

Please write clearly in block capitals.

Centre number

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Candidate number

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Surname

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Forename(s)

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Candidate signature

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# GCSE MATHEMATICS

# H

Higher Tier Paper 2

Thursday 9 June 2016

Morning

Time allowed: 2 hours

## Materials

For this paper you must have:

- a calculator
- mathematical instruments.



## 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 105.
- The quality of your written communication is specifically assessed in Questions 2, 7, 10 and 15. These questions are indicated with an asterisk (\*).
- You may ask for more answer paper, graph paper and tracing paper. These must be tagged securely to this answer book.

## Advice

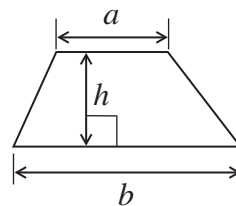
- In all calculations, show clearly how you work out your answer.



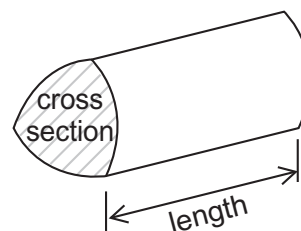
J U N 1 6 4 3 6 5 2 H 0 1

### Formulae Sheet: Higher Tier

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

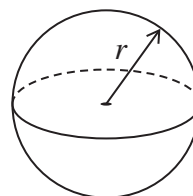


**Volume of prism** = area of cross section  $\times$  length



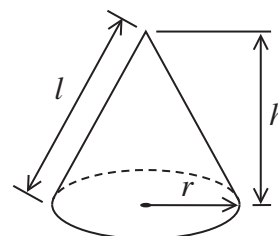
**Volume of sphere** =  $\frac{4}{3}\pi r^3$

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



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

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

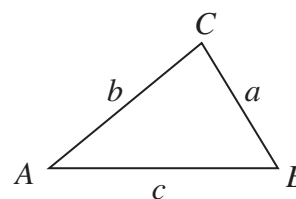


**In any triangle ABC**

**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** Here are the ingredients to make 8 biscuits.

75 g	flour
50 g	sugar
40 g	butter
2	egg yolks

Work out the ingredients to make 20 biscuits.

**[3 marks]**

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\_\_\_\_\_ g flour

\_\_\_\_\_ g sugar

\_\_\_\_\_ g butter

\_\_\_\_\_ egg yolks

3
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Turn over ►



**\*2 (a)** Alice wants to book a holiday for one adult and one child.

<p style="text-align: center;"><b>Holiday</b></p> <p style="text-align: center;">£720 per adult</p> <p style="text-align: center;">£430 per child</p> <p style="text-align: center;"><b>Special Offer</b> 15% off</p>
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Alice has £1000

Does she have enough money to book this holiday using the special offer?  
Tick a box.

Yes

No

You **must** show your working.

**[5 marks]**

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**2 (b)** Ben changes £800 to Euros before he goes on holiday.  
£1 = 1.25 Euro

He spends 895 Euros.

He changes the Euros that he has left to Pounds (£).  
The exchange rate is now £1 = 1.40 Euro

How many Pounds does he get back?

**[4 marks]**

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Answer £ \_\_\_\_\_

**Turn over for the next question**



- 3 This formula converts degrees Celsius ( $C$ ) to degrees Fahrenheit ( $F$ ).

$$F = \frac{9}{5}C + 32$$

Use the formula to convert  $28^{\circ}\text{C}$  to  $^{\circ}\text{F}$   
Give your answer to the nearest whole number.

**[3 marks]**

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Answer \_\_\_\_\_  $^{\circ}\text{F}$



4 (a) The  $n$ th term of a sequence is  $6 - 2n$

Work out the first three terms of the sequence.

[2 marks]

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

4 (b) Here is the term-to-term rule for a different sequence.

Multiply previous term by 2 and then subtract 3

The third term in this sequence is 31

Work out the **first** term.

[3 marks]

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Answer \_\_\_\_\_



- 5 The table shows information about the pay per hour of 40 people.

Pay per hour, $x$ (£)	Frequency		
$5 < x \leq 15$	14		
$15 < x \leq 25$	12		
$25 < x \leq 35$	11		
$35 < x \leq 45$	2		
$45 < x \leq 55$	1		
	Total = 40		

- 5 (a) Which group contains the median pay per hour?  
Circle your answer.

[1 mark]

$5 < x \leq 15$        $15 < x \leq 25$        $25 < x \leq 35$        $35 < x \leq 45$        $45 < x \leq 55$

- 5 (b) Work out an estimate of the mean pay per hour.

[4 marks]

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Answer £ \_\_\_\_\_





- 6 A baker makes 130 loaves so that there are  
6 times as many white loaves as granary loaves  
half as many brown loaves as white loaves.

How many of each type does he make?

[3 marks]

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White \_\_\_\_\_

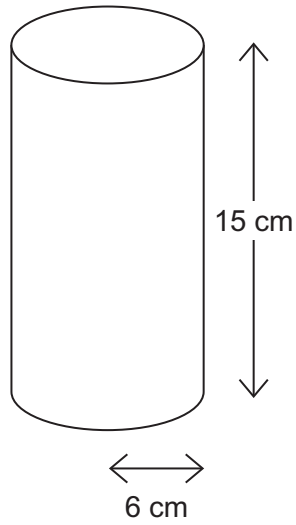
Brown \_\_\_\_\_

Granary \_\_\_\_\_

Turn over for the next question



7 (a) The diagram shows a cylinder.



The radius of the base is 6 cm  
The height is 15 cm

Work out the volume.

[3 marks]

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



**\*7 (b)**  $1000 \text{ cm}^3 = 1 \text{ litre}$

A tank contains  $45\,000 \text{ cm}^3$  of water.  
The tank leaks at  $0.75 \text{ litres/minute}$ .

How long does the tank take to empty?

**[4 marks]**

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Answer \_\_\_\_\_

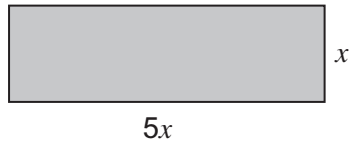
**Turn over for the next question**

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**Turn over ►**

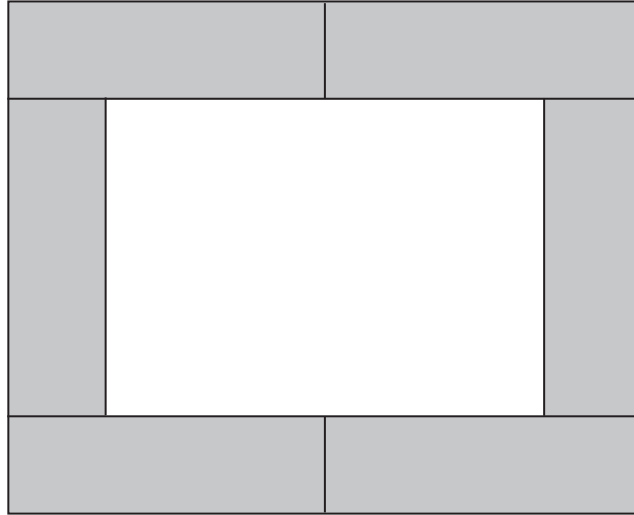


- 8 The diagram shows a rectangle.



Not drawn accurately

Six of these rectangles are joined to make this shape.



The area of the white rectangle in the middle is  $1440 \text{ cm}^2$

Work out the area of **one** shaded rectangle.

[5 marks]

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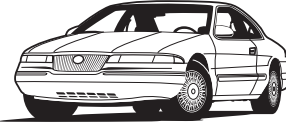


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Answer \_\_\_\_\_  $\text{cm}^2$



9



**Price reduced**

25% off

Now £14 625

Work out the price of the car before it was reduced.

**[3 marks]**

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Answer £ \_\_\_\_\_

**Turn over for the next question**

8

**Turn over ►**



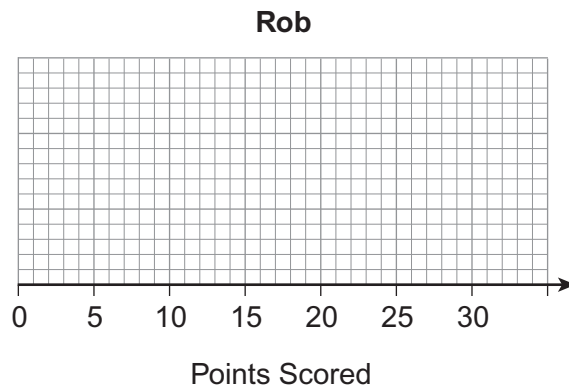
- 10** Rob played in 15 basketball matches.  
The stem-and-leaf diagram shows the number of points he scored in each match.

Key: 0 | 5 represents 5 points

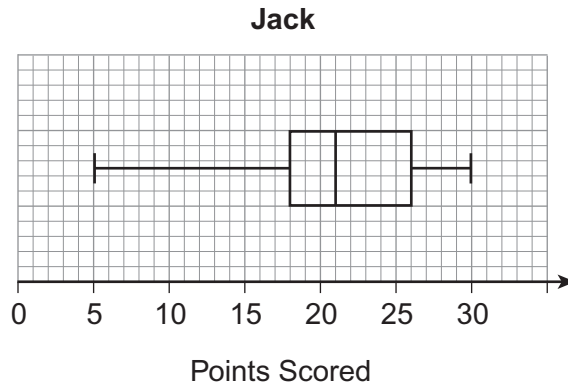
0	5							
1	2	2	4	5	6	7	8	
2	2	2	3	6	6	9		
3	0							

- \*10 (a)** Draw a box plot to represent the data.

**[4 marks]**



10 (b) This box plot represents the points that Jack scored in 15 basketball matches.



Jack says,

“I am better at basketball than Rob.”

Give **two** reasons that support his statement.

[2 marks]

Reason 1 \_\_\_\_\_

\_\_\_\_\_

Reason 2 \_\_\_\_\_

\_\_\_\_\_

Turn over for the next question

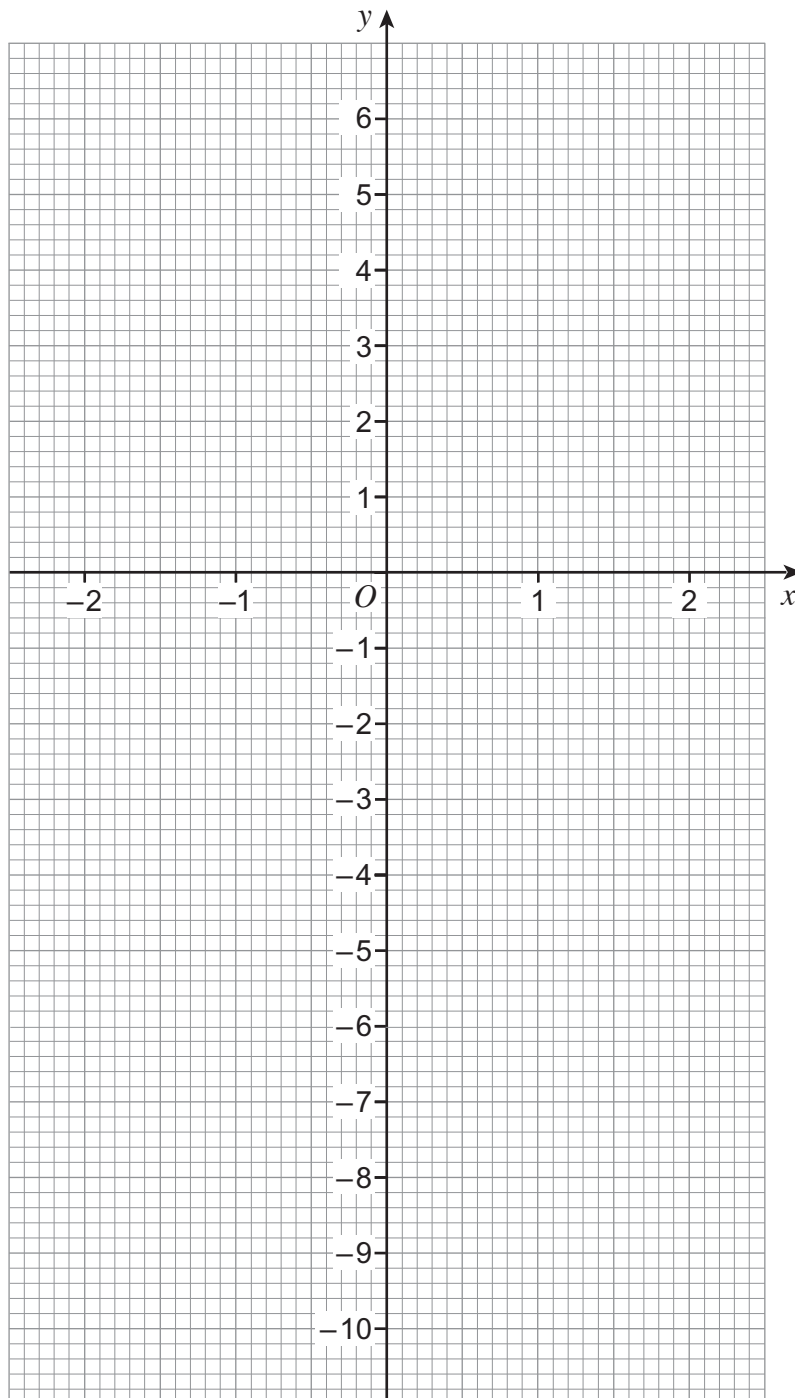


11 Here is a table of values for  $y = x^3 - 2$  for  $x = -2$  to  $2$

$x$	-2	-1	0	1	2
$y$	-10	-3	-2	-1	6

Draw the graph of  $y = x^3 - 2$  for values of  $x$  from  $-2$  to  $2$

[2 marks]

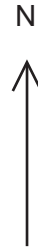




12

Two boats leave a port at the same time.  
Boat A travels due West at an average speed of 20 km/h  
Boat B travels due South at an average speed of 30 km/h

How far apart are the boats after 2.5 hours?  
Give your answer to 2 significant figures.

**[5 marks]**

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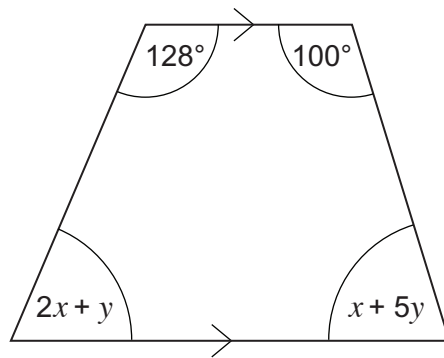
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Answer \_\_\_\_\_ km

7
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**Turn over ►**

- 13 The diagram shows a trapezium.



Not drawn  
accurately

Work out the values of  $x$  and  $y$ .

[5 marks]

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$x =$  \_\_\_\_\_ degrees

$y =$  \_\_\_\_\_ degrees



**14** Write down the equation of the straight line that

passes through the point (0, 4)

**and**

is parallel to the line  $y = 5x + 3$

**[2 marks]**

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Answer \_\_\_\_\_

**\*15** Bags of nails weigh 200 grams each.

Boxes of screws weigh 140 grams each.

Both measurements are given to the nearest 10 grams.

Show that 4 bags of nails **could** weigh the same as 6 boxes of screws.

**[3 marks]**

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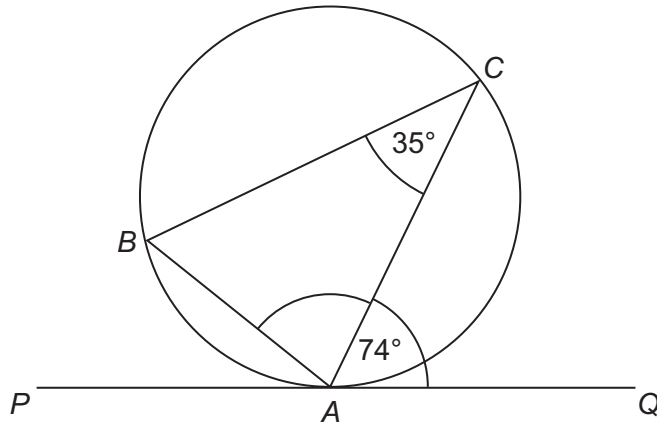
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16

$A$ ,  $B$  and  $C$  are points on a circle.  
 $PAQ$  is a tangent to the circle.



Not drawn  
accurately

Work out the size of angle  $CAB$ .

[2 marks]

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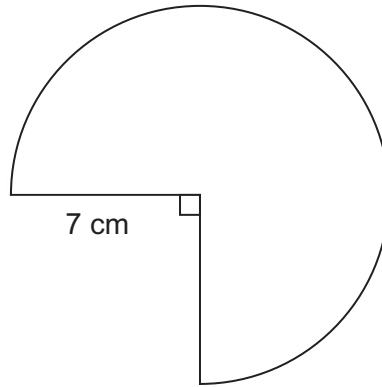


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Answer \_\_\_\_\_ degrees



- 17 The diagram shows a sector of a circle.  
The radius is 7 cm



Not drawn accurately

Work out the **perimeter** of the shape.

[3 marks]

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

Turn over for the next question



- 18** The table shows information about the masses of 400 hamsters.

Mass, $w$ (grams)	Frequency
$80 < w \leq 100$	100
$100 < w \leq 115$	150
$115 < w \leq 125$	90
$125 < w \leq 150$	60

- 18 (a)** A sample of size 50, stratified by the groups in the table, is to be taken.

Work out the number of hamsters from each group in the sample.  
Write your answers in the table below.

**[3 marks]**

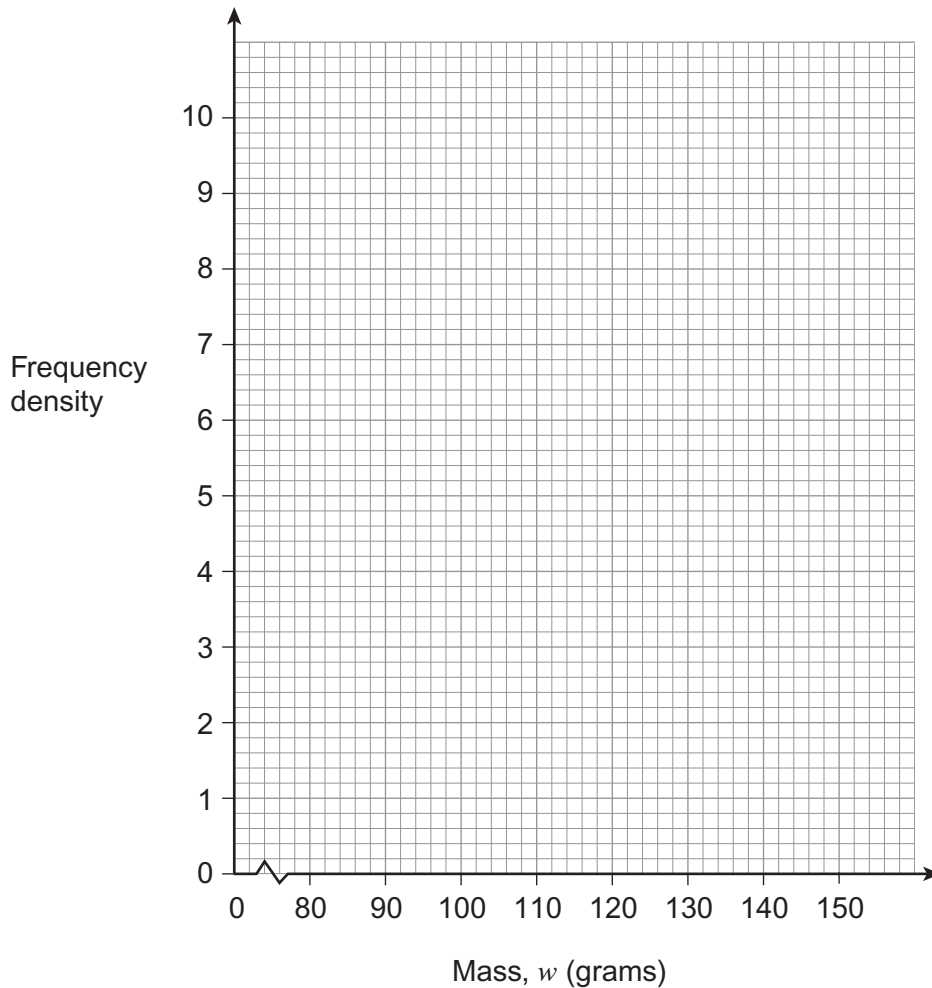
Mass, $w$ (grams)	Number in the sample
$80 < w \leq 100$	
$100 < w \leq 115$	
$115 < w \leq 125$	
$125 < w \leq 150$	



- 18 (b)** Draw a histogram for the data.  
You may use the table to help you.

[4 marks]

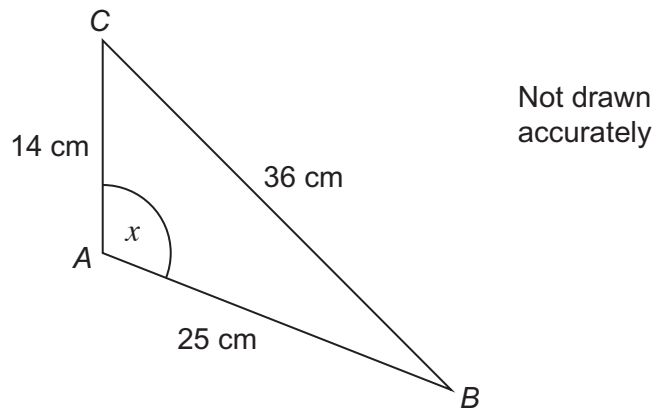
Mass, $w$ (grams)	Frequency		
$80 < w \leq 100$	100		
$100 < w \leq 115$	150		
$115 < w \leq 125$	90		
$125 < w \leq 150$	60		



Turn over ►



19

Work out the size of angle  $x$ .**[3 marks]**

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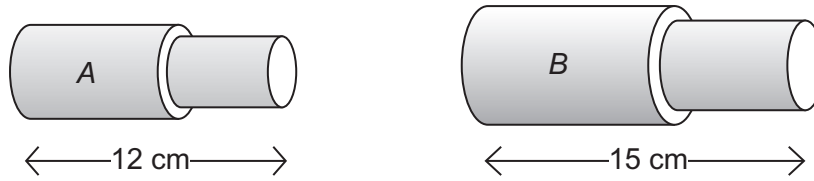
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Answer \_\_\_\_\_ degrees





20 These two solid shapes are similar.



The volume of  $A$  is  $1400 \text{ cm}^3$

Work out the volume of  $B$ .

[3 marks]

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

Turn over for the next question



- 21** A bag contains 10 counters.  
4 of the counters are black and 6 are white.
- Two counters are picked at random.
- Work out the probability that they are both black.

**[3 marks]**

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Answer \_\_\_\_\_



22 (a) Factorise  $49c^2 - d^2$

[2 marks]

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Answer \_\_\_\_\_

22 (b) Simplify  $\frac{x^2 - 6x}{2x^2 - 7x - 30}$

[3 marks]

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Answer \_\_\_\_\_

23 You are given that  $(x + a)^2 - 7 \equiv x^2 + 10x + b$

Work out the values of  $a$  and  $b$ .

[2 marks]

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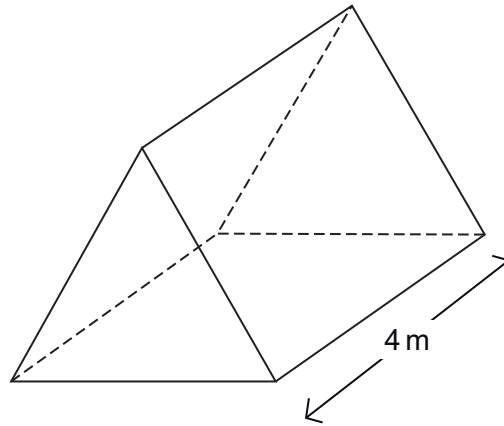
$a =$  \_\_\_\_\_

$b =$  \_\_\_\_\_





- 25 A tent is in the shape of a triangular prism.



The length of the tent is 4 metres.  
The volume is  $8 \text{ m}^3$

The cross-section of the tent is an **equilateral** triangle.

Shaun is 1.95 metres tall.

Can he stand at the highest part of the tent without having to bend over?  
You **must** show your working.

[5 marks]

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Answer \_\_\_\_\_

**END OF QUESTIONS**



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