

Mathematics 9

Final Examination

2025/2026

Name: _____

Section: _____

Date: _____

Time Allowed: 90 minutes

Candidate Instructions

- Do not open this examination paper until instructed to do so.
 - The formula sheet is provided.
 - Scrap paper is provided, but all final work must be shown in the examination booklet.
 - Answer **all** questions.
 - Show all steps of your working — partial credit may be awarded.
 - Correct solutions with no work shown may earn at most half marks.
 - Use correct mathematical notation and units where appropriate.
 - Diagrams are not necessarily drawn to scale.
 - **Calculators are permitted.**
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Total: 85 Marks

INTEGRITY STATEMENT

I, _____, affirm that I will not give or receive any unauthorized help on this examination, and that all work submitted will be entirely my own. Furthermore, I will complete this assessment in a fair, honest, and trustworthy manner, following the teacher's instructions and acting in accordance with PASB's core values.

Student Signature: _____

1. Complete the following table by placing ticks ($\checkmark$) to show which of the number sets $\mathbb{N}$, $\mathbb{Z}$, $\mathbb{Q}$, and $\mathbb{R}$ these numbers belong to. The first row has been completed as an example.

[3 marks]

- $\mathbb{N}$ = natural numbers
- $\mathbb{Z}$ = integers
- $\mathbb{Q}$ = rational numbers
- $\mathbb{R}$ = real numbers

	$\mathbb{N}$	$\mathbb{Z}$	$\mathbb{Q}$	$\mathbb{R}$
$-\frac{3}{11}$			$\checkmark$	$\checkmark$
42				
3.14				
$\sqrt{23}$				
-113				
$\frac{24}{6}$				
$-5\frac{1}{5}$				

2. Simplify the following radical expressions.

(a) $5\sqrt{12} - 2\sqrt{27} + 3\sqrt{75}$

[1 marks]

(b) Rationalize and simplify: $\frac{6}{\sqrt{5} - 2}$

[2 marks]

3. Let $x = 1352.406$ and $y = 0.0001352406$.

(a) State the value of x correct [2 marks]

(i) to 2 decimal places.

(ii) to 3 significant figures.

(b) State the value of y correct [2 marks]

(i) to 5 decimal places.

(ii) to 2 significant figures.

(c) State the value of x in the form $a \times 10^k$ where $1 \leq a < 10$ and $k \in \mathbb{Z}$. [1 marks]

(d) State the value of y in the form $a \times 10^k$ where $1 \leq a < 10$ and $k \in \mathbb{Z}$. [1 marks]

4. Simplify. Write your final answer with positive exponents only.

(a) $\frac{(4x^{-2}y^3)^2(3x^5y^{-1})}{6x^{-3}y^4}$ [3 marks]

(b) $\frac{12a^{-3}b^2}{4a^{-5}b^{-1}}$ [1 marks]

5. Solve the following equations.

(a) Solve $\sqrt{x+9} = x-3$. [2 marks]

(b) Solve $\frac{2}{x-1} = 5$. [2 marks]

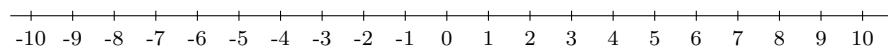
6. Solve the following.

(a) Solve $\frac{3}{4}(2x-5) = \frac{1}{2}(x+7)$. [2 marks]

(b) Solve and represent the solution on the number line:

$$-3(2x-1) \leq 4x+13$$

[1 marks]



(c) Solve $3|2y-5|-4=17$. [1 marks]

7. A gym charges a registration fee of \$35 and then \$18 per month. A student has at most \$200 to spend. Write and solve an inequality to find the maximum number of full months the student can afford. [2 marks]

8. A linear relationship is shown in the table.

x	-4	-1	2	5
y	9	3	-3	-9

(a) Write the equation of the line in slope-intercept form.

[2 marks]

(b) Write the equation of the line in standard form.

[1 marks]

9. Zoe's weight is 62 kg, correct to the nearest kilogram.

Anu's weight is 85 kg, correct to the nearest kilogram.

(a) Write down the upper bound for the weight of Zoe.

[1 marks]

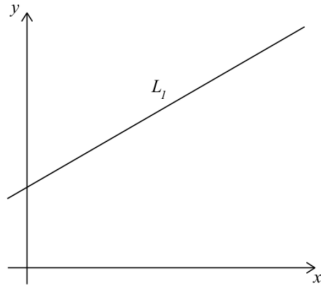
(b) Write down the lower bound for the weight of Anu.

[1 marks]

(c) Work out the upper bound for the difference between Zoe's weight and Anu's weight.

[2 marks]

10. The line L_1 has equation $2y - x - 7 = 0$ and is shown on the diagram.



The point A has coordinates $(1, 4)$.

(a) Show that A lies on L_1 . [2 marks]

The point C has coordinates $(5, 12)$. M is the midpoint of AC .

(b) Find the coordinates of M . [2 marks]

(c) Find the length of AC . [2 marks]

The straight line, L_2 , is perpendicular to AC and passes through M .

(d) Find the gradient of AC . [1 marks]

(e) Find the gradient of L_2 . [1 marks]

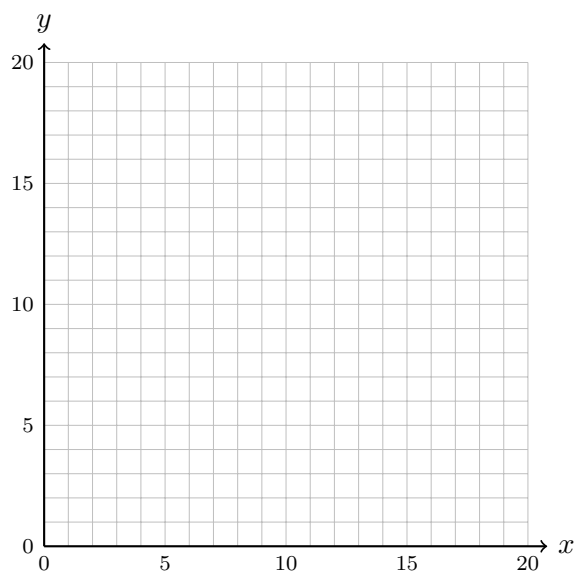
(f) Using the point M , find the equation of L_2 in the form $y = mx + b$. [2 marks]

11. A school fundraiser sells notebooks and water bottles. Let x be the number of notebooks and y be the number of water bottles. The constraints are

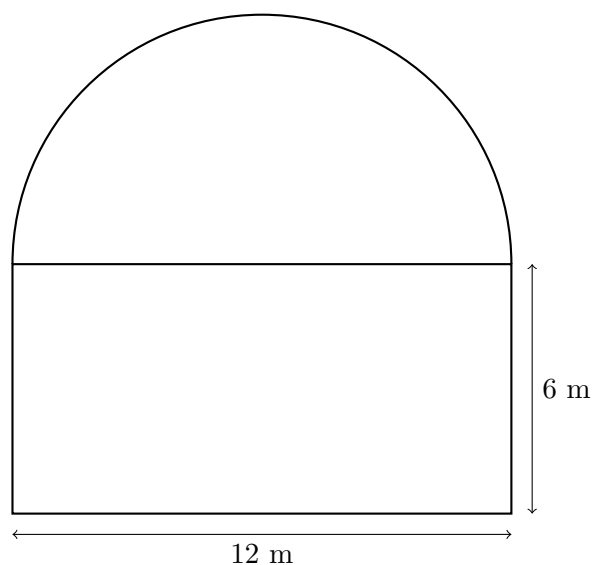
$$\begin{cases} x + y \leq 18 \\ 2x + 5y \leq 60 \\ x \geq 0, \quad y \geq 0 \end{cases}$$

(a) Graph the feasible region on the grid.

[2 marks]



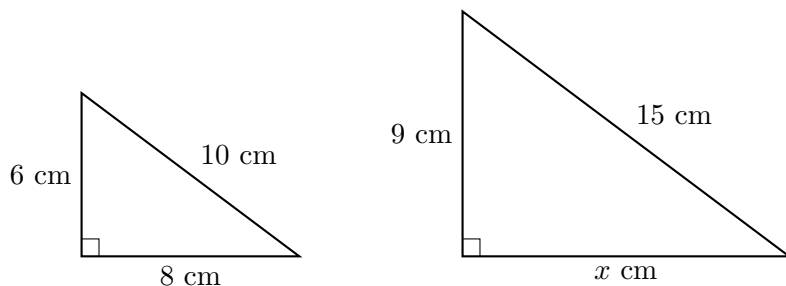
- 12.** The diagram shows a composite garden made from a rectangle and a semicircle. The semicircle has diameter 12 m.



- (a) Find the total area of the garden. Give your answer to 1 decimal place. [2 marks]

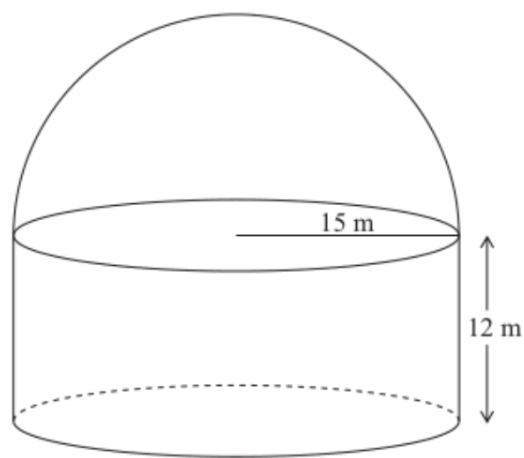
- (b) Find the perimeter of the outside boundary. Give your answer to 1 decimal place. [2 marks]

- 13.** The two triangles shown below are similar. Find the value of x .



[2 marks]

14. An observatory is built in the shape of a cylinder with a hemispherical roof on the top as shown in the diagram. The height of the cylinder is 12 m and its radius is 15 m.



(a) Calculate the volume of the observatory. [3 marks]

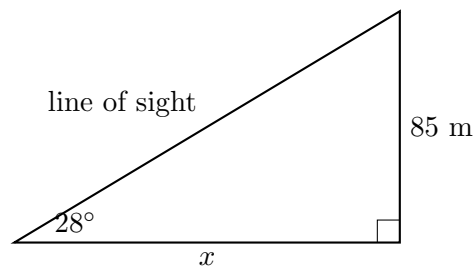
(b) The hemispherical roof is to be painted. Calculate the area that is to be painted. [2 marks]

15. For each statement, justify your answer.

(a) Determine whether side lengths 7 cm, 10 cm, and 18 cm can form a triangle. [1 marks]

(b) Determine whether a triangle with side lengths 10 cm, 24 cm, and 26 cm is right-angled. [1 marks]

16. A drone is flying above level ground. The diagram shows the situation.



- (a) Find the horizontal distance x from the point directly below the drone to the landing pad. Give your answer to 1 decimal place. [2 marks]

- (b) In a 30° – 60° – 90° triangle, the short leg is 7 cm. Find the exact length of the long leg. [1 marks]

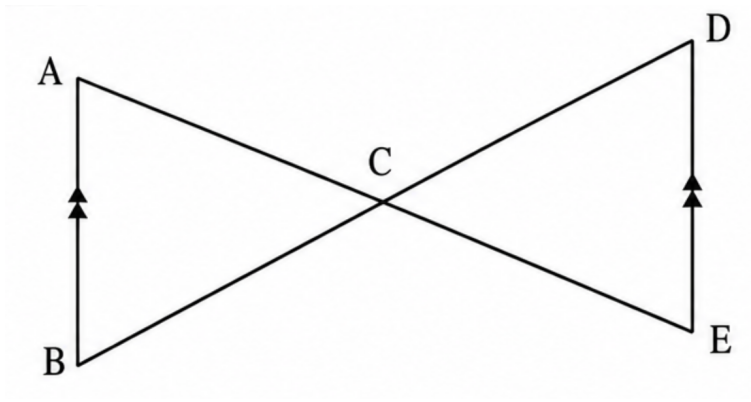
17. Solve the following algebraic expressions and equations.

- (a) Expand and simplify: $(2x - 3)(x + 5) - 4(x - 1)$. [2 marks]

- (b) Solve by factoring: $x^2 - 5x - 14 = 0$. [2 marks]

- (c) Solve using the quadratic formula: $2x^2 + 3x - 4 = 0$. Give exact answers in simplest radical form. [2 marks]

18. Given $\overline{AB} \parallel \overline{DE}$, $\overline{AB} \cong \overline{DE}$, and C is the midpoint of $\overline{AE}$. Prove that $\triangle ABC \cong \triangle DEC$.



[4 marks]

Statements	Reasons

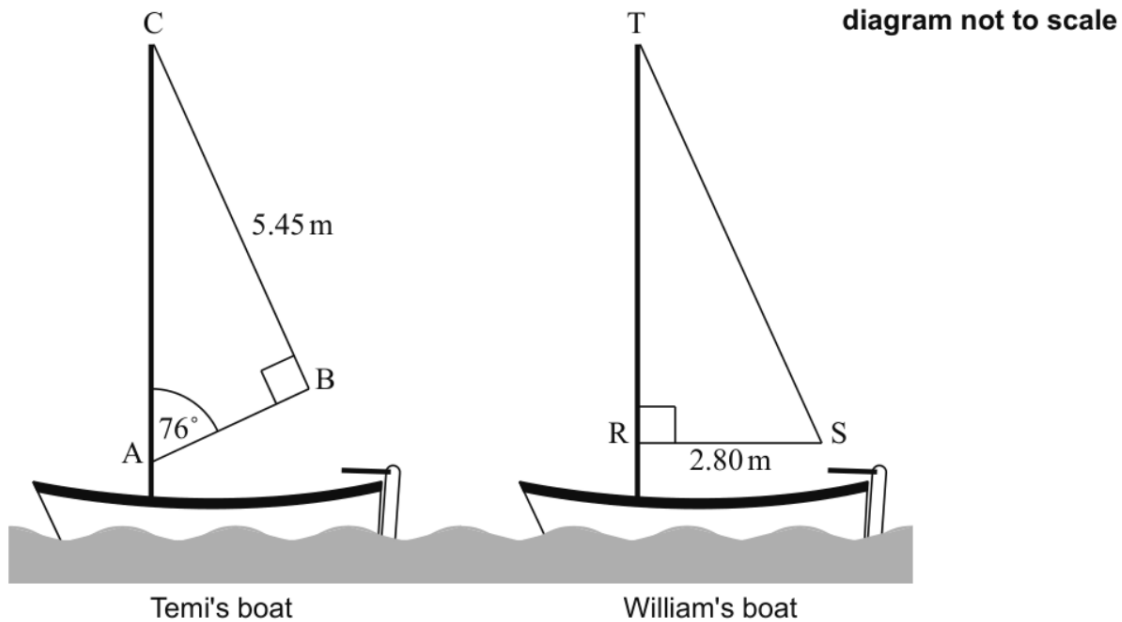
19. Solve the system of equations.

$$\begin{cases} x + y = 11 \\ 2x - y = 4 \end{cases}$$

(a) Find the value of x . [1 marks]

(b) Find the value of y . [1 marks]

20. Temi's sailing boat has a sail in the shape of a right-angled triangle, ABC . $BC = 5.45$ m, $\angle CAB = 76^\circ$ and $\angle ABC = 90^\circ$.



William also has a sailing boat with a sail in the shape of a right-angled triangle, TRS . $RS = 2.80$ m. The area of William's sail is 10.7 m^2 .

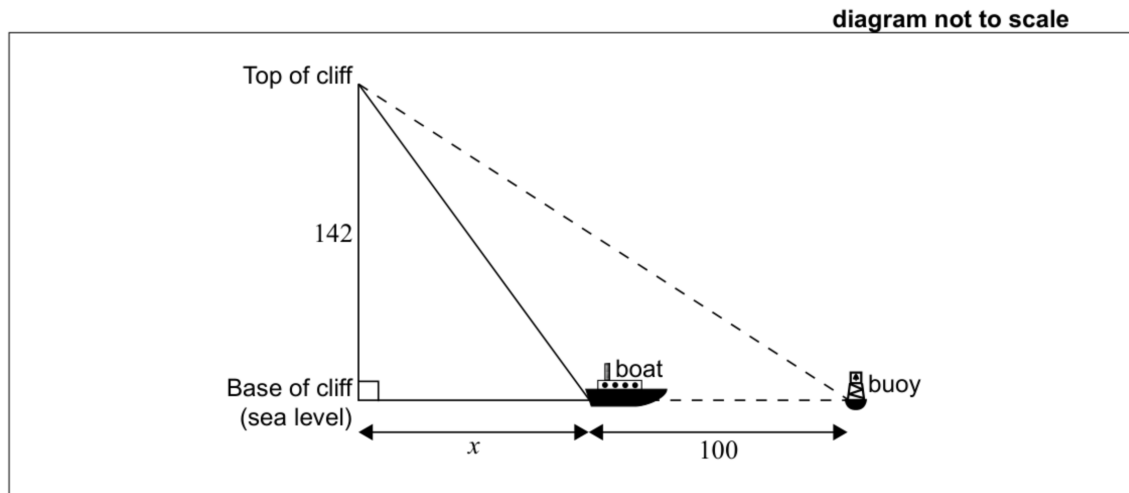
(a) Calculate AC , the height of Temi's sail. [2 marks]

(b) Calculate RT , the height of William's sail. [2 marks]

(c) Calculate the size of angle RST . [2 marks]

21. A buoy is floating in the sea and can be seen from the top of a vertical cliff. A boat is travelling from the base of the cliff directly towards the buoy.

The top of the cliff is 142 m above sea level. Currently the boat is 100 metres from the buoy and the angle of depression from the top of the cliff to the boat is 64° .



(a) Draw and label the angle of depression on the diagram. [1 marks]

(b) Find x , the horizontal distance currently between the base of the cliff and the boat. [2 marks]

(c) Hence find the horizontal distance between the base of the cliff and the buoy. [1 marks]

(d) Find the distance from the **top of the cliff** to the buoy. [2 marks]