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	
18–19	
TOTAL	

General Certificate of Secondary Education
Higher Tier
November 2010

Mathematics (Modular) (Specification B) Module 5

43055/2H

H

Paper 2 Calculator

Friday 12 November 2010 9.00 am to 10.15 am

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

Time allowed
- 1 hour 15 minutes

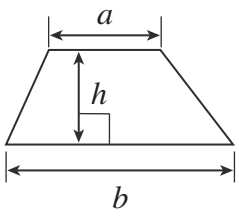
Instructions
- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Use a calculator where appropriate.
- 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 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. This must be tagged securely to this answer booklet.

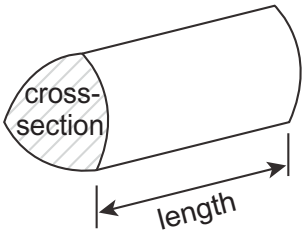
Advice
- In all calculations, show clearly how you work out your answer.

Formulae Sheet: Higher Tier

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

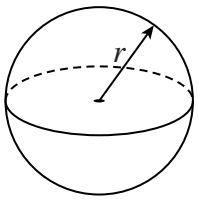


Volume of prism = area of cross-section × length



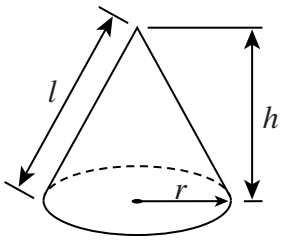
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

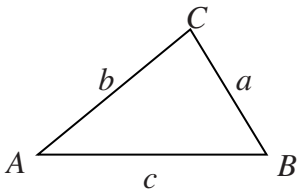
Curved surface area of cone = $\pi r l$



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 (a) Solve $\frac{3}{4}x = 6$

.....

.....

Answer x = ... *(1 mark)*

1 (b) Solve $4(y - 5) = 28$

.....

.....

.....

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

1 (c) w is an integer such that $4 \leqslant 2w < 11$

Work out **all** the possible values of w.

.....

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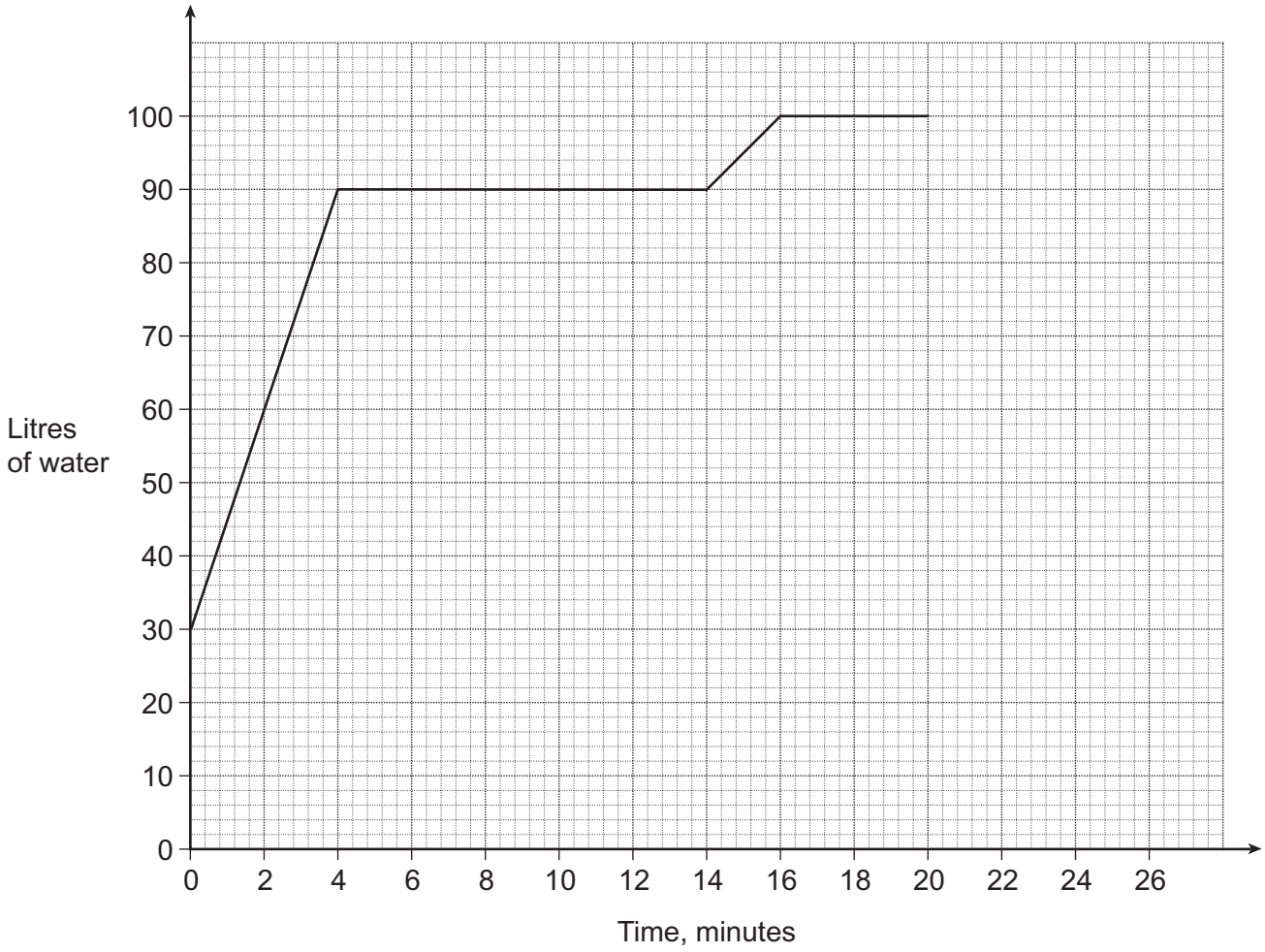
Answer ..... *(3 marks)*

Turn over for the next question

7

2 Louise fills a bath with 30 litres of hot water.

The graph shows how the number of litres of water in the bath changes during the next 20 minutes.



This is what happens during the 20 minutes.

- Louise adds cold water by turning on the cold water tap.
- She gets in the bath immediately after adding the cold water.
- While still in the bath, she adds hot water by turning on the hot water tap.
- After a few more minutes in the bath she gets out.
- As she gets out of the bath she starts to empty the water from the bath.

2 (a) How long does it take to add the cold water?

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

2 (b) How much cold water is added?

.....

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

2 (c) How many minutes is Louise in the bath?

.....

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

2 (d) Which tap adds water at the faster rate?
Use the graph to give a reason for your answer.

Answer .....

Reason .....

.....

(1 mark)

2 (e) The water empties from the bath at a rate of 20 litres per minute.

How many minutes does it take to empty the bath?

.....

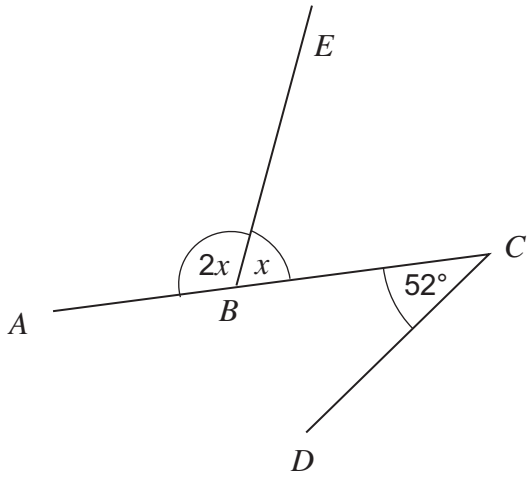
.....

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

6

3 ABC is a straight line.

Angle ABE is twice the size of angle CBE.



Not drawn accurately

Show that BE is **not** parallel to DC.

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(3 marks)

4 (a) Tamsin weighed 8 pounds when she was born.
Robert weighed 3.8 kilograms when he was born.

Who weighed more?
You **must** show your working.

.....

.....

.....

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

4 (b) Complete the last of these three conversions.

3 metres = 300 centimetres

2 square metres = 20 000 square centimetres

4 cubic metres = ... cubic centimetres

.....
(1 mark)

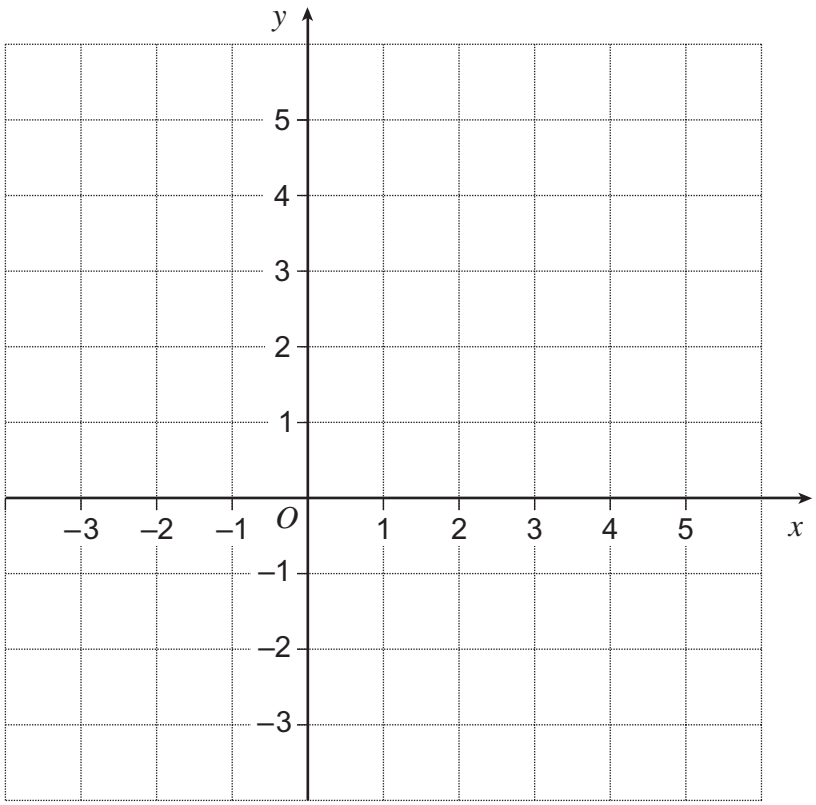
Turn over for the next question

7

5 Work out the area enclosed by the lines

$y = 3$ $x = -2$ $y = x$

Use the grid to help you.



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Answer ..... square units *(4 marks)*

6 Complete each statement using the symbols + – × ÷

An example has been done for you.

$6e$ [+] $2e$ [–] $5e = 3e$

6 (a) $-5(w + 2x) = -5w$ [ ] $10x$

.....

(1 mark)

6 (b) y^5 [ ] $y^2 = y$ [ ] y^2

.....

(1 mark)

6 (c) $3(m + 1)^2$ [ ] $(m + 1) = 3(m + 1)$

.....

(1 mark)

6 (d) $p^2 - 9 = (p$ [ ] $3)(p$ [ ] $3)$

.....

(1 mark)

7 The nth term of a sequence is $14 - 8n$

Write down the first **three** terms of the sequence.

.....

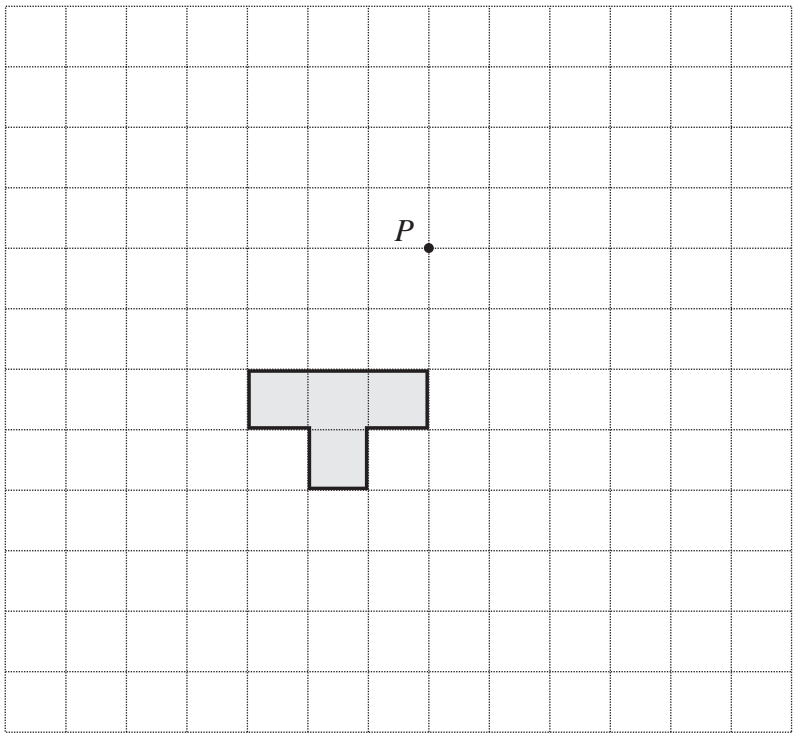
.....

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

10

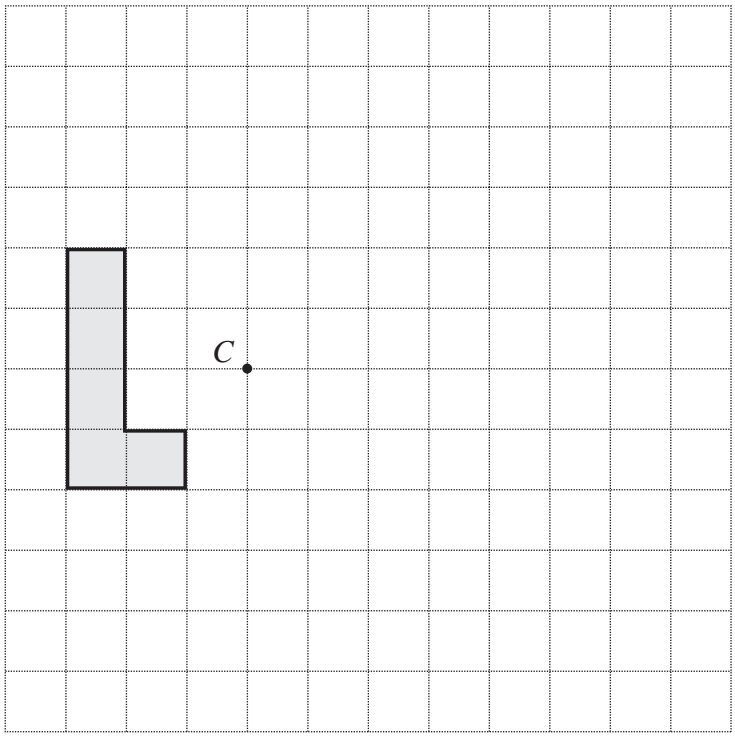
Turn over ▶

8 (a) Rotate the T-shape by a quarter turn anticlockwise about P.



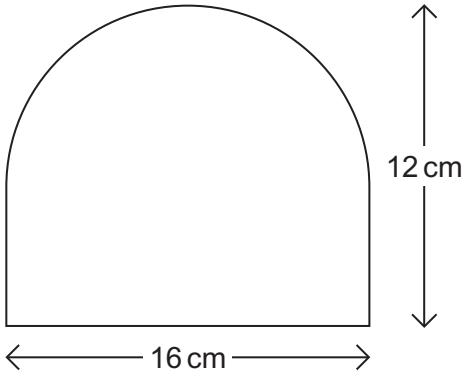
(2 marks)

8 (b) Enlarge the L-shape by scale factor –2 using C as the centre of enlargement.



(2 marks)

9 This shape is made from a rectangle and a semicircle.



Not drawn accurately

Calculate the area of the shape.
Give your answer to an appropriate degree of accuracy.

.....

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Answer ..... cm^2 *(5 marks)*

10 (a) Factorise fully $12x^2 - 3x$

.....

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

10 (b) Factorise $x^2 + 7x - 30$

.....

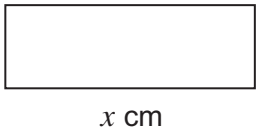
.....

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

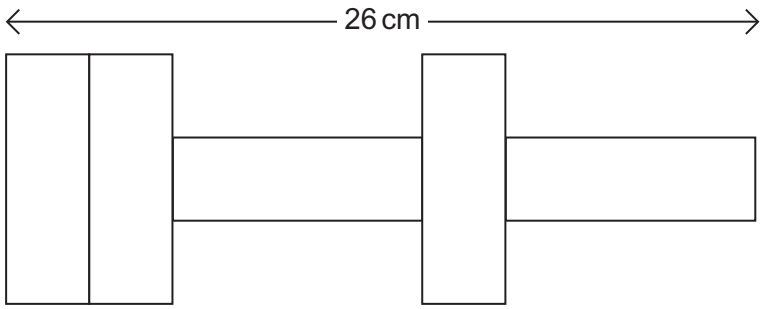
13

Turn over ▶

11 A rectangle has length x cm and width y cm.



Some of these rectangles are used to make the two shapes shown below.



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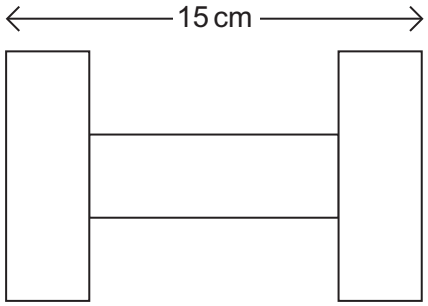
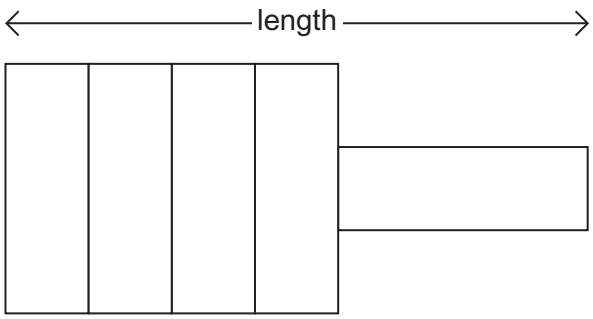


Another shape is made using some of these rectangles.



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Work out the length of this shape.

You **must** show your working.

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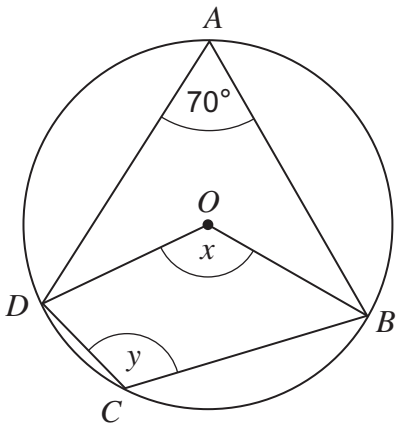
Answer ..... cm *(5 marks)*

Turn over for the next question

5

12 (a) A, B, C and D are four points on the circumference of a circle, centre O.



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12 (a) (i) Give a reason why angle x is 140°.

.....

.....

(1 mark)

12 (a) (ii) Give a reason why angle y is 110°.

.....

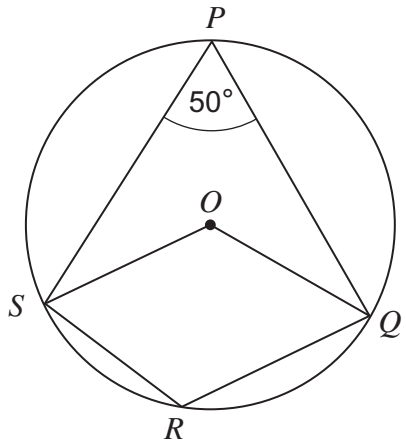
.....

(1 mark)

12 (b) P, Q, R and S are four points on the circumference of a circle, centre O.

$OQ = RQ$

Angle $SPQ = 50°$



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Show that $OQRS$ is **not** a rhombus.

.....

.....

.....

(2 marks)

13 The equation of a straight line is $3x + y = 2$

13 (a) Work out the gradient of the line.

.....

.....

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

13 (b) Work out the coordinates of the point where the line crosses the y-axis.

.....

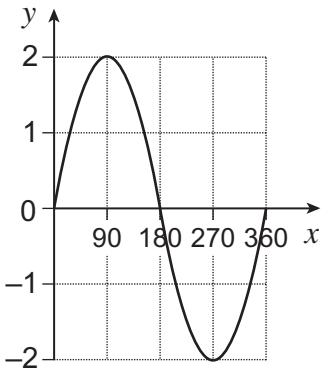
Answer (..... , ...) *(1 mark)*

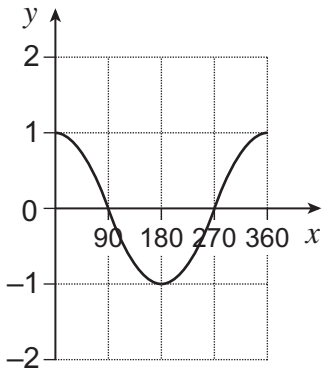
7

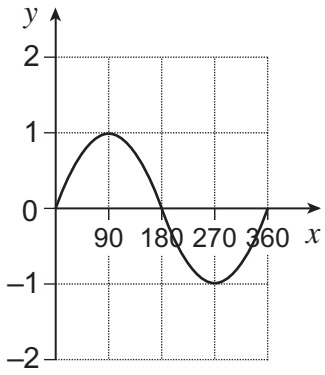
14 (a) Here are four equations.

A $y = \cos x$ B $y = 2\sin x$ C $y = \sin 2x$ D $y = \sin x$

Match each sketch graph to its equation.



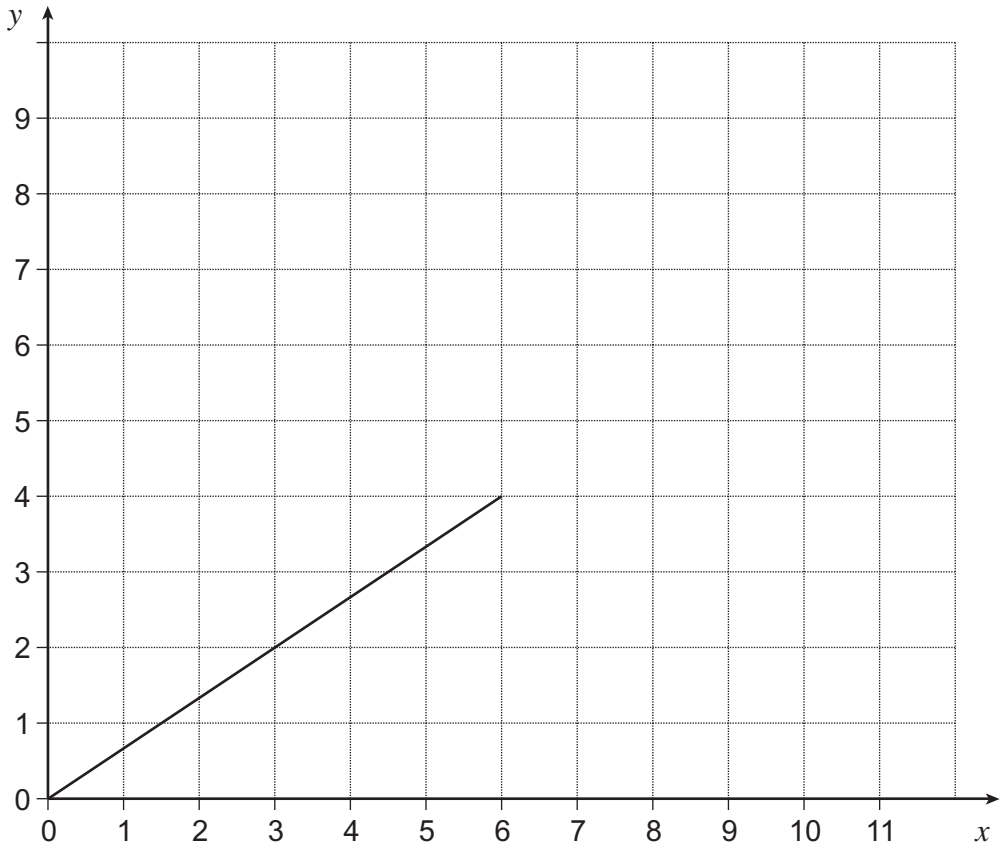




Equation ..... Equation ..... Equation .....

(3 marks)

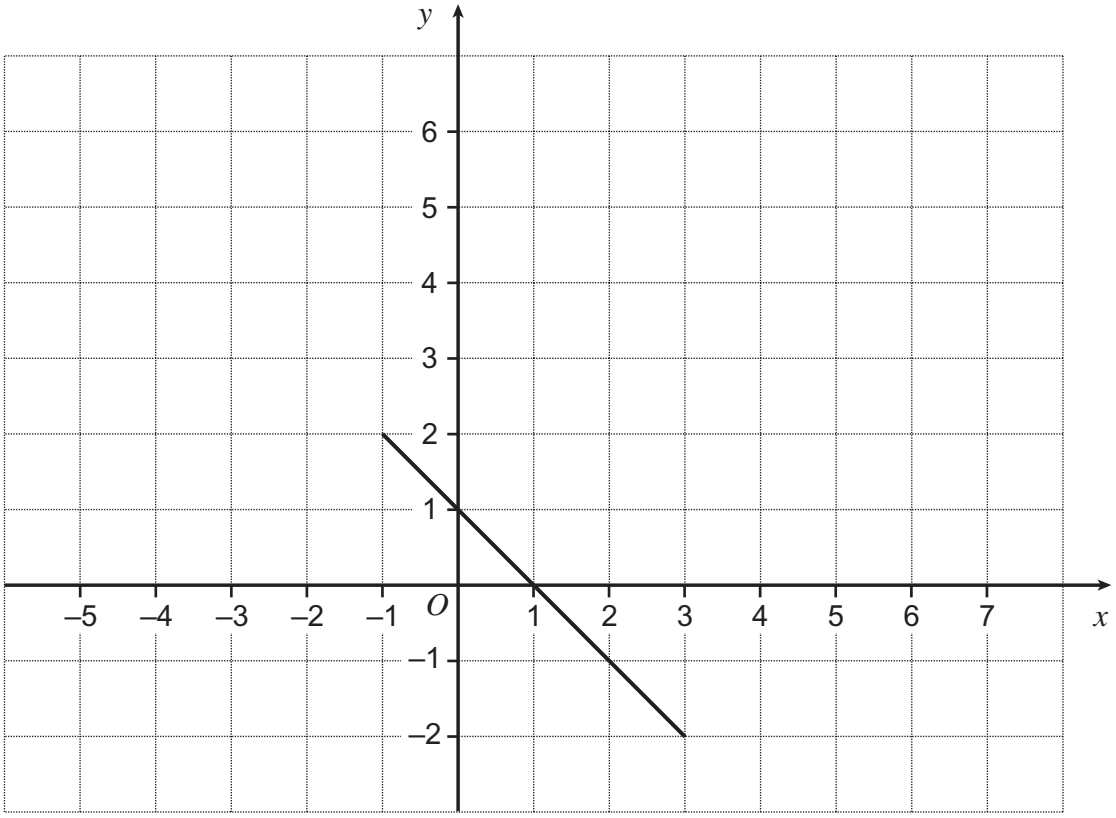
14 (b) (i) The graph of $y = f(x)$ is shown on the grid.



On the grid, draw the graph of $y = f(x) + 5$

(1 mark)

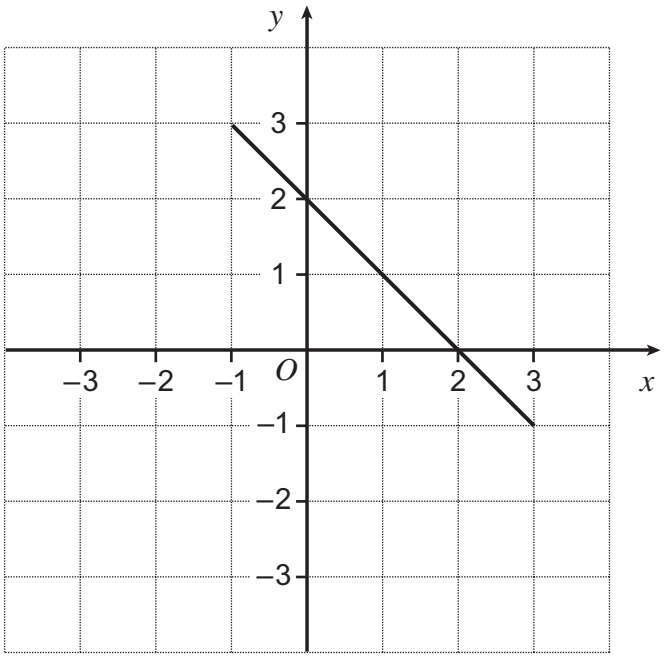
14 (b) (ii) The graph of $y = g(x)$ is shown on the grid.



On the grid, draw the graph $y = g(x + 4)$

(1 mark)

14 (b) (iii) The graph of $y = h(x)$ is shown on the grid.



On the grid, draw the graph $y = -h(x)$

(1 mark)

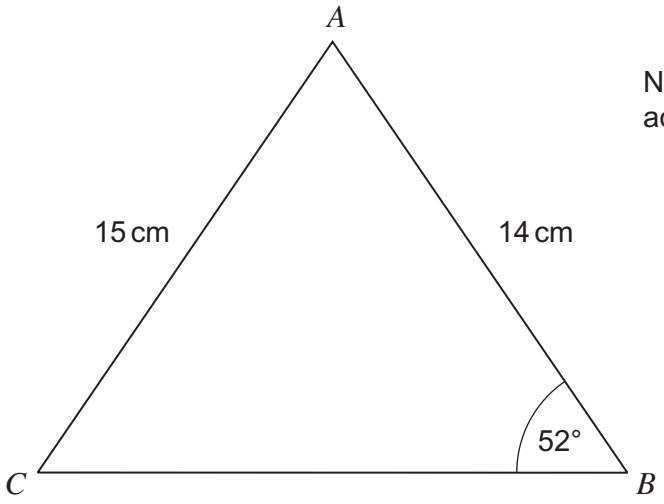
6

Turn over ▶

15 ABC is a triangle.

AB = 14 cm and AC = 15 cm

$\angle ABC$ = 52°



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Work out the largest angle in the triangle.

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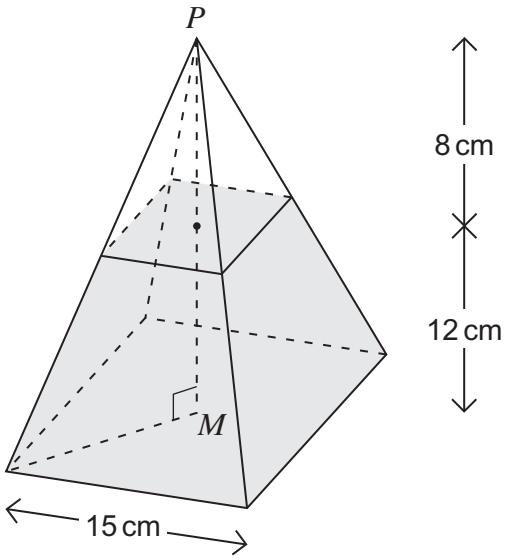
Answer ..... degrees *(4 marks)*

16 A right pyramid has a square base of edge 15 centimetres.
The height of the pyramid is 20 centimetres.
The vertex, P, of the pyramid is directly over the midpoint, M, of the base.
The pyramid is filled with sand to a depth of 12 centimetres.



Not drawn accurately

Work out the volume of the sand.

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Answer ..... cm^3 *(5 marks)*

END OF QUESTIONS

9

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED