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NAME:	CLASS:	INDEX NO:
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QUEENSWAY SECONDARY SCHOOL
END-OF-YEAR EXAMINATION 2024
SECONDARY 2

E

MATHEMATICS

Paper 1

4052/01

26 September 2024

Candidates answer on Question Paper.

1 hour

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, highlighters, glue or correction tape.

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 this paper is 40.

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 answers correct to three significant figures. Give answers in degrees to one decimal place.

For π , use either your calculator value or 3.142.

[Turn over

Answer **all** the questions.

1 (a) Calculate $\sqrt{\frac{5.6^3}{0.9}} + 10.01$.

Write down the first 5 digits on your calculator display.

Answer [1]

(b) Write your answer to **part (a)** correct to 4 significant figures.

Answer [1]

2 (a) Solve the inequality $-\frac{3}{8}y - 1 \leq \frac{1}{6}$.

Answer [2]

(b) Hence, state the smallest integer that satisfies the inequality.

Answer [1]

3

- 3 (a) Expand and simplify $(10p + 3)(2p - 1)$.

Answer [2]

- (b) Hence, factorise $20(k - 1)^2 - 4(k - 1) - 3$ completely.

Answer [2]

- 4 Solve the following pair of simultaneous equations.

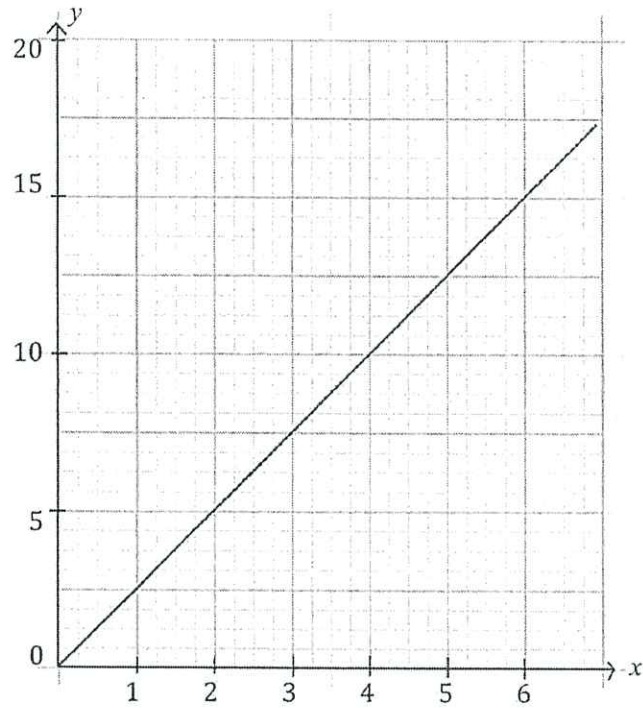
$$5x - 3y = 2$$

$$3x + 4y = 7$$

Answer $x = \dots\dots\dots$

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

- 5 The graph of a straight line is drawn on the grid below. Point $(k, 12.5)$ lies on the line.



- (a) State the value of k .

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

- (b) Find the equation of the line.

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

- (c) Explain why x and y are in direct proportion.

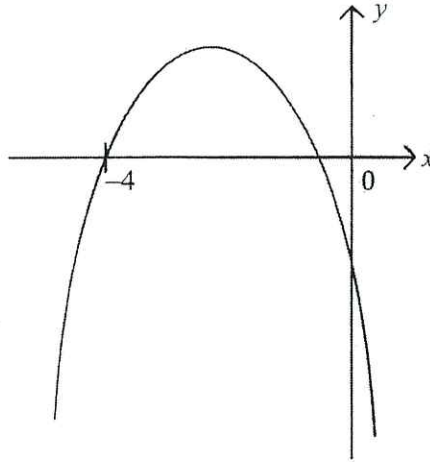
Answer

.....

.....

..... [1]

- 6 The diagram shows the curve $y = -x^2 - 5x - 4$.



- (a) Find the y -intercept.

Answer y - intercept = [1]

- (b) The equation of the line of symmetry is $x = -2.5$. Find the other x - intercept.

Answer x - intercept = [1]

7 (a) Simplify the following.

(i) $\frac{16q^3r^4}{18q^2r^6}$

Answer [1]

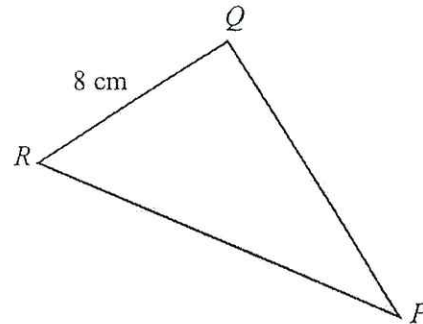
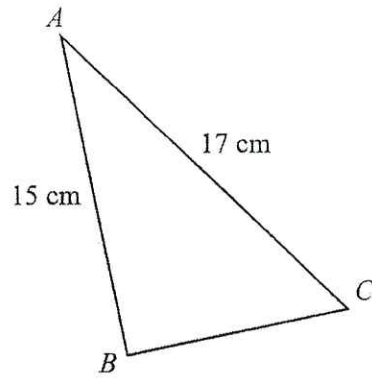
(ii) $\frac{p-2q}{8} \div \frac{4p-8q}{24}$

Answer [2]

(b) Make z the subject of the formula $xz - x = z + 1$.

Answer [2]

- 8 Triangles ABC and PQR congruent.



- (a) Find the length of RP .

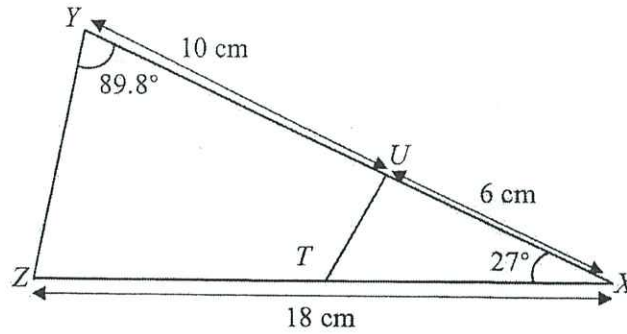
Answer cm [1]

- (b) Show that triangle ABC is a right-angled triangle.

Answer

[2]

- (c) Triangle XYZ is similar to triangle XTU .
 $YU = 10$ cm, $UX = 6$ cm and $ZX = 18$ cm.
 Angle $XYZ = 89.8^\circ$ and angle $ZXU = 27^\circ$.



Find

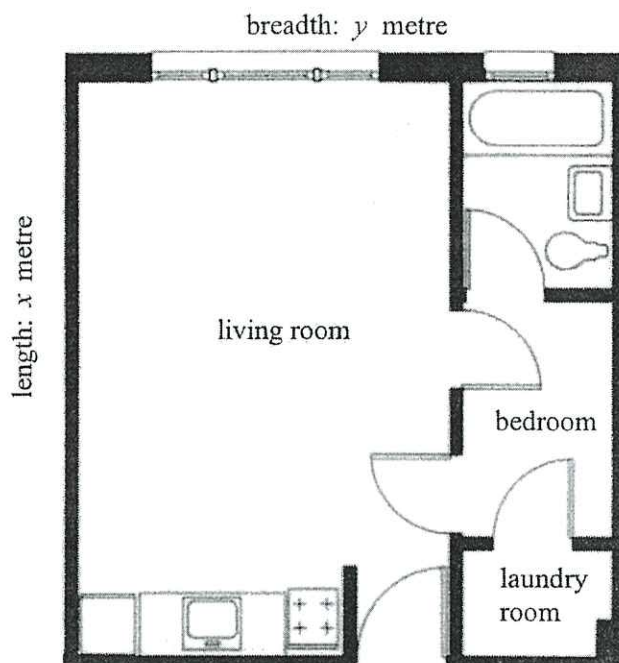
- (i) angle UTX ,

Answer $^\circ$ [1]

- (ii) length XT .

Answer cm [2]

- 9 The figure shows the floorplan of an apartment drawn to a scale of 1 : 150. The apartment has an actual length of x metre and an actual breadth of y metre.



- (a) Find the values of

(i) x ,

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

(ii) y .

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

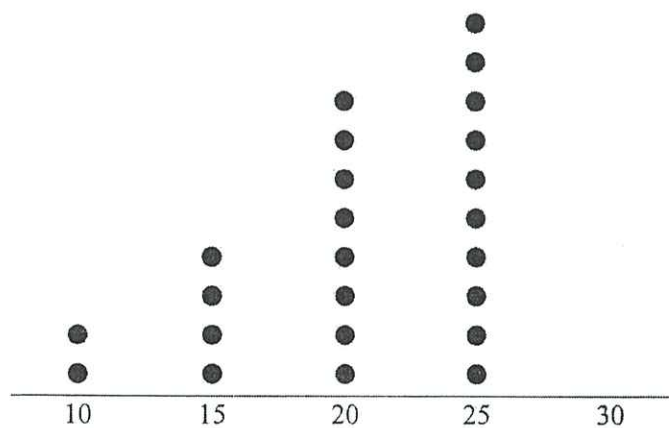
- (b) A square floor rug has an area of 1.44 m^2 . Determine if the floor rug can be placed in the living room. Show your working.

Answer

[3]

- 10 Jane constructed a dot diagram on a piece of paper to represent the time taken, in minutes, for a group of students to complete their lunch. However, she accidentally left out the dots representing the students who took 30 minutes to complete their lunch.

A student is selected at random. The probability that the selected student took 30 minutes to finish the lunch is 0.2, complete the dot diagram below. Show your working clearly.



[3]

- 11 The stem-and-leaf diagram represents the amount of money Kelly spent daily over 30 days.

10	0	0							
11	8	8	9						
12	0	3	5	5	6	6			
13	5	5	5	5	5	8	8		
14	0	0	1	2	2	5	7	9	9
15	2	2	4						

Key: 11|8 means \$11.80

- (a) Kelly aims to spend at most \$15 each day. Find the percentage of the number of days where Kelly overspent.

Answer % [1]

- (b) Kelly realises that she needs to make a one-time payment of \$10 for her phone bill on one of these days. Find the new mean.

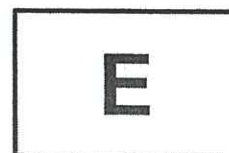
Answer \$ [2]

END OF PAPER

NAME:	CLASS:	INDEX NO:
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QUEENSWAY SECONDARY SCHOOL
END-OF-YEAR EXAMINATION 2024
SECONDARY 2



MATHEMATICS

Paper 2

4052/02

1 October 2024

1 hour 30 minutes

Candidates answer on the Question Paper.

READ THESE INSTRUCTIONS FIRST

Write your name, class and index number in the spaces at the top of this page.

Write in dark blue or black pen.

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

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

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 this paper is 60.

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.

[Turn over

Section A (28 marks)

- 1 At an electronics store, customers who pay a \$20 membership fee can enjoy a 20% discount on all items. Jane wants to buy a laptop priced at \$1000. The salesperson recommends that she become a member.

How much less does she have to pay in total if she joins as a member and buys the laptop?

Answer \$ [2]

- 2 Factorise each of the following expressions completely

(a) $2y^2 - 18$,

Answer [2]

(b) $4px + 8qx - py - 2qy$.

Answer [2]

- 3 (a) An outdoor camp is planned for a group of 30 students and food is bought to last for 8 days.

Given that all students consume the same amount of food every day, find the number of days the food can last if 6 students are absent from the camp.

Answer days [2]

- (b) P is inversely proportional to the square root of Q . If Q is increased by 300%, find the percentage decrease in P .

Answer % [2]

- 4 (a) Solve $x(x-5) = 6$.

Answer $x =$ or [2]

- (b) Explain why $y^2 + 81 = 0$ has no real solutions. Show your working clearly.

Answer

 [2]

5 Express the following as a single fraction in its simplest form

(a) $\frac{4}{x-2} - \frac{3-x}{2-x},$

Answer [2]

(b) $\frac{1}{3x^2-2x-5} + \frac{1}{x+1}.$

Answer [3]

6 p is a positive integer.

- (a) Explain why $2p + 4$ is an even number.

Answer

[1]

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

Answer [1]

- (c) Write down an expression for the next even number which is greater than $2p + 4$.

Answer [1]

- (d) Find, in its simplest form, an expression for the sum of squares of these two even numbers.

Answer [2]

- 7 The number of books read by a group of students in one month is recorded.

No. of books read	0	1	2	3	4	5
No. of students	3	7	x	6	5	3

- (a) If the mean number of books read is $2\frac{3}{7}$, find the value of x .

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

- (b) If the median number of books read is 3, find the greatest possible value of x .

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

- (c) If the modal number of books read is 1, find the greatest possible value of x .

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

Section B (32 mark)

- 8 (a) A card is drawn at random from a box containing 30 cards numbered 1 to 30.

Find the probability of drawing

- (i) a '4',

Answer [1]

- (ii) a prime number,

Answer [1]

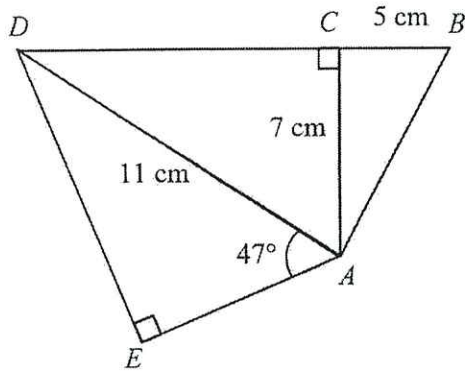
- (iii) an even number.

Answer [1]

- (b) There are 18 identical balls in a bag. 8 of the balls are red and the rest are yellow. After x yellow balls are removed from the bag, the probability of getting a yellow ball is $\frac{3}{7}$. Find the value of x .

Answer $x =$ [2]

- 9 In the diagram, BCD is a straight line.
 $BC = 5$ cm, $AD = 11$ cm and $AC = 7$ cm.
 Angle $DCA = \text{angle } DEA = 90^\circ$ and angle $EAD = 47^\circ$.



Calculate

(a) CD ,

Answer cm [2]

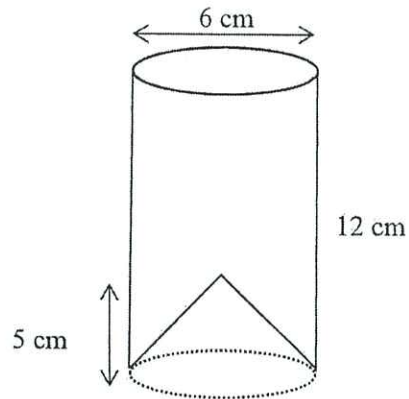
(b) angle CBA ,

Answer $^\circ$ [2]

(c) DE .

Answer cm [2]

- 10 The diagram shows a solid ornament formed by removing a cone from a solid cylinder. The cylinder has a diameter of 6 cm and a height of 12 cm. The cone has a height of 5 cm.



- (a) Find the volume of the ornament.

Answer cm^3 [2]

- (b) Show that the slant height of the cone is 5.83 cm when it is rounded to 3 significant figures.

Answer

[1]

- (c) Jane painted the exterior of the ornament. It is given that it will cost \$8 to paint an area of 10 cm^2 . Find the total cost of the paint needed for the ornament.

Answer \$ [4]

- 11 A bird takes off from the top of a tree. Its position during its flight is represented by the equation $y = 7 + 6x - x^2$, where y is the height of the bird above ground level, in metres, and x is its horizontal distance from the tree, in metres.

The table below gives some values of x and the corresponding values of y .

x (m)	0	1	2	4	5	6
y (m)	7	12	15	15	12	p

- (a) Find the value of p .

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

- (b) Using a scale of 2 cm to represent 1 unit on the x -axis and 2 cm to represent 2 units on the y -axis, draw the graph of $y = 7 + 6x - x^2$ for $0 \leq x \leq 6$ on the grid in the next page. [3]

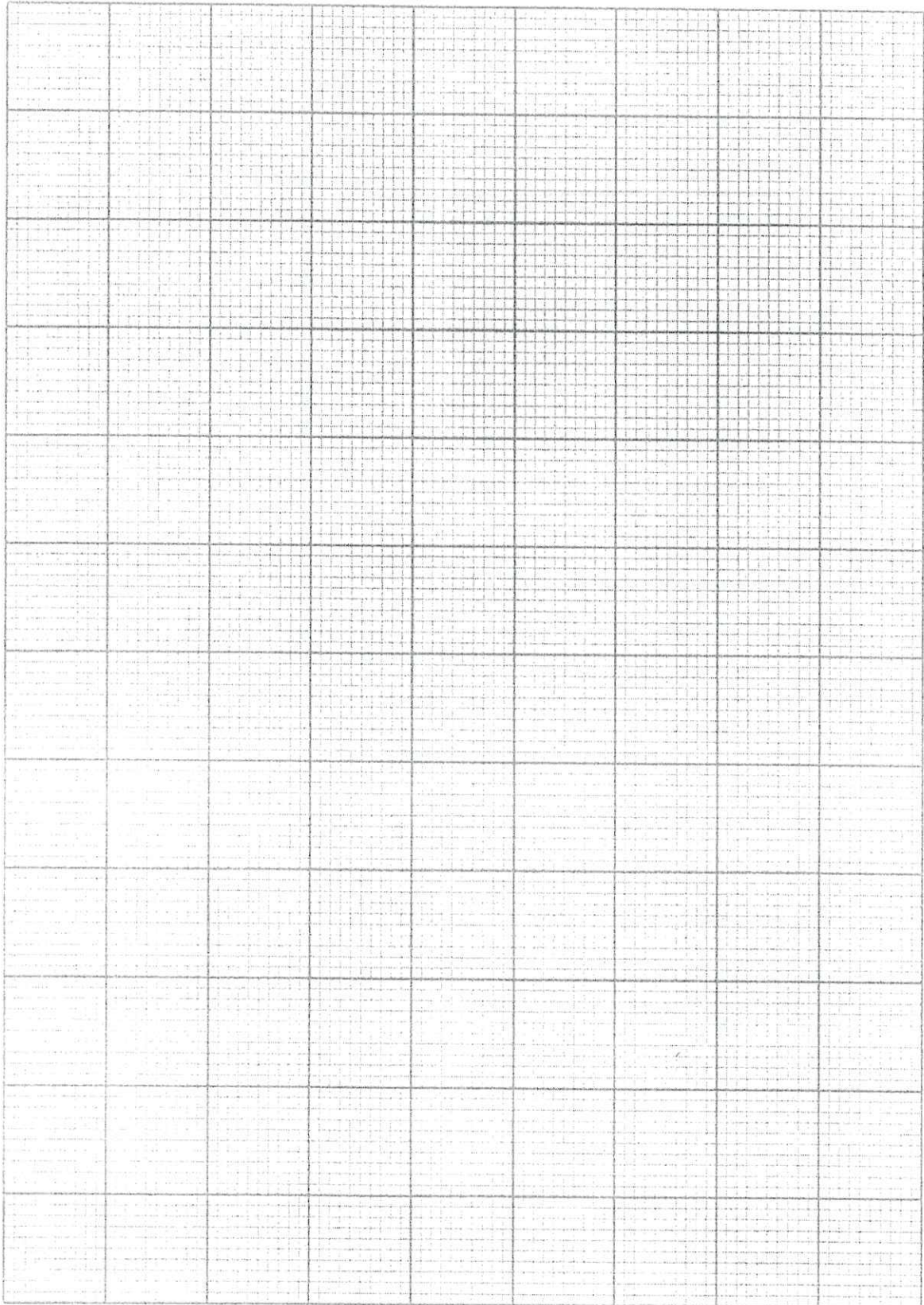
- (c) Find the horizontal distance(s) from the tree if the bird is at a height of 13 m.

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

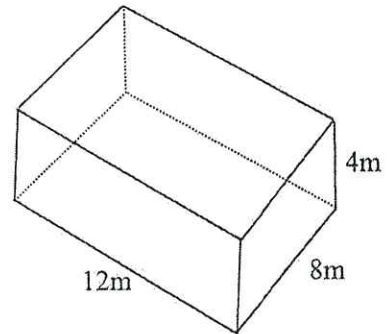
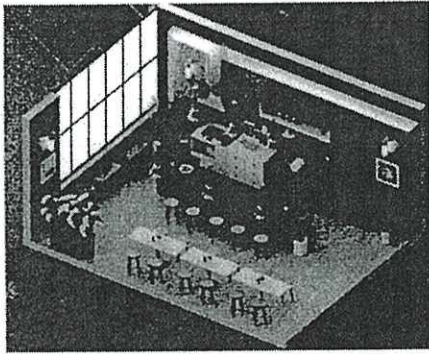
- (d) Alison claims that the bird managed to fly 20 metres above ground level during its path. Using the graph drawn, determine and explain if her claim is correct.

Answer $\dots\dots\dots$

$\dots\dots\dots$ [1]



- 12 James bought a shop to open a cafe.
The cafe can be modelled as a cuboid with length 12 m, breadth 8 m and height 4 m.



- (a) A tile store sells ceramic floor tiles at \$15 per square metre. James wants to buy tiles for his cafe.

Find the total cost of purchasing the tiles for the entire floor area. Assume that there is no wastage in cutting tiles.

Answer \$..... [2]

- (b) James has a budget of \$2000 for purchasing tables. Each table cost \$25.

By forming an inequality, find the maximum number of tables he can purchase.

Answer tables [2]

- (c) James decided to buy an air purifier to improve the air quality of his cafe.

Air Changes per Hour (ACH) is used to measure air quality. It measures the number of times the air in a room gets replaced within one hour. ACH is dependent on the volume of air that the air purifier delivers and is measured in cubic feet per minute (CFM).

ACH is calculated based on the formula as shown below

$$\text{ACH} = \frac{\text{CFM} \times 60}{\text{Volume of room (m}^3\text{)} \times 35.314}$$

James is deciding between two brands of air purifiers.

He would like to purchase an air purifier that has the lowest cost and meets the recommended ACH rating.

The recommended ACH rating for his cafe is between 5 ACH to 6 ACH.

The table below shows the CFM and prices of the air purifiers.

Brand	CFM	Price
Purifier A	1300	\$1200
Purifier B	1350	\$1246

Determine which air purifier James should buy. Show your working clearly.

Answer

[4]

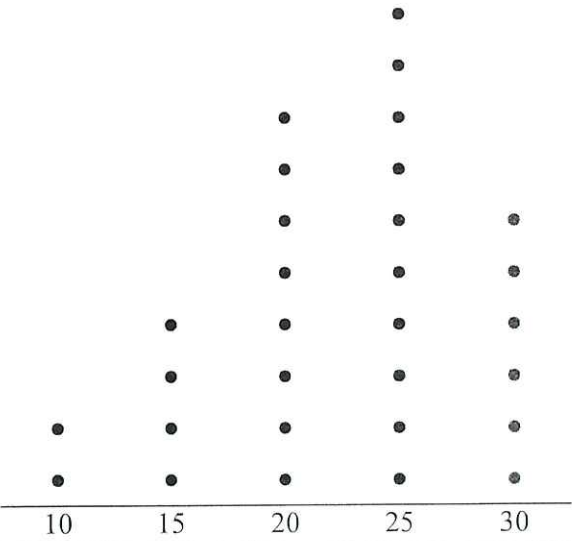
END OF PAPER

2024 2E EOY P1 MS

	Solution	Marks	Remarks
1a	23.978	B1	
1b	23.98	B1	
2a	$-\frac{3}{8}y - 1 \leq \frac{1}{6}$ $-\frac{3}{8}y \leq \frac{7}{6}$ $y \geq -\frac{28}{9} \text{ or } y \geq -3\frac{1}{9}$	M1 A1	
2b	-3	B1	
3a	$(10p+3)(2p-1)$ $= 20p^2 - 10p + 6p - 3$ $= 20p^2 - 4p - 3$	M1 A1	
3b	Let $p=k-1$, $20(k-1)^2 - 4(k-1) - 3$ $= [10(k-1)+3][2(k-1)-1]$ $= (10k-7)(2k-3)$	M1 A1	Allow ecf
4	$5x - 3y = 2 \text{ ---(1)}$ $3x + 4y = 7 \text{ ---(2)}$ $(1) \times 3: 15x - 9y = 6 \text{ ---(3)}$ $(2) \times 5: 15x + 20y = 35 \text{ ---(4)}$ $(3) - (4):$ $-29y = -29$ $y = 1$ Sub $y=1$ into (3): $15x - 9 = 6$ $15x = 15$ $x = 1$ <u>Alternative Method: Substitution</u>	M1 A1 A1	M1: for correct method

	$5x - 3y = 2$ ---(1) $3x + 4y = 7$ ---(2) From (1): $x = \frac{2+3y}{5}$ ---(3) Sub (3) into (2): $3(\frac{2+3y}{5}) + 4y = 7$ $y = 1$ Sub $y=1$ into (3): $x = \frac{2+3(1)}{5}$ $x=1$	 [M1] [A1] [A1]	
5a	5	B1	
5b	Gradient = $\frac{10-0}{4-0} = 2.5$ $y = 2.5x$	M1 A1	
5c	x and y are in direct proportion because the graph of y against x is a straight line that passes through the origin.	B1	
6a	-4	B1	
6b	-1	B1	
7ai	$\frac{16q^3r^4}{18q^2r^6} = \frac{8q}{9r^2}$	B1	
7aii	$\frac{p-2q}{8} \div \frac{4p-8q}{24}$ $= \frac{p-2q}{8} \times \frac{24}{4p-8q}$ $= \frac{p-2q}{8} \times \frac{24}{4(p-2q)}$ $= \frac{3}{4}$	M1 A1	

7b	$xz - x = z + 1$ $xz - z = 1 + x$ $z(x - 1) = 1 + x$ $z = \frac{1+x}{x-1}$	M1 A1	
8a	17	B1	
8b	$BC = QR = 8\text{cm}$ $AC^2 = 17^2 = 289$ $AB^2 + BC^2 = 15^2 + 8^2 = 289$	M1	
	Since $AC^2 = AB^2 + BC^2$, by converse of Pythagoras' Theorem, triangle ABC is a right-angled triangle.	A1	
8ci	89.8°	B1	
8cii	XT $= 16 \times \frac{6}{18}$ $= 5.33$ Or $5\frac{1}{3}$ Alternative Solution: $\frac{XT}{XY} = \frac{UX}{ZX}$ $\frac{XT}{16} = \frac{3}{18}$ $XT = 5.33$ Or $5\frac{1}{3}$	M1 A1 [M1] [A1]	
9ai	Accepted range: 12.15m – 13.2m	B1	
9aai	Accepted range: 11.55m – 12.3m	B1	
9b	Actual length = $\sqrt{1.44} = 1.2\text{m} = 120\text{cm}$ Map length = $\frac{120}{150} = 0.8\text{cm}$ Since the length of the square rug is 0.8cm on the map. The floor rug can be placed in the living room. <u>Alternative Solution</u> Map : Actual	M1 M1 B1	

	1cm : 1.5m 1cm ² : 2.25m ² 4/9 cm ² : 1m ² 0.64 cm ² : 1.44 m ² Area of the floorplan = 62.37 cm ² – 70.4 cm ² Since the area of the rug is smaller than the area of the floorplan, the floor rug can be placed in the living room.	[M1] [M1] [B1]	: Finding area ratio
10	8units --- 24 people 1unit --- 3 people 10units --- 30 people 	M1 M1 A1	: Forming the relationship : Finding total number of people : Drawing 6 dots for 30 minutes
11a	$\frac{3}{30} \times 100\% = 10\%$	B1	
11b	New total = \$ 400.40 + \$ 10 = \$410.40 New mean = $\frac{\$410.40}{30} = \13.68	M1 A1	: Finding new total

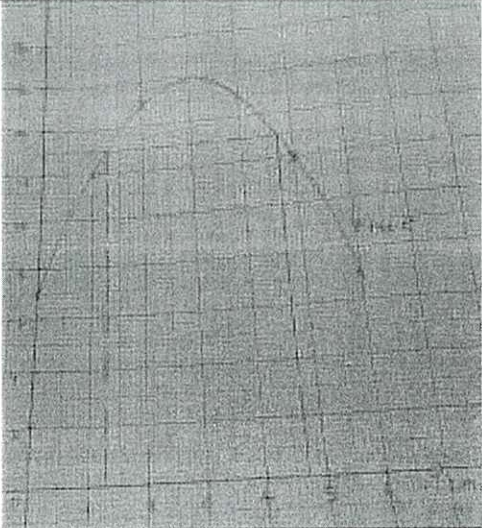
Queensway End-Of-Year Exams 2024 Marking Scheme Paper 2

Mathematics – Sec 2 EXP

No	Essential Steps	Marking	Remarks
1	Difference in amount $= 1000 - \frac{80}{100} \times 1000 + 20$ $= \$180$	M1 A1	M1 Finding amount of money paid with membership $\frac{80}{100} \times 1000 + 20$
2a	$2y^2 - 18$ $= 2(y^2 - 9)$ $= 2(y - 3)(y + 3)$	M1 A1	For taking common factor of 2
2b	$4px + 8qx - py - 2qy$ $= 4x(p + 2q) - y(p + 2q)$ $= (p + 2q)(4x - y)$	M1 A1	
3a	For 30 students, food can last 8 days For 1 student, food can last 240 days For 24 students, food can last 10 days	M1 A1	Accept B2
3b	new $Q = 4Q$ new $p = \frac{1}{\sqrt{4Q}}$ $= \frac{1}{2\sqrt{Q}}$ $= \frac{1}{2} \times p$ % decrease = 50%	M1 A1	
4a	$x(x - 5) - 6 = 0$ $x^2 - 5x - 6 = 0$ $(x - 6)(x + 1) = 0$ $x = 6 \text{ or } x = -1$	M1 A1	M1 for $x^2 - 5x - 6 = 0$
4b	$y^2 = -81$ We cannot square root a negative number.	M1 A1	

5a	$\frac{4}{x-2} - \frac{3-x}{2-x}$ $= \frac{4}{x-2} + \frac{3-x}{x-2}$ $= \frac{7-x}{x-2}$	M1 A1	M1 for making common denominator
5b	$\frac{1}{3x^2-2x-5} + \frac{1}{x+1}$ $= \frac{1}{(x+1)(3x-5)} + \frac{1}{x+1}$ $= \frac{1}{(x+1)(3x-5)} + \frac{3x-5}{(x+1)(3x-5)}$ $= \frac{3x-4}{(x+1)(3x-5)}$	M1 M1 A1	M1 factorisation of $3x^2-8x+5$ M1 for making common denominator
6(a)	$2p+4=2(p+2)$ which is a multiple of 2. Hence, it will always be even number.	B1	
6(b)	$(2p+4)^2$ $= 4p^2+16+2(2p)(4)$ $= 4p^2+16+16p$	B1	
6(c)	$2p+6$	B1	
6(d)	$(2p+4)^2 + (2p+6)^2$ $= 4p^2+16+2(2p)(4)+4p^2+36+2(2p)(6)$ $= 4p^2+16+16p+4p^2+36+24p$ $= 8p^2+52+40p$	M1 A1	Error carry forward method mark for wrong $2p+6$
7(a)	Mean = $\frac{0+7+2x+18+20+15}{24+x}$ $\frac{17}{7} = \frac{60+2x}{24+x}$ $17(24+x) = 7(60+2x)$ $408+17x = 420+14x$ $-12 = -3x$ $x = 4$	M1 A1	
7(b)	3	B1	
7(c)	6	B1	
8(ai)	$\frac{1}{30}$	B1	
8(aii)	$\frac{1}{3}$	B1	
8(aiii)	$\frac{1}{2}$	B1	

8(b)	$\frac{10-x}{18-x} = \frac{3}{7}$ $54-3x = 70-7x$ $4x = 16$ $x = 4$	M1 A1	Accept B2
9(a)	$CD^2 = 11^2 - 7^2$ $CD = 8.4852$ $CD = 8.49\text{cm}$	M1 A1	
9(b)	$\tan \angle CBA = \frac{7}{5}$ $\angle CBA = \tan^{-1} \frac{7}{5}$ $\angle CBA = 54.5^\circ$	M1 A1	
9(c)	$\sin 47^\circ = \frac{DE}{11}$ $DE = 8.04\text{cm}$	M1 A1	
10(a)	Volume $= \pi(3)^2(12) - \frac{1}{3}(\pi)(3^2)(5)$ $= 292.168$ $= 292\text{cm}^3$	M1 A1	M1 for finding volume of cone and vol of cylinder correctly .
10(b)	$l^2 = 5^2 + 3^2$ $l = \sqrt{34}$ $l = 5.83$	B1	Show evidence of using Pythagoras theorem
10(c)	Total SA $= \pi(3)(3) + (\pi)(3)(\sqrt{34}) + 2\pi(3)(12)$ $= 309.415\text{cm}^2$ $= 309\text{cm}^2$ $\frac{8}{10} \times 309.42$ $= \$247.54 \text{ or } \$247.53 \text{ (if 5.83 is used)}$	M1 A1 M1 A1	M1 Error carry forward slant height due to calculation. Accept also if student use 5.83 as slant height. M1 for finding per cm ² Accept if student use 5.83 and obtain 247.53

11(a)	7	B1	
11(b)		B1 for plotted points B1 for smooth line B1 for correct scale and axes	Error carry forward based on value of p .
11(c)	1.3m or 4.7m	B1	Accept 1.2 – 1.3 and 4.7 to 4.8
11(d)	She is incorrect. Based on the graph, the highest height travelled by the bird is 16m.	B1	Accept highest height (± 0.2)
12(a)	Floor area $= 12 \times 8$ $= 96\text{m}^2$ Total cost $= 96 \times 15$ $= \$1440$	M1 A1	
12(b)	Let n be the no. of tables $25n \leq 2000$ $n \leq 80$ 80 tables	M1 A1	Do not award marks if inequality is not formed.
12(c)	Volume $= 12 \times 8 \times 4$ $= 384\text{m}^3$	B1	

