Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Pages	Mark
3	
4–5	
6–7	
8–9	
10–11	
12–13	
14–15	
16–17	
18	
TOTAL	

General Certificate of Secondary Education
Higher Tier
November 2010

Mathematics (Modular) (Specification B) Module 5

43055/1H

H

Paper 1 Non-calculator

Tuesday 9 November 2010 9.00 am to 10.15 am

For this paper you must have:
- mathematical instruments.

You must **not** use a calculator.

Time allowed
- 1 hour 15 minutes

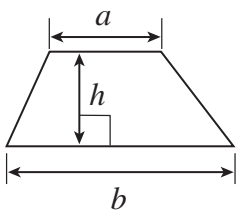
Instructions
- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work you do not want to be marked.

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

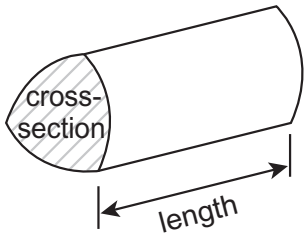
Advice
- In all calculations, show clearly how you work out your answer.

Formulae Sheet: Higher Tier

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

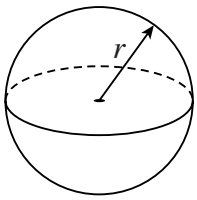


Volume of prism = area of cross-section × length



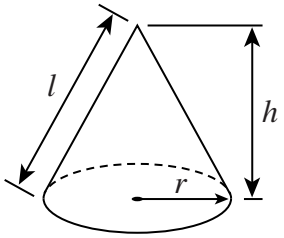
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

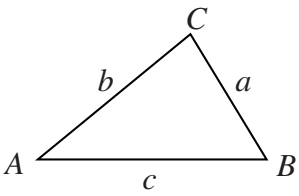
Curved surface area of cone = $\pi r l$



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 In each part, circle the odd one out.
Give a reason for your answer.

1 (a) $x + 4 = 12$ $x - 5 = 13$ $4x = 32$

Reason .....

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(1 mark)

1 (b) Circumference Perimeter Volume Height

Reason .....

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(1 mark)

1 (c) Sector Arc Chord Diameter

Reason .....

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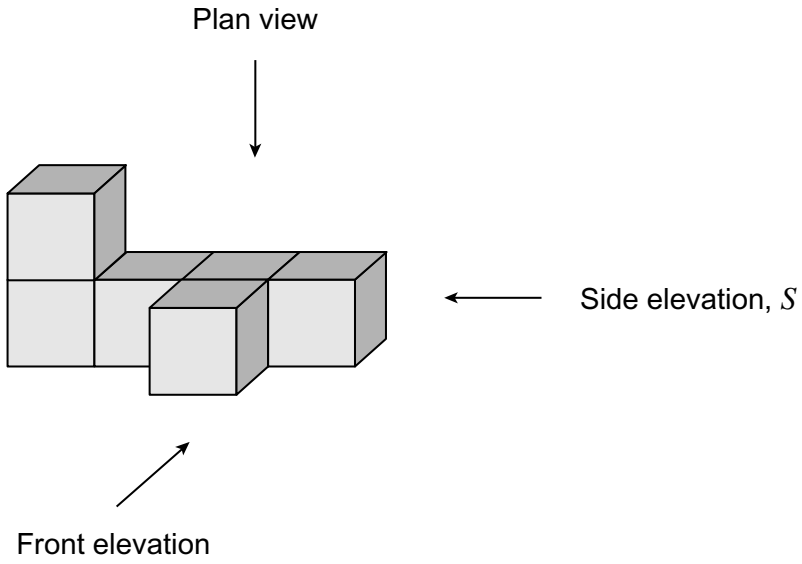
(1 mark)

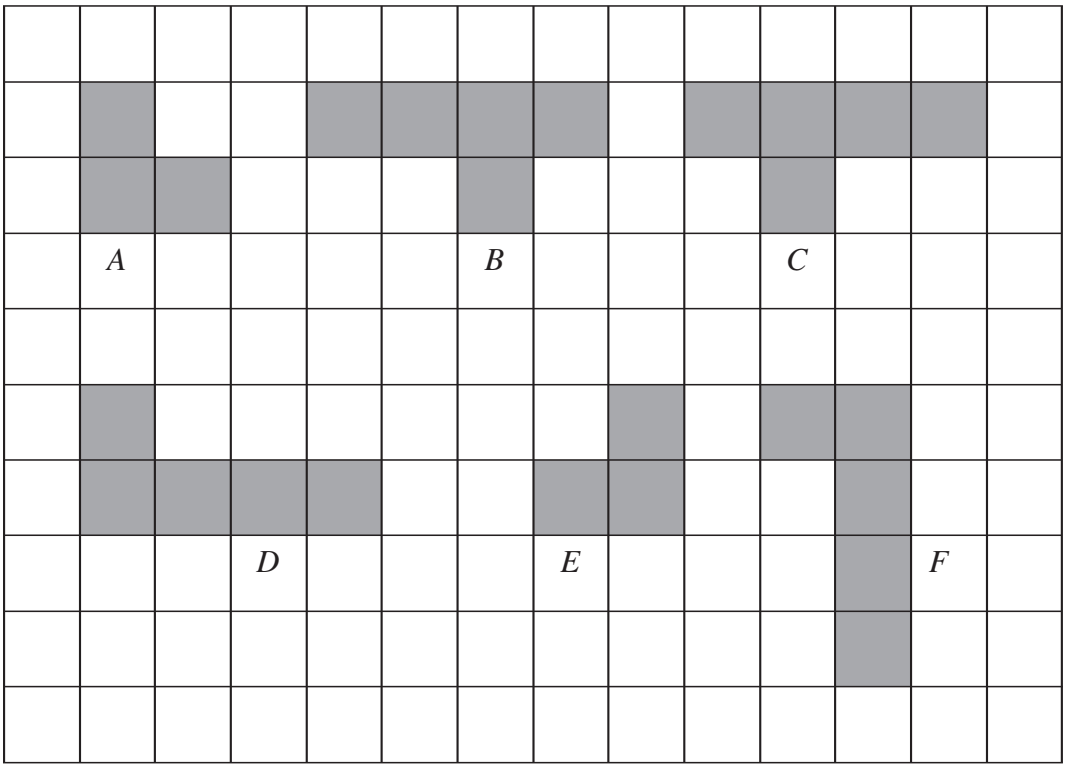
Turn over for the next question

3

2 This solid shape is made from centimetre cubes.



2 (a) Here are some diagrams.



2 (a) (i) Which is the plan view?

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

2 (a) (ii) Which is the front elevation?

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

2 (a) (iii) Which is the side elevation, S?

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

2 (b) What is the total surface area of the solid?
State the units of your answer.

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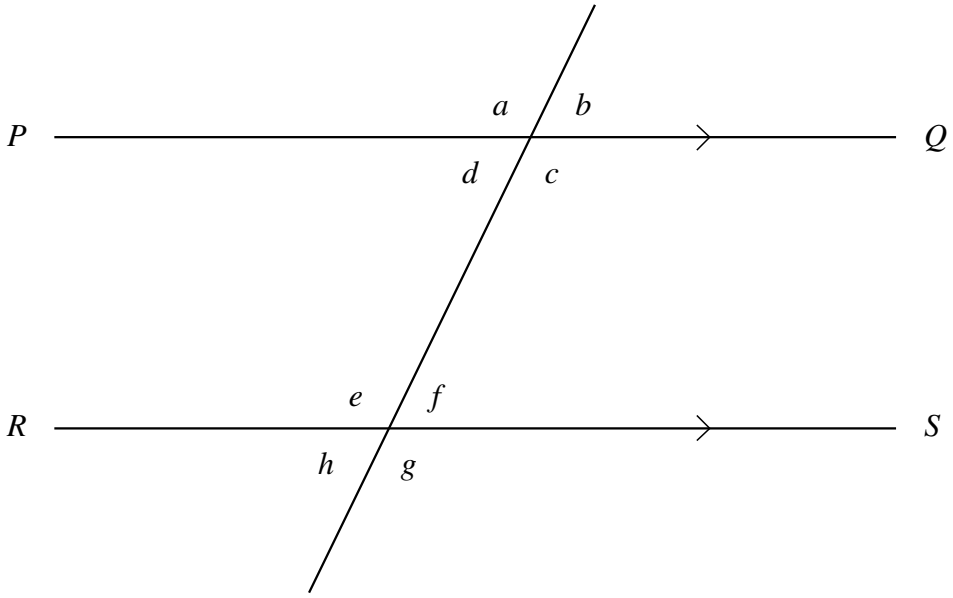
Answer ..... *(3 marks)*

Turn over for the next question

6

3 On the diagram PQ is parallel to RS.



3 (a) Which angle is vertically opposite to angle a?

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

3 (b) Which angle is alternate to angle f?

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

3 (c) Which angle is corresponding to angle c?

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

4 The values of some expressions for $x = 4$ and $x = 7$ are shown.

Expression	Value when $x = 4$	Value when $x = 7$
$3x^2$	48	
$6 - \frac{3x}{2}$		$-4\frac{1}{2}$
	9	12
$\frac{1}{3 - x}$		$-\frac{1}{4}$

Complete the **four** missing entries in the table.

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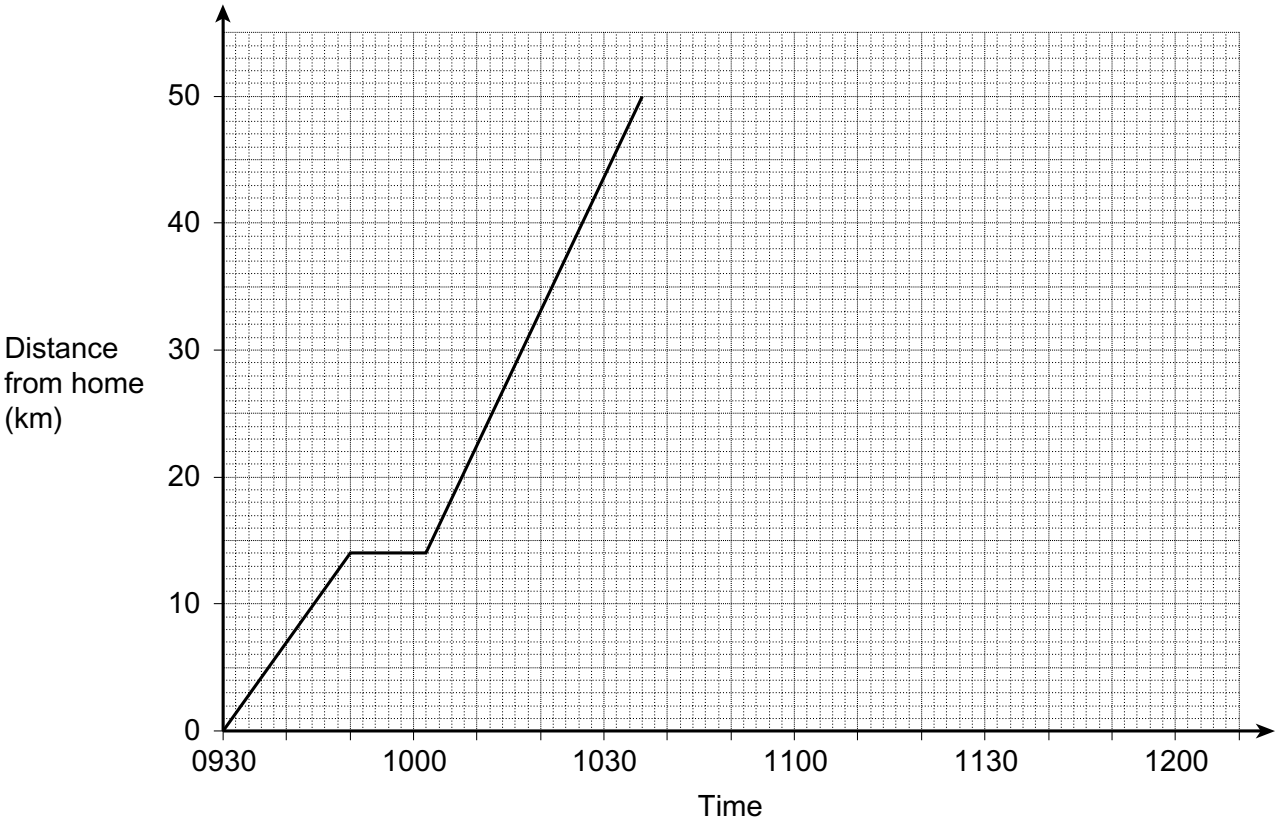
(4 marks)

Turn over for the next question

7

5 Marcus leaves home at 0930 to drive to Leeds, 50 km away.
He stops at a petrol station on his way to Leeds.
The graph shows his journey to Leeds.



5 (a) How far has he gone before he stops at the petrol station?

Answer ..... km *(1 mark)*

5 (b) How many minutes is he at the petrol station?

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Answer ..... minutes *(1 mark)*

5 (c) Marcus stays in Leeds until 1110.
He leaves Leeds and arrives home at 1150.

5 (c) (i) Complete the graph.

(1 mark)

5 (c) (ii) Calculate his average speed for the return journey.
Give your answer in kilometres per hour.

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Answer ..... km/h *(2 marks)*

5 (d) Here is a formula for working out the total petrol costs, T (£), for one year.

$$T = \frac{dA}{p}$$

The table shows information for Marcus.

Distance travelled in one year (d)	30 000 kilometres
Average cost of petrol (A)	£1.10 per litre
Petrol consumption (p)	15 kilometres per litre

5 (d) (i) Work out his total petrol costs for one year.

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Answer £ ..... *(3 marks)*

5 (d) (ii) In the following year Marcus travels fewer kilometres but his total petrol costs stay the same.

Give a possible reason for this.

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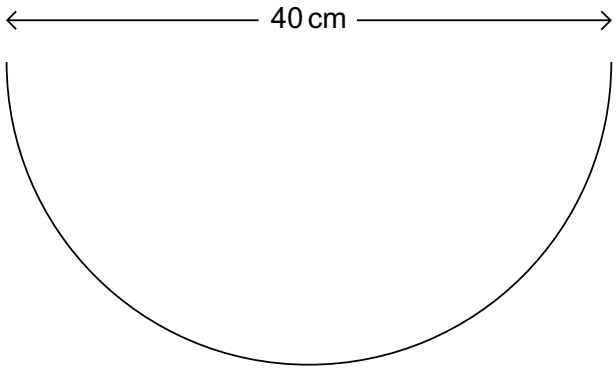
(1 mark)

9

6 A wire is in the shape of a semi-circle of diameter 40 cm.



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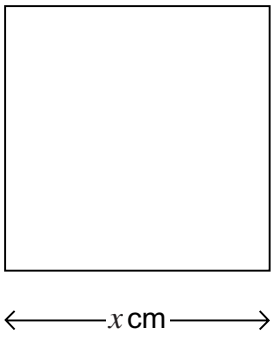
The wire is bent into the shape of a square of side x cm.



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Work out the value of x.
Use $\pi = 3.14$ in your calculations.

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Answer ..... cm *(4 marks)*

7 (a) Multiply out $4(x - 5)$

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

7 (b) Solve $9x + 7 = 4x - 3$

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

7 (c) Solve $8x - 3 < 2$

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Answer ..... *(2 marks)*

7 (d) Simplify fully $5x^4y^2 \times 3x^3y^7$

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Answer ..... *(2 marks)*

7 (e) Solve $\frac{x + 20}{3} = x - 4$

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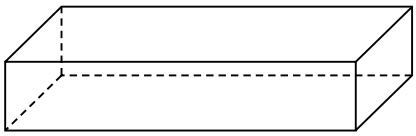
Answer x = ... *(3 marks)*

15

8 The diagram shows a cuboid.
All the faces are rectangles.



How many planes of symmetry does the cuboid have?

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

9 Solve the simultaneous equations $2y = x + 6$
$y = 2x - 3$

You **must** show your working.
Do **not** use trial and improvement.

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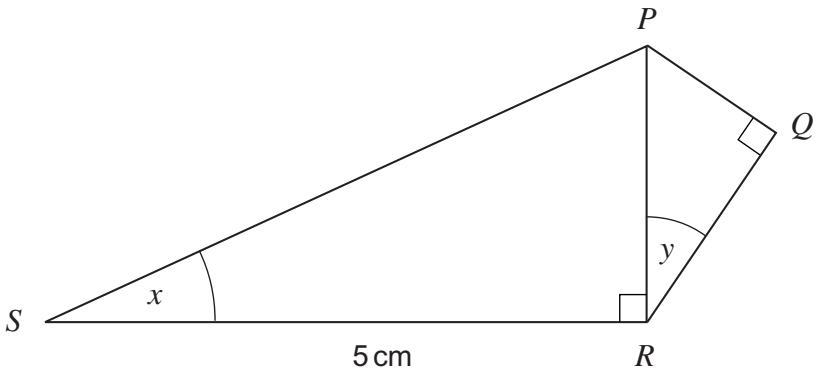
Answer x = ..., y = ... *(3 marks)*

10 The diagram is made up of two right-angled triangles, PQR and PRS.
The length of SR is 5 cm.

tan x = 0.8 and cos y = 0.9

Not drawn accurately



Work out the length of QR.

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Answer ..... cm *(4 marks)*

Turn over for the next question

8

11 (a) Make x the subject of $y = \frac{x}{w} - t$

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

11 (b) (i) Expand and simplify $(2x + 3y)(x - y)$

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

11 (b) (ii) Using your answer to part (i), or otherwise,

expand and simplify $(2x^2 + 3y^3)(x^2 - y^3)$

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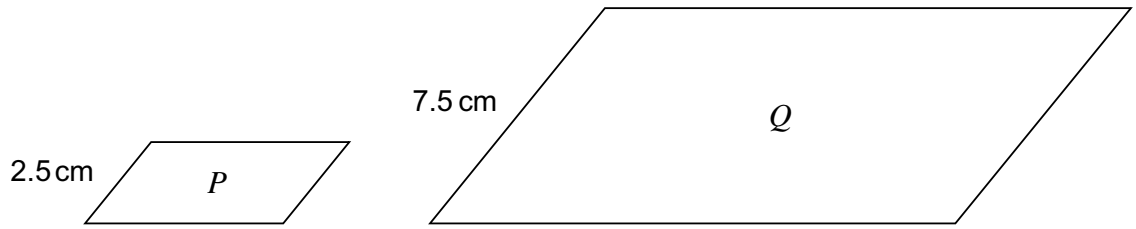
Answer ..... *(2 marks)*

12 The diagram shows two similar parallelograms, P and Q.

Not drawn accurately



The lengths of the shorter sides are 2.5 cm and 7.5 cm, as shown.
The area of parallelogram Q is 54 cm^2.

Work out the area of parallelogram P.

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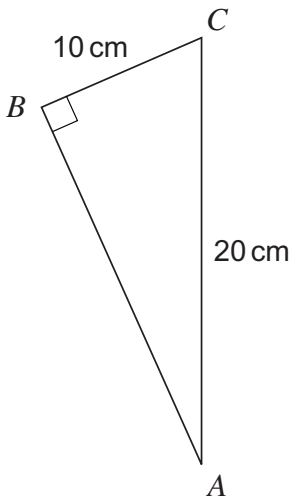
Answer ..... cm^2 *(3 marks)*

Turn over for the next question

10

13 Triangle ABC is right-angled at B.

You are given $\sin 30° = 0.5$ $\sin 60° = 0.866$
$\cos 30° = 0.866$ $\cos 60° = 0.5$



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13 (a) Work out the area of triangle ABC.

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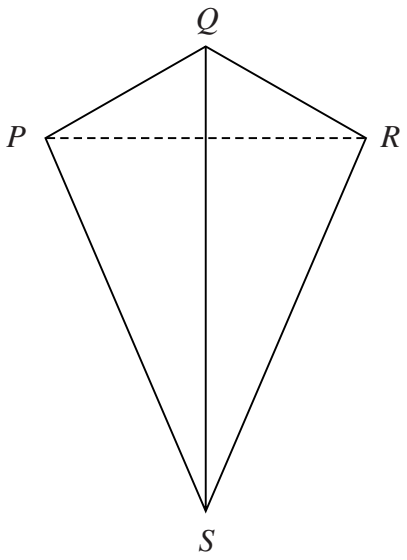
Answer ..... cm^2 *(4 marks)*

13 (b) A kite $PQRS$ is made by putting two of these triangles together as shown.



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Use your answer to part (a), or another method, to work out the length of the diagonal PR.

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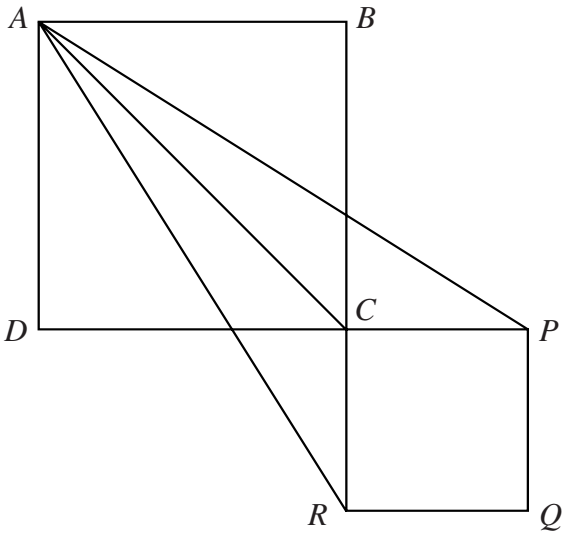
Answer ..... cm *(4 marks)*

Turn over for the next question

8

14 In the diagram, $ABCD$ and $CPQR$ are squares.
BCR and DCP are straight lines.



Prove that triangles ACP and ACR are congruent.
You **must** show your working.
Give reasons for the statements you make.

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(4 marks)

END OF QUESTIONS

4

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