

91947



Draw a cross through the box (☒)
 if you have NOT written in this booklet

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Mana Tohu Mātauranga o Aotearoa
 New Zealand Qualifications Authority

Level 1 Mathematics and Statistics 2024

91947 Demonstrate mathematical reasoning

Credits: Five

Achievement	Achievement with Merit	Achievement with Excellence
Demonstrate mathematical reasoning.	Demonstrate mathematical reasoning with relational thinking.	Demonstrate mathematical reasoning with extended abstract thinking.

Check that the National Student Number (NSN) on your admission slip is the same as the number at the top of this page.

You should attempt ALL the questions in this booklet.

Pull out Resource Booklet 91947R from the centre of this booklet.

Show ALL working.

If you need more room for any answer, use the extra space provided at the back of this booklet.

Check that this booklet has pages 2–16 in the correct order and that none of these pages is blank.

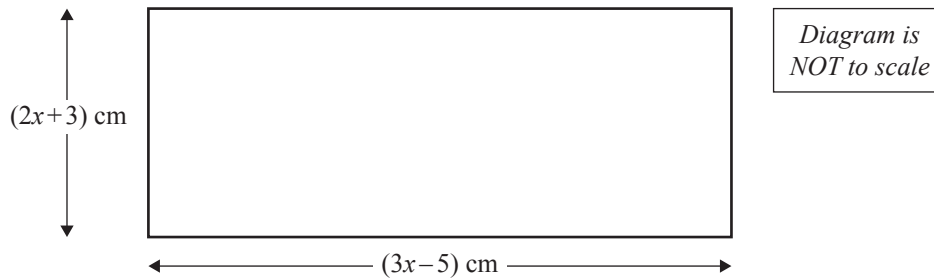
Do not write in any cross-hatched area (▨). This area may be cut off when the booklet is marked.

YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION.

QUESTION ONE

The perimeter of a shape is the distance around the outside of the shape.

- (a) The perimeter of the rectangle shown below is 56 cm.



Form an equation and solve it to find the value of x .

- (b) In a triangle ABC, the length of the side $AB = y$ cm.

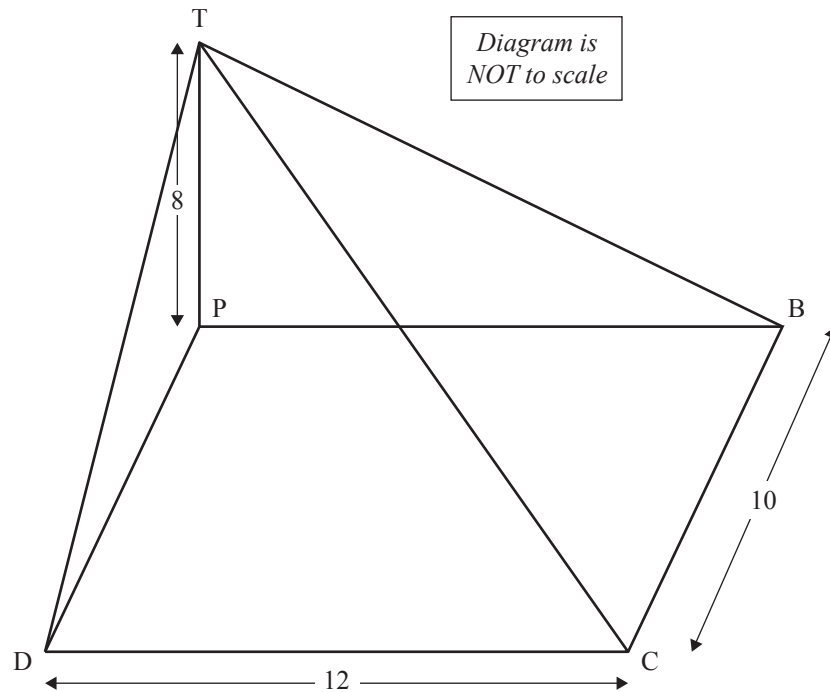
The side AC is k cm longer than the side AB, where k is bigger than 2.

The side BC is 4 cm shorter than the side AC.

The perimeter of the triangle is **five times** the length of AB.

Find the **perimeter** of the triangle ABC, giving your answer in terms of k .

- The points B, C, D are all joined to T.
The points P, B, C, D form a rectangle.
The lines PB and PD are both perpendicular to PT.
 $PT = 8$, $DC = 12$, $BC = 10$
All lengths are in metres.



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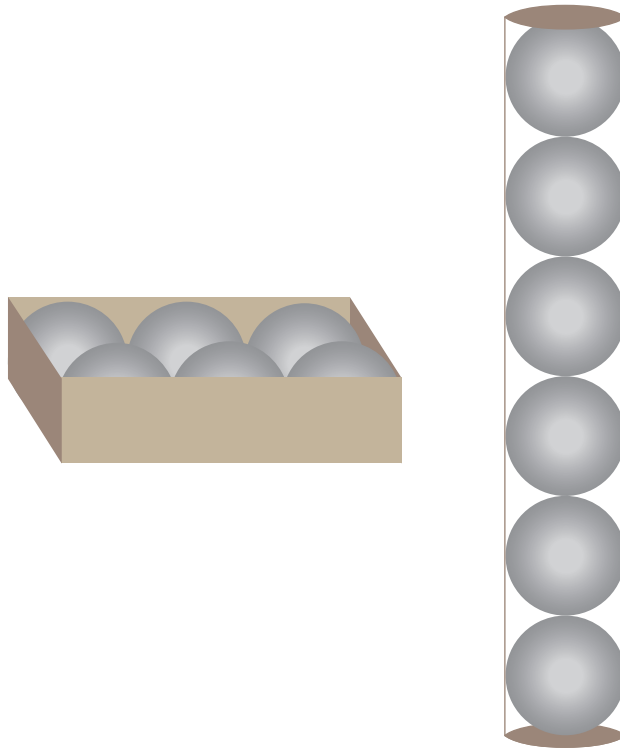
$$PT = 8, DC = 12, BC = 10$$

All lengths are in metres.

Calculate the length of the line joining C to T, showing your working.

- (d) A sphere is a three-dimensional object shaped like a ball.

The diagram shows a rectangular box containing six spheres.



The diagram also shows how the same six spheres could be packaged into a cylindrical tube.

The spheres fit tightly into the box and tube, as shown.

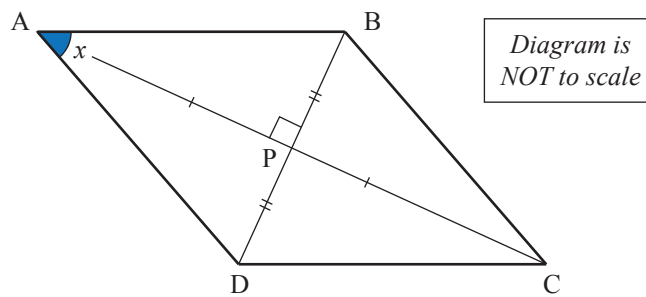
All spheres in both the box and the tube are exactly the same size.

The volume of each sphere is 150 cm^3 .

Show clear working to decide which container, rectangular or cylindrical, has the greater empty space by calculating the **percentage** of empty space inside each container.

QUESTION TWO

- (a) The diagram shows a rhombus. A rhombus is a shape with four equal-length sides. The length of the diagonal BD is 10 cm, and the length of the perimeter is 60 cm.



Find the size, x , of angle BAD.

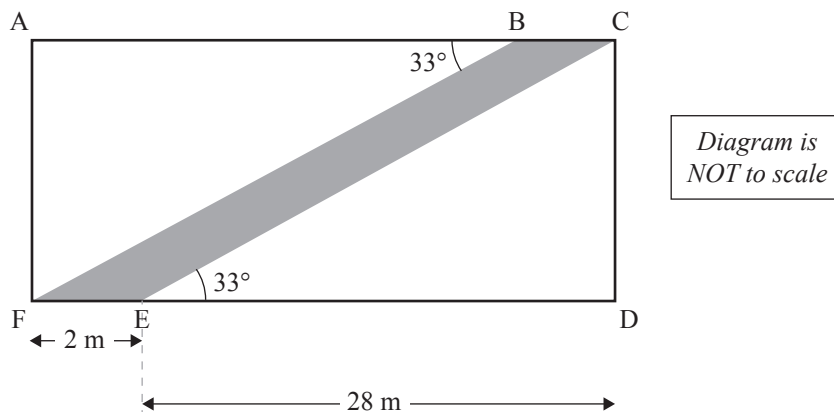
Show your working clearly.

- (b) The diagram below shows a rectangle with a grey stripe through it.

Lines FB and EC are parallel to each other.

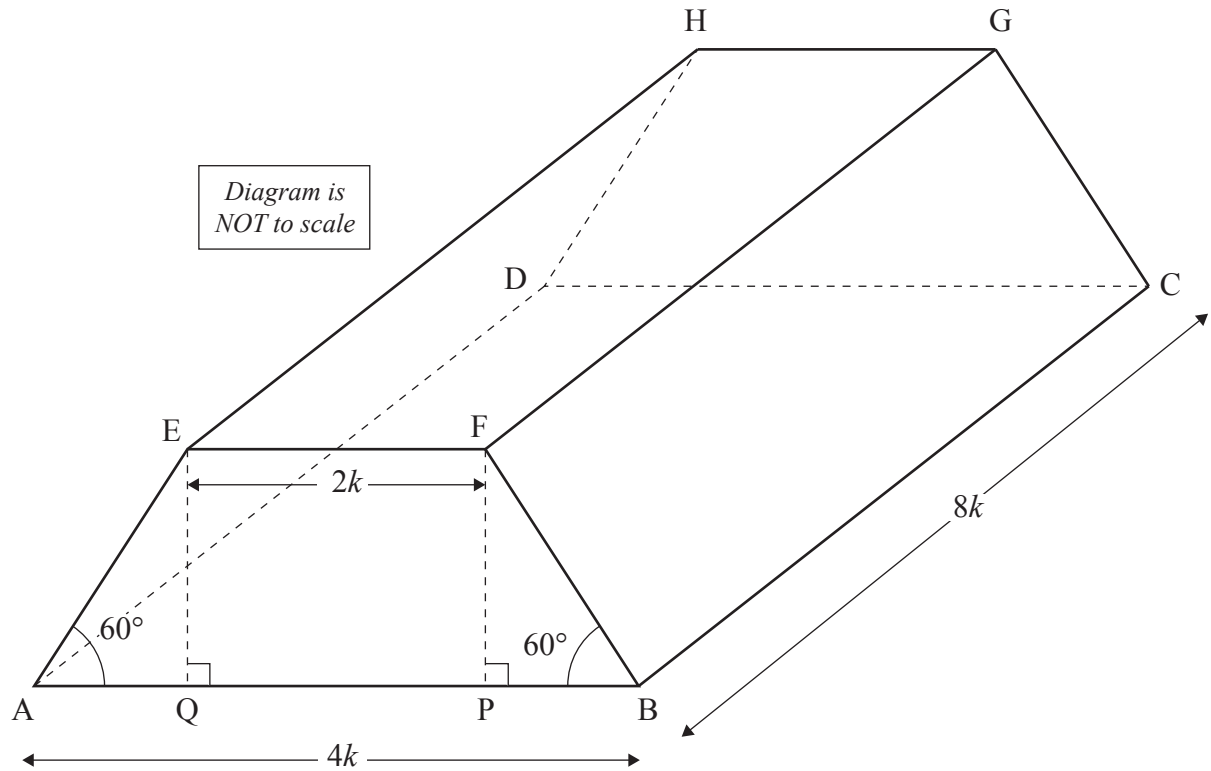
Angle CED = angle ABF = 33° .

FE = 2 metres, ED = 28 metres.



Find the area of the stripe BCEF.

- (c) The diagram below shows a prism with rectangular base, ABCD. The cross-section, ABFE, is a symmetrical trapezium, with $AE = BF$. $AB = 4k$, $EF = 2k$, $BC = 8k$, angle $ABF = 60^\circ$. All lengths are in metres.



- (i) Show that the length $PF = 1.7321k$ metres.
Show your working clearly.

(a) Find the co-ordinates of the y-axis intercept for the exponential graph $y = 5^{3x+2} + 4$.

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(b) A sequence is shown in the table below:

x	y
1	24
2	35
3	48
4	63
5	80

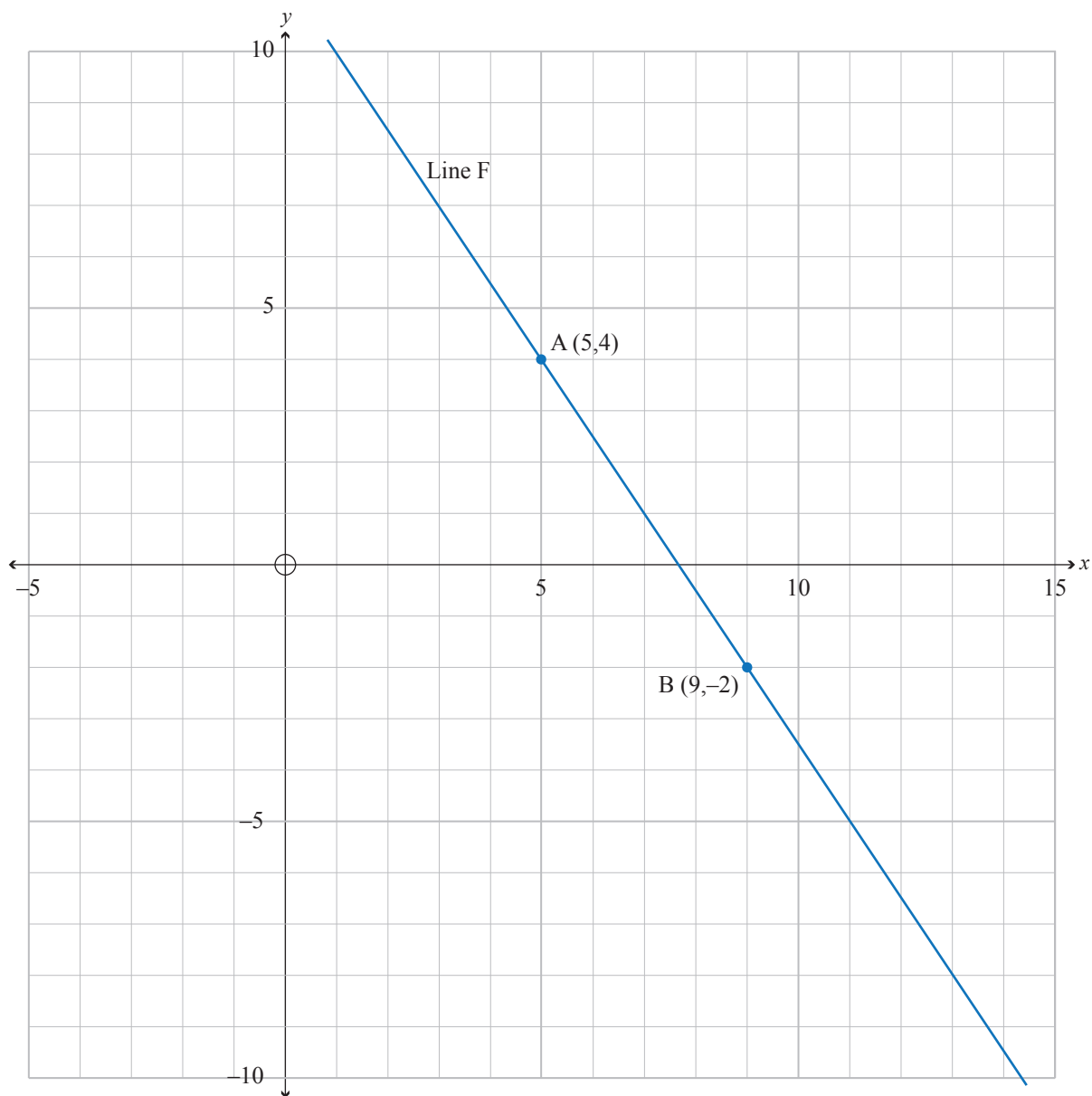
(i) Find an equation that represents y , for any given x -value.

Justify your answer by showing appropriate mathematical working.

- In your answer, describe at least THREE different features.

Question Three continues
on the following page.

- (c) Use the diagram below to help you.



- (i) The points A (5,4) and B (9,-2) lie on the blue line, labelled F, shown in the diagram above.

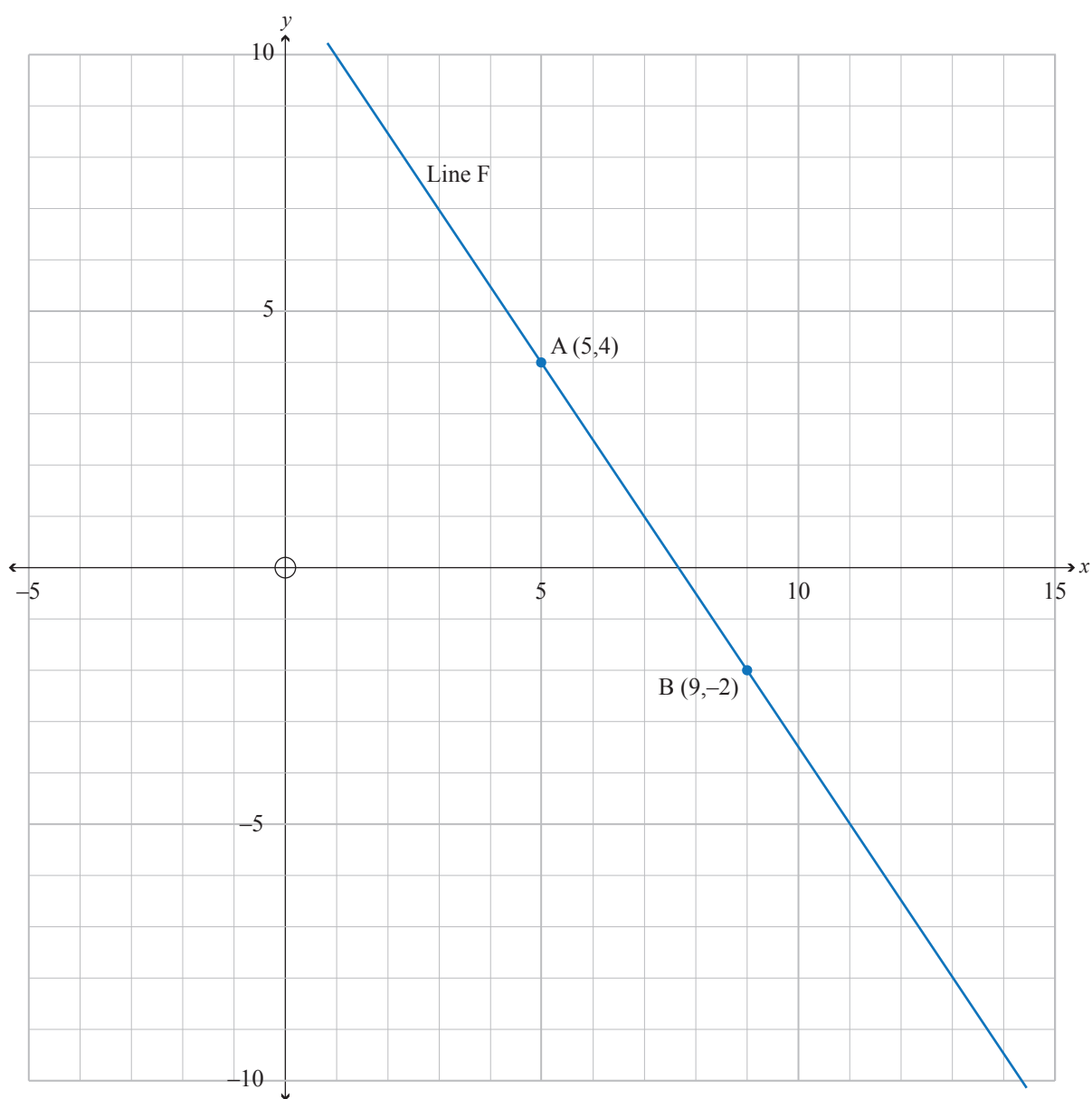
Find an equation of the line F.

If you need to redraw your response to part (ii), use the diagram on page 14.

- Find the co-ordinates of the point where the lines F and G intersect each other.
Use either an algebraic method OR a graphical method (using the diagram opposite).

SPARE DIAGRAMS

If you need to redraw your response to Question Three (c), use the diagram below. Make sure it is clear which answer you want marked.



Extra space if required.
Write the question number(s) if applicable.

QUESTION
NUMBER

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Write the question number(s) if applicable.

QUESTION
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