O

GAN ENG SENG SCHOOL
Preliminary Exam 2025

CANDIDATE NAME			
CLASS		**INDEX NUMBER**	

MATHEMATICS
Paper 1

4052/01

28 Aug 2025
2 hours 15 minutes

Sec 4 Express/ 5 Normal Academic

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your class, index number and name on all the work you hand in.
Write in dark blue or black pen on both sides of the 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.
If working is needed for any question it must be shown with the answer.
Omission of essential working will result in loss of marks.
Calculators should be used where appropriate.
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, unless the question requires the answer in terms of π.

The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 90.

	For Examiner's Use
Total	90

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Mathematical Formulae

Compound interest

$$\text{Total amount} = P\left(1+\frac{r}{100}\right)^n$$

Mensuration

$$\text{Curved surface area of a cone} = \pi rl$$

$$\text{Surface area of a sphere} = 4\pi r^2$$

$$\text{Volume of a cone} = \frac{1}{3}\pi r^2 h$$

$$\text{Volume of a sphere} = \frac{4}{3}\pi r^3$$

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

$$\text{Arc length} = r\theta, \text{ where } \theta \text{ is in radians}$$

$$\text{Sector area} = \frac{1}{2}r^2\theta, \text{ where } \theta \text{ is in radians}$$

Trigonometry

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

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

Statistics

$$\text{Mean} = \frac{\sum fx}{\sum f}$$

$$\text{Standard deviation} = \sqrt{\frac{\sum fx^2}{\sum f} - \left(\frac{\sum fx}{\sum f}\right)^2}$$

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Answer **all** the questions.

1 **(a)** Calculate $\dfrac{33.17 \times 55.2^{\frac{1}{3}}}{-(-1)+\sqrt[3]{647.9}}$, giving your answer correct to 1 significant figure.

Answer _____ [1]

(b) Convert 3 m/s to km/h.

Answer _____ km/h [1]

---

2 **(a)** If $10^m = 2$ and $10^n = 11$, find the value of 10^{2m-n}.

Answer _____ [1]

(b) Simplify $\dfrac{7mn^{-1}}{m^2} \div \dfrac{(mn^2)^3}{7}$.

Answer _____ [2]

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3 The period, T, of a pendulum is proportional to the square root of its length, L.
If the period is increased by 25%, calculate the percentage change in the length.

Answer _____ [2]

---

4 The stem and leaf diagram below shows the times, in minutes, taken by a group of students in a school to assemble a toy car for a charity event.

1	0	2	4	5	5	8	8	9					
2	1	1	3	3	4	5	6	6	6	7	7	8	9
3	0	0	0	1	1	3	7						

Key: 2|0 represents 20 minutes

(a) Find the time taken by the slowest student to assemble a toy car.

Answer _____ minutes [1]

(b) 25% of the students took less than p minutes to assemble a toy car.
Find the value of p.

Answer $p =$ _____ [1]

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5 Mdm Siti took a bank loan of $12 000 where the bank charges an annual compound interest of 7% compounded half-yearly.
Find the interest earned at the end of 2 years.

Answer $\$$_____ [3]

---

6 Given that $z = \frac{\sqrt{x^2 + y}}{2}$, express x in terms of z and y.

Answer $x =$ _____ [2]

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7 **(a)** **(i)** Express $x^2 - 6x - 16$ in the form $(x+a)^2 + b$.

Answer _____ [2]

(ii) Write down the coordinates of the turning point of the graph $y = x^2 - 6x - 16$.

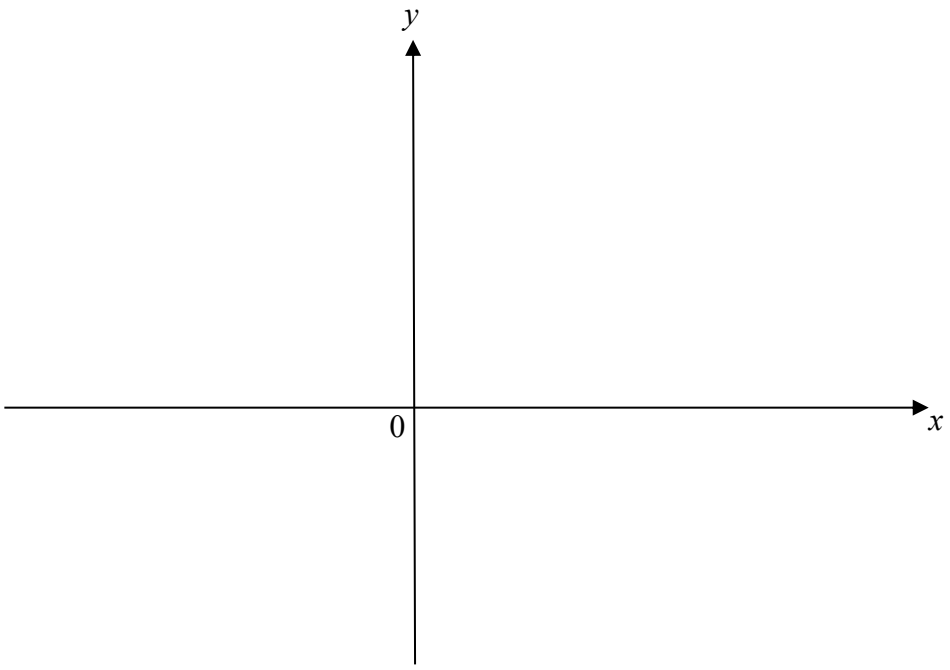
Answer (,) [1]

(iii) Write down the equation of line of symmetry.

Answer _____ [1]

(b) Sketch the graph of $y = -3(x+1)(x-5)$ on the axes below. Indicate clearly the points where the graph crosses the axes and the turning point.

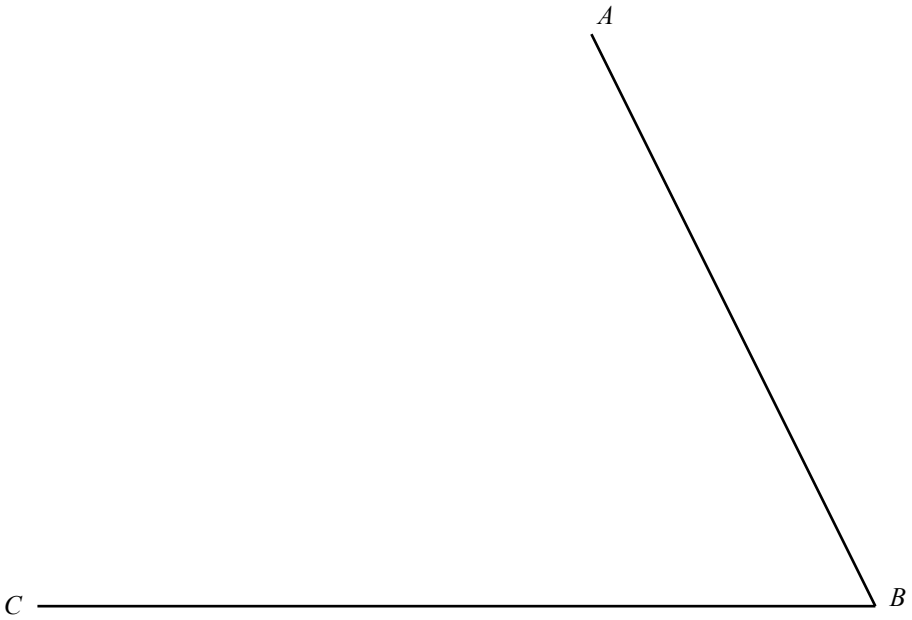
Answer



[2]

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8 Three points A, B and C are shown below.



(a) Construct the perpendicular bisector of BC. [1]

(b) Construct the bisector of angle ABC. [1]

(c) Mark clearly a possible point which is equidistant from B and C, and is nearer to AB than to BC. Label this point P. [1]

(d) The point N is such that angle $BCN = 85^{\circ}$ and $AN = 7$ cm.
Find the two possible positions of N and label them N_1 and N_2. [2]

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9 The sum of the first n terms of a sequence is $n(3n-2)$.

(a) Find the first 3 terms of the sequence.

Answer _____ , _____ , _____ [2]

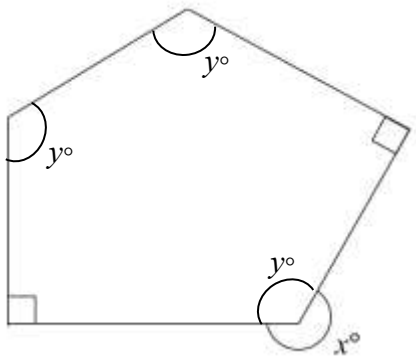
(b) Find, in terms of n, and expression for the nth term of this sequence.

Answer _____ [1]

---

10 **(a)** The diagram below shows a pentagon with two of its interior angles as right angles, and the remaining interior angles are equal.

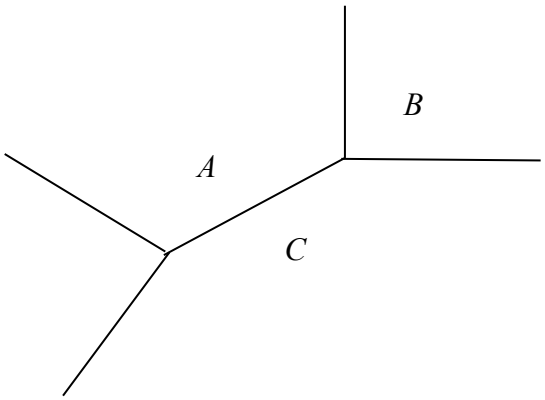
Find the value of $\frac{y}{x}$.



Answer $\frac{y}{x} =$ _____ [2]

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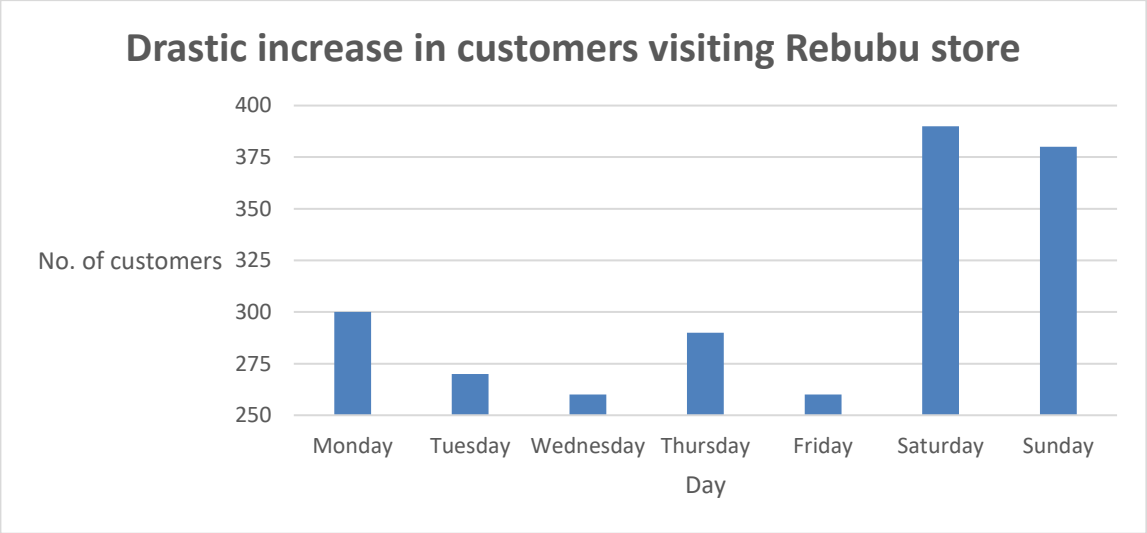
(b) The diagram shows three regular polygons, A, B and C, joined together.
Polygon A has 12 sides and polygon B has 4 sides.
Find the number of sides in polygon C.



Answer _____ sides [2]

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11 Charles drew the bar graph below for his Element of Business Studies project.



Explain how the bar graph may be misleading.

Answer _____

_____

_____ [1]

12 The position vector of C is $\begin{pmatrix} -2 \\ 5 \end{pmatrix}$. The position vector of D is $\begin{pmatrix} 3 \\ -1 \end{pmatrix}$.

(a) Find the vector that represents the translation from C to D.

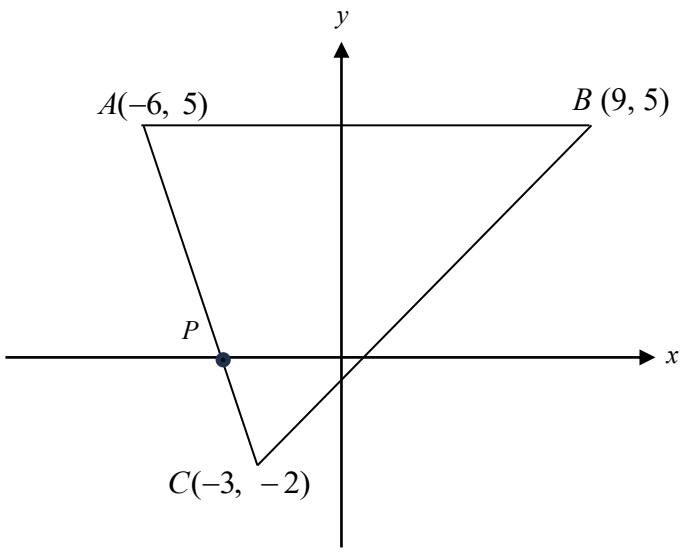
Answer _____ [1]

(b) E is a point on CD such that $\left|\overrightarrow{CE}\right| = 2\sqrt{61}$, and the x-coordinate of C is greater than the x-coordinate of E. Find $\overrightarrow{CE}$.

Answer _____ [2]

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13 A, B and C are the points $A(-6,\ 5)$, $B(9,\ 5)$ and $C(-3,-2)$.



Find

(a) the equation of line AC,

Answer _____ [2]

(b) the equation of the line that is parallel to AC and passes through B,

Answer _____ [2]

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(c) area of triangle ABC,

Answer _____ units^2 [2]

(d) the shortest distance from A to BC,

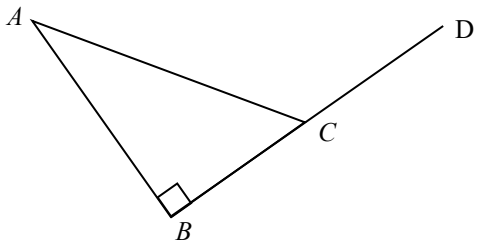
Answer _____ units [2]

(e) the coordinate of point P as the line AC intersects the x-axis at P.

Answer _____ [2]

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14 In the figure, $AB = 12$ cm, $BC = 5$ cm and $\angle ABC = 90°$



(a) Find the value of $\cos \angle ACD$.

Answer _____ [2]

(b) If A, B and C lie on the circumference of a circle, write down the radius of the circle.

Answer _____ cm [1]

---

15 Some bacteria were introduced into a culture.

The number, N, of bacteria t hours after being introduced is given by

$$N = 500 \times 4^t$$

(a) How many bacteria were introduced into the culture?

Answer _____ [1]

(b) Find the percentage increase in the number of bacteria at the end of the second hour.

Answer _____ % [2]

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(c) Find the time taken for the number of bacteria to reach 64 000.

Answer $t =$ _____ hours [1]

---

16 **(a)** Simplify $\dfrac{x^2 + xy}{x^2 + 2xy + y^2}$

Answer _____ [2]

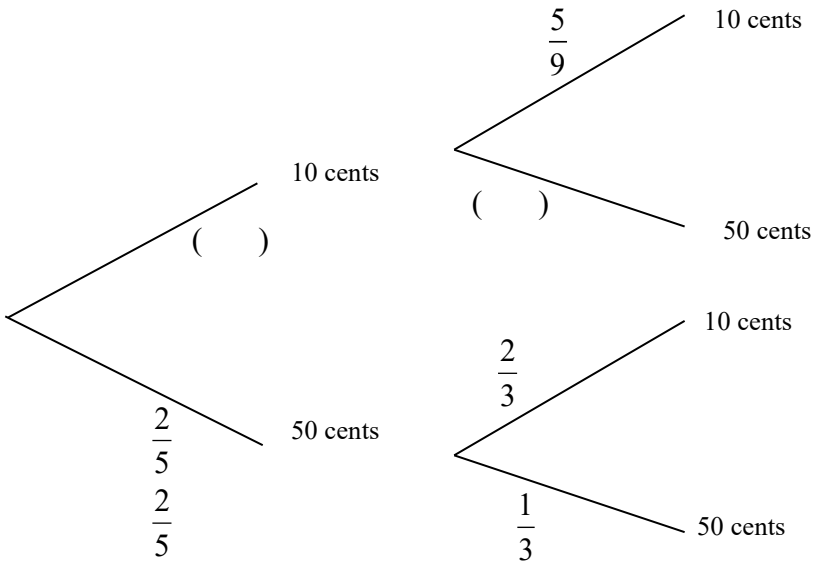
(b) Factorise completely $10yz - 5y^2 - 2xz + xy$.

Answer _____ [2]

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17 Mrs Chan has four 50-cent coins and six 10-cent coins in her purse. She takes out two coins at random from her purse, one after another.

(a) Complete the tree diagram below. [1]
Answer



(b) Find the probability that

(i) the total amount of the two coins taken is exactly 60 cents.

Answer _____ [2]

(ii) at least one 50-cent coin is taken.

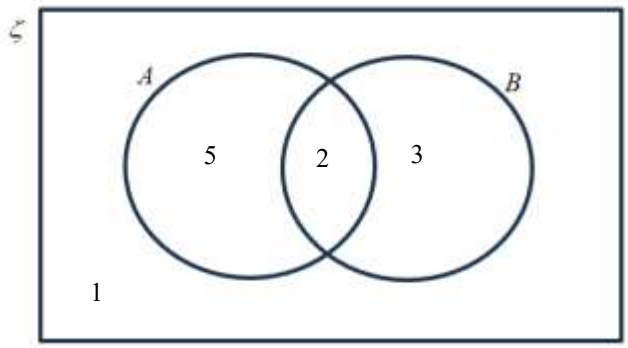
Answer _____ [2]

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18 **(a)** Mr Lim bought a refrigerator on hire purchase. The cash price of the refrigerator is \$1,200. He paid a 20% deposit and agreed to pay the balance in 12 equal monthly instalments. Each instalment included an interest of 1.5% per month on the unpaid balance.
Calculate the total amount paid for the refrigerator under hire purchase.

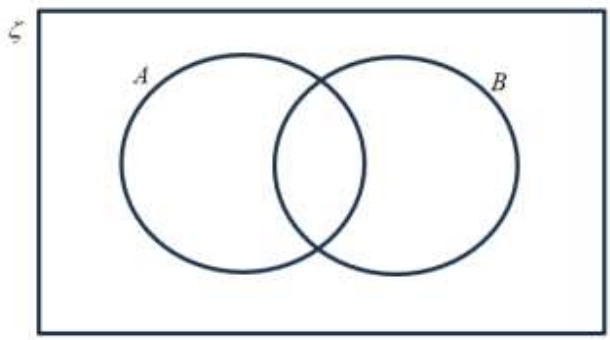
Answer _____ [2]

(b) **(i)** The Venn diagram shows the universal set and the number of elements in each of its subsets.
Find the number of element in the set $(A \cap B) \cup (A \cup B)'$.



Answer _____ [1]

(ii) On the Venn diagram, shade the region which represents $(A' \cup B) \cap (A \cup B)'$.



Answer On the diagram [1]

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19 A nature reserve has a land area of 225 km^2.

(a) Find the area of the nature reserve on a map with a scale of 1: 1 000 000.

Answer _____ cm^2 [2]

(b) The same nature reserve is represented by an area of 36 cm^2 on another map. Express the scale of this map in 1: n.

Answer _____ [2]

---

20 **(a)(i)** Express 4624 as a product of its prime factors.

Answer _____ [1]

(ii) Given that p and q are prime numbers, find the value of p and of q so that $4624 \times pq^{-1}$ is a perfect cube.

Answer $p =$ _____ , $q =$ _____ [2]

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(b) Javen's test marks are listed below.

26 a 29 25 b c

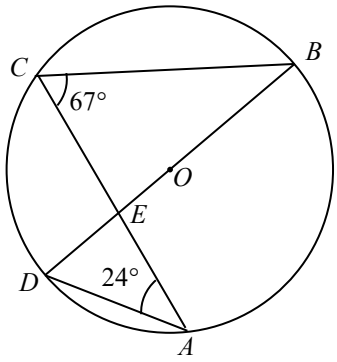
The mean mark is 28.
The median mark is 28.
The modal mark is 29.

Given that $a < b < c$, find the values of a, b, and c.

Answer _____ [2]

---

21 The diagram shows a circle $ABCD$ with centre O and BD passing through O. AC intersects BD at E. Angle $ACB = 67°$ and angle $DAC = 24°$.



(a) Prove, stating your reasons clearly, that ΔAED is similar to ΔBEC.
Answer

[2]

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(b) Given that $AE = 3.5$ cm, $CE = 4$ cm, $DE = 2$ cm, calculate the length of EB.

Answer _____ cm [2]

(c) Calculate, as a fraction, the numerical value of the ratio $\frac{\text{minor arc length } AD}{\text{minor arc length } BC}$.

Answer _____ [2]

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22 The diagram shows three geometrically similar vases, A, B and C.
The volume of Vase A is 400 cm³ and its base area is 50 cm².



Vase A Vase B Vase C

(a) The base radius of Vase B is three times that of Vase A.
Calculate the base area of Vase B.

Answer _____ cm² [2]

(b) The base area of Vase C is 800 cm².
Find

(i) the ratio of the curved surface area of Vase C to the curved surface area of Vase A,

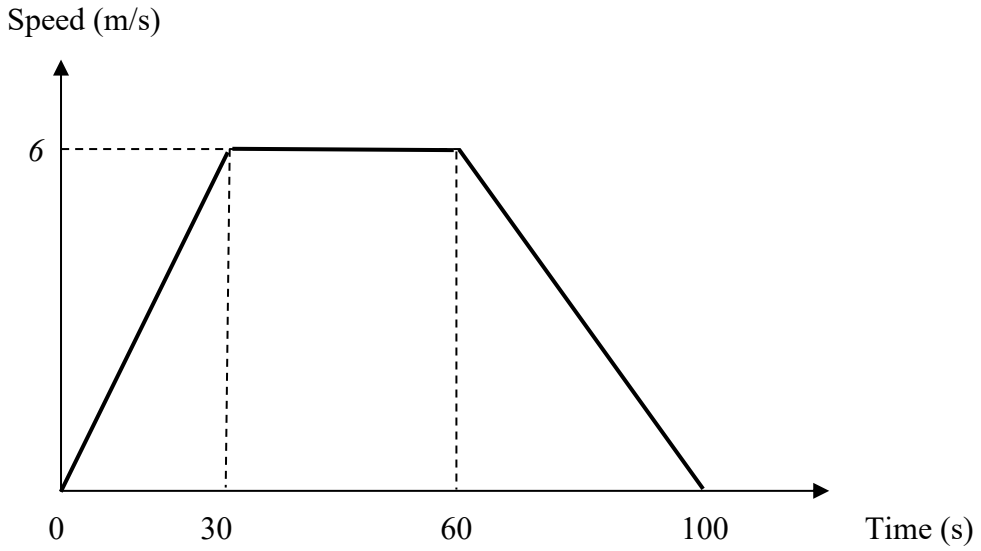
Answer _____ [1]

(ii) the volume of Vase C.

Answer _____ cm³ [2]

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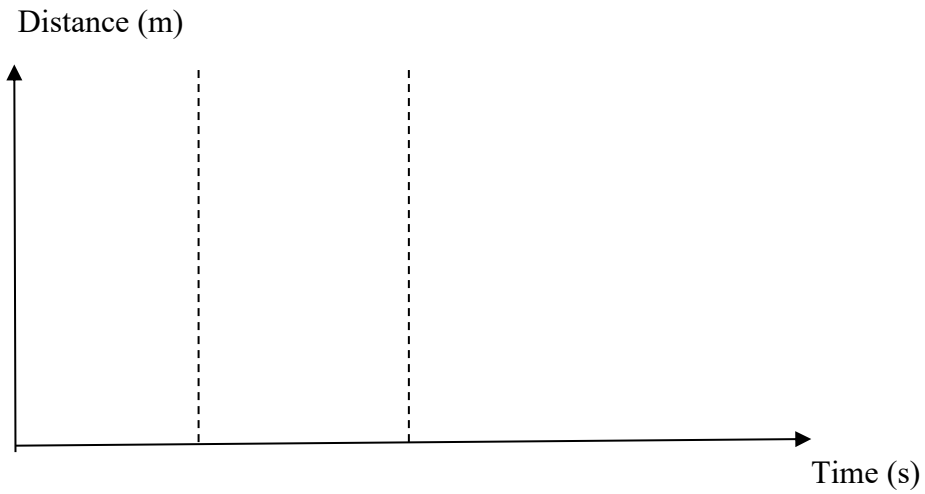
23 The diagram below shows part of the speed-time graph of Javier's cycle journey. Javier travelled from the starting point to point A in 100 seconds.



(a) Calculate Javier's cycling speed at $t = 70s$.

Answer _____ m/s [2]

(b) Sketch the corresponding distance-time graph on the axes below.
Answer [2]



END OF PAPER

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