

Surname											Other Names											
Centre Number												Candidate Number										
Candidate Signature																						

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General Certificate of Secondary Education  
November 2009



**MATHEMATICS (MODULAR) (SPECIFICATION B)**  
**Module 5 Higher Tier**  
**Paper 1 Non-calculator**

**43055/1H**  
**H**

Thursday 5 November 2009 9.00 am to 10.15 am

<p><b>For this paper you must have:</b></p> <ul style="list-style-type: none"> <li>mathematical instruments.</li> </ul> <p>You must <b>not</b> use a calculator.</p>	
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Time allowed: 1 hour 15 minutes

**Instructions**

- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Answers written in margins or on blank pages will not be marked.
- Do all rough work in this book.

**Information**

- The maximum mark for this paper is 70.
- The marks for questions are shown in brackets.
- You may ask for more answer paper, graph paper and tracing paper. This must be tagged securely to this answer book.

**Advice**

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

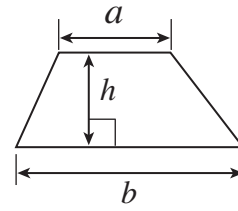
For Examiner's Use	
Pages	Mark
3	
4–5	
6–7	
8–9	
10–11	
12–13	
14–15	
16	
TOTAL	
Examiner's Initials	



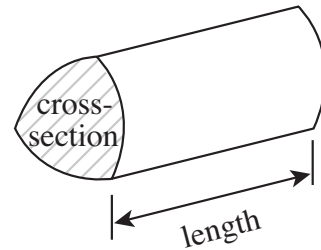
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### Formulae Sheet: Higher Tier

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

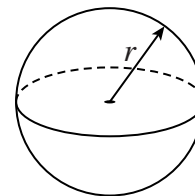


**Volume of prism** = area of cross-section  $\times$  length



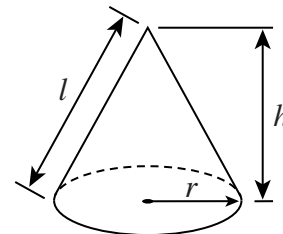
**Volume of sphere** =  $\frac{4}{3}\pi r^3$

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



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

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

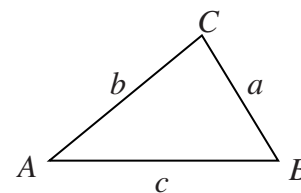


**In any triangle ABC**

**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

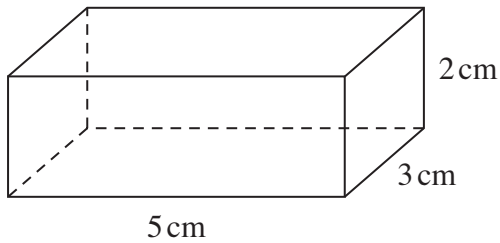
The solutions of  $ax^2 + bx + c = 0$ , where  $a \neq 0$ , are given by

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



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

- 1 The diagram shows a cuboid.



- 1 (a) Work out the volume of the cuboid.

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 .....

Answer .....  $\text{cm}^3$  (2 marks)

- 1 (b) Write down the volume of the cuboid in  $\text{mm}^3$ .

.....

Answer .....  $\text{mm}^3$  (1 mark)

- 2 (a) The front and side elevations of a solid shape are both circles.  
 The plan view is also a circle.

Write down the name of the shape.

Answer ..... (1 mark)

- 2 (b) The shadow of a solid shape is a rectangle.  
 The solid shape could be some of the shapes in the list.

Circle **all** the shapes it could be.

Cuboid      Prism      Cone      Tetrahedron      Cube

(2 marks)



- 3 (a) Rearrange the formula  $r = \frac{C}{2\pi}$  to make  $C$  the subject.

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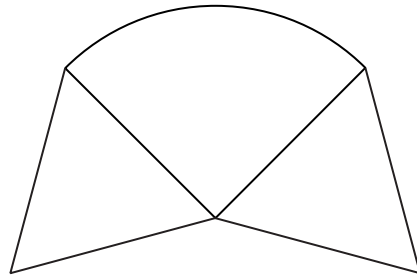
Answer  $C =$  ..... (1 mark)

- 3 (b) Use  $\pi = 3.14$  to work out the circumference of a circle of radius 3 cm.

.....  
 .....

Answer ..... cm (2 marks)

- 3 (c) This shape is made from a quarter-circle of radius 3 cm and two equilateral triangles as shown.



Not drawn accurately

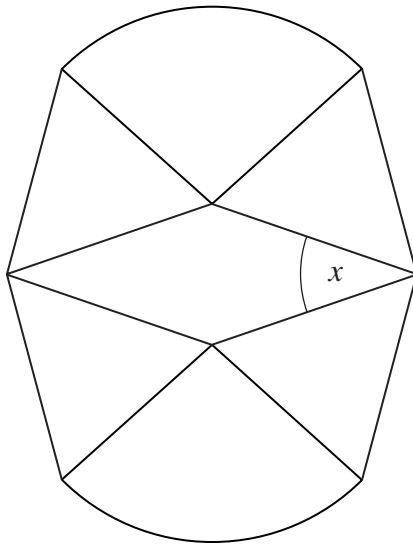
- 3 (c) (i) Work out the perimeter of the shape.

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Answer ..... cm (3 marks)



3 (c) (ii) Two of the shapes are joined together as shown.



Not drawn accurately

Work out angle  $x$ .

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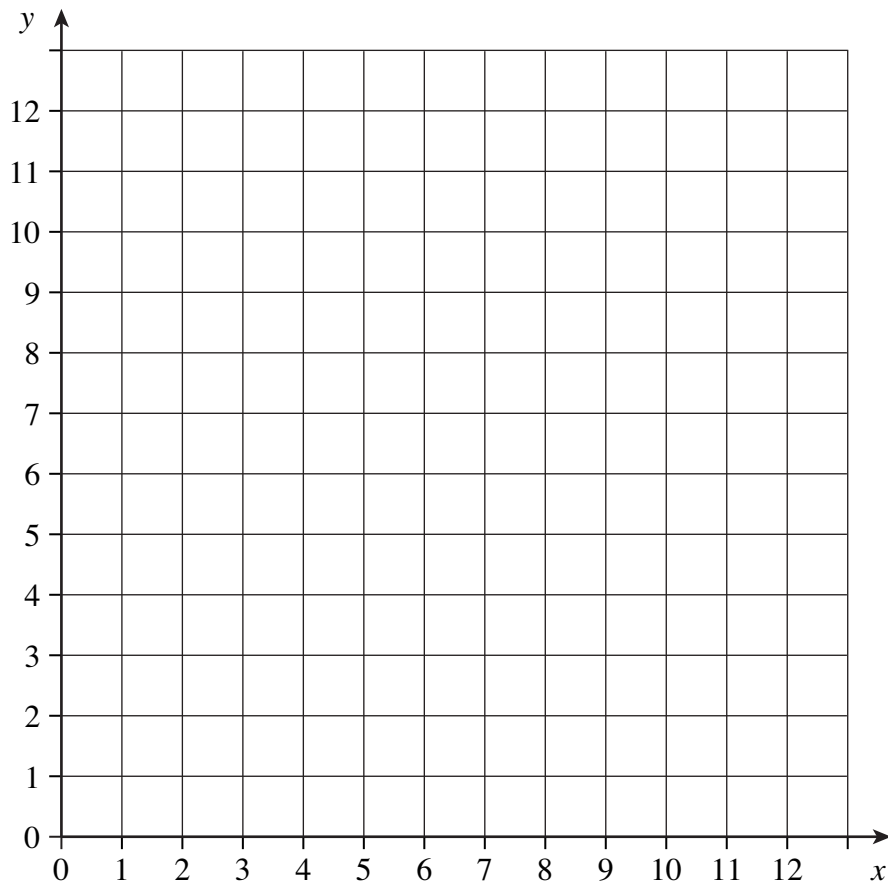
Answer ..... degrees (4 marks)

**Turn over for the next question**



4 Here is a grid.

$A(2, 1)$ ,  $B(8, 9)$ ,  $C(12, 9)$  and  $D(6, 1)$  are the coordinates of the vertices of a parallelogram.



4 (a) Work out the area of the parallelogram.

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Answer ..... square units (3 marks)



4 (b) Calculate the perimeter of the parallelogram.  
You **must** show your working.

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Answer ..... units (4 marks)

5 (a) Work out the value of  $5c - 4h$  when  $c = 0.4$  and  $h = 2.5$

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Answer ..... (2 marks)

5 (b) Solve  $7x + 11 = 4(x - 7)$

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Answer  $x =$  ..... (3 marks)



6 (a) Circle the answer which describes the graph of  $y = 2x - 1$

Smooth curve      Straight sloping line      Jagged line      Straight horizontal line

(1 mark)

6 (b) Work out the coordinates of **two** points that the graph of  $y = 2x - 1$  passes through.

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Answer (..... , ..... ) and (..... , ..... ) (2 marks)

6 (c) (i) Use the equation  $y = 2x - 1$  to find the value of  $x$  when  $y = 2.8$

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Answer  $x =$  ..... (2 marks)

6 (c) (ii) Solve  $2x - 1 < 2.8$

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Answer ..... (1 mark)





7 The diagram shows a map.



Milan is 300 km from Venice.

Use this fact to work out the distance from Venice to Naples.

You **must** state any measurements you make.

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Answer ..... km (4 marks)

Turn over ►



8 (a) Factorise fully  $20x - 12$

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Answer ..... (1 mark)

8 (b) (i) Factorise  $x^2 + 7x + 12$

.....

.....

Answer ..... (2 marks)

8 (b) (ii) Write down the value of  $x^2 + 7x + 12$  when  $x = -3$

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Answer ..... (1 mark)

8 (c) Solve  $\frac{x+3}{2} + \frac{2x-1}{3} = 7$

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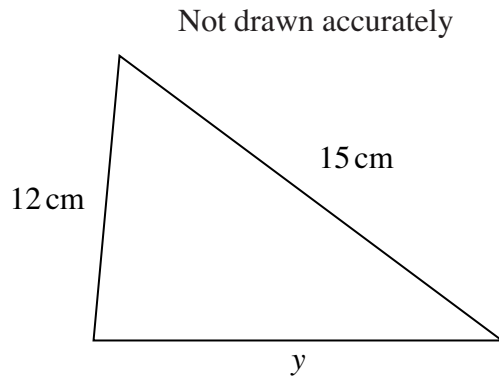
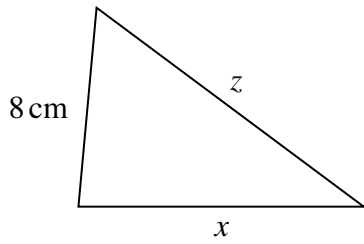
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Answer  $x =$  ..... (4 marks)



9 The diagram shows two similar triangles.



9 (a) Work out the value of  $z$ .

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Answer ..... cm (3 marks)

9 (b) Write down an equation connecting  $y$  and  $x$ .

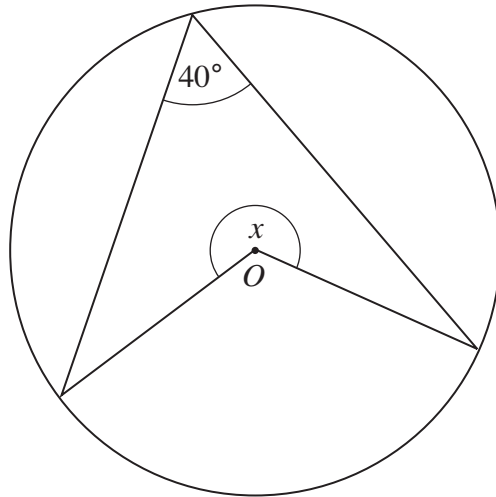
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Answer ..... (1 mark)

Turn over for the next question



10 (a) The diagram shows a circle centre  $O$ .



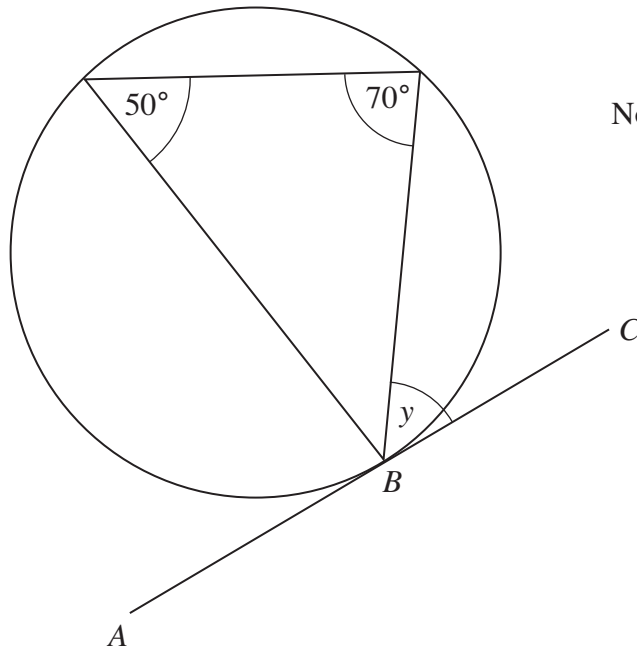
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Work out the value of  $x$ .

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Answer ..... degrees (2 marks)

10 (b)  $ABC$  is a tangent to the circle.



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Write down the value of  $y$ .

Answer ..... degrees (1 mark)



11 Here are four equations.

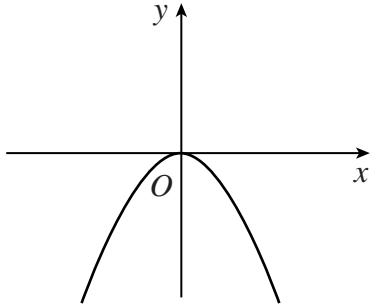
A  $y = x^3$

B  $y = 2x^2$

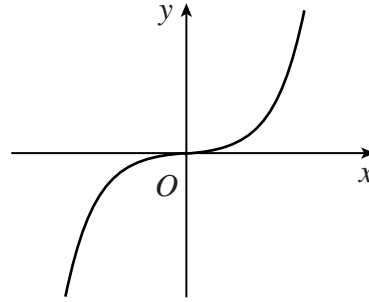
C  $y = \frac{10}{x}$

D  $y = -x^2$

Match each graph to its equation.



Equation .....



Equation .....

(2 marks)

12 Given that  $x^2 + 12x + a \equiv (x + b)^2$

find the values of  $a$  and  $b$ .

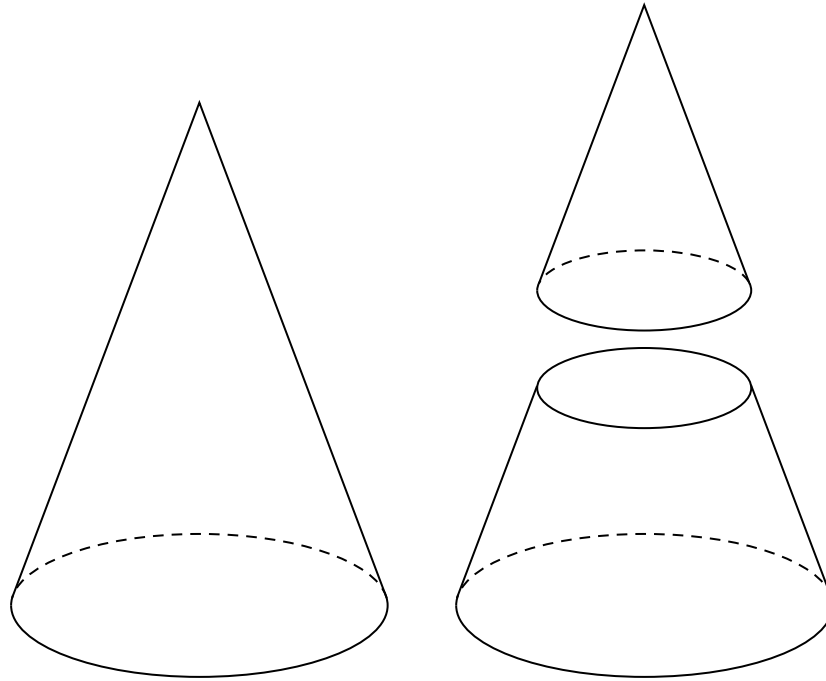
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Answer  $a = \dots\dots\dots$ ,  $b = \dots\dots\dots$  (3 marks)

**Turn over for the next question**



- 13** The diagram shows a large cone cut into two parts, a small cone and a frustum of a cone.  
 The cones are similar.  
 The height of the small cone is half the height of the large cone.  
 The height of the large cone is 16 cm.  
 The area of the base of the large cone is  $15 \text{ cm}^2$ .



- 13 (a)** Work out the volume of the large cone.

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Answer .....  $\text{cm}^3$  (2 marks)



**13 (b) (i)** Express the volume of the small cone as a fraction of the volume of the large cone.  
Give your answer in its simplest form.

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Answer ..... (2 marks)

**13 (b) (ii)** Hence, or otherwise, work out the volume of the frustum.

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Answer ..... cm<sup>3</sup> (2 marks)

**Turn over for the next question**



14 (a) (i) Show that  $(4x + y)(3x - 2y) \equiv 12x^2 - 5xy - 2y^2$

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(1 mark)

14 (a) (ii) Hence simplify fully  $\frac{12x^2 - 5xy - 2y^2}{(4x + y)(3x - 2y)}$

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Answer ..... (1 mark)

14 (b)  $x$  and  $y$  represent integers.  
 $x$  is even.

Show or explain clearly why  $(4x + y)(3x - 2y)$  is also even.

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(4 marks)

**END OF QUESTIONS**

