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Candidate number

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# GCSE MATHEMATICS

# H

Higher Tier

Paper 3 Calculator

Tuesday 12 June 2018

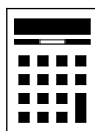
Morning

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.
- 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.
- 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.

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>	



Answer **all** questions in the spaces provided

**1** Circle the decimal that is closest in value to  $\frac{11}{20}$  **[1 mark]**

0.56

0.6

0.525

0.5

**2** Circle the list of **all** the integers that satisfy  $-2 < x \leq 4$  **[1 mark]**

-2, -1, 0, 1, 2, 3

-1, 0, 1, 2, 3

-2, -1, 0, 1, 2, 3, 4

-1, 0, 1, 2, 3, 4

**3** Circle the largest number. **[1 mark]**

 $3.\dot{2}7$ 

3.27

3.277

 $3.20\dot{7}$ 

- 4 What is the size of an exterior angle of a regular decagon?  
Circle your answer.

[1 mark]

18°

36°

144°

162°

- 5  $a$  is a common factor of 72 and 120  
 $b$  is a common multiple of 6 and 9

Work out the highest possible value of  $\frac{a}{b}$

[4 marks]

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Answer \_\_\_\_\_

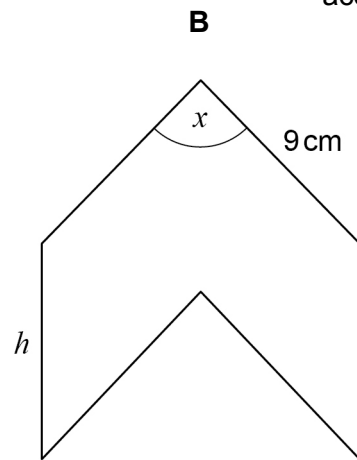
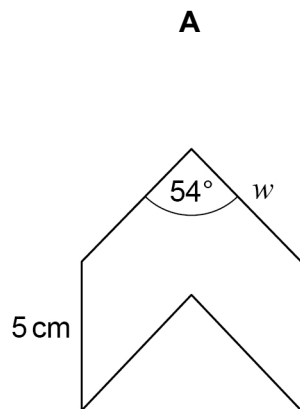
**Turn over for the next question**



6

A and B are similar shapes.

B is an enlargement of A with scale factor 1.5

Not drawn  
accuratelyWork out the values of  $x$ ,  $h$  and  $w$ .**[3 marks]**


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$$x = \text{_____ degrees}$$

$$h = \text{_____ cm}$$

$$w = \text{_____ cm}$$





- 8 (a) Show that the lines  $y = 3x + 7$  and  $2y - 6x = 8$  are parallel.

Do **not** use a graphical method.

[3 marks]

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- 8 (b) Is the point  $(-5, -6)$  above, below or on the line  $y = 3x + 7$  ?

Tick **one** box.

Above

Below

On the line

You **must** show your working.

Do **not** use a graphical method.

[2 marks]

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9 The cost of a ticket increases by 10% to £19.25

Work out the original cost.

[3 marks]

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Answer £ \_\_\_\_\_

10 The  $n$ th term of a sequence is  $12n - 5$

Work out the numbers in the sequence that

have two digits

and

are **not** prime.

[3 marks]

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Answer \_\_\_\_\_



$$11 \quad \mathbf{a} = \begin{pmatrix} 6 \\ -10 \end{pmatrix} \quad \mathbf{b} = \begin{pmatrix} -1 \\ 2 \end{pmatrix} \quad \mathbf{c} = \begin{pmatrix} -4 \\ 7 \end{pmatrix}$$

11 (a) Work out  $\mathbf{a} + \mathbf{b} + \mathbf{c}$

[2 marks]

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Answer

$$\left( \quad \right)$$

11 (b) Show that  $\mathbf{a} + 2\mathbf{c}$  is parallel to  $\mathbf{b}$

[2 marks]

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12

$$\text{pressure} = \frac{\text{force}}{\text{area}}$$

A force of 40 Newtons is applied to an area of 3.2 square metres.

Work out the pressure.

Give the units of your answer.

**[2 marks]**

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Answer \_\_\_\_\_

13

Tick **all** the statements that are true for any rhombus.

**[1 mark]**

The diagonals are lines of symmetry

The diagonals bisect each other

The diagonals are perpendicular

The diagonals are equal in length

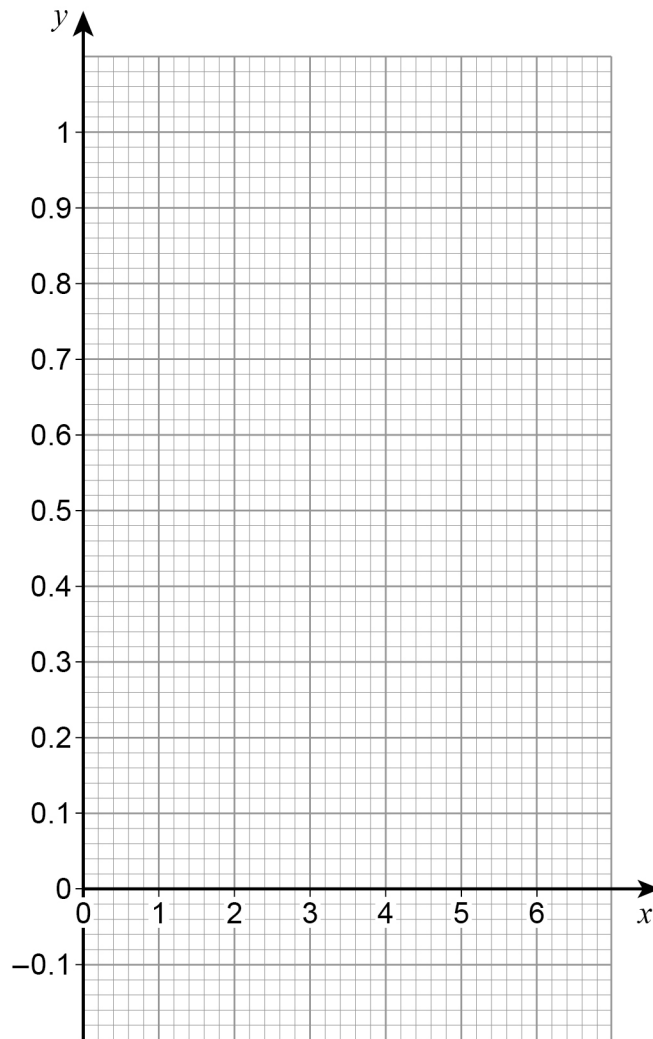
**Turn over for the next question**

**Turn over ►**

14

Draw the graph of  $y = 0.8^x$  for values of  $x$  from 0 to 6**[3 marks]**

$x$	0	1	2	3	4	5	6
$y$							



- 15** Amy has  $x$  beads.  
Billy has three more beads than Amy.  
Carly has four times as many beads as Billy.  
Circle the expression for the number of beads that Carly has.

[1 mark]

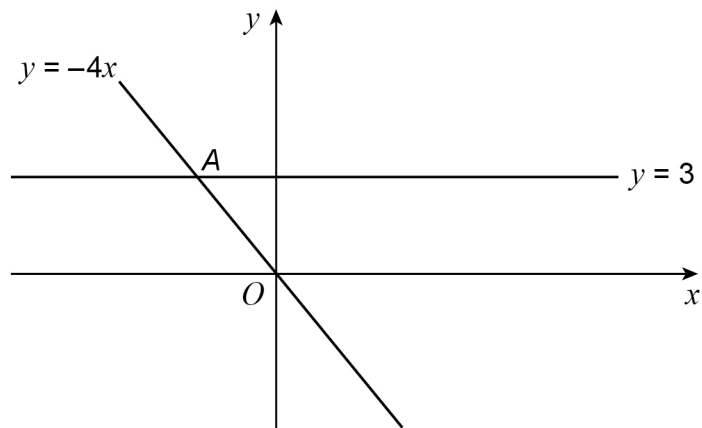
$4x + 3$

$3x + 4$

$4(x + 3)$

$x + 12$

- 16** Two straight lines intersect at point A.

Not drawn  
accurately

Circle the coordinates of A.

[1 mark]

$(-\frac{3}{4}, 3)$

$(-4, 3)$

$(-12, 3)$

$(-\frac{4}{3}, 3)$



17 Here are two methods to make a 4-digit code.  
Codes can have repeated digits.

**Method A**

For the first two digits use an odd number between 30 and 100  
For the last two digits use a multiple of 11

**Method B**

Use four digits in the order    even    odd    even    odd  
Do **not** use the digit zero

Which method gives the **greater** number of possible codes?  
You **must** show your working.

**[3 marks]**

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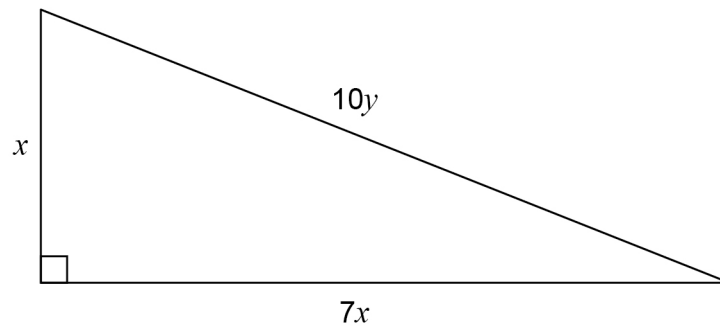
Answer \_\_\_\_\_





20

All dimensions are in centimetres.

Not drawn  
accuratelyUse Pythagoras' theorem to work out the exact value of  $\frac{x}{y}$ **[3 marks]**

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Answer \_\_\_\_\_



- 21** The mass of an ornament is  $m$  grams.  
The height of the ornament is  $h$  centimetres.  
 $m$  is directly proportional to the cube of  $h$ .  
 $m = 1600$  when  $h = 8$

- 21 (a)** Work out an equation connecting  $m$  and  $h$ .

[3 marks]

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Answer \_\_\_\_\_

- 21 (b)** Work out the mass of an ornament of height 12 centimetres.

[2 marks]

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

**Turn over for the next question**

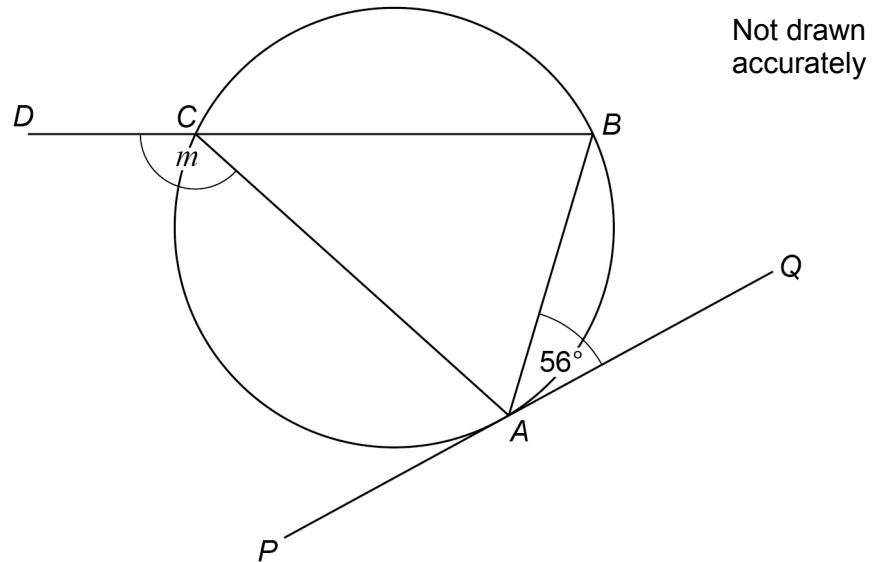


22

$A$ ,  $B$  and  $C$  are points on a circle.

$DCB$  is a straight line.

$PAQ$  is a tangent to the circle.



Sam is trying to work out the size of angle  $m$ .

Here is his working.

$$\text{angle } ACB = 56^\circ$$

angles in the same segment are equal

$$m = 180^\circ - 56^\circ$$

angles at a point on a straight line add up to  $180^\circ$

$$m = 124^\circ$$

Make a criticism of his working.

[1 mark]

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23

A sequence of numbers is formed by the iterative process

$$u_{n+1} = \frac{3}{u_n + 1}, \quad u_1 = 4$$

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

**[2 marks]**

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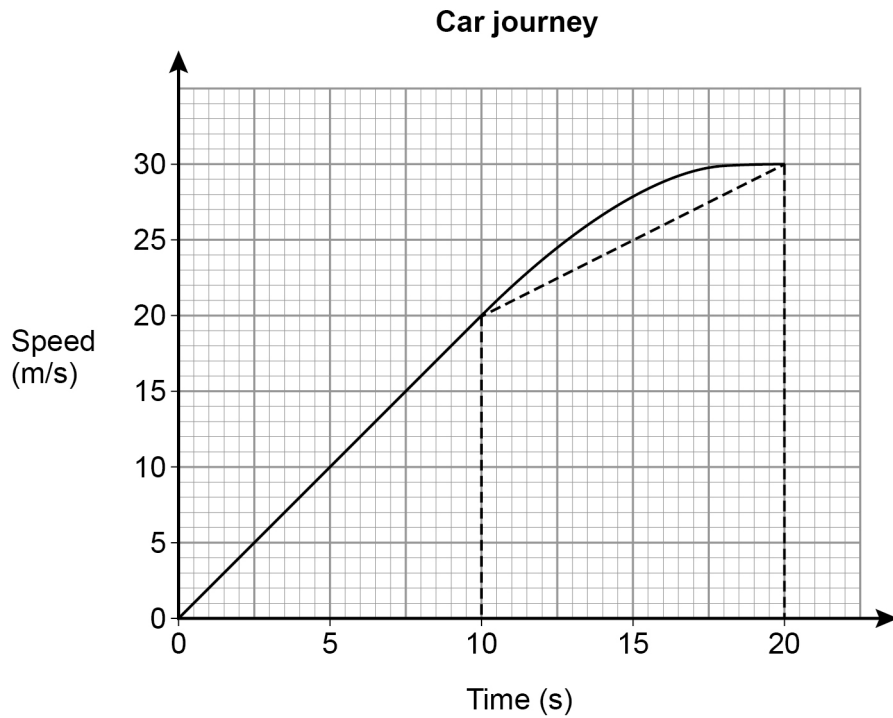
$$u_2 = \underline{\hspace{10em}}$$

$$u_3 = \underline{\hspace{10em}}$$

**Turn over for the next question**



- 24** The speed-time graph shows 20 seconds of a car journey.  
Harry wants to estimate the distance the car travels in this time.  
He uses a triangle and a trapezium, as shown, to estimate the area under the graph.



- 24 (a)** Complete Harry's method to estimate the distance the car travels.

**[3 marks]**

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Answer \_\_\_\_\_ m



**24 (b)** For this journey, which of these is true for Harry's method?

Tick **one** box.

**[1 mark]**

It works out an overestimate of the distance

It works out an underestimate of the distance

It could work out an overestimate or an underestimate of the distance

**Turn over for the next question**

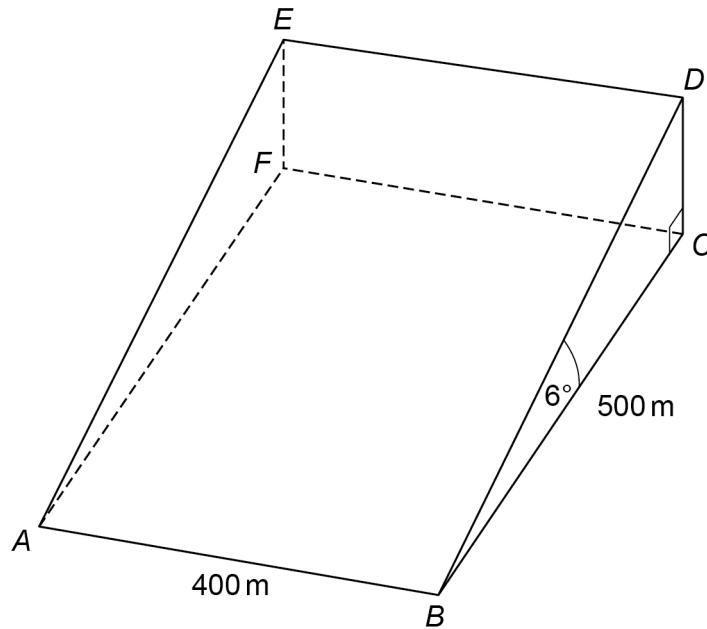


25

$ABCDEF$  is a triangular prism which represents part of a hill.

$ABCF$  is the horizontal rectangular base.

$D$  is vertically above  $C$ .



25 (a) Work out the height  $CD$ .

[2 marks]

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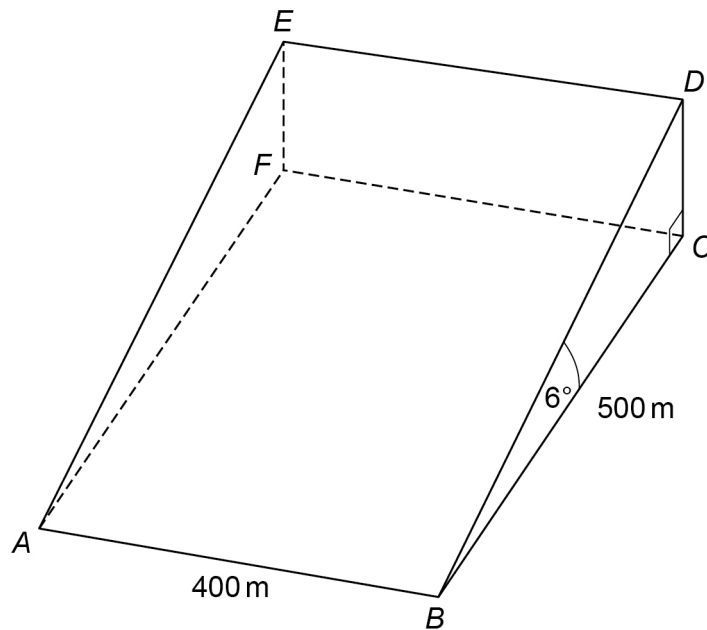


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Answer \_\_\_\_\_ m



- 25 (b) Jamil walks in a straight line from  $A$  to  $D$ .



Work out the size of angle  $DAC$ .

You **must** show your working.

[4 marks]

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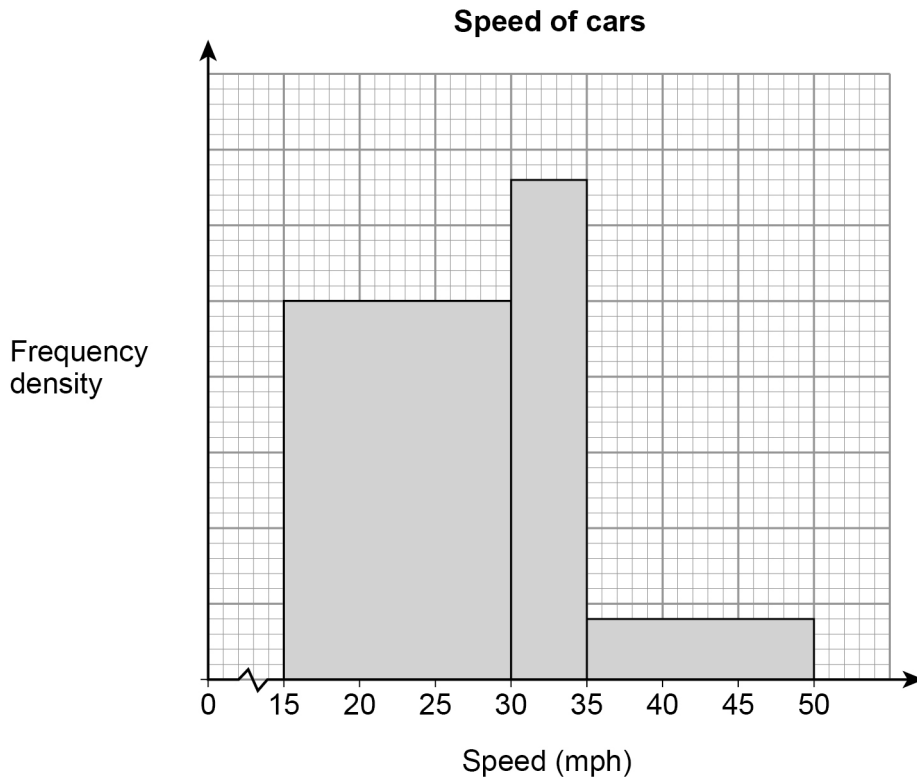


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Answer \_\_\_\_\_ degrees



**26** The histogram shows information about the speed of cars as they pass a checkpoint.  
The scale on the frequency density axis is missing.



The histogram shows information about 480 cars.

**26 (a)** How many cars does the first bar represent?

**[4 marks]**

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Answer \_\_\_\_\_



**26 (b)** Cars with a speed greater than 40 mph are over the speed limit.

Use the histogram to estimate the number of cars that are over the speed limit.

**[2 marks]**

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Answer \_\_\_\_\_

**Turn over for the next question**

6

**Turn over ►**



27

A bag contains 30 discs.

10 are red and 20 are blue.

One disc is taken out at random and replaced by **two** of the other colour.

Another disc is then taken out at random and replaced by **two** of the other colour.

Another disc is then taken out at random.

Work out the probability that all three discs taken out are **red**.

**[3 marks]**

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Answer \_\_\_\_\_







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