ST. MARGARET'S SCHOOL (SECONDARY)

End-of-Year Examinations 2025

CANDIDATE NAME

CLASS | REGISTER NUMBER

G3 MATHEMATICS

6 October 2025

Secondary 2 **2 hours 15 minutes**

Candidates answer on the Question Paper.

READ THESE INSTRUCTIONS FIRST

Write your name, registration number and class on all the work you hand in.
Write in dark blue or black pen.
You may use a soft pencil for any diagrams or 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 90.

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 or 3.142.

For Examiner's Use

Section A

Answer **all** the questions.

1 Arrange the following numbers in descending order.

$$\sqrt{0.0081}, \quad \frac{0.901}{10^2}, \quad \frac{39.9}{441}, \quad 0.0271^{\frac{2}{3}}$$

Answer ....., ..., ..., ... [1]
Largest *Smallest*

---

2 **(a)** Express 2100 as a product of its prime factors.

Answer ..... [1]

(b) The highest common factor of two numbers is 20. Their lowest common multiple is 2100. Both numbers are greater than 100 and smaller than 500.
Find the two numbers.

Answer ....., ... [2]

---

3 y is directly proportional to x^2.
If x is increased by 300%, find the percentage increase in y.

Answer ..... % [2]

4(a) Solve the following equations.

(i) $\frac{x}{5}+\frac{2x+3}{4}=6$

Answer x = ... [2]

(ii) $5x^2 + 10 = 27x$

Answer x = ... , ... [2]

(b) Solve the inequality $5(4x - 7) \geq 7(1 + 3x)$.

Answer ..... [2]

5 Factorise $4ab + 6b + 16a + 24$.

Answer ..... [2]

---

6 Solve the following simultaneous equations.

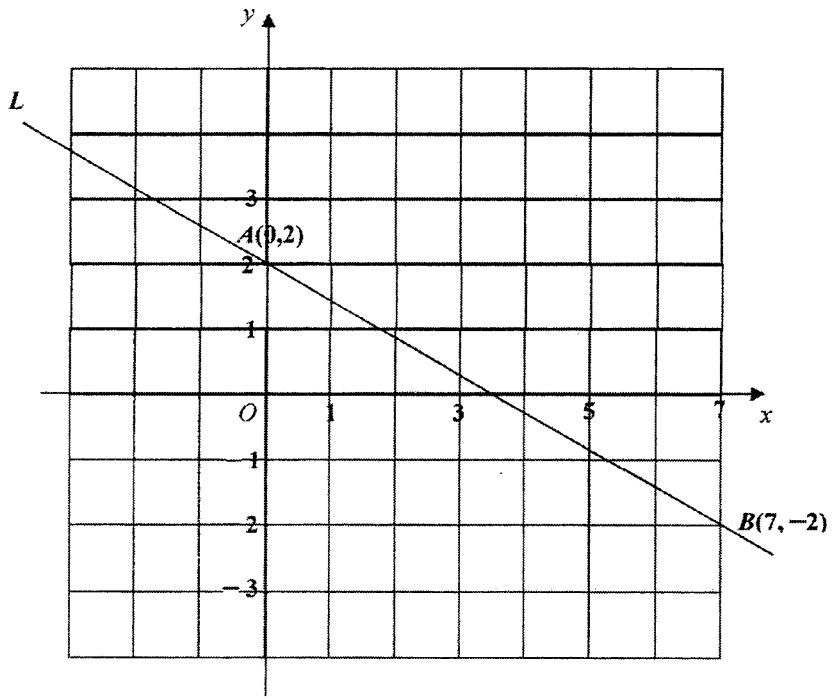
$3x - 2y = 8$

$4x + 5y = 3$

Answer $x =$ .....

$y =$ ..... [3]

7 The line L passes through the point $A(0,2)$ and $B(7, -2)$.



(a) Find the gradient of the line L.

Answer ..... [2]

(b) Write down the equation of line L.

Answer ..... [1]

8 A map has a scale of 1 : 50 000.

(a) Two towns on the map are 8.8 cm apart.
Find the actual distance between the two towns in kilometres.

Answer .....km [2]

(b) A forest covers an actual area of 2.25 km^2.
Find the area of the forest on the map in cm^2.

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

9 It is given that $3a = \dfrac{5b-3c}{b+2c}$.

(a) Find a when $b = 9$ and $c = 12$.

Answer $a =$ ..... [2]

(b) Express b in terms of a and c.

Answer ..... [2]

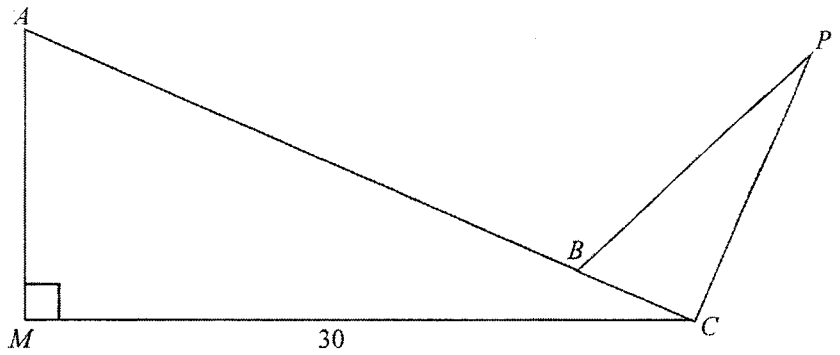
---

10 Simplify $\dfrac{x}{5x-35} \div \dfrac{x^2-5x}{x^2-14x+49}$.

Answer ..... [2]

---

11 In the diagram, ABC is a straight line. The ratio of $AB : AC$ is 4 : 5 and $\sin\angle MAC = \frac{3}{5}$. $MC = 30$cm, $PC = 24$ cm and $PB = 26$ cm.

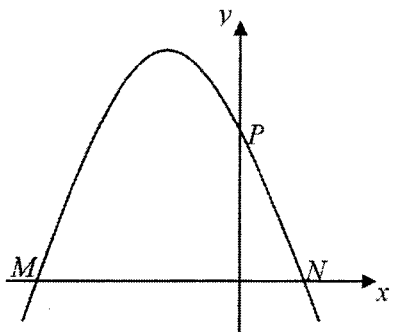


(a) Find the length of AC.

Answer .....cm [1]

(b) Show that $\triangle PBC$ is a right-angled triangle. [3]

12 The graph of $y = (x+5)(3-x)$ is given below.



(a) State the values of the two x-intercepts.

Answer $x =$ ....., ... [2]

(b) Write down the coordinates of P.

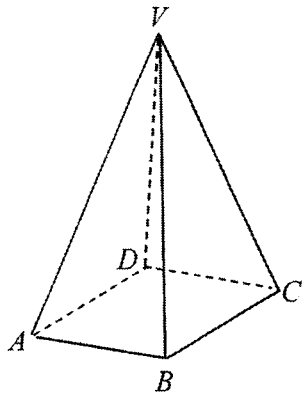
Answer (....., ...) [1]

(c) Find the equation of the line of symmetry of the graph.

Answer ..... [1]

13 *VABCD* is a pyramid with a square base of side 24 cm. *O* is the centre of square *ABCD*. The vertical height, *VO* of the pyramid is 16 cm.

(a) Find the slant height of $\triangle VBC$.

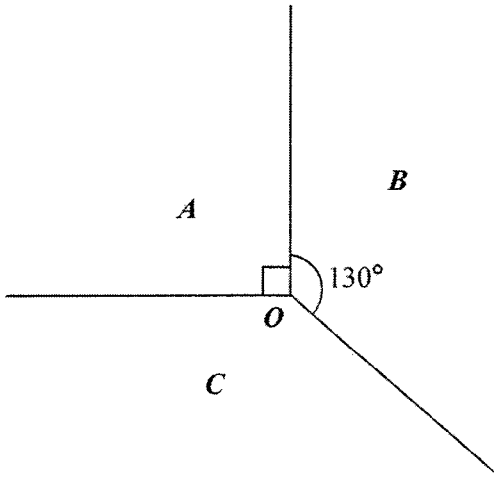


Answer .....cm [2]

(b) Find the total surface area of the pyramid.

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

14 The diagram shows the three vertices of each of three polygons, A, B and C that fit at point O. The interior angle of polygon A is 90° and the interior angle of polygon B is 130°.



(a) Given that C is a regular polygon. Find its interior angle.

Answer .....° [1]

(b) Hence, find the number of sides of the regular polygon C.

Answer ..... [2]

Section B

Answer **all** the questions.

15 Two classes of students sat for a Mathematics test. Their scores are shown below in the stem-and-leave diagram.

Class *A*							Class *B*					
			7	1	0	5	2	5				
	8	7	6	5	5	6	4	5	6			
5	5	2	2	2	2	7	1	2	2	4	5	9
		4	2	2	1	8	2	3	3	5	7	
				7	3	9	0	2	5	5		

Key: 0|5|2 means 50 marks for a student in Class *A* and 52 marks for a student in Class *B*.

(a) Find the median score for Class *B*.

Answer ..... [1]

(b) Find the modal score of the test for class *A*.

Answer ..... [1]

(c) Find the mean score of class *B*.

Answer ..... [2]

(d) Which class did better? Explain.

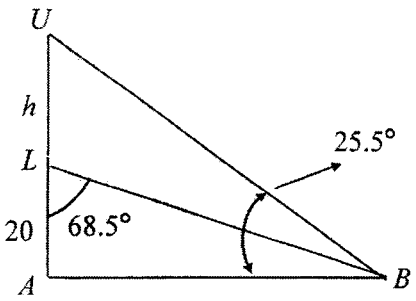
Answer .....

.....

.....

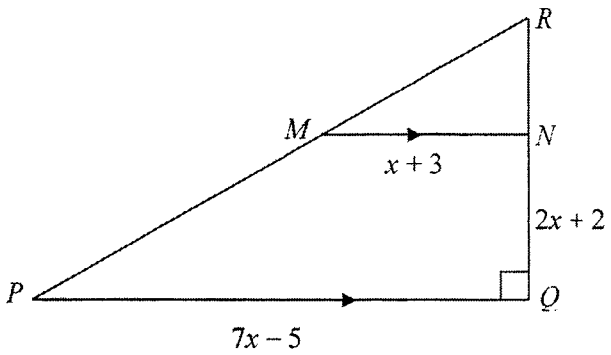
..... [2]

16 The lower edge, L, of a window UL of a house is 20 m vertically above a point A on level ground. B is a point to the east of A such that angle $UBA = 25.5°$. Given that angle $ALB = 68.5°$. Find the height, h, of the window.



Answer ..... m [5]

17 PQR is a right-angled triangle where angle $PQR = 90°$. M is a point on PR and N is a point on RQ such that MN is parallel to PQ.



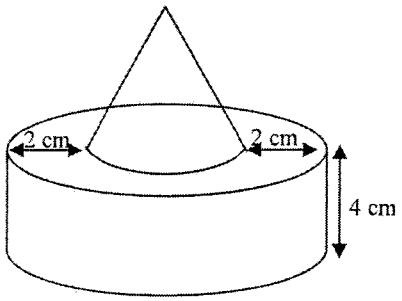
(a) Given that the area of $MNPQ = 228$ cm^2, form an equation in x and show that it reduces to $4x^2 + 3x - 115 = 0$. [3]

(b) Solve $4x^2 + 3x - 115 = 0$. Explain why one of the values is to be rejected. [3]

(c) Given that $\triangle RMN$ and $\triangle RPQ$ are similar triangles, find the exact length of RN.

Answer ..... cm [3]

18 A solid made of wax consists of a cone and a cylinder. The cylinder has a height of 4 cm and its base area is 150 cm^2.



(a) Find the radius of the cylinder.

Answer ..... cm [2]

(b) Find the radius of the cone.

Answer ..... cm [2]

(c) Given that the height of the cone is 12 cm, calculate the volume of the solid.

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

19 A ball it thrown upwards from the top of a building. The height h metres, of the ball above the building after t seconds is given by the equation $h = 25t - 5t^2$. Some corresponding values of h and t are given in the table below.

t	0	1	2	3	4	5	6
h	0	a	30	30	20	0	b

(a) Find the values of a and of b.

Answer $a =$ ..... [1]

$b =$ ..... [1]

(b) Draw the graph of $h = 25t - 5t^2$ for $0 \leq t \leq 6$ on the grid provided on the next page. [2]

(c) Using your graph, find the length of the time when the object is 26 m **above** the height of the building.

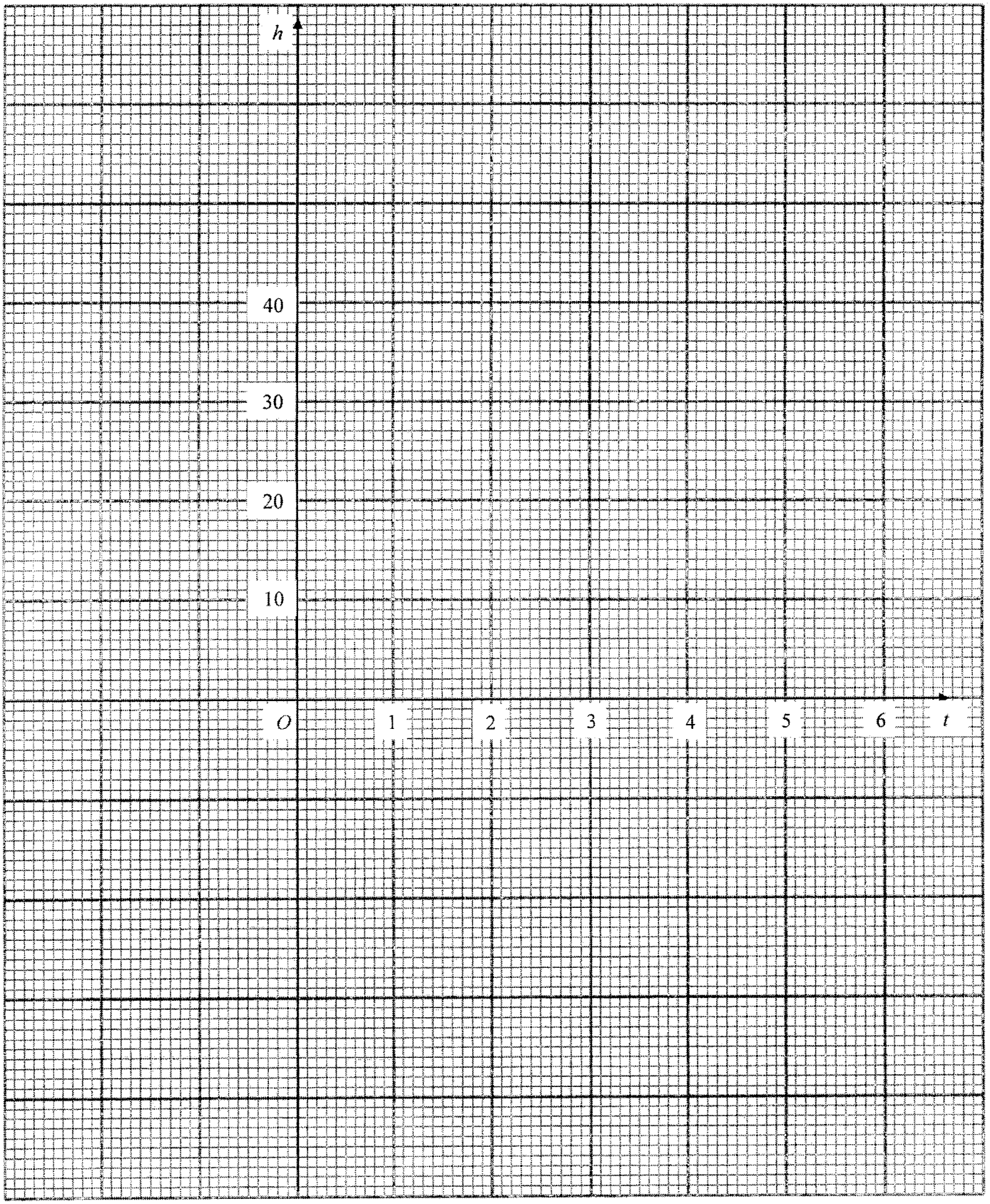
Answer $t =$ ..... s [2]

(d) Find the time when the object will reach the greatest height.

Answer $t =$ ..... s [1]

(e) Given that the ball hits the ground 6 seconds after it was thrown, state the height of the building from the graph.

Answer ..... m [1]


h
40
30
20
10
O
1
2
3
4
5
6
t

20 Amy is starting a small business importing and selling vertical pot towers. She has identified a supplier in Malaysia and plans to sell through an e-commerce platform in Singapore.

Amy imported 1000 vertical pot towers from Malaysia at RM 3.99 per tower. She engaged Swift Delivery Logistic (SDL) to transport the towers to Singapore at a cost of RM 540. The exchange rate at the time of purchase was S$1 = RM 3.29.

(a) Calculate the total cost (in Singapore dollars) that Amy paid for purchasing and delivering the1000 vertical pot towers. Round your answer to the nearest cent.

Answer S$..... [3]

Amy plans to sell each tower at S$3.75 through Ezyshop, an e-commerce platform that charges various fees as shown in the table below.

Fee Type	Rate
Platform Fees	4% per transacted amount
Logistic Delivery Fees	5% per transaction below $10; 2.5% per transaction above $10
Credit Card Charge	0.5% of the transacted amount
Promotional Fees	6.5% of transacted amount
Tracking Fees	1.5% of transacted amount

The above miscellaneous fees as well as every transacted amount are all subjected to a 9% Goods and Services Tax (GST).

(b) Determine Amy's net profit if she successfully sells all 1000 towers through Ezyshop at the planned selling price. Show all calculations clearly.

Answer S$..... [5]

(c) Amy has decided she will only continue this business if her profit margin is at least 150%. Based on your calculations, should she continue? Justify your answer.

Answer She ..... continue because .....

..... [2]

ANSWER

Founded 1842

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Section A

Answer **all** the questions.

1 Arrange the following numbers in descending order.

$$\sqrt{0.0081}, \quad \frac{0.901}{10^2}, \quad \frac{39.9}{441}, \quad 0.0271^{\frac{2}{3}}$$

Answer $\frac{39.9}{441}$ *Largest*, $0.0271^{\frac{2}{3}}$, $\sqrt{0.0081}$, $\frac{0.901}{10^2}$ *Smallest* [1]

---

2 **(a)** Express 2100 as a product of its prime factors.

Answer $2^2 \times 3 \times 5^2 \times 7$ [1]

(b) The highest common factor of two numbers is 20. Their lowest common multiple is 2100. Both numbers are greater than 100 and smaller than 500.
Find the two numbers.

$20 = 2^2 \times 5$

$2100 = 2^2 \times 3 \times 5^2 \times 7$

1st no. $= 2^2 \times 5 \times 7 = 140$

2nd no. $= 2^2 \times 3 \times 5^2 = 300$

Answer 140, 300 [2]

---

3 y is directly proportional to x^2.
If x is increased by 300%, find the percentage increase in y.

$y = kx^2$

original

$y_1 = kx_1^2$

new

$y_2 = k(4x_1)^2$

$= 16kx_1^2$

$= 16y_1$

% increase $= \frac{16y_1 - y_1}{y_1} \times 100$

$= 1500$

Answer 1500 % [2]

4(a) Solve the following equations.

(i) $\frac{x}{5}+\frac{2x+3}{4}=6$

$4x + 5(2x+3) = 20(6)$

$4x + 10x + 15 = 120$

$14x = 105$

$x = \frac{105}{14}$

$x = 7\frac{1}{2}$ or 7.5

Answer $x =$ $7\frac{1}{2}$ or 7.5 [2]

(ii) $5x^2 + 10 = 27x$

$5x^2 - 27x + 10 = 0$

$(5x - 2)(x - 5) = 0$

$5x - 2 = 0$ or $x - 5 = 0$

$x = \frac{2}{5}$ $\quad$ $x = 5$

Answer $x =$ $\frac{2}{5}$, 5 [2]

(b) Solve the inequality $5(4x - 7) \geq 7(1 + 3x)$.

$20x - 35 \geq 7 + 21x$

$-x \geq 42$

$x \leq -42$

Answer $x \leq -42$ [2]

5 Factorise $4ab + 6b + 16a + 24$.

$= (4ab + 6b) + (16a + 24)$

$= 2b(2a + 3) + 8(2a + 3)$

$= (2a + 3)(2b + 8)$

$= 2(2a + 3)(b + 4)$

Answer $2(2a + 3)(b + 4)$ [2]

---

6 Solve the following simultaneous equations.

$3x - 2y = 8$ ——— (1)

$4x + 5y = 3$ ——— (2)

from (1),

$2y = 3x - 8$

$y = \frac{3x - 8}{2}$ ——— (3)

Sub (3) into (2),

$4x + 5\left(\frac{3x - 8}{2}\right) = 3$

$8x + 15x - 40 = 6$

$23x = 46$

$x = 2$

Sub $x = 2$ into (3),

$y = \frac{3(2) - 8}{2}$

$y = -1$

Answer $x =$ 2

$y =$ -1 [3]

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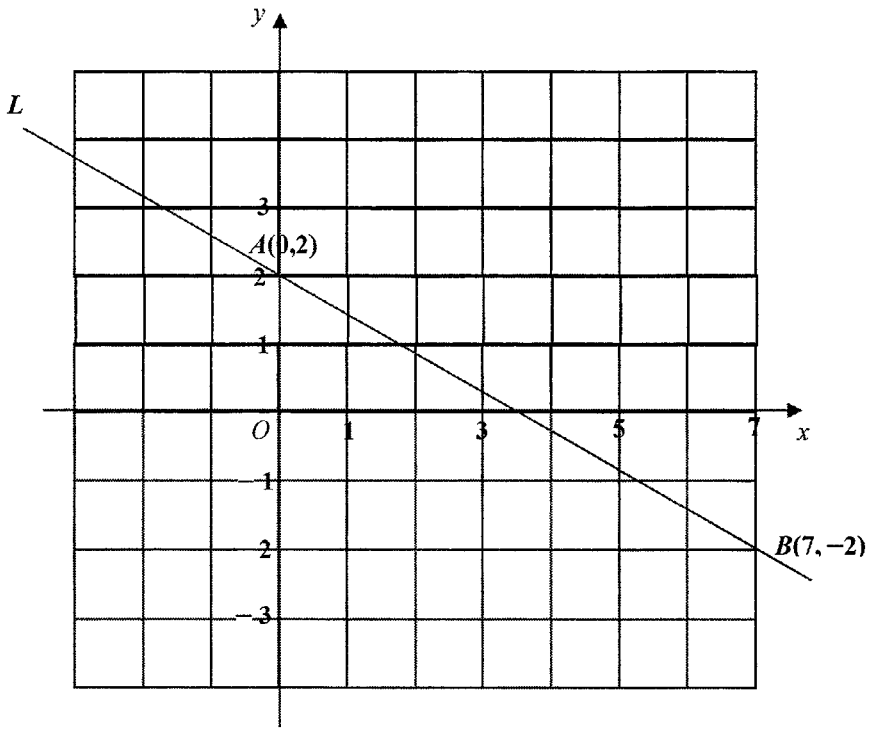
7 The line L passes through the point $A(0,2)$ and $B(7, -2)$.



(a) Find the gradient of the line L.

gradient $= \frac{-2-2}{7-0}$

$= \frac{-4}{7}$

Answer $-\frac{4}{7}$ [2]

(b) Write down the equation of line L.

Answer $y = -\frac{4}{7}x + 2$ [1]

or $7y = -4x + 14$

8 A map has a scale of 1 : 50 000.

(a) Two towns on the map are 8.8 cm apart.
Find the actual distance between the two towns in kilometres.

scale = 1 : 50 000

= 1 cm : 0.5 km

actual distance

= 8.8 × 0.5

= 4.4 km

Answer 4.4 km [2]

(b) A forest covers an actual area of 2.25 km^2.
Find the area of the forest on the map in cm^2.

area scale = $1 cm^2 : 0.25 km^2$

area on map

$= \frac{2.25}{0.25}$

$= 9 cm^2$

Answer 9 cm^2 [2]

9 It is given that $3a = \dfrac{5b-3c}{b+2c}$.

(a) Find a when $b = 9$ and $c = 12$.

$3a = \dfrac{5(9)-3(12)}{9+2(12)}$

$= \dfrac{3}{11}$

$a = \dfrac{1}{11}$

Answer $a =$ $\dfrac{1}{11}$ [2]

(b) Express b in terms of a and c.

$3ab + 6ac = 5b - 3c$

$5b - 3ab = 6ac + 3c$

$b(5-3a) = 6ac + 3c$

$b = \dfrac{6ac+3c}{5-3a}$

Answer $b = \dfrac{6ac+3c}{5-3a}$ [2]

---

10 Simplify $\dfrac{x}{5x-35} \div \dfrac{x^2-5x}{x^2-14x+49}$.

$x \cdot 7 \mid -7x$
$x \cdot 7 \mid -7x$
$x^2 \mid -14x$

$\dfrac{x}{5x-35} \times \dfrac{(x-7)(x-7)}{x^2-5x} = \dfrac{x}{5(x-7)} \times \dfrac{(x-7)(x-7)}{x(x-5)}$

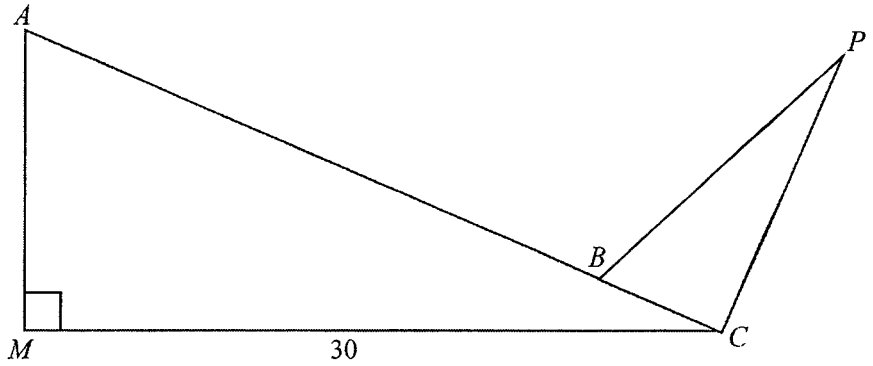
$= \dfrac{1}{5} \times \dfrac{(x-7)}{x-5}$

$= \dfrac{x-7}{5(x-5)}$

Answer $\dfrac{x-7}{5(x-5)}$ [2]

---

11 In the diagram, ABC is a straight line. The ratio of $AB : AC$ is 4 : 5 and $\sin\angle MAC = \frac{3}{5}$. $MC = 30$cm, $PC = 24$ cm and $PB = 26$ cm.



(a) Find the length of AC.

$\sin\angle MAC = \frac{3}{5}$

$\frac{30}{AC} = \frac{3}{5}$

$AC = 50$ cm

Answer 50 .....cm [1]

(b) Show that $\triangle PBC$ is a right-angled triangle. [3]

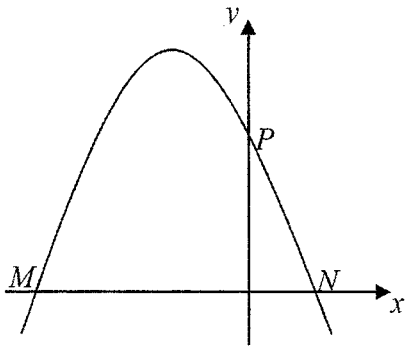
$BC = \frac{1}{5} \times 50 = 10$ cm

$BC^2 + PC^2 = 10^2 + 24^2 = 676$

$PB^2 = 26^2 = 676$

Since $BC^2 + PC^2 = PB^2$, by the Converse of Pythagoras' Theorem, $\triangle PBC$ is a right-angled $\triangle$.

12 The graph of $y = (x + 5)(3 - x)$ is given below.



(a) State the values of the two x-intercepts.

Answer $x =$ -5 , 3 [2]

(b) Write down the coordinates of P.

Answer (0 , 15) [1]

(c) Find the equation of the line of symmetry of the graph.

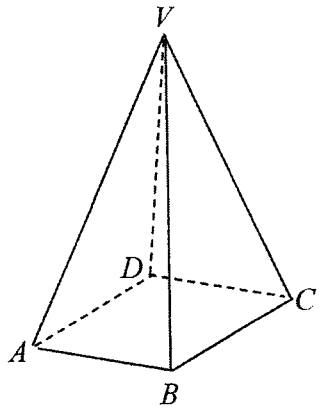
Answer $x = -1$ [1]

13 *VABCD* is a pyramid with a square base of side 24 cm. *O* is the centre of square *ABCD*. The vertical height, *VO* of the pyramid is 16 cm.

(a) Find the slant height of $\triangle VBC$.

$l = \sqrt{16^2 + 12^2}$

$= 20$



20

Answer .....cm [2]

(b) Find the total surface area of the pyramid.

total surface area

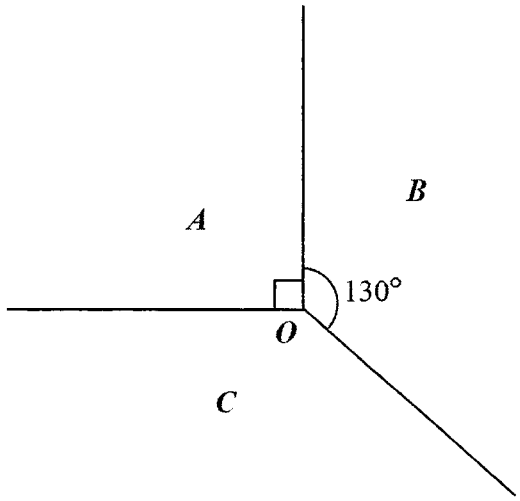
$= 4\left(\frac{1}{2} \times 24 \times 20\right) + (24 \times 24)$

$= 1536 \text{ cm}^2$

1536

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

14 The diagram shows the three vertices of each of three polygons, A, B and C that fit at point O. The interior angle of polygon A is 90° and the interior angle of polygon B is 130°.



(a) Given that C is a regular polygon. Find its interior angle.

$360° - 90° - 130°$

$= 140°$

Answer 140 ° [1]

(b) Hence, find the number of sides of the regular polygon C.

ext. $\angle = 180° - 140°$

$= 40°$

no. of sides $= \frac{360}{40}$

$= 9$

Answer 9 [2]

Section B

Answer **all** the questions.

15 Two classes of students sat for a Mathematics test. Their scores are shown below in the stem-and-leave diagram.

Class *A*							Class *B*					
			7	1	0	5	2	5				
	8	7	6	5	5	6	4	5	6			
5	5	2	2	2	2	7	1	2	2	4	5	9
		4	2	2	1	8	2	3	3	5	7	
				7	3	9	0	2	5	5		

Key: 0|5|2 means 50 marks for a student in Class *A* and 52 marks for a student in Class *B*.

(a) Find the median score for Class *B*.

$\frac{75+79}{2} = 77$

Answer 77 [1]

(b) Find the modal score of the test for class *A*.

Answer 72 [1]

(c) Find the mean score of class *B*.

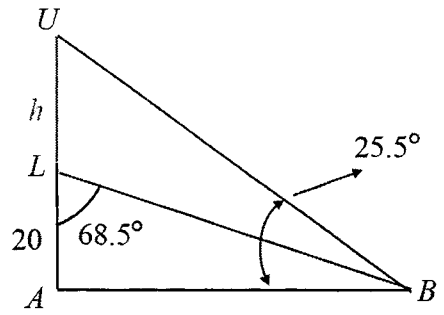
Answer 76.85 [2]

(d) Which class did better? Explain.

Answer Mean score of Class A = 72.5. Since the mean score of Class B is higher than that of Class A, Class B did better.

[2]

16 The lower edge, L, of a window UL of a house is 20 m vertically above a point A on level ground. B is a point to the east of A such that angle $UBA = 25.5°$. Given that angle $ALB = 68.5°$. Find the height, h, of the window.



$\tan 68.5° = \frac{AB}{20}$

$AB = 20 \tan 68.5°$

$= 50.7729$ m

$\tan 25.5° = \frac{h+20}{50.7729}$

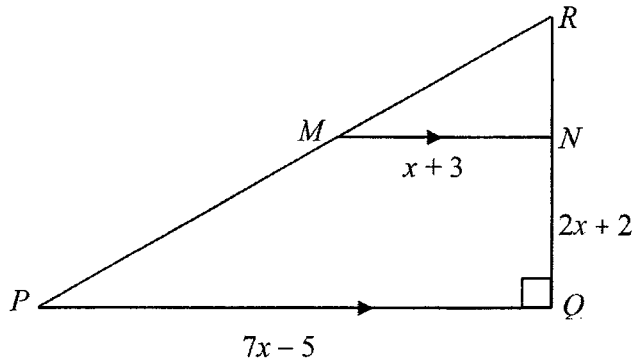
$h+20 = 24.2174$

$h = 4.2174$

≈ 4.22 m (3 sf)

Answer 4.22 ..... m [5]

17 PQR is a right-angled triangle where angle $PQR = 90°$. M is a point on PR and N is a point on RQ such that MN is parallel to PQ.



(a) Given that the area of $MNPQ = 228$ cm^2, form an equation in x and show that it reduces to $4x^2 + 3x - 115 = 0$. [3]

$\frac{1}{2}(x+3+7x-5)(2x+2) = 228$

$(8x-2)(x+1) = 228$

$8x^2 + 8x - 2x - 2 - 228 = 0$

$8x^2 + 6x - 230 = 0$ $\div 2$

$4x^2 + 3x - 115 = 0$ (shown)

(b) Solve $4x^2 + 3x - 115 = 0$. Explain why one of the values is to be rejected. [3]

$(4x+23)(x-5) = 0$

$4x + 23 = 0$ or $x - 5 = 0$

$x = \frac{-23}{4}$ $\quad x = 5$

$x = -\frac{23}{4}$ to be rejected because length cannot be a negative value.

(c) Given that $\triangle RMN$ and $\triangle RPQ$ are similar triangles, find the exact length of RN.

$\frac{RN}{RN+2(5)+2} = \frac{5+3}{7(5)-5}$

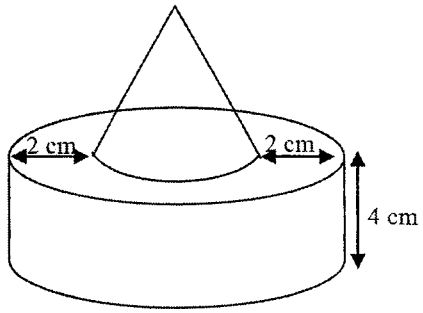
$\frac{RN}{RN+12} = \frac{8}{30}$

$30RN = 8RN + 96$

$RN = 4\frac{4}{11}$ cm

Answer ..... cm [3]

18 A solid made of wax consists of a cone and a cylinder. The cylinder has a height of 4 cm and its base area is 150 cm^2.



(a) Find the radius of the cylinder.

$\pi r^2 = 150$

$r = \sqrt{\frac{150}{\pi}}$

$= 6.9098$

$= 6.91$ cm (3sf)

Answer 6.91 cm [2]

(b) Find the radius of the cone.

radius $= 6.9098 - 2$

$= 4.9099$

$= 4.91$ cm (3sf)

Answer 4.91 cm [2]

(c) Given that the height of the cone is 12 cm, calculate the volume of the solid.

Vol. of solid

$= 150(4) + \frac{1}{3}(\pi \times 4.9099^2 \times 12)$

$= 902.9389$

$= 903\ cm^3$ (3 sf)

Answer 903 cm^3 [3]

19 A ball it thrown upwards from the top of a building. The height h metres, of the ball above the building after t seconds is given by the equation $h = 25t - 5t^2$. Some corresponding values of h and t are given in the table below.

t	0	1	2	3	4	5	6
h	0	a	30	30	20	0	b

(a) Find the values of a and of b.

Answer $a =$ 20 [1]

$b =$ −30 [1]

(b) Draw the graph of $h = 25t - 5t^2$ for $0 \leq t \leq 6$ on the grid provided on the next page. [2]

(c) Using your graph, find the length of the time when the object is 26 m **above** the height of the building.

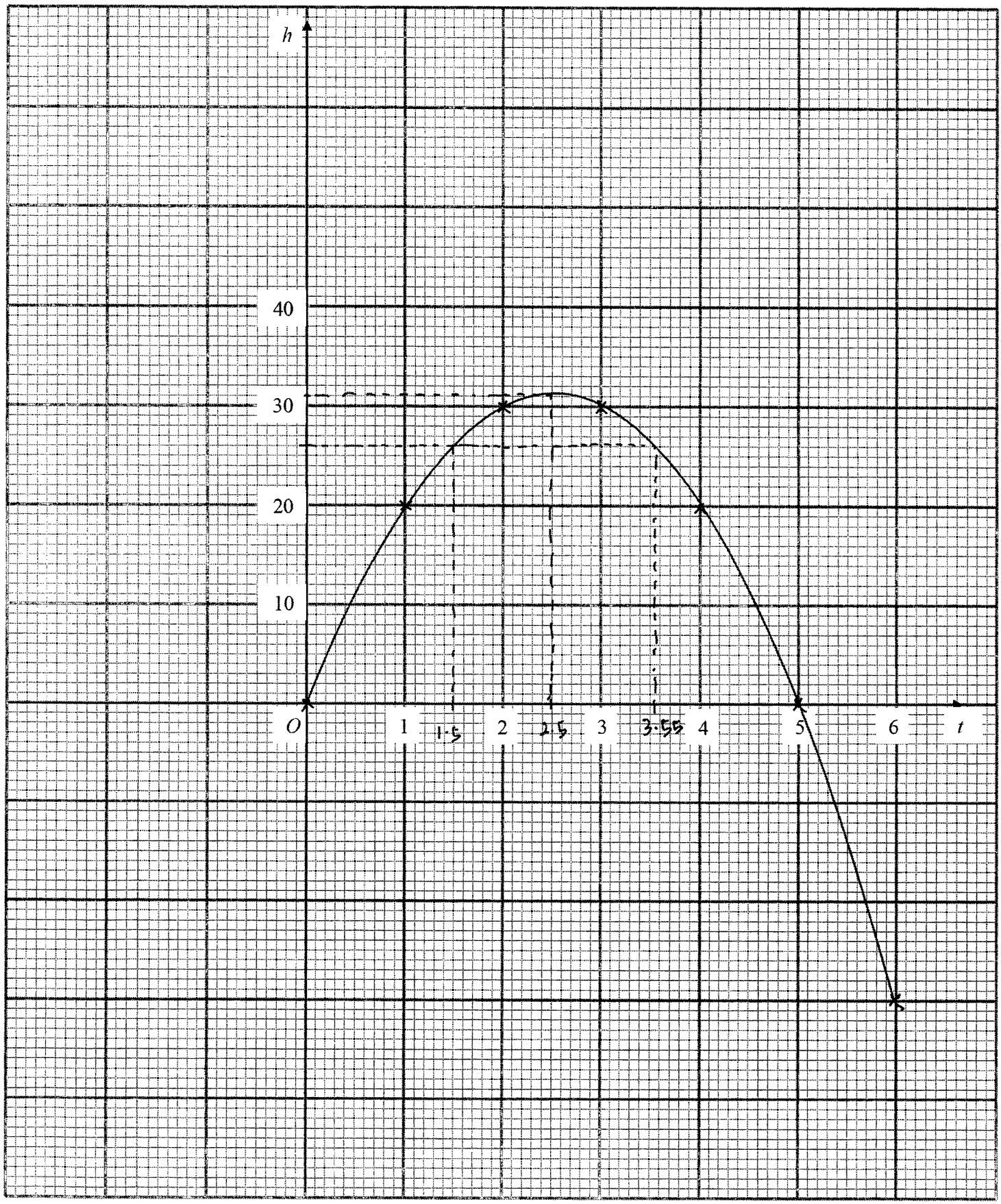
Answer $t =$ 2.05 s [2]

(d) Find the time when the object will reach the greatest height.

Answer $t =$ 2.5 s [1]

(e) Given that the ball hits the ground 6 seconds after it was thrown, state the height of the building from the graph.

Answer 30 m [1]


h
40
30
20
10
O
1
1·5
2
2·5
3
3·55
4
5
6
t

20 Amy is starting a small business importing and selling vertical pot towers. She has identified a supplier in Malaysia and plans to sell through an e-commerce platform in Singapore.

Amy imported 1000 vertical pot towers from Malaysia at RM 3.99 per tower. She engaged Swift Delivery Logistic (SDL) to transport the towers to Singapore at a cost of RM 540. The exchange rate at the time of purchase was S$1 = RM 3.29.

(a) Calculate the total cost (in Singapore dollars) that Amy paid for purchasing and delivering the1000 vertical pot towers. Round your answer to the nearest cent.

total cost in RM = $1000 \times 3.99 + 540$

$= 4530$

cost in SGD $= \frac{4530}{3.29}$

$= 1376.\overline{6996}$

$= 1376.90$ (nearest cent)

Answer S$ 1376.90 [3]

Amy plans to sell each tower at S$3.75 through Ezyshop, an e-commerce platform that charges various fees as shown in the table below.

Fee Type	Rate
Platform Fees	4% per transacted amount
Logistic Delivery Fees	5% per transaction below $10; 2.5% per transaction above $10
Credit Card Charge	0.5% of the transacted amount
Promotional Fees	6.5% of transacted amount
Tracking Fees	1.5% of transacted amount

The above miscellaneous fees as well as every transacted amount are all subjected to a 9% Goods and Services Tax (GST).

(b) Determine Amy's net profit if she successfully sells all 1000 towers through Ezyshop at the planned selling price. Show all calculations clearly.

platform fees
$= \frac{4}{100} \times \$3750$
$= \$150$

logistic delivery
$= \frac{2.5}{100} \times \$3750$
$= \$93.75$

credit card charge
$= \frac{0.5}{100} \times \$3750$
$= \$18.75$

promotional fees
$= \frac{6.5}{100} \times \$3750$
$= \$243.75$

tracking fees
$= \frac{1.5}{100} \times \$3750$
$= \$56.25$

total fees
$= \$562.50$

GST $= \frac{9}{100} \times \$(562.50 + 3750)$
$= \$385.125$

total cost price
$= \$2327.5246$

net profit
$= \$(3750 - 2327.5246)$
$= \$1422.4754$
$= \$1422.48$

Answer S$ 1422.48 [5]

(c) Amy has decided she will only continue this business if her profit margin is at least 150%. Based on your calculations, should she continue? Justify your answer.

% profit $= \frac{1422.4754}{2327.5246} \times 100$

$= 61.1153 < 150$

Answer She should not continue because her profit margin is only 61.1153% which is less than 150%. [2]

OR

b) platform fees

$= \frac{4}{100} \times \$3750$

$= \$150$

logistic delivery

$= \frac{5}{100} \times \$3750$

$= \$187.50$

credit card charge

$= \frac{0.5}{100} \times \$3750$

$= \$18.75$

promotional fees

$= \frac{6.5}{100} \times \$3750$

$= \$243.75$

tracking fees

$= \frac{1.5}{100} \times \$3750$

total fees

$= \$656.25$

$GST = \frac{9}{100} \times \$(656.25 + 3750)$

$= \$396.5625$

total cost

$= \$2429.7121$

net profit $= \$1320.29$

c) % profit

$= \frac{1320.2879}{2429.7121} \times 100$

$= 54.339 < 150$