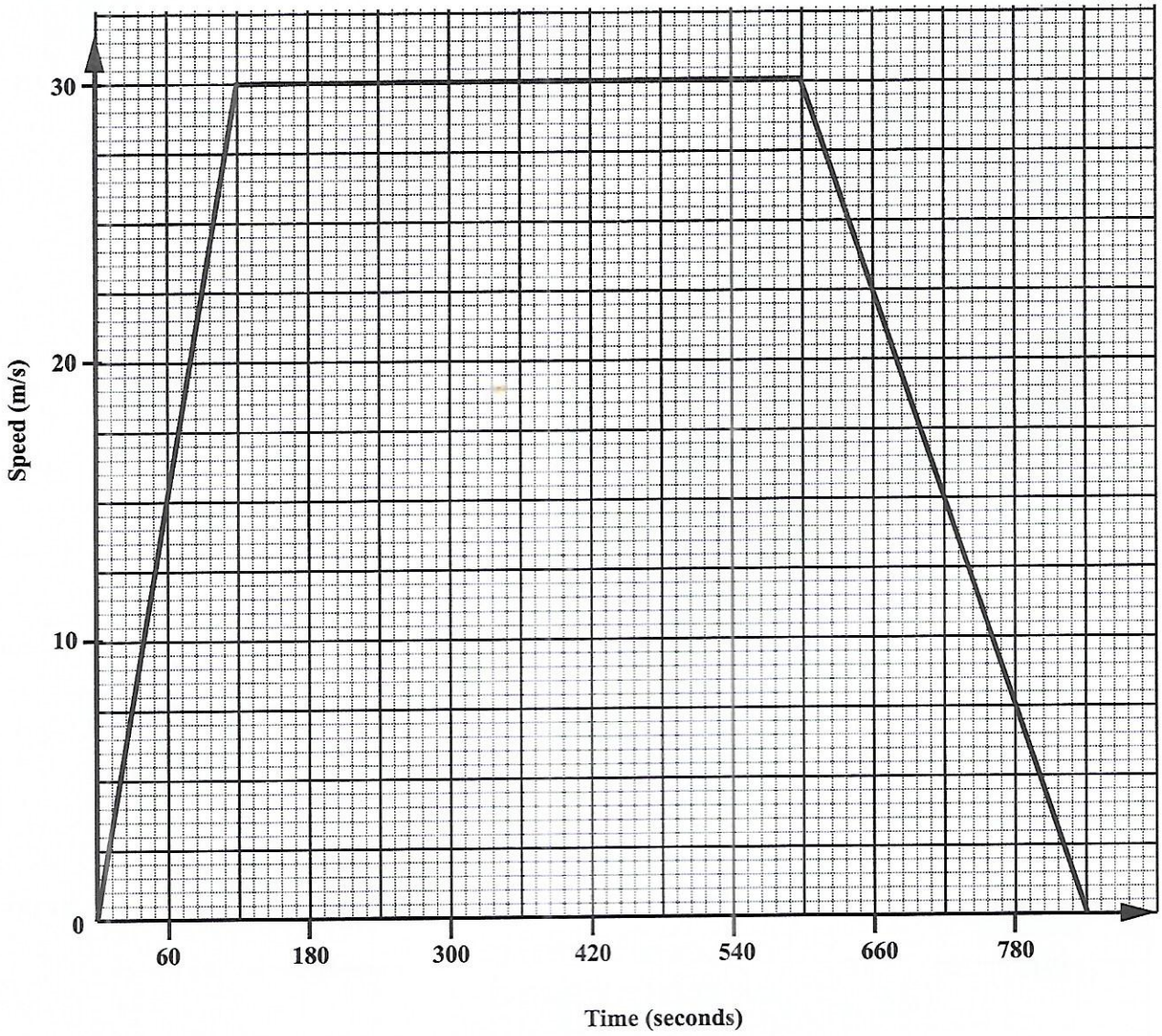
$y = x^2 + x - 2$
$y = 2x + 4$

.....

(2 marks)

GO ON TO THE NEXT PAGE

(c) The following diagram shows the velocity–time graph of a car's journey from Town R to Town Q. The car accelerates for two minutes, travels at a constant maximum speed, then slows to a stop.



(i) Determine the initial acceleration of the car.

.....

(2 marks)

(ii) Calculate the distance between the two towns.

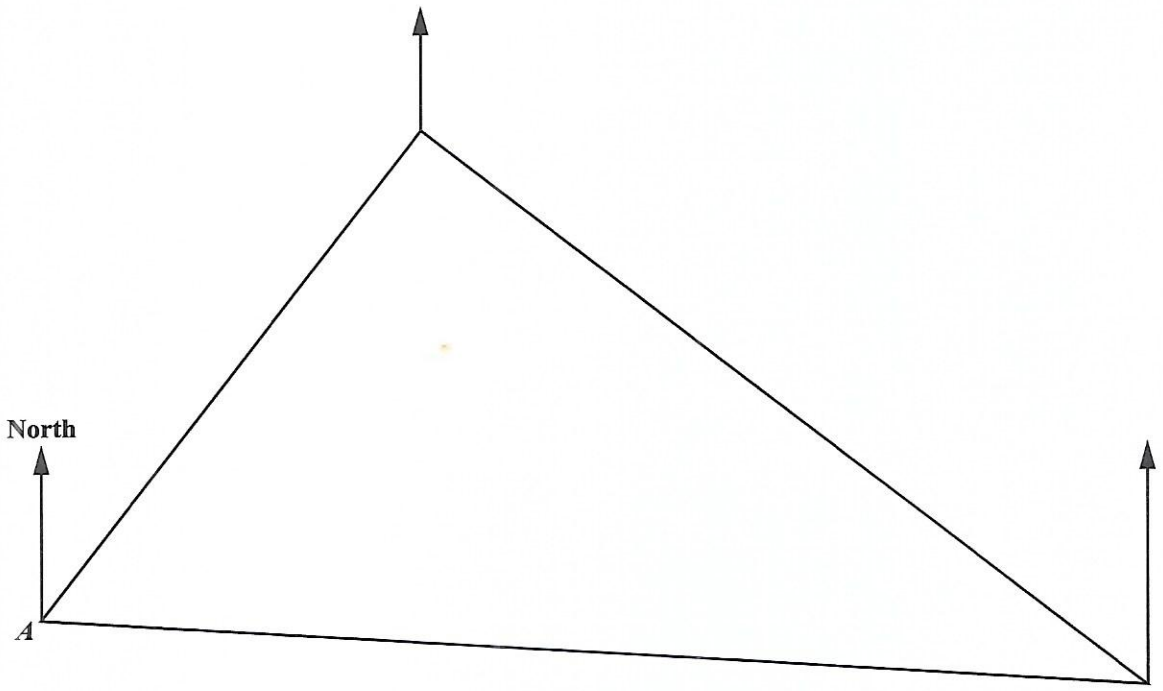
.....

(2 marks)

Total 12 marks

GEOMETRY AND TRIGONOMETRY

9. (a) A ship sails from Point A to Point B, which is 15 km from A on a bearing of 042°. The ship then sails to Point C, which is 19 km from B on a bearing of 130°. The following diagram shows a sketch of the ship's journey.



(i) On the diagram, insert the bearings 042° and 130°. **(1 mark)**

(ii) Calculate the distance between Town A and Town C.

.....

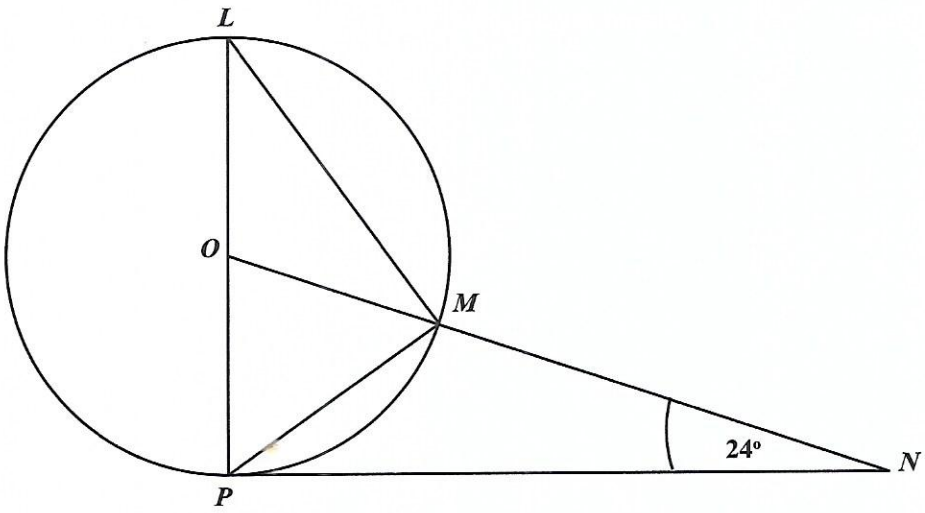
(2 marks)

(iii) Determine the bearing of Town *A* from Town *C*.

.....

(3 marks)

(b) The points L, M and P lie on the circumference of a circle whose centre is O. The line NP is a tangent to the circle at P and OMN is a straight line. The line PL is a diameter and Angle $ONP = 24°$.



Calculate the value of EACH of the following angles. Show detailed working where necessary and give a reason to support your answers.

(i) Angle PON

.....

(2 marks)

(ii) Angle *PLM*

.....

(2 marks)

(iii) Angle *PMN*

.....

(2 marks)

Total 12 marks

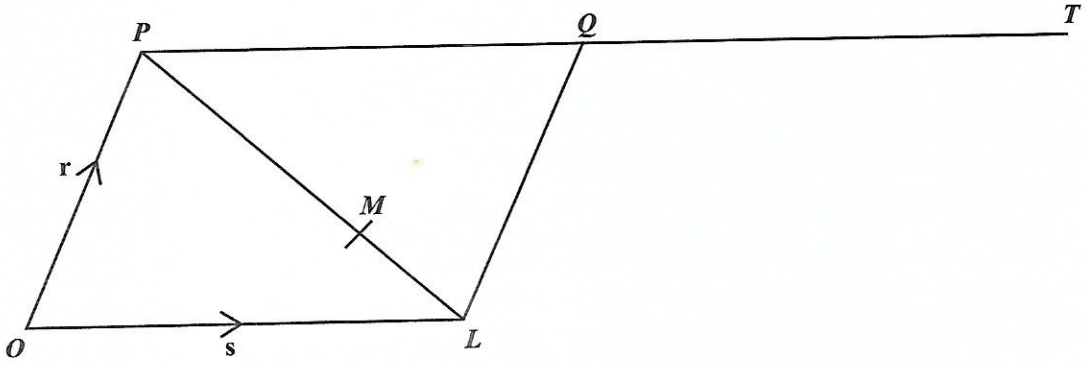
VECTORS AND MATRICES

10. (a) In the diagram below $OPQL$ is a parallelogram.

$\overrightarrow{OP} = \mathbf{r}$ and $\overrightarrow{OL} = \mathbf{s}$.

T is the point such that $\overrightarrow{PQ} = \overrightarrow{QT}$.

The point M divides PL in the ratio 2:1.



(i) Find, in terms of **r** and **s**,

a) $\overrightarrow{PL}$

.....

(1 mark)

b) $\overrightarrow{OM}$.

.....

(2 marks)

(ii) Prove that the points O, M and T are collinear.

.....

(3 marks)

(b) Three matrices, A, B and C, are such that

$$A = \begin{pmatrix} 3 & 2 \\ 5 & 4 \end{pmatrix}, \quad B = \begin{pmatrix} 4 & 0 & 2 \\ 3 & -1 & 7 \end{pmatrix} \text{ and } C = \begin{pmatrix} 4 & -1 & 2 \\ 7 & 3 & -5 \end{pmatrix}.$$

(i) Find the matrix $AB + C$.

.....

(3 marks)

(ii) Find A^{-1}, the inverse of A.

.....

(2 marks)

GO ON TO THE NEXT PAGE

(iii) Write down the 2×2 matrix that represents the matrix product AA^{-1}.

.....

(1 mark)

Total 12 marks

END OF TEST

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.