



Please write clearly in block capitals.

Centre number

Candidate number

Surname \_\_\_\_\_

Forename(s) \_\_\_\_\_

Candidate signature \_\_\_\_\_

I declare this is my own work.

# GCSE MATHEMATICS



Higher Tier

Paper 1 Non-Calculator

Tuesday 19 May 2020

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.
- 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.
- If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).
- Do all rough work in this book. Cross through any work you do not want to be marked.

### Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 80.
- You may ask for more answer paper, graph paper and tracing paper. These must be tagged securely to this answer book.

For Examiner's Use	
Pages	Mark
2-3	
4-5	
6-7	
8-9	
10-11	
12-13	
14-15	
16-17	
18-19	
20-21	
22-23	
24-25	
<b>TOTAL</b>	

### Advice

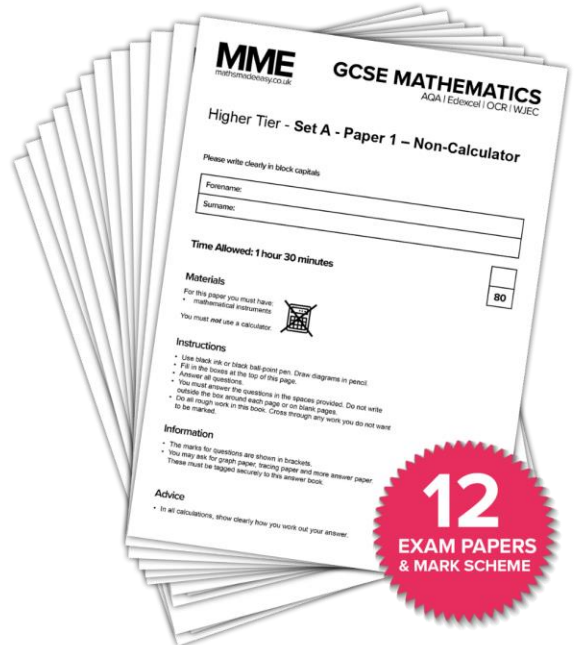
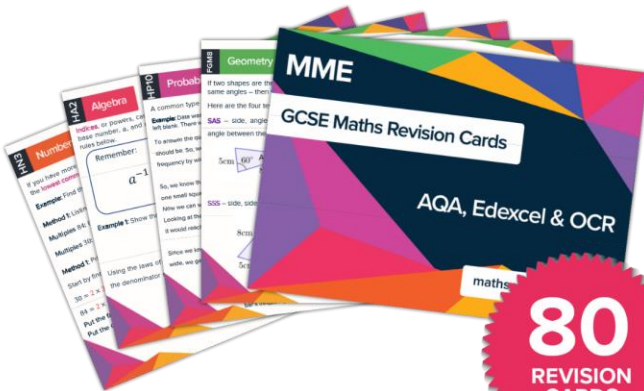
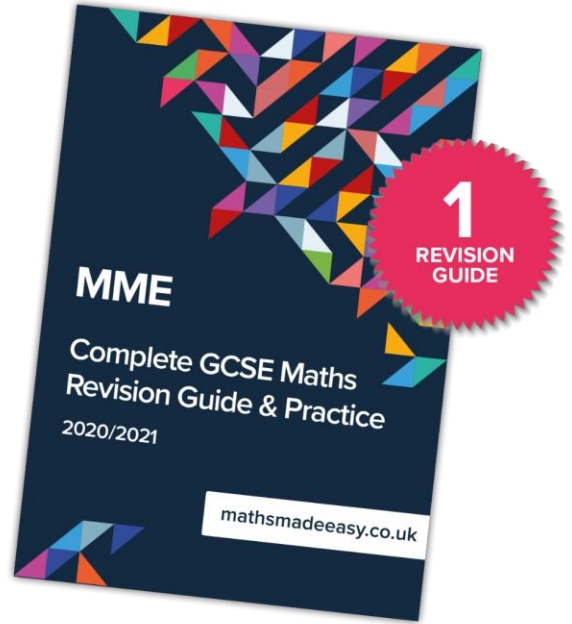
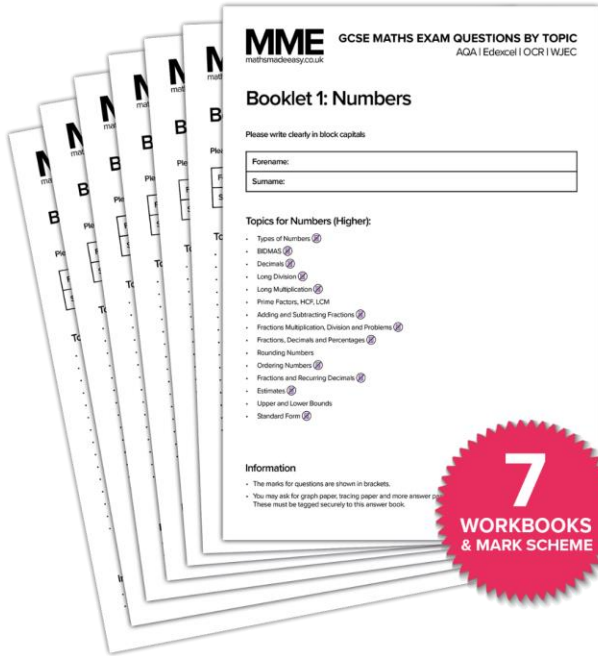
In all calculations, show clearly how you work out your answer.



JUN2083001H01

# MME.

## GCSE Maths Products



Available in the course in a box  
or for purchase separately.

Answer **all** questions in the spaces provided.

Do not write outside the box

1 Circle the fraction that is equivalent to 4.75

[1 mark]

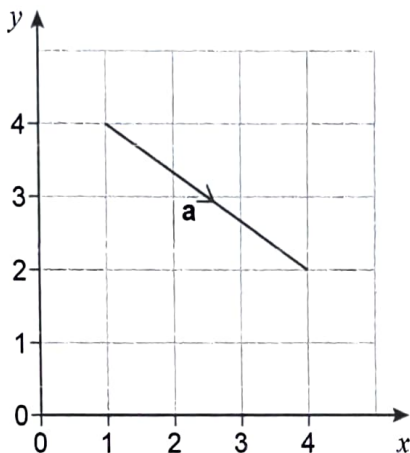
$$\frac{15}{4}$$

$$\frac{19}{4}$$

$$\frac{21}{4}$$

$$\frac{23}{4}$$

2 Here is vector **a**.



Circle the column vector that represents **a**.

[1 mark]

$$\begin{pmatrix} 3 \\ 2 \end{pmatrix}$$

$$\begin{pmatrix} -3 \\ 2 \end{pmatrix}$$

$$\begin{pmatrix} 3 \\ -2 \end{pmatrix}$$

$$\begin{pmatrix} -3 \\ -2 \end{pmatrix}$$

3 Which one of these is a square number **and** a cube number?

Circle your answer.

[1 mark]

100

1000

10000

1000000



Do not write outside the box

4 Circle the reciprocal of  $\frac{5}{6}$

[1 mark]

$\frac{6}{5}$

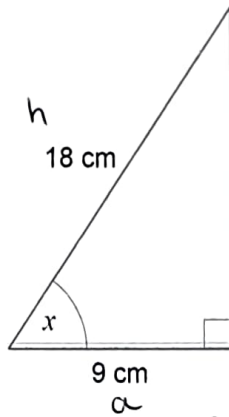
$\frac{1}{6}$

$-\frac{1}{6}$

$-\frac{6}{5}$

5 Use trigonometry to work out the size of angle  $x$ .

Not drawn accurately



[2 marks]

$$\cos(x) = \frac{9}{18} = \frac{1}{2}$$

$$x = 60^\circ$$

Answer 60 degrees

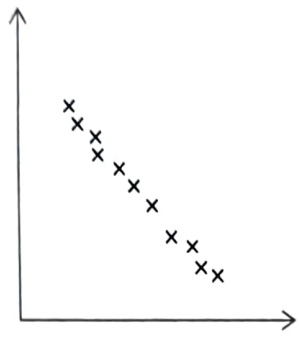


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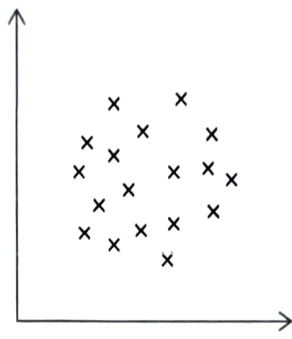
6

A and B are scatter graphs.

Graph A



Graph B



What type of correlation is shown by each graph?

Choose from

- Weak positive
- Strong positive
- Weak negative
- Strong negative
- No correlation

[2 marks]

Graph A Strong negative

Graph B No correlation



7 Here is some information about 80 people who play in bands.

12 are singers but not guitar players.

30% are neither a singer nor a guitar player.

$\frac{1}{4}$  of the guitar players are also singers.

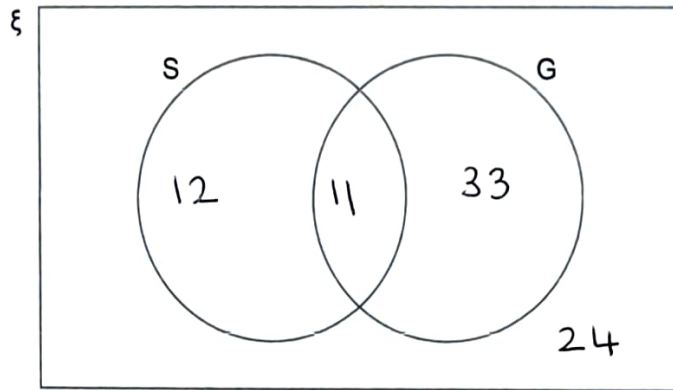
Complete this Venn diagram to represent the information.

[4 marks]

$\xi$  = 80 people who play in bands

S = singers

G = guitar players



$$30\% \text{ of } 80 = 24$$

$$80 - 12 - 24 = 44 \text{ (G)}$$

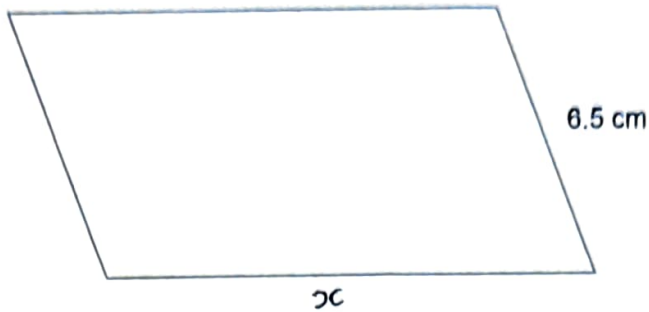
$$\frac{1}{4} \text{ of } 44 = 11$$

$$44 - 11 = 33$$



- 8 The shorter side of a parallelogram has length 6.5 cm

Not drawn  
accurately



The length of the shorter side is  $\frac{1}{9}$  of the perimeter.

Work out the length of the longer side.

[3 marks]

$$\text{perimeter} = 2x + 13$$

$$\hookrightarrow \frac{1}{9}(2x + 13) = 6.5$$

$$\Rightarrow 2x + 13 = 58.5$$

$$\Rightarrow 2x = 45.5$$

$$\Rightarrow x = 22.75 \text{ cm}$$

Answer 22.75 cm



- 9 (a) All the terms of a **geometric** progression are positive.  
The second and fourth terms are shown.

$$\begin{array}{ccccccc} & 2 & & & 8 & & 16 \\ \dots\dots\dots & & 4 & & \dots\dots\dots & & \end{array}$$

Work out the first and third terms.

[2 marks]

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First term 2

Third term 8

- 9 (b) The first two terms of an **arithmetic** progression are shown.

$$\begin{array}{cccc} p & & 5p & \dots\dots \\ & \nearrow & & \\ & +4p & & \end{array}$$

The sum of the first three terms is 90

Work out the value of  $p$ .

[3 marks]

$$3^{\text{rd}} \text{ term} = 5p + 4p = 9p$$

$$p + 5p + 9p = 90$$

$$\Rightarrow 15p = 90$$

$$\Rightarrow p = 6$$

Answer 6





Do not write outside the box

10

The cost of a holiday is £2400

Rana pays a deposit followed by monthly payments, in the ratio

deposit : total of the monthly payments = 3 : 5

She makes 6 equal monthly payments.

Work out her monthly payment.

[4 marks]

$$2400 \div (3 + 5) = 300$$

$$300 \times 5 = 1500$$

$$6 \overline{) 1500} \quad 1500 \div 6 = 250$$

Answer £ 250



Do not write outside the box

11 As a decimal  $\frac{11}{40} = 0.275$

Work out  $\frac{33}{400}$  as a decimal.

[2 marks]

$$\frac{11}{40} \times \frac{3}{10} = \frac{33}{400} = 0.275 \times \frac{3}{10}$$


---


$$= 0.825 \times \frac{1}{10} = 0.0825$$

Answer 0.0825

Turn over for the next question

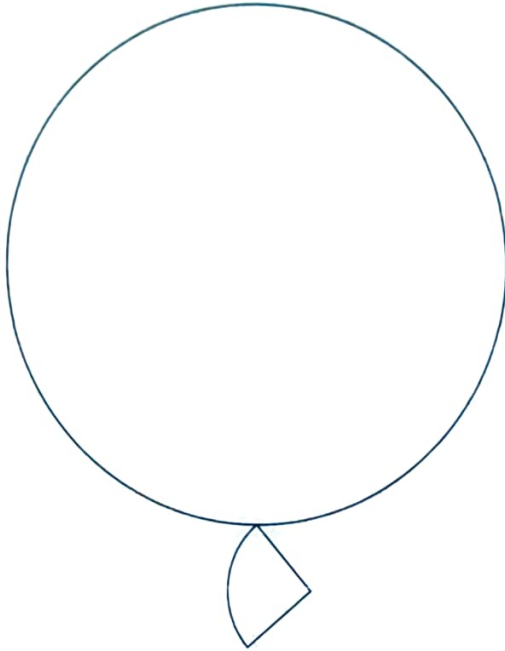
6

Turn over ►



- 12 Two wire shapes make an earring.  
The shapes are  
a circle with radius 21 mm  
and  
a quarter circle.

Not drawn  
accurately



radius of circle : radius of quarter circle = 7 : 2

- 12 (a) Show that the radius of the quarter circle is 6 mm

[1 mark]

$$21 \div 7 = 3$$

$$3 \times 2 = 6 \text{ mm}$$



12 (b) Work out the **total** length of the wire in the earring.

Give your answer in the form  $a\pi + b$  where  $a$  and  $b$  are integers.

[4 marks]

$$C = \pi d$$

$$\text{circ. of large circle} = \pi \times 21 \times 2 = 42\pi$$

$$\text{arc of quarter circle} = \pi \times 6 \times 2 \times 1/4 = 3\pi$$

$$\text{perimeter of quarter circle} = 3\pi + 6 + 6 = 3\pi + 12$$

$$\text{Total length} = 42 + 3\pi + 12 = 45\pi + 12$$

Answer            $45\pi + 12$            mm

Turn over for the next question



13 (a)  $s$  and  $t$  are positive integers.

$(x+s)(x-t)$  is expanded and simplified.

The answer is  $x^2 + kx - 40$  where  $k$  is a positive integer.

Work out the **smallest** possible value of  $k$ .

[2 marks]

$$s \times (-t) = -40$$

$$\Rightarrow st = 40 \quad (s, t > 0)$$

$$s = 8$$

$$t = 5$$

$$8 - 5 = 3$$

Answer 3

13 (b) Faisal tries to solve  $(x+2)(x-7) = 0$

Here is his working.

	$(x+2) = 0$	or	$(x-7) = 0$
Answer	$x = 2$	or	$x = 7$

Give a reason why his answer is wrong.

[1 mark]

Should be  $x = -2$ , because for  $x = -2$ ,

$x+2 = 0$  is satisfied.



14 (a)  $c = 2^{10} \times 3 \times 5^6$

Work out  $18c$ .

Give your answer as a product of prime factors in index form.

[2 marks]

$$18 = 2 \times 9 = 2 \times 3^2$$

$$18c = 2 \times 3^2 \times 2^{10} \times 3 \times 5^6$$

$$= 2^{11} \times 3^3 \times 5^6$$

Answer  $2^{11} \times 3^3 \times 5^6$

14 (b) Work out  $\sqrt[3]{\frac{2^7 \times 11^3}{2}}$

Give your answer as an integer.

[2 marks]

$$\sqrt[3]{\frac{2^7 \times 11^3}{2}} = \text{or } \sqrt[3]{2^6 \times 11^3}$$

$$= 2^{2} \times 11 = 44$$

Answer  $44$



15

$$3x = \frac{1}{2}y$$

Circle the ratio  $x : y$ 

[1 mark]

6 : 1

1 : 6

3 : 2

2 : 3

16

A sequence of numbers is formed by the iterative process

$$u_{n+1} = \frac{4}{u_n - 1} \quad u_1 = 9$$

Work out the values of  $u_2$  and  $u_3$ 

[2 marks]

$$u_2 = \frac{4}{9-1} = \frac{1}{2}$$

$$u_3 = \frac{4}{\frac{1}{2}-1} = -8$$

$$u_2 = \underline{\quad 0.5 \quad}$$

$$u_3 = \underline{\quad -8 \quad}$$

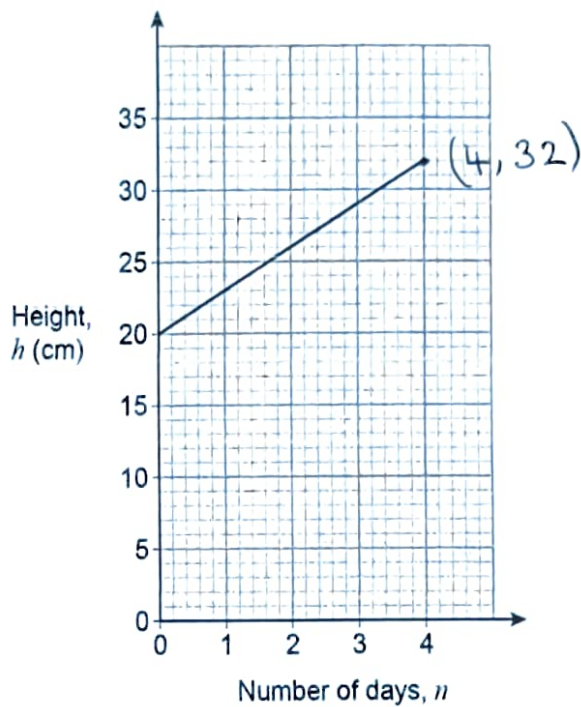


17

Jim buys a plant of height 20 cm

The graph shows how the height of the plant changes during the next 4 days.

Do not write  
outside the  
box



Work out a formula for  $h$  in terms of  $n$ .

[3 marks]

$$\text{gradient} = \frac{32 - 20}{4 - 0} = 3$$

$$\text{h intercept} = 20$$

Answer  $h = 3n + 20$





18

Solve the simultaneous equations

$$2x + 4y = -9 \quad (1)$$

$$2y = 4x - 7 \quad (2)$$

[4 marks]

$$2 \times (2) \Rightarrow 4y = 8x - 14$$

Substitute  $4y = 8x - 14$  into (1)

$$\Rightarrow 2x + (8x - 14) = -9$$

$$\Rightarrow 10x - 14 = -9$$

$$\Rightarrow 10x = 5$$

$$\Rightarrow x = 0.5$$

Sub.  $x = 0.5$  into (2)

$$2y = 2 - 7 = -5$$

$$y = -2.5$$

$$x = \underline{0.5} \quad y = \underline{-2.5}$$



- 19 Circle the expression that is equivalent to  $\frac{x}{5} + \frac{x}{10}$  [1 mark]

$$\frac{3x}{10}$$

$$\frac{2x}{15}$$

$$\frac{x}{25}$$

$$\frac{x^2}{50}$$

- 20 (a) Write down the value of  $7^0$  [1 mark]

Answer 1

- 20 (b) Work out the value of  $32^{-\frac{3}{5}}$  [2 marks]

$$32^{\frac{1}{5}} = 2$$

$$2^{-3} = \frac{1}{2^3} = \frac{1}{8}$$

Answer  $\frac{1}{8}$

Turn over for the next question



21

Write these numbers in order of size.

15.6

$3\sqrt{23}$

$2.1^4$

$\frac{47}{3}$

Start with the smallest.

[2 marks]

 $\sqrt{23}$  is between 4 and 5,  $3\sqrt{23}$  is between 12 and 15

$16 < 2.1^4$

15.6 ~~6~~ ...

$3 \overline{) 47.200}$

Smallest

$3\sqrt{23}$

$15.6$

$\frac{47}{3}$

Largest

$2.1^4$

Do not write  
outside the  
box

22 (a)  $y$  is directly proportional to  $x^3$

$$y = 17 \quad \text{when} \quad x = 4$$

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

[3 marks]

$$y = kx^3$$

$$17 = k \times 4^3$$

$$\Rightarrow k = \frac{17}{64}$$

$$y = \frac{17}{64}x^3$$

Answer  $y = \frac{17}{64}x^3$

22 (b)  $m$  is inversely proportional to  $\sqrt{r}$

The value of  $r$  is multiplied by 4

Circle what happens to the value of  $m$ .

[1 mark]

$\times 2$

$\times 16$

$\div 2$

$\div 16$

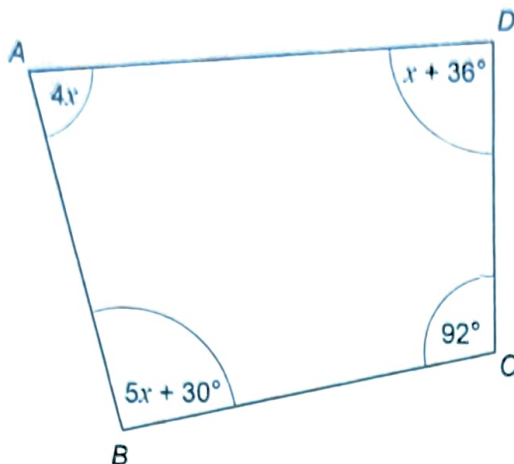
Turn over for the next question



23

ABCD is a quadrilateral.

Not drawn accurately



Prove that ABCD is **not** a cyclic quadrilateral.

[4 marks]

In a cyclic quadrilateral opposite angles add up to  $180^\circ$ .

So if ABCD is a cyclic quadrilateral then  
 $4x + 92 = 180 = 5x + 30 + x + 36$

$4x + 92 = 180$	Sub. in $x = 22$
$\Rightarrow 4x = 88$	into $5x + 30 + x + 36$
$\Rightarrow x = 22$	$= 198 \neq 180$
	So ABCD is not a cyclic quadrilateral as opposite angles cannot add to $180^\circ$



24

 $y$  is an obtuse angle.

Which statement is true?

Tick **one** box.

[1 mark]

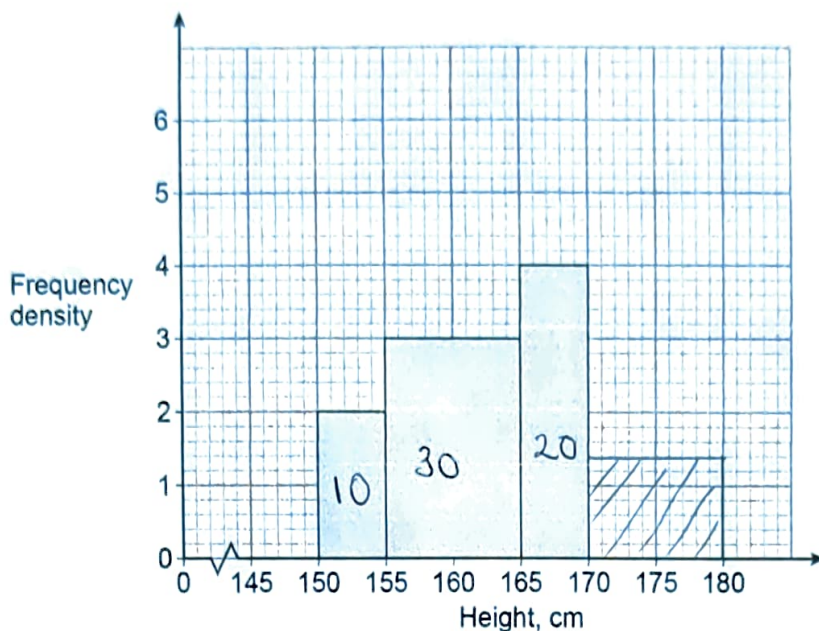
 $\sin y > 0$  and  $\cos y > 0$  $\sin y > 0$  and  $\cos y < 0$  $\sin y < 0$  and  $\cos y > 0$  $\sin y < 0$  and  $\cos y < 0$ 

Turn over for the next question

Turn over ►



- 25 A histogram is drawn to represent the heights of a sample of women. Three of the four bars are shown. The bar for  $170 \text{ cm} < \text{height} < 180 \text{ cm}$  is missing.



There are 74 women in the sample.

Complete the histogram.

[4 marks]

$$74 - 10 - 30 - 20 = 14$$

$$14 \div 10 = 1.4$$



26 (a) Show that  $\frac{14}{\sqrt{7}}$  can be written in the form  $a\sqrt{b}$  where  $a$  and  $b$  are integers.

[2 marks]

$$\frac{14}{\sqrt{7}} \times \frac{\sqrt{7}}{\sqrt{7}} = \frac{14\sqrt{7}}{7} = 2\sqrt{7}$$

26 (b) Work out  $2\sqrt{10} \times \sqrt{80} \times \sqrt{18}$

Give your answer as an integer.

[3 marks]

$$2\sqrt{10} \times \sqrt{80} \times \sqrt{18} = 2\sqrt{10 \times 80 \times 18}$$

$$= 2\sqrt{\quad}$$

$$= 2\sqrt{10} \times 4\sqrt{5} \times 3\sqrt{2}$$

$$= 24\sqrt{100} = 240$$

Answer 240

Turn over for the next question





Do not write outside the box

27 A and B are similar solid cylinders.

base area of A : base area of B = 9 : 25

Complete these ratios.

[2 marks]

curved surface area of A : curved surface area of B = 9 : 25

height of A : height of B = 3 : 5

curved surface area =  $\pi d \times h$

28 Factorise fully  $144 - 4x^2$

[2 marks]

$= 4(36 - x^2)$

$= 4(6 - x)(6 + x)$

Answer  $4(6 - x)(6 + x)$



- 29 The graph of  $y = x^3 + 6$  is translated 4 units to the right.  
The translated graph has equation  $y = f(x)$   
Work out  $f(x)$ .  
Give your answer in the form  $x^3 + ax^2 + bx + c$  where  $a$ ,  $b$  and  $c$  are integers.

[4 marks]

$$y = (x-4)^3 + 6$$

$$= (x-4)(x^2 - 8x + 16) + 6$$

$$= x^3 - 8x^2 + 16x - 4x^2 + 32x - 64 + 6$$

$$= x^3 - 12x^2 + 48x - 58$$

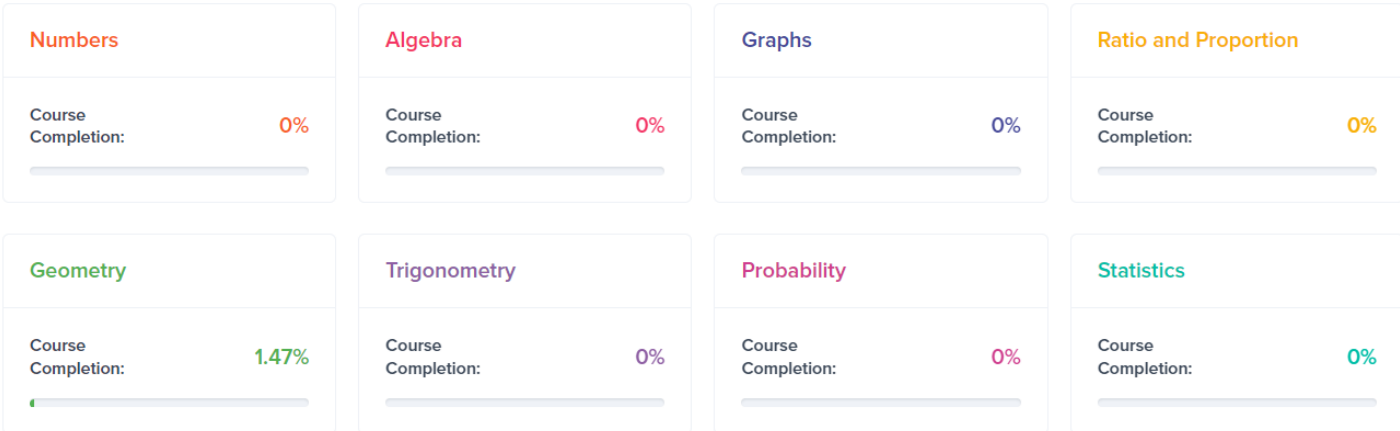
Answer  $x^3 - 12x^2 + 48x - 58$

END OF QUESTIONS



# MME.

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77% → -4%

Calculate the following:

$$\frac{(15 - 3)}{2} \div 3$$

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Item	Status	Latest Result
0% Completed		
2. Algebra	0% Completed	+
3. Graphs	0% Completed	-
3.1 Gradients of Straight Line Graphs		+
3.2 $y=mx+c$		+
3.3 Coordinates and Midpoints		+
3.4 Drawing Straight Line Graphs		+
3.5 Parallel Lines		-
3.6 Quadratic and Cubic Graphs		+
3.7 Turning Points of Quadratic Graphs		+
3.8 Circle Graphs and Tangents		+

Item	Status	Latest Result
Revision	Incomplete	-
Practice Tests	0/3 Complete	-
Online Exam	Incomplete	-