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0607/41

May/June 2015

2 hours 15 minutes

Additional Materials: Geometrical Instruments
Graphics Calculator

READ THESE INSTRUCTIONS FIRST

DO **NOT** WRITE IN ANY BARCODES.

The total number of marks for this paper is 120.

This document consists of **20** printed pages.

Formula List

For the equation $ax^2 + bx + c = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Curved surface area, A , of cylinder of radius r , height h . $A = 2\pi rh$

Curved surface area, A , of cone of radius r , sloping edge l . $A = \pi rl$

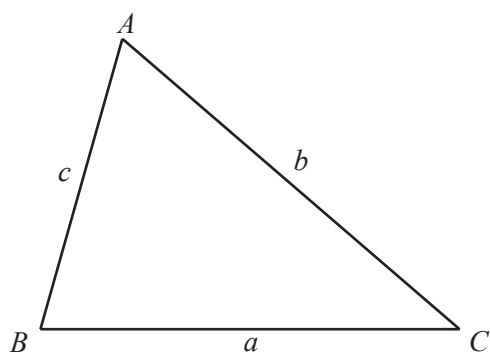
Curved surface area, A , of sphere of radius r . $A = 4\pi r^2$

Volume, V , of pyramid, base area A , height h . $V = \frac{1}{3}Ah$

Volume, V , of cylinder of radius r , height h . $V = \pi r^2 h$

Volume, V , of cone of radius r , height h . $V = \frac{1}{3}\pi r^2 h$

Volume, V , of sphere of radius r . $V = \frac{4}{3}\pi r^3$



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

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

$$\text{Area} = \frac{1}{2}bc \sin A$$

Answer **all** the questions.

- 1** The table shows the marks that 80 students scored in an examination.

Mark	0	1	2	3	4	5	6	7	8	9	10
Number of students	1	5	6	8	9	10	12	8	16	3	2

- (a)** Write down the mode.

Answer(a) [1]

- (b)** Write down the range.

Answer(b) [1]

- (c)** Find the median.

Answer(c) [1]

- (d)** Find the interquartile range.

Answer(d) [2]

- (e)** Calculate the mean.

Answer(e) [1]

- 2 Solve the simultaneous equations.
You must show all your working.

$$\begin{aligned}5x - 2y &= 11.5 \\4x + 3y &= 0\end{aligned}$$

Answer $x =$

$y =$ [4]

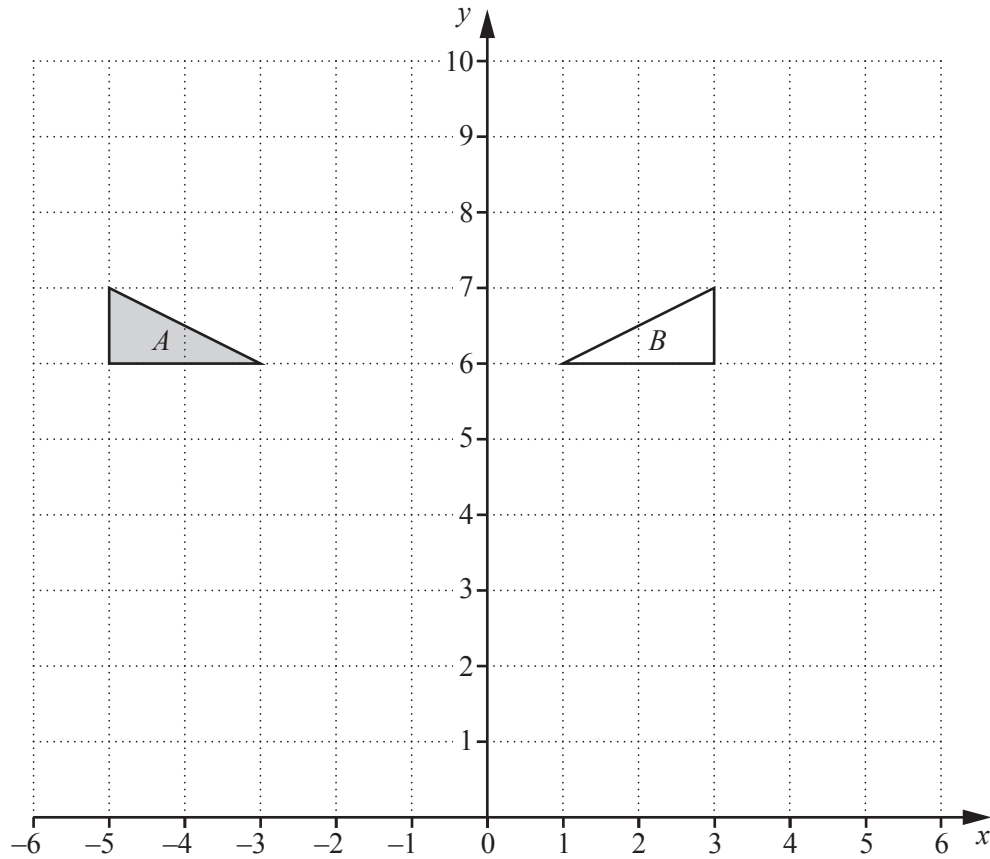
- 3 A car of length 4.5 metres is travelling at 72 km/h.
The car approaches a tunnel of length 260 metres.

(a) Change 72 km/h into m/s.

Answer(a) m/s [1]

- (b) Find the time it will take for the car to pass completely through the tunnel.
Give your answer in seconds.

Answer(b) s [2]



- (a) Describe fully the **single** transformation that maps triangle *A* onto triangle *B*.

Answer(a) [2]

- (b) Rotate **triangle B** through 90° clockwise, centre $(-1, 6)$. Draw this triangle and label it *C*. [3]

- (c) Describe fully the **single** transformation that maps **triangle C** onto triangle *A*.

Answer(c) [2]

- 5 (a) y varies inversely as the square root of x .
 $y = 5$ when $x = 9$.

(i) Find the value of y when $x = 25$.

Answer(a)(i) $y = \dots\dots\dots$ [2]

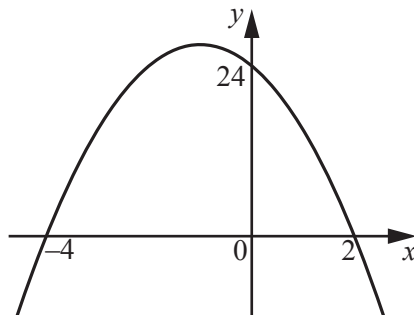
(ii) Find the value of x when $y = 25$.

Answer(a)(ii) $x = \dots\dots\dots$ [2]

(iii) Find x in terms of y .

Answer(a)(iii) $x = \dots\dots\dots$ [2]

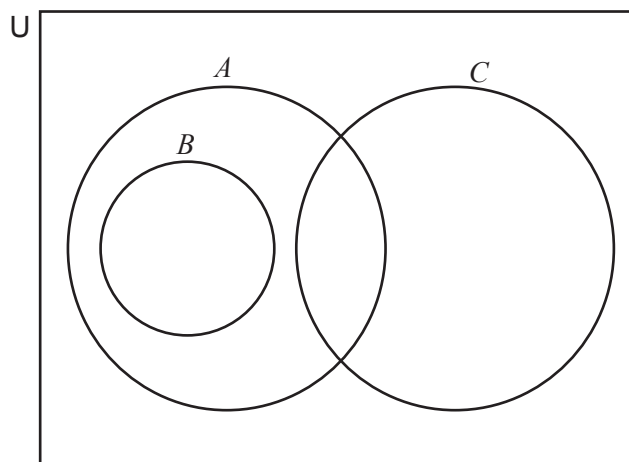
(b)



Find the equation of this quadratic curve.

Answer(b) $\dots\dots\dots$ [3]

- 6 The Venn diagram shows the sets A , B and C .



$$U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15\}$$

$$A = \{\text{factors of } 12\}$$

$$B = \{\text{factors of } 6\}$$

$$C = \{11, 12, 13, 14\}$$

- (a) List the elements of sets A and B .

$$\text{Answer(a)} \quad A = \{ \dots\dots\dots \}$$

$$B = \{ \dots\dots\dots \} \quad [2]$$

- (b) Write all the elements of U in the correct regions of the Venn diagram above. [3]

- (c) List the elements of

(i) $A \cap B$,

$$\text{Answer(c)(i)} \{ \dots\dots\dots \} \quad [1]$$

(ii) $A' \cap C$,

$$\text{Answer(c)(ii)} \{ \dots\dots\dots \} \quad [1]$$

(iii) $B \cup C'$.

$$\text{Answer(c)(iii)} \{ \dots\dots\dots \} \quad [1]$$

- (d) Find

(i) $n(A \cup B \cup C)$,

$$\text{Answer(d)(i)} \dots\dots\dots [1]$$

(ii) $n(A \cap B \cap C)$.

$$\text{Answer(d)(ii)} \dots\dots\dots [1]$$

- 7 Squash balls have radius 1.5 cm.
They are sold in boxes. Each box is a cuboid.
Each box has length 15 cm, width 12 cm and height 3 cm.

(a) Show that the maximum number of balls in a box is 20.

[1]

(b) Calculate the volume of **one** ball.

Answer(b) cm^3 [2]

(c) Calculate the total volume of 20 balls.

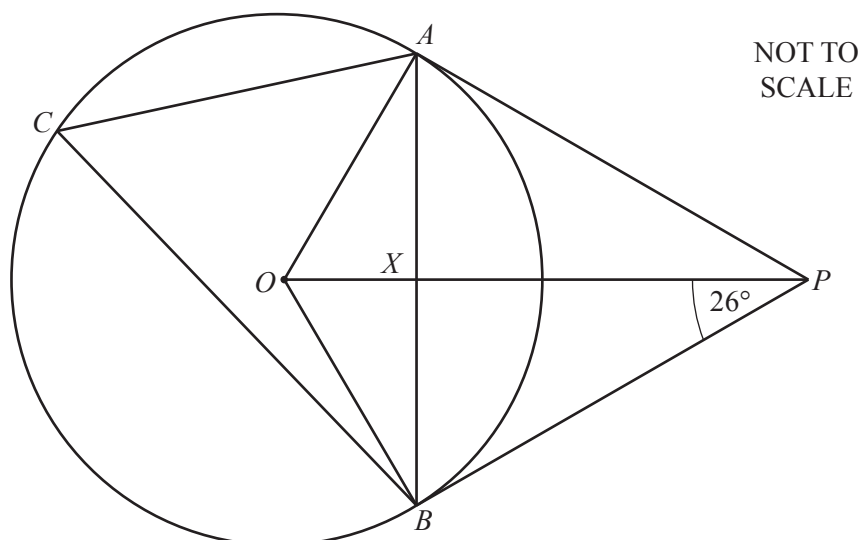
Answer(c) cm^3 [1]

(d) Write your answer to **part (c)** in standard form.

Answer(d) cm^3 [1]

(e) Calculate the percentage of the volume of the box that the 20 balls fill.

Answer(e) % [2]



A , B and C lie on a circle, centre O .
 AP and BP are tangents to the circle.
 AB intersects OP at the point X and angle $OPB = 26^\circ$.

(a) Find the size of

(i) angle ABP ,

Answer(a)(i) [1]

(ii) angle OBA ,

Answer(a)(ii) [1]

(iii) angle ACB .

Answer(a)(iii) [1]

(b) Write down the mathematical name of quadrilateral $AOBP$.

Answer(b) [1]

(c) Complete these statements.

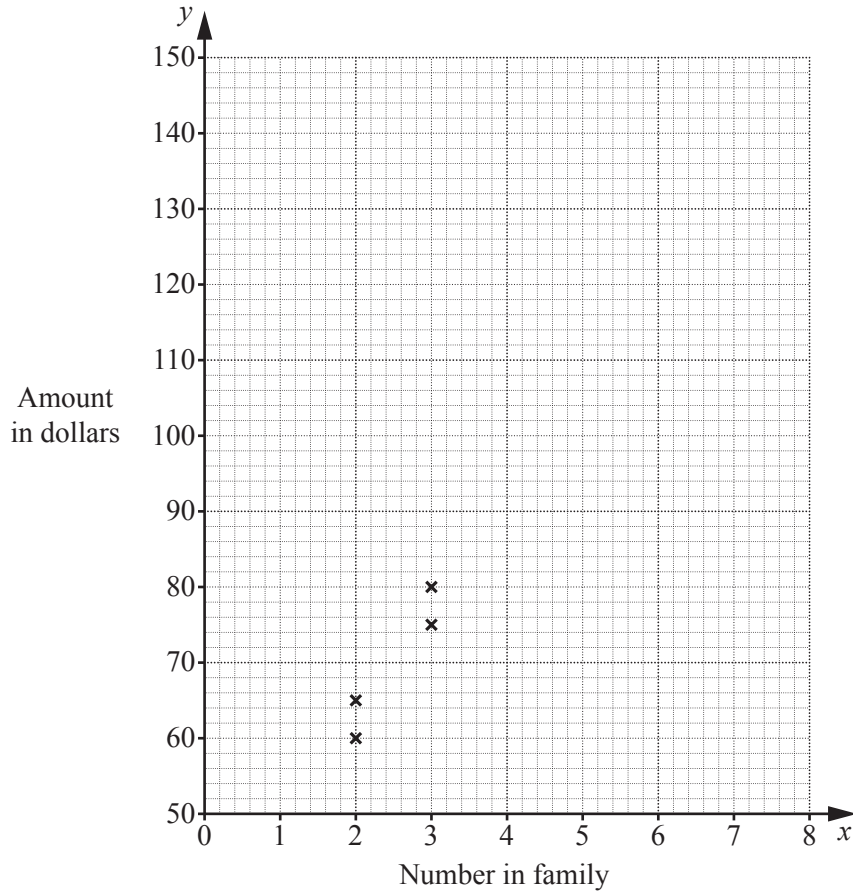
(i) Triangle OBP is congruent to triangle [1]

(ii) Triangle OBP is similar, but not congruent to, triangle [1]

- 9 The table shows the amount in dollars, y , that 10 families of different size, x , spend in one week.

Number in family, (x)	2	2	3	3	5	5	6	6	6	6
Amount in dollars, (y).	60	65	80	75	100	105	120	135	125	115

- (a) (i) Complete the scatter diagram.
The first four points have been plotted for you.



[2]

- (ii) What type of correlation is shown by the scatter diagram?

Answer(a)(ii) [1]

(b) Find

(i) the mean family size,

Answer(b)(i) [1]

(ii) the mean amount spent in one week.

Answer(b)(ii) \$ [1]

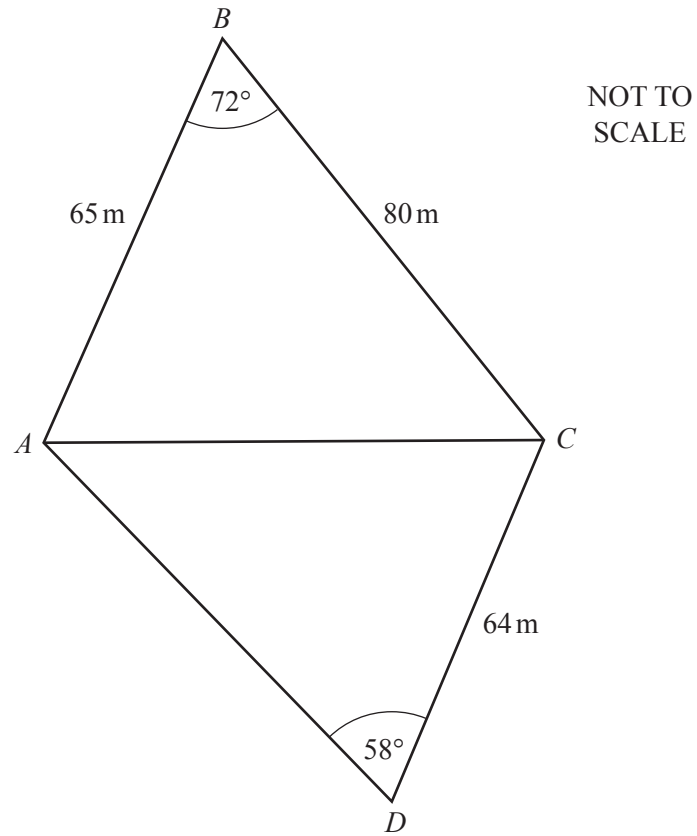
(c) (i) Find the equation of the regression line in the form $y = mx + c$.

Answer(c)(i) $y =$ [2]

(ii) Use your answer to **part (c)(i)** to estimate the amount spent in one week by a family of 4.

Answer(c)(ii) \$ [1]

10



(a) Find AC .

Answer(a) m [2]

(b) Calculate angle CAD .

Answer(b) [3]

(c) Calculate the area of the quadrilateral $ABCD$.

Answer(c) m^2 [4]

11 Paula invests \$3000 in Bank *A* and \$3000 in Bank *B*.

(a) Bank *A* pays compound interest at a rate of 4% each year.

(i) Find the total amount that Paula has in Bank *A* at the end of 3 years.

Answer(a)(i) \$ [2]

(ii) After how many complete years is the total amount that Paula has in Bank *A* greater than \$4000?

Answer(a)(ii) [3]

(b) Bank *B* pays simple interest at a rate of 5% each year.

(i) Find the total amount that Paula has in Bank *B* at the end of 3 years.

Answer(b)(i) \$ [1]

(ii) After how many complete years is the total amount that Paula has in Bank *B* greater than \$4000?

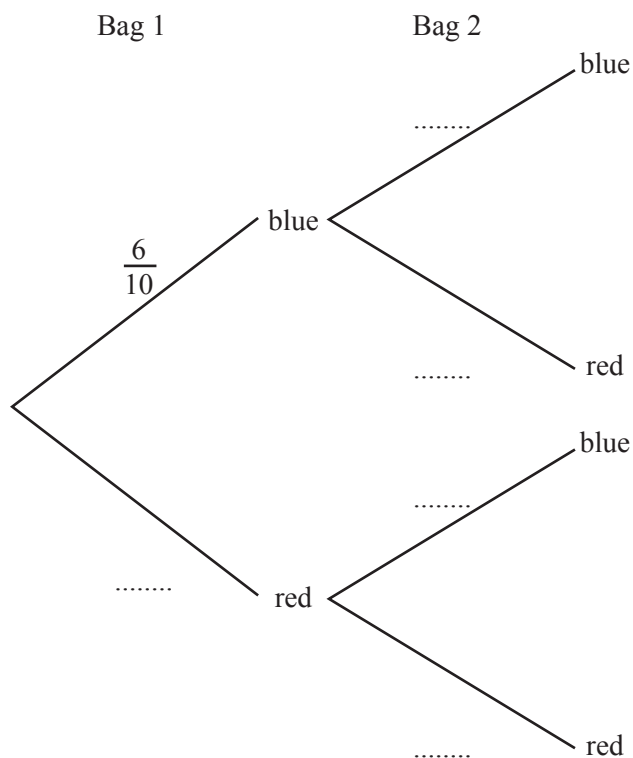
Answer(b)(ii) [1]

(c) After how many complete years will the total amount that Paula has in Bank *A* be greater than the total amount that Paula has in Bank *B*?

Answer(c) [3]

- 12 Bag 1 only contains 6 blue balls and 4 red balls.
 Bag 2 only contains 8 blue balls and 2 red balls.
 Marco chooses a ball at random from Bag 1 and puts it in Bag 2.
 He then chooses a ball at random from Bag 2 and puts it in Bag 1.

(a) Complete the tree diagram.



[2]

(b) Find the probability that the two balls chosen are

(i) both blue,

Answer(b)(i) [2]

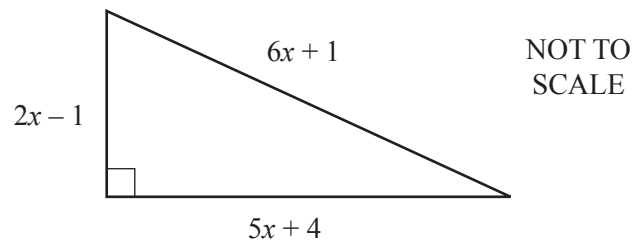
(ii) one red and one blue.

Answer(b)(ii) [3]

(c) Find the probability that, after Marco chooses the two balls, there are exactly 6 blue balls in Bag 1.

Answer(c) [3]

13 In this question all lengths are in centimetres.



(a) Write down a quadratic equation, in terms of x , and show that it simplifies to

$$7x^2 - 24x - 16 = 0.$$

[3]

(b) Factorise $7x^2 - 24x - 16$.

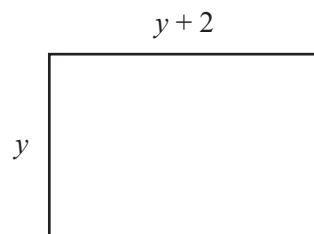
Answer(b) [2]

- (c) Show that the area of the triangle is 84 cm^2 .

[2]

- (d) The area of this rectangle is equal to the area of the triangle.

Find the value of y .



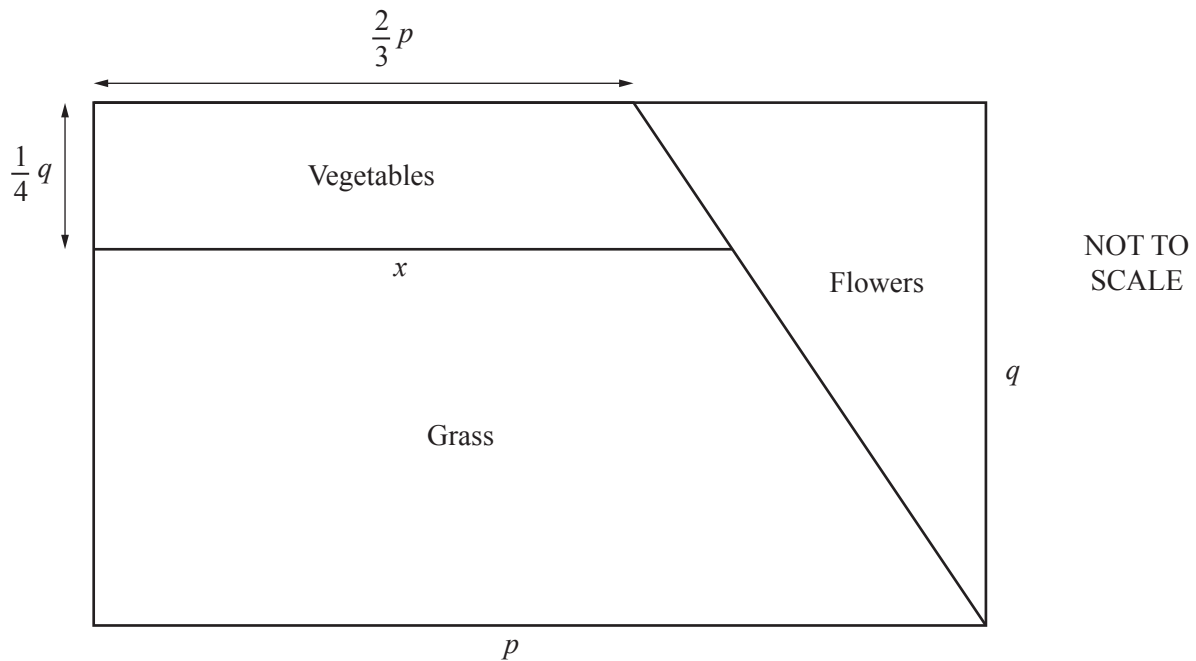
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Answer(d) $y = \dots\dots\dots$ [4]

- 14 In this question all measurements are in metres.

A rectangular garden has length p and width q .

The garden is divided into 3 sections as shown in the diagram.



- (a) Write down an expression, in terms of p and q , for the area for flowers.

Answer(a)m² [1]

- (b) Show that $x = \frac{3}{4}p$.

[2]

- (c) Find an expression, in terms of p and q , for the area for grass.
Give your answer in its simplest form.

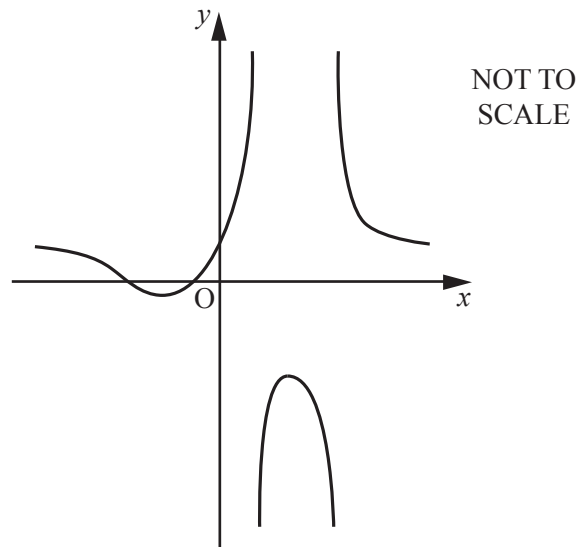
Answer(c)m² [2]

- (d) Find the ratio area for vegetables : area for grass .

Answer(d) : [2]

Question 15 is printed on the next page.

- 15 The diagram shows a sketch of the graph of $y = f(x)$ where $f(x) = \frac{x^2 + 4x + 3}{x^2 - 4x + 3}$.



- (a) (i) Find the equations of the three asymptotes.

Answer(a)(i) [3]

- (ii) Find the co-ordinates of the local maximum point.

Answer(a)(ii) (.....) [2]

- (iii) Find the co-ordinates of the local minimum point.

Answer(a)(iii) (.....) [2]

- (b) Find the values of k , when

- (i) $f(x) = k$ has no solutions,

Answer(b)(i) [2]

- (ii) $f(x) = k$ has one solution.

Answer(b)(ii) [1]

- (c) Solve the inequality $f(x) > 0$.

Answer(c) [3]

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