

Surname					Other Names				
Centre Number					Candidate Number				
Candidate Signature									

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General Certificate of Secondary Education
June 2005



MATHEMATICS (MODULAR) (SPECIFICATION B)
Module 5 Higher Tier
Paper 2 Calculator

33005/H2

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Wednesday 15 June 2005 9.00 am to 10.15 am

<p>In addition to this paper you will require:</p> <ul style="list-style-type: none"> • a calculator • mathematical instruments. 	
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For Examiner's Use	
Pages	Mark
3	
4 – 5	
6 – 7	
8 – 9	
10 – 11	
12 – 13	
14 – 15	
16	
TOTAL	
Examiner's Initials	

Time allowed: 1 hour 15 minutes

Instructions

- Use blue or black ink or ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer **all** questions in the spaces provided.
- Do all rough work in this booklet.
- If your calculator does not have a π button, take the value of π to be 3.14 unless otherwise instructed in the question.

Information

- The maximum mark for this paper is 70.
- Mark allocations are shown in brackets.
- Additional answer paper, graph paper and tracing paper will be issued on request and must be tagged securely to this answer booklet.
- You are expected to use a calculator where appropriate.

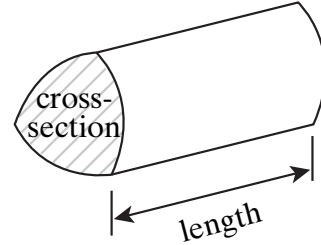
Advice

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

Formulae Sheet: Higher Tier

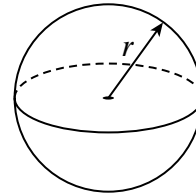
You may need to use the following formulae:

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



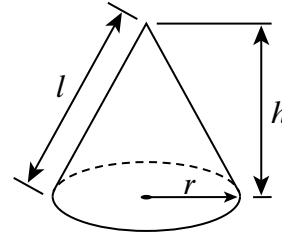
Volume of sphere = $\frac{4}{3} \pi r^3$

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



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

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

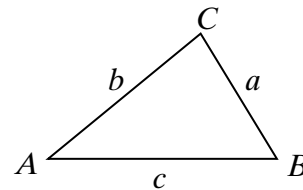


In any triangle ABC

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



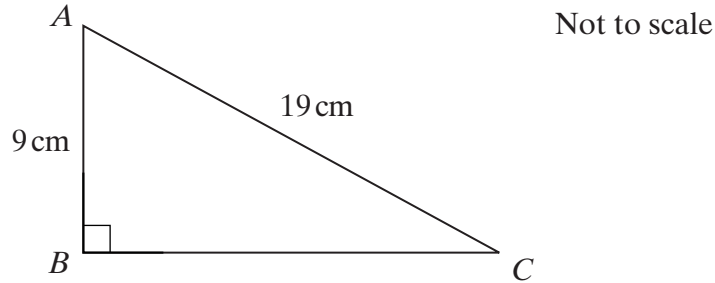
The Quadratic Equation

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 (a) ABC is a right-angled triangle.
 $AC = 19$ cm and $AB = 9$ cm.



Calculate the length of BC .

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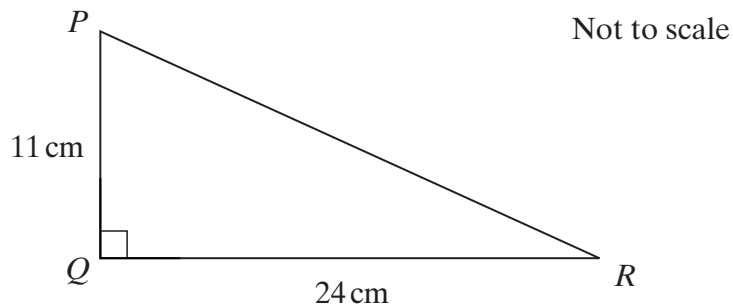
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Answer cm (3 marks)

- (b) PQR is a right-angled triangle.
 $PQ = 11$ cm and $QR = 24$ cm.



Calculate the size of angle PRQ .

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Answer degrees (3 marks)

Turn over ►

2 Solve the equation $5x - 1 = 3(x + 2)$

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Answer $x =$ (3 marks)

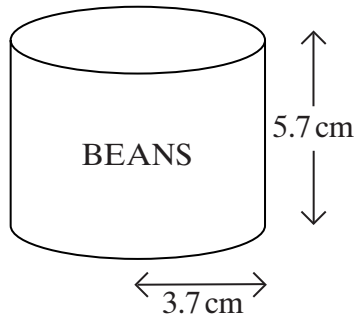
3 A solution of the equation $x^3 - 8x = 110$ lies between $x = 5$ and $x = 6$.

Use trial and improvement to find this solution.
Give your answer to one decimal place.

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Answer $x =$ (3 marks)

- 4 The diagram shows a cylindrical can of beans.
The height is 5.7 cm.
The radius of the base is 3.7 cm.



Not to scale

Calculate the **total** surface area of the can.

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Answer cm² (5 marks)

TURN OVER FOR THE NEXT QUESTION

5 (a) Expand and simplify $4(2x - 1) + 3(x + 6)$

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Answer (2 marks)

(b) Expand $x^2(4 - 2x)$

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Answer (2 marks)

(c) Expand and simplify $(x + 1)(x - 3)$

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Answer (2 marks)

(d) Simplify $2x^3y^5 \times 4x^4y$

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Answer (2 marks)

6

SUPERGROW GARDEN CENTRE

ROSES
£ x each

SHRUBS
£ y each

- (a) Megan buys 4 roses and 3 shrubs.
She pays £33.

Use this information to write down an equation in x and y .

..... (1 mark)

- (b) Josh buys 6 roses and 6 shrubs.
He pays £57.

Use this information to write down another equation in x and y .

..... (1 mark)

- (c) Solve your equations simultaneously to find the values of x and y .
You **must** show your working.
Do **not** use trial and improvement.

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Answer $x =$, $y =$ (3 marks)

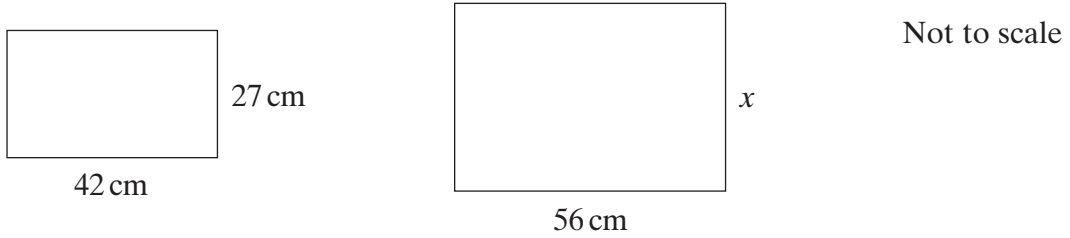
Turn over 

7 (a) Which of these statements are correct?

- P** all isosceles triangles are similar
- Q** all squares are similar
- R** all parallelograms are similar
- S** all regular pentagons are similar

Answer (2 marks)

(b) These two rectangles are similar.

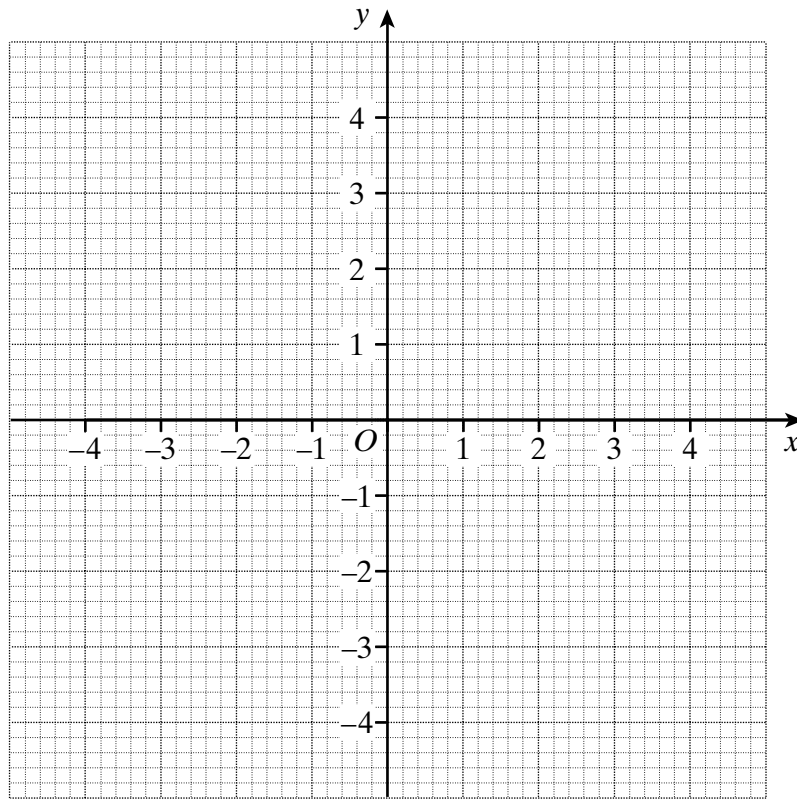


Calculate the value of x .

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Answer cm (3 marks)

- 8 (a) On the grid below, draw the graph of $x^2 + y^2 = 9$



(1 mark)

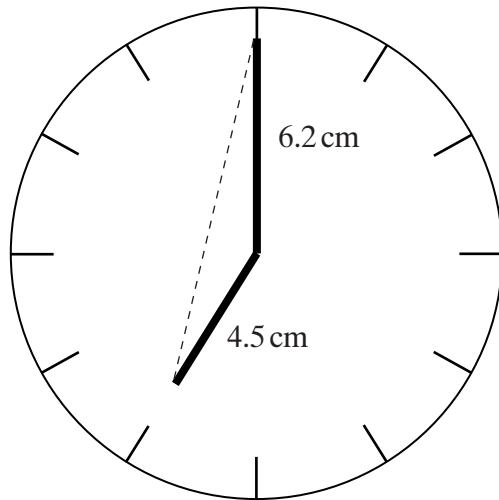
- (b) Write down the equation of the tangent to the curve at the point (0,3).

Answer (1 mark)

TURN OVER FOR THE NEXT QUESTION

Turn over ►

- 9 The hour hand of a clock is 4.5 cm long.
The minute hand is 6.2 cm long.



Not drawn accurately

Calculate the distance between the tips of the hands at 7 o'clock.

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Answer cm (4 marks)

- 10 (a) This is a page from Zoe's exercise book.

$$2^3 - 1^3 = 7 \text{ (prime)}$$

$$3^3 - 2^3 = 19 \text{ (prime)}$$

$$4^3 - 3^3 = 37 \text{ (prime)}$$

The difference
between
consecutive cube
numbers
is always a prime
number.

Give a counter example to show that Zoe is wrong.
Justify your answer.

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(2 marks)

- (b) Prove that $(n + 5)^2 - (n + 3)^2 = 4(n + 4)$

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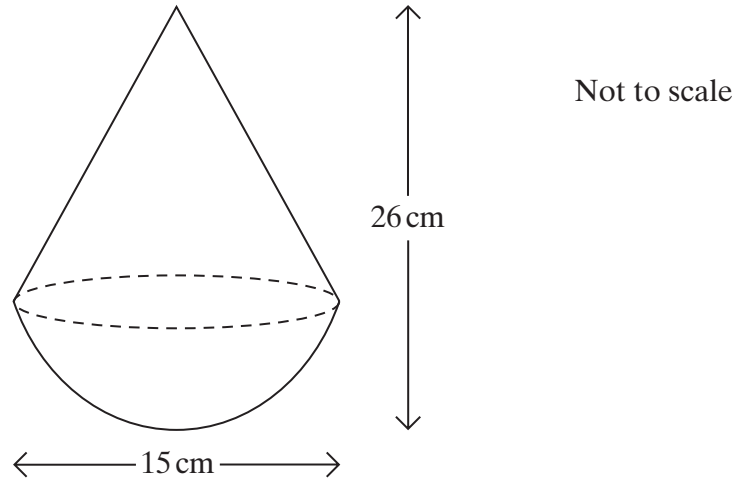
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(3 marks)

Turn over ►

- 11** A child's toy is in the shape of a cone on top of a hemisphere.
The diameter of the hemisphere is 15 cm and the overall height of the toy is 26 cm.



Calculate the volume of this toy.

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Answer cm³ (5 marks)

- 12 The perimeter of a rectangle is 25 cm.
The length of the rectangle is x cm.



Not to scale

x cm

- (a) Write down an expression for the width of the rectangle in terms of x .

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Answer cm (1 mark)

- (b) The area of the rectangle is 38 cm^2 .

Show that $2x^2 - 25x + 76 = 0$

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(2 marks)

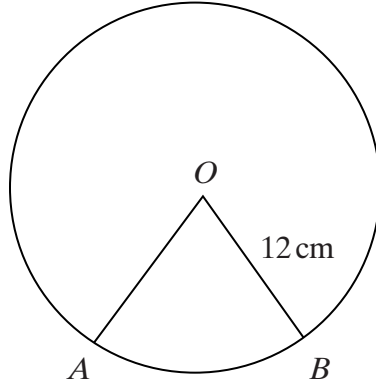
- (c) Solve the equation given in part (b) to find the value of x .
Give your answer to 2 decimal places.

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Answer (3 marks)

Turn over ►

- 13** AOB is a sector of a circle of radius 12 cm.
The area of the minor sector AOB is 98 cm^2 .



Not drawn accurately

Calculate the size of angle AOB .

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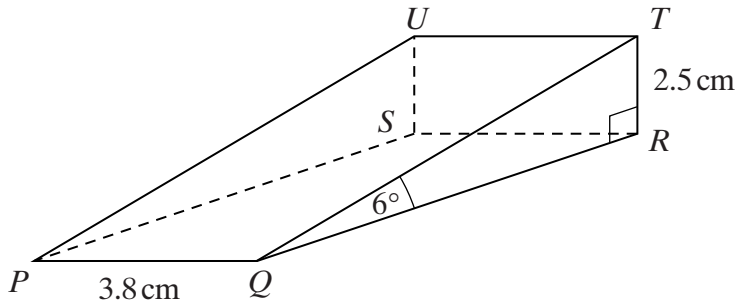
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Answer degrees (3 marks)

- 14** The diagram shows a door-wedge with a rectangular horizontal base $PQRS$.
The sloping face $PQTU$ is also rectangular.
 $PQ = 3.8$ cm and angle $TQR = 6^\circ$
The height TR is 2.5 cm.



Not drawn
accurately

Calculate the length of the diagonal PT .

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Answer cm (5 marks)

TURN OVER FOR THE NEXT QUESTION

Turn over ▶

15 Solve the equation $\frac{2}{y+1} + \frac{3}{2y-3} = 1$

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Answer (5 marks)

END OF QUESTIONS