Surname

Other Names

Candidate Signature

AQA

General Certificate of Secondary Education
Higher Tier
June 2010

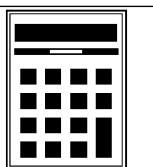# Mathematics (Modular) **43055/2H**
(Specification B)
Module 5

H

Paper 2 Calculator

Friday 11 June 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.
● Do all rough work in this book. Cross through any work you do not want to be marked.
● 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. These must be tagged securely to this answer booklet.

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

43055/2H

Formulae Sheet: Higher Tier

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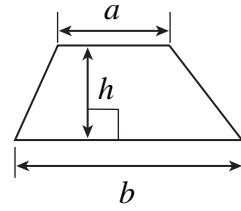
Volume of prism = area of cross-section × length
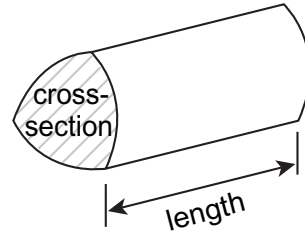
Volume of sphere = $\frac{4}{3}\pi r^3$

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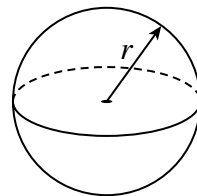
Volume of cone = $\frac{1}{3}\pi r^2 h$

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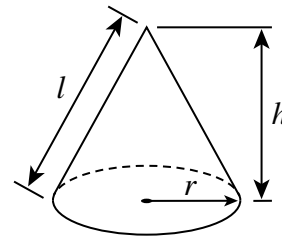
In any triangle ABC

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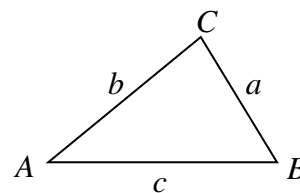
The Quadratic Equation

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   Lucy leaves home at 8.00 am.
She cycles a distance of 24 kilometres to her friend's house.
The graph shows her journey.
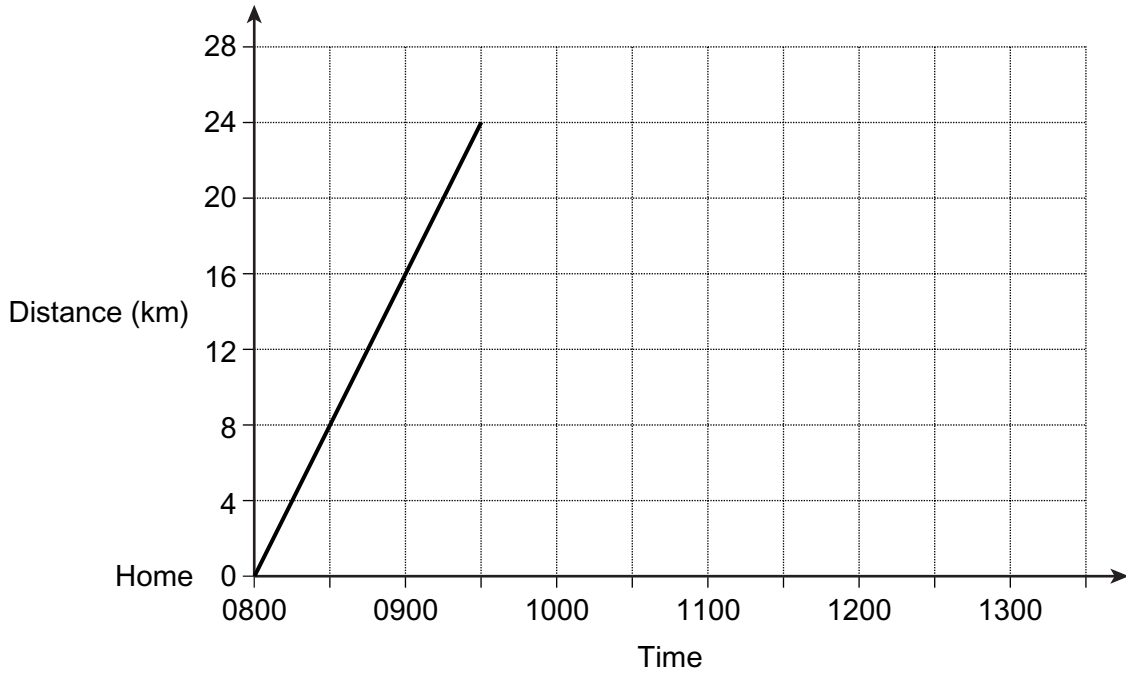
1 (a)   What is her average speed?
Give your answer in kilometres per hour.

....

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

1 (b)   Lucy stays at her friend's house for one hour.
She cycles home at an average speed of 12 kilometres per hour.

At what time does Lucy arrive home?
You **must** show your working.

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....

Answer ....   *(3 marks)*

4

Turn over ▶

2 Complete the table to show some properties of quadrilaterals.
The first one has been done for you.

	Both pairs of opposite angles equal	Diagonals equal in length	Rotational symmetry of order 2
Parallelogram	✓	✗	✓
Square			
Rhombus			
Kite			

(3 marks)

3 Zak is trying to solve the equation $x^3 - 5x = 8$
He says that there is a solution between $x = 2.7$ and $x = 2.8$

Is Zak correct?
Explain your answer.

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(2 marks)

4 Calculate the area of the shape.

Not drawn accurately

11 cm

10 cm

3 cm

12 cm

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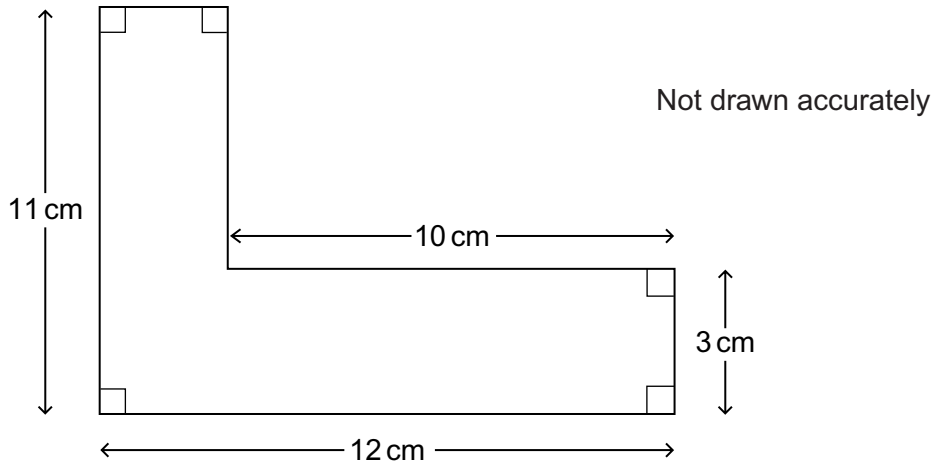
Answer .... cm^2 *(3 marks)*

Turn over for the next question

8

Turn over ▶

5   A rectangular tank contains water.
The height of the water is 8 cm.
The length of the diagonal of the surface of the water is 10 cm.
Water is leaking from the tank at a steady rate.
The tank is empty after 2 minutes.
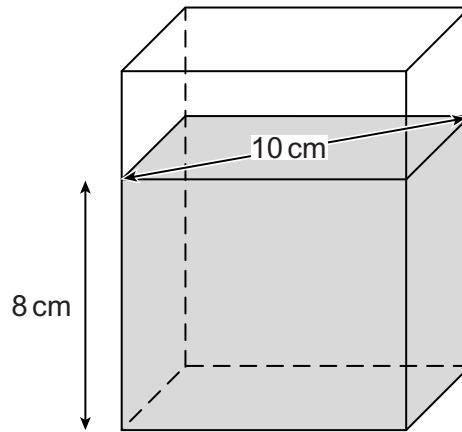
5 (a)   Sketch the graph of the length of the diagonal against the time.
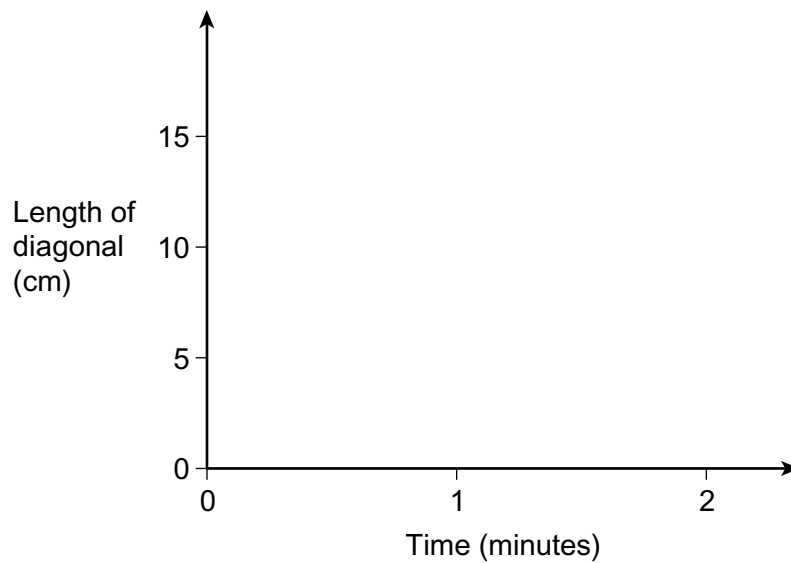
(1 mark)

5 (b)   Sketch the graph of the height against the time.
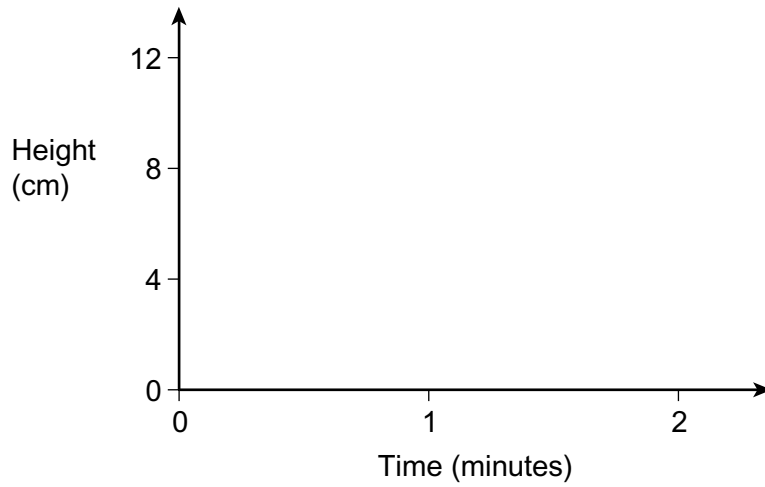
(1 mark)

6
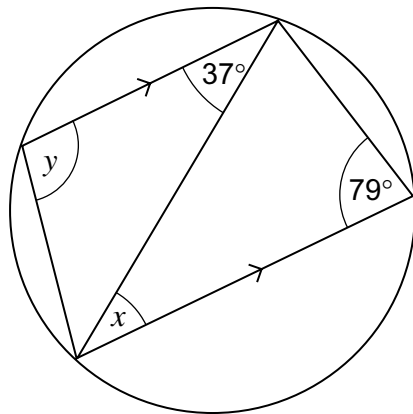
Not drawn accurately

6 (a)   Write down the value of x.
Give a reason for your answer.

Answer .... degrees

Reason ....
(2 marks)

6 (b)   Work out the value of y.

....

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

___

6

Turn over ▶

7 (a)   Shape *A* and shape *B* touch at point *P*.
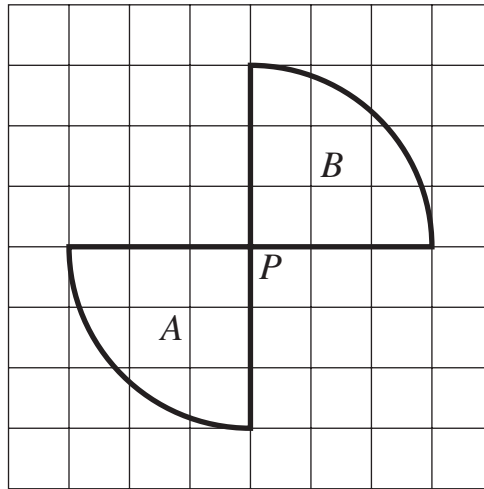
A single transformation will take shape *A* to shape *B*.

7 (a) (i)   Sergio says the single transformation is a rotation.

Describe the rotation fully.

....

....
(2 marks)

7 (a) (ii)   Ranvir says the single transformation is a reflection.

Draw the mirror line for the reflection on the grid.
(1 mark)

7 (b)   Shape *C* is **not** shown on the grid.
Shape *D* is a translation of shape *C*.

The translation vector from shape *C* to shape *D* is $\begin{pmatrix} 5 \\ -2 \end{pmatrix}$

Draw shape *C* on the grid.

(2 marks)

5

Turn over ▶
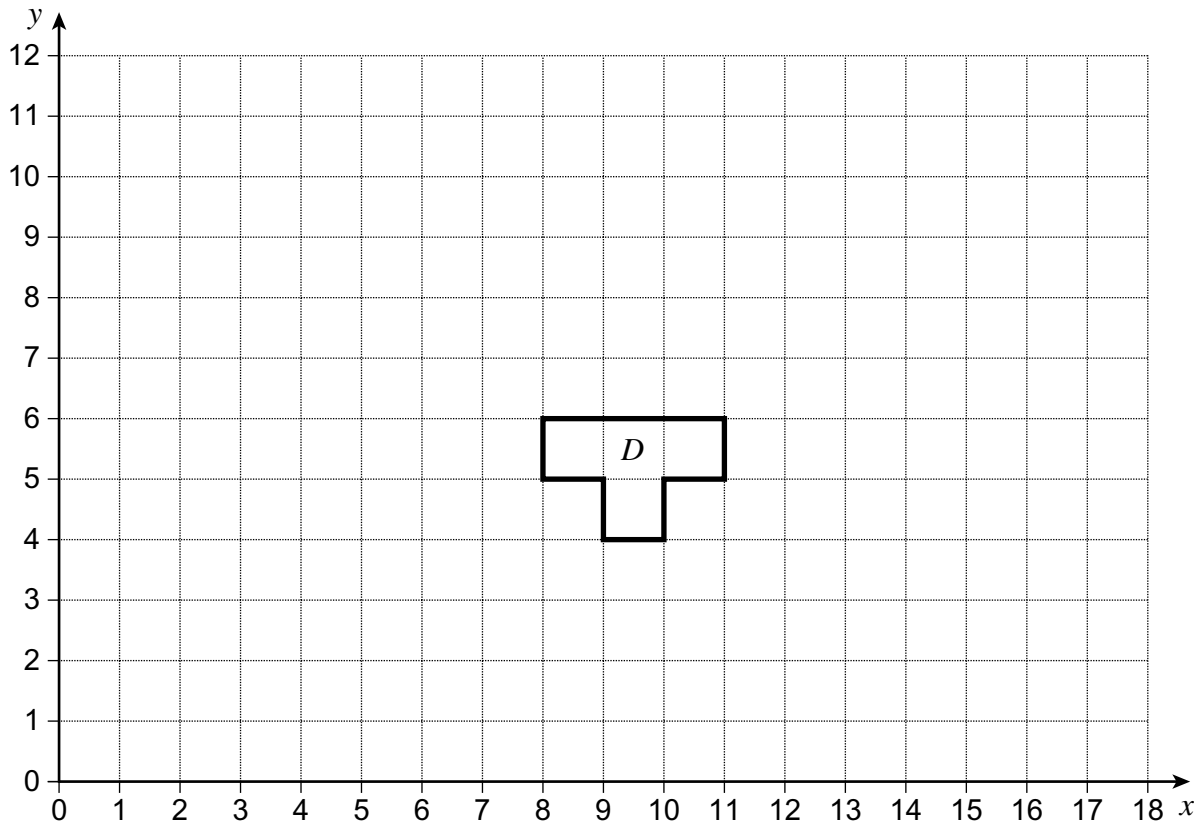
8   Using ruler and compasses, construct the bisector of angle *ABC*.

A

B   *C*
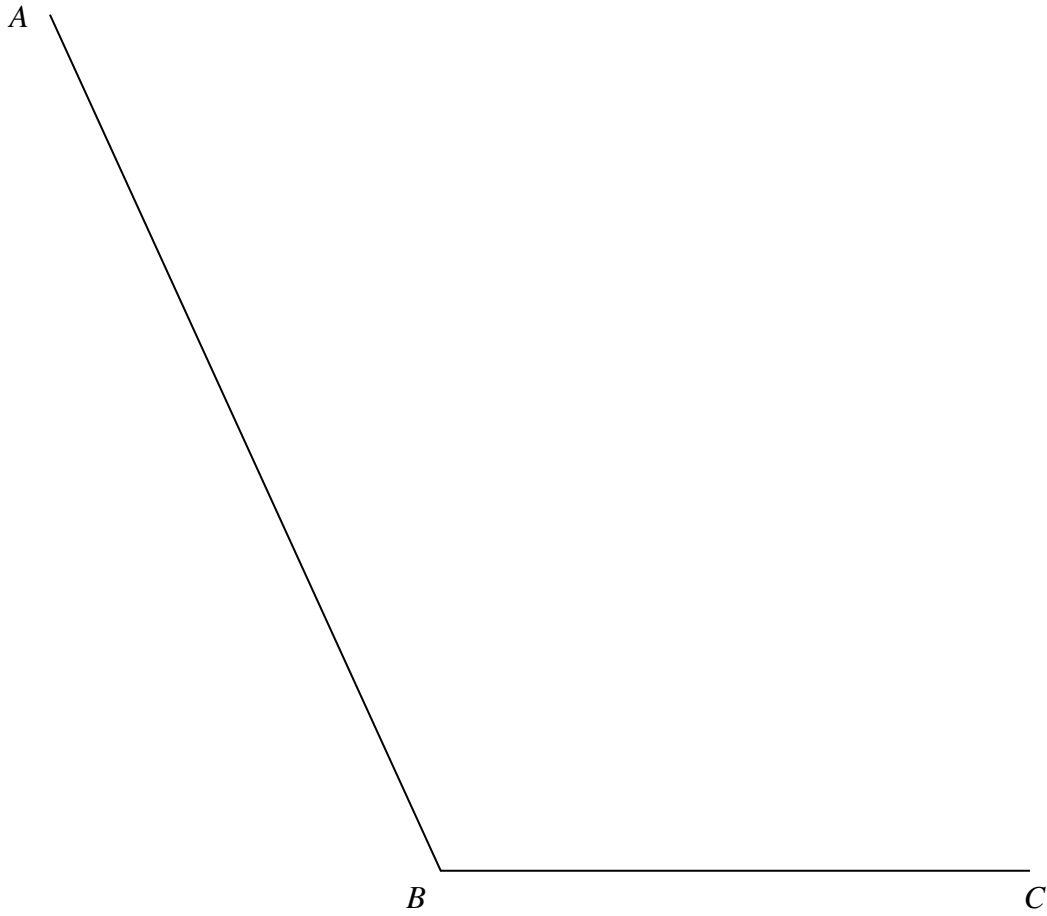
(2 marks)

9 (a) Factorise $6a + 9$

....

Answer .... *(1 mark)*

9 (b) Show that $4(2p + 1) + 3(2 - p) = 5(p + 2)$

....

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....

(2 marks)

9 (c) n is an integer such that $-2.3 \leqslant n < 5$

9 (c) (i) Write down the smallest possible value of n.

Answer .... *(1 mark)*

9 (c) (ii) Write down the largest possible value of n.

Answer .... *(1 mark)*

9 (d) m is an integer.

Show that $(m + 2)^2 - m^2 - 4$ is a multiple of 4.

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(2 marks)

9

Turn over ▶

10 (a)   The perimeter of a square is $12y$ cm.

Work out an expression, in terms of y, for the area of the square.

....

....

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

10 (b)   Ronni buys g sandwiches at £2 each and h cakes at 79 pence each.

Write an expression, in terms of g and h, for the total cost.
Give your answer in pounds.

....

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Answer £ ....   *(2 marks)*

10 (c)   Simplify $2a^3b \times 3ab^2$

....

Answer ....   *(2 marks)*

10 (d)   Make w the subject of $6x = \sqrt{2w + y}$

....

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Answer ....   *(3 marks)*

11 A logo is used by a business.
The logo is produced in two sizes.
The two logos are similar.

Not drawn
accurately

4.4 cm

1.2 cm

x

7.8 cm

16.9 cm
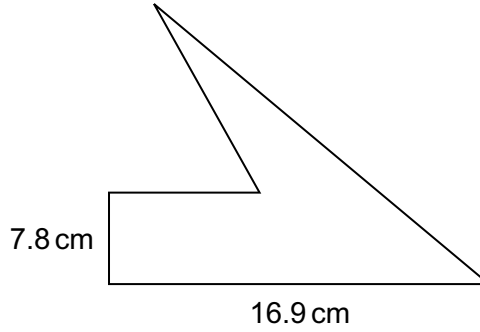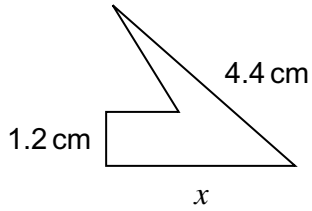
Work out the value of x.

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

Turn over for the next question

12

Turn over ▶

12   A straight line L is shown on the grid.
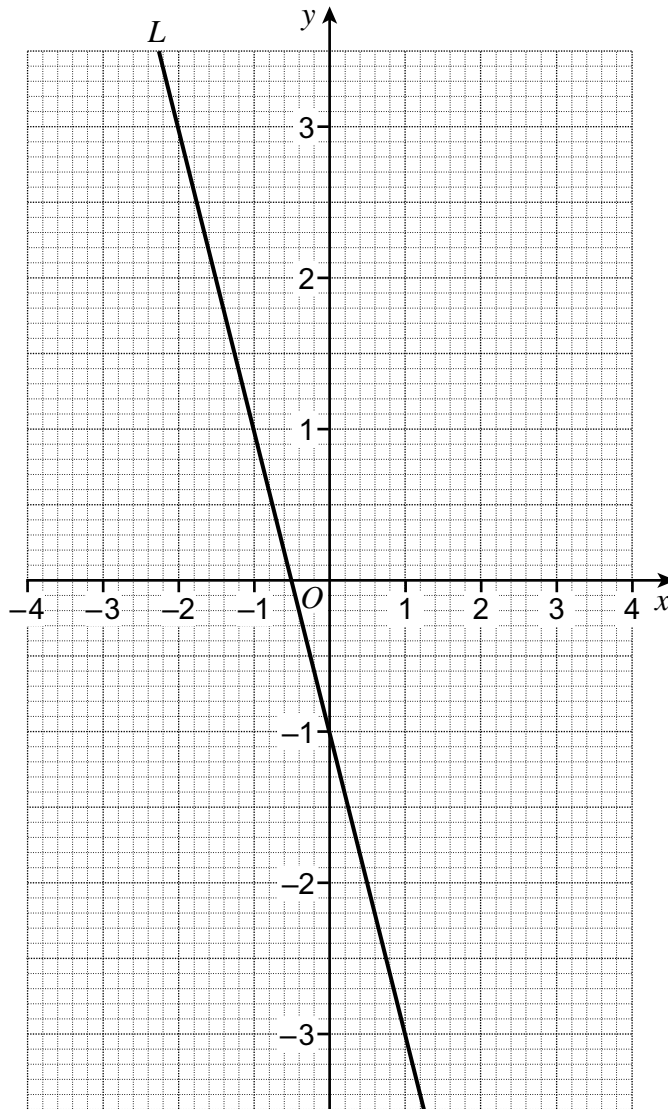
12 (a)   Work out the equation of line L.

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Answer .... *(3 marks)*

12 (b)   Write down the gradient of a line perpendicular to line L.

Answer .... *(1 mark)*

13 The diagram shows a cone.
The radius of the base is 4 cm.
The vertical height is 7.5 cm.
The slant height is l cm.
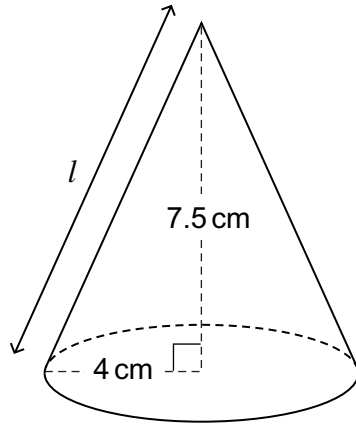
Not drawn accurately

13 (a) Work out the value of l.

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

13 (b) Work out the curved surface area of the cone.
Give your answer to an appropriate degree of accuracy.

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....

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

Turn over ▶

14 Here is a trapezium.
All lengths are in metres.

$2x-3$

$2x+4$

$x+2$
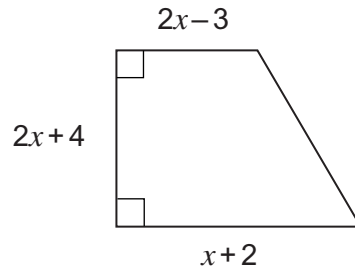
The area of the trapezium is $20\,m^2$.

14 (a) Show that $\quad 3x^2 + 5x - 22 = 0$

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(3 marks)

14 (b) Two of these trapezia are joined together to make a rectangle.
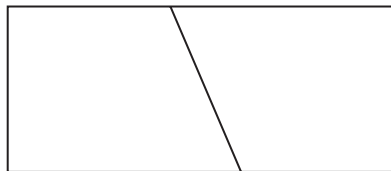
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Use the equation given in part (a) to help you work out the perimeter of the rectangle.

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Answer .... metres   *(4 marks)*

15   *AB* is parallel to *DC*.

$AB = \frac{2}{3} DC$

M is the midpoint of *DC*.

N is the midpoint of *AB*.

$\overrightarrow{DC}$ = 6**a** and $\overrightarrow{DA}$ = **b**
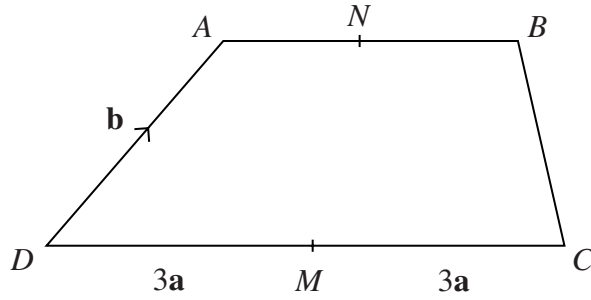
Not drawn accurately

15 (a)   Write $\overrightarrow{AB}$ in terms of **a**

....

Answer ....   *(1 mark)*

15 (b)   Write $\overrightarrow{MN}$ in terms of **a** and **b**

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Answer ....   *(3 marks)*

11

Turn over ▶

16 *ABC* is a right-angled triangle.
AB = 17 cm and *BC* = 6 cm
The line *BD* bisects the angle *ABC*.
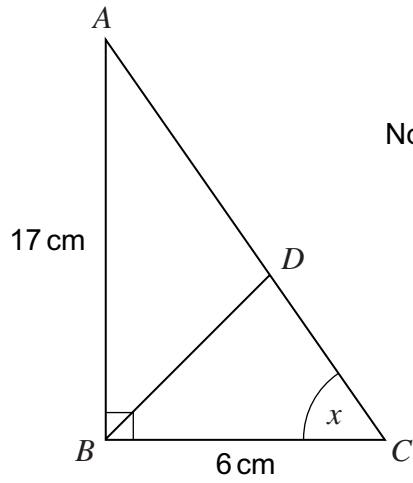
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16 (a) Write down the value of tan *x*.

Answer .... *(1 mark)*

16 (b) Calculate the length *BD*.

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

END OF QUESTIONS

6

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