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Centre number

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Candidate number

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# GCSE MATHEMATICS (LINEAR)

# H

Higher Tier Paper 1

Thursday 26 May 2016

Morning

Time allowed: 1 hour 30 minutes

## Materials

For this paper you must have:

- mathematical instruments.

You must **not** use a calculator.



## Instructions

- Use black ink or black ball-point pen. Draw diagrams in pencil.
- 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.

## Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 70.
- The quality of your written communication is specifically assessed in Questions 1, 12 and 20. These questions are indicated with an asterisk (\*).
- You may ask for more answer paper, tracing paper and graph paper. These must be tagged securely to this answer book.

## Advice

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

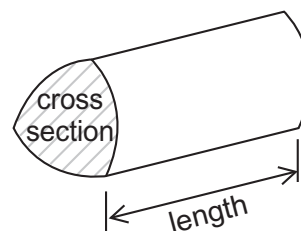


### Formulae Sheet: Higher Tier

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



**Volume of prism** = area of cross section  $\times$  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** =  $\pi r l$

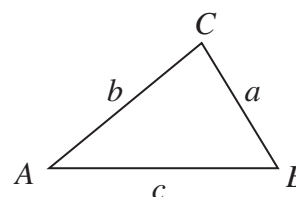


**In any triangle ABC**

**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** Increase £190 by 35%

**[3 marks]**

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Answer £ \_\_\_\_\_

**Turn over for the next question**

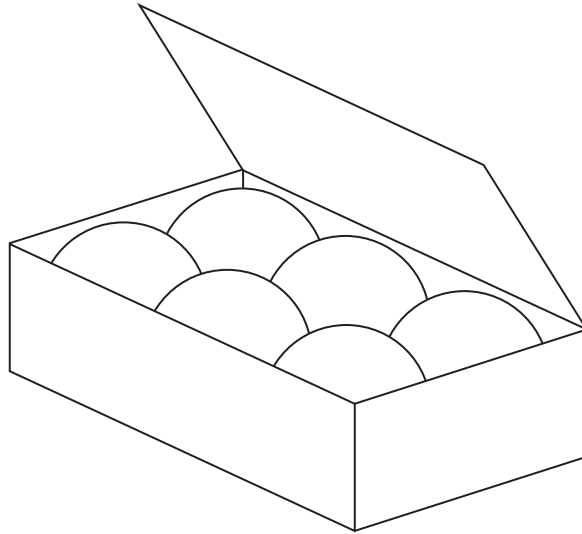
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**Turn over ►**



2 Six balls just fit inside a box as shown.

The balls each have a diameter of 5 cm  
The box is a cuboid.



Work out the volume of the box.

**[3 marks]**

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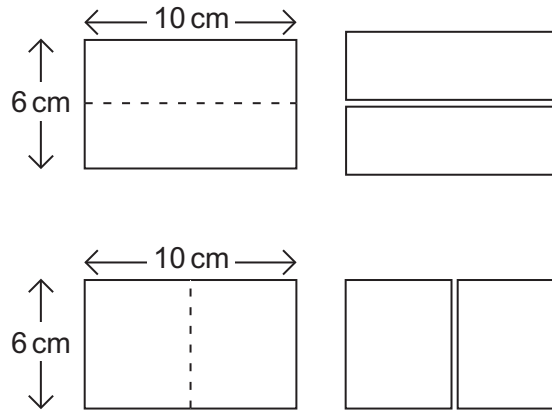
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Answer \_\_\_\_\_  $\text{cm}^3$

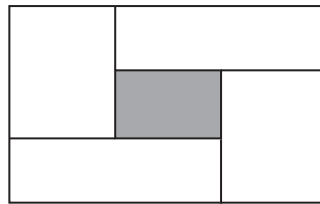


3 Two 10 cm by 6 cm rectangles are cut in half as shown.



Not drawn accurately

The four pieces are joined together, without overlap, as shown.



Not drawn accurately

Work out the perimeter of the shaded rectangle.

[3 marks]

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Answer \_\_\_\_\_ cm



- 4** A bag has only red, white, blue and yellow counters.  
A counter is taken from the bag at random.  
Here are some of the probabilities.

Colour	Red	White	Blue	Yellow
Probability	0.1		0.3	

- 4 (a)** The probability of taking a white counter is twice the probability of taking a yellow counter.

Complete the table.

**[2 marks]**

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- 4 (b)** There are 500 counters in the bag altogether.

Complete the table.

**[2 marks]**

Colour	Red	White	Blue	Yellow	Total
Number of counters in the bag	50				500

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- 4 (c)** All of the yellow counters are taken out of the bag.

Work out the probability of taking a red counter at random from the bag now.

**[2 marks]**

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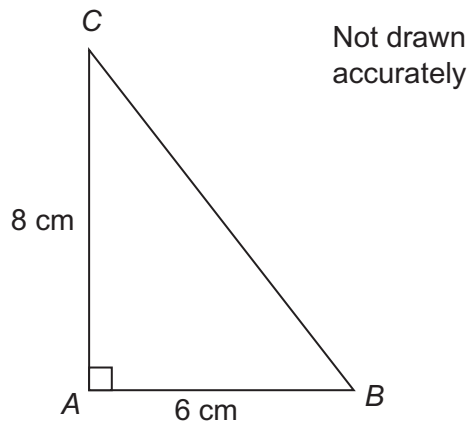


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Answer \_\_\_\_\_



5 Work out length  $BC$ .



[3 marks]

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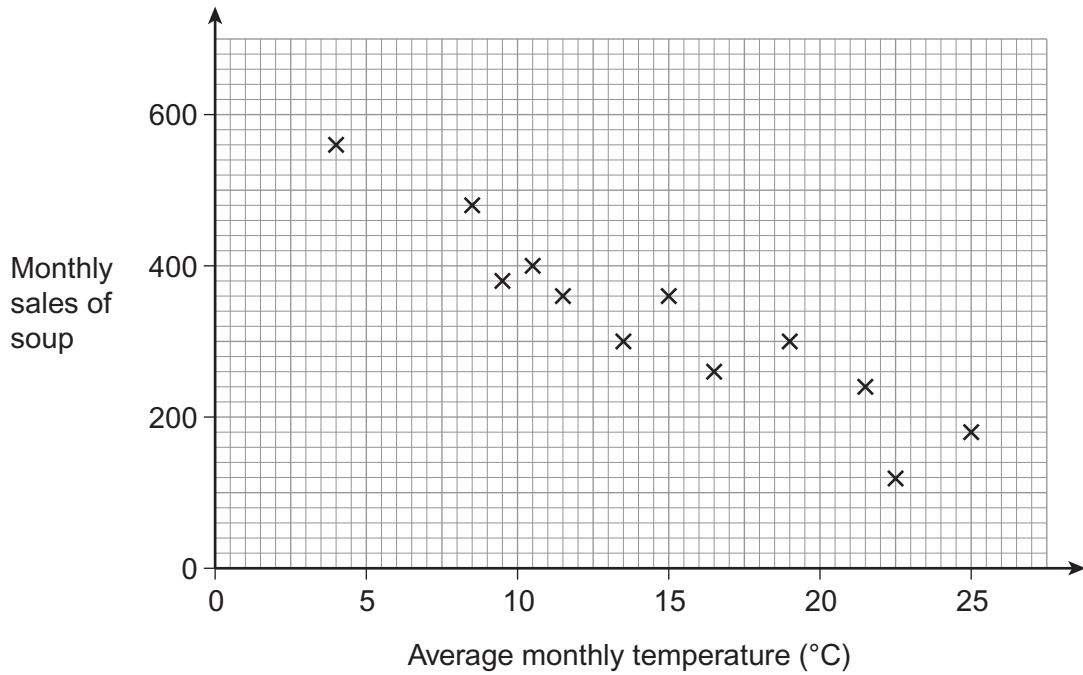
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Answer \_\_\_\_\_ cm

Turn over for the next question



6 A café owner records the average monthly temperature and the monthly sales of soup over a year.



6 (a) The scatter graph shows negative correlation.

Write down the relationship between average monthly temperature and monthly sales of soup.

[1 mark]

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6 (b) The average monthly temperature for the next month is predicted to be 7°C

Use the graph to estimate the sales of soup that month. You **must** show your working.

[2 marks]

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Answer \_\_\_\_\_





7 Dwayne Pipes uses this formula to work out the cost of a plumbing job in pounds.

$$\text{Cost of job} = 35 \times \text{number of hours} + 40$$

Ivor Wrench uses this formula to work out the cost of a plumbing job in pounds.

$$\text{Cost of job} = 40 \times \text{number of hours} + 17.5$$

A job of  $x$  hours costs the same with Dwayne and Ivor.

Set up and solve an equation to work out  $x$ .

**[4 marks]**

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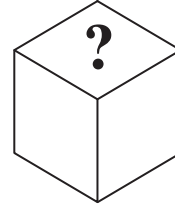
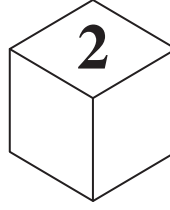
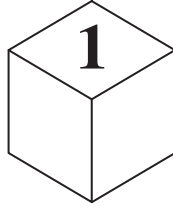
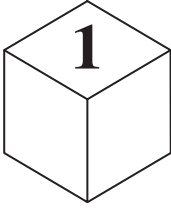
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$$x = \underline{\hspace{10cm}}$$



- 8 (a) The scores on four ordinary, six-sided dice are put in order.



The median of the **four** scores is 0.5 **less** than the mean of the four scores.

Circle the value of the fourth score.

[1 mark]

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- 8 (b) The dice are rolled again.  
The median of the scores is 0.5 **less** than the range.

Work out a possible set of scores.

[2 marks]

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Answer \_\_\_\_\_ , \_\_\_\_\_ , \_\_\_\_\_ , \_\_\_\_\_



9 (a) Simplify fully  $\frac{w^3 \times w^4}{w^2}$  [1 mark]

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Answer \_\_\_\_\_

9 (b) Simplify fully  $2x^2y^3 \times 4xy^2$  [2 marks]

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Answer \_\_\_\_\_

9 (c) Simplify fully  $12a^4b^5 \div 2a^2b$  [2 marks]

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Answer \_\_\_\_\_

Turn over for the next question



**10 (a)** Work out  $3 \times 10^5 \times 6 \times 10^{-2}$

Write your answer in standard form.

**[2 marks]**

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Answer \_\_\_\_\_

**10 (b)** Work out  $(8 \times 10^4 + 4 \times 10^4) \div 24$

Write your answer in standard form.

**[2 marks]**

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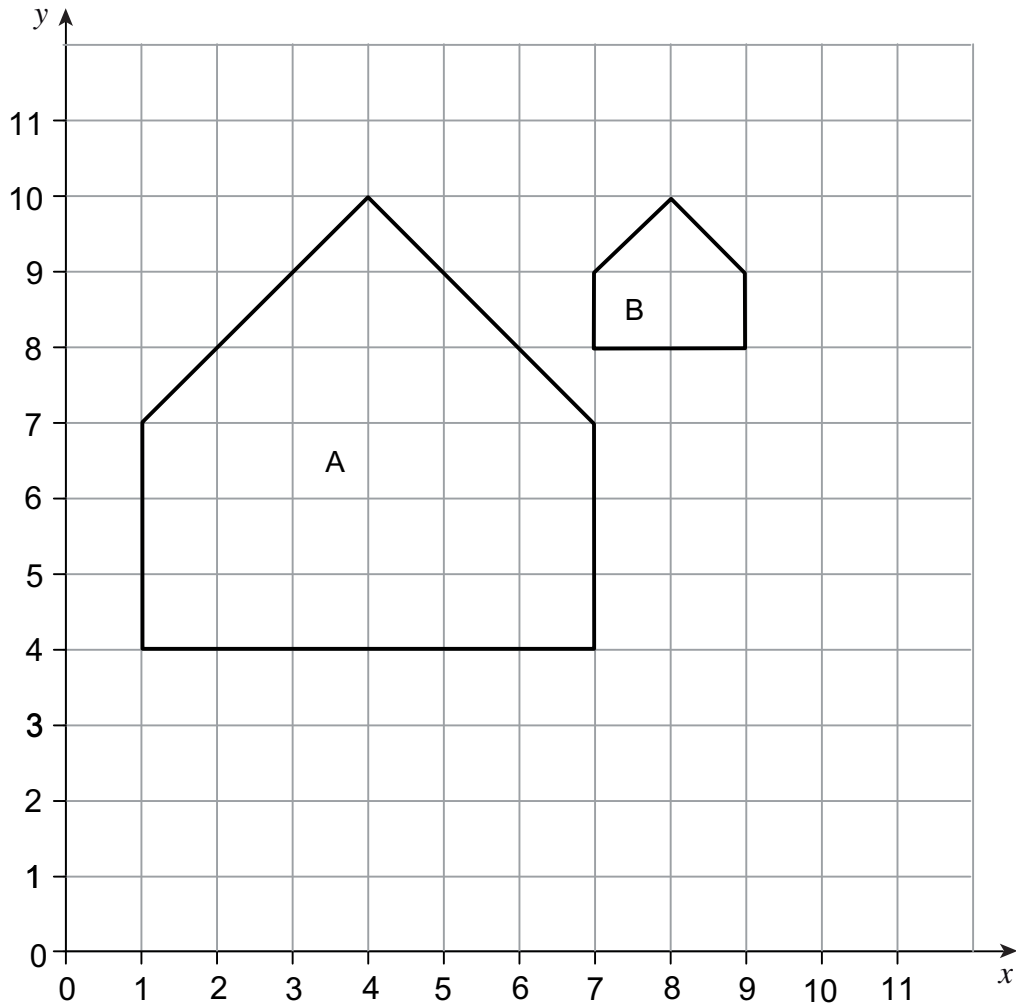
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Answer \_\_\_\_\_



11 Describe fully the **single** transformation that maps shape A to shape B.

[3 marks]



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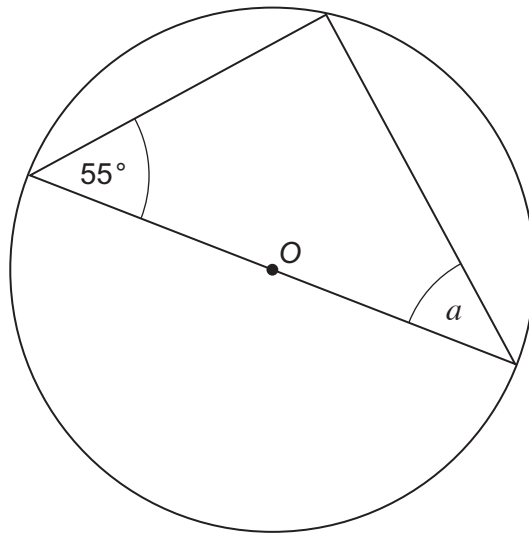
Turn over ►



**12 (a)**  $O$  is the centre of the circle.

Work out the size of angle  $a$ .

[1 mark]

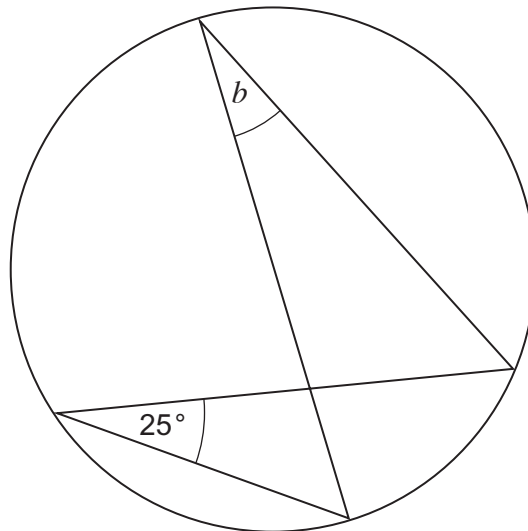


Not drawn  
accurately

Answer \_\_\_\_\_ degrees

**12 (b)** Write down the size of angle  $b$ .

[1 mark]



Not drawn  
accurately

Answer \_\_\_\_\_ degrees



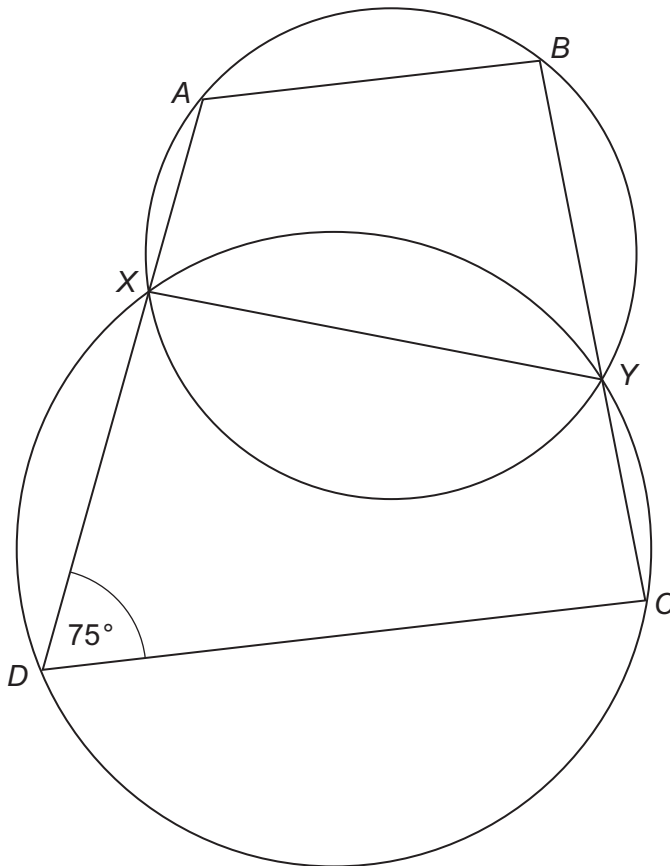
**\*12 (c)** Two circles, with different radii, intersect at  $X$  and  $Y$ .

$A$  and  $B$  are points on the smaller circle.

$C$  and  $D$  are points on the larger circle.

$AXD$  and  $BYC$  are straight lines.

Angle  $XDC = 75^\circ$



Not drawn accurately

Show that  $AB$  is parallel to  $DC$ .

[3 marks]

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Turn over ►



**13 (a)** Expand and simplify  $(6x - 1)(2x + 3)$

**[2 marks]**

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Answer \_\_\_\_\_

**13 (b)** Solve  $4x^2 + x - 3 = 0$

**[3 marks]**

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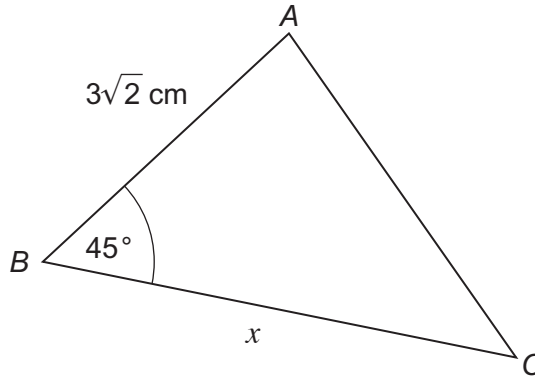
Answer \_\_\_\_\_





14

$ABC$  is a triangle.  
 $AB = 3\sqrt{2}$  cm  
 Angle  $ABC = 45^\circ$



Not drawn  
accurately

The area of  $ABC$  is  $12$  cm<sup>2</sup>

You are given that  $\sin 45^\circ = \frac{1}{\sqrt{2}}$

Work out the length  $x$ .

[2 marks]

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Answer \_\_\_\_\_ cm



15 Rearrange  $y = \frac{3x + 5}{x}$  to make  $x$  the subject.

You **must** show your working.

**[3 marks]**

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Answer \_\_\_\_\_



16 Solve  $\frac{1}{2}(3x - 1) < \frac{3}{8}(x + 1)$

[3 marks]

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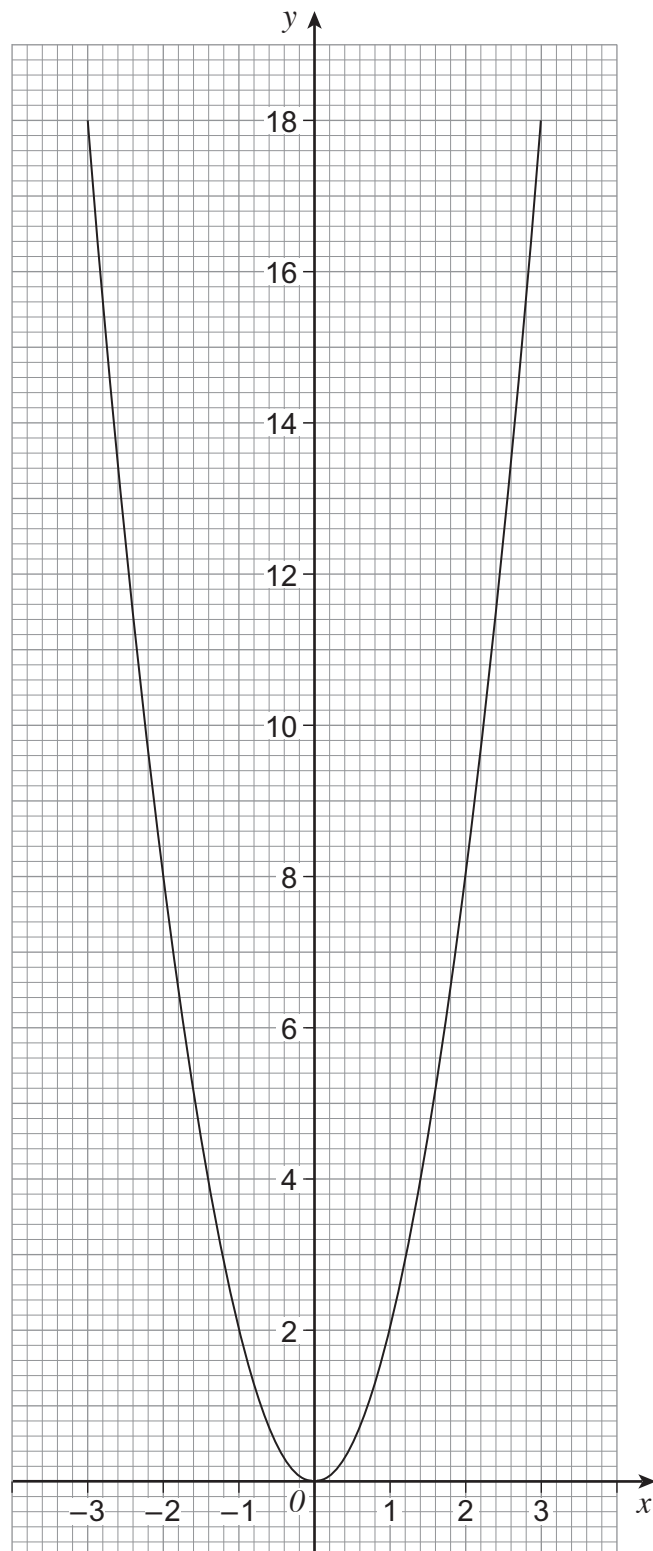
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Answer \_\_\_\_\_

Turn over for the next question



17 Here is the graph of  $y = 2x^2$  for values of  $x$  from  $-3$  to  $3$



- 17 (a)** Use the graph to estimate the solutions to  $2x^2 = 15$   
Show clearly how you obtained your answer.

**[2 marks]**


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Answer \_\_\_\_\_ and \_\_\_\_\_

- 17 (b)** Use the graph to estimate the value of  $\sqrt{5}$   
Show clearly how you obtained your answer.

**[2 marks]**


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Answer \_\_\_\_\_

- 18** Simplify fully  $\frac{(5 - \sqrt{3})(3 - \sqrt{3})}{2}$

Give your answer in the form  $a + b\sqrt{3}$  where  $a$  and  $b$  are integers.

**[3 marks]**


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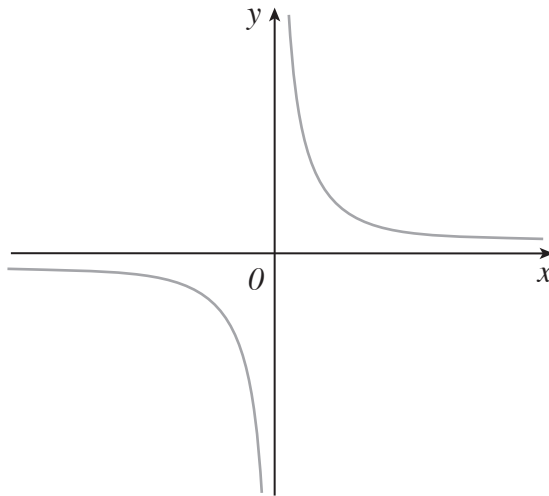
Answer \_\_\_\_\_

7
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**Turn over ►**

- 19 (a)** Circle a possible equation for the graph shown below.

[1 mark]



$$y = x^3$$

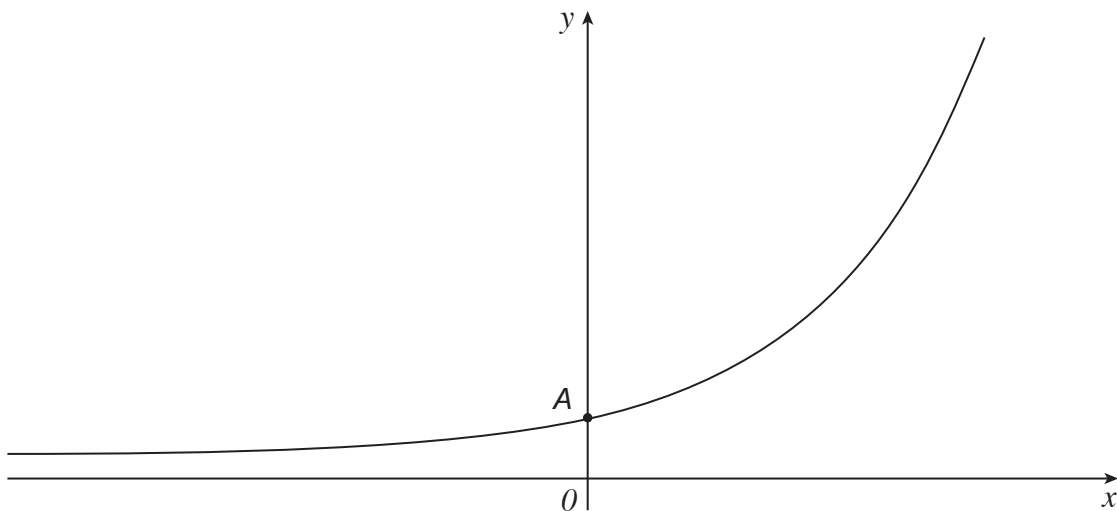
$$y = \frac{1}{x}$$

$$y = \cos x$$

$$y = \sin x$$

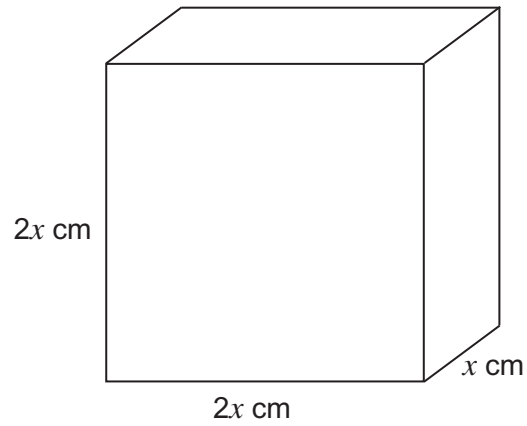
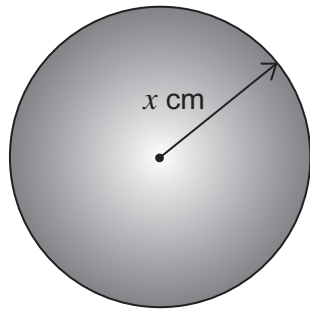
- 19 (b)** This is the graph of  $y = 2^x$   
Write down the co-ordinates of A.

[1 mark]



Answer ( \_\_\_\_\_ , \_\_\_\_\_ )



**\*20**A sphere has a radius of  $x$  cmA cuboid has edges of length  $x$  cm, width  $2x$  cm and height  $2x$  cm

Show clearly that the sphere has the larger volume.

**[3 marks]**

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**END OF QUESTIONS**

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