General Certificate of Secondary Education
November 2009

AQA

MATHEMATICS (MODULAR) (SPECIFICATION B)   **43055/2H**
Module 5 Higher Tier
Paper 2 Calculator

H

Tuesday 10 November 2009   9.00 am to 10.15 am

For this paper you must have:
- a calculator
- mathematical instruments.

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.
- Use a calculator where appropriate.
- Do all rough work in this book.
- If your calculator does not have a π button, take the value of π to be 3.14 unless another value is given in the question.

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.

43055/2H

Formulae Sheet: Higher Tier

Area of trapezium $= \frac{1}{2}(a+b)h$
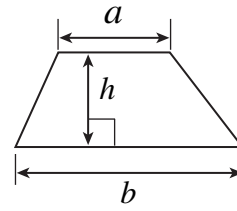
Volume of prism $=$ area of cross-section $\times$ length
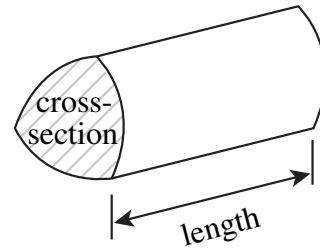
Volume of sphere $= \frac{4}{3}\pi r^3$

Surface area of sphere $= 4\pi r^2$
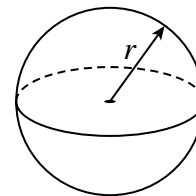
Volume of cone $= \frac{1}{3}\pi r^2 h$

Curved surface area of cone $= \pi r l$
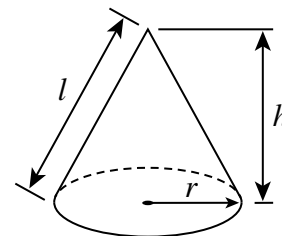
In any triangle *ABC*

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

Sine rule $\quad \dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$

Cosine rule $\quad a^2 = b^2 + c^2 - 2bc \cos A$
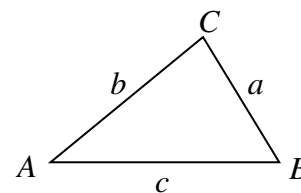
The Quadratic Equation

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   In the diagram, *AEC* and *DEB* are straight lines.
Angle *D* = 38° and angle *C* = 90°
AE = *BE*
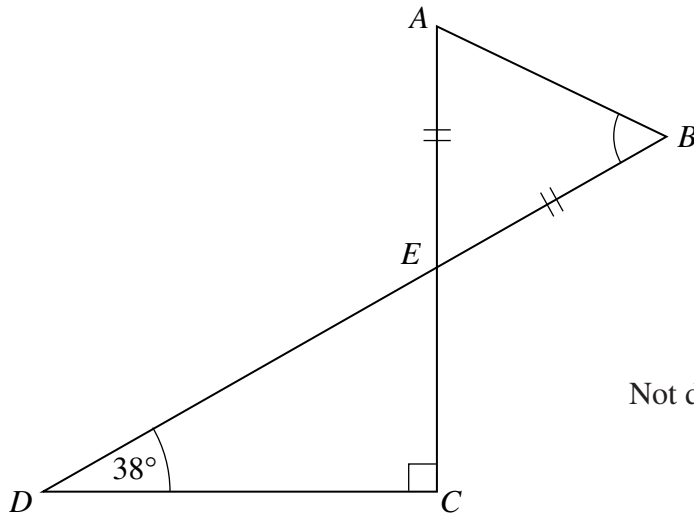
Not drawn accurately

Calculate the size of angle *B*.

....

....

....

....

....

Answer .... degrees   *(4 marks)*

Turn over ▶

2 A solution of the equation $x^3 - 5x = 31$ lies between $x = 3$ and $x = 4$

Use trial and improvement to find this solution, to one decimal place.
The first trial is shown in the table.

x	$x^3 - 5x$	Comment
3	$27 - 15 = 12$	Too small

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

0 4

3 (a) The diagram shows a trapezium.

7.8 cm

6.2 cm

7.5 cm

Not drawn accurately

14.8 cm
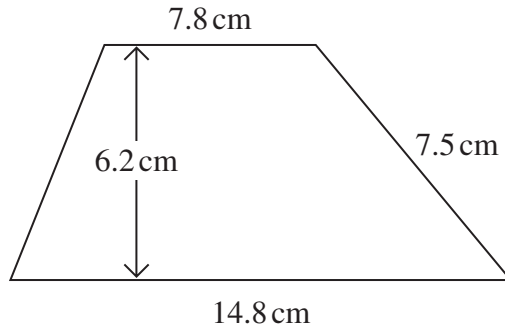
Calculate the area of the trapezium.

....

....

....

....

Answer .... cm² *(2 marks)*

3 (b) Calculate the area of a semicircle of diameter 34 cm.

Not drawn accurately

←——— 34 cm ———→
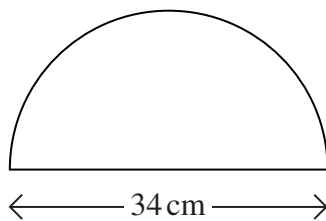
Give your answer to a suitable degree of accuracy.

....

....

....

....

Answer .... cm² *(3 marks)*

8

Turn over ▶

4   (a)   Complete the table of values for $y = 7 + 2x - x^2$

x	–2	–1	0	1	2	3	4
y	–1	4	7		7	4	

....

....

(2 marks)

4   (b)   Draw the graph of $y = 7 + 2x - x^2$ for values of *x* from –2 to 4.
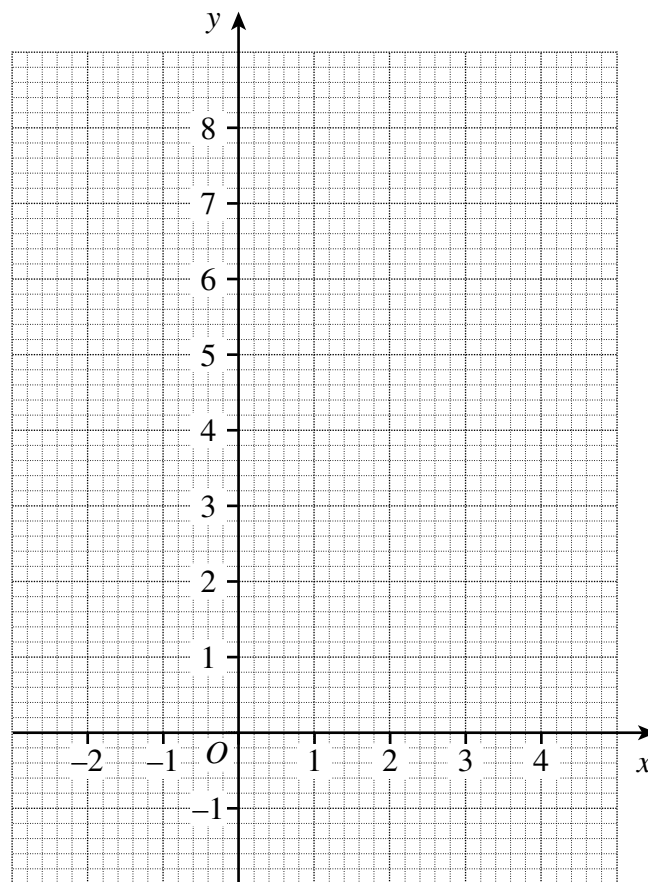
(2 marks)

4   (c)   Use your graph to solve the equation $7 + 2x - x^2 = 0$

Answer ....   *(2 marks)*

4   (d)   This graph has a line of symmetry.

Write down its equation.

Answer ....   *(1 mark)*

5 The diagram shows a parallelogram.
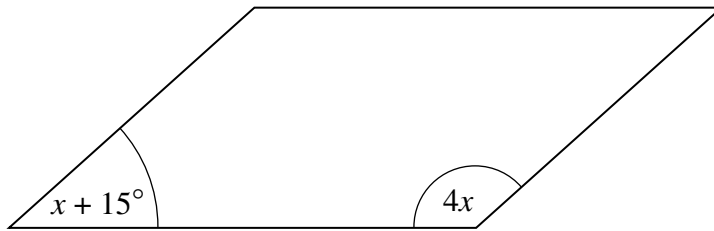
Not drawn
accurately

Work out the value of *x*.

....

....

....

....

Answer .... degrees   *(3 marks)*

Turn over for the next question

10

Turn over ▶

6 (a) Describe fully the **single** transformation which takes shape *A* to shape *B*.

....

....

....
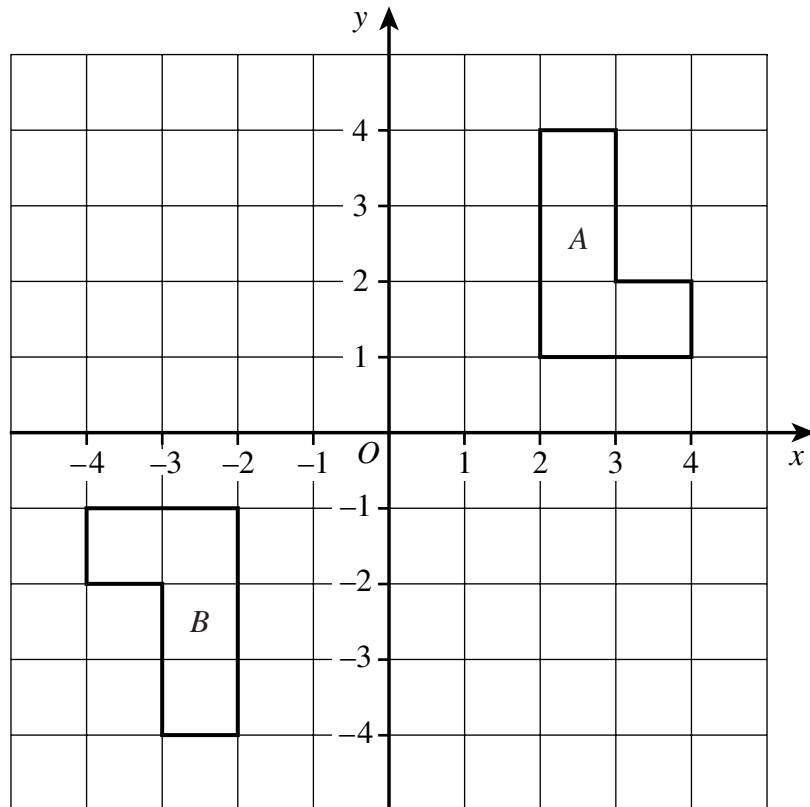
(3 marks)

6 (b) Describe fully the **single** transformation which takes triangle *T* to triangle *V*.

....

....

....

(3 marks)

Turn over ▶
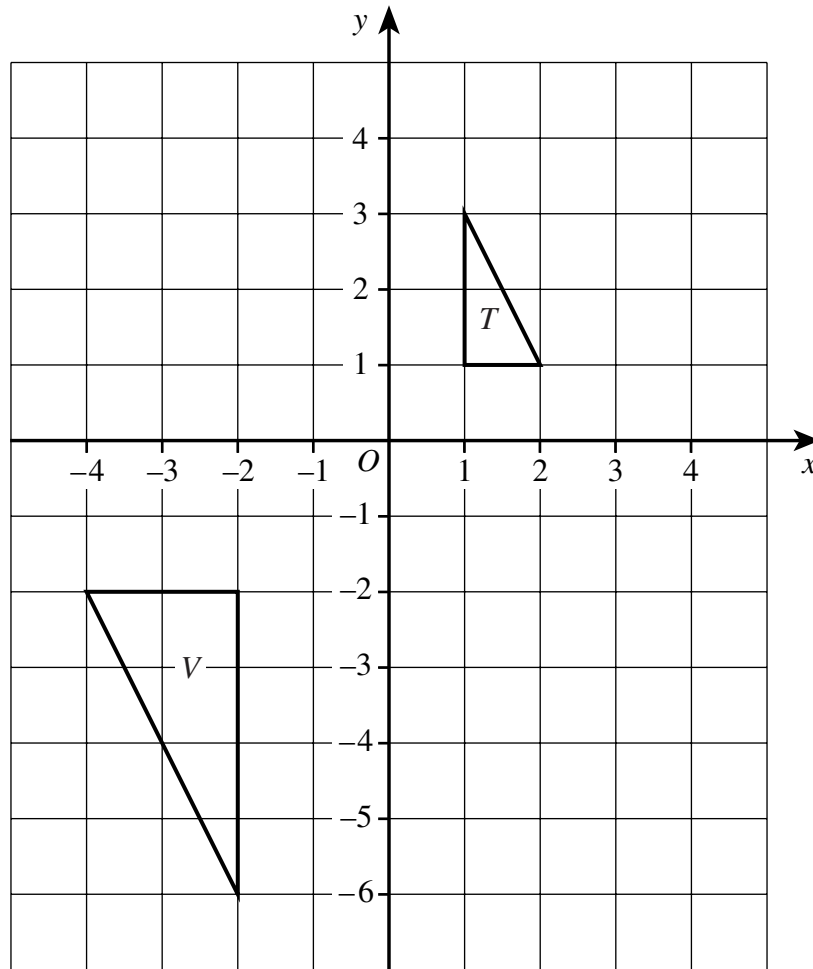
7 The diagram shows a triangular prism of length 44 cm.
The volume of the prism is 1089 cm³.

44 cm
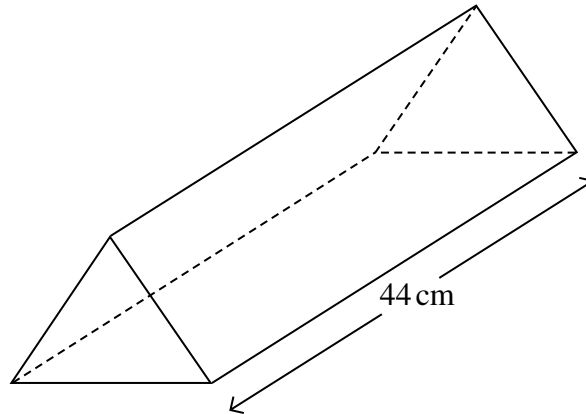
Calculate the area of the triangular cross-section of this prism.
State the units of your answer.

....

....

....

....

Answer ....   *(3 marks)*

8 **(a)** Sofia measures the length of her foot.
It is 23 cm, to the nearest centimetre.

Write down the greatest possible length of Sofia's foot.

Answer .... cm   *(1 mark)*

8 **(b)** Tanya measures the length of her foot.
It is 19.5 cm, to the nearest half centimetre.

Write down the smallest possible length of Tanya's foot.

Answer .... cm   *(1 mark)*

9 Part of a number grid is shown below.

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31	32	33	34	35
36	37	38	39	40	41	42
43	44	45	46	47	48	49
50	51	52	53	54	55	56

The shaded shape is called S_{18} because 18 is at the left-hand end of the top row.

9 (a) This is S_n

n		
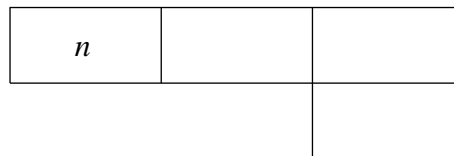
Fill in the empty boxes of S_n

(2 marks)

9 (b) The sum of all the numbers in S_n is always a multiple of 4

Explain why.

....

....

....

....

(3 marks)

10

Turn over ▶

10 (a) Expand and simplify $4(c + 1) - 3(c - 2)$

....

....

....

Answer .... *(2 marks)*

10 (b) Simplify $2x^3y \times 3x^2y^3$

....

....

Answer .... *(2 marks)*

10 (c) Solve the inequality $7n - 1 < 3n + 5$

....

....

....

....

Answer .... *(2 marks)*

11 (a) In triangle *ABC*, angle *A* = 90°
AB = 9 cm and *BC* = 13 cm
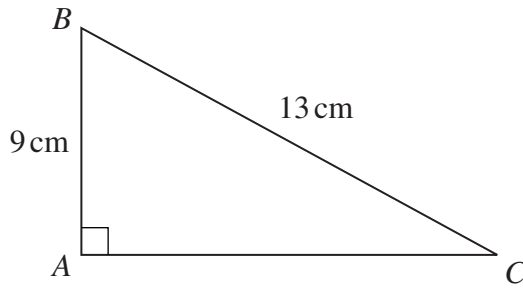
Not drawn
accurately

Calculate the size of angle *C*.

....

....

....

....

Answer .... degrees   *(3 marks)*

11 (b) In triangle *PQR*, angle *R* = 105°, *PR* = 8 cm and *RQ* = 11 cm
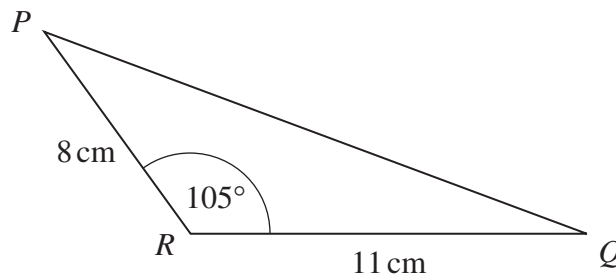
Not drawn
accurately

Calculate the length of *PQ*.

....

....

....

....

....

Answer .... cm   *(3 marks)*

12

Turn over ▶

12 The diagram shows a triangle with height h cm.
The base of the triangle is 7 cm longer than its height.
The area of the triangle is 36 cm^2.
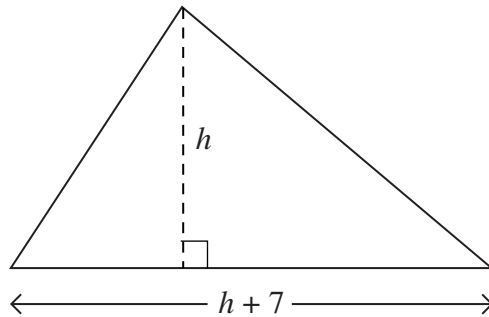
Not drawn
accurately

12 (a) Show that $h^2 + 7h - 72 = 0$

....

....

....

....

....

(3 marks)

12 (b) Solve the equation $h^2 + 7h - 72 = 0$ to find the height of the triangle.
Give your answer to two decimal places.

....

....

....

....

....

....

Answer .... cm *(3 marks)*

*Areas outside
the box will
not be scanned
for marking*

13 The surface area of a sphere is $2450 \, \text{cm}^2$.

Calculate the radius of the sphere.

....

....

....

....

....

Answer .... cm   *(3 marks)*

14 Solve the simultaneous equations.

$$y = 2x + 3$$
$$x^2 + y^2 = 2$$

....

....

....

....

....

....

....

....

Answer ....
(6 marks)

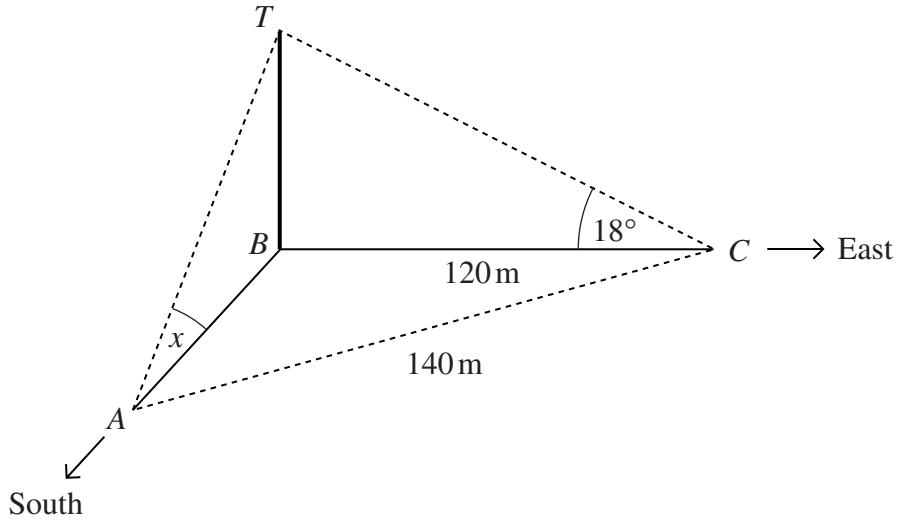**Turn over for the next question**

15

Turn over ▶

15 *TB* is a vertical tower on level ground.

Point *C* is 120 metres due east of the tower.
The angle of elevation of the top of the tower from point *C* is 18°.

A is a point due south of the tower.
The distance *AC* is 140 metres.

The angle of elevation of the top of the tower from point *A* is marked *x*.

Calculate *x*.

....

....

....

....

....

....

....

....

Answer .... degrees   *(5 marks)*

END OF QUESTIONS

5