

For AQA

General Certificate of Secondary Education

**MATHEMATICS (MODULAR)**

**Module 5 Higher Tier**

**Paper A1 Non-Calculator**

**H**

**For this paper you must have:**

- mathematical instruments.

You must **not** use a calculator.



Time allowed: 1 hour 15 minutes

**Instructions and Information**

- Do not write on this question paper – use blank paper and the answer sheets provided.
- The maximum mark for this paper is 70.

**Advice**

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

**Formulae: Higher Tier**

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

**Volume of a prism** = area of cross-section  $\times$  length

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

**Surface area of sphere**  $= 4\pi r^2$

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

**Curved surface area of cone**  $= \pi r l$

**In any triangle ABC**

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

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

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

**The Quadratic Equation**

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

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

*Churchill  
Maths*

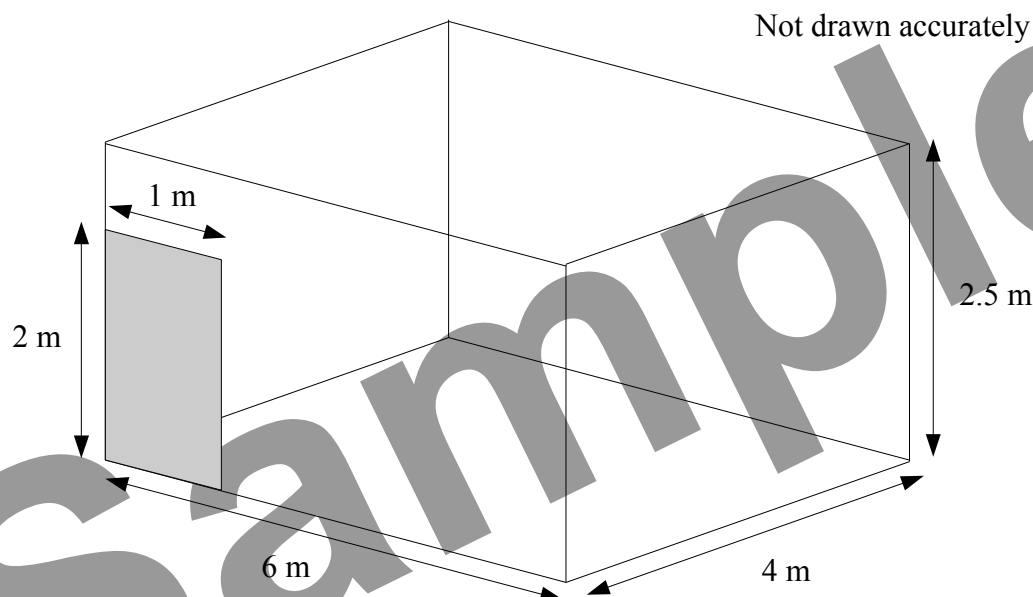


Written by Shaun Armstrong

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

Answer **all** questions.

1

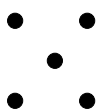


The diagram shows the dimensions of Brian's dining room.  
He wants wallpaper hung on all four walls except for the door which is shaded.

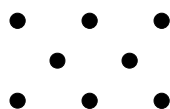
Work out the total area that he wants covered with wallpaper.

*(3 marks)*

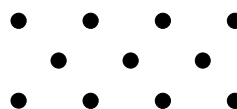
2 Here are some patterns made with dots.



Pattern number 1



Pattern number 2



Pattern number 3

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

*(1 mark)*

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

*(1 mark)*

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

*(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.

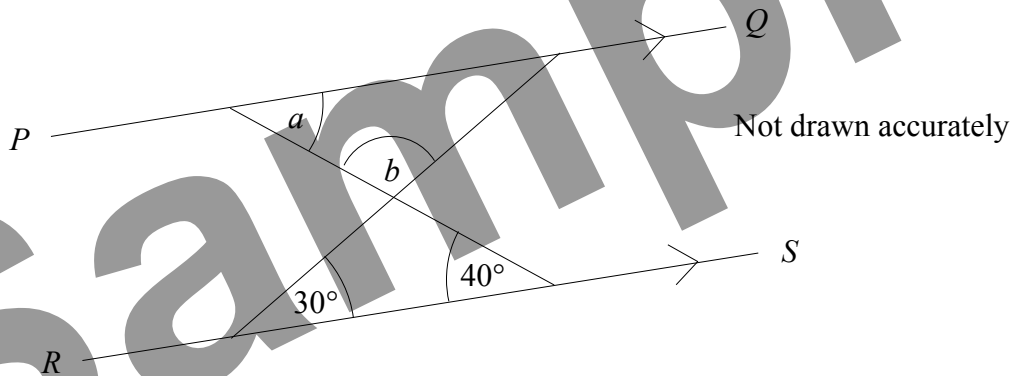
(a)  $ab + bc$

(1 mark)

(b)  $\pi ab^2$

(1 mark)

4 (a)



The lines  $PQ$  and  $RS$  are parallel.

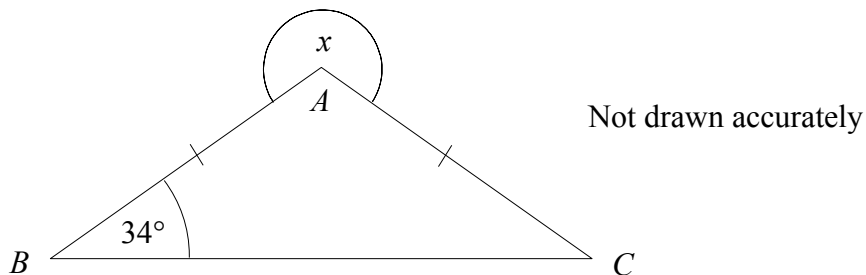
- (i) Write down the size of the angle marked  $a$ .  
Give a reason for your answer.

(2 marks)

- (ii) Find the size of the angle marked  $b$ .

(2 marks)

(b)



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

Find the size of the angle marked  $x$ .

(3 marks)

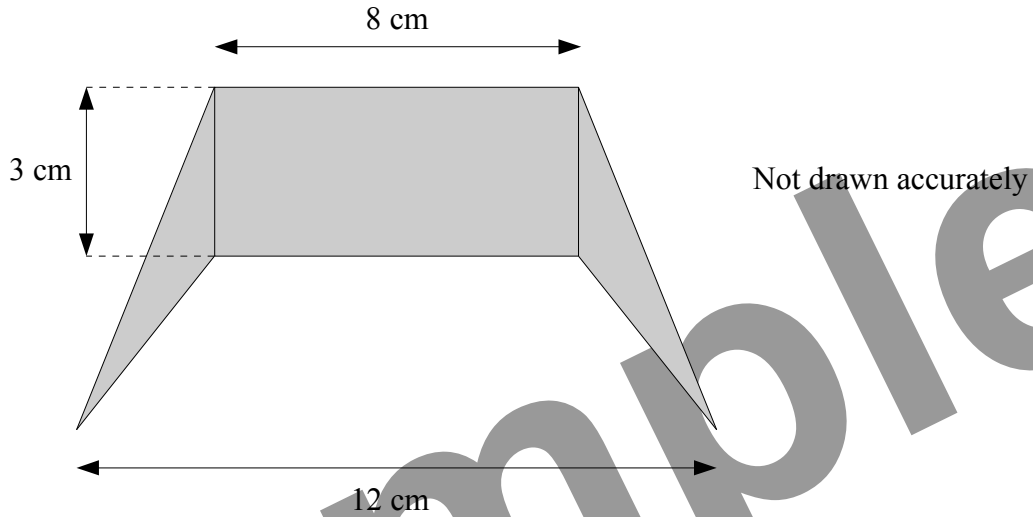
5 (a) Solve  $5p + 9 = p - 3$

(3 marks)

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

(3 marks)

6



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

Work out the area of the shaded shape.

(3 marks)

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

(3 marks)

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

(1 mark)

8 Triangle  $ABC$  is shown on the answer sheets.

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

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

(2 marks)

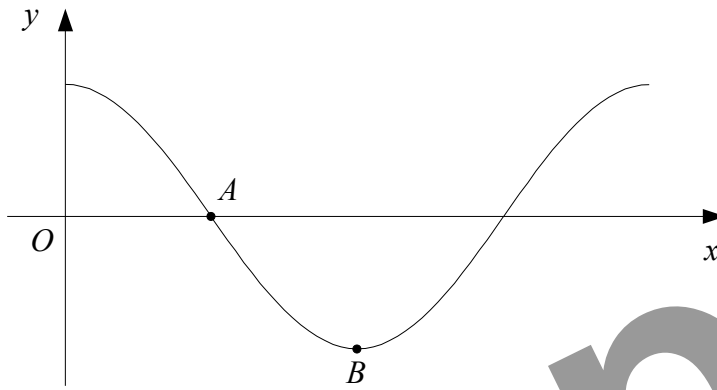
(b)  $(2a)^2$

(1 mark)

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

(1 mark)

10



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

(a) Write down the coordinates of

(i)  $A$ ,

(1 mark)

(ii)  $B$ .

(1 mark)

(b) On the copy of the diagram above on the answer sheets, sketch the graph of  $y = \cos 2x^\circ$ .

(2 marks)

11

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

Rearrange the formula to make  $r$  the subject.

(3 marks)

12

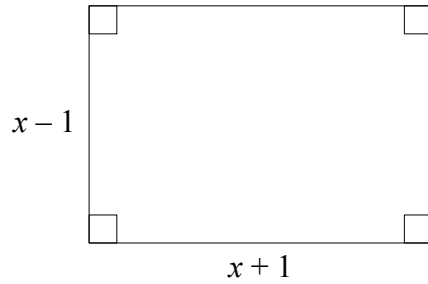
(a) Show that  $x^2 - 8x + 19$  can be written in the form  $(x + a)^2 + b$  for all values of  $x$ .  
State the value of  $a$  and the value of  $b$ .

(3 marks)

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

(2 marks)

13



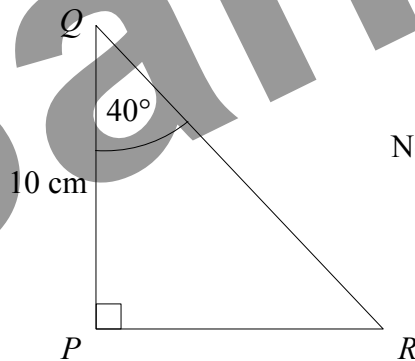
Not drawn accurately

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.

(5 marks)

14



Not drawn accurately

$PQR$  is a triangle.

$PQ = 10$  cm.  
 Angle  $PQR = 40^\circ$ .  
 Angle  $QPR = 90^\circ$ .

Angle	Sine	Cosine	Tangent
$40^\circ$	0.643	0.766	0.839
$50^\circ$	0.766	0.643	1.192

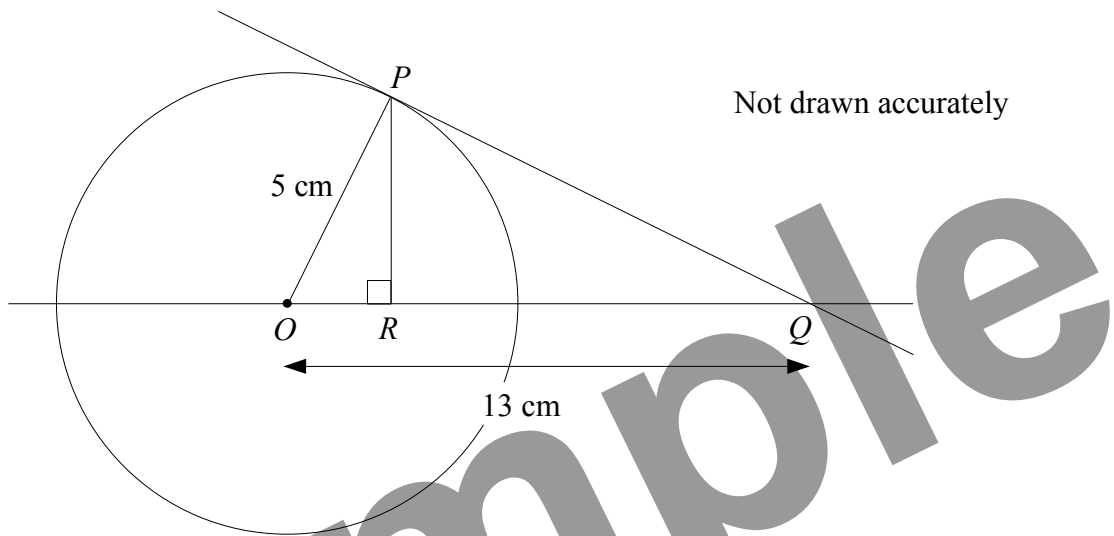
Use the values in the table to work out the length of  $PR$ .

(3 marks)

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

(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  $ORP = 90^\circ$ .

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

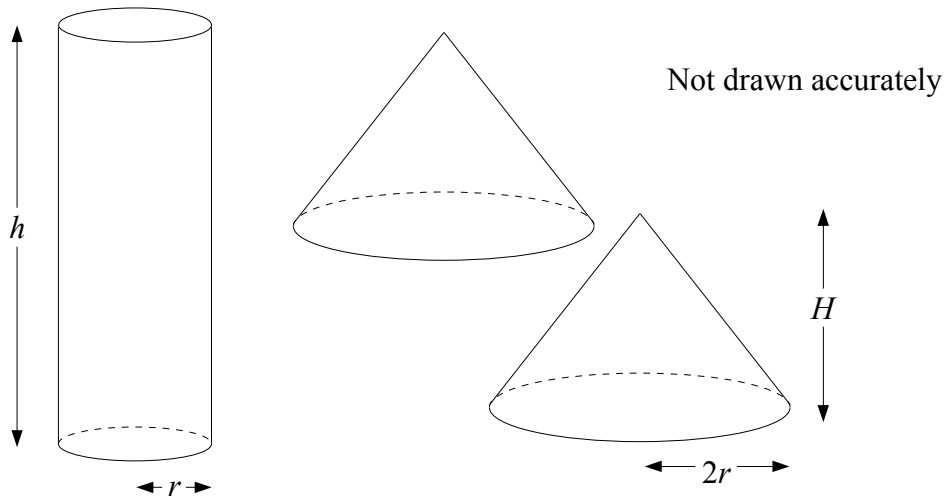
(3 marks)

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

(b) Find the exact length of  $OR$ .

(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.

(4 marks)

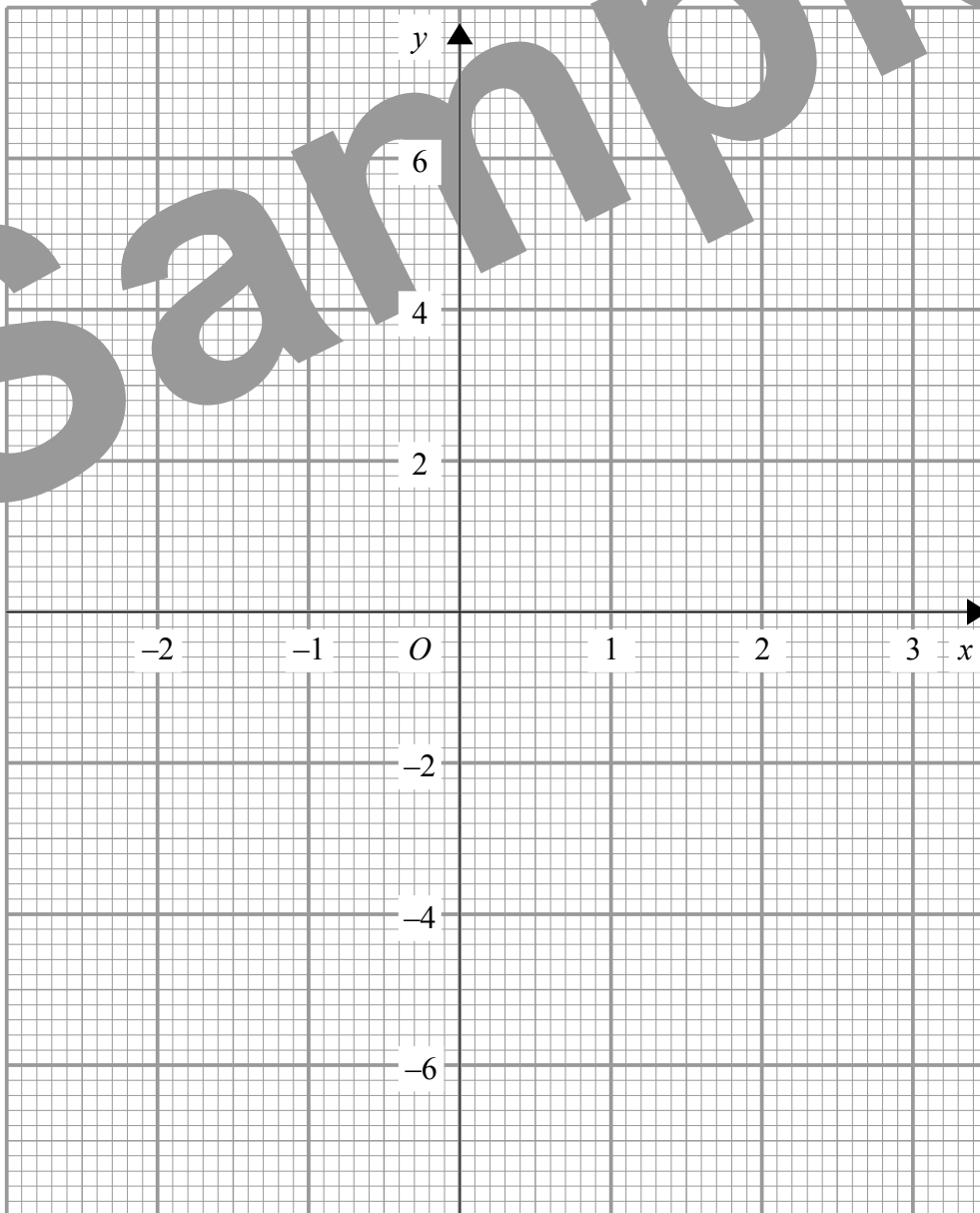
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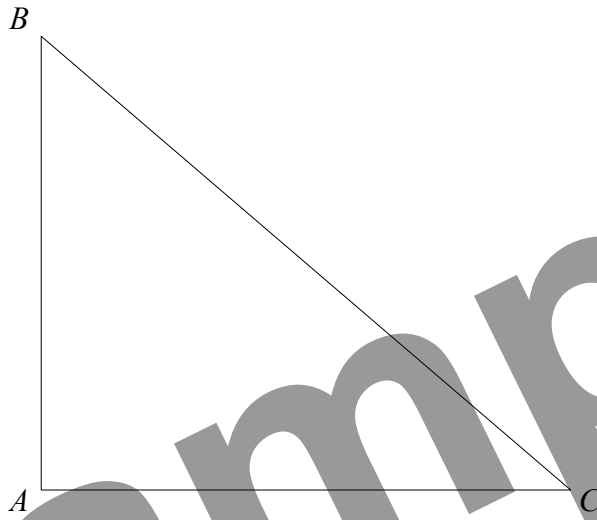
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**Answer Sheets for Higher Tier, Module 5 Paper A1**

7





10 (b)

