CXC

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

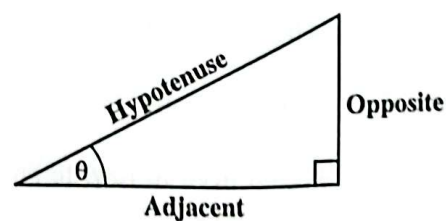|	
Volume of a prism	$V = Ah$ where A is the area of a cross-section and h is the perpendicular length.
Volume of a cylinder	$V = \pi r^2 h$ where r is the radius of the base and h is the perpendicular height.
Volume of a right pyramid	$V = \frac{1}{3} Ah$ where A is the area of the base and h is the 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 $ax^2 + bx + c = 0$, then $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
Trigonometric ratios	$\sin \theta = \dfrac{\text{length of opposite side}}{\text{length of hypotenuse}}$ $\cos \theta = \dfrac{\text{length of adjacent side}}{\text{length of hypotenuse}}$ $\tan \theta = \dfrac{\text{length of opposite side}}{\text{length of adjacent side}}$
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. Area of $\Delta ABC = \frac{1}{2} ab \sin C$ Area of $\Delta ABC = \sqrt{s(s-a)(s-b)(s-c)}$ where $s = \dfrac{a+b+c}{2}$
Sine rule	$\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$
Cosine rule	$a^2 = b^2 + c^2 - 2bc \cos A$

149

A007

01234020/J/CSEC 2025
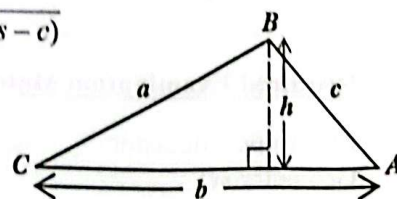
SECTION I

Answer ALL questions.

All working must be clearly shown.

1. (a) Using a calculator or otherwise, determine the value of

(i) $\frac{2}{3}$ of $\left(\frac{1}{8} + \frac{5}{12} \div \frac{1}{9} \right)$, giving your answer in EXACT form

....

(2 marks)

(ii) $314.2 - \frac{26082}{52164}$, giving your answer in standard form.

....

(2 marks)

01234020/J/CSEC 2025

(b)   Jim packed several cases of fruit juice for sale. Each case contained 24 boxes of juice in 3 different varieties, apple, orange and pineapple, in the ratio 2:5:1 respectively.

(i)   How many boxes of **pineapple** juice were packed in each case?

....

(1 mark)

GO ON TO THE NEXT PAGE

01234020/J/CSEC 2025

(ii) The profit gained from selling ALL of the boxes of pineapple juice is $35.64. Each box of pineapple juice was sold at $3.34.

a) Show that the cost price of a box of pineapple juice is $2.35.

....

(3 marks)

b) Calculate the percentage profit made on the sale of the boxes of pineapple juice.

....

(1 mark)

Total 9 marks

01234020/J/CSEC 2025

0 1 2 3 4 0 2 0 0 7

2. (a) (i) Factorize EACH of the following algebraic expressions.

a) $x^2 - 49$

....

b) $x^2 + 2x - 35$

....

(2 marks)

(ii) Hence, simplify the expression $\dfrac{x^2 - 49}{x^2 + 2x - 35}$.

....

(1 mark)

GO ON TO THE NEXT PAGE

0 1 2 3 4 0 2 0 0 8

(b) Rearrange the formula shown below to make m the subject.

$$s = k - m^2$$

....
(2 marks)

(c) Lisa has \$56 to buy a total of **no more than** 70 red balloons and green balloons for her party.

She buys more green balloons than red balloons but must buy at least 15 red balloons. Each red balloon costs \$0.75 and each green balloon costs \$0.50.

Let x and y represent the number of red balloons and the number of green balloons respectively. Write TWO inequalities in x and y, other than $x \geq 0$ and $y \geq 0$, to represent the information above.

....
(2 marks)

GO ON TO THE NEXT PAGE

0 1 2 3 4 0 2 0 0 9

(d)   Given that y is inversely proportional to $(x - 2)$ and $x = 11$ when $y = 9$, find the value of y when $x = 29$.

149

....

(2 marks)

Total 9 marks

A007

0 1 2 3 4 0 2 0 1 0

3. (a) The diagram below shows a **regular** hexagon, *LMNOPQ*, whose side is 8 cm.
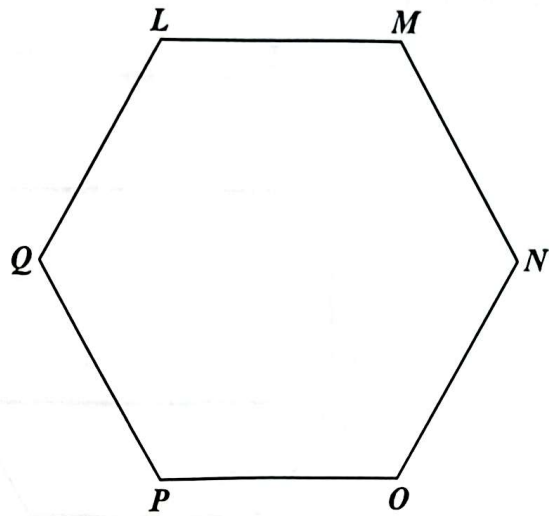
(i) Show that the value of Angle *PQL* is 120°.

....

(2 marks)

(ii) The vertices of a rectangle, *WXYZ*, touch the sides *PQ*, *QL*, *MN* and *NO* of the hexagon in Part (a). *ZY* and *WX* are parallel to *LM* and *PO*.
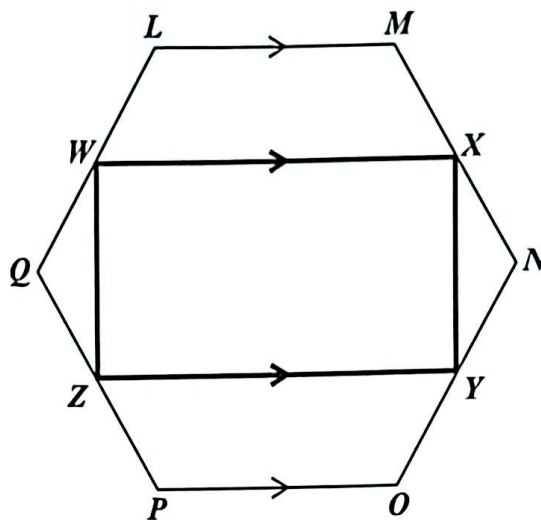
Calculate the value of Angle *LWX*.

....

(2 marks)

01234020/J/CSEC 2025

(b)   **In the following parts, show all your construction lines where required.**

The field of a sports club is in the shape of a quadrilateral, *RSTU*. A scaled diagram of this field is shown below.
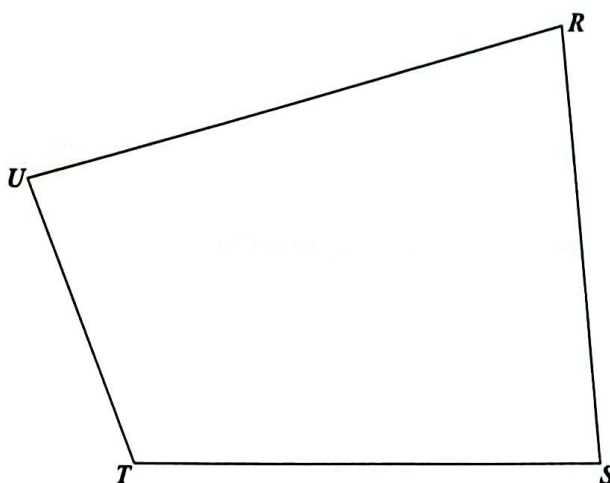
A lamppost is to be erected on the field at a point marked *L*, so that floodlights can be installed. The point *L* should be located in such a way that *L* lies on the perpendicular bisector of the line *UR* and Angle *LST* equals 30°.

Using a ruler and compasses only, locate the point *L* on the field.   **(5 marks)**

                                                              Total 9 marks

01234020/J/CSEC 2025

4.   A line segment joins the points $C(-5, 6)$ and $D(7, 2)$.

(a)   Calculate the midpoint of the line segment CD.

149

....

(2 marks)

(b)   Find the gradient of the line segment CD.

A007

....

(2 marks)

(c)   Determine the equation of the perpendicular bisector of *CD*.

....
(3 marks)

(d)   Another line, *AB*, is parallel to *CD* and passes through the point (0, 1). Write down the equation of the line *AB*.

....
(2 marks)

Total 9 marks

5. **(a)** The table below shows the marks, out of 10, that 40 students in a class gained on an essay writing test.

Marks (x)	Number of Students (f)
4	3
6	9
7	8
8	7
9	8
10	5

(i) Calculate the students' mean score on the test.

....

(2 marks)

149

A007

(ii) Determine the

    a) modal mark

....

(1 mark)

    b) median mark.

....

(1 mark)

(iii) Using the information in the table below, a pie chart is constructed to represent the marks students gained.

Marks (x)	Number of Students (f)
$3 \leq x \leq 4$	3
$5 \leq x \leq 6$	9
$7 \leq x \leq 8$	15
$9 \leq x \leq 10$	13

Calculate the angle for the sector representing the interval marks, $5 \leq x \leq 6$, in the pie chart.

149

....

(1 mark)

01234020/J/CSEC 2025

A007

(b)   The diagram below shows two fair six-sided dice, *P* and *Q*.

P   Q
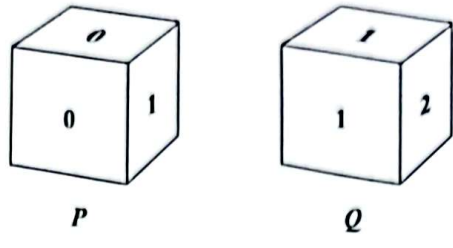
The six numbers on Die *P* are 0, 0, 1, 1, 2, 3.
The six numbers on Die *Q* are 1, 1, 1, 2, 2, 3.
When a die is rolled, the score is the number on the top face.

(i)   Die *P* is rolled once. What is the probability that the score is NOT 2?

....
                                                                                        (1 mark)

(ii)   Die *Q* is rolled **twice**. What is the probability that the score is 1 both times?

....
                                                                                        (1 mark)

(iii)   Die *Q* is rolled 72 times. Calculate an estimate of the number of times the score is 3.

....
                                                                                        (1 mark)

GO ON TO THE NEXT PAGE

01234020/J/CSEC 2025

(iv)   Each die is rolled once. The product of the scores is recorded. The sample space diagram is shown below.

3	0	0	3	3	6	9
2	0	0	2	2	4	6
2	0	0	2	2	4	6
1	0	0	1	1	2	3
1	0	0	1	1	2	3
1	0	0	1	1	2	3
×	0	0	1	1	2	3

Die Q (vertical axis label)

Die P

Find the probability that the product of the scores is 2 OR 3.

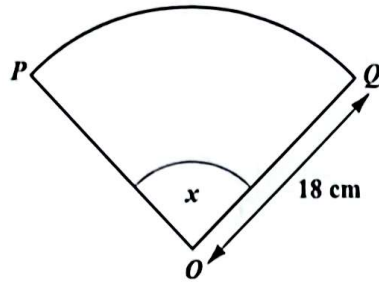...

(1 mark)

Total 9 marks

6. [In this question, use $\pi = \frac{22}{7}$.]

(a) A piece of wire, 61 cm long, is bent to form a sector, as shown in the diagram below. The sector of the circle, OPQ, has centre O and a radius of 18 cm.

(i) Show that the value of x is approximately 80°.

....

(3 marks)

(ii) Calculate the area enclosed by the wire.

....

(2 marks)

GO ON TO THE NEXT PAGE

(b) A cylindrical block of cheese has a radius of 12 cm and a height of 8 cm. The cheese is divided into equal slices. The uniform cross-section of a slice of the cheese is a sector whose angle is 18°, as shown in the diagram below.
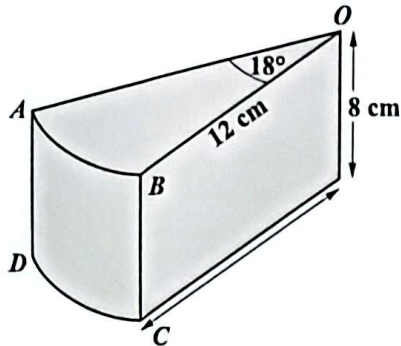
(i) Calculate the length of the arc AB.

....

(1 mark)

(ii) Determine the area of the curved face, $ABCD$.

....

(1 mark)

(iii) Given that the area of OAB is 22.6 cm², calculate the volume of the ENTIRE block of cheese.

....

(2 marks)

Total 9 marks

GO ON TO THE NEXT PAGE

7.   A sequence of patterns is made of dots and lines of unit length. Some of these lines form squares. The first three diagrams in the sequence are shown below.
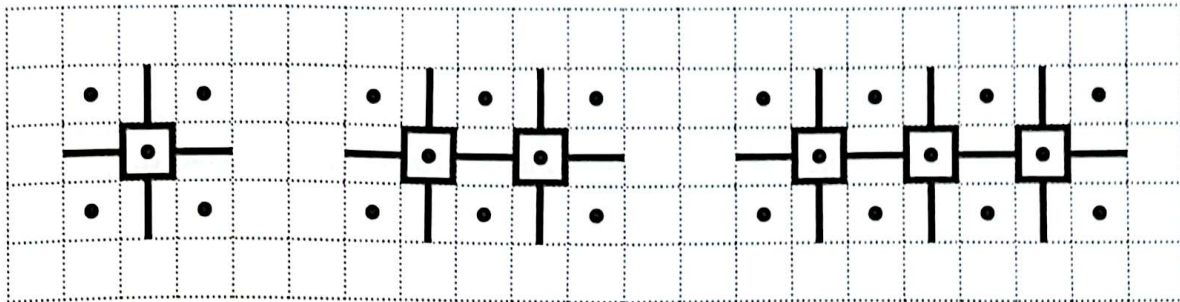

Diagram 1   Diagram 2   Diagram 3

(a)   Add more lines and dots to the diagram below to show Diagram 4 of the sequence.
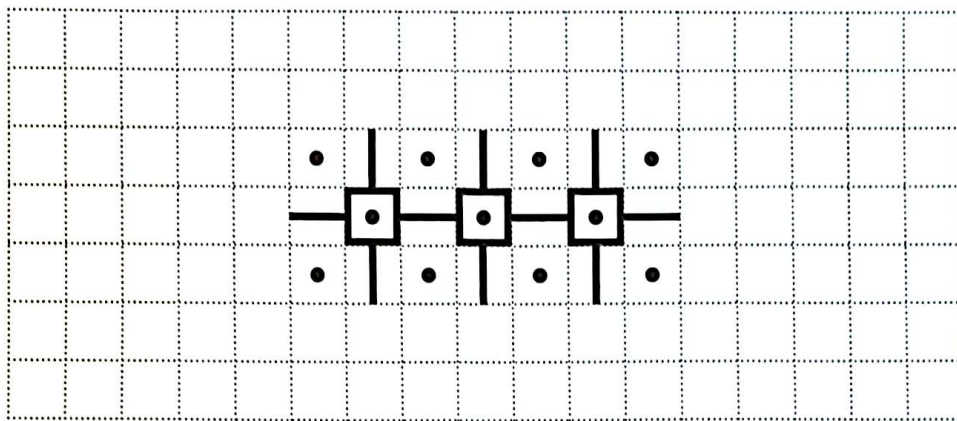
Diagram 4

(2 marks)

(b) The number of dots, D, and the number of unit lines that form each diagram, L, form a pattern. The values for D and L for the first 3 diagrams are written in the table below. Study the pattern of numbers in each row of the table.

Complete the rows numbered (i), (ii) and (iii).

	Diagram	Number of Dots (D)	Number of Lines (L)	
	1	5	8	
	2	8	15	
	3	11	22	
(i)	4	_____	_____	(2 marks)
	⋮	⋮	⋮	
(ii)	_____	59	_____	(2 marks)
	⋮	⋮	⋮	
(iii)	n	_____	_____	(2 marks)

(c) One of the diagrams in the sequence has 148 **lines**. Calculate the number of **dots** in this diagram.

....

(2 marks)

Total 10 marks

GO ON TO THE NEXT PAGE

SECTION II

Answer ALL questions.

ALGEBRA, RELATIONS, FUNCTIONS AND GRAPHS

8. (a) The functions f and g are defined as follows

$$f : x \rightarrow \frac{1 + 3x}{x - 1}, x \neq 1$$

$$g : x \rightarrow 5 - x.$$

(i) Calculate the value of $f(-2)$.

....

(1 mark)

(ii) Determine a simplified expression for $fg(x)$.

....

(2 marks)

(iii) Derive an expression in terms of x for the inverse function, $f^{-1}(x)$.

....

(3 marks)

GO ON TO THE NEXT PAGE

(b) The velocity–time graph below describes the journey of a car over a period of 70 seconds. The journey is represented in 5 stages labelled I to V.
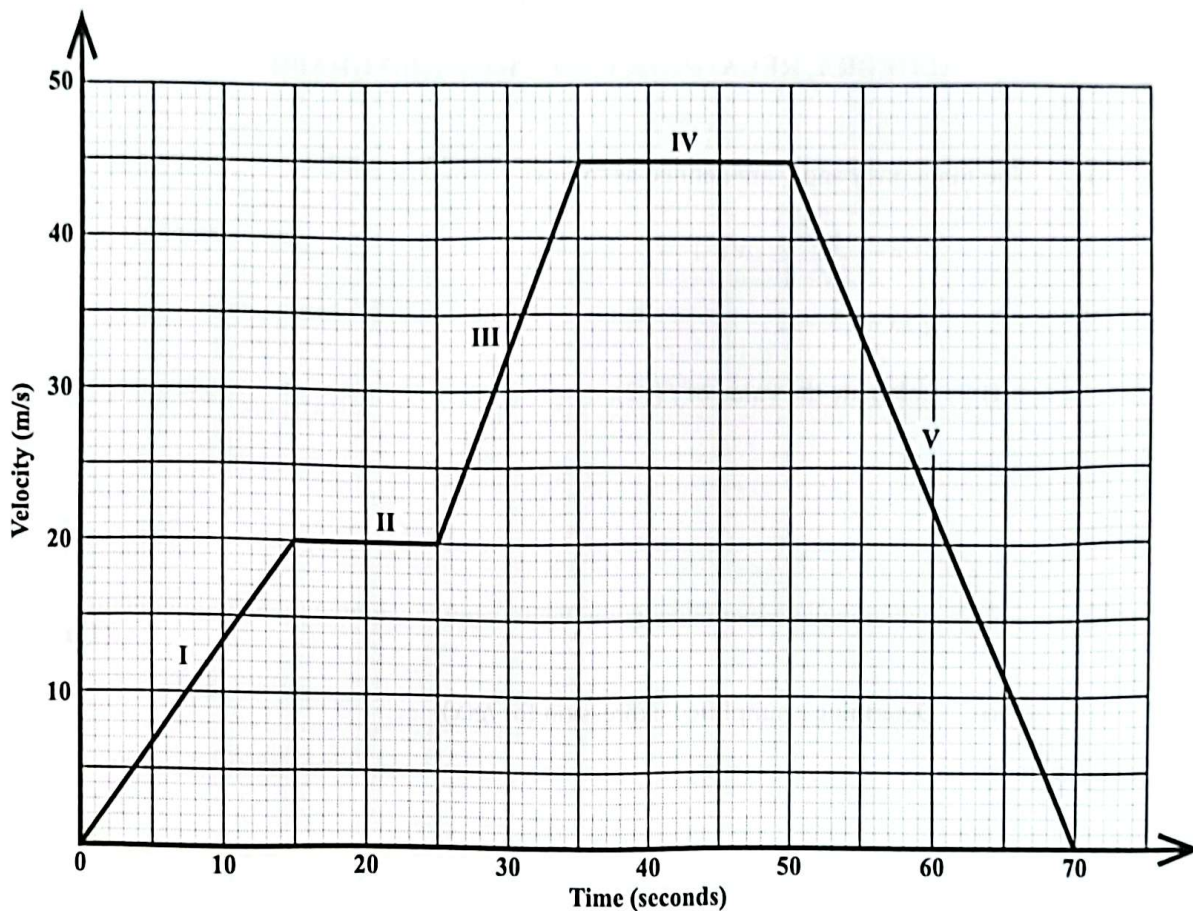
(i) Complete the following statement.

During Stage IV, the car is travelling at .... m/s with an acceleration

of .... m/s². **(2 marks)**

(ii) Determine the MAXIMUM acceleration of the car during the 70 seconds.

....

(2 marks)

01234020/J/CSEC 2025

(iii)   Calculate the distance travelled by the car during the **first 25 seconds** of its journey.

....

(2 marks)

Total 12 marks

149

A007

GEOMETRY AND TRIGONOMETRY

9.   (a)   The diagram below shows a circle with its centre O and the points P, Q, L and N lying on its circumference. $LN = NQ$ and RM is a tangent to the circle at L. Angle $MLN = 63°$.
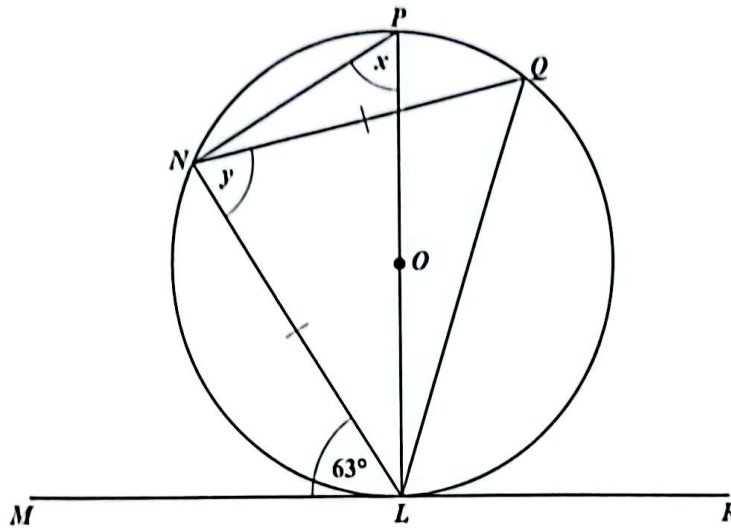
(i)   Explain why Angle x and Angle NQL are equal.

....

....

....

(1 mark)

(ii)   Determine the value of EACH of the following angles. Show detailed working
        where possible and give a **reason** for your answer.

a)   Angle x

        Reason ....

        ....

        ....
                                                                                        (2 marks)

b)   Angle y

        Reason ....

        ....

        ....
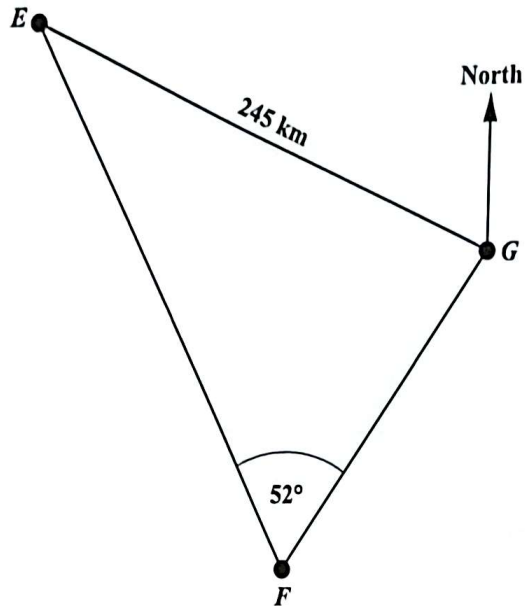   **(2 marks)**

(b) Two ports, E and G, are on level ground, 245 km apart. The bearing of E from G is 302°. A ship is anchored at F, some distance away from G, on a bearing of 228°. Angle $EFG = 52°$. This information is shown on the diagram below.

(i) a) On the diagram above, insert the angle 228°, the bearing of F from G.

(1 mark)

b) Determine the value of Angle FEG.

....

(1 mark)

GO ON TO THE NEXT PAGE

01234020/J/CSEC 2025

(ii)   Calculate *GF*, the distance the ship is from Port *G*.

....

(2 marks)

(iii)   a)   Indicate the point *H* on the line *EF*, such that *GH* is the SHORTEST distance from *G* to *EF*.   **(1 mark)**
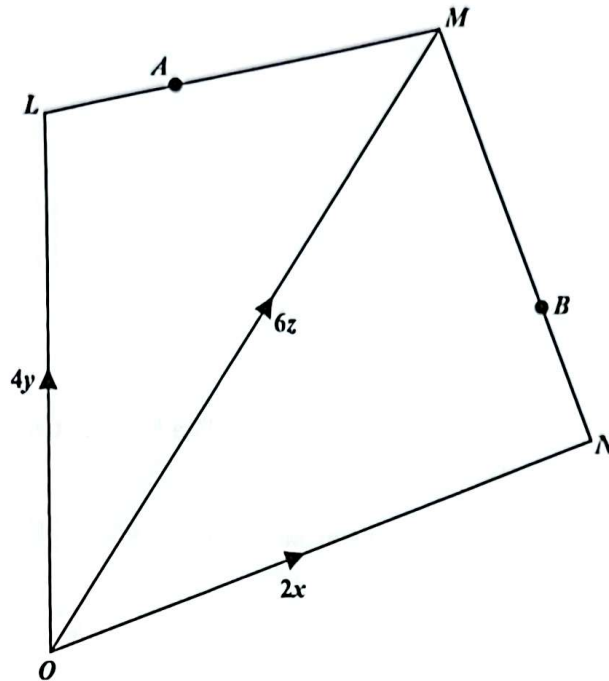
b)   Determine the distance *GH*.

....

(2 marks)

Total 12 marks

VECTORS AND MATRICES

10. **(a)** The diagram below shows quadrilateral $OLMN$, in which O is the origin, $\overrightarrow{OL} = 4y$, $\overrightarrow{OM} = 6z$ and $\overrightarrow{ON} = 2x$. The point A lies on LM such that $LA : AM = 1:2$ and the point B on MN such that $MB : BN = 2:1$.

    (i) Express, in its simplest form, $\overrightarrow{MN}$ in terms of x and z.

....

(1 mark)

(ii)   a)   Find, in terms of x and y, in its simplest form, an expression for $\overrightarrow{LN}$.

....

(1 mark)

    b)   Show that $\overrightarrow{AB}$ equals $\frac{2}{3}(2x - 4y)$.

....

(2 marks)

(iii)   Based on your results in Part (ii), state TWO geometric properties relating LN to AB.

....

....

....

....

(2 marks)

01234020/J/CSEC 2025

(b)   Determine the values of the unknowns in EACH of the matrix equations below.

(i) $\begin{bmatrix} 4 & 0 \\ -2 & 5 \end{bmatrix} + \begin{bmatrix} x & 2 \\ 8 & -1 \end{bmatrix} = \begin{bmatrix} -3 & 2 \\ y & 4 \end{bmatrix}$

....
(2 marks)

(ii) $\begin{bmatrix} 5 & -3 \\ 2 & 3 \end{bmatrix} \begin{bmatrix} a & 2 \\ c & -1 \end{bmatrix} = \begin{bmatrix} -10 & 13 \\ 17 & 1 \end{bmatrix}$

....
(4 marks)

Total 12 marks

END OF TEST

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