

Please write clearly in block capitals.

Centre number

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Candidate number

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# GCSE MATHEMATICS

# H

Higher Tier

Paper 2 Calculator

Date of Exam

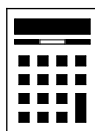
Morning

Time allowed: 1 hour 30 minutes

## 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. 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.

## Advice

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

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

**1** The equation of a line is  $y = 2x - 1$

Circle the point that is the intercept with the  $y$ -axis.

[1 mark]

$(0, -1)$

$(-1, 0)$

$(0, \frac{1}{2})$

$(\frac{1}{2}, 0)$

**2** Simplify  $\frac{a^4 \times a^6}{a^3}$

Circle your answer.

[1 mark]

$a^7$

$a^8$

$a^{21}$

$a^6$

**3** A coin is thrown 50 times.

The coin lands on heads 30 times.

Circle the relative frequency of landing on heads.

[1 mark]

30

3 : 5

30%

$\frac{3}{5}$

- 4** A number,  $x$ , is 15.8 when rounded to 3 significant figures.  
Circle the error interval.

[1 mark]

$$15.75 < x < 15.85$$

$$15.75 \leq x < 15.85$$

$$15.75 < x \leq 15.85$$

$$15.75 \leq x \leq 15.85$$

- 5 (a)** Expand and simplify  $(x + 5)(x - 4)$

[2 marks]

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Answer \_\_\_\_\_

- 5 (b)** Solve  $(x - 8)(x + 7) = 0$

[1 mark]

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Answer \_\_\_\_\_

**6** Dev invests £1500 for 2 years.  
The compound interest rate is 1.6% per year.

**6 (a)** Which calculation works out the total value after 2 years?  
Circle your answer.

**[1 mark]**

$$£1500 \times 1.6 \times 2$$

$$£1500 \times 1.6^2$$

$$£1500 \times 1.016 \times 2$$

$$£1500 \times 1.016^2$$

**6 (b)** Emma invests £1500 for 2 years.

The interest rate is

1.8% for the first year

1.3% for the second year.

Whose investment is worth more after 2 years?

You **must** show your working.

**[4 marks]**

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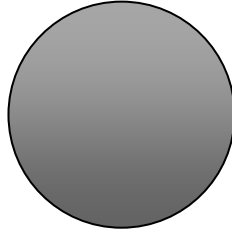
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Answer \_\_\_\_\_

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

A steel sphere, radius 9 cm, is shown.



7 (a) Work out the volume of the sphere.

[2 marks]

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Answer \_\_\_\_\_ cm<sup>3</sup>

7 (b) The density of the steel is 7.8 grams/cm<sup>3</sup>

Work out the mass of the sphere.

[2 marks]

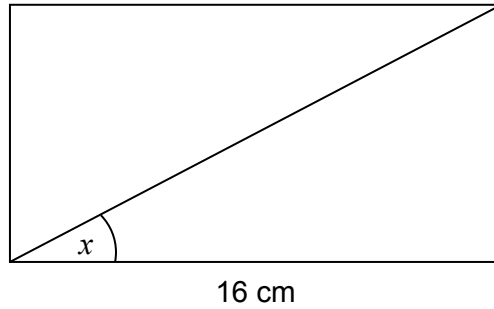
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Answer \_\_\_\_\_ grams

Turn over for the next question

8

The area of the rectangle is  $68 \text{ cm}^2$ Not drawn  
accuratelyWork out the size of angle  $x$ .**[3 marks]**

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

9

Which number is **not** in standard form?

Circle your answer.

**[1 mark]**

$1.01 \times 10^9$

$0.99 \times 10^{-2}$

$9.8 \times 10^6$

$4.632 \times 10^{-5}$

10

A charity collection was made.

Information about the amounts given by men is shown in the table.

Amount, $x$ (£)	Midpoint	Number of men	
$0 \leq x < 5$		11	
$5 \leq x < 10$		7	
$10 \leq x < 15$		2	
		Total = 20	

The mean amount given by **women** was £6.30 per person.

Compare the mean amounts given by men and women.

[4 marks]

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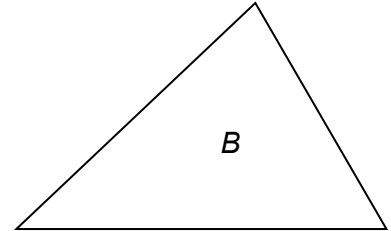
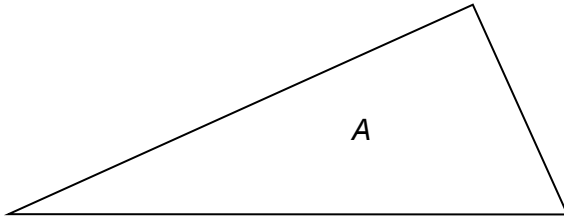
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Turn over for the next question

Turn over ►

- 11** The angles in triangle  $A$  are in the ratio  $1 : 2 : 3$   
The angles in triangle  $B$  are in the ratio  $4 : 5 : 6$

Not drawn  
accurately



Jack says,

“The middle number in each ratio is one third of the total,  
so one of the angles in each triangle is 60 degrees”

Is he correct?

Show working to support your answer.

**[2 marks]**

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**12** In a class, the ratio boys : girls is  $x : y$

Circle the fraction of the class that are girls.

**[1 mark]**

$$\frac{x}{y}$$

$$\frac{y}{x}$$

$$\frac{x}{x+y}$$

$$\frac{y}{x+y}$$

**13** The price of a computer is reduced by 17.5%

The reduced price is £264

By how much is the price reduced?

**[4 marks]**

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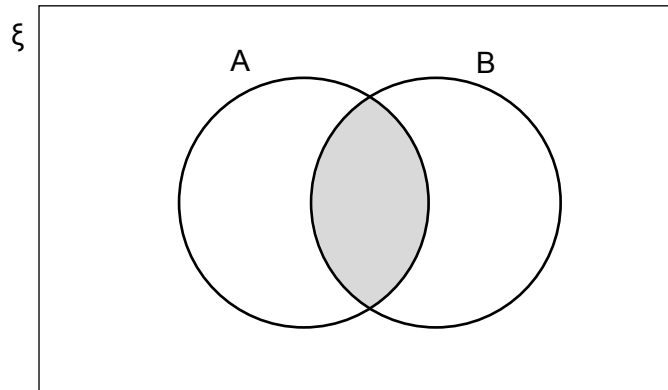
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Answer £ \_\_\_\_\_

- 14**  $\xi$  = numbers between 0 and 1 with 3 decimal places  
 A = numbers that round to 0.7 to 1 decimal place  
 B = numbers that round to 0.75 to 2 decimal places

- 14 (a)** Work out a possible number, with 3 decimal places, that is in the shaded area.



[1 mark]

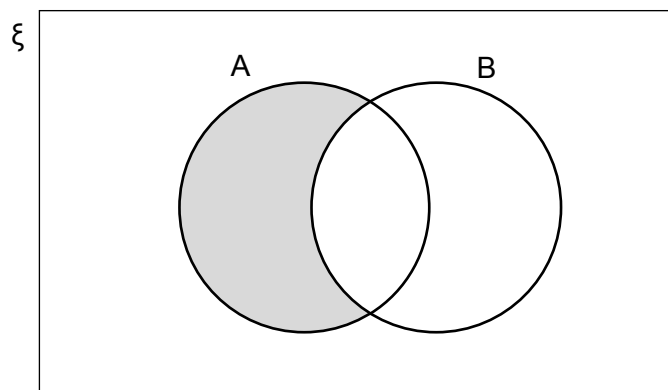
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Answer \_\_\_\_\_

- 14 (b)** Work out a possible number, with 3 decimal places, that is in the shaded area.



[1 mark]

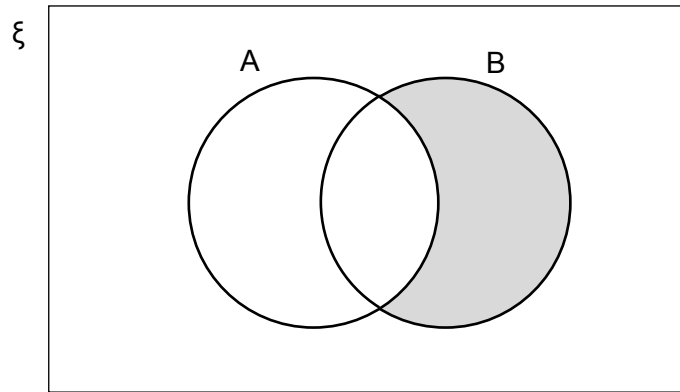
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Answer \_\_\_\_\_

- 14 (c)** Work out a possible number, with 3 decimal places, that is in the shaded area.



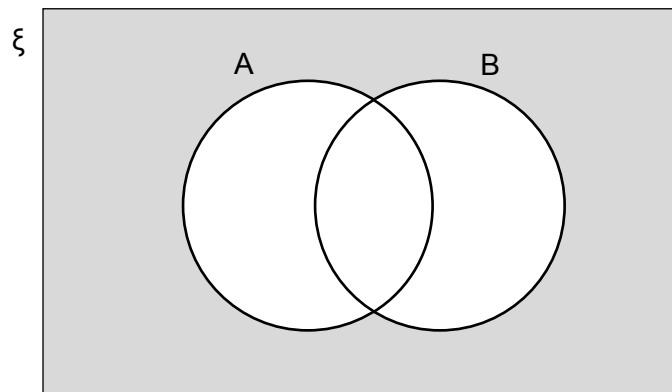
[1 mark]

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Answer \_\_\_\_\_

- 14 (d)** Work out a possible number, with 3 decimal places, that is in the shaded area.



[1 mark]

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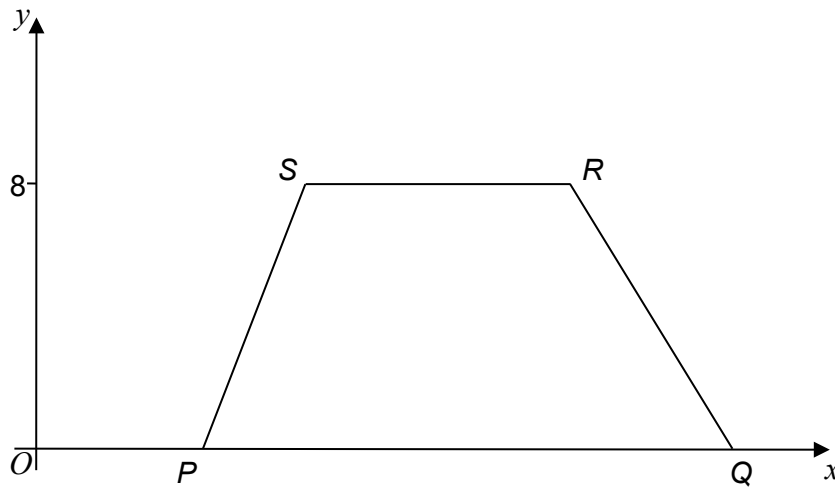
Answer \_\_\_\_\_

**15**  $PQRS$  is a trapezium with  $PQ$  parallel to  $SR$ .

$P$  and  $Q$  are on the  $x$ -axis.

The  $y$ -coordinate of  $S$  is 8

$PQ > SR$



Not drawn  
accurately

The area of  $PQRS$  is 48 square units.

Work out one possible set of points for  $P$ ,  $Q$ ,  $R$  and  $S$ .

**[4 marks]**

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$P$  ( \_\_\_\_\_ , \_\_\_\_\_ )

$Q$  ( \_\_\_\_\_ , \_\_\_\_\_ )

$R$  ( \_\_\_\_\_ , \_\_\_\_\_ )

$S$  ( \_\_\_\_\_ , \_\_\_\_\_ )

- 16 (a)** I am thinking of two different numbers.  
They are both greater than 10  
Their highest common factor (HCF) is half the smaller number.

Work out one possible pair of numbers.

[1 mark]

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

- 16 (b)**  $a$ ,  $b$  and  $c$  are prime numbers.

$$N = a^3 \times b^2 \times c$$

Is  $N$  always odd?

Tick a box.

Yes

No

Give reasons for your answer.

[2 marks]

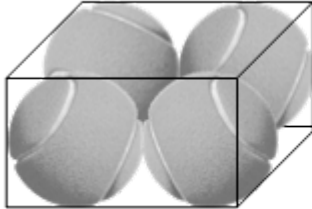
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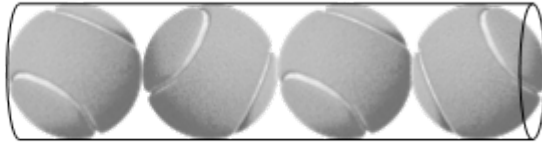
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**17** Here are two closed containers.  
Four tennis balls just fit in each container.  
Each tennis ball has diameter 64 mm

**Cuboid**



**Cylinder**



Which container has the smaller surface area?

You **must** show your working.

**[5 marks]**

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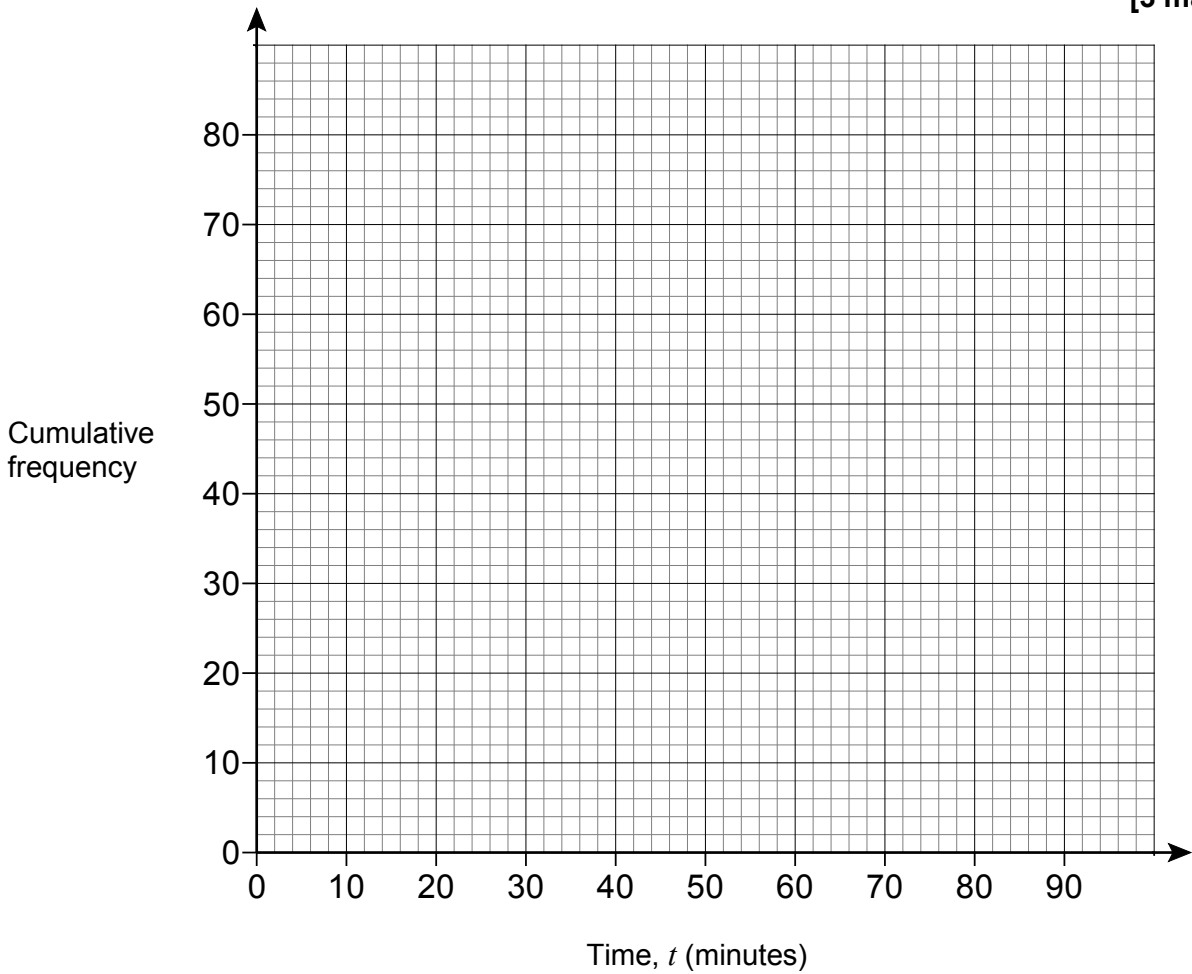
Answer \_\_\_\_\_

**18** Here is some information about the times, in minutes, 80 teachers took to get to work.

Time $t$ (minutes)	Frequency		
$0 < t \leq 20$	12		
$20 < t \leq 40$	32		
$40 < t \leq 60$	25		
$60 < t \leq 90$	11		

**18 (a)** On the grid, draw a cumulative frequency graph.

**[3 marks]**



**18 (b)** Estimate the number of teachers who took between 50 minutes and 70 minutes to travel to work.

**[2 marks]**

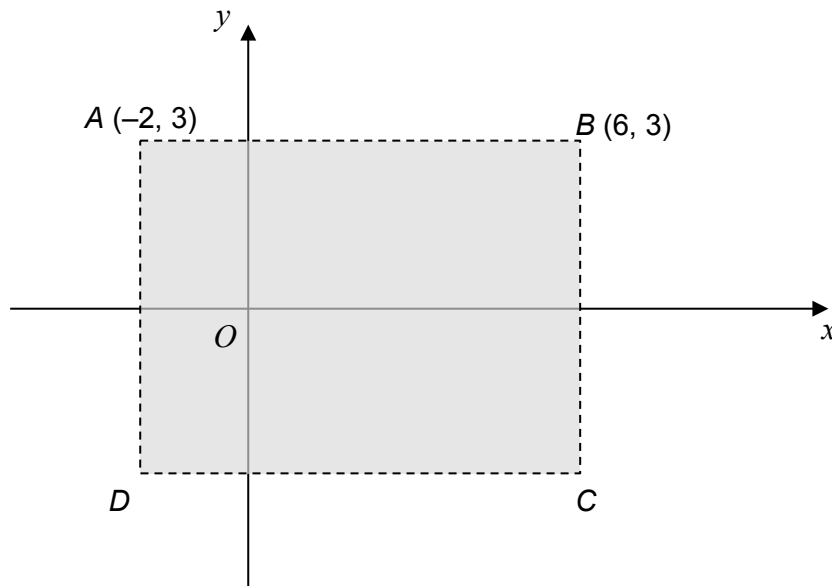
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Answer \_\_\_\_\_

- 19 (a)**  $ABCD$  is a rectangle.  
The  $x$ -axis is a line of symmetry.



These inequalities describe the shaded region.

$$p < x < q \quad \text{and} \quad r < y < s$$

Write down the values of  $p$ ,  $q$ ,  $r$  and  $s$ .

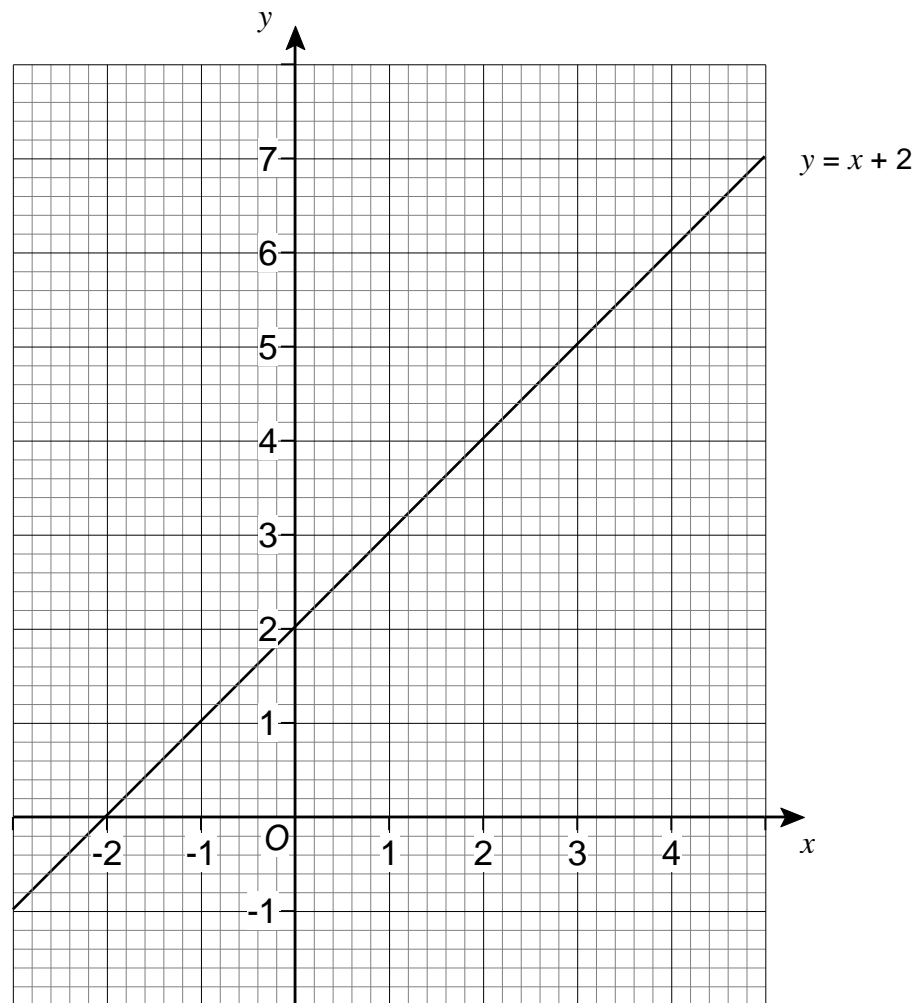
**[2 marks]**

$$p = \underline{\hspace{2cm}} \qquad q = \underline{\hspace{2cm}}$$

$$r = \underline{\hspace{2cm}} \qquad s = \underline{\hspace{2cm}}$$



19 (b) The grid shows the graph of  $y = x + 2$



On the grid, identify the region represented by

$$y \leq x + 2 \quad \text{and} \quad y > 3 - x \quad \text{and} \quad x \leq 3$$

Label the region R.

[3 marks]

Turn over for the next question

Turn over ►

**20**  $f(x) = 3^{2x}$  and  $g(x) = x^3$  for all values of  $x$ .

**20 (a)** Work out the value of  $f(1) + g(4)$

**[2 marks]**

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Answer \_\_\_\_\_

**20 (b)** Work out the value of  $g^{-1}(-27)$

**[2 marks]**

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Answer \_\_\_\_\_

**20 (c)** Work out an expression for  $gf(x)$   
Give your answer as a power of 3 in its simplest form.

**[2 marks]**

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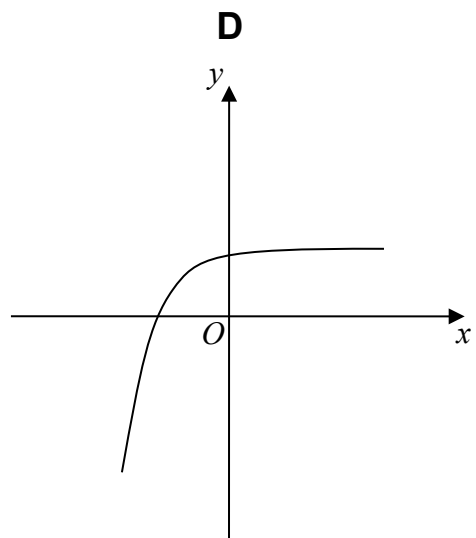
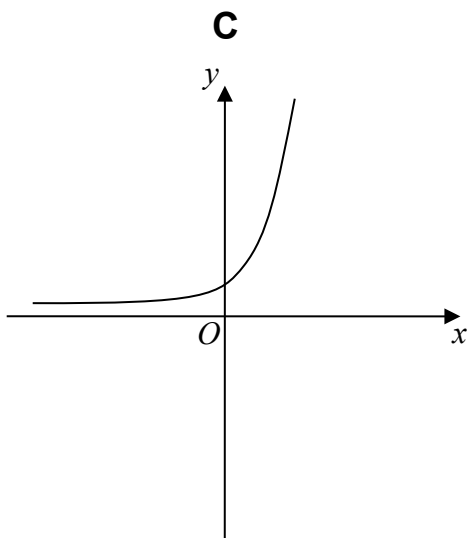
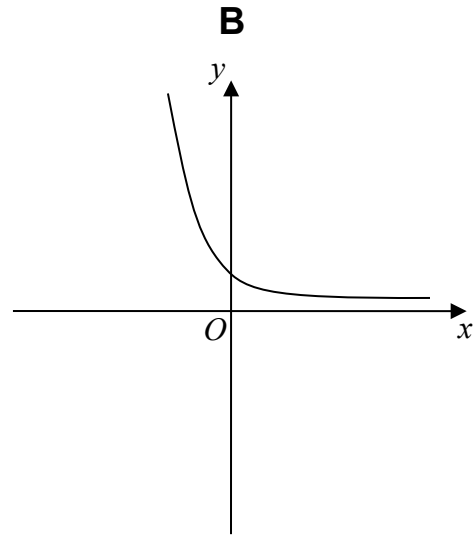
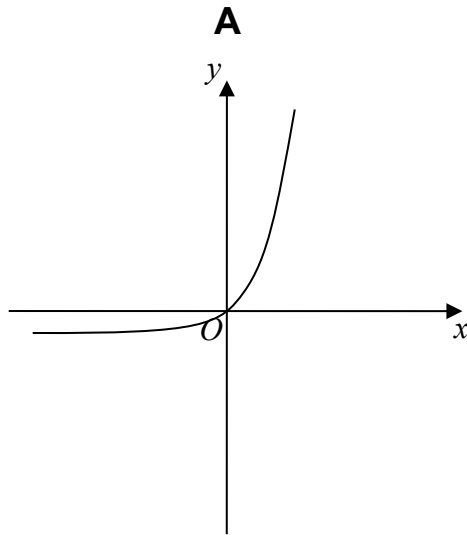
Answer \_\_\_\_\_

20 (d) One of these graphs is a sketch of  $y = 3^{2x}$

Which one?

Circle the correct letter.

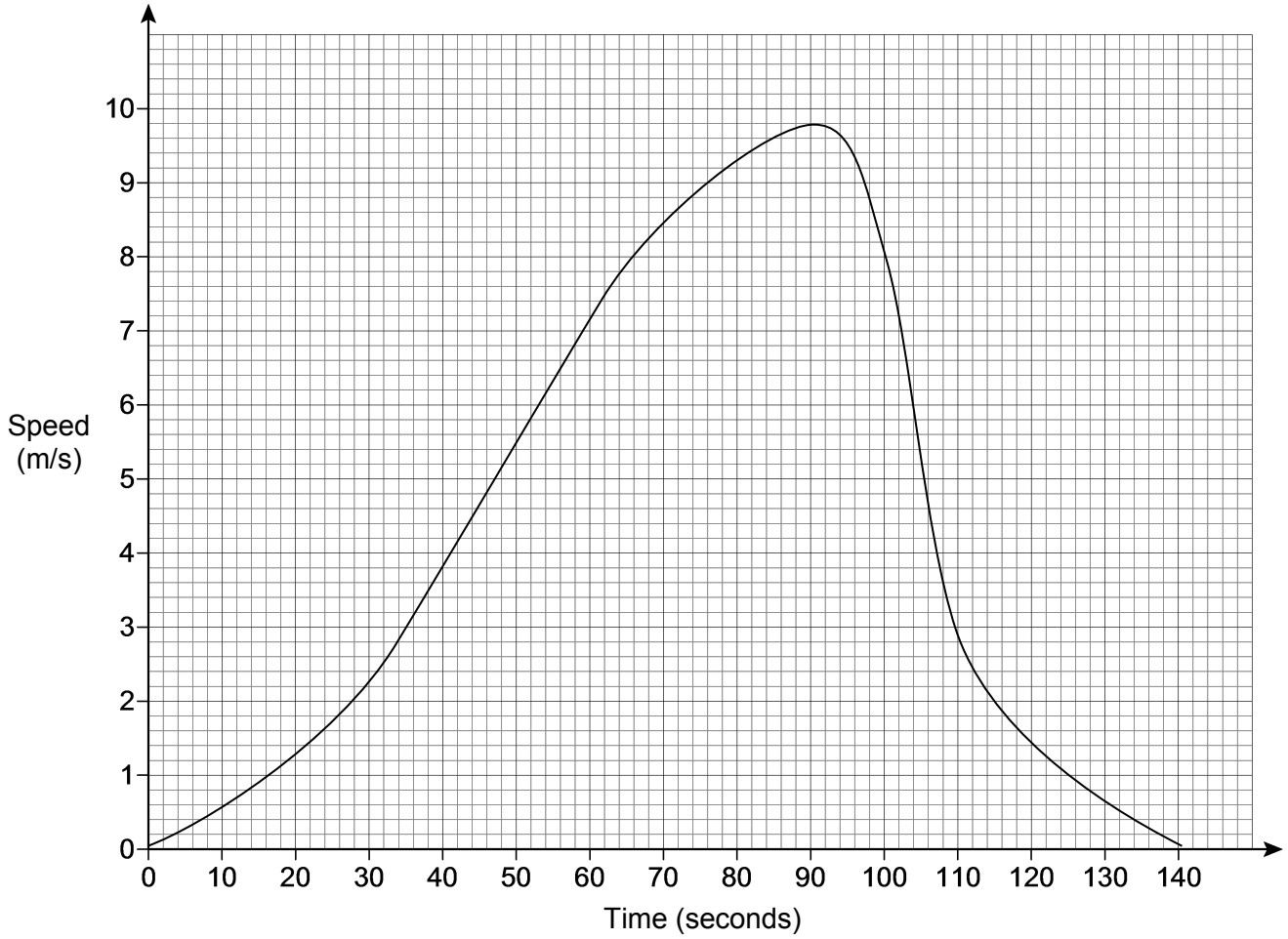
[1 mark]



Turn over for the next question

Turn over ►

**21** The graph shows the speed of a skier.  
Nick wants to estimate the distance travelled by the skier in 140 seconds.



**21 (a)** He works out the area of the triangle with vertices  $(0, 0)$ ,  $(140, 0)$  and  $(90, 9.8)$

Does Nick's method give a good estimate?

Tick a box.

Yes

No

Give a reason for your answer.

**[2 marks]**

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**21 (b)** Use Nick's method to work out an estimate of the distance.

**[1 mark]**

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Answer \_\_\_\_\_ metres

**21 (c)** Helen uses a different method.

She starts by estimating how many of the smallest squares are in the region between the graph and the horizontal axis.

Her estimate is 1550 squares.

Complete Helen's method to estimate the distance.

**[2 marks]**

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Answer \_\_\_\_\_ metres

**Turn over for the next question**

**22** The value of a car, £ $V$ , after  $t$  years, is modelled by the equation

$$V = A \times k^{-t} \quad \text{where } A \text{ and } k \text{ are constants.}$$

The value of the car when new was £22 000

The value of the car after 2 years is £14 080

Work out the values of  $A$  and  $k$ .

**[4 marks]**

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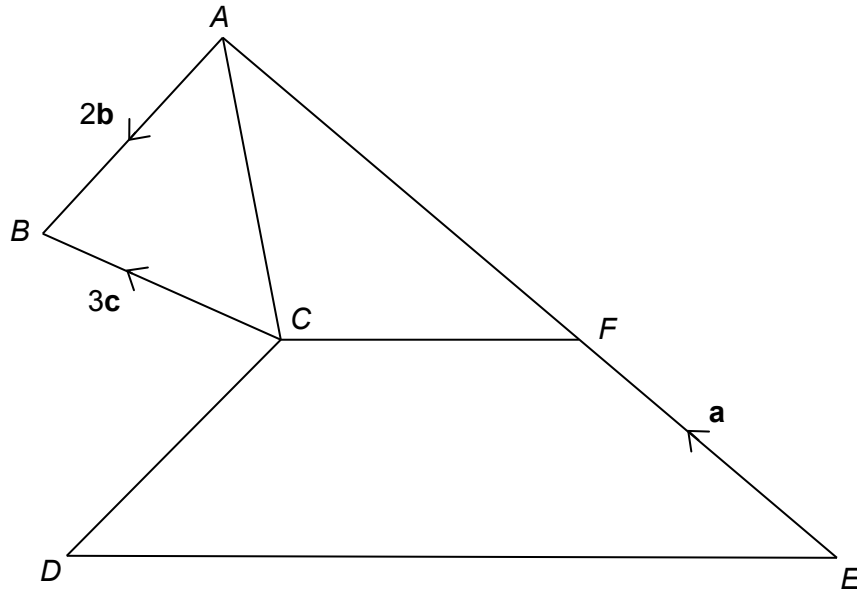
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$$A = \underline{\hspace{10cm}}$$

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

23

 $AFE$  is a straight line. $AF : FE = 3 : 2$  $DE$  is parallel to  $CF$ . $DE = 2CF$ 

$$\vec{EF} = \mathbf{a} \quad \vec{AB} = 2\mathbf{b} \quad \vec{CB} = 3\mathbf{c}$$


Work out  $\vec{DE}$  in terms of  $\mathbf{a}$ ,  $\mathbf{b}$  and  $\mathbf{c}$ .

[4 marks]

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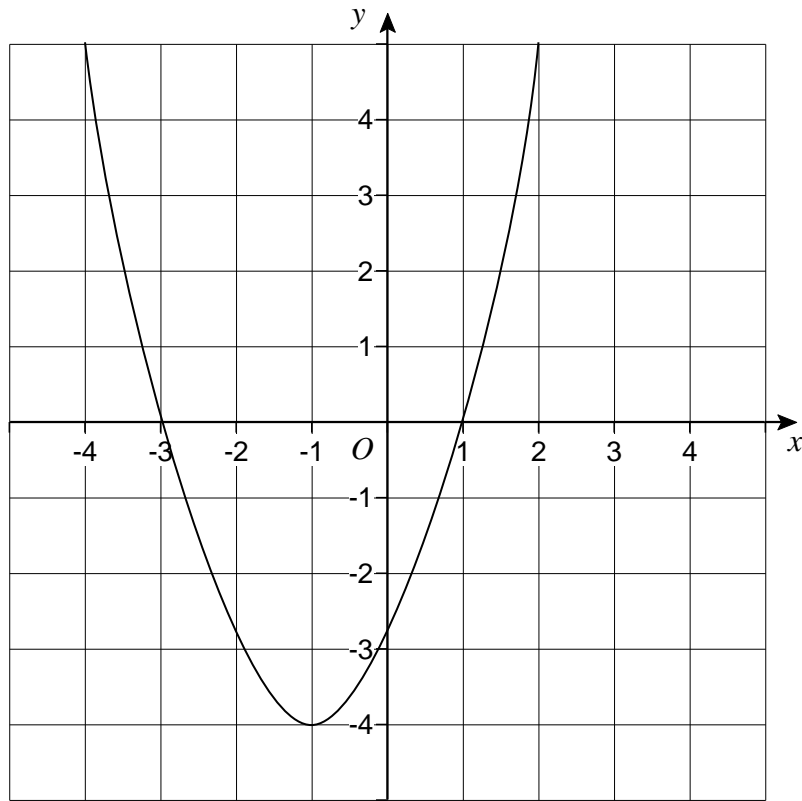


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Answer \_\_\_\_\_

Turn over ►

- 24 (a)** Here is the graph of  $y = f(x)$   
The graph has a turning point at  $(-1, -4)$



On the grid, draw the graph of  $y = f(x - 2)$

**[1 mark]**



**24 (b)** The graph of  $y = -3x^2 + 4x - 5$  is reflected in the  $y$ -axis.

Work out the equation of the reflected graph.

Give your answer in its simplest form.

**[2 marks]**

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Answer \_\_\_\_\_

**END OF QUESTIONS**

**There are no questions printed on this page**

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