

Surname					Other Names				
Centre Number					Candidate Number				
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General Certificate of Secondary Education
June 2004



MATHEMATICS (MODULAR) (SPECIFICATION B) 33005/H1
Module 5 Higher Tier
Paper 1 Non-Calculator

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Tuesday 8 June 2004 1.30 pm to 2.45 pm

<p>In addition to this paper you will require:</p> <ul style="list-style-type: none"> mathematical instruments. <p>You must not use a calculator.</p>	
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For Examiner's Use	
Pages	Mark
3	
4 – 5	
6 – 7	
8 – 9	
10 – 11	
12 – 13	
14 – 15	
16 – 17	
18 – 19	
20 – 21	
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.

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.

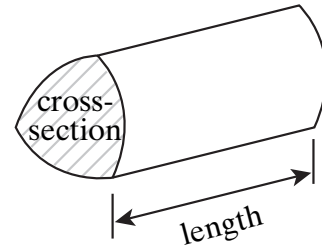
Advice

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

Formulae Sheet: Higher Tier

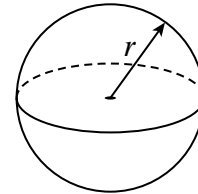
You may need to use the following formulae:

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



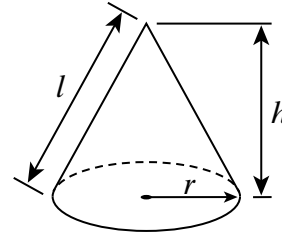
Volume of sphere = $\frac{4}{3} \pi r^3$

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



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

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

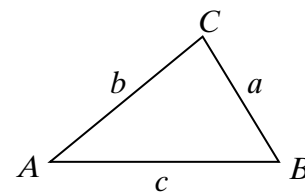


In any triangle ABC

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 sequence of numbers is shown.

2 5 8 11 14

(a) Find an expression for the n th term of the sequence.

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.....

Answer (2 marks)

(b) Explain why 99 will not be a term in this sequence.

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.....
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(2 marks)

TURN OVER FOR THE NEXT QUESTION



Turn over ►

- 2 (a) The line LM is drawn below.



Use ruler and compasses to construct the perpendicular bisector of LM .
You **must** show clearly all your construction arcs.

(2 marks)

- (b) Complete the sentence.

The perpendicular bisector of LM is the locus of points which are

.....
(1 mark)

3 Here is a list of quadrilaterals.

kite rectangle rhombus square trapezium

For each of the following descriptions, choose the correct name from the list.
You may find it helpful to sketch the quadrilaterals in the spaces provided.

- (a) One pair of sides are parallel.
The other two sides are not parallel.

Answer (1 mark)

- (b) All the angles are the same size.
Only opposite sides are equal.

Answer (1 mark)

- (c) All the sides are the same length.
The diagonals are not equal in length.

Answer (1 mark)

Turn over ►

4 (a) Complete the table of values for $y = 2x^2 - 4x - 1$

x	-2	-1	0	1	2	3
y	15		-1		-1	5

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(2 marks)

(b) On the grid opposite, draw the graph of $y = 2x^2 - 4x - 1$ for values of x from -2 to +3.

(2 marks)

(c) An approximate solution of the equation $2x^2 - 4x - 1 = 0$ is $x = 2.2$

(i) Explain how you can find this from the graph.

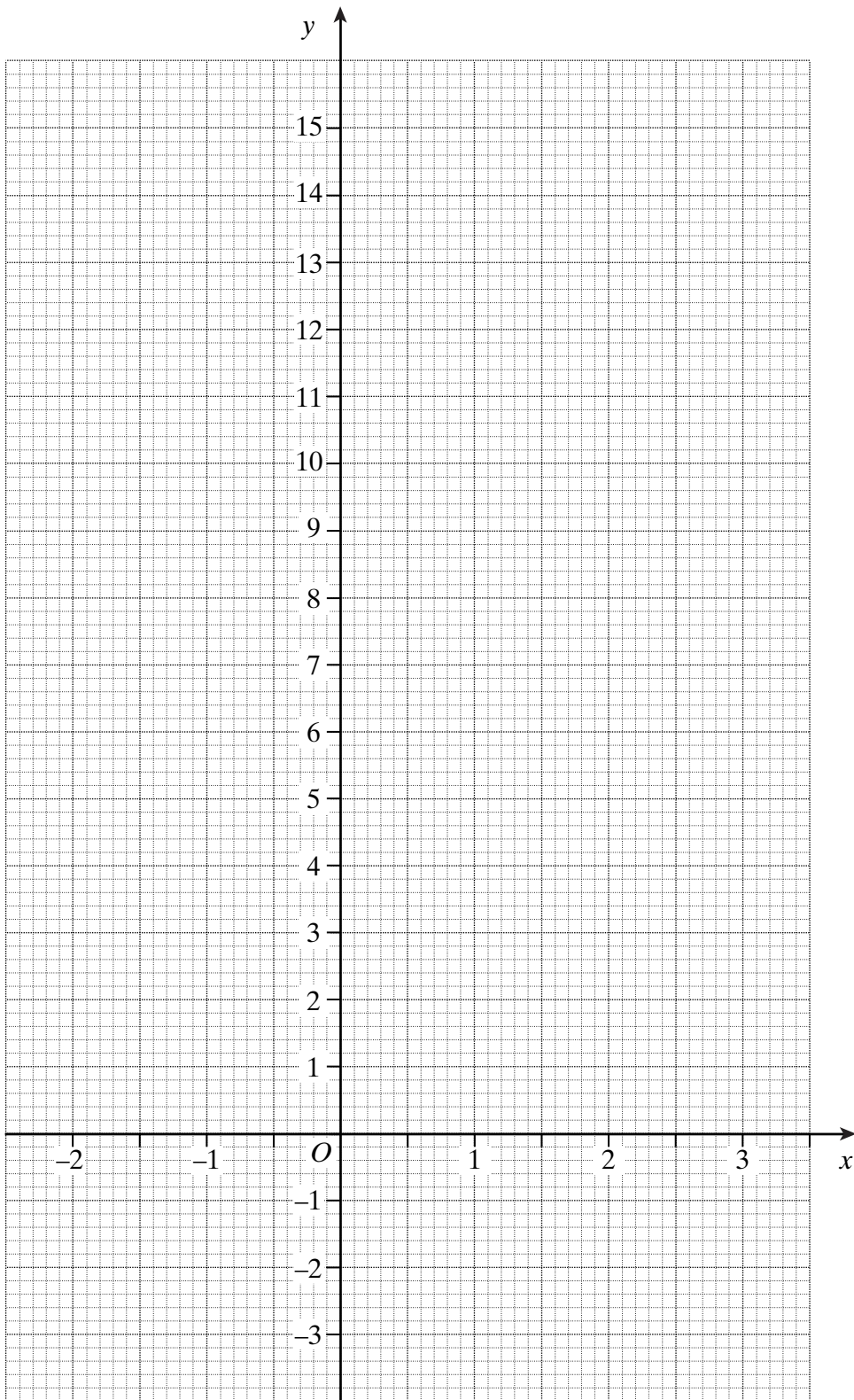
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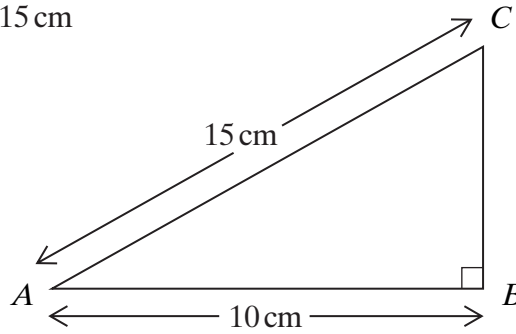
(1 mark)

(ii) Use your graph to write down another solution of this equation.

Answer $x =$ (1 mark)



- 5 (a) The diagram shows a right-angled triangle ABC .
 $AB = 10\text{ cm}$ and $AC = 15\text{ cm}$



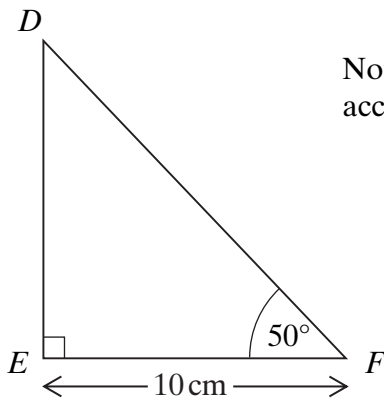
Not drawn accurately

Calculate the length of BC .
 Leave your answer as a square root.

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Answer cm (3 marks)

- (b) The diagram shows a right-angled triangle DEF .
 $EF = 10\text{ cm}$
 Angle $F = 50^\circ$



Not drawn accurately

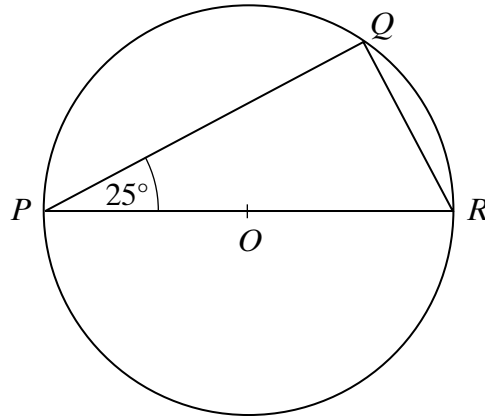
Angle	Sine	Cosine	Tangent
40°	0.643	0.766	0.839
50°	0.766	0.643	1.192

Use the table of data to work out the length of DE .

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Answer cm (3 marks)

- 6 (a) In the diagram, O is the centre of the circle and P , Q and R are points on the circumference.
Angle $P = 25^\circ$



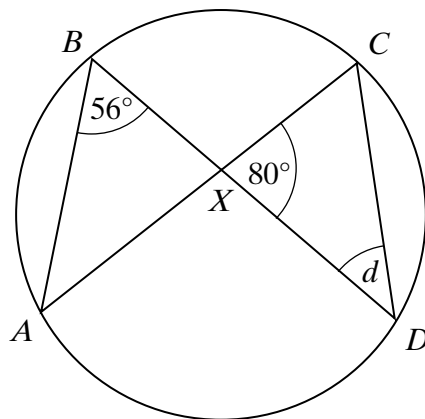
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Work out the size of angle R .

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Answer degrees (2 marks)

- (b) A , B , C and D are four points on the circumference of another circle.
 AC meets BD at X .
Angle $ABD = 56^\circ$ and angle $CXD = 80^\circ$



Not drawn accurately

Work out the value of angle d .
You **must** show all your working.

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Answer degrees (3 marks)

Turn over ►

7 (a) Factorise $x^2 - 10x + 25$

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Answer (2 marks)

(b) Factorise $2x^2 + 3x - 5$

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Answer (2 marks)

8 Solve the simultaneous equations

$$4x + 3y = 5$$

$$2x - 5y = 9$$

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

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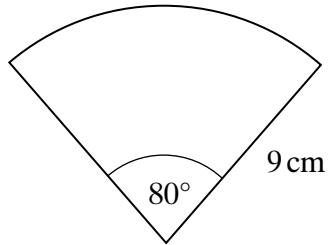
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Answer $x = \dots\dots\dots$, $y = \dots\dots\dots$ (4 marks)

TURN OVER FOR THE NEXT QUESTION

Turn over 

- 9 (a) The diagram shows a sector of a circle of radius 9 centimetres.



Not drawn accurately

Find the perimeter of the sector.
Give your answer in terms of π .

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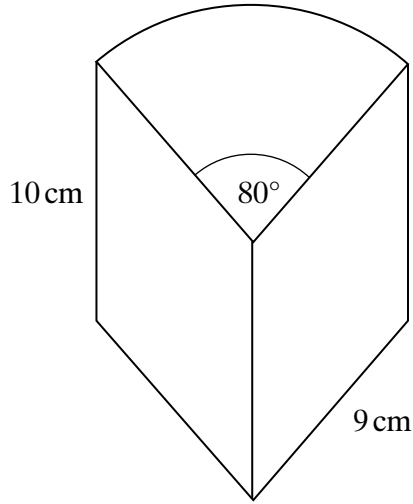
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Answer cm (3 marks)

- (b) The cross-section of a prism is a sector of a circle, of radius 9 centimetres, as shown. The height of the prism is 10 centimetres.



Not drawn accurately

Calculate the volume of the prism.
Give your answer in terms of π .

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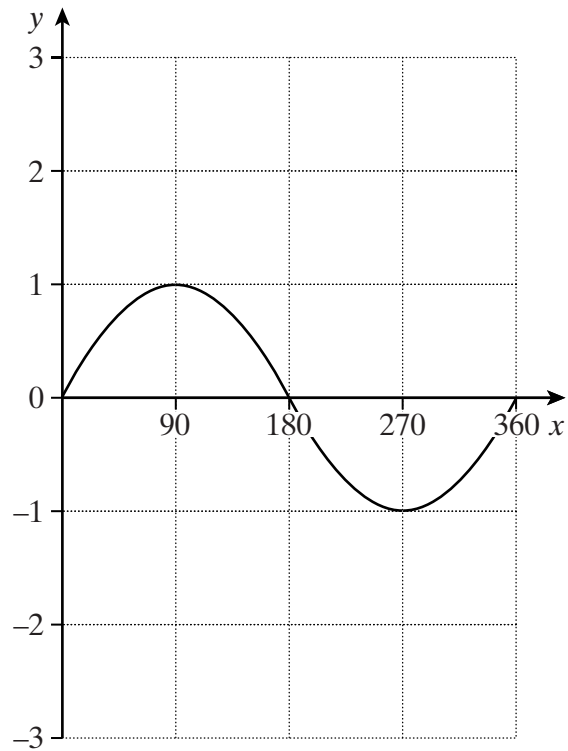
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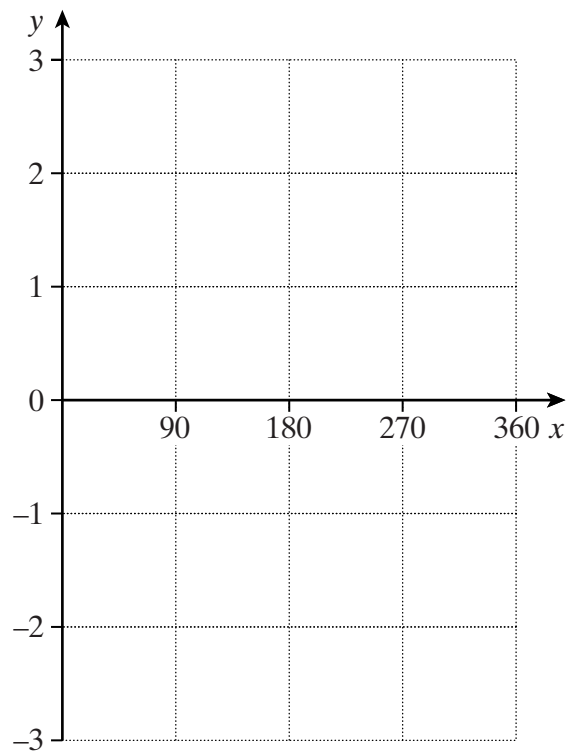
Answer (4 marks)

10 The diagram shows the graph of $y = \sin x^\circ$ for $0 \leq x \leq 360$



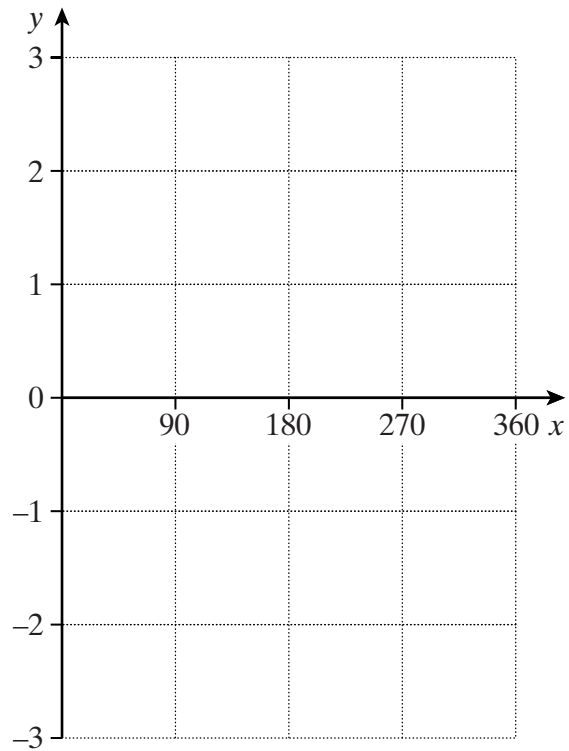
On the axes below sketch the following graphs.

(a) $y = 2 \sin x^\circ$ for $0 \leq x \leq 360$



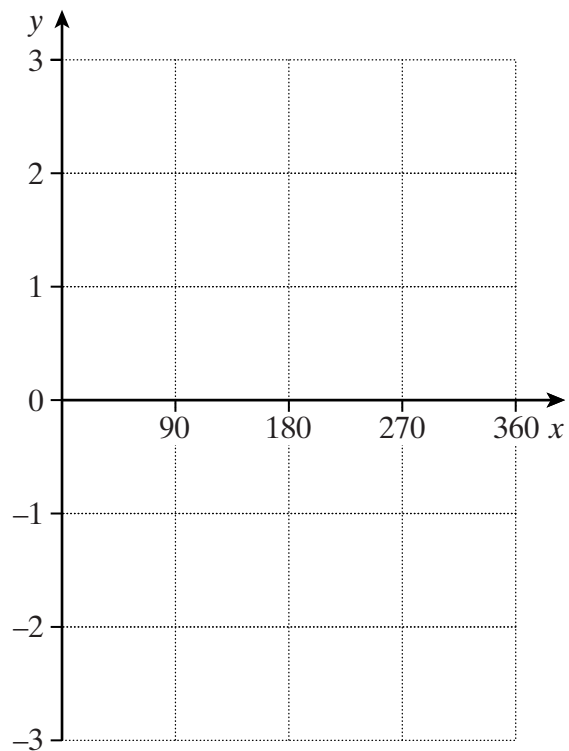
(1 mark)

(b) $y = \sin 2x^\circ$ for $0 \leq x \leq 360$



(1 mark)

(c) $y = 2 + \sin x^\circ$ for $0 \leq x \leq 360$

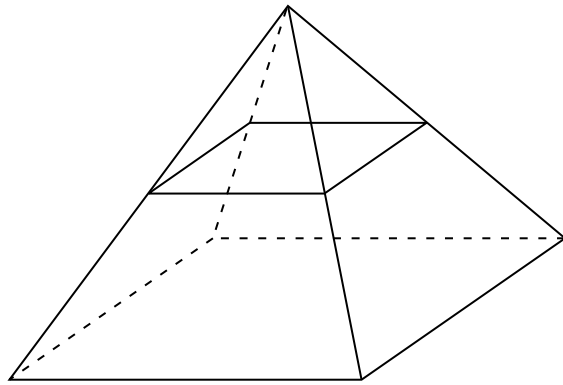


(1 mark)

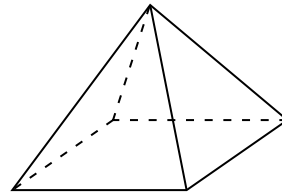
Turn over 

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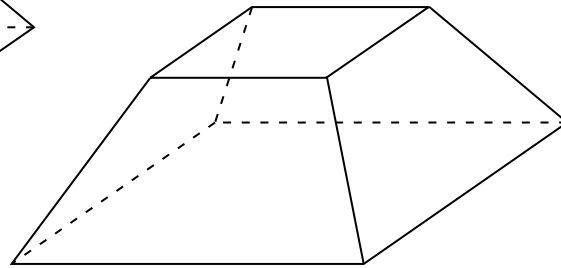
- 11 A square-based pyramid *A* is divided into two parts: a square-based pyramid *B* and a frustum *C*, as shown.



Pyramid *A*



Pyramid *B*



Frustum *C*

Pyramid *A* is similar to pyramid *B*.

The base of pyramid *A* is a square of side 10 cm.

The base of pyramid *B* is a square of side 5 cm.

The vertical height of pyramid *A* is 12 cm.

- (a) You are given the formula

$$\text{Volume of a pyramid} = \frac{1}{3} \times \text{area of base} \times \text{vertical height}$$

Calculate the volume of the frustum *C*.

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Answer cm³ (4 marks)

- (b) Express the volume of the frustum C as a fraction of the volume of the larger pyramid A .
Give your answer in its simplest form.

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Answer (2 marks)

TURN OVER FOR THE NEXT QUESTION

12 (a) Simplify $\frac{6(x+5)^2}{2(x+5)}$

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Answer (2 marks)

(b) Simplify $\frac{x^2 - 9}{x^2 + 3x}$

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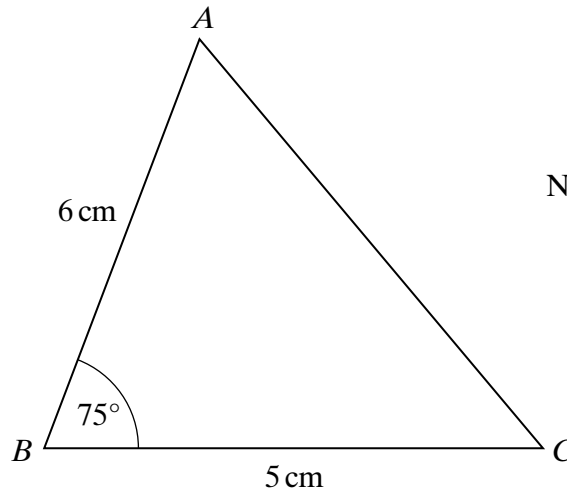
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Answer (3 marks)

- 13 The diagram shows a triangle ABC .
 $AB = 6\text{ cm}$, $BC = 5\text{ cm}$ and angle $B = 75^\circ$



You are given that $\sin 75^\circ = 0.966$ to 3 significant figures.

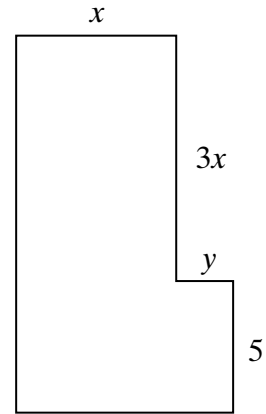
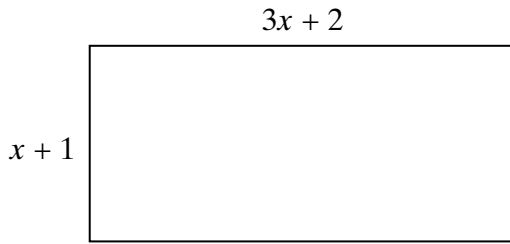
Calculate the area of the triangle.
Give your answer to a suitable degree of accuracy.

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Answer cm^2 (3 marks)

- 14** The diagrams show a rectangle and an L shape.
All the angles are right angles.
All lengths are in centimetres.
The shapes are equal in area.

Diagrams not to scale



Calculate the value of y .

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Answer cm (6 marks)

15 (a) Find the values of a and b such that

$$x^2 + 6x - 3 = (x + a)^2 + b$$

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Answer $a = \dots\dots\dots$, $b = \dots\dots\dots$ (2 marks)

(b) Hence, or otherwise, solve the equation

$$x^2 + 6x - 3 = 0$$

giving your answers in surd form.

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Answer (3 marks)

END OF QUESTIONS

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