

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 (LINEAR)

# H

Higher Tier Paper 1

Wednesday 4 November 2015 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 3, 6 and 13. 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

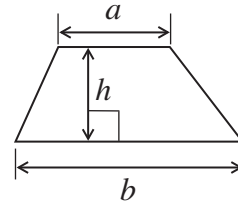
- In all calculations, show clearly how you work out your answer.



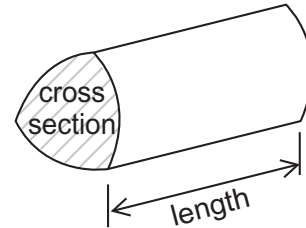
N 0 V 1 5 4 3 6 5 1 H 0 1

### Formulae Sheet: Higher Tier

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

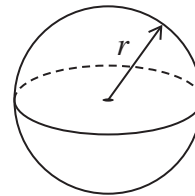


**Volume of prism** = area of cross section  $\times$  length



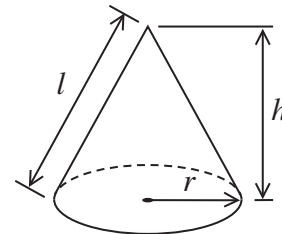
**Volume of sphere** =  $\frac{4}{3}\pi r^3$

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



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

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

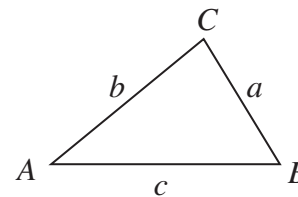


**In any triangle ABC**

**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 Divide 270 in the ratio 3 : 2 : 1

[3 marks]

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Answer ..... : ..... : .....

2 Solve  $\frac{4x - 1}{7} = 2x$

[3 marks]

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$x =$  .....

Turn over for the next question



\*3 Three shops sell the same washing machine.

**Shop A**



£150 deposit  
plus  
£60 a month for 6 months

**Shop B**



Usual price £600  
20% off

**Shop C**



Usual price £720  
 $\frac{1}{4}$  off

In which shop is the washing machine cheapest?  
You **must** show your working.

**[5 marks]**

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Answer .....



4 A shape is made from a rectangle R and a square S.



Not drawn  
accurately

The shape has a perimeter of 44 cm  
The area of the square is 36 cm<sup>2</sup>

Work out the area of the shape.

**[4 marks]**

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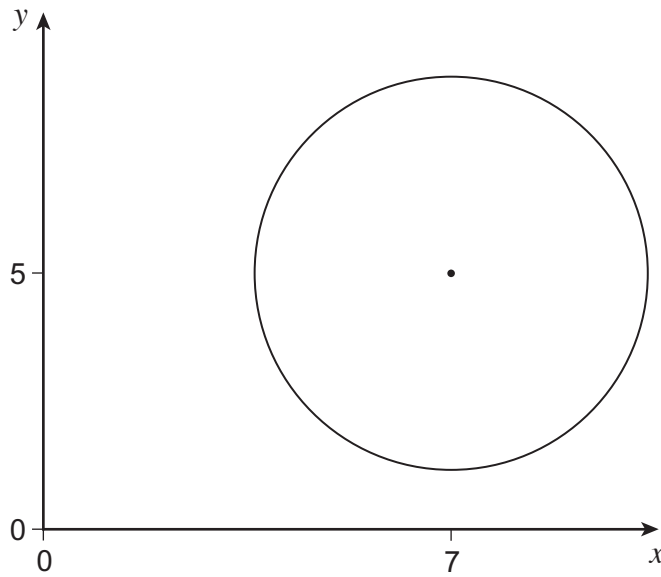
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Answer ..... cm<sup>2</sup>

**Turn over for the next question**



- 5 A circle radius 3 units, centre (7, 5) is shown.



Not drawn  
accurately

Work out the coordinates of **any** point that lies on the circumference of the circle.  
You **must** show your working, which may be on the diagram.

[2 marks]

Answer ( ..... , ..... )



6 Fay is testing an ordinary six-sided dice to see if it is biased.  
She throws the dice 120 times.

6 (a) Work out the number of times the dice is expected to land on 1

[1 mark]

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Answer .....

\*6 (b) Here are the actual results.

Number on dice	1	2	3	4	5	6	Total
Frequency	5	19	17	20	21	38	120

Is the dice biased?  
Tick a box.

Yes  No  Cannot tell

Give a reason for your answer.

[2 marks]

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5

Turn over ►



7 These expressions represent four numbers.

$$2x + 2$$

$$3x - 1$$

$$4x - 6$$

$$5x + 2$$

The sum of the first two expressions is 36

Work out the value of the median of the four numbers.

**[5 marks]**

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Answer .....





8 (a) Expand and simplify fully  $4(x - 2) - 2(3 - 5x)$

[3 marks]

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Answer .....

8 (b) Simplify fully  $\frac{8a^2 + 10ab}{12a + 15b}$

[3 marks]

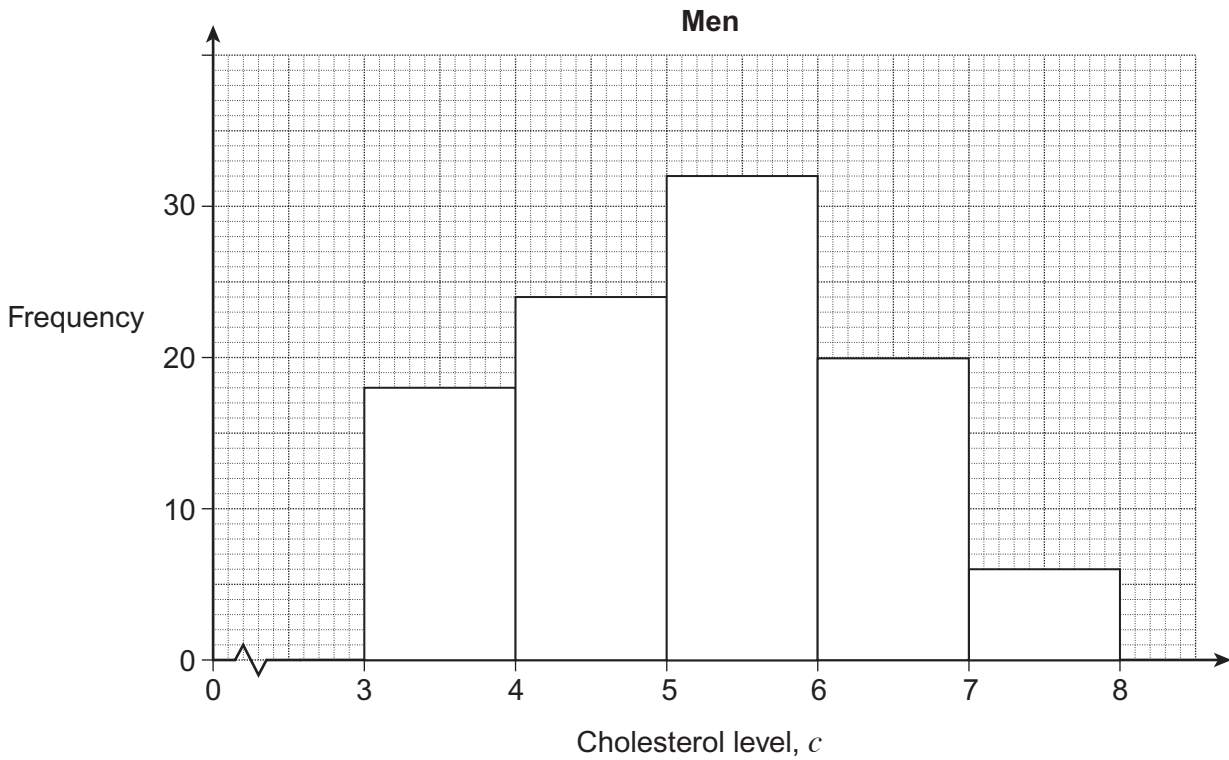
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Answer .....

Turn over for the next question



9 (a) The frequency diagram shows information about the cholesterol level of 100 men.



Work out an estimate of the median cholesterol level of the men.

[3 marks]

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Answer .....



9 (b) The box plot shows information about the cholesterol level of 100 women.



None of these 100 women have a cholesterol level of 6.8

Estimate how many of the **200 people** have a cholesterol level above 6.8  
You **must** show your working.

**[3 marks]**

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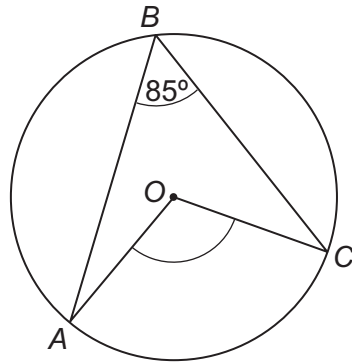
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Answer .....



10 (a) The diagram shows a circle, centre  $O$ .



Not drawn  
accurately

Work out the size of angle  $AOC$ .  
Give a reason for your answer.

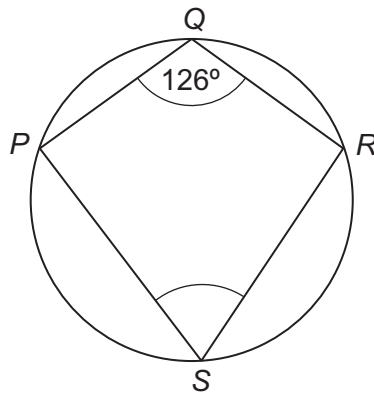
[2 marks]

Answer ..... degrees

Reason .....

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10 (b)  $P, Q, R$  and  $S$  are points on the circumference of a circle.



Not drawn  
accurately

Work out the size of angle  $PSR$ .  
Give a reason for your answer.

[2 marks]

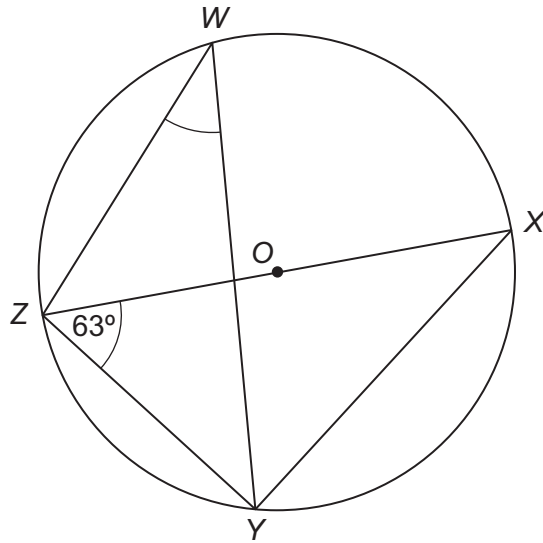
Answer ..... degrees

Reason .....

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- 10 (c)**  $W, X, Y$  and  $Z$  are points on the circumference of a circle centre  $O$ .  
 $ZX$  is a diameter.  
 Angle  $YZX = 63^\circ$



Not drawn  
accurately

Work out the size of angle  $ZWY$ .  
 You **must** show your working, which may be on the diagram.

**[2 marks]**

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Answer ..... degrees

**Turn over for the next question**



11 Solve  $2(7x + 3) < 4x - 1$

[3 marks]

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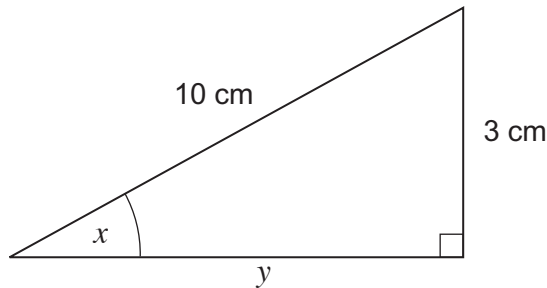
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Answer .....

12



Not drawn  
accurately

12 (a) Work out the length  $y$  in the form  $\sqrt{a}$  where  $a$  is an integer.

[2 marks]

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Answer ..... cm

12 (b) Write down the value of  $\tan x$

[1 mark]

Answer .....



**\*13** The square number sequence is

1            4            9            16            25            .....

Prove algebraically that the difference of two consecutive square numbers is an odd number.

**[4 marks]**

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**Turn over for the next question**

**10**

**Turn over ►**



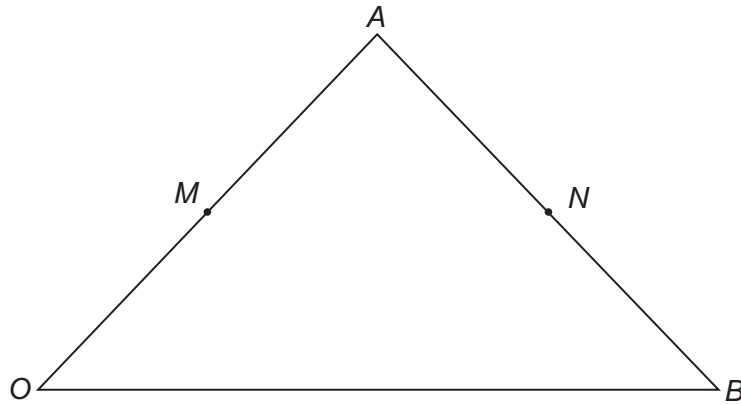
**14** In triangle  $OAB$

$M$  is the midpoint of  $OA$ .

$N$  is the midpoint of  $AB$ .

$$\vec{OA} = 2\mathbf{a}$$

$$\vec{OB} = 2\mathbf{b}$$



Not drawn  
accurately

**14 (a)** Write down  $\vec{AB}$  in terms of  $\mathbf{a}$  and  $\mathbf{b}$ .

[1 mark]

Answer .....

**14 (b)** Show that  $\vec{MN} = \mathbf{b}$

[2 marks]

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14 (c) Explain why triangles *AMN* and *AOB* are similar.

[2 marks]

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15 (a) Circle the value of  $(5\sqrt{3})^2$

[1 mark]

15                   $25\sqrt{3}$                   75                  225

15 (b) Simplify fully  $(16x^4y^{12})^{\frac{3}{4}}$

[3 marks]

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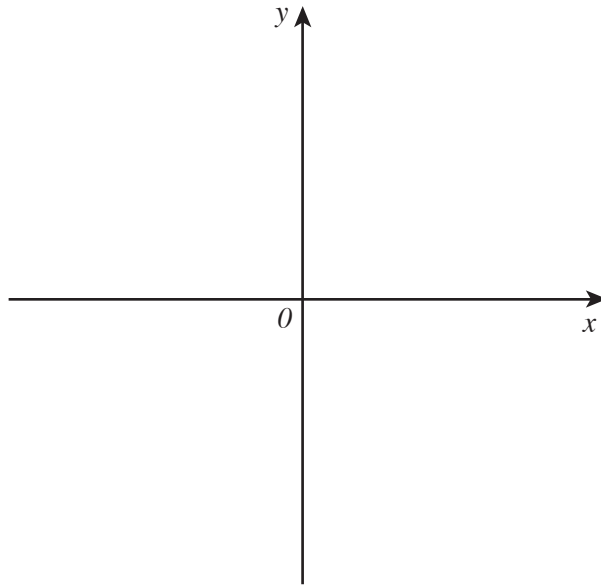
Answer .....

Turn over for the next question



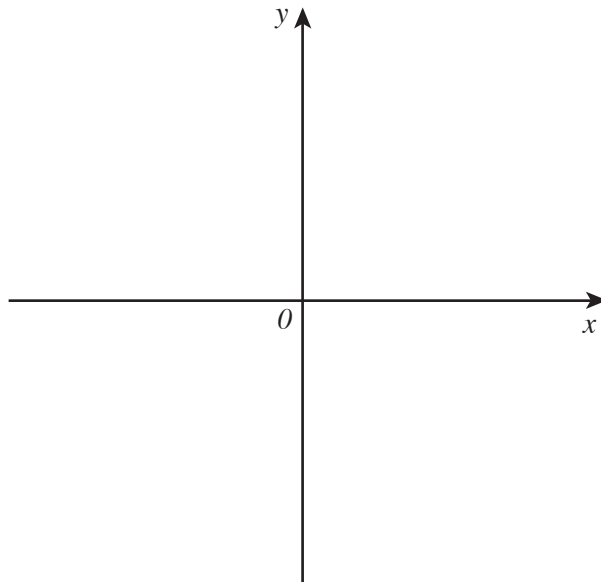
16 (a) Sketch the graph of  $y = x^3$

[1 mark]



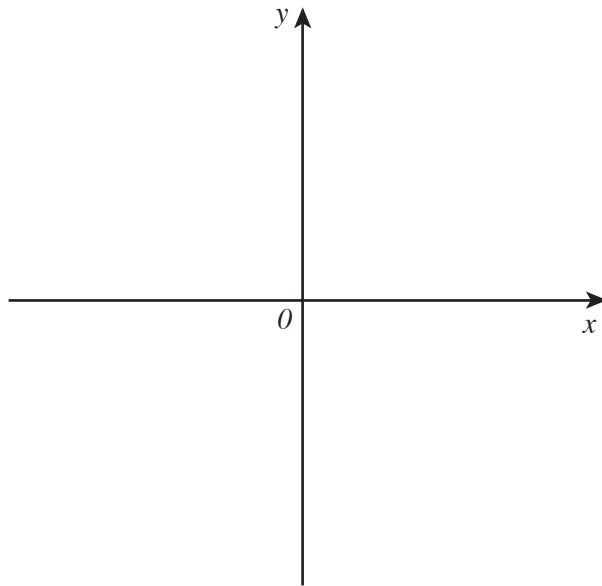
16 (b) Sketch the graph of  $y = x^2 + 3$

[1 mark]



16 (c) Sketch the graph of  $y = \frac{1}{x}$

[1 mark]



17  $y$  is inversely proportional to  $x$ .  
When  $y = 2, x = 5$

Work out an equation connecting  $y$  and  $x$ .

[3 marks]

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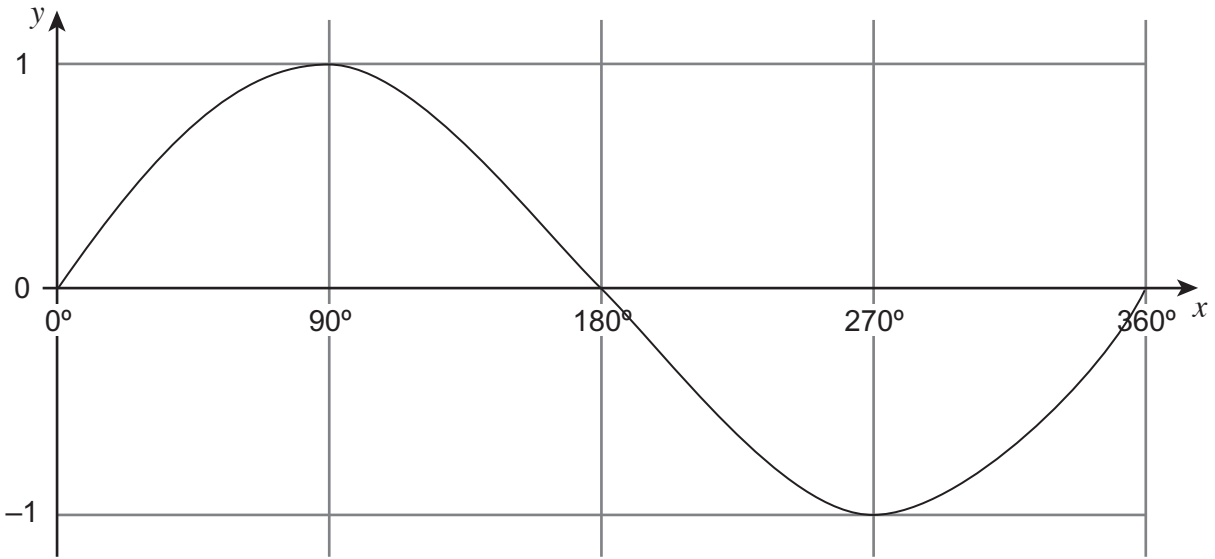
Answer .....

6

Turn over ►



18 This is a sketch graph of  $y = \sin x$  for  $0^\circ \leq x \leq 360^\circ$



18 (a) Write down the number of solutions for  $\sin x = 0.5$  for  $0^\circ \leq x \leq 360^\circ$

[1 mark]

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Answer .....

18 (b)  $\sin x = \sin 10$

Write down the value of  $x$  for  $90^\circ \leq x \leq 180^\circ$

[1 mark]

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Answer .....

**END OF QUESTIONS**

