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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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I declare this is my own work.

# GCSE MATHEMATICS

# H

Higher Tier Paper 2 Calculator

Friday 10 November 2023 Morning Time allowed: 1 hour 30 minutes

### 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 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	
26	
<b>TOTAL</b>	

### Advice

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



N 0 V 2 3 8 3 0 0 2 H 0 1

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

Do not write  
outside the  
box

1 Expand  $5x(x^2 + 3)$

[1 mark]

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Answer \_\_\_\_\_

2 (a) Write 1.52 as an improper fraction in its simplest form.

[1 mark]

Answer \_\_\_\_\_

2 (b) Work out 60 as a percentage of 20

[1 mark]

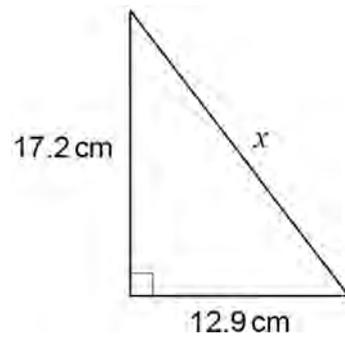
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Answer \_\_\_\_\_ %



3

Use Pythagoras' theorem to work out the value of  $x$ .**[3 marks]**Not drawn  
accurately

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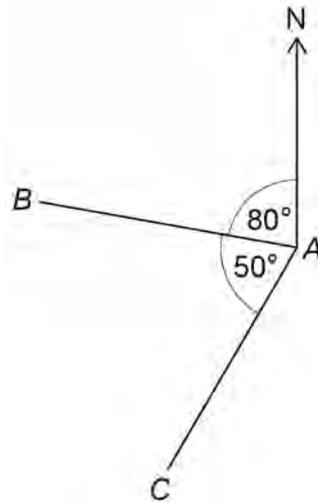
 $x =$  \_\_\_\_\_ cm

Turn over for the next question

Turn over ►



- 4 A, B and C are three points.



Not drawn  
accurately

Work out the bearing of C from A.

[1 mark]

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Answer \_\_\_\_\_ °



5 Three shops sell the same type and size of lip balm stick.

**Shop A**



£2.39 each

**Shop B**



£3.08 each

Buy one,  
get one half price

**Shop C**



Pack of 4

Was £11.40

Now  $\frac{1}{6}$  off

Which shop is the best value for 8 sticks and what is the total cost in that shop?

Show working to support your answer.

[5 marks]

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Shop \_\_\_\_\_ Total cost £ \_\_\_\_\_



6 Round 1 of voting for Head Student is taking place in a school.

6 (a) To reach round 2, a student must receive **at least**  $\frac{4}{15}$  of the votes.

What is the largest possible number of students that can reach round 2?

Circle your answer.

[1 mark]

15

11

3

4

6 (b) There are 900 votes in round 1  
Sean receives 180 votes.

Amy draws a pie chart to represent the results.

Here is her method to work out the angle needed for Sean.

$$180 \div 900 \times 100 = 20$$

The angle should be  $20^\circ$

Is Amy's method correct?

Tick a box.

Yes

No

Give a reason for your answer.

[1 mark]

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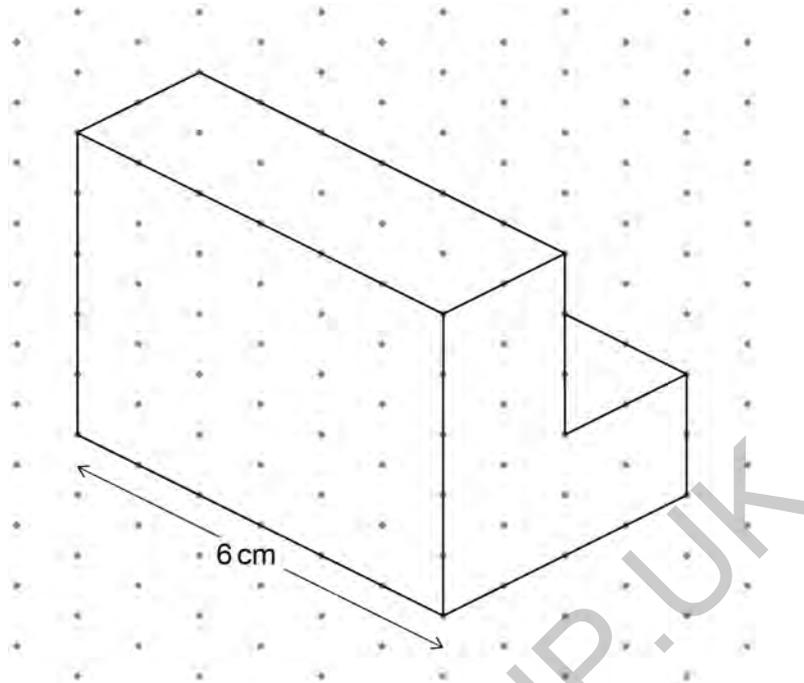
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7 Here is a prism drawn on an isometric grid.



Work out the volume of the prism.

[3 marks]

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Answer \_\_\_\_\_  $\text{cm}^3$







- 11** A fair coin is thrown a number of times.  
The probability that **every** throw results in Heads is  $\frac{1}{64}$   
How many times is the coin thrown? **[1 mark]**

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Answer \_\_\_\_\_

- 12** Here is some information about the members of a basketball club.

	Number of members	Mean height of members
Junior	30	1.6 m
Senior	20	2.05 m

Work out the mean height of all 50 members of the club.  
Give your answer as a decimal.

**[3 marks]**

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

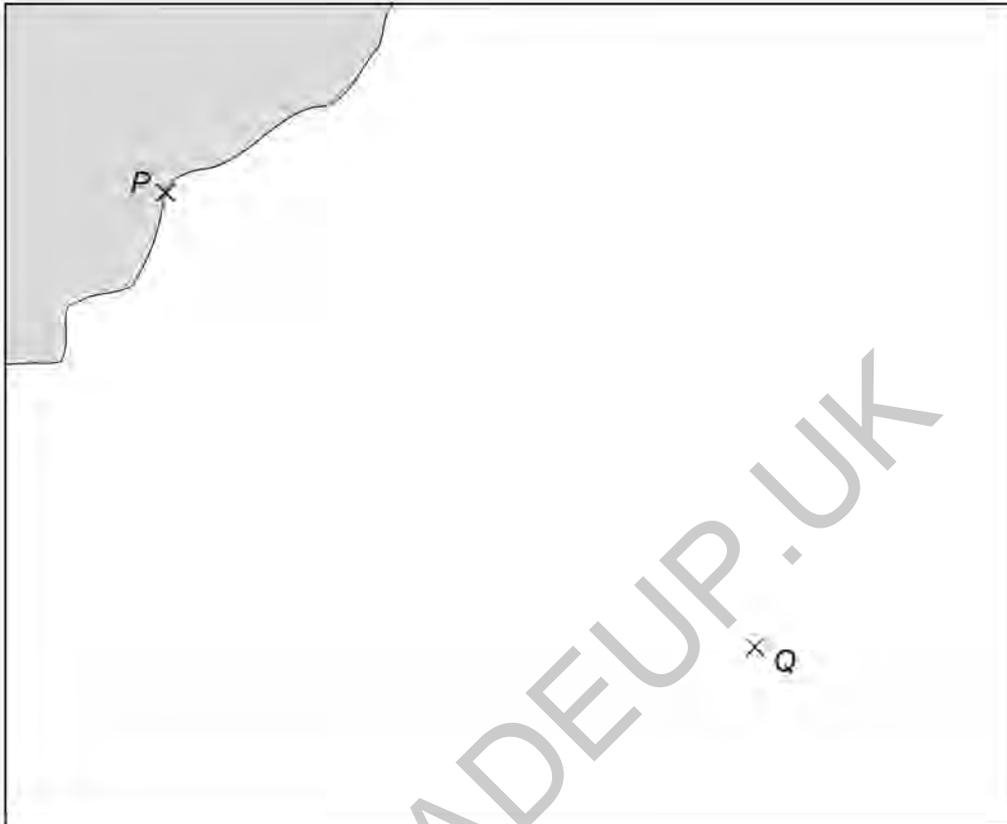




14 Use a ruler and compasses in this question.

The scale diagram shows port  $P$  and lighthouse  $Q$ .

**Scale:** 1 cm represents 2 km



A ship is  
less than 14 km from  $P$   
and  
closer to  $Q$  than to  $P$ .

Label the region,  $R$ , where the ship could be.

Show all your construction lines.

**[4 marks]**



- 15 A bag contains discs.

<b>Trial</b>
A disc is chosen at random from the bag. The colour of the disc is noted. The disc is put back into the bag.

The trial is carried out 100 times.

The table shows the relative frequency of a blue disc after every 25 trials.

<b>Total number of trials</b>	25	50	75	100
<b>Relative frequency of a blue disc</b>	0.4	0.36	0.4	0.32

- 15 (a) For the trials from the 26th to the 50th, how many times was a blue disc chosen?

[2 marks]

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Answer \_\_\_\_\_

- 15 (b) There is a total of 1000 discs in the bag.

Work out the **best** estimate of the number of blue discs in the bag.

[1 mark]

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Answer \_\_\_\_\_



16  $a > 0$  and  $b < 0$

Circle the correct statement.

[1 mark]

$$a - b < 0$$

$$-\frac{b}{a} < 0$$

$$\frac{1}{a} < 0$$

$$b^3 < 0$$

17 190 people were asked how much they spent on takeaways one month.  
The table shows information about the results.

Amount, $x$ (£)	Cumulative frequency
$0 < x \leq 10$	16
$0 < x \leq 20$	64
$0 < x \leq 30$	140
$0 < x \leq 40$	184
$0 < x \leq 50$	190

17 (a) How many people spent **more** than £20 ?

[2 marks]

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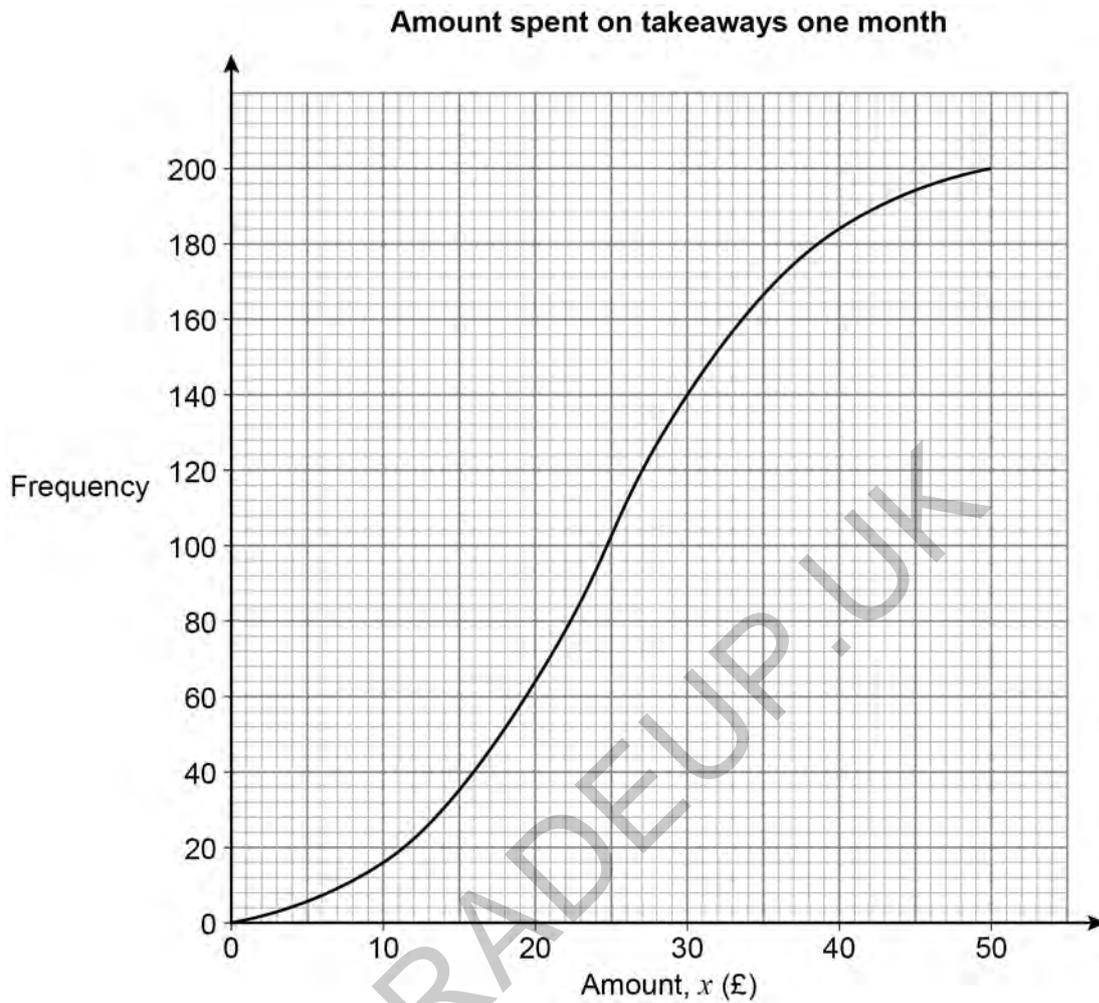


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Answer \_\_\_\_\_



17 (b) Farah draws this cumulative frequency curve to represent the results.



Give **two** criticisms of her graph.

[2 marks]

Criticism 1 \_\_\_\_\_

\_\_\_\_\_

Criticism 2 \_\_\_\_\_

\_\_\_\_\_



18 By completing the square, prove that  $x^2 + 6x + 13$  is always positive.

[3 marks]

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19

$A$  is directly proportional to  $B^4$

The value of  $B$  is doubled.

Pete thinks that the value of  $A$  will be 8 times bigger because  $4 \times 2$  is 8

Is he correct?

Tick a box.

Yes

No

Give a reason for your answer.

[1 mark]

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Turn over for the next question

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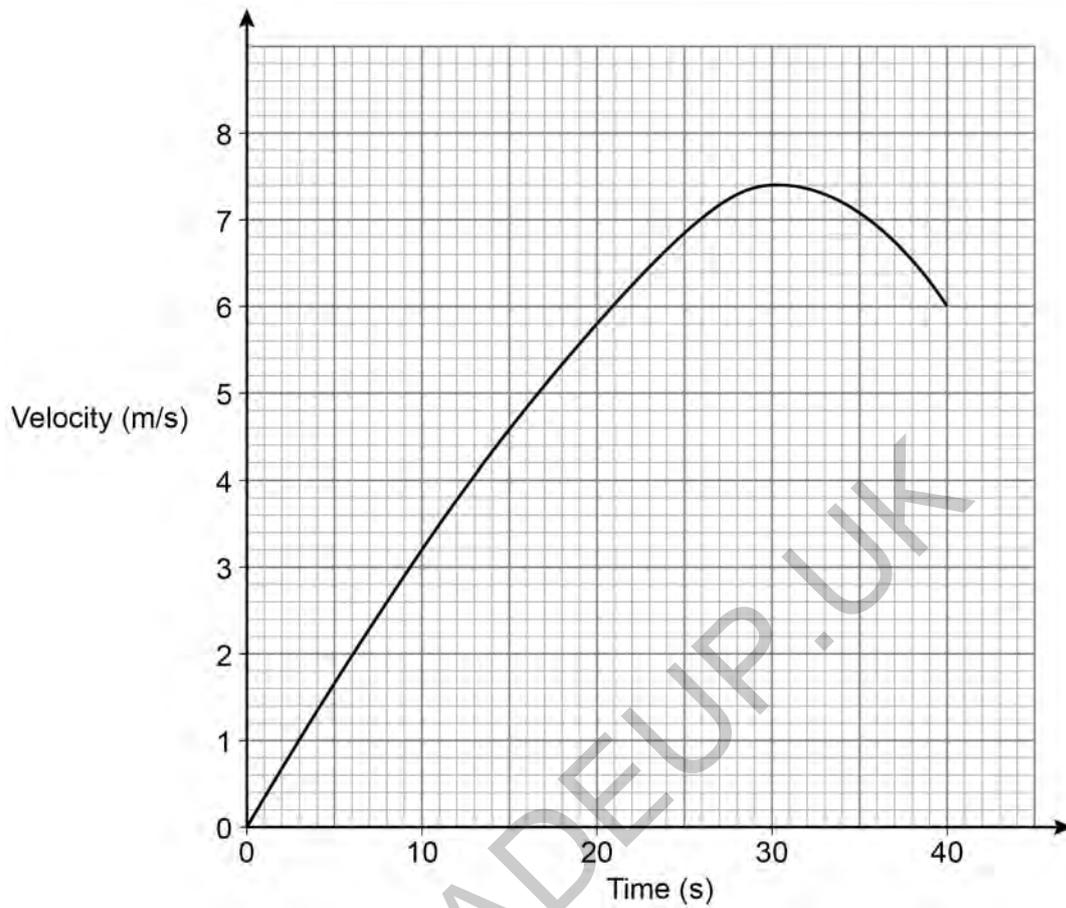
Turn over ►







23 Here is the velocity-time graph of a cyclist for 40 seconds.



23 (a) By dividing the area under the graph into four sections of equal widths, estimate the distance travelled during the 40 seconds.

[3 marks]

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

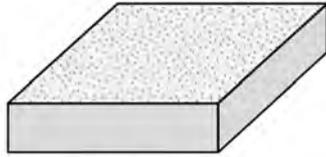




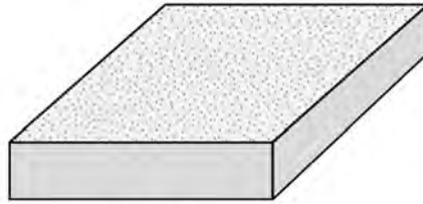
25

Here are two square-based paving stones.

The stones are similar solids.



20 cm



25 cm

The price per  $\text{cm}^3$  is the same for both stones.

The price of the **larger** stone is £17.50

Work out the price of the smaller stone.

**[4 marks]**

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Answer £ \_\_\_\_\_



26

Rick borrows £1500 from a bank.

He pays back £100 each month.

This iterative formula works out the amount he still owes at the end of each month.

$$A_{n+1} = 1.02 \times A_n - 100$$

$$A_0 = 1500$$

Work out the amount he still owes at the end of the 2nd month.

**[3 marks]**

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Answer £ \_\_\_\_\_

Turn over for the next question

7
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Turn over ►





28

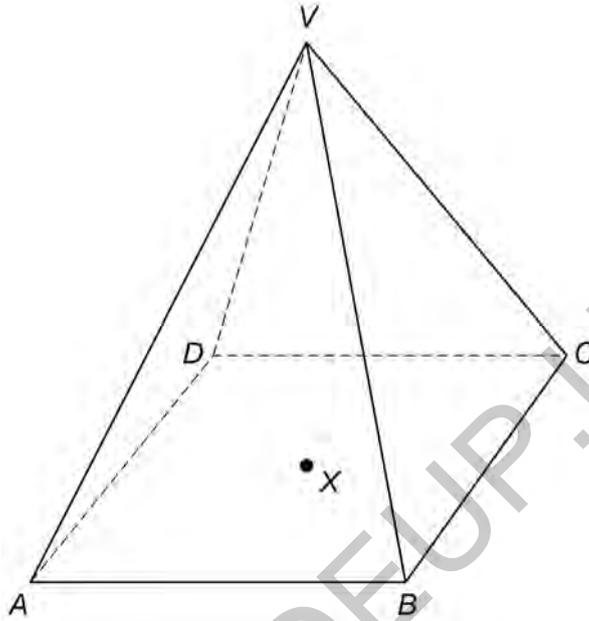
$VABCD$  is a pyramid with a horizontal square base.

$X$  is the centre of the base.

$V$  is vertically above  $X$ .

$$BD = 18 \text{ cm}$$

$$\text{Angle } VBX = 72^\circ$$



Work out the length of  $VB$ .

[3 marks]

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



- 29** A code is three letters, each of which is in the word LOGIC  
Vinny assumes that letters in the code may be used more than once.  
He works out how many possible codes there are.  
In fact, the first two letters are the same and the third is different.  
How many of Vinny's codes are **not** possible? **[2 marks]**

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Answer \_\_\_\_\_

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**END OF QUESTIONS**



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