

For AQA

Name

General Certificate of Secondary Education

MATHEMATICS (MODULAR)

Module 5 Higher Tier

Paper A1 Non-Calculator

For this paper you must have:

- mathematical instruments.

You must **not** use a calculator.



Time allowed: 1 hour 15 minutes

Instructions and Information

- Write your name in the box at the top of the page.
- Answer **all** questions in the spaces provided.
- The maximum mark for this paper is 70.
- The marks for questions are shown in brackets.

Advice

- In all calculations, show clearly how you work out your answer.

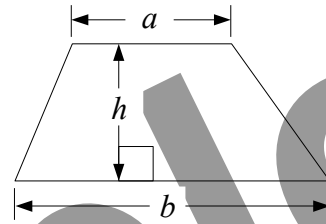


Written by Shaun Armstrong

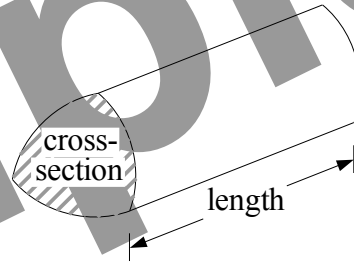
Only to be copied for use in the purchaser's school or college

Formulae Sheet: Higher Tier

$$\text{Area of trapezium} = \frac{1}{2}(a + b)h$$

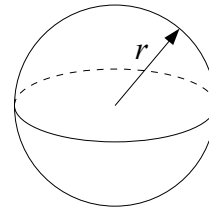


$$\text{Volume of a prism} = \text{area of cross-section} \times \text{length}$$



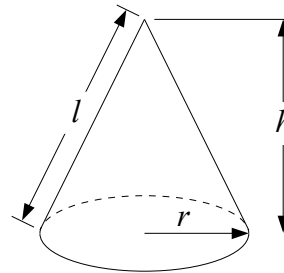
$$\text{Volume of sphere} = \frac{4}{3}\pi r^3$$

$$\text{Surface area of sphere} = 4\pi r^2$$



$$\text{Volume of cone} = \frac{1}{3}\pi r^2 h$$

$$\text{Curved surface area of cone} = \pi r l$$

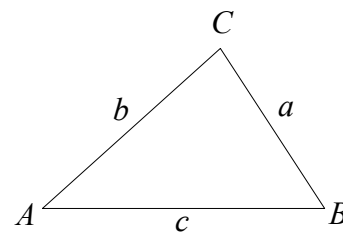


In any triangle ABC

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

$$\text{Sine Rule} \quad \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$\text{Cosine Rule} \quad a^2 = b^2 + c^2 - 2bc \cos A$$



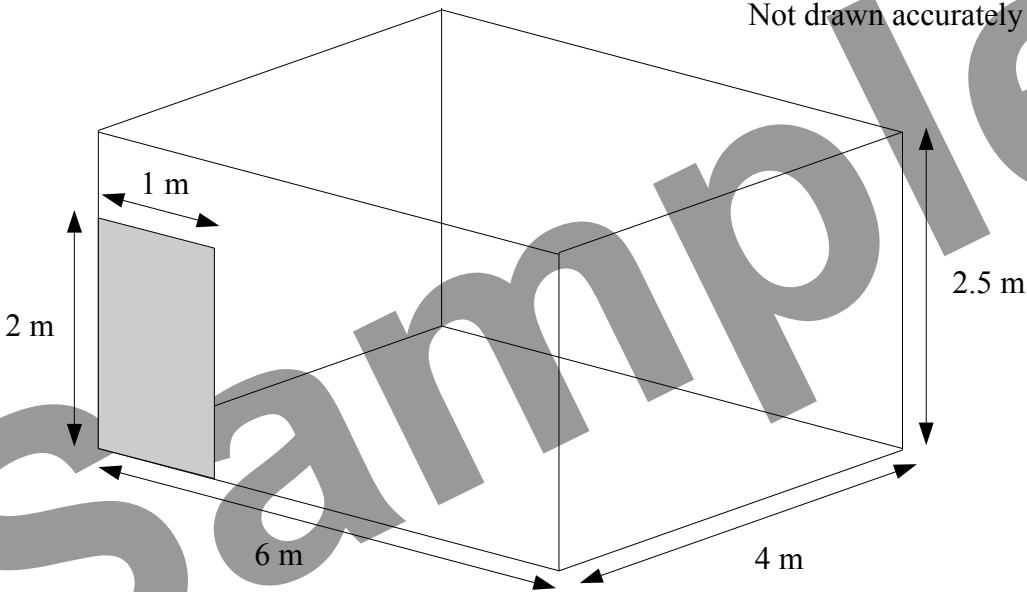
The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$, where $a \neq 0$, are given by

$$x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$$

Answer **all** questions in the spaces provided.

1



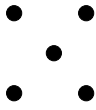
The diagram shows the dimensions of Brian's dining room.
He wants wallpaper hung on all four walls except for the door which is shaded.

Work out the total area that he wants covered with wallpaper.

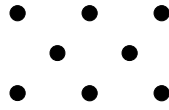
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Answer m² (3 marks)

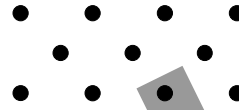
2 Here are some patterns made with dots.



Pattern number 1



Pattern number 2



Pattern number 3

2 (a) How many dots will there be in Pattern number 4.

.....
.....

Answer (1 mark)

2 (b) How many dots will there be in the top row of dots in Pattern number 20.

.....

Answer (1 mark)

2 (c) Find an expression, in terms of n , for the total number of dots in Pattern number n .

.....
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Answer (3 marks)

3 In this question, the letters a , b and c represent lengths.

State whether each expression could represent a length, an area or a volume.

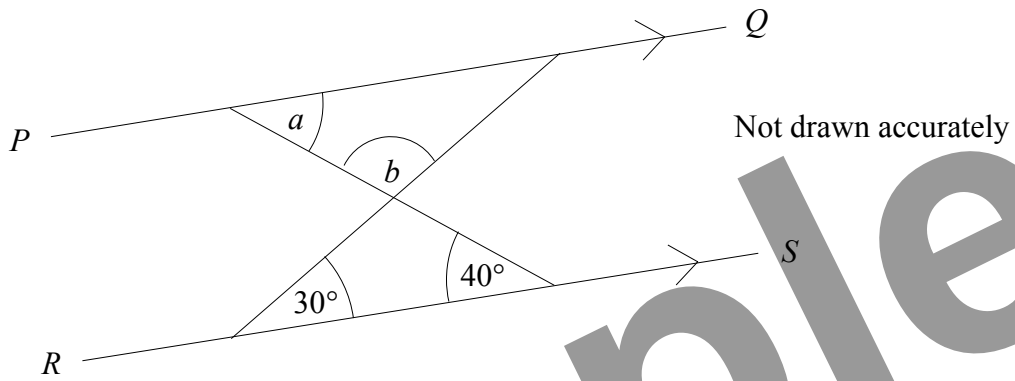
3 (a) $ab + bc$

Answer (1 mark)

3 (b) πab^2

Answer (1 mark)

4 (a)



The lines PQ and RS are parallel.

4 (a) (i) Write down the size of the angle marked a .
Give a reason for your answer.

Answer $a = \dots\dots\dots$ degrees

Reason $\dots\dots\dots$

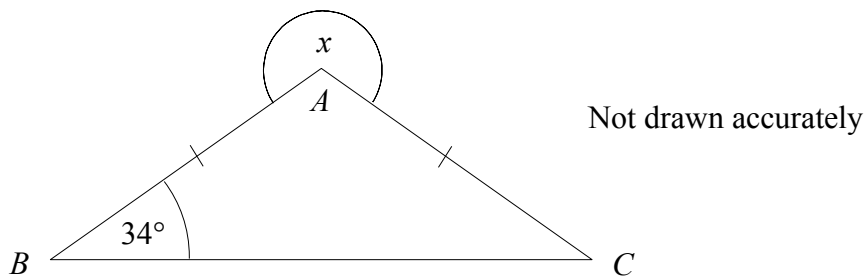
(2 marks)

4 (a) (ii) Find the size of the angle marked b .

$\dots\dots\dots$
 $\dots\dots\dots$

Answer $b = \dots\dots\dots$ degrees (2 marks)

4 (b)



In the diagram, $AB = AC$ and angle $ABC = 34^\circ$.

Find the size of the angle marked x .

$\dots\dots\dots$
 $\dots\dots\dots$
 $\dots\dots\dots$

Answer $x = \dots\dots\dots$ degrees (3 marks)

5 (a) Solve $5p + 9 = p - 3$

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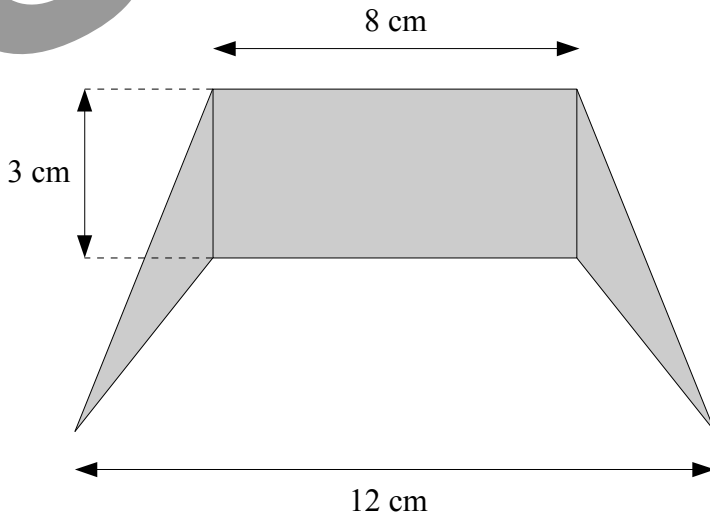
Answer $p =$ (3 marks)

5 (b) Solve $x^2 - 7x + 10 = 0$

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Answer (3 marks)

6



Not drawn accurately

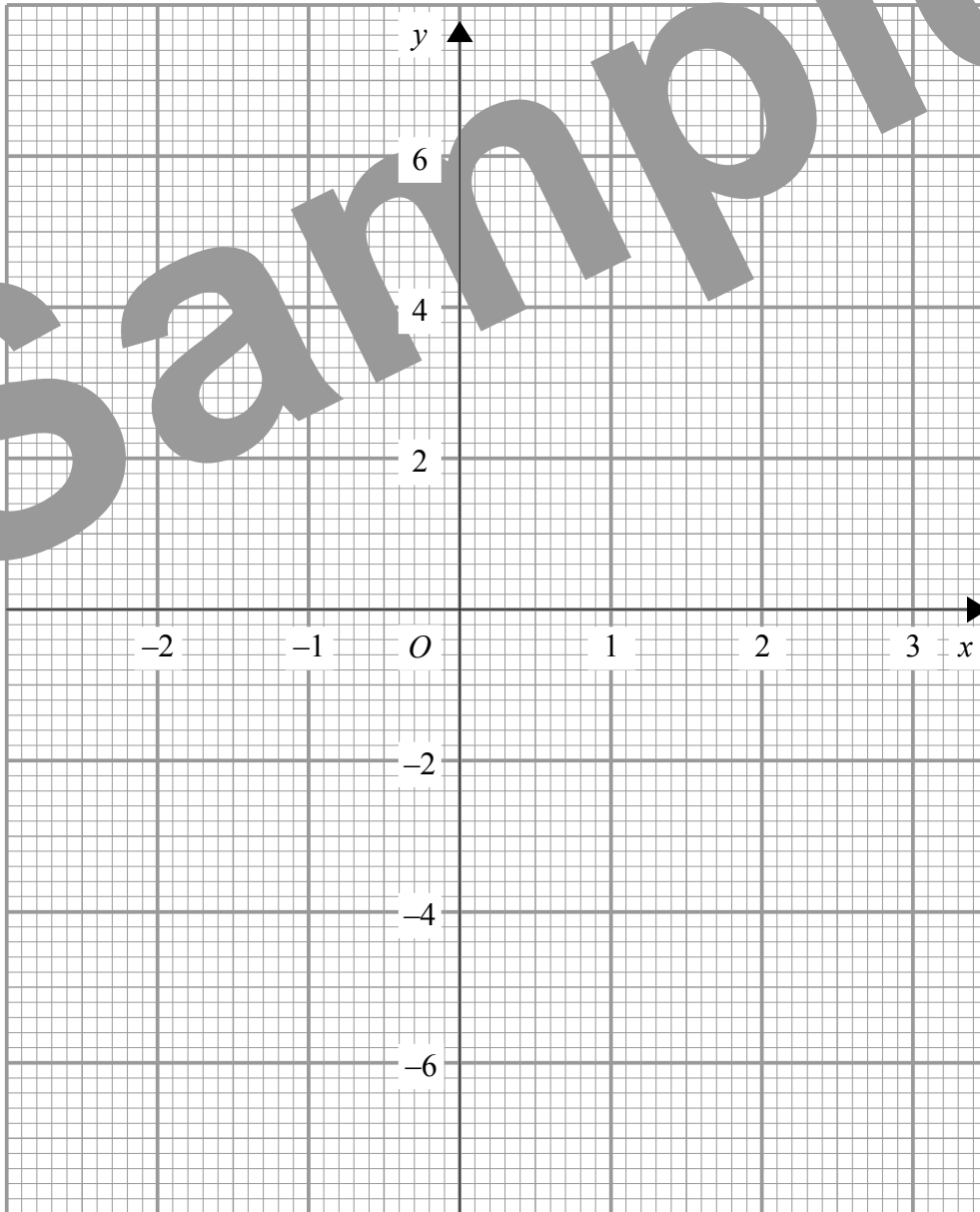
The shaded shape is made from a rectangle and two identical triangles.

Work out the area of the shaded shape.

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Answer cm^2 (3 marks)

7 (a) On the grid, draw the graph of $y = 2x - 3$

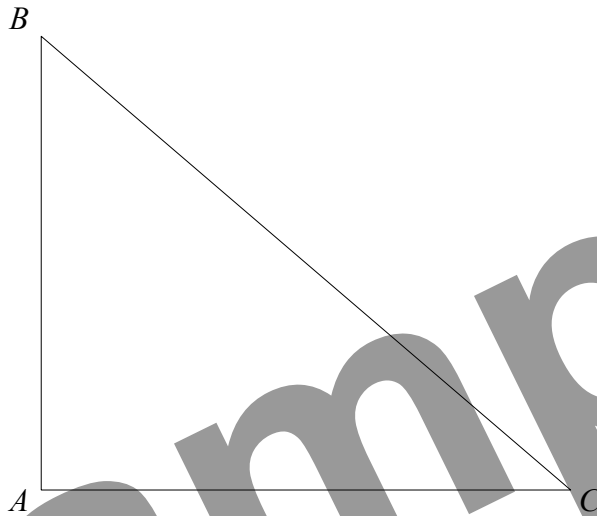


(3 marks)

7 (b) Use your graph to solve the equation $2x - 3 = 1.4$

Answer $x = \dots\dots\dots$ (1 mark)

8



ABC is a triangle.

Shade the region inside the triangle which is nearer to point A than point C and less than 5 cm from the point C .

(4 marks)

9 Simplify

9 (a) $2p + q - p + 4q$

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Answer (2 marks)

9 (b) $(2a)^2$

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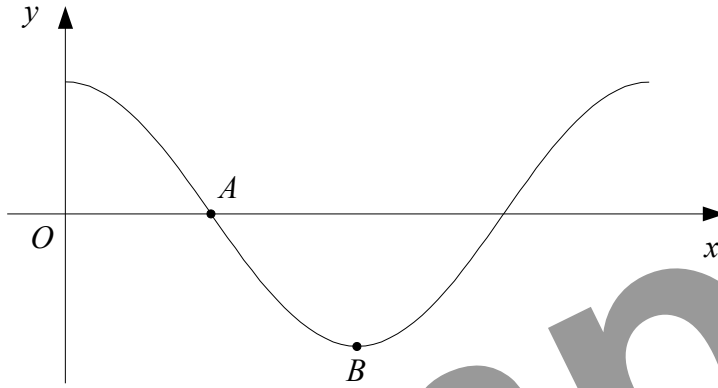
Answer (1 mark)

9 (c) $\frac{x^5 \times x^2}{x^3}$

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Answer (1 mark)

10



The diagram shows a sketch of part of the graph of $y = \cos x$.

10 (a) Write down the coordinates of

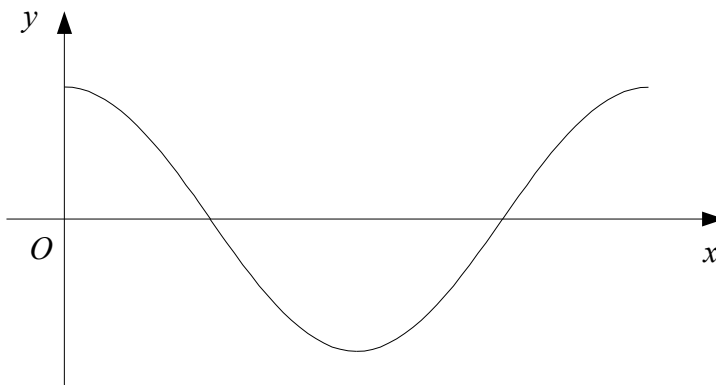
10 (a) (i) A ,

Answer (.....,) (1 mark)

10 (a) (ii) B .

Answer (.....,) (1 mark)

10 (b) On this copy of the diagram above, sketch the graph of $y = \cos 2x$.



(2 marks)

11

$$P = 2\pi r + 5r - l$$

Rearrange the formula to make r the subject.

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Answer $r =$ (3 marks)

12 (a) Show that $x^2 - 8x + 19$ can be written in the form $(x + a)^2 + b$ for all values of x .
State the value of a and the value of b .

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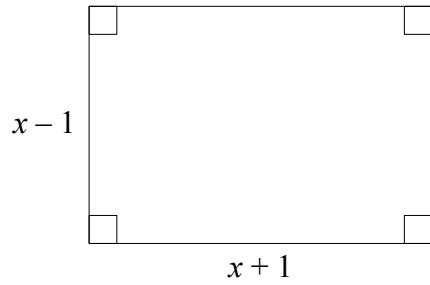
Answer $a =$ $b =$ (3 marks)

12 (b) Hence, or otherwise, explain how you know that the curve $y = x^2 - 8x + 19$ does not cross cross the x -axis.

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(2 marks)

13



Not drawn accurately

The diagram shows a rectangle measuring $(x - 1)$ cm by $(x + 1)$ cm.
The diagonals of the rectangle are each 10 cm long.

Find the area of the rectangle.

Sample

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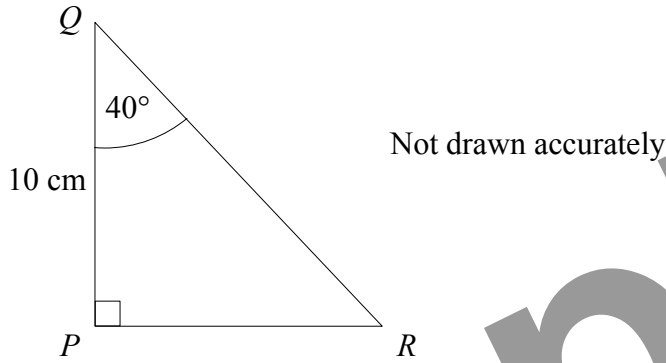
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Answer cm^2 (5 marks)

14



PQR is a triangle.

$PQ = 10$ cm.

Angle $PQR = 40^\circ$.

Angle $QPR = 90^\circ$.

Angle	Sine	Cosine	Tangent
40°	0.643	0.766	0.839
50°	0.766	0.643	1.192

Use the values in the table to work out the length of PR .

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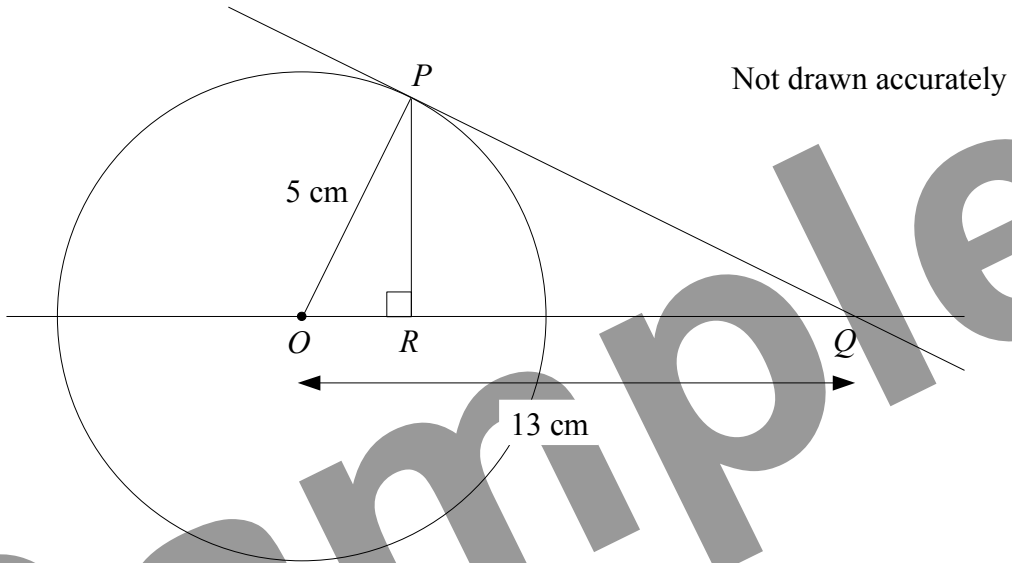
Answer cm (3 marks)

15 Prove algebraically that the sum of three consecutive even numbers is always a multiple of 6.

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(3 marks)

16



P is a point on a circle, centre O .
The line PQ is the tangent to the circle at P .
 R is the point on OQ such that angle $ORP = 90^\circ$.

- 16 (a) Prove that triangle OPR and triangle OPQ are similar.

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(3 marks)

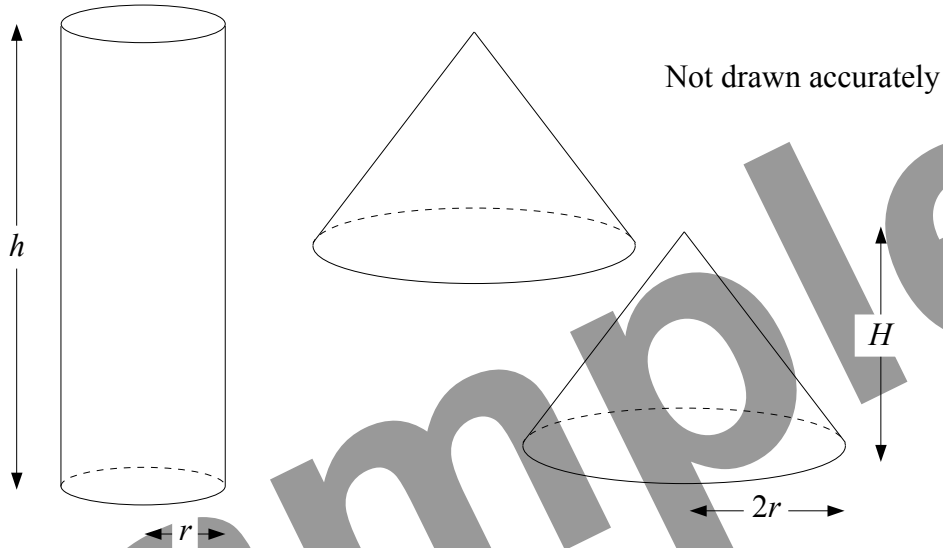
$OP = 5$ cm.
 $PQ = 13$ cm.

- 16 (b) Find the exact length of OR .

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Answer cm (2 marks)

17



Some plasticine is used to make a solid cylinder of base radius r cm and height h cm.

The plasticine is then split in half and used to make two identical cones.
Each cone has base radius $2r$ cm and height H cm.

Express H in terms of h .
Give your answer in its simplest form.

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Answer $H =$ (4 marks)

END OF QUESTIONS