Name:	Register No.:	Class:

CRESCENT GIRLS' SCHOOL
SECONDARY FOUR
PRELIMINARY EXAMINATION

MATHEMATICS **4052/01**
Paper 1 **19 August 2024**
2 hours 15 mins

Candidates answer on the Question Paper.

READ THESE INSTRUCTIONS FIRST
Write your name and index number on all the work you hand in.
Write in dark blue or black pen on both sides of the paper.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, 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.
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.

At the end of the examination, fasten all your work securely together.
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

Question	1	2	3	4	5	6	7	8	9	10	11	12
Marks												
Question	13	14	15	16	17	18	19	20	21	22	23	24
Marks												

Table of Penalties		Qn. No.		
Presentation	–1			
Accuracy/ Units	–1		Parent's/ Guardian's Signature	90

This question paper consists of 20 printed pages.

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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 Calculate $\dfrac{1.75(-2.03)^3}{-3.85^2 \div \sqrt[3]{135.7}}$.

(a) Write down the first six digits on your calculator display.

Answer ..... [1]

(b) Write your answer in part **(a)** correct to 3 decimal places.

Answer ..... [1]

2 The following items are to be packed into gift bags for distribution to an old folks' home.
84 packets of cereals. 126 cans of baked beans. 168 packets of biscuits.
The items are to be packed such that the contents in each gift bag are the same and there are no leftovers. Find

(a) the maximum number of gift bags required,

Answer ..... [2]

(b) the list of contents in each gift bag.
Answer

.....

..... [1]

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3 In a concert, $\frac{1}{3}$ of the audience were under the age of 20, 25% were over 50 and $\frac{2}{3}$ of those over 50 were females.

(a) Find the fraction of the whole audience that were between 20 and 50 inclusive.

Answer ..... [1]

(b) 100 of the audience were men above 50. Find the audience size.

Answer ..... [2]

4 y is inversely proportional to x^2.

If x is decreased by 60%, find the percentage increase in y.

Answer .....% [3]

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5 Finance company *A* pays investors compound interest at 1.2% per annum, compounded every month.
Finance company *B* pays investors simple interest at 1.5% per annum.
Mr Tan intends to invest a certain sum for 5 years. He thinks he should invest in finance company *A*.
Do you agree? Explain.
Answer

.....

..... [3]

6 **(a)** A pair of shoes costs $\$\left(3x^2-7\right)$ and a bag costs $\$\left(2x^2-3x+5\right)$.
Find the total cost of three such pairs of shoes and five of the bags, in terms of x.

Answer $ ..... [2]

(b) Factorise p^3-2p^2-4p+8 completely.

Answer ..... [2]

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7 **(a)** Solve the inequalities $\frac{3}{2}x-2<3x-8\leq\frac{2x+71}{3}$.

Answer ..... [2]

(b) ζ = {positive integers less than 17}

$A=\{x:3\leq x<15\}$

B = {factors of 20}

(i) List down the elements in the set $A\cap B$.

Answer ..... [1]

(ii) Find $n(A\cup B)'$

Answer ..... [1]

8 P is the point $(-6,-4)$ and Q is the point (x,y). The gradient of the line PQ is $\frac{2}{3}$.

Find the ratio of $x:y$ in its simplest form.

Answer ..... : ..... [2]

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9 A map is drawn to a scale of 1 : 25 000.

(a) The distance between two points on the map is 27.5 centimetres. Find the actual distance, in kilometres, between the two points.

Answer ..... km [1]

(b) A farm has an area of 36 square centimetres on this map.
Find the area of the farm, in square centimetres, on a second map which is drawn to a scale of 1 : 120 000.

Answer ..... cm^2 [3]

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10 The first four terms in a sequence of numbers are given below.

$$T_1 = 3^2 + 2 = 11$$
$$T_2 = 4^2 + 5 = 21$$
$$T_3 = 5^2 + 8 = 33$$
$$T_4 = 6^2 + 11 = 47$$

(a) Find T_5.

Answer ..... [1]

(b) Show that the n^{th} term of the sequence, T_n, is given by $n^2 + 7n + 3$. [1]

Answer

(c) T_n and T_{n+1} are consecutive terms in the sequence. Find and simplify an expression, in terms of n, for $T_{n+1} - T_n$.

Answer ..... [2]

(d) Explain why two consecutive terms of the sequence cannot have a difference of 6.

Answer

.....

..... [2]

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11 **(a)** The number of sides of regular polygon A is triple that of another regular polygon B.

The ratio of each interior angle of the polygon A to that of the polygon B is 4 : 3.

(i) Find the number of sides of the polygon A.

Answer ..... [2]

(ii) Hence, find the exterior angle of the polygon B.

Answer .....° [1]

(b) Explain briefly why each interior angle of a polygon cannot be 110°.

.....

..... [1]

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12 Solve the simultaneous equations.

$$4x + \frac{37}{3} = \frac{1}{3}y$$

$$\frac{1}{3}x - 3 = -4y$$

Answer $x =$ ..... , $y =$ ..... [3]

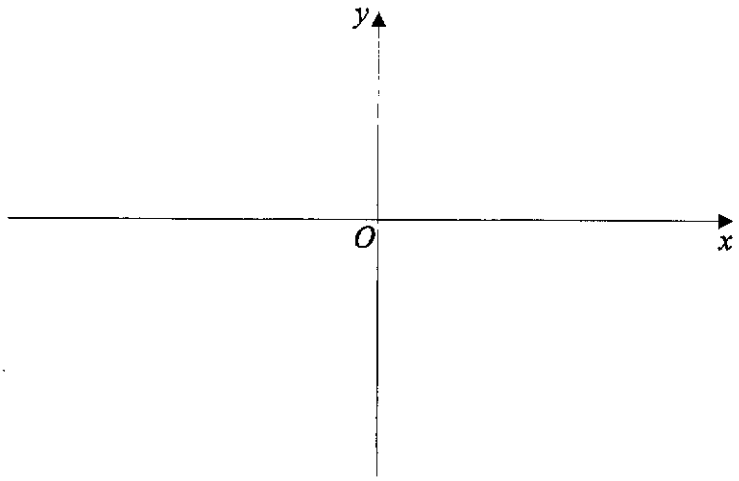
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13 **(a)** Express $y = -x^2 - 6x - 5$ in the form $y = a(x+b)^2 + c$.

Answer ..... [1]

(b) Sketch the graph of $y = -x^2 - 6x - 5$ on the axes below.
Indicate the values where the graph crosses the axes and the maximum point on the graph.

Answer



[2]

14 Jane had some drinks with her friends at a café which gave a \$6 discount. All prices are subjected to 10% service charge and 9% Goods and Services Tax. Her final bill was \$83.93. Find the marked price of her meal.

Answer \$ ..... [2]

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15 At a fruit juice stall, a cup of orange juice costs \$4.40, a cup of apple juice costs \$4.80 and a cup of grape juice costs \$6.20. On Saturday, there were 55 orders for orange juice, 41 orders for apple juice and 25 orders for grape juice. On Sunday, there were 42 orders for orange juice, x orders for apple juice and 20 orders for grape juice.

(a) Write down a 2×3 matrix, **A**, representing the orders over Saturday and Sunday.

Answer **A** = ... [1]

(b) Find, in terms of x, the matrix $\mathbf{P}=\mathbf{A}\begin{pmatrix}4.40\\4.80\\6.20\end{pmatrix}$.

Answer **P** = ... [1]

(c) Explain clearly what each element in matrix **P** represents.

.....

.....

..... [1]

(d) If the total revenue on Sunday is about 10% less that the total revenue on Saturday, calculate

(i) the value of x,

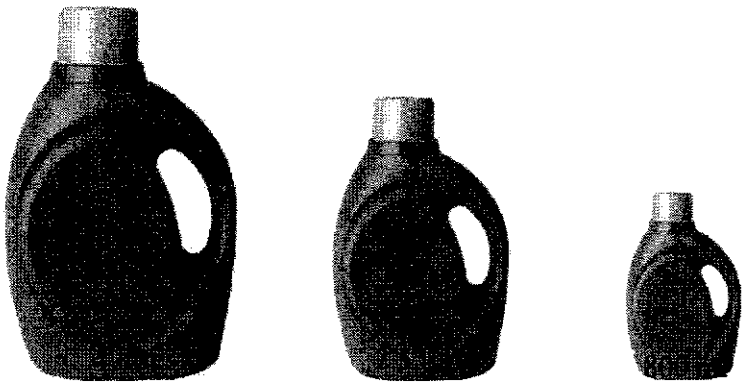
Answer ..... [2]

(ii) and the total revenue on the weekends using matrix multiplication.

Answer \$..... [2]

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16 The diagram shows three geometrically similar detergent bottles of the same brand.



A: \$15.50 *B*: \$10.20 *C*: \$4.50

(a) Explain which of the above bottles is the best value for money.

Answer

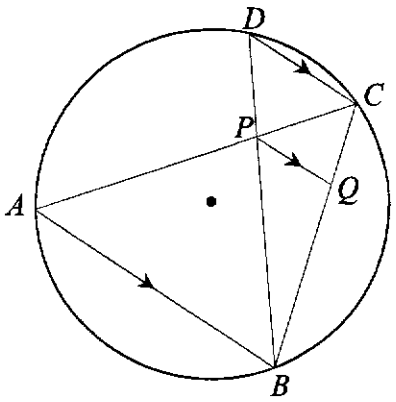
Bottle ..... is the best value for money. [2]

(b) The bottles are all geometrically similar.
The height of the 800 ml bottle is 12.5 cm.
Calculate the height of the 2.5 litres bottle.

Answer ..... cm [2]

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17 $ABCD$ is a cyclic quadrilateral and AB, PQ and DC are parallel.
Given that $PQ : DC = 2 : 3$ and area of triangle $BPQ = 25\ \text{cm}^2$.



(a) Show that triangle BPQ and triangle BDC are similar.
Answer

.....
.....
.....
..... [2]

(b) Calculate the area of triangle PCD.

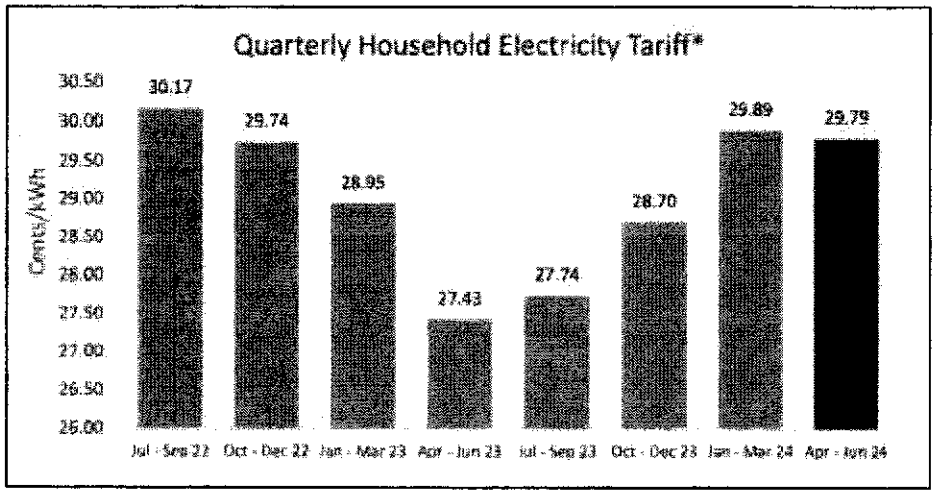
Answer ..... cm^2 [2]

(c) What type of triangle is PAB? Justify your answer.
Answer

.....
.....
.....
.....
..... [2]

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18



Source - https://www.spgroup.com.sg/about-us/media-resources/news-and-media-releases/Electricity-Tariff-Revision-for-the-Period-1-April-to-30-June-2024

(a) Find the percentage decrease of the quarterly household electrical tariff between July – Sept 22 and April – June 2023.

Answer ..... % [2]

(b) Explain briefly why the bar chart might be considered misleading.

.....

.....

.....

..... [1]

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19 The table below shows the heights of 40 students.

Height (H cm)	$90 < H \leq 100$	$100 < H \leq 110$	$110 < H \leq 120$	$120 < H \leq 130$	$130 < H \leq 140$
Frequency	2	9	13	10	6

(a) Calculate an estimate of the mean height of the students.

Answer ..... cm [1]

(b) Calculate an estimate of the standard deviation of the heights.

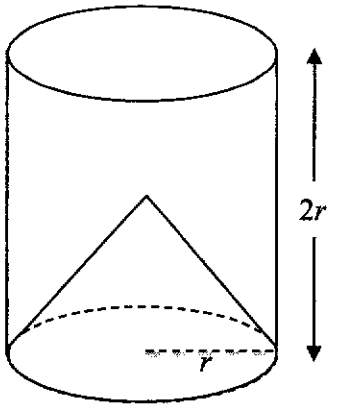
Answer ..... cm [1]

(c) It was discovered that the students were not instructed to remove their shoes during measurement. Assuming that the average height of the soles of the shoes is 2.5 cm, state the standard deviation.

Answer ..... cm [1]

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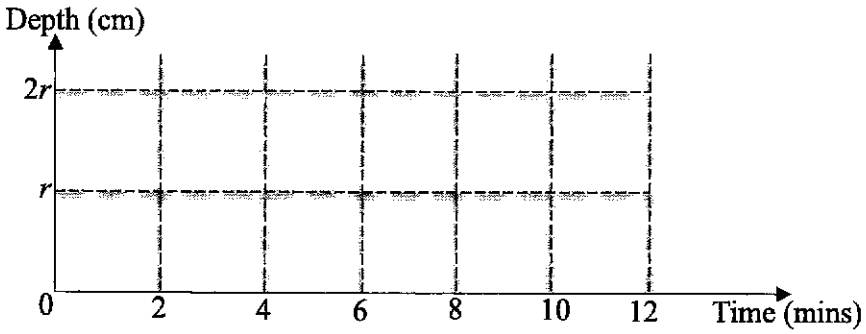
20 A solid cone of height and radius r cm is placed inside a cylindrical container of the same radius and a height of $2r$ cm.
Water is poured into the empty container at a constant rate.
After 4 minutes, the depth of the water is r cm.



(a) Find the time taken to fill the container completely.

Answer ..... minutes [2]

(b) On the axes in the answer space, sketch the graph showing how the height varies with time.



[2]

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21 The diagram below is a map showing the positions of two buildings, P and Q.
Building Q is due south of P. The scale is 1 cm to 100 m.
Another building, R is on a bearing of 100° from P.
The distance between Q and R is 1050 m.

(a) Mark and label on the diagram the position of building R. [1]

(b) A convenience store is located at T, which is equidistant from lines PQ and QR and is nearer to P than to Q.
Mark and label the possible position of the convenience store T. [3]
Answer



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22 The equation of a line L, is given as $y = 2x + 5$.

(a) A point on the line L is thrice as far from y-axis as compared to the x-axis. Find the coordinates of the point.

Answer (....., ...) [2]

(b) The line L is reflected about the x-axis. Find the equation of this line.

Answer ..... [2]

23 A box contains red, blue and green balls. Each ball is labelled either 2, 3, 4 or 5.
The table below shows the probability of the colour and number drawn for the balls.

	Number on the ball			
Colour	2	3	4	5
Red	0.1	0	0.2	0.15
Blue	0.1	0.05	0	0.2
Green	0	0.1	0.1	0

(a) A ball is drawn at random from the box. Find the probability that

(i) it is blue or odd,

Answer ..... [1]

(ii) it is not red and not even.

Answer ..... [1]

(b) There are 135 red balls in the box. How many balls are there in the box altogether?

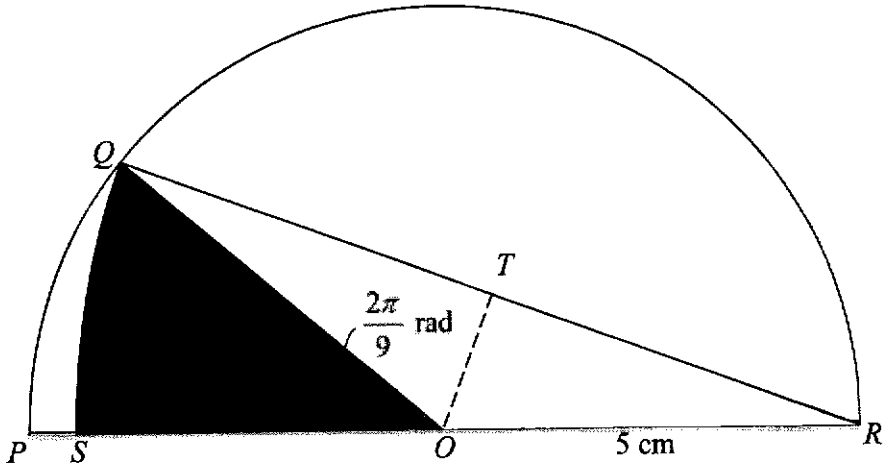
Answer ..... [1]

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24 The diagram shows a semicircle, centre O, of radius 5 cm.

The radius OQ makes an angle of $\frac{2\pi}{9}$ radians with the radius OP.

The arc QS of the circle has centre R and the point S lies on OP.



Find

(a) angle QRO,

Answer ..... rad [1]

(b) QR,

Answer ..... cm [2]

(c) the area of the shaded region.

Answer ..... cm^2 [3]

END OF PAPER

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CRESCENT GIRLS' SCHOOL
SECONDARY FOUR
PRELIMINARY EXAMINATION 2024

MATHEMATICS **4052/02**
Paper 2 **20 Aug 2024**
2 hours 15 minutes

Candidates answer on the Question Paper.

READ THESE INSTRUCTIONS FIRST

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The use of an approved scientific calculator is expected, where appropriate.
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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

Question	1	2	3	4	5	6	7	8	9	10
Marks										

Table of Penalties		Question No.		
Presentation	–1			
Accuracy/ Units	–1		Parent's / Guardian's Signature	90

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Mathematical Formulae

Compound Interest

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

Mensuration

Curved surface area of a cone = πrl

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

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

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

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

Arc length = $r\theta$, where θ is in radians

Sector area $= \frac{1}{2}r^2\theta$, where θ 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

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

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

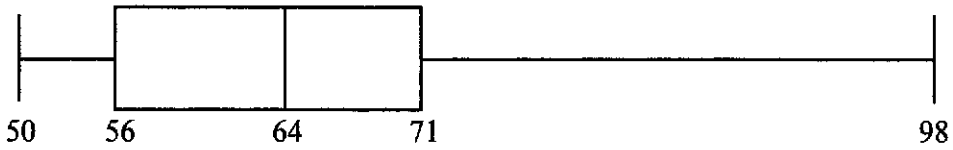
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1 20 students of class 4A took a test. The marks are shown in the stem and leaf diagram.

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

Key: 5|2 means 52 marks

The marks are also represented in the box-and-whisker plot.



(a) Find the value of k.

Answer $k =$ ..... [1]

(b) Would you prefer to use the mean or the median mark to describe the performance of class 4A? Give a reason for your answer.

Answer .....

..... [2]

(c) Class 4B took the same test as class 4A. A student from 4B was subsequently transferred to 4A and a new box-and-whisker plot for 4A was then drawn. It is given that the plot remained unchanged.

How many marks did the transfer student obtain in the test?

Answer .....marks [1]

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2 **(a)** Given that $p=\sqrt{\frac{q}{2}-r^2}+3$, express r in terms of p and q.

Answer ..... [2]

(b) Simplify $\frac{\left(-x^2y^3\right)^4}{3}\div\frac{2xy^0}{5xy^2}$.

Answer ..... [4]

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(c) **(i)** Factorise $9x^2 - 4$.

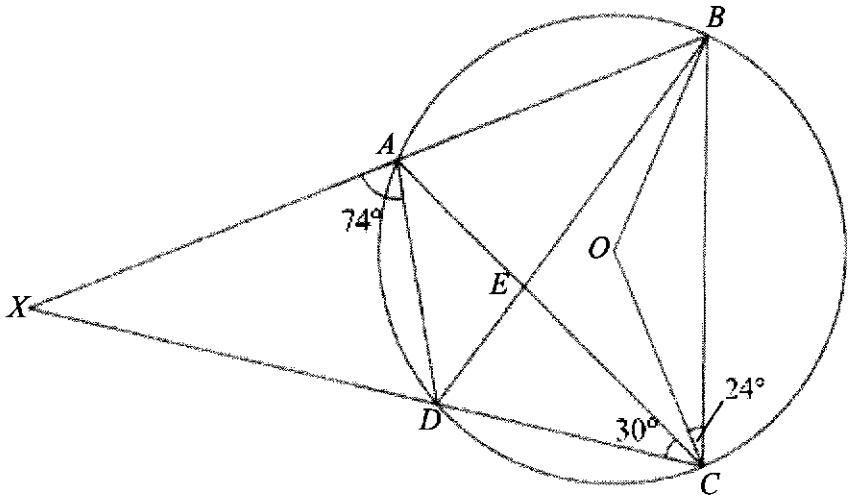
Answer ..... [1]

(ii) Hence, express $\frac{3x}{9x^2-4} - \frac{2}{3x-2}$ as a single fraction in its simplest form.

Answer ..... [3]

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3 A, B, C and D are points on the circumference of a circle with centre O. BA produced and CD produced meet at X. Angle $BCO = 24°$, angle $ACD = 30°$ and angle $XAD = 74°$.



(a) Stating the reasons clearly, find

(i) angle ABD,

Answer .....° [1]

(ii) angle BAC,

Answer .....° [2]

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(iii) angle ECO.

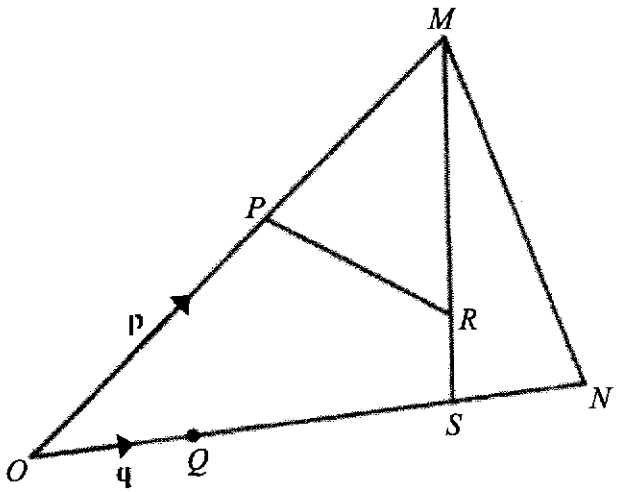
Answer .....° [2]

(b) W is a point on the same side of the major segment formed by the chord AD. Given that angle $AWD = 45°$, state with reason whether the point W lies on the circumference of the circle, outside the circle or inside the circle.

[2]

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4 In the diagram, $\overrightarrow{OP} = \mathbf{p}$, $\overrightarrow{OQ} = \mathbf{q}$, $\overrightarrow{OP} = \frac{2}{3}\overrightarrow{OM}$, $\overrightarrow{OQ} = \frac{1}{3}\overrightarrow{OS}$, $\overrightarrow{OQ} = \overrightarrow{SN}$ and $SM = 3SR$.



(a) Express, as simply as possible, in terms of $\mathbf{p}$ and $\mathbf{q}$,

(i) $\overrightarrow{MS}$,

Answer $\overrightarrow{MS} =$ ..... [1]

(ii) $\overrightarrow{PN}$,

Answer $\overrightarrow{PN} =$ ..... [2]

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(iii) $\overrightarrow{PR}$.

Answer $\overrightarrow{PR}$ = ... [3]

(b) Write down two facts about P, R and N.

Answer .....

.....

..... [2]

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(c) Find the numerical value of $\frac{\text{Area of } \triangle MPR}{\text{Area of } \triangle MON}$.

Answer $\frac{\text{Area of } \triangle MPR}{\text{Area of } \triangle MON} =$ ..... [2]

(d) The coordinates of A and B are $(6,5)$ and $(8,1)$ respectively.

(i) Express $\overrightarrow{AB}$ as a column vector.

Answer $\overrightarrow{AB} =$ ..... [1]

(ii) Find $\left|\overrightarrow{AB}\right|$.

Answer $\left|\overrightarrow{AB}\right| =$ ..... [2]

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5 A bag contains 42 red, 15 blue and y orange sweets. One sweet is picked at random from the bag. The probability of picking up an orange sweet is $\frac{6}{25}$.

(a) Show that the value of y is 18.

[2]

(b) Two sweets are drawn at random one after another, from the bag, without replacement. Calculate the probability that

(i) both sweets are of the same colour,

Answer ..... [2]

(ii) one sweet drawn is red and the other is blue,

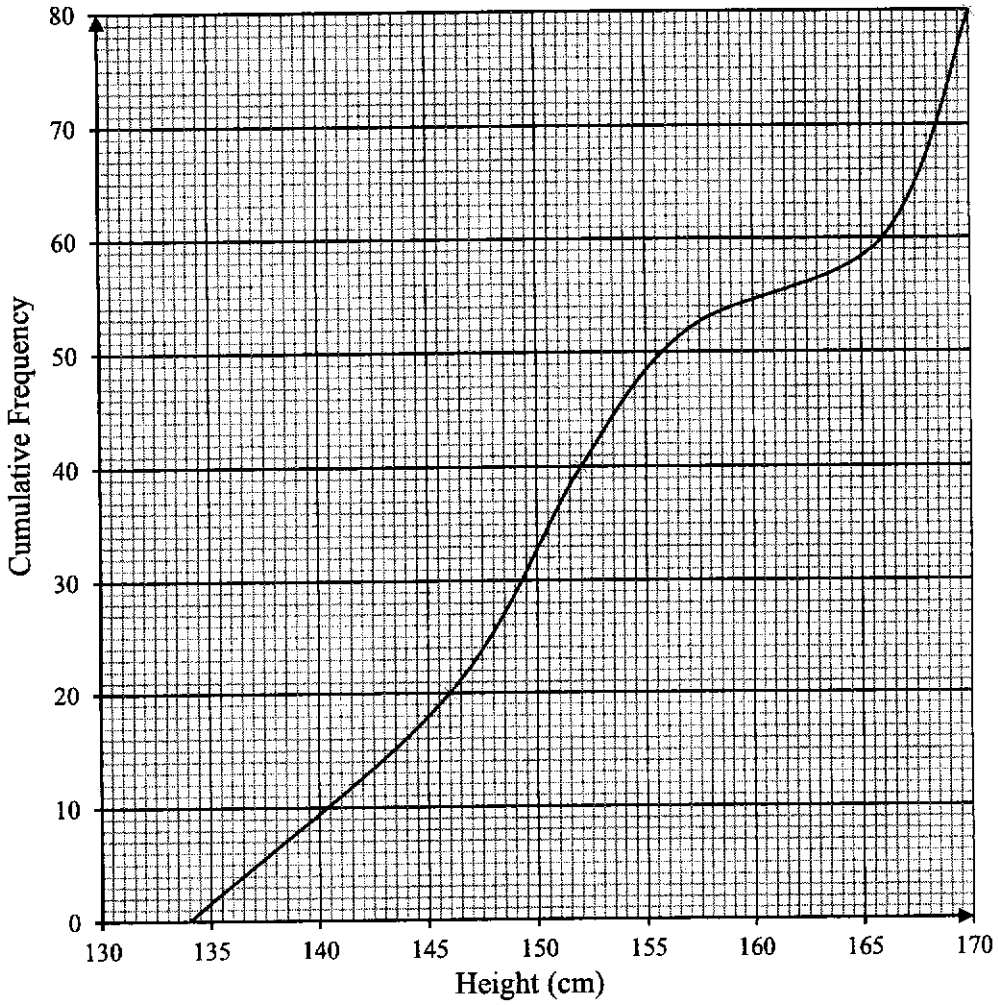
Answer ..... [2]

(iii) at least one sweet drawn is orange.

Answer ..... [2]

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6 The cumulative frequency graph shows the distribution of the heights, in centimetres, of 80 girls.



(a) Use your graph to estimate

(i) the median height,

Answer ..... cm [1]

(ii) the interquartile range,

Answer ..... cm [2]

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(iii) 35% of the girls are taller than h cm. Find the value of h.

Answer ..... cm [2]

(b) The cumulative frequency graph of the heights of 80 boys was drawn on the same axes.
The curve representing the heights of the boys lies on the right side of the curve representing the heights of the girls.
The curve representing the heights of the boys is steeper than the curve representing the heights of the girls.
Compare the median and interquartile range of the heights of the boys and the heights of the girls.

Answer .....

.....

.....

..... [2]

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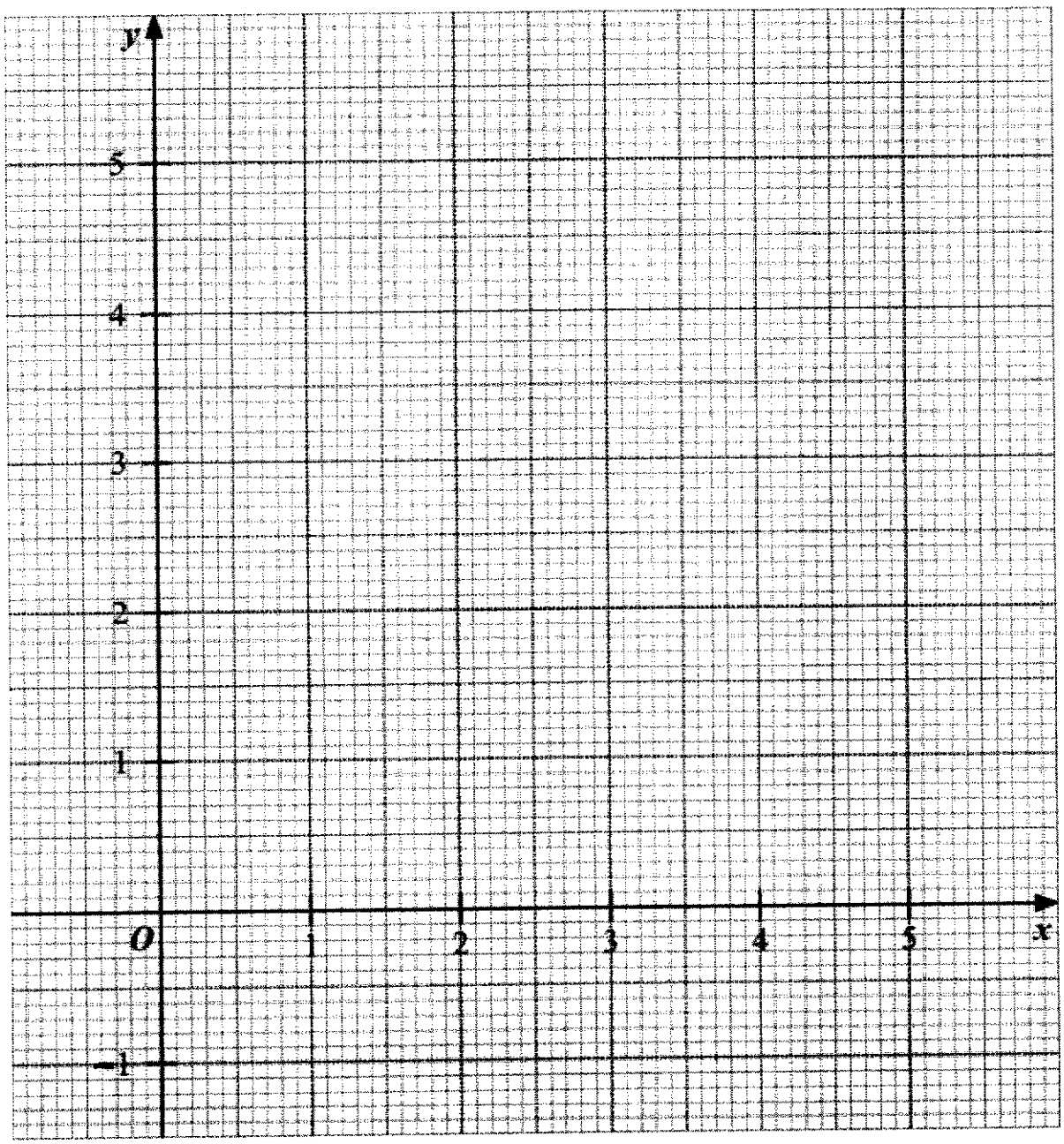
7 The following is the table of values for $y = 2x + \frac{5}{x} - 6$.

x	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5
y	5	1	0.3	0.5	1	1.7	2.4	3.3	4.1	p

(a) Calculate the value of p.

Answer $p =$ ..... [1]

(b) On the grid, draw the graph of $y = 2x + \frac{5}{x} - 6$ for $0.5 \leq x \leq 5$. [2]



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(c) By drawing a tangent, find the gradient at the point where $x = 1$.

Answer gradient = ... [2]

(d) Showing your working clearly, explain how your graph shows that there is no solution to the equation $2x + \frac{5}{x} = 5$.

[2]

(e) **(i)** Draw the graph of $y = \frac{1}{2}x + 1$ on the grid in part **(b)** for $0.5 \leq x \leq 5$.

[1]

(ii) Write down the x coordinates of the points at which the two graphs intersect.

Answer x = ... or ..... [1]

(iii) Given that a, b and c are integers, find the equation, in the form $ax^2 + bx + c = 0$, which is satisfied by the values of x found in **(e)(ii)**.

Answer ..... [2]

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8 A chocolate sculpture consists of a solid hemisphere of radius 6 cm which is mounted on a frustum as shown in Diagram 2. The frustum is created by cutting a solid right circular cone of radius 10 cm into two parts horizontally, as shown in Diagram 1. The height of the frustrum is given by x cm.

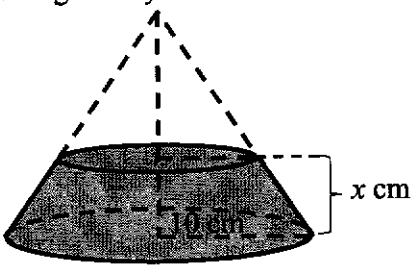


Diagram 1

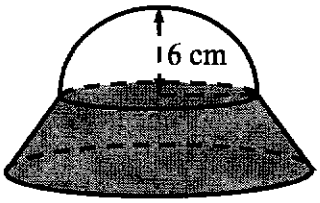


Diagram 2

(a) The height of the cone is 8 cm before it is cut to obtain the frustum. Show that the value of x is 3.2.

[2]

(b) Find the volume of the chocolate sculpture, giving your answer to 3 significant figures.

Answer ..... cm^3 [3]

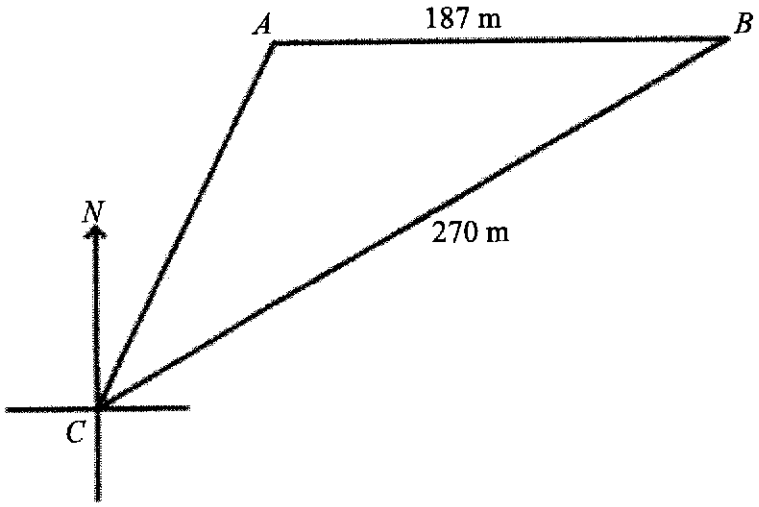
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(c) Find the total surface area of the chocolate sculpture, giving your answer to 3 significant figures.

Answer ..... cm^2 [4]

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9 The diagram shows a triangular field ABC on horizontal ground. B is due east of A and is on a bearing of 061° from C. $AB = 187$ m and $BC = 270$ m.



(a) Show that AC is approximately 139.82 m.

[3]

(b) Find the area of the field ABC, giving your answer to 4 significant figures.

Answer ..... m^2 [2]

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(c) A drone is hovering vertically above B. The angle of depression of A from the drone is $12°$. Calculate the height of the drone above B.

Answer ..... m [2]

(d) Alex moves in a straight line from B to C and stops at P where $AP = 183$ m.
He claims that there are two such positions of P.
Determine, with clear calculations, if Alex is right.

[4]

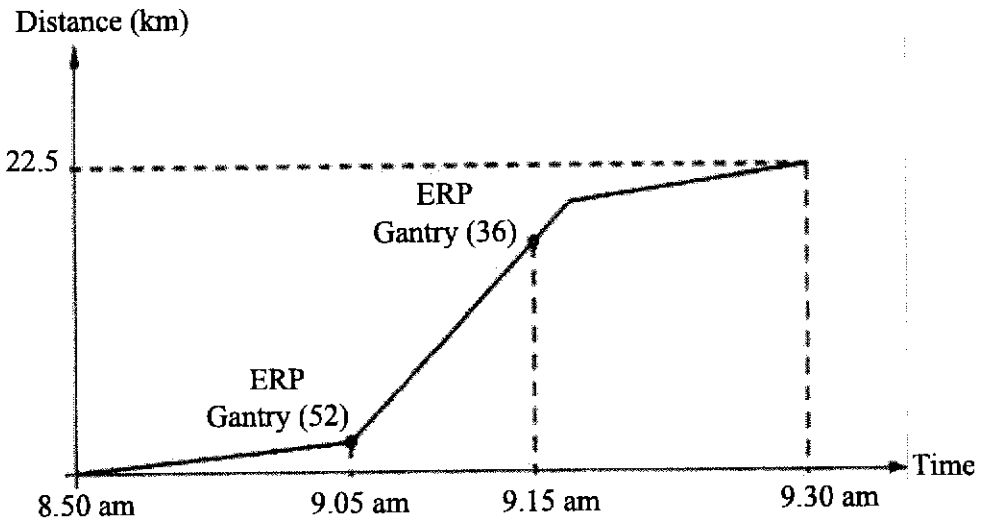
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10 Electronic Road Pricing System (ERP) is used in managing road congestion. Based on a pay-as-you-use principle, motorists are charged when they use priced roads during peak hours. The table below shows the time periods and respective ERP rates in a certain year.

Time Period	ERP Rates			
	Clementi Avenue 2 into AYE (City) Gantry 53	Clementi Avenue 6 into AYE (City) Gantry 52	AYE to City before Alexandra Road Gantry 36	PIE into CTE Gantry 42
8.30 am – 8.35 am	$2.50	$2.50	$1.50	$4.50
8.35 am – 8.55 am	$3.00	$3.00	$2.00	$5.00
8.55 am – 9.00 am	$2.50	$2.50	$1.50	$4.50
9.00 am – 9.05 am	$2.00	$2.00	$1.00	$4.00
9.05 am – 9.25 am	$2.00	$2.00	$1.00	$4.00
9.25 am – 9.30 am	$1.50	$1.50	$0.50	$3.50

Adapted from: https://onemotoring.lta.gov.sg/content/dam/onemotoring/Driving/pdf/24Jun24/Cars-24_June_2024.pdf

(a) Ms Teng travelled through the Clementi Avenue 6 into AYE (City) ERP gantry (52) at 9.05 am and then passed the AYE to City before Alexandra Road gantry (36) at 9.15 am. The distance-time graph is shown.



Calculate

(i) the total ERP charges paid by Ms Teng,

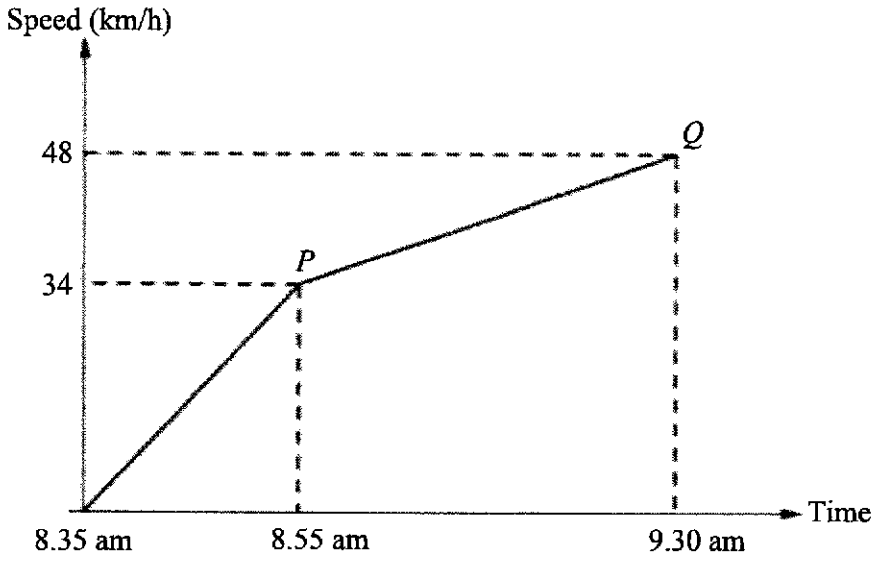
Answer $ ..... [1]

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(ii) the average speed travelled by Ms Teng throughout the journey.

Answer ..... km/h [2]

(b) The next day, Ms Teng travelled using alternative high traffic routes so as to avoid all the ERP charges. Her speed-time graph is shown below.



Given that the distance travelled is the area under the speed-time graph, calculate the total distance travelled,

Answer ..... km [2]

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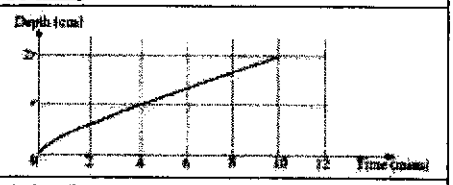
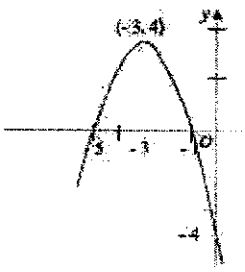
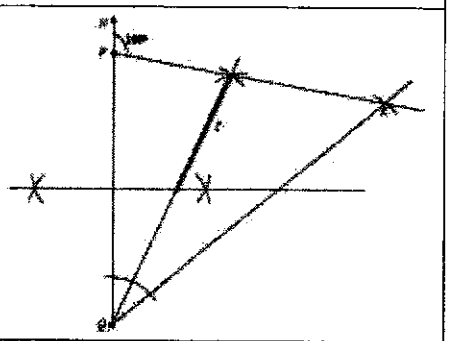
(c) While Ms Teng saved on ERP charges travelling on the alternative routes, she also valued her time and the cost of petrol consumed. The value of Ms Teng's time can be modelled by the following equation:

Value of time = time saved in minutes × \$0.15

Given that the petrol consumption rate of her car is 8.7 litres per 100 kilometres and the cost of petrol is \$2.76 per litre, determine the route that Ms Teng would prefer in future. Justify your answer with clear workings. [5]

END OF PAPER

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Answers			
1(a)	5.07533	15(a)	$\begin{pmatrix} 55 & 41 & 25 \\ 42 & x & 20 \end{pmatrix}$
1(b)	5.075	15(b)	$\begin{pmatrix} 593.80 \\ 308.80+4.8x \end{pmatrix}$
2(a)	42	15(c)	The elements show the total revenue of the fruit juice stall on Saturday and Sunday respectively
2(b)	2 packets of cereals, 3 cans of baked beans, 4 packets of biscuits	15(d)(i)	47
3(a)	$\frac{5}{12}$	15(d)(ii)	\$1128.20
3(b)	1200	16(a)	Bottle *A*
4	525%	16(b)	18.3 cm
5	No, interest from finance company *A* is higher.	17(b)	18.75 cm^2
6(a)	$19x^2-15x+4$	17(c)	Isosceles triangle
6(b)	$(p-2)^2(p+2)$	18(a)	9.08%
7(a)	$4<x\leq 13\frac{4}{7}$	18(b)	As the vertical axis does not start from zero, it might give the wrong impression that the percentage changes are much larger
7(b)(i)	$\{4,5,10\}$	19(a)	117.25 cm
7(b)(ii)	2	19(b)	11.1 cm
8	3:2	19(c)	11.1 cm
9(a)	6.875 km	20(a)	10 mins
9(b)	1.5625 cm^2	20(b)	
10(a)	63	22(a)	$(-3,-1)$
10(c)	$2n+8$	22(b)	$y=-2x-5$
10(d)	Since *n* must be a positive integer, two consecutive terms in the sequence cannot have a difference of 6	23 (a)(i)	0.6
11(a)	8	23(a)(ii)	0.35
11(b)	When the interior angle is 110°, *n* is not an integer	23(b)	300
12	$x=-3.\ \ y=1$	24 (a)	$\frac{\pi}{9}$ rad
13(a)	$y=-(x+3)^2+4$	24(b)	9.40 cm
13(b)		21	
14	\$76		

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Answer Key

1(a)	2
1(b)	I will use the median mark as there is an outlier, 98 marks, and the median is less affected by the outlier than the mean.
1(c)	64
2(a)	$r=\pm\sqrt{\frac{q}{2}-(p-3)^2}$
2(b)	$\frac{5x^8y^{14}}{6}$
2(c)(i)	$(3x-2)(3x+2)$
2(c)(ii)	$-\frac{3x+4}{(3x-2)(3x+2)}$ or $\frac{-3x-4}{(3x-2)(3x+2)}$ or $\frac{3x+4}{(-3x+2)(3x+2)}$
3(a)(i)	30°
3(a)(ii)	66°
3(a)(iii)	20°
3(b)	W must lie inside the circle
4(a)(i)	$3\mathbf{q}-\frac{3}{2}\mathbf{p}$
4(a)(ii)	$4\mathbf{q}-\mathbf{p}$
4(a)(iii)	$2\mathbf{q}-\frac{1}{2}\mathbf{p}$
4(b)	P, R and N are collinear. $PN=2PR$ or $PR=\frac{1}{2}PN$
4(c)	$\frac{1}{6}$
4(d)(i)	$\begin{pmatrix}2\\-4\end{pmatrix}$
4(d)(ii)	4.47 units
5(b)(i)	$\frac{373}{925}$
5(b)(ii)	$\frac{42}{185}$
5(b)(iii)	$\frac{393}{925}$
6(a)(i)	152 cm
6(a)(ii)	20 cm
6(a)(iii)	$h=157$
6(b)	Median height of the boys is higher than the girls. Interquartile range of the height of the boys is smaller than the girls.
7(a)	5
7(c)	-3
7(d)	Draw $y=-1$ No solution as curve does not intersect the line $y=-1$

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7(e)(ii)	$x = 0.9$ or 3.75
7(e)(iii)	$3x^2 - 14x + 10 = 0$
8(b)	1110 cm^3
8(c)	798 cm^2
9(b)	12240 m^2
9(c)	39.7 m
9(d)	He is wrong. There is only one such position of P, instead of two.
10(a)(i)	\$3
10(a)(ii)	$33\frac{3}{4}$ or 33.75 km/h
10(b)	29.6 km
10(c)	Ms Teng will choose the ERP route in future

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