Cambridge Assessment International Education

Cambridge O Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

4290320217

MATHEMATICS (SYLLABUS D) **4024/12**

Paper 1 Non-calculator **October/November 2025**

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.
- Calculators must **not** be used in this paper.
- You may use tracing paper.
- You must show all necessary working clearly.

INFORMATION

- The total mark for this paper is 100.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **20** pages.

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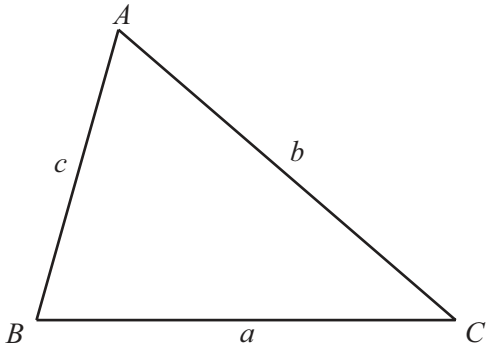
List of formulas

Area, A, of triangle, base b, height h.	$A = \frac{1}{2}bh$
Area, A, of circle of radius r.	$A = \pi r^2$
Circumference, C, of circle of radius r.	$C = 2\pi r$
Curved surface area, A, of cylinder of radius r, height h.	$A = 2\pi rh$
Curved surface area, A, of cone of radius r, sloping edge l.	$A = \pi rl$
Surface area, A, of sphere of radius r.	$A = 4\pi r^2$
Volume, V, of prism, cross-sectional area A, length l.	$V = Al$
Volume, V, of pyramid, base area A, height h.	$V = \frac{1}{3}Ah$
Volume, V, of cylinder of radius r, height h.	$V = \pi r^2 h$
Volume, V, of cone of radius r, height h.	$V = \frac{1}{3}\pi r^2 h$
Volume, V, of sphere of radius r.	$V = \frac{4}{3}\pi r^3$
For the equation $ax^2 + bx + c = 0$, where $a \neq 0$,	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

For the triangle shown,



$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc\cos A$$

$$\text{Area} = \frac{1}{2}ab\sin C$$

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Calculators must **not** be used in this paper.

1 Ruth records the colour of each of 24 cars.

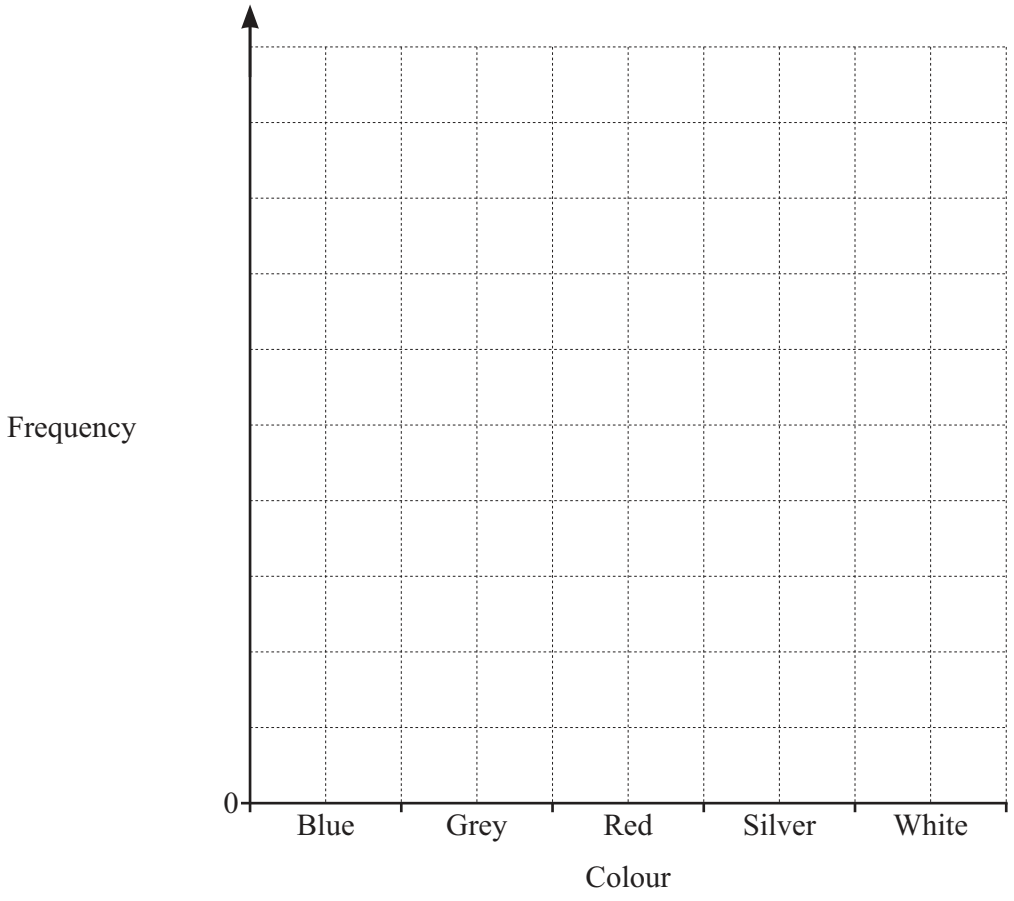
Red	Blue	Silver	Blue	Silver	Silver	White	Silver
Red	Silver	Silver	Blue	Grey	Grey	Silver	Red
White	Red	Blue	Grey	Blue	Silver	Red	Red

(a) Complete the frequency table.
You may use the tally column to help you.

Colour	Tally	Frequency
Blue		
Grey		
Red		
Silver		
White		

[2]

(b) Draw a bar chart to show the information in the table.
Complete the scale on the frequency axis.



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2 Work out.

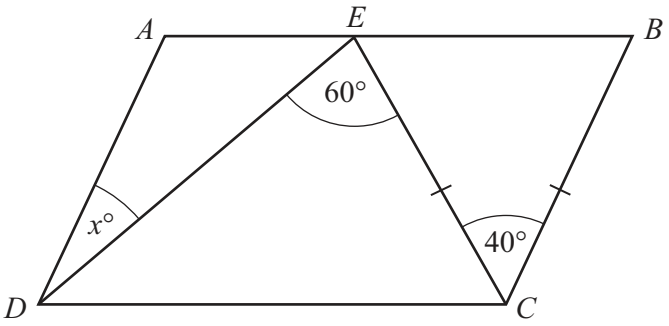
(a) $0.78 - 0.2$

..... [1]

(b) -8×-5

..... [1]

3



NOT TO SCALE

ABCD is a parallelogram.
E is a point on *AB* and $EC = BC$.
Angle $ECB = 40°$ and angle $DEC = 60°$.

Find the value of x.

$x =$ ..... [4]

4 Petra thinks of a number.
The number is a multiple of 7.

Petra says:

> When I write my number correct to the nearest ten it is 30.

Find the number that Petra thinks of.

..... [2]

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5 Write these numbers in order of size, starting with the smallest.

$0.8 \qquad \frac{7}{9} \qquad \frac{17}{20} \qquad 84.5\%$

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

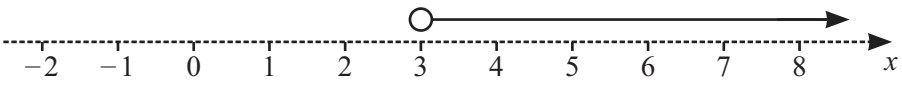
smallest

6 Solve.

$6x - 3 = 4x + 9$

$x =$ ..... [2]

7 **(a)** Write down the inequality represented on the number line.



..... [1]

(b) Solve the inequality.

$x - 2 < 7$

..... [1]

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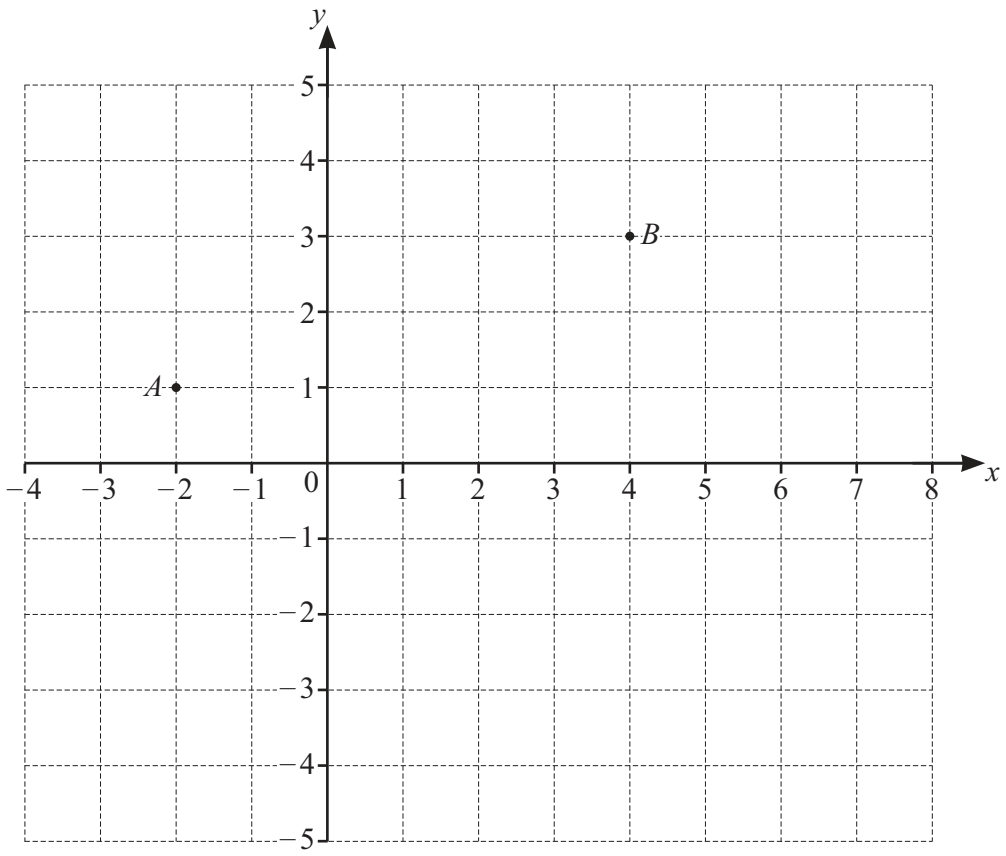
8 Point A and point B are plotted on the grid.



(a) Write down the coordinates of point A.

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

(b) The coordinates of point C are $(p, -1)$.
The gradient of the line BC is -2.

Find the value of p.

$p =$ ..... [2]

(c) AB and BC are two sides of the parallelogram $ABCD$.

Find the coordinates of point D.

(..... , ...) [2]

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9 **(a)** Sara has a bag containing 60 red counters, 72 blue counters and 36 green counters.

Find the ratio of red counters : blue counters : green counters in the bag.
Write the ratio in its simplest form.

..... : ..... : ..... [2]

(b) Sunil has a bag containing yellow counters and white counters.
The ratio of yellow counters to white counters is 5 : 8.
There are 18 more white counters than yellow counters.

Work out the number of yellow counters and the number of white counters.

Yellow counters = ...

White counters = ...

[3]

10 Work out.

$$1\frac{2}{5} \div \frac{3}{10}$$

Give your answer as a mixed number in its simplest form.

..... [3]

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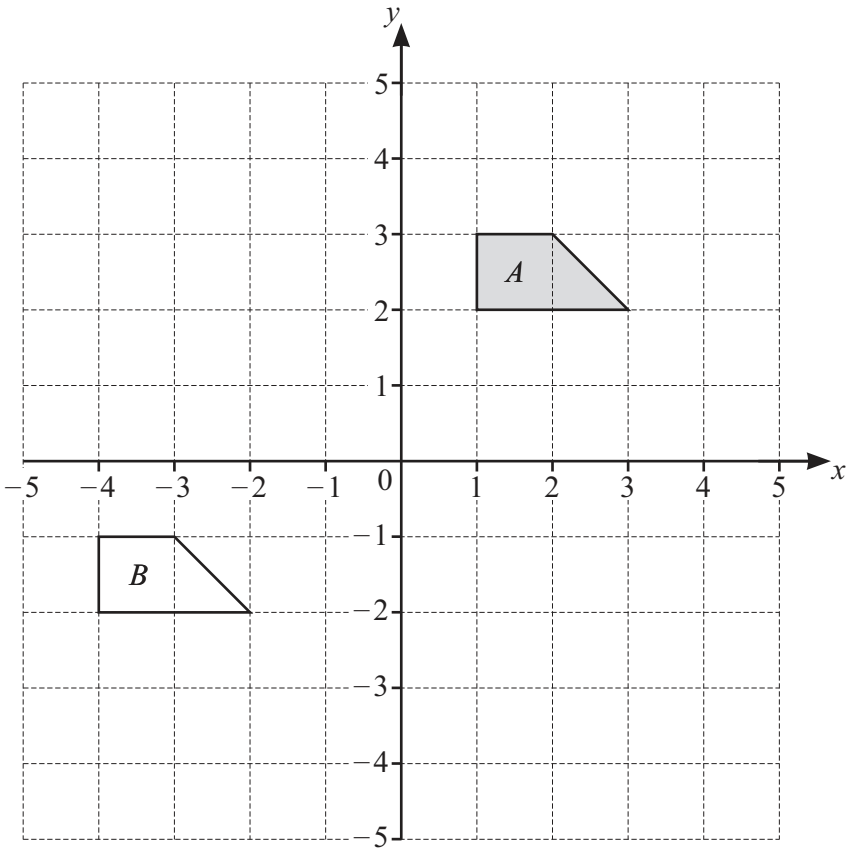
11 Shape A and shape B are drawn on the grid.



(a) Describe fully the **single** transformation that maps shape A onto shape B.

.....

..... [2]

(b) Draw the image of shape A after a rotation of 90° clockwise about the origin. [2]

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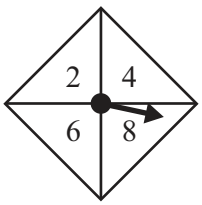
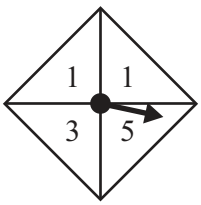


Spinner A



Spinner B

Luca has these two fair spinners.

(a) Luca spins both spinners and adds the two numbers to find his score.

(i) Complete the sample space diagram to show all the possible scores.

Spinner A

Spinner B	+	2	4	6	8
	1	3			
	1	3			
	3	5			
	5	7	9	11	13

[1]

(ii) Find the probability that Luca's score is greater than 10.

..... [2]

(b) Luca spins spinner A twice.
He now multiplies the two numbers to find his score.

Find the probability that his score is greater than 30.

..... [2]

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13 Thomas works in a shop.
He is paid $12 for each hour he works.
He is also paid a bonus of 5% of the value of the items he sells.

One day, Thomas works for 5 hours.
He is paid a total of $82 including his bonus.

Work out the value of the items Thomas sells on this day.

$ ..... [4]

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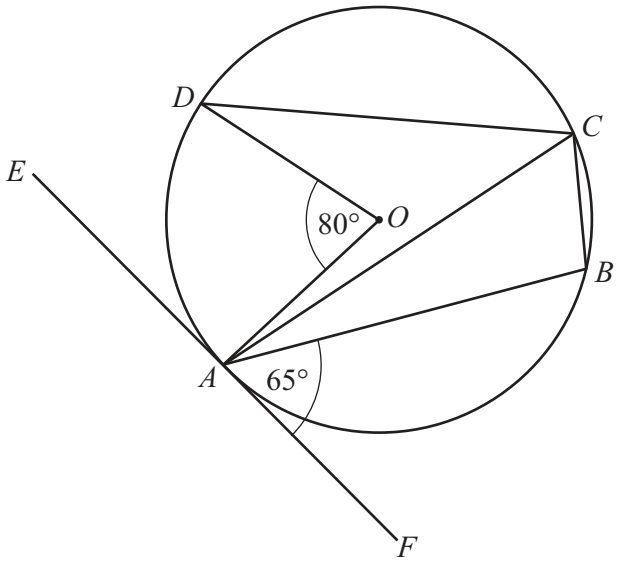

NOT TO SCALE

A, B, C and D are points on a circle, centre O.
EF is a tangent to the circle at A.
Angle $BAF = 65°$ and angle $AOD = 80°$.

Find angle BCD.
Give a geometrical property to explain each step of your working.

.....

.....

.....

.....

.....

.....

Angle $BCD =$ .....

[4]

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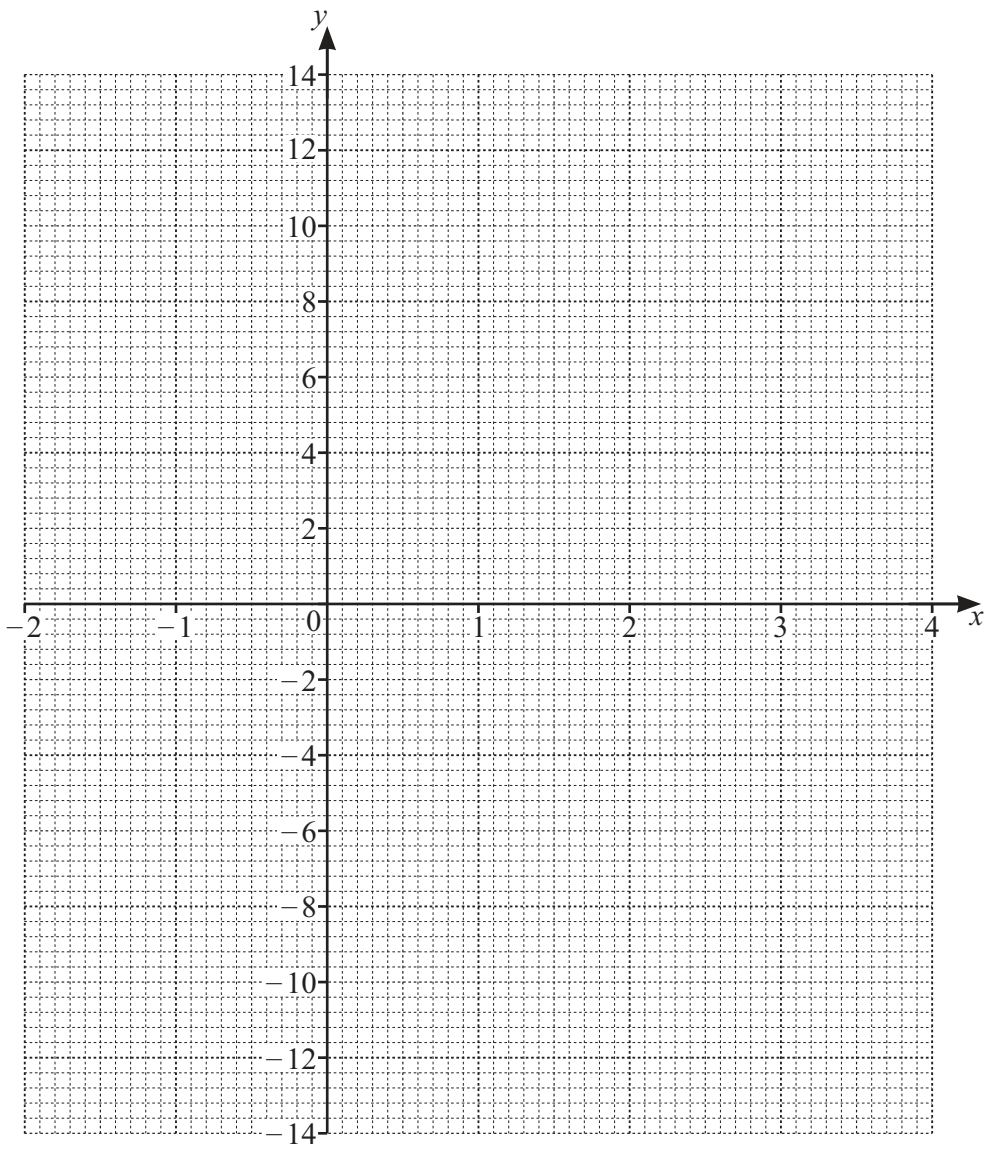
15 **(a)** Complete the table for $y = x^3 - 4x^2 + 12$.

x	-2	-1	0	1	2	3	4
y	-12	7	12	9	4	3	

[1]

(b) Draw the graph of $y = x^3 - 4x^2 + 12$ for $-2 \leqslant x \leqslant 4$.



[4]

(c) Use your graph to solve the equation $x^3 - 4x^2 + 12 = 0$.

$x =$ ..... [1]

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(d) By drawing a suitable line on the grid, find the roots of the equation $x^3 - 4x^2 + x + 4 = 0$.

$x =$ ..... or $x =$ ..... or $x =$ ..... [4]

16 **(a)** Expand and simplify.

$(3 + \sqrt{2})(1 + 4\sqrt{2})$

..... [2]

(b) Rationalise the denominator.

$\frac{1}{1 + \sqrt{7}}$

..... [2]

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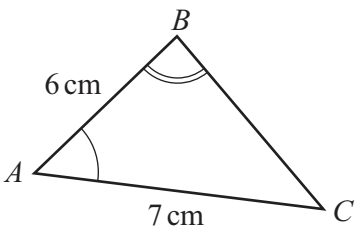

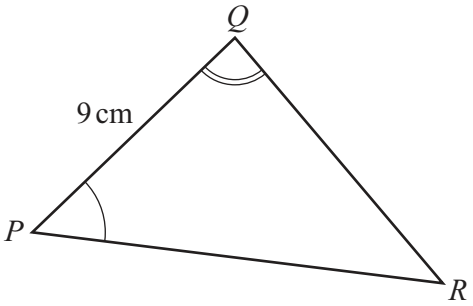

NOT TO SCALE

Triangle ABC is similar to triangle PQR.

(a) Calculate PR.

$PR =$ ..... cm [2]

(b) The area of triangle ABC is $16\,\text{cm}^2$.

Calculate the area of triangle PQR.

..... cm^2 [2]

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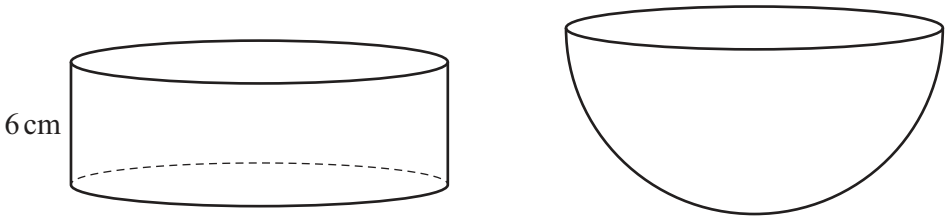
18 The diagram shows a solid cylinder and a solid hemisphere.



NOT TO SCALE

The radius of the cylinder is equal to the radius of the hemisphere.
The volume of the cylinder is equal to the volume of the hemisphere.
The height of the cylinder is 6 cm.

Calculate the total surface area of the hemisphere.
Give your answer in terms of π.

..... cm^2 [5]

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19 **(a)** Evaluate $16^{-\frac{3}{4}}$.

..... [2]

(b) Write $9^2 \times 3^{-\frac{1}{2}}$ as a single power of 3.

..... [2]

20 $f(x) = ax + 3 \qquad g(x) = (x+b)^2$

(a) Find $f^{-1}(x)$.

$f^{-1}(x) =$ ..... [2]

(b) $gf(x) = 9x^2 + 24x + 16$

a and b are positive integers.

Find the value of a and the value of b.

$a =$ .....

$b =$ .....

[3]

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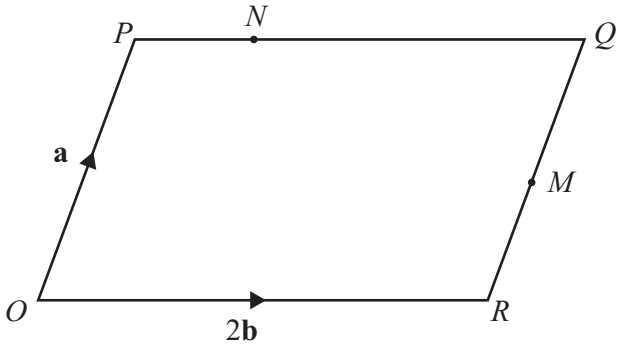

NOT TO SCALE

OPQR is a parallelogram.
$\overrightarrow{OP} = \mathbf{a}$ and $\overrightarrow{OR} = 2\mathbf{b}$.
M is the midpoint of *QR*.
N is a point on *PQ* and *PN* : *NQ* = 1 : 3.

(a) Find, as simply as possible, in terms of **a** and/or **b**

(i) $\overrightarrow{MQ}$

$\overrightarrow{MQ} =$ ..... [1]

(ii) $\overrightarrow{NM}$.

$\overrightarrow{NM} =$ ..... [2]

(b) Line *OP* is extended to point *X*.
MNX is a straight line.

Find the position vector of *X*.

..... [2]

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22 Ade and Maha make cards.
One day they each work for 4 hours making cards.
Ade takes x minutes to make one card.

(a) Show that the number of cards Ade makes in 4 hours is given by $\frac{240}{x}$.

[1]

(b) Maha takes 2 minutes less than Ade to make one card.
Maha and Ade make a total of 70 cards in 4 hours.

Form an equation and show that it simplifies to $7x^2 - 62x + 48 = 0$.

[4]

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(c) Solve by factorisation.

$7x^2 - 62x + 48 = 0$

$x =$ ..... or $x =$ ..... [3]

(d) Work out the number of cards Maha makes in 1 hour.

..... [2]

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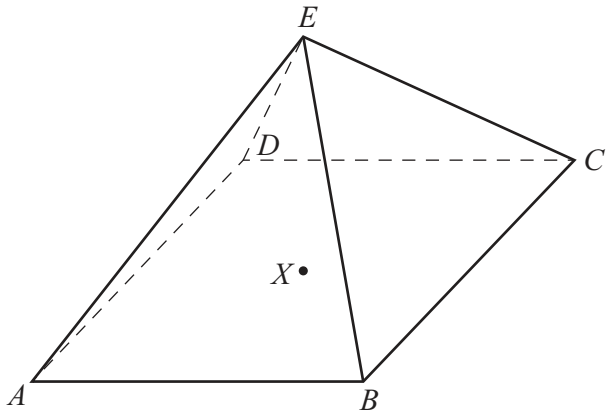

NOT TO SCALE

The diagram shows a square-based pyramid.
X is the centre of the square base.

Vertex E is vertically above X and $EX = 7$ cm.
The perpendicular height of triangle BEC is 11 cm.

Work out the length of the base of the pyramid.
Give your answer as a surd in its simplest form.

..... cm [4]

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