

Please write clearly in block capitals.

Centre number

Candidate number

Surname \_\_\_\_\_

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

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

I declare this is my own work.

# INTERNATIONAL GCSE MATHEMATICS EXTENSION

# E

Paper 1E

Monday 8 November 2021

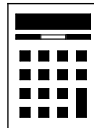
07:00 GMT

Time allowed: 2 hours

## Materials

For this paper you must have:

- a calculator
- mathematical instruments
- the Formulae Sheet (enclosed).



## 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 100.
- You may ask for more answer paper, graph paper and tracing paper. These must be tagged securely to this answer book.
- If your calculator does not have a  $\pi$  button, take the value of  $\pi$  to be 3.142

## Advice

- Show all necessary working; otherwise marks for method may be lost.

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	
26–27	
28–29	
<b>TOTAL</b>	



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

- 1** The point (8, 1) is translated to the point (3, 1)

Circle the translation vector.

[1 mark]

$$\begin{pmatrix} 5 \\ 0 \end{pmatrix}$$

$$\begin{pmatrix} -5 \\ 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 \\ 5 \end{pmatrix}$$

$$\begin{pmatrix} 0 \\ -5 \end{pmatrix}$$

- 2** Increase  $x$  by 8%

Circle your answer.

[1 mark]

$$0.08x$$

$$0.8x$$

$$1.08x$$

$$1.8x$$

- 3** The equation of a line is  $y = 7 - 4x$

Circle the coordinates of the  $y$ -intercept.

[1 mark]

$$(7, 0)$$

$$(0, 7)$$

$$(-4, 0)$$

$$(0, -4)$$



- 4 A prism has 12 vertices.  
How many edges does the prism have?  
Circle your answer.

[1 mark]

6

8

12

18

- 5 Write these numbers in order of size, starting with the **smallest**.

$3.8 \times 10^4$

$1.6 \times 10^7$

$5.3 \times 10^4$

[2 marks]

smallest \_\_\_\_\_

\_\_\_\_\_

largest \_\_\_\_\_



**6 (a)** The first four terms of a linear sequence are

-5      3      11      19

Work out an expression for the  $n$ th term.

**[2 marks]**

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Answer \_\_\_\_\_

**6 (b)** A different sequence has  $n$ th term  $\frac{48 - n^2}{n}$

Work out the sum of the 5th term and the 6th term.

**[2 marks]**

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Answer \_\_\_\_\_



- 7 Five of the interior angles of a hexagon add up to  $610^\circ$

Work out the size of the other interior angle.

[2 marks]

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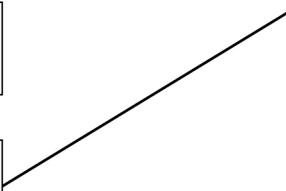
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Answer \_\_\_\_\_<sup>o</sup>

- 8 Match each equation to a description of its graph.

One has been done for you.

[4 marks]

$y = \frac{1}{x}$		A horizontal line
$y = -1$		A line with gradient 1
$y = x - 1$		A vertical line
$y = x^2$		A curve passing through (0, 1)
$y = x^3 + 1$		A reciprocal function
		$y$ has no negative values



- 9 Here is some information about the length of time that 120 students were online.

Time, $t$ (hours)	Frequency	Midpoint	
$0 \leq t < 2$	66		
$2 \leq t < 4$	26		
$4 \leq t < 6$	20		
$6 \leq t < 8$	8		

Work out an estimate for the mean time.

Give your answer in hours and minutes.

[3 marks]

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Answer \_\_\_\_\_ hours \_\_\_\_\_ minutes



**10 (a)**  $x$  is an integer.

A is the set of factors of  $x$

$$n(A) = 3$$

Circle the possible value of  $x$ .

[1 mark]

25

26

27

28

**10 (b)**  $\xi$  is the set of integers from 20 to 50

B is the set of multiples of 3

C is the set of multiples of 4

Work out the elements of  $B \cap C$

[2 marks]

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Answer \_\_\_\_\_

**10 (c)**  $\xi$  is the set of integers from 11 to 19

D is the set of prime numbers.

Work out the elements of  $D'$

[2 marks]

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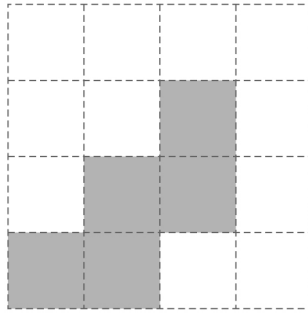
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Answer \_\_\_\_\_



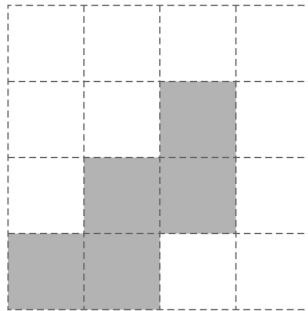
11 (a) Shade **one** more square so that the shaded shape is the net of a cube.

[1 mark]

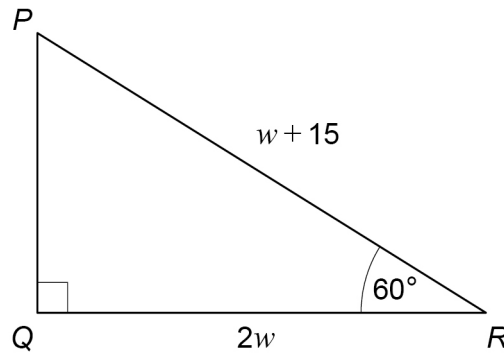


11 (b) Shade a **different** square so that the shaded shape is the net of a cube.

[1 mark]



- 12**  $PQR$  is a right-angled triangle.  
All lengths are in cm.



- 12 (a)** Show that  $w = 5$

[1 mark]

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- 12 (b)** Using  $w = 5$  and Pythagoras' theorem, work out the length  $PQ$ .

[3 marks]

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

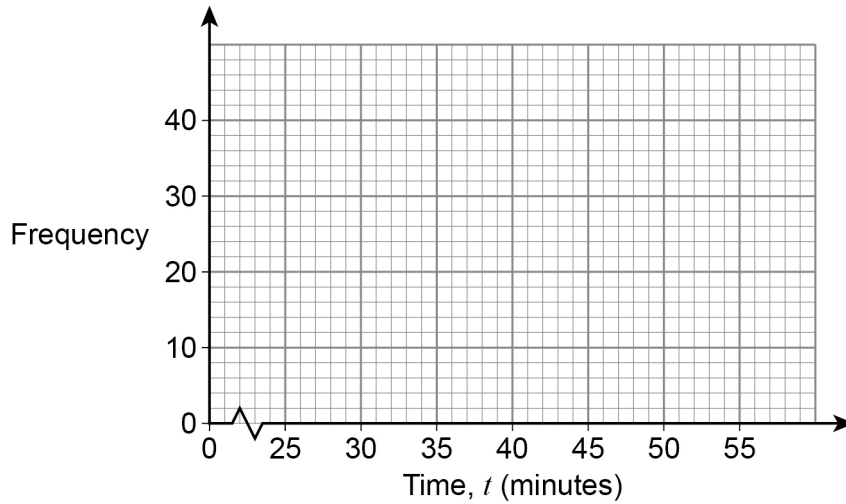


- 13** 76 people finished a race.  
The table shows their times.

Time, $t$ (minutes)	Frequency
$30 \leq t < 35$	38
$35 \leq t < 40$	22
$40 \leq t < 45$	10
$45 \leq t < 50$	6

- 13 (a)** Draw a frequency polygon to represent the data.

**[2 marks]**



**13 (b)** 5% of all the people who started the race did **not** finish.

Work out the number of people who started the race.

**[3 marks]**

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Answer \_\_\_\_\_

**14** Convert  $0.6 \text{ m}^3$  to  $\text{cm}^3$

Circle your answer.

**[1 mark]**

$60 \text{ cm}^3$

$6000 \text{ cm}^3$

$600\,000 \text{ cm}^3$

$60\,000\,000 \text{ cm}^3$

**Turn over for the next question**



- 15** Here is a formula to work out the reading age,  $R$  years, of a piece of text.

$$R = 0.4(L + N) + 5$$

where  $L$  = mean number of words per sentence

$N$  = mean number of words per sentence with at least 3 syllables

- 15 (a)** For a magazine,

$$L = 16$$

$$N = 6.5$$

Work out the value of  $R$ .

**[2 marks]**

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$$R = \underline{\hspace{10em}}$$

- 15 (b)** For a newspaper,

$$R = 17.5$$

$$L = 22$$

Work out the value of  $N$ .

**[3 marks]**

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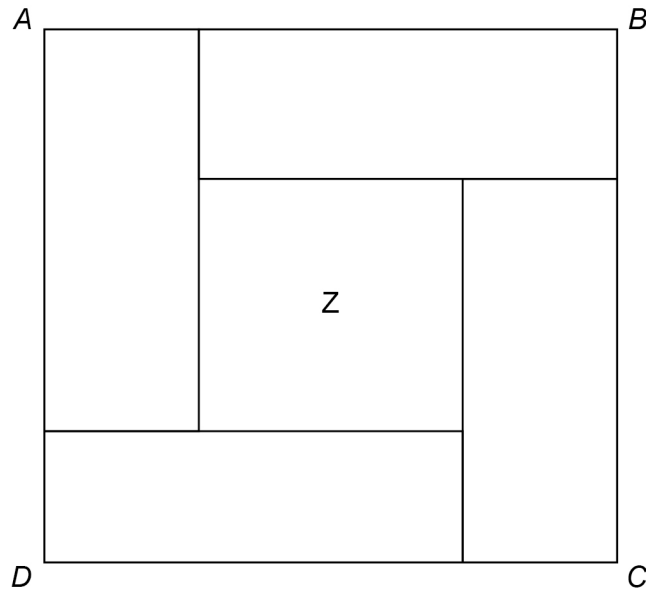


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$$N = \underline{\hspace{10em}}$$



16

 $ABCD$  is a square.It is divided into four **identical** rectangles and a square,  $Z$ .Not drawn  
accuratelyThe sides of each rectangle are in the ratio  $1 : 4$ The area of  $Z$  is  $75.69 \text{ cm}^2$ Work out the area of **one** rectangle.**[4 marks]**


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

Turn over ►

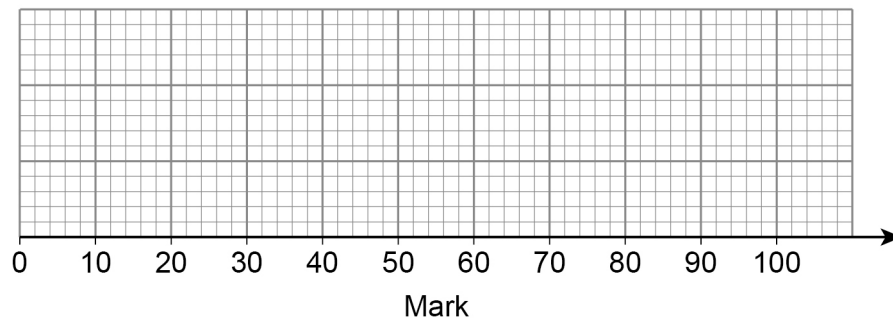


**17** Here is some information about the marks of Class A in a test.

Lowest	20
Highest	88
Median	52
Upper quartile	74
Interquartile range	28

**17 (a)** Draw a box plot for this information.

**[3 marks]**



**17 (b)** Class B took the same test.

Here is some information about the marks of class B.

Lower quartile	40
Median	56
Interquartile range	33

**Using the information**, tick a box to answer each of the following questions.

**[3 marks]**

	<b>Class A</b>	<b>Class B</b>	<b>Cannot tell</b>
On average, which class had the higher marks?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Which class had the more consistent marks?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Which class had the higher upper quartile mark?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Turn over for the next question**

**Turn over ►**



18

Work out the integer values of  $a$ ,  $b$  and  $c$  that make the calculation correct.

$$\begin{aligned}\sqrt[3]{2^{12} \div (2^4)^9} &= \sqrt[3]{2^{12} \div 2^a} \\ &= \sqrt[3]{2^b} \\ &= 2^c\end{aligned}$$

**[3 marks]**

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$$a = \underline{\hspace{2cm}} \quad b = \underline{\hspace{2cm}} \quad c = \underline{\hspace{2cm}}$$



19

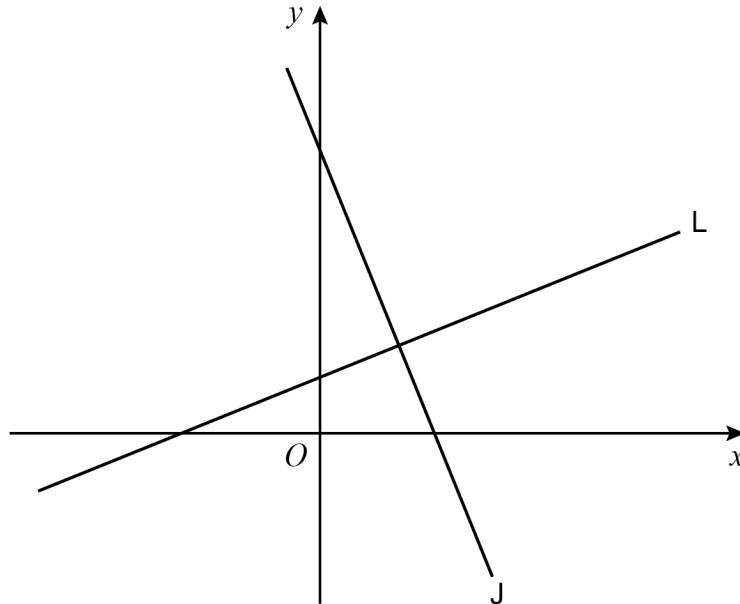
The equation of line L is  $y = \frac{1}{2}x + 1$

Line L and line J

are perpendicular

intersect at the point (4, 3)

Not drawn  
accurately



Work out the equation of line J.

Give your answer in the form  $y = mx + c$

[3 marks]

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Answer \_\_\_\_\_

6

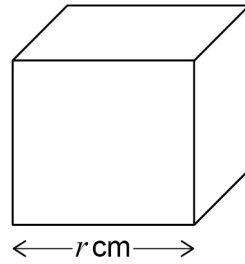
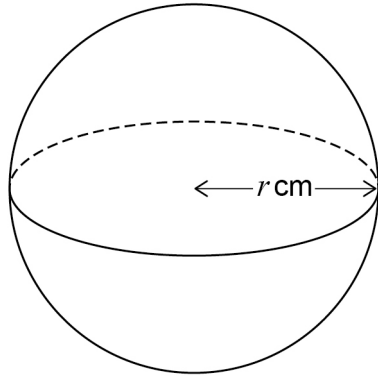
Turn over ►



20

A sphere has radius  $r$  cm and volume  $p$  cm<sup>3</sup>

A cube has edge  $r$  cm and surface area  $q$  cm<sup>2</sup>



volume of a sphere =  $\frac{4}{3}\pi r^3$  where  $r$  is the radius

Work out the value of  $r$  when  $p = q$

Give your answer in terms of  $\pi$

[3 marks]

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$r =$  \_\_\_\_\_









25 Simplify  $\frac{5x^2}{12} \div \frac{2x}{9x+6}$

Give your answer in the form  $\frac{ax^2 + bx}{8}$  where  $a$  and  $b$  are integers.

[4 marks]

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Answer \_\_\_\_\_



**26**  $f(x) = \sqrt{x-1}$  for  $x \geq 1$

**26 (a)** Circle the range of  $f(x)$

**[1 mark]**

$f(x) > 0$

$f(x) \geq 0$

$f(x) > 1$

$f(x) \geq 1$

**26 (b)** Work out an expression for  $f^{-1}(x)$

**[2 marks]**

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Answer \_\_\_\_\_

**26 (c)**  $g(x) = x^2 + 6x + 10$

Work out  $fg(4)$

**[2 marks]**

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Answer \_\_\_\_\_





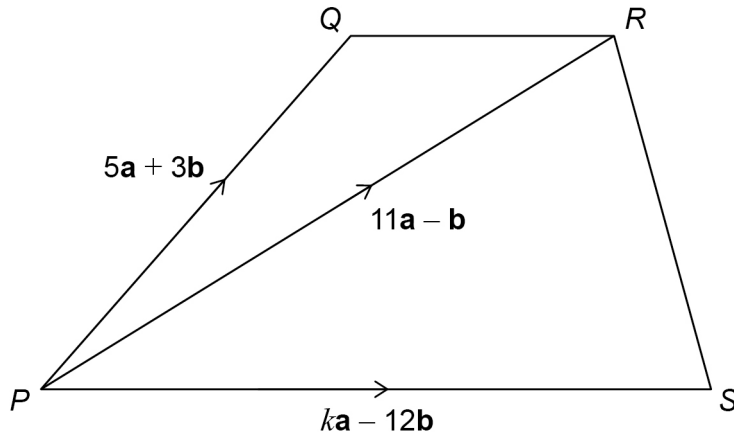
28

$PQRS$  is a quadrilateral with  $QR$  parallel to  $PS$ .

$$\overrightarrow{PQ} = 5\mathbf{a} + 3\mathbf{b}$$

$$\overrightarrow{PR} = 11\mathbf{a} - \mathbf{b}$$

$$\overrightarrow{PS} = k\mathbf{a} - 12\mathbf{b}$$



Not drawn  
accurately

Work out the value of  $k$ .

[3 marks]

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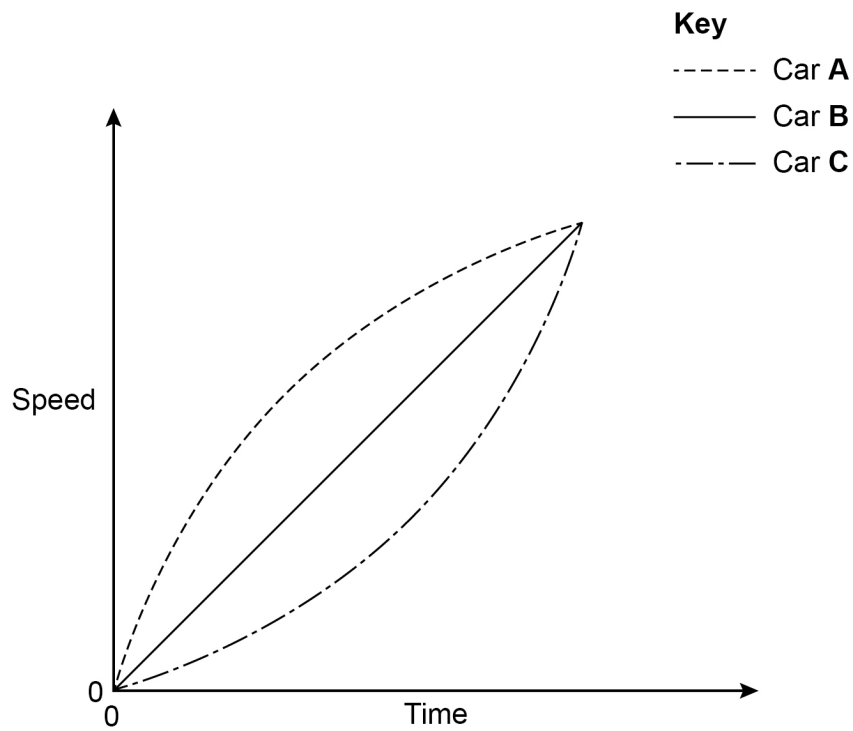
$$k = \underline{\hspace{10em}}$$

Turn over ►



29

Here is a sketch of the speed-time graphs of three cars.



Tick the correct statement.

**[1 mark]**

All three cars travel the same distance.

Car A travels the greatest distance.

Car B travels the greatest distance.

Car C travels the greatest distance.



30

70 biscuits are put into an empty tin.

Each biscuit has a mass of 12 g to the nearest gram.

The total mass of the tin and biscuits is 950 g to the nearest gram.

Work out the upper bound of the mass of the empty tin.

You **must** show your working.

**[3 marks]**

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Answer \_\_\_\_\_ g

Turn over for the next question

4

Turn over ►



31

Joel has a bag containing six counters.

One is red, two are yellow and three are blue.

Joel takes two counters at random from the bag.

Work out the probability that the counters are the same colour.

**[3 marks]**

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Answer \_\_\_\_\_





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outside the  
box*

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ANSWER IN THE SPACES PROVIDED**





