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MATHEMATICS

0580/33

Paper 3 (Core)

October/November 2020

2 hours

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You should use a calculator where appropriate.
- You may use tracing paper.
- You must show all necessary working clearly.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.
- For π , use either your calculator value or 3.142.

INFORMATION

- The total mark for this paper is 104.
- The number of marks for each question or part question is shown in brackets [].

This document has **16** pages. Blank pages are indicated.

- 1 (a) A cruise ship travels 2067 km.

(i) Write 2067 in words.

..... [1]

(ii) Write 2067 correct to the nearest hundred.

..... [1]

- (b) When full, the cruise ship carries 880 guests and 360 crew.

Write the ratio guests : crew in its simplest form.

..... : [1]

- (c) There are 480 cabins on the ship.
On one cruise, 456 of these cabins were used.

Find the percentage of cabins that were used.

..... % [1]

- (d) Last year the cost of a cruise was \$4600.
This year the cost of the same cruise is \$4784.

Work out the percentage increase in the cost.

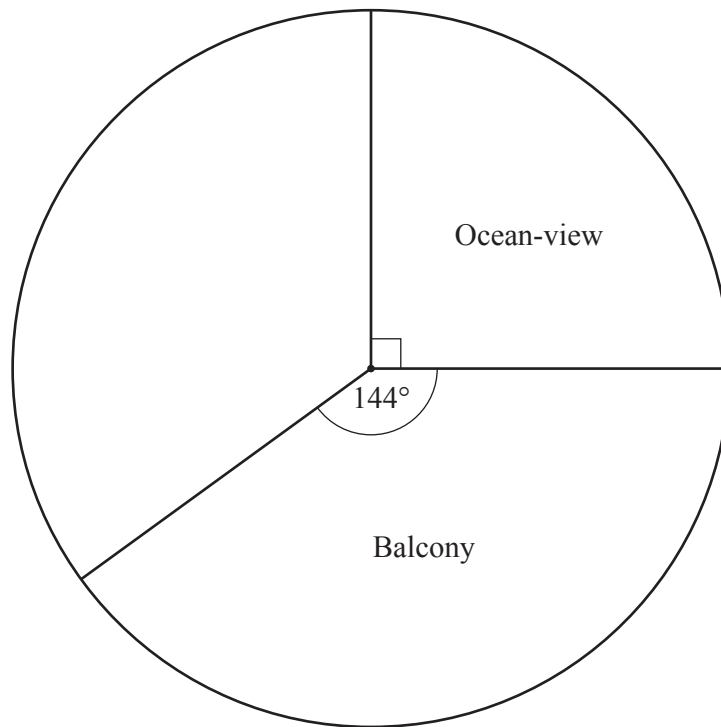
..... % [2]

- (e) The cost of building the ship was \$153 000 000.

Write 153 000 000 in standard form.

..... [1]

- (f) There are 480 cabins on the ship.
There are four types of cabin: Ocean-view, Balcony, Interior and Suite.
Hannah starts to draw a pie chart to show the numbers of each type of cabin.



- (i) Show that there are 120 Ocean-view cabins on the ship.

[1]

- (ii) The table shows information about each type of cabin.

Type of cabin	Number of cabins	Sector angle in a pie chart
Ocean-view	120	90°
Balcony	192	144°
Interior	68	
Suite	100	

- (a) Complete the table.

[2]

- (b) Complete the pie chart.

[1]

2 (a) Using numbers from 55 to 85, write down

(i) a multiple of 23,

..... [1]

(ii) a factor of 120,

..... [1]

(iii) a common multiple of 8 and 12,

..... [1]

(iv) a number that is **both** square **and** odd,

..... [1]

(v) a number that has exactly 2 factors.

..... [1]

(b) Write 220 as the product of its prime factors.

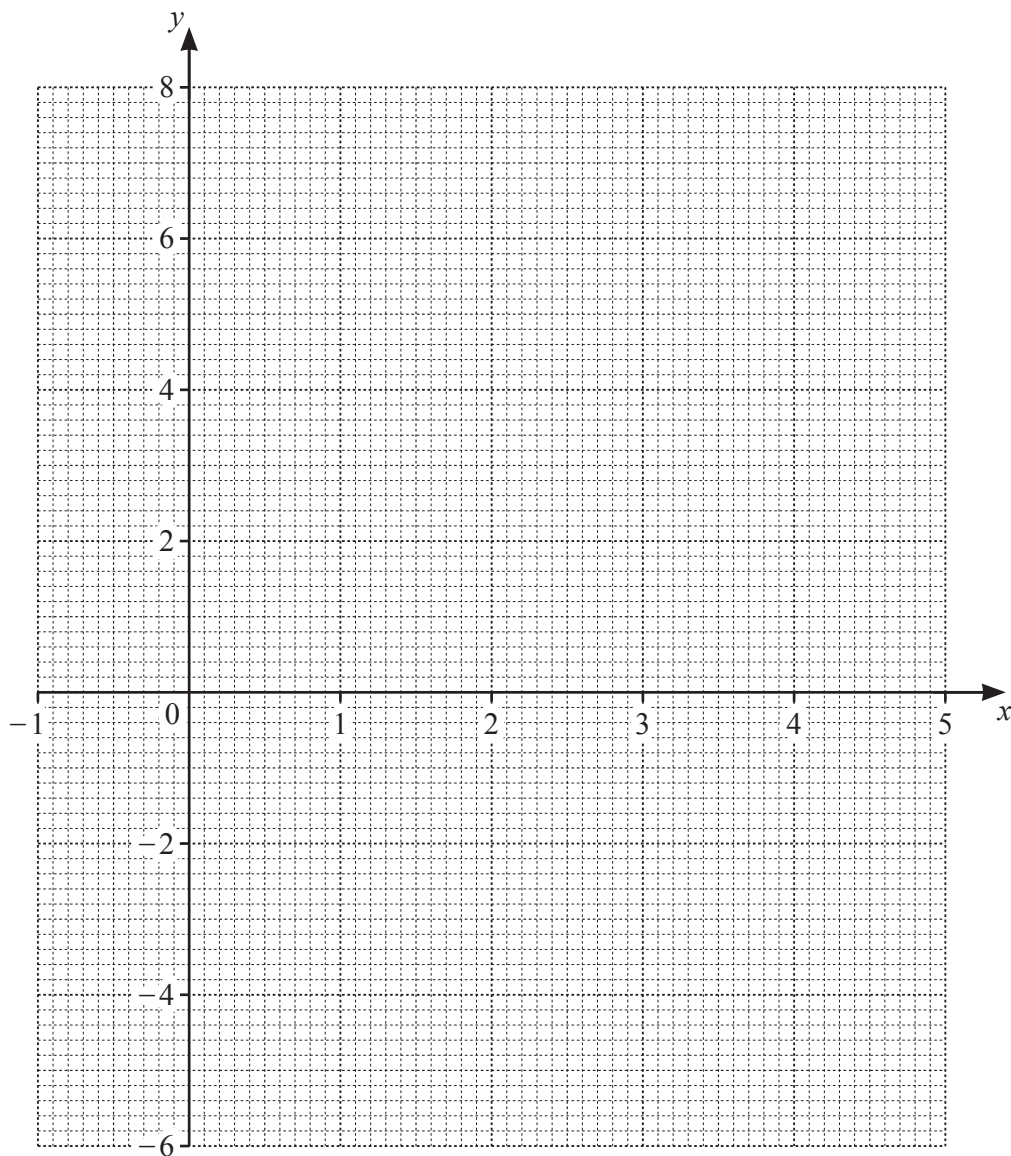
..... [2]

- 3 (a) Complete the table of values for $y = 1 + 5x - x^2$.

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

[2]

- (b) On the grid, draw the graph of $y = 1 + 5x - x^2$ for $-1 \leq x \leq 5$.



[4]

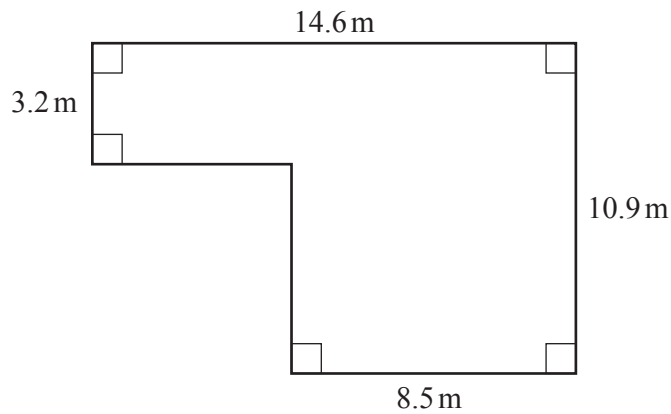
- (c) (i) On the grid, draw the line $y = 3$.

[1]

- (ii) Use your line to solve the equation $1 + 5x - x^2 = 3$.

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

- 4 (a) The diagram shows the plan of part of Rachel's garden.



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Calculate the area.

..... m^2 [3]

- (b) Rachel has a pond in her garden in the shape of a circle.
The circumference of the pond is 4.25 m.

Calculate the diameter of the pond.
Give your answer in centimetres.

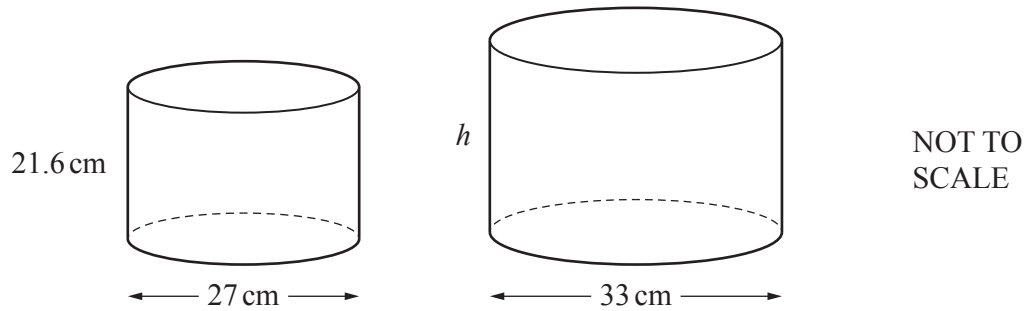
..... cm [3]

- (c) A plant pot is a cylinder with radius 15 cm and height 24 cm.

Calculate the volume of the pot.

..... cm^3 [2]

- (d) The diagram shows two mathematically similar plant pots.



The smaller pot has height 21.6 cm and diameter 27 cm.
The larger pot has diameter 33 cm.

Find the height, h , of the larger pot.

$h = \dots\dots\dots$ cm [2]

- (e) A shop sells bags of compost in three different sizes.

Small
30 litres
\$5.82

Medium
50 litres
\$9.45

Large
75 litres
\$14.50

Work out which size of bag gives the best value.
Show how you decide.

$\dots\dots\dots$ [3]

- 5 The table shows the maximum power, kW, and the time taken, in seconds, to accelerate from 0 to 100 km/h for each of 10 cars.

Maximum power (kW)	77	52	103	55	44	51	85	135	90	110
Time (seconds)	12.5	14.9	9.0	12.1	14.4	12.9	10.0	7.1	11.0	9.4

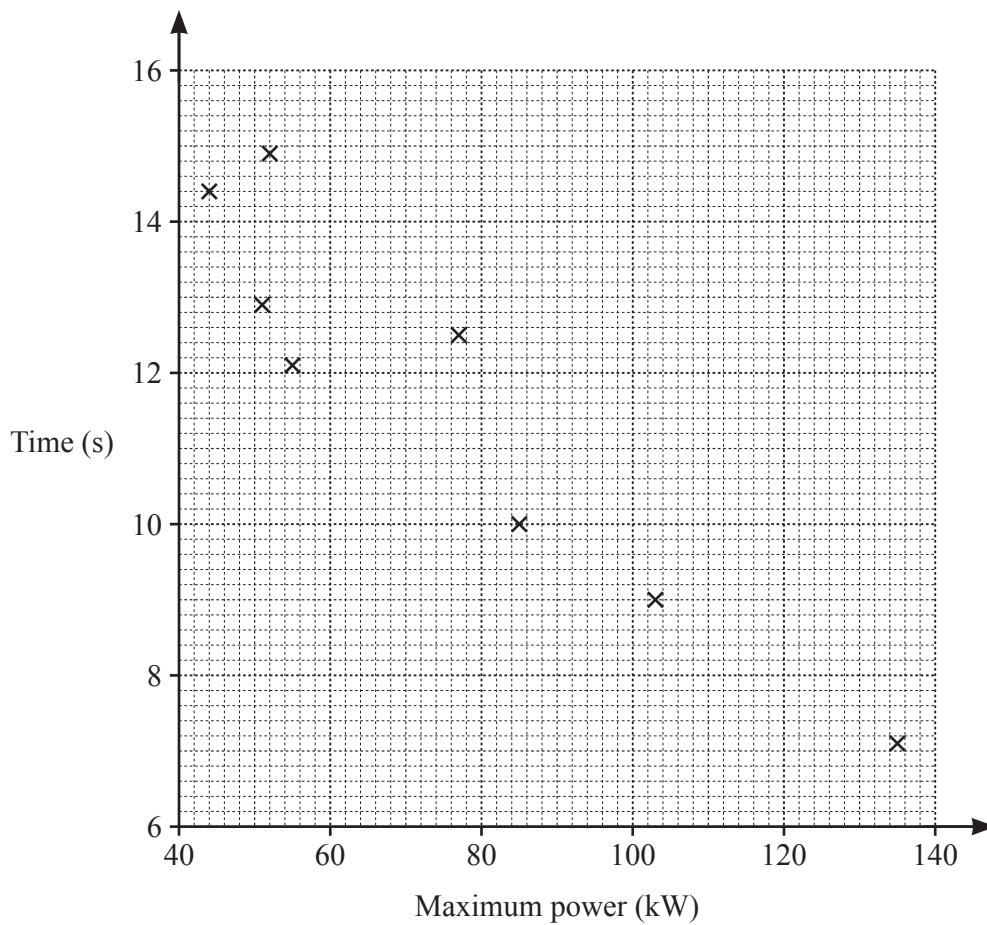
- (a) (i) Find the range of the times.

..... s [1]

- (ii) Find the median maximum power.

..... kW [2]

- (b) (i) Complete the scatter diagram.
The first eight points have been plotted for you.



[1]

- (ii) What type of correlation is shown on the scatter diagram?

..... [1]

- (iii) Describe the relationship between the maximum power of a car and the time taken to accelerate from 0 to 100 km/h.

.....

..... [1]

- (iv) Draw a line of best fit on the scatter diagram.

[1]

- (v) Another car has a maximum power of 63 kW.

Use your line of best fit to estimate the time taken for this car to accelerate from 0 to 100 km/h.

..... s [1]

- (c) Robert buys a car for \$18 160.

He pays a deposit of \$6460.

He pays the rest of the money in 24 equal monthly payments.

Work out the amount of each monthly payment.

\$ [3]

- (d) A fuel tank holds 52 litres when full.

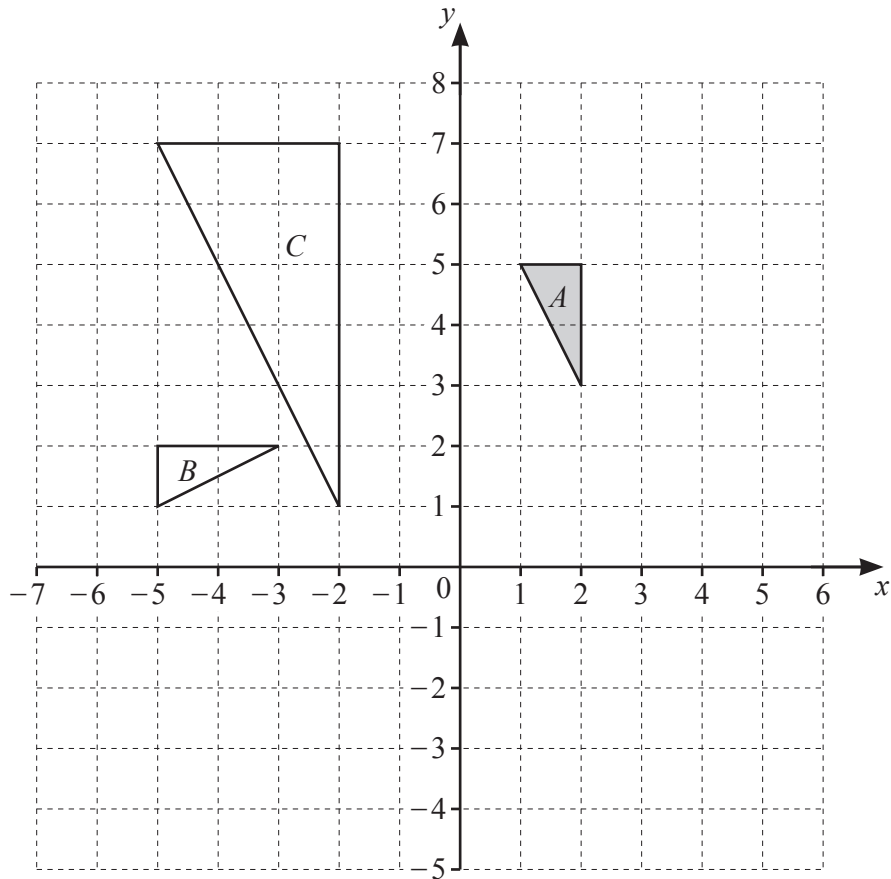
The tank is a quarter full.

Jim fills the tank with fuel that costs \$2.18 per litre.

Work out how much Jim pays.

\$ [3]

6 (a)



(i) On the grid, draw the image of

(a) triangle A after a translation by the vector $\begin{pmatrix} 3 \\ -7 \end{pmatrix}$, [2]

(b) triangle A after a reflection in the line $x = 3$. [2]

(ii) Describe fully the **single** transformation that maps triangle A onto triangle B .

..... [3]

(iii) Describe fully the **single** transformation that maps triangle A onto triangle C .

..... [3]

(b) $\mathbf{a} = \begin{pmatrix} 3 \\ -2 \end{pmatrix}$ $\mathbf{b} = \begin{pmatrix} 5 \\ 7 \end{pmatrix}$ $\mathbf{c} = \begin{pmatrix} -1 \\ 4 \end{pmatrix}$

Work out.

(i) $\mathbf{a} + \mathbf{b}$

$$\begin{pmatrix} \\ \end{pmatrix} \quad [1]$$

(ii) $\mathbf{b} - 2\mathbf{c}$

$$\begin{pmatrix} \\ \end{pmatrix} \quad [2]$$

(c) Point P has coordinates $(6, -2)$ and $\overrightarrow{PQ} = \begin{pmatrix} -4 \\ 5 \end{pmatrix}$.

Find the coordinates of point Q .

$$(\text{.....}, \text{.....}) \quad [1]$$

7 (a) $W = 3a + 5c$

Find the value of W when $a = 6$ and $c = 2$.

$W = \dots\dots\dots$ [2]

(b) Factorise completely.

$12b + 8b^2$

$\dots\dots\dots$ [2]

(c) Make m the subject of the formula $y = 4m - p$.

$m = \dots\dots\dots$ [2]

(d) Find the value of x when $5^x \times 5^3 = 5^{12}$.

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

(e) Find the value of

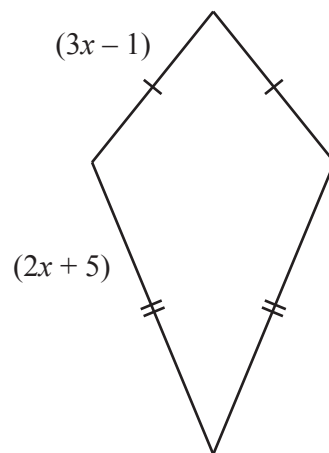
(i) 3^0 ,

..... [1]

(ii) 5^{-2} .

..... [1]

(f) In this part, all measurements are in centimetres.



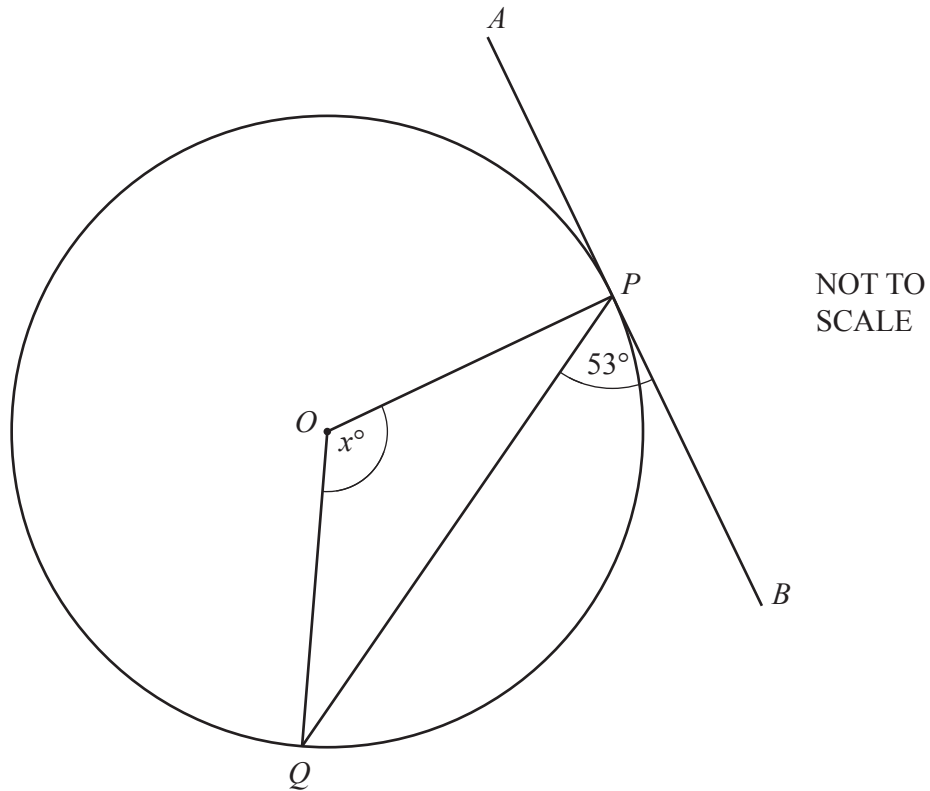
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The diagram shows a kite with sides $(2x + 5)$ and $(3x - 1)$.
The perimeter of the kite is 33 cm.

Work out the length of a shorter side.

..... cm [5]

8 (a)



P and Q are points on the circle, centre O .
 APB is a tangent to the circle at P .

- (i) Write down the mathematical name for the line PQ .

..... [1]

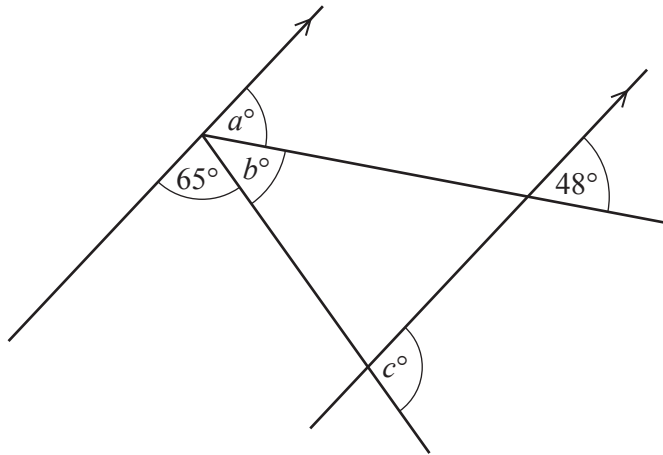
- (ii) Explain why angle OPB is 90° .

..... [1]

- (iii) Find the value of x .

$x =$ [3]

(b)

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The diagram shows two parallel lines and two straight lines.

- (i) Find the value of a .
Give a reason for your answer.

$a = \dots\dots\dots$ because $\dots\dots\dots$ [2]

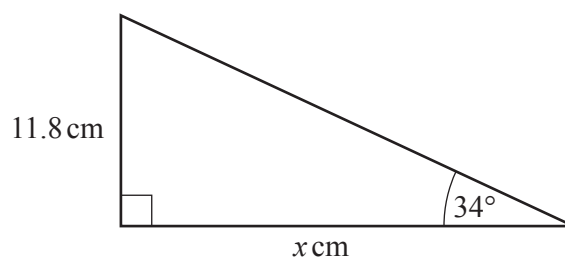
- (ii) Find the value of b .
Give a reason for your answer.

$b = \dots\dots\dots$ because $\dots\dots\dots$ [2]

- (iii) Find the value of c .

$c = \dots\dots\dots$ [2]

(c)

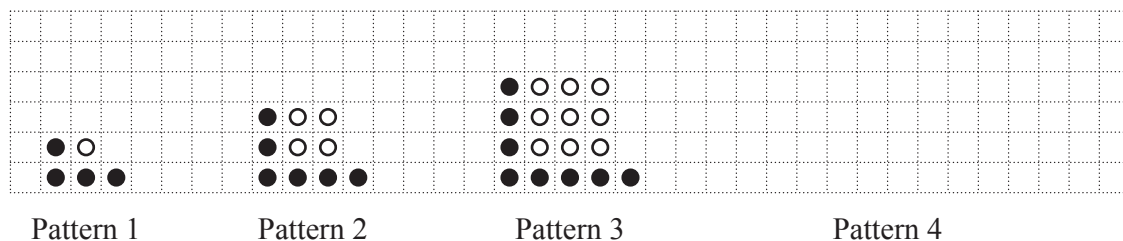
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Calculate the value of x .

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

Question 9 is printed on the next page.

- 9 A sequence of patterns is made using black counters and white counters.



- (a) Draw Pattern 4. [1]

- (b) Complete the table.

Pattern	1	2	3	4	5
Number of black counters	4	6	8		
Number of white counters	1	4	9		

[2]

- (c) Write an expression, in terms of n , for

- (i) the number of black counters in Pattern n ,

..... [2]

- (ii) the number of white counters in Pattern n .

..... [1]

- (d) Elena has 30 black counters and 140 white counters.

Can she make Pattern 12 using her counters?

Explain your answer.

..... because

..... [2]

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