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Name	Class	Index Number
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BROADRICK SECONDARY SCHOOL
SECONDARY 2 G3
END-OF-YEAR EXAMINATION 2024

MATHEMATICS

4052

Section 1

October 2024

Candidates answer on the Question Paper.

2 hours 15 minutes

READ THESE INSTRUCTIONS FIRST

Write your name, class and index number on all the work you hand in.

Write in dark blue or black pen.

You may use an HB pencil for any diagrams or graphs.

Do not use staples, paper clips, glue or correction fluid.

Section 1 & Section 2

Answer all questions on the Question Paper.

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 for each section securely together.

The number of marks is given in brackets [] at the end of each question or part question.

The total number of the marks for this paper is 90.

For Examiner's Use		
Error in	Question Number	Marks Deducted
Rounding-off		
Reasoning		
Presentation		

For Examiner's Use	
Section 1	/ 45
Section 2	/ 45
Total	90

[Turn Over]

Answer **all** the questions in this section.

- 1 Magnus and Nila share \$560 in the ratio 5 : 11.

Find the amount each receives.

Answer Magnus \$

Nila \$

[2]

-
- 2 Write the following in ascending order.

$$\frac{34}{37} \quad 0.\dot{9} \quad \sqrt{0.9} \quad 0.902$$

Answer,, [1]

-
- 3 (a) Factorise completely $xy^3 + x^3y$.

Answer [1]

- (b) Expand and simplify $(2+3p)(7-4p)-3(-2p)$.

Answer [2]

- 4 Two classes took a Mathematics test.
The table below shows the marks obtained by the students in Class A.

21	50	42	30	27	46
25	34	16	19	33	25

- (a) The back-to-back stem-and-leaf diagram shows the test results of Class B.

Complete the back-to-back stem-and-leaf diagram for Class A.

[1]

Answer

Leaves for Class A	Stem	Leaves for Class B			
	1	5	8		
	2	2	2	5	8 9
	3	1	1	1	7
	4	0	1	4	
	5				

Key: 6 | 1 means 16 marks

Key: 1 | 5 means 15 marks

- (b) The passing mark for the Mathematics test is 25 marks.

Express the total number of students who passed as a fraction of the total number of students in Class A and B.

Answer [1]

- 5 Write as a single fraction in its simplest form $\frac{3x+4}{x^2-2x-15} - \frac{5}{x+3}$.

Answer [3]

-
- 6 Gerald collects magnets from around the world.

20% of the magnets are from Europe.

60% of the remaining magnets are from Asia.

The other 8 magnets are from Australia.

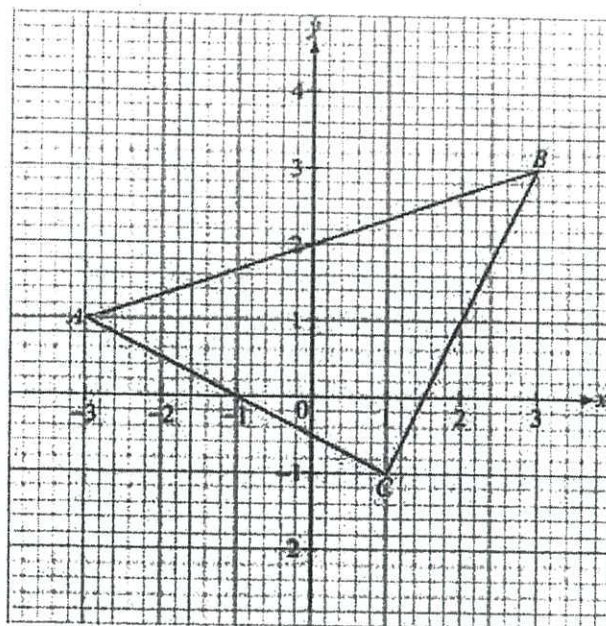
Calculate the total number of magnets in his collection.

Answer [2]

7 Simplify $\frac{14y+2x}{y-x} \div \frac{x^2-49y^2}{x-y}$.

Answer [3]

- 8 The points A , B and C on the Cartesian plane below are connected by straight lines to form $\triangle ABC$.



- (a) Name the line with a negative gradient.

Answer Line [1]

- (b) Hence, find the gradient of this line.

Answer [2]

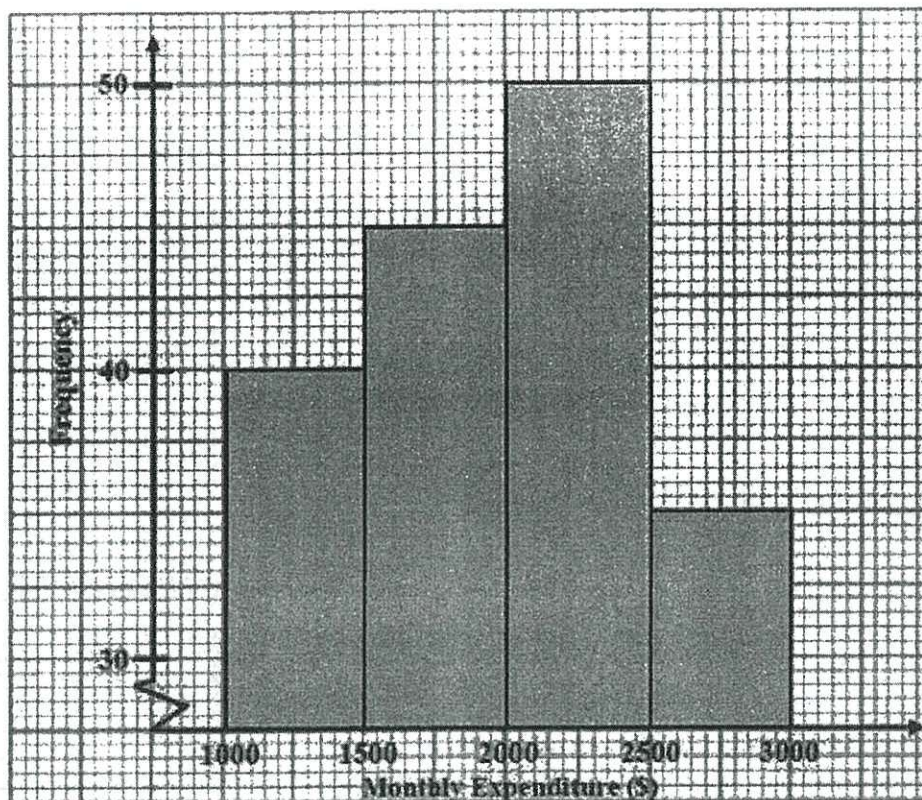
- 9 Explain why $x^2 + 2xy + y^2 + x + y$ is always even, if x and y are positive integers.

.....

 [3]

- 10 The following histogram shows the monthly expenditure in some households.

Monthly expenditure in some households



- (a) Find the ratio of the number of households whose monthly expenditure was less than \$1500 to the number of households whose monthly expenditure was more than \$2500.

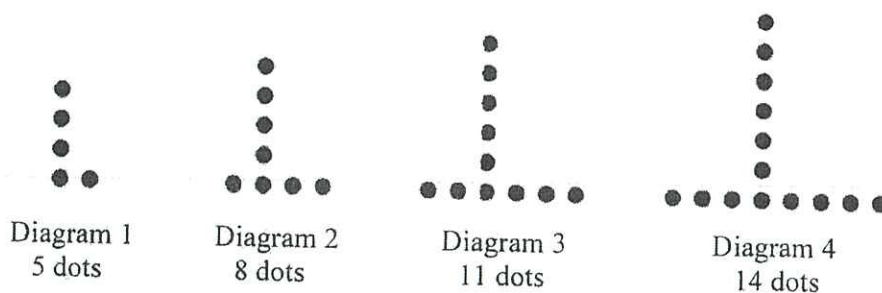
Answer : [1]

- (b) State one misleading feature of the histogram and how it may lead to a misinterpretation of the data.

.....

 [2]

- 11 The first four diagrams in a sequence are shown below.



- (a) Find the number of dots in diagram 7.

Answer [1]

- (b) Find an expression, in terms of n , for the number of dots in Diagram n .

Answer [2]

- (c) Explain why it is not possible to have a diagram with 478 dots.

.....
 [2]

- 12 (a) $A = p^4 \times q^8 \times r^{12}$ where p, q and r are prime numbers.

Explain why A is a perfect square.

.....
..... [1]

- (b) $B = 3^2 \times 7 \times 11$ and $C = 3 \times 5^2 \times 7 \times 11^2$.

Find the smallest positive integer value of k such that $B \times C \times k$ is a perfect cube.

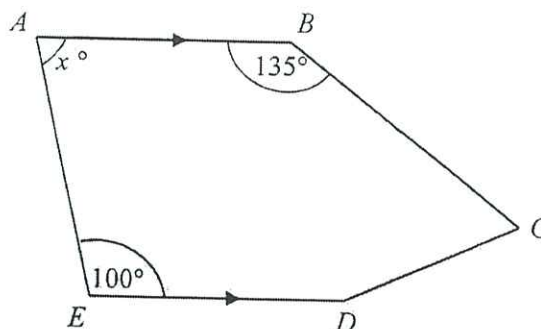
Answer $k =$ [2]

- (c) A rectangle with dimensions 198 cm by 495 cm is to be filled with identical squares with lengths of integer values only.

Find the least number of squares needed to fill the rectangle.

Answer [2]

- 13 In the diagram, $ABCDE$ is a pentagon and AB is parallel to ED .
 angle $AED = 100^\circ$, angle $ABC = 135^\circ$ and angle $EAB = x^\circ$.



- (a) Find the value of x , stating your reason clearly.

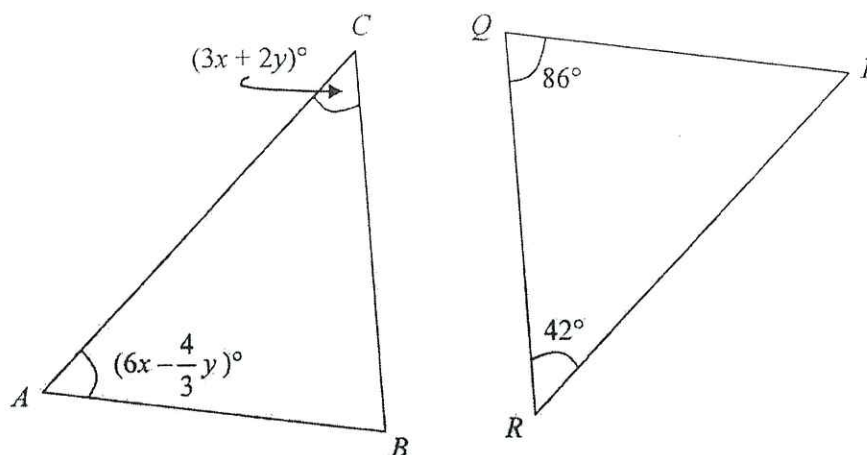
Answer $x = \dots\dots\dots$ [2]

- (b) The remaining two interior angles of the pentagon are in the ratio 4 : 11.

Find the size of the smallest exterior angle of the pentagon.

Answer $\dots\dots\dots^\circ$ [3]

- 14 Triangle ABC is congruent to triangle PQR .



- (a) Given that $3x + 2y = 42$, form another equation relating x and y .

Answer [2]

- (b) Solve the simultaneous equations in (a) to find the values of x and of y .

Answer $x = \dots\dots\dots$

$y = \dots\dots\dots$

[3]

End of Section 1

Name	Class	Index Number
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BROADRICK SECONDARY SCHOOL

SECONDARY 2 G3

END-OF-YEAR EXAMINATION 2024

MATHEMATICS

4052

Section 2

October 2024

Candidates answer on the Question Paper.

2 hours 15 minutes

READ THESE INSTRUCTIONS FIRST

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

Section 2

Answer **all** the questions.

The number of marks is given in brackets [] at the end of each question or part question.

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 total of the marks for Section 2 is 45.

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.

You are to hand in Section 1 and Section 2 separately.

For Examiner's Use (To combine with Section 1)		
Error in	Question Number	Marks Deducted
Rounding-off		
Reasoning		
Presentation		

For Examiner's Use
45

[Turn Over

Answer **all** the questions in this section.

- 1 (a) Solve the inequality $5 - y > 7$.

Answer [1]

- (b) Solve $6 - 7x = x + 5(1 - 2x)$.

Answer $x =$ [2]

- (c) It is given that $a = \frac{2b - 3a}{5 - b}$.

- (i) Make b the subject of the formula.

Answer $b =$ [2]

- (ii) Find the value of b when $a = -1$.

Answer $b =$ [1]

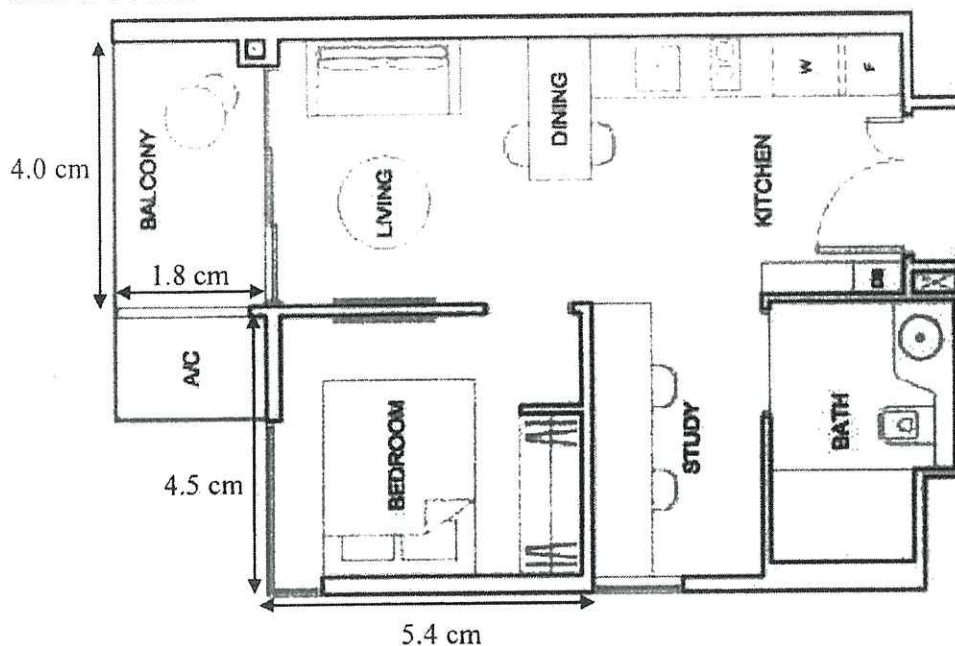
- (d) y is directly proportional to x^2 .

If this value of x is doubled, show that the value of y is increased by 300%.

Answer

[2]

- 2 The diagram (not drawn to scale) shows a floor plan of an apartment drawn to a scale of 1 : 120.



Find

- (a) the actual dimensions of the balcony in metres,

Answer m by m [1]

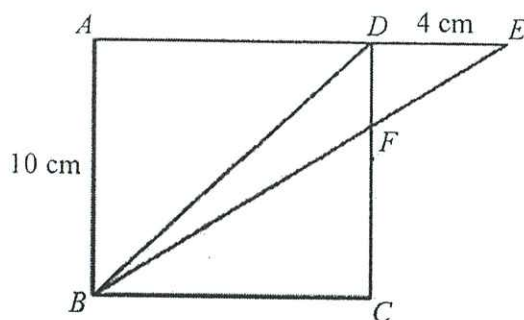
- (b) the actual area of the bedroom, in square metres,

Answer m² [2]

- (c) the area of the apartment drawn on the floor plan, in cm², if it has an actual area of 156 m².

Answer cm² [2]

- 3 The diagram shows a square $ABCD$ of side 10 cm.
 ADE and BFE are straight lines and $DE = 4$ cm.



- (a) Calculate the length of BE .

Answer cm [2]

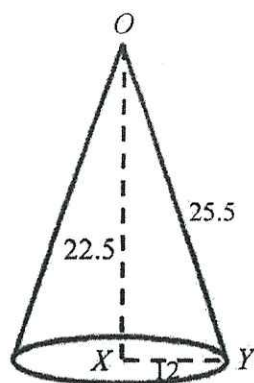
- (b) Find angle BEA .

Answer ° [2]

- (c) Calculate the shortest distance from D to BE .

Answer cm [2]

- 4 The diagram shows a solid cone where $XY = 12$ cm, $OX = 22.5$ cm and $OY = 25.5$ cm.



- (a) Prove that OX is perpendicular to the base of the cone.

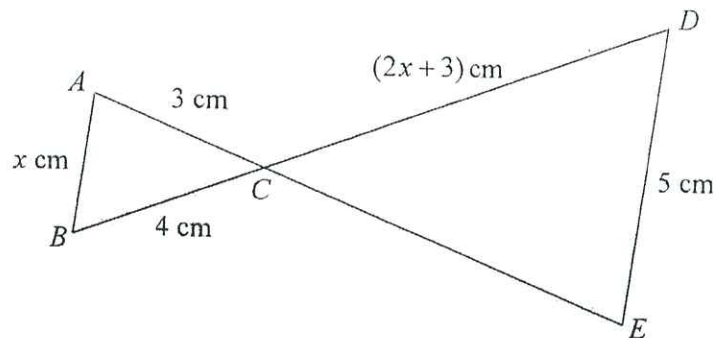
Answer

[2]

- (b) Calculate the total surface area of the solid cone.

Answer cm^2 [2]

- 5 In the diagram (not drawn to scale), triangle ABC is similar to triangle EDC .
 $AB = x$ cm, $CD = (2x + 3)$ cm, $AC = 3$ cm, $BC = 4$ cm and $DE = 5$ cm.



- (a) Form an equation in terms of x and show that it reduces to $2x^2 + 3x - 20 = 0$.

Answer

[2]

- (b) Solve the equation $2x^2 + 3x - 20 = 0$.

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

- (c) Hence, find the length of CE .

Answer $\dots\dots\dots$ cm [2]

- 6 The variables x and y are connected by the equation $y = 7 - (x - 3)^2$.
Some corresponding values of x and y are given in the table below.

x	0	1	2	3	4	5	6
y	p	3	6	7	6	3	-2

- (a) Find the value of p .

Answer $p = \dots\dots\dots$ [1]

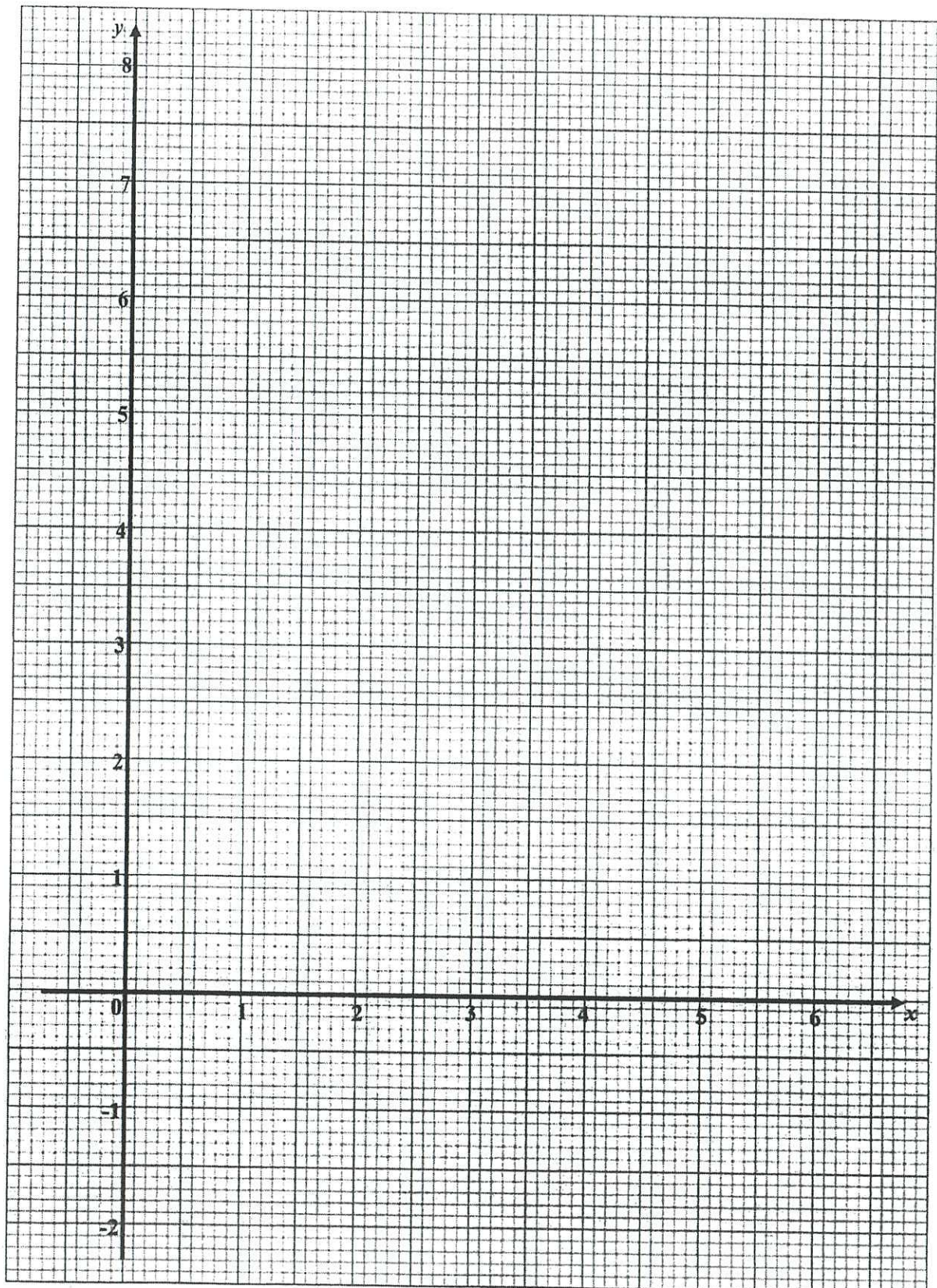
- (b) On the grid opposite, draw the graph of $y = 7 - (x - 3)^2$ for $0 \leq x \leq 6$. [3]

- (c) Using your graph drawn, find the equation of the line of symmetry.

Answer $\dots\dots\dots$ [1]

- (d) By drawing a line on your graph, find the value(s) of x that satisfy/ satisfies the equation $2 = 7 - (x - 3)^2$.

Answer $x = \dots\dots\dots$ [2]



- 7 A small business makes and sells slime.
Workers are paid a basic hourly rate with an additional payment for each item they make.

Labour Costs	
Basic rate	\$12 per hour
Classic slime	\$2.30 per container
Glitter slime	\$2.50 per container
Crunchy slime	\$2.70 per container

- (a) Annie makes 11 containers of classic slime in an hour.

Calculate the time she takes to make one container of classic slime, giving your answer to the nearest minute and second.

Answer min s [1]

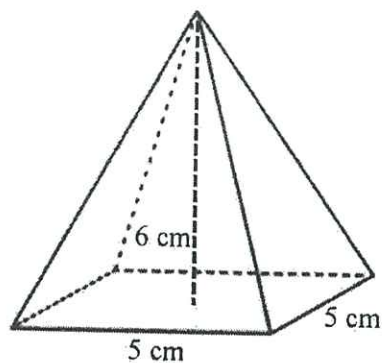
- (b) Zelda makes glitter slime.
One day she works for 6 hours and earns a total of \$192.

Show that Zelda made an average of 8 containers of glitter slime per hour.

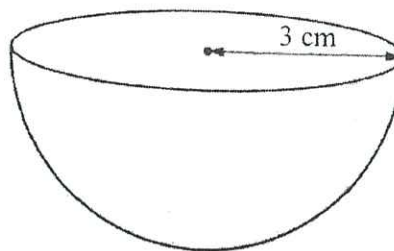
Answer

[2]

- (c) The slime is packed into containers of different shapes shown below.



Pyramid



Hemisphere

Material cost and selling price	
Cost of slime	\$0.08 / cm ³
Selling price of slime	\$0.15 / cm ³

A large quantity order of 100 containers of crunchy slime has come in.

Phoebe was assigned the order and she can make and pack 10 containers of crunchy slime in an hour.

Which container shape(s) will prevent the company from making a loss? Justify your decision and show your method clearly.

Take the value of π as 3.14 in your calculations.

Answer

.....

..... [5]

End of Section 2 & End of Paper

Broadrick Secondary School Secondary 2 G3 EOY 2024 Marking Scheme Section 1

No.	Solutions		Marks																																																											
1	$Magnus = \frac{5}{16} \times 560 = \175		B1																																																											
	$Nila = \frac{11}{16} \times 560 = \385		B1																																																											
2	$0.902, \frac{34}{37}, \sqrt{0.9}, 0.\dot{9}$		B1																																																											
3a	$xy^3 + x^3y$ $= xy(y^2 + x^2)$		B1																																																											
3b	$(2 + 3p)(7 - 4p) - 3(-2p)$ $= 14 - 8p + 21p - 12p^2 + 6p$ $= -12p^2 + 19p + 14$		M1 A1																																																											
4a	<table><tr><th colspan="4">Leaves for Class A</th><th>Stem</th><th colspan="5">Leaves for Class B</th></tr><tr><td></td><td></td><td>9</td><td>6</td><td>1</td><td>5</td><td>8</td><td></td><td></td><td></td></tr><tr><td>7</td><td>5</td><td>5</td><td>1</td><td>2</td><td>2</td><td>2</td><td>5</td><td>8</td><td>9</td></tr><tr><td></td><td>4</td><td>3</td><td>0</td><td>3</td><td>1</td><td>1</td><td>1</td><td>7</td><td></td></tr><tr><td></td><td></td><td>6</td><td>2</td><td>4</td><td>0</td><td>1</td><td>4</td><td></td><td></td></tr><tr><td></td><td></td><td></td><td>0</td><td>5</td><td></td><td></td><td></td><td></td><td></td></tr></table>	Leaves for Class A				Stem	Leaves for Class B							9	6	1	5	8				7	5	5	1	2	2	2	5	8	9		4	3	0	3	1	1	1	7				6	2	4	0	1	4						0	5						B1
Leaves for Class A				Stem	Leaves for Class B																																																									
		9	6	1	5	8																																																								
7	5	5	1	2	2	2	5	8	9																																																					
	4	3	0	3	1	1	1	7																																																						
		6	2	4	0	1	4																																																							
			0	5																																																										
4b	$\frac{19}{26}$		B1																																																											
5	$\frac{3x+4}{x^2-2x-15} - \frac{5}{x+3}$ $= \frac{3x+4}{(x-5)(x+3)} - \frac{5}{x+3}$ $= \frac{3x+4-5(x-5)}{(x-5)(x+3)}$ $= \frac{3x+4-5x+25}{(x-5)(x+3)}$ $= \frac{-2x+29}{(x-5)(x+3)}$		M1 M1 A1																																																											

6	$\frac{100-60}{100} \times (100-20) = 32\%$ $Total = \frac{100}{32} \times 8 = 25$	M1 A1
7	$\frac{14y+2x}{y-x} \div \frac{x^2-49y^2}{x-y}$ $= \frac{14y+2x}{y-x} \times \frac{x-y}{x^2-49y^2}$ $= \frac{2(7y+x)}{y-x} \times \frac{-(y-x)}{(x-7y)(x+7y)}$ $= \frac{-2}{x-7y} \text{ or } \frac{2}{7y-x}$	M1 M1 A1
8a	Line AC or Line CA	B1
8b	$m = \frac{1-(-1)}{-3-1}$ $m = -\frac{1}{2}$	M1 A1
9	$x^2 + 2xy + y^2 + x + y$ $= (x+y)^2 + x + y$ $= (x+y)(x+y+1)$ If x and y are positive integers, the sum of x and y multiplied by the sum of x and y and 1 will always be the product of an even number and an odd number which is always an even number.	M1 M1 A1
10a	40:35 8:7	B1
10b	The vertical axis of the histogram does not start from zero. This makes it seem like the number of households whose monthly expenditure was between \$2000 and \$2500 was triple the number of households whose monthly expenditure was between \$2500 and \$3000 when it was only $1\frac{3}{7}$ times.	B1 B1

11a	23 dots	B1												
11b	$5 + (n-1)(3)$ $= 5 + 3n - 3$ $= 2 + 3n$	M1 A1												
11c	$2 + 3n = 478$ $3n = 478 - 2$ $3n = 476$ $n = \frac{476}{3} = 158\frac{2}{3}$ Since $n = 158\frac{2}{3}$ is not an integer value, it is not possible to have a diagram with 478 dots.	M1 A1												
12a	A is a perfect square since all the powers are multiples of 2.	B1												
12b	$BC = 3^3 \times 5^2 \times 7^2 \times 11^3$ $k = 5 \times 7 = 35$	M1 A1												
12c	<table border="1"> <tr> <td>3</td><td>198</td><td>495</td></tr> <tr> <td>3</td><td>66</td><td>165</td></tr> <tr> <td>11</td><td>22</td><td>55</td></tr> <tr> <td></td><td>2</td><td>5</td></tr> </table> Number of squares = $2 \times 5 = 10$	3	198	495	3	66	165	11	22	55		2	5	M1 A1
3	198	495												
3	66	165												
11	22	55												
	2	5												
13a	$x = 180 - 100 = 80^\circ$ (int angles, AB// DE)	B1 B1												
13b	Sum of remaining two interior angles of pentagon $= (n-2) \times 180 - 100 - 80 - 135$ $= (5-2) \times 180 - 100 - 80 - 135$ $= 540 - 100 - 80 - 135$ $= 225^\circ$ Largest angle $= \frac{11}{15} \times 225 = 165^\circ$ Smallest exterior angle $= 180 - 165 = 15^\circ$	M1 M1 A1												

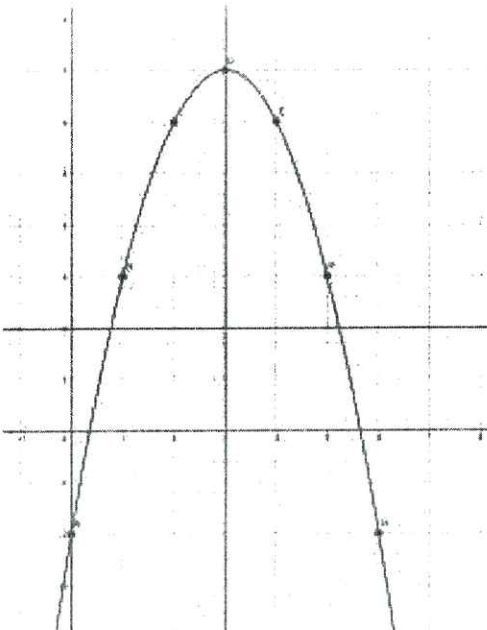
14a	$6x - \frac{4}{3}y = 180 - 86 - 42$ (angle sum of triangle)	M1
	$6x - \frac{4}{3}y = 52$	A1
14b	$3x + 2y = 42$ ----- (1)	
	$6x - \frac{4}{3}y = 52$ ----- (2)	
(1) × 2	$6x + 4y = 84$ ----- (3)	
(2) - (3)	$-\frac{4}{3}y - 4y = 52 - 84$ $-\frac{16}{3}y = -32$ $y = -32 \div -\frac{16}{3}$ $y = 6$	M1 A1
(1):	$3x + 2y = 42$ $3x + 2(6) = 42$ $3x + 12 = 42$ $3x = 42 - 12$ $3x = 30$ $x = \frac{30}{3} = 10$	A1

Broadrick Secondary School Secondary 2 G3 EOY 2024 Marking Scheme Section 2

No.	Solutions	Marks
1a	$5 - y > 7$ $-y > 7 - 5$ $-y > 2$ $y < -2$	B1
1b	$6 - 7x = x + 5(1 - 2x)$ $6 - 7x = x + 5 - 10x$ $-7x - x + 10x = 5 - 6$ $2x = -1$ $x = -\frac{1}{2}$	M1 A1
1ci	$a = \frac{2b - 3a}{5 - b}$ $a(5 - b) = 2b - 3a$ $5a - ab = 2b - 3a$ $-ab - 2b = -3a - 5a$ $b(-a - 2) = -8a$ $b = \frac{-8a}{-a - 2}$ $b = \frac{8a}{a + 2}$	M1 A1
1cii	$b = \frac{8(-1)}{-1 + 2} = -8$	B1
1d	$y = kx^2$ $k = \frac{y}{x^2}$ $y_{\text{new}} = k(2x)^2$ $y_{\text{new}} = \left(\frac{y}{x^2}\right)(4x^2)$ $y_{\text{new}} = 4y$ Percentage change = $\frac{4y - y}{y} \times 100\% = 300\%$ (shown)	M1 A1

2a	$1\text{ cm} : 120\text{ cm}$ $1\text{ cm} : 1.2\text{ m}$ $4\text{ cm} : 4.8\text{ m}$ $1.8\text{ cm} : 2.16\text{ m}$ Dimensions 4.8 m by 2.16 m	B1
2b	$1\text{ cm} : 1.2\text{ m}$ $1^2\text{ cm}^2 : 1.2^2\text{ m}^2$ $1\text{ cm}^2 : 1.44\text{ m}^2$ $(4.5 \times 5.4)\text{ cm}^2 : 34.992\text{ m}^2$	M1 A1
2c	$1\text{ cm}^2 : 1.44\text{ m}^2$ $\frac{156}{1.44}\text{ cm}^2 : 156\text{ m}^2$ $108\frac{1}{3}\text{ cm}^2 : 156\text{ m}^2$	M1 A1
3a	$BE^2 = 10^2 + (10 + 4)^2$ $BE = \sqrt{10^2 + 14^2}$ $BE = 17.20465 = 17.2\text{ cm (to 3 s.f.)}$	M1 A1
3b	$\tan \angle BEA = \frac{10}{14}$ $\angle BEA = \tan^{-1}\left(\frac{10}{14}\right)$ $\angle BEA = 35.53767$ $\angle BEA = 35.5^\circ \text{ (to 1 d.p.)}$	M1 A1
3c	$\sin 35.53767 = \frac{d}{4}$ $d = 4 \sin 35.53767$ $d = 2.32495$ $d = 2.32\text{ cm (to 3 s.f.)}$	M1 A1

4a	$OY^2 = 25.5^2 = 650.25$ $OX^2 + XY^2 = 22.5^2 + 12^2 = 650.25$ Since $OY^2 = OX^2 + XY^2 = 650.25$ angle OXY is a right angle and OX is perpendicular to the base of the cone (by the converse of Pythagoras Theorem)	M1 A1
4b	Total surface area $= \pi r^2 + \pi rl$ $= \pi(12)^2 + \pi(12)(25.5)$ $= 1413.716694$ $= 1410 \text{ cm}^2 \text{ (to 3 s.f.)}$	M1 A1
5a	$\frac{x}{5} = \frac{4}{2x+3}$ $x(2x+3) = 20$ $2x^2 + 3x = 20$ $2x^2 + 3x - 20 = 0 \text{ (shown)}$	M1 A1
5b	$2x^2 + 3x - 20 = 0$ $(2x-5)(x+4) = 0$ $2x-5 = 0 \text{ or } x+4 = 0$ $x = \frac{5}{2} \text{ or } x = -4$	M1 A1, A1
5c	$\frac{CE}{3} = \frac{2(\frac{5}{2}) + 3}{4}$ $\frac{CE}{3} = \frac{8}{4}$ $CE = \frac{8}{4}(3) = 6 \text{ cm}$	M1 A1

6a	$p = 7 - (0 - 3)^2 = -2$	B1
6b	Graph  P2 – all points plotted correctly P1 – for maximum 2 errors C1 – smooth curve that passes through all points	P1 P1 C1
6c	$x = 3$	B1
6d	Draw line $y = 2$ $x = 0.75$ or 5.25	M1 A1

7a	Time $= \frac{60}{11} = 5.45454 = 5 \text{ min } 27s$	B1
7b	Amount earned from containers $= 192 - 6(12) = \$120$ Number of containers in 6 hours $= \frac{120}{2.50} = 48$ Number of containers in 1 hour $= \frac{48}{6} = 8 \text{ containers (shown)}$	M1 A1
7c	Labour costs $= \frac{100}{10} \times 12 + 2.70(100) = \390 Pyramid volume $= \frac{1}{3} (5 \times 5) \times 6 = 50 \text{ cm}^3$ Labour and material costs for Pyramid $= (100 \times 50 \times 0.08) + 390 = \790 Selling price for Pyramid $= (100 \times 50 \times 0.15) = \750 Hemisphere volume $= \frac{1}{2} \times \frac{4}{3} \times 3.14 \times 3^3 = 56.52 \text{ cm}^3$ Labour and material costs for Hemisphere $= (100 \times 56.52 \times 0.08) + 390 = \842.16 Selling price for Hemisphere $= (100 \times 56.52 \times 0.15) = \847.80	M1 M1 M1 M1
	Therefore, the hemisphere will not result in a loss.	A1

End of Marking Scheme