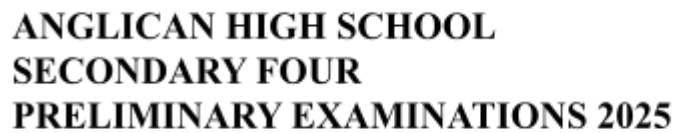


CLASS: 4 ()



S4

4052/02

25 August 2025

2 hours 15 minutes

Candidates answer on the Question Paper.

Write your name, index number and class on all the work you hand in.
Write in dark blue or black pen.
You may use a HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.

Answer **all** the 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.

The use of an approved scientific calculator is expected, 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 number of marks for this paper is 90.

For Examiners' Use

For Examiners Use								
Questions	1	2	3	4	5	6	7	8
Marks								
Questions	9	10	11	12	13	14	15	16
Marks								
Table of Penalties	Units					90		
	Clarity/Logic							
	Accuracy/Precision							
	Parent's Name and Signature: Date:							

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Compound Interest

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

Mensuration

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

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

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

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

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

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

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

Trigonometry

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

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

Statistics

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

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

1 _____ Rearrange the formula to make c the subject. $D = (a - c)^2 - a^2$

Answer: $c = \dots\dots\dots$ [3]

- 2** **(a)** A investor deposits \$18 000 with a finance company paying compound interest on a monthly basis at 6% per annum.

Calculate the interest received at the end of 5 years, correct to 2 decimal places.

Answer: \$..... [2]

- (b)** The price of a washing machine is \$900 before discount.
After selling the machine at a 20% discount, the seller still makes a profit of 25%.

Calculate the cost price of the washing machine.

Answer: \$..... [3]

- (c) The price of a gaming laptop is \$2 999. John buys this laptop on hire purchase after putting a down payment of \$600. For the remaining amount of the laptop, John has to pay the seller a monthly instalment of \$120 over 2 years.

Calculate the interest rate charged by the seller.

Answer:% [3]

- 3 Write as a single fraction in its simplest form $\frac{2}{9x^2 - 1} + \frac{1}{1 - 3x}$.

Answer: [3]

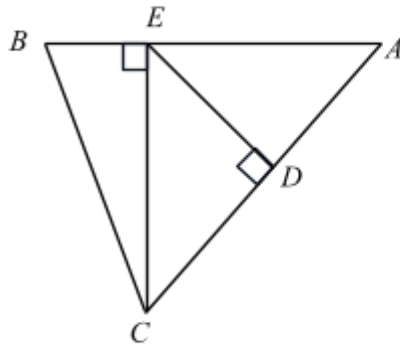
- 4 (a) Express $-x^2 + 4x - 3$ in the form $a(x+b)^2 + c$.

Answer: [2]

- (b) Hence, write down the coordinates of the turning point of the graph $-x^2 + 4x - 3$.

Answer: [1]

- 5 In triangle ABC , angle CDE and angle CEB are right angles.
 $DE = 2.5$ cm, $CD = 5$ cm, $AE = x$ cm and $CE = y$ cm.



- (a) (i) Show that $\triangle ECD$ and $\triangle ACE$ are similar.

Answer

.....

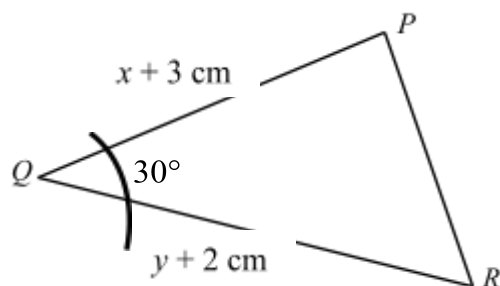
 [1]

- (ii) Express y in terms of x .

Answer: [1]

- (b) (i) In triangle PQR , angle $PQR = 30^\circ$, $PQ = x + 3$ cm and $QR = y + 2$ cm.

Express the area of triangle PQR in terms of x and y .



Answer: Area of triangle $PQR = \dots\dots\dots \text{cm}^2$ [1]

- (ii) The area of triangle PQR is $17\frac{1}{2} \text{ cm}^2$.

Using your answer in **a(ii)** and **b(i)**, find the value of x and of y .

Answer $x = \dots\dots\dots$

$y = \dots\dots\dots$ [3]

- 6 In the Singapore F1 Grand Prix, the drivers must complete 62 laps around a circuit that is 4.940 km long.
One F1 driver completed 32 laps in 65 minutes.

What must be the minimum average speed, in km/h, for the remaining laps if he wants to complete the race in at most two hours?

Answer: $\dots\dots\dots$ km/h [3]

- 7 The position vector of point C is $\begin{pmatrix} 2 \\ -3 \end{pmatrix}$. The position vector of point D is $\begin{pmatrix} 4 \\ h \end{pmatrix}$. $|CD| = \sqrt{20}$.

Find the two possible values of h .

Answer $h = \dots\dots\dots$ or $\dots\dots\dots$ [3]

8

There are 180 oranges in a box.

The table shows the distribution of the masses of these oranges.

Mass (m g)	$90 < m \leq 100$	$100 < m \leq 110$	$110 < m \leq 120$	$120 < m \leq 130$	$130 < m \leq 140$
Frequency	10	28	51	45	48

- (a) Calculate an estimate of the standard deviation of the masses.

Answer: $\dots\dots\dots$ g [1]

- (b) The weighing machine was faulty and overestimated each of the oranges by 5g.

Explain, with a reason, what will happen to the standard deviation.

.....

 [2]

- (c) Explain why the range of the masses of oranges may not be 50g.

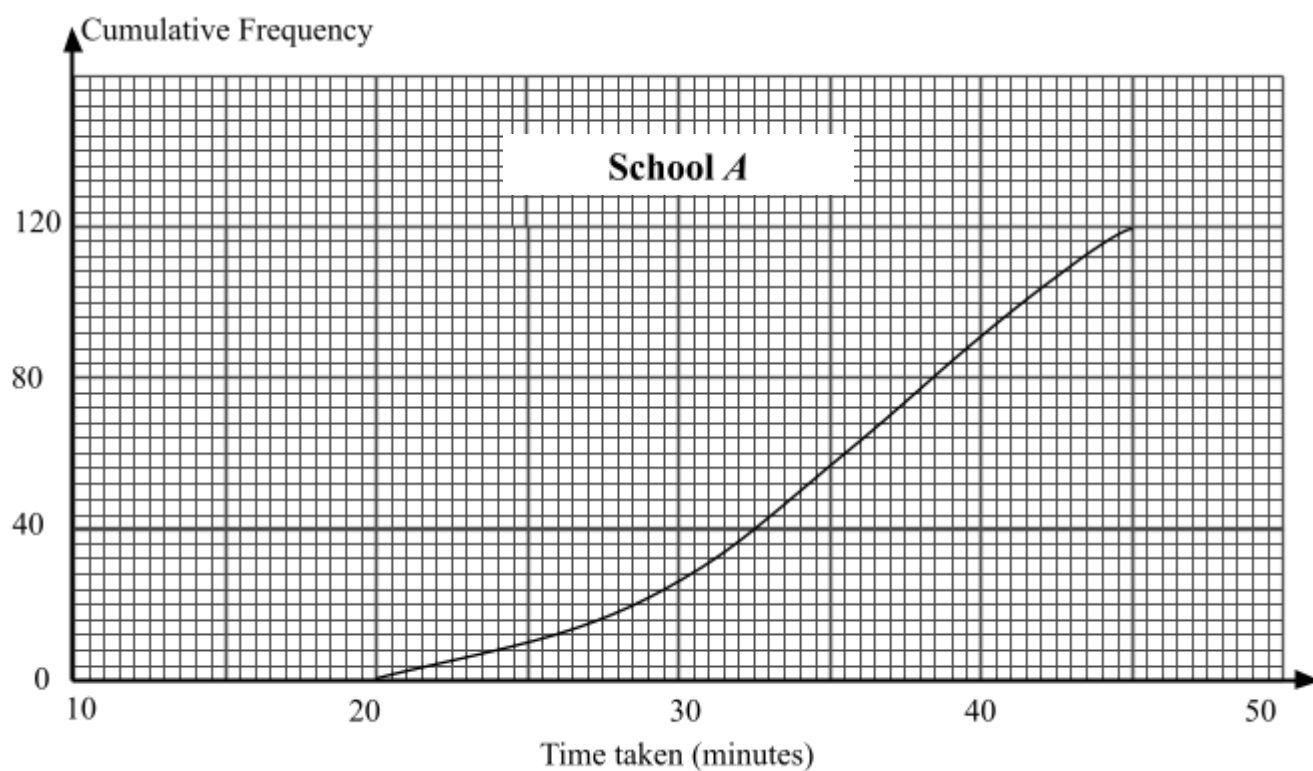
.....
 [1]

- (d) Roy says, “The modal class is the interval $110 < m \leq 120$ but the modal mass may not be in the interval $110 < m \leq 120$.” Is he correct? Give a reason for your answer.

.....

 [2]

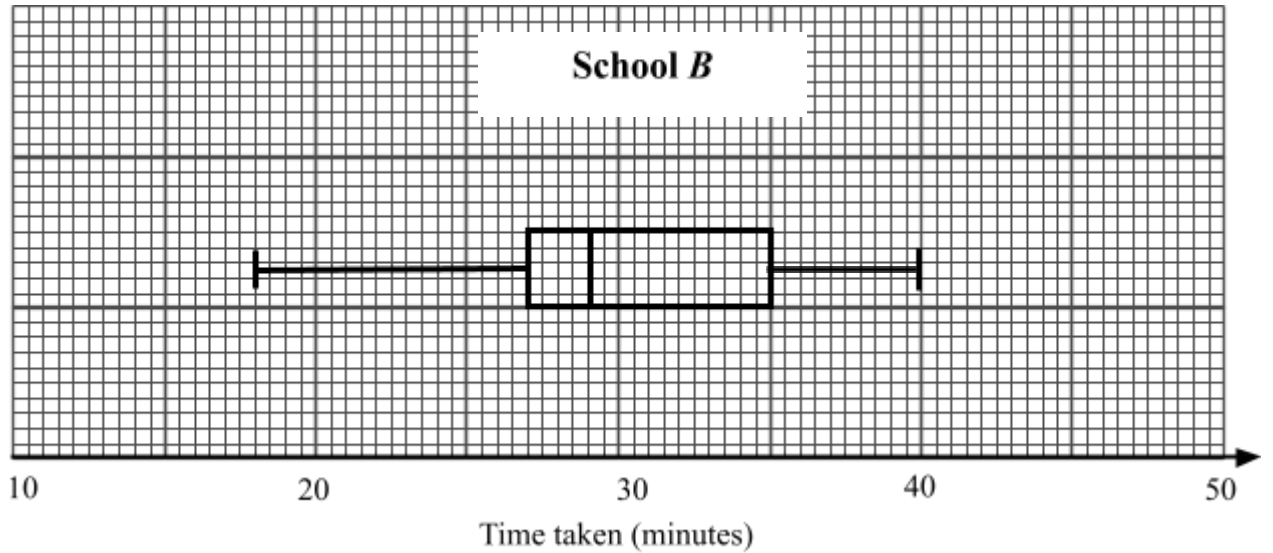
- 9 The time taken by 120 students to travel to school *A* was recorded.
The cumulative frequency curve below shows the distribution of their commute times.



- (a) Calculate the percentage of students who took at least 35 minutes to reach school.

Answer:% [1]

The commute times of another group of 120 students from school *B* were recorded. The box-and-whisker plot below shows the distribution of their travel times.



- (b) Mr Chan claims that in school B, there are twice as many students who take less than 27 minutes, than those who take more than 35 minutes.

Comment, with reasons on whether the data supports the claim.

.....

 [2]

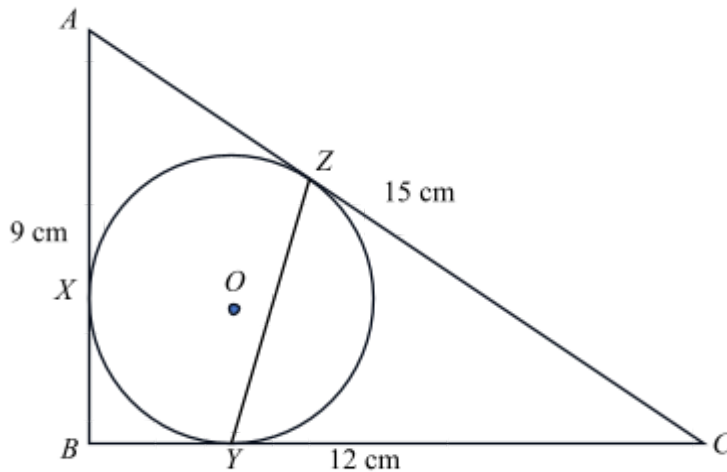
- (c) Give two comments comparing the commute times of the two groups of students.

1.....

 2.....

 [2]

- 10** In the diagram, triangle ABC is a right-angled triangle.
 $AB = 9$ cm, $BC = 12$ cm and $AC = 15$ cm.
 A circle with centre O and radius 3 cm is inscribed inside triangle ABC .
 The circle touches the sides of the circle at X , Y and Z respectively.



- (a) Show that the obtuse angle $YOZ = 2.50$ radians, correct to 3 significant figures.

Answer

- (b) Find the perimeter of the major segment YXZ .

[2]

Answer:cm [4]

- 11** A group of N children are at school celebrating National Day.
The children come in either red or white T-shirts.
Three girls from the group wore white T-shirts.

- (a) Two children are selected at random from the group.

The probability that both are girls wearing white T-shirts is $\frac{1}{70}$.

Find N .

Answer: $N =$ [2]

- (b) One child is selected at random.

The probability that it is a girl wearing a red T-shirt is $\frac{3}{7}$.

Three children are chosen at random.

The probability that one is a boy wearing a white T-shirt and two are girls wearing

red T-shirts is $\frac{108}{665}$.

Find the value of a , of b and of c as shown in the table of information about the group of children.

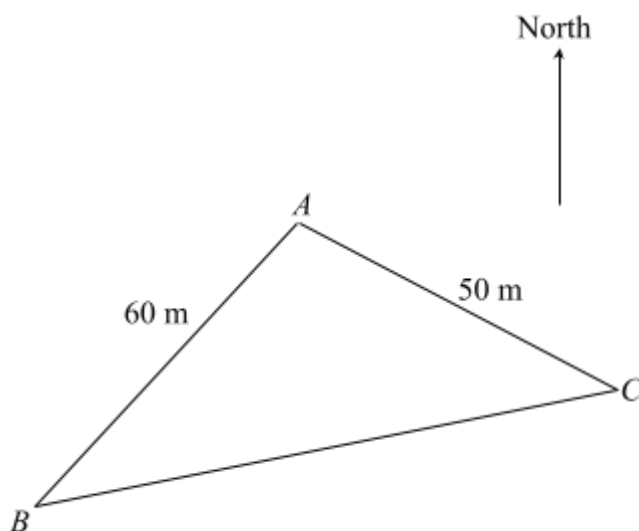
	White T-shirts	Red T-shirts
Boys	a	b
Girls	3	c

Answer: $a = \dots\dots\dots$

$b = \dots\dots\dots$

$c = \dots\dots\dots$ [3]

- 12** The diagram shows three points A , B and C on horizontal ground.
 A is at a bearing of 040° from B and C is at a bearing of 125° from A .
 $AB = 60$ m and $AC = 50$ m.



- (a) Find
 (i) the bearing of B from A ,

Answer: $\dots\dots\dots^\circ$ [1]

- (ii) the area of triangle ABC ,

Answer: $\dots\dots\dots\text{m}^2$ [2]

(iii) the distance BC ,

Answer:m [2]

(iv) angle ACB ,

Answer:° [2]

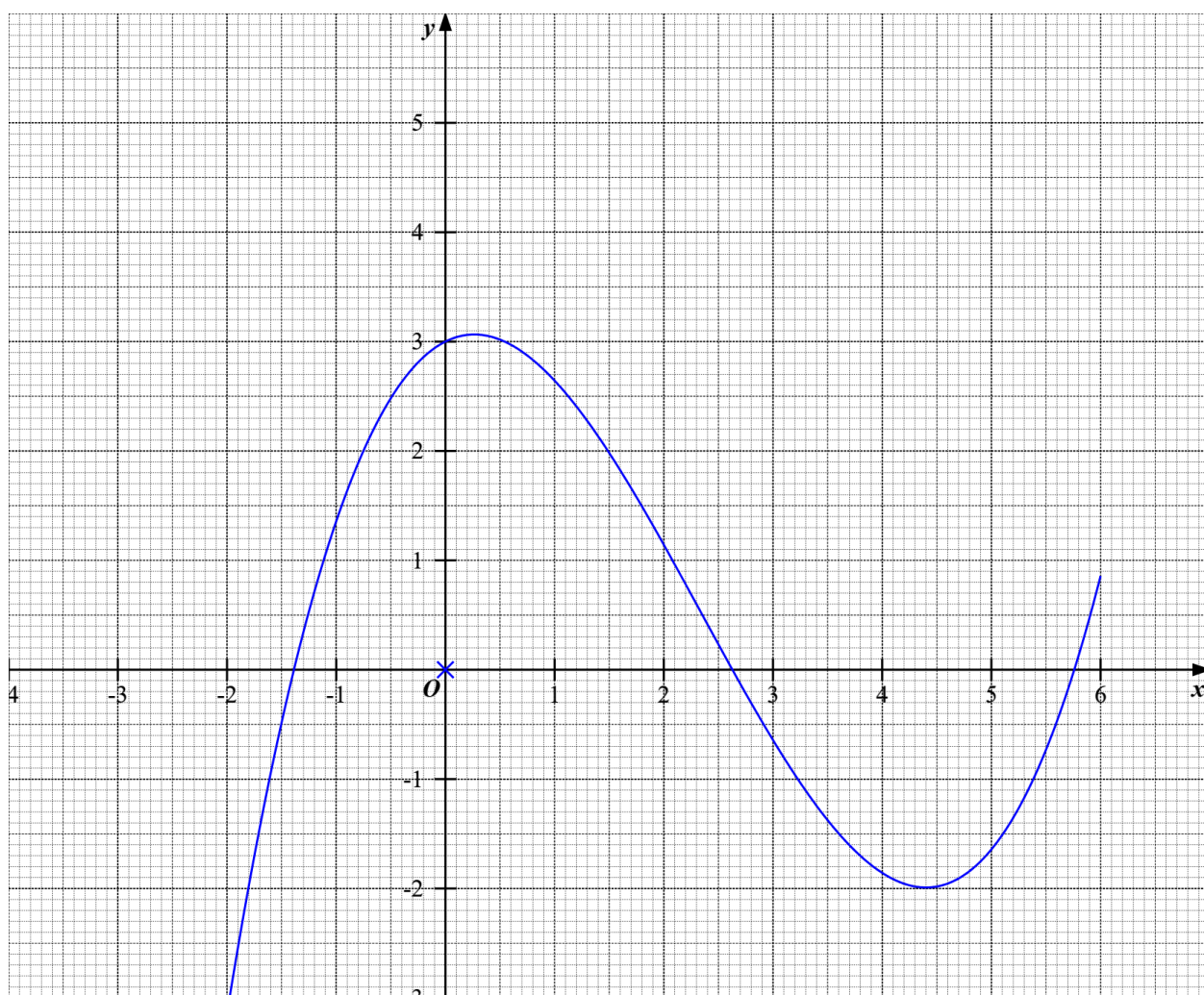
(v) the shortest distance AX , where X is a point along BC .

Answer:m [2]

- (b) Point A is the base of a vertical mast AT . The angle of depression of C from the T is 33° . Find the greatest angle of elevation of T from a point along BC .

Answer:° [3]

- 13 The graph of $y = \frac{1}{7}x^3 - x^2 + \frac{1}{2}x + 3$ is drawn on the grid.



Using your graph,

- (a) write down the range of values of x such that $y \geq 2$.

Answer: [1]

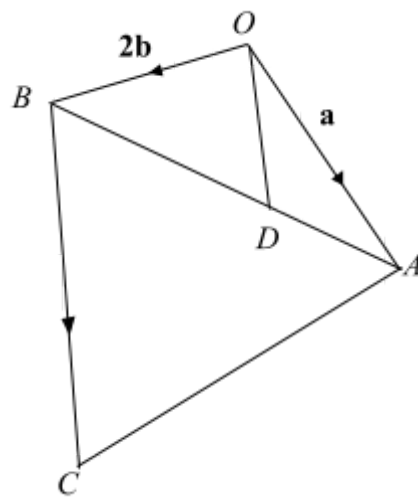
- (b) find the gradient of the tangent to the curve where $x = -0.5$.

Answer: [2]

- (c) by drawing a suitable straight line on the grid, solve the equation
 $6x^3 - 42x^2 + 126 = 21x$.

Answer: [3]

14



$OACB$ is a quadrilateral.

$\overrightarrow{OA} = \mathbf{a}$, $\overrightarrow{OB} = 2\mathbf{b}$ and $\overrightarrow{BC} = 2\mathbf{a} + 2\mathbf{b}$. $BD : DA = 2 : 1$.

(a) Write each of the following in terms of $\mathbf{a}$ and $\mathbf{b}$,

(i) $\overrightarrow{AB}$,

Answer:[1]

(ii) $\overrightarrow{CA}$,

Answer:[1]

(iii) $\overline{DO}$.

Answer:[1]

(b) Explain why $\overline{DO}$ is parallel to $\overline{BC}$.

.....

..... [1]

(c) Show that the area of $\frac{\text{Area of triangle } OBD}{\text{Area of triangle } BCD} = \frac{1}{3}$.

Answer

[1]

(d) Find

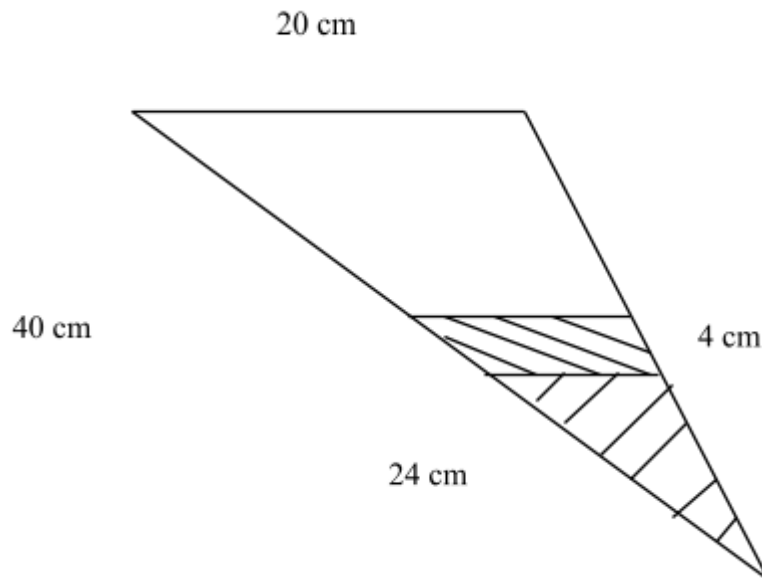
(i) $\frac{\text{Area of triangle } BCD}{\text{Area of triangle } CAD}$,

Answer:[1]

(ii) $\frac{\text{Area of triangle } OBD}{\text{Area of triangle } CAD}$

Answer:[1]

- 15 The diagram shows a container with diameter 20 cm and height 40 cm. It contains water to a height of 24 cm from the vertex of the container. A layer of oil of height 4 cm floats on the water surface.



- (a) Calculate the diameter of the water in the container.

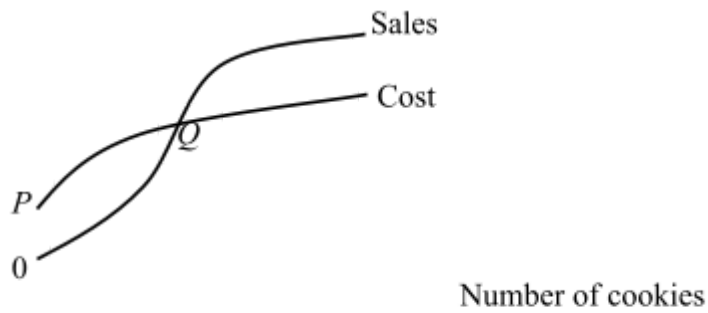
Answer:cm [1]

- (b) The curved surface area of the container is 150 cm^2 .
Calculate the curved surface of the container in contact with the oil.

Answer:cm² [3]

~~16~~ The graph below shows the monthly cost and total sales of cookies by Mrs Tan.

Monthly Amount (\$)



(a) Explain what does point P represent.

.....

[1]

(b) Explain what does point Q represent.

.....

Mrs Tan bought 3 ovens costing \$10 950 that will be fully depreciated (means reduced to \$0) in 2 years.

Each oven is to be used to bake large, medium and small cookies respectively.

Each large, medium and small circular cookie has a thickness of 0.4 cm and measures 6 cm, 4 cm and 3 cm in diameter respectively.

Selling price for each large cookie is \$1, medium cookie is \$0.80 and small cookie is \$0.50.

Order for each type of cookies must be in multiples of 20.

On a particular day, she receives orders from 18 locations amounting to a total of 160 large, 100 medium and 140 small pieces of cookies. The cost of delivery to each location is \$3.50.

The table below shows the cost of producing and packing the cookies on a particular day.

- Electricity and water usage : \$6.
- Depreciation of oven : \$15.
- Cost of delivery.
- Cost of materials.
- Cost of packaging.

The cost of materials are shown in the table below.

Each piece of	Cost of material
Large cookie	20 cents
Medium cookie	15 cents
Small cookie	11 cents

Mrs Tan wants to pack exactly 20 cookies in each container. The table below shows the dimensions and cost of the different types of containers from a supplier for her to select.

Dimensions of circular containers available		Cost of each circular container
Diameter (cm)	Height (cm)	
7	10	\$0.60
6	7	\$0.50
5	10	\$0.40
4	7	\$0.30

- (c) By taking 1 year to be 365 days, show that the depreciation cost of the 3 ovens per day is \$15.

Answer

[1]

- (d) Calculate Mrs Tan's profit from the sales of cookies on this particular day.

Answer

[6]

- (e) Without raising the price of the large, medium and small cookies, suggest a way to help Mrs Tan increase the profit margin.

Answer:

.....

.....[1]

End of Paper