

A



Surname _____

Forename(s) _____

Centre Number _____

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I declare this is my own work.

GCSE

MATHEMATICS

H

Higher Tier Paper 2 Calculator

8300/2H

Thursday 3 November 2022

Morning

Time allowed: 1 hour 30 minutes

At the top of the page, write your surname and forename(s), your centre number, your candidate number and add your signature.

[Turn over]

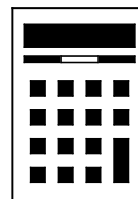


N 0 V 2 2 8 3 0 0 2 H 0 1

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.
- Answer ALL questions.
- You must answer the questions in the spaces provided. Do not write 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.

ADVICE

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

DO NOT TURN OVER UNTIL TOLD TO DO SO



Answer ALL questions in the spaces provided.

1 Work out $\frac{4^6 - 11}{\sqrt{625} - 225}$

Circle your answer. [1 mark]

−61.6

−20.425

204.25

3870.56

2 Work out $(3.1 \times 10^9)^2$

Circle your answer. [1 mark]

6.2×10^{18}

6.2×10^{81}

9.61×10^{18}

9.61×10^{81}



- 3 The equation of a line is $y = 3x - 6$

Circle the coordinates of the y -intercept.
[1 mark]

$(0, -6)$ $(-6, 0)$ $(0, 3)$ $(3, 0)$

- 4 $a \times b^4 = c$

Circle the correct expression for a . [1 mark]

$$\frac{c}{\sqrt[4]{b}}$$

$$\frac{c}{b^{-4}}$$

$$\left(\frac{c}{b}\right)^4$$

$$\frac{c}{b^4}$$

[Turn over]



5 **Written as the product of prime factors,**

$$12\,600 = 2^3 \times 3^2 \times 5^2 \times 7$$

and

$$14\,112 = 2^5 \times 3^2 \times 7^2$$

**Work out the highest common factor (HCF) of
12 600 and 14 112**

Give your answer as an integer. [2 marks]

Answer _____

6



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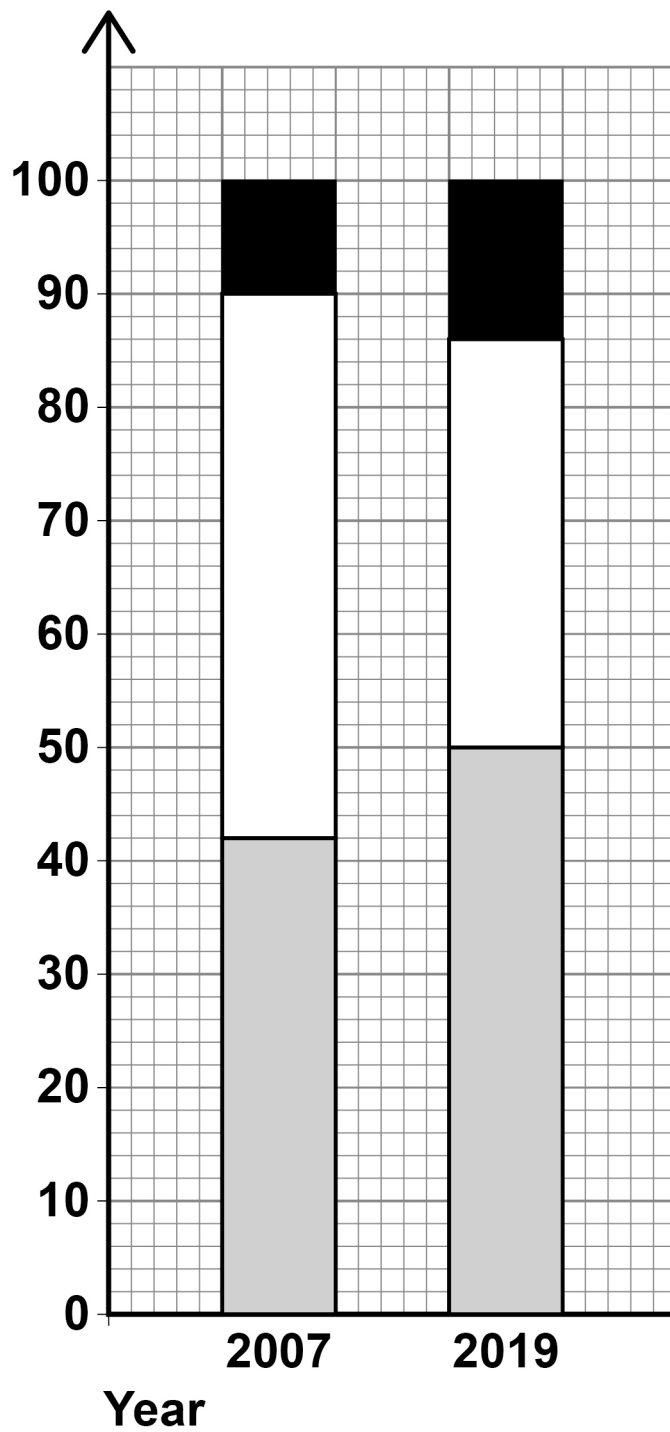


6 The composite bar chart, on the opposite page, shows information about the **PERCENTAGE** of drinks sold by a café in 2007 and 2019

6 (a) In 2007 the café sold a total of 24 000 drinks.

How many MORE teas than coffees were sold?
[2 marks]

Answer _____

KEY:**Coffee****Tea****Other****Percentage of
drinks sold****[Turn over]**

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- 6 (b) Were more coffees sold at the café in 2019 than in 2007 ?

Tick a box.

☐

Yes

☐

No

☐

Cannot tell

Give a reason for your answer. [1 mark]

[Turn over]



- 7 (a) k is a whole number between 40 and 50

The cube root of k is 3, to the nearest whole number.

Work out the **LARGEST** possible value of k .
[2 marks]

Answer _____



7 (b) Fay tries to solve $x^2 = 100$

She says,

“The only possible value of x is 10”

Give a reason why she is NOT correct. [1 mark]

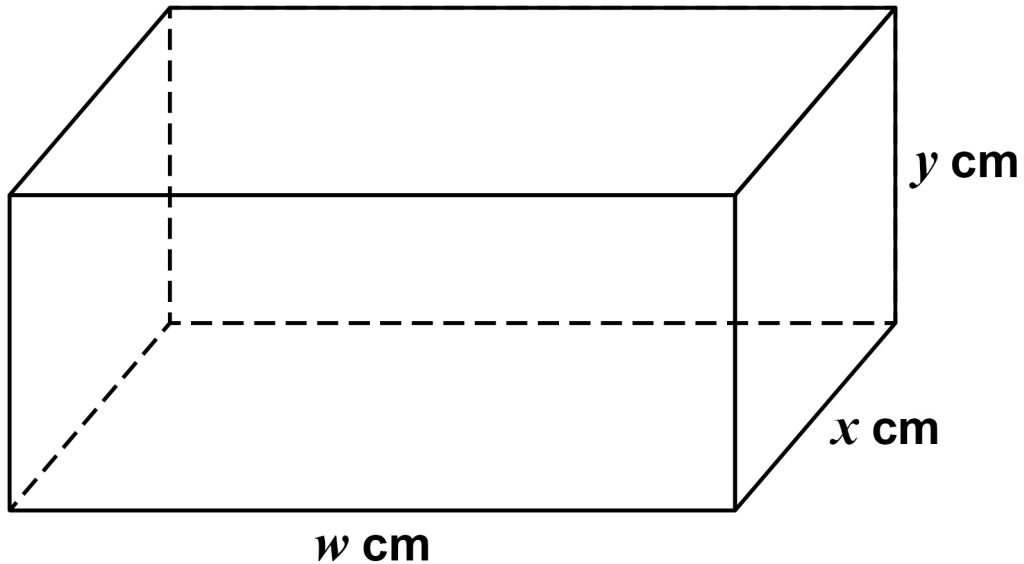
[Turn over]

6



8 (a) Here is a cuboid.

w , x and y are DIFFERENT whole numbers.



The total length of ALL the edges of the cuboid is 80 cm

The volume is GREATER than 200 cm^3

Work out one possible set of values for w , x and y . [2 marks]

$w =$ _____

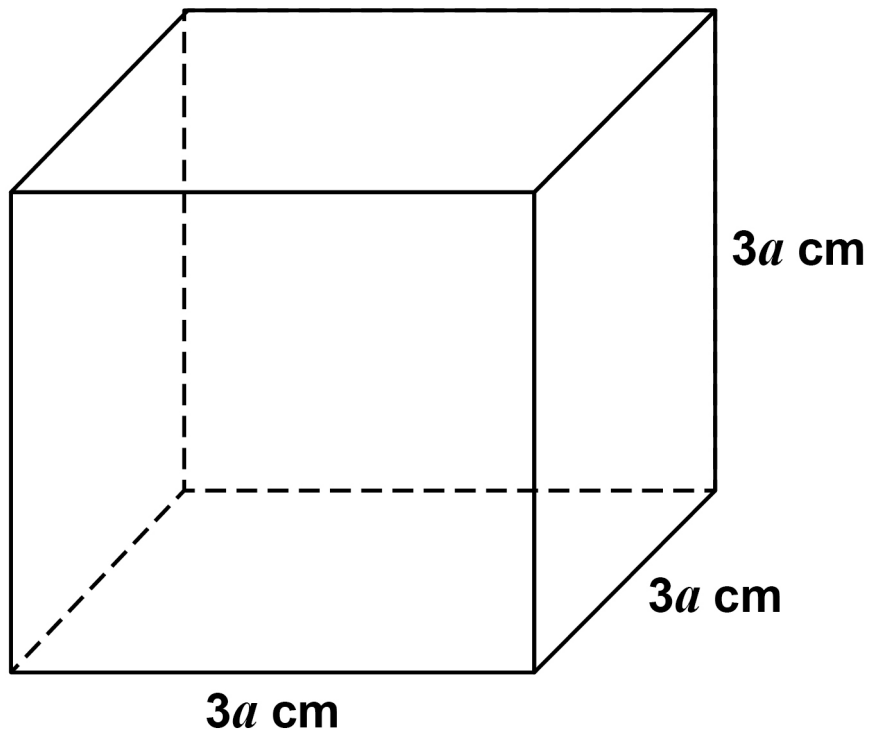
$x =$ _____

$y =$ _____

[Turn over]



8 (b) Here is a solid cube.



Circle the expression for the TOTAL surface area in cm^2 [1 mark]

$36a$

$54a$

$36a^2$

$54a^2$



9 The 47th triangular number is 1128

The 48th triangular number is 1176

Work out the 49th triangular number. [1 mark]

Answer _____

[Turn over]

4



- 10 The n th terms of two linear sequences, A and B, are added to give the n th term of a new sequence.

The new sequence starts

8 13 18 23

The n th term of sequence A is $n + 1$

Work out the n th term of sequence B. [4 marks]

Answer _____

11 A tank contains 40 litres of water.

11 (a) Water leaks out of the tank at a rate of 1.2 litres per minute.

The leak is stopped after 20 minutes.

Show that, when the leak is stopped, the tank contains 16 litres of water. [1 mark]

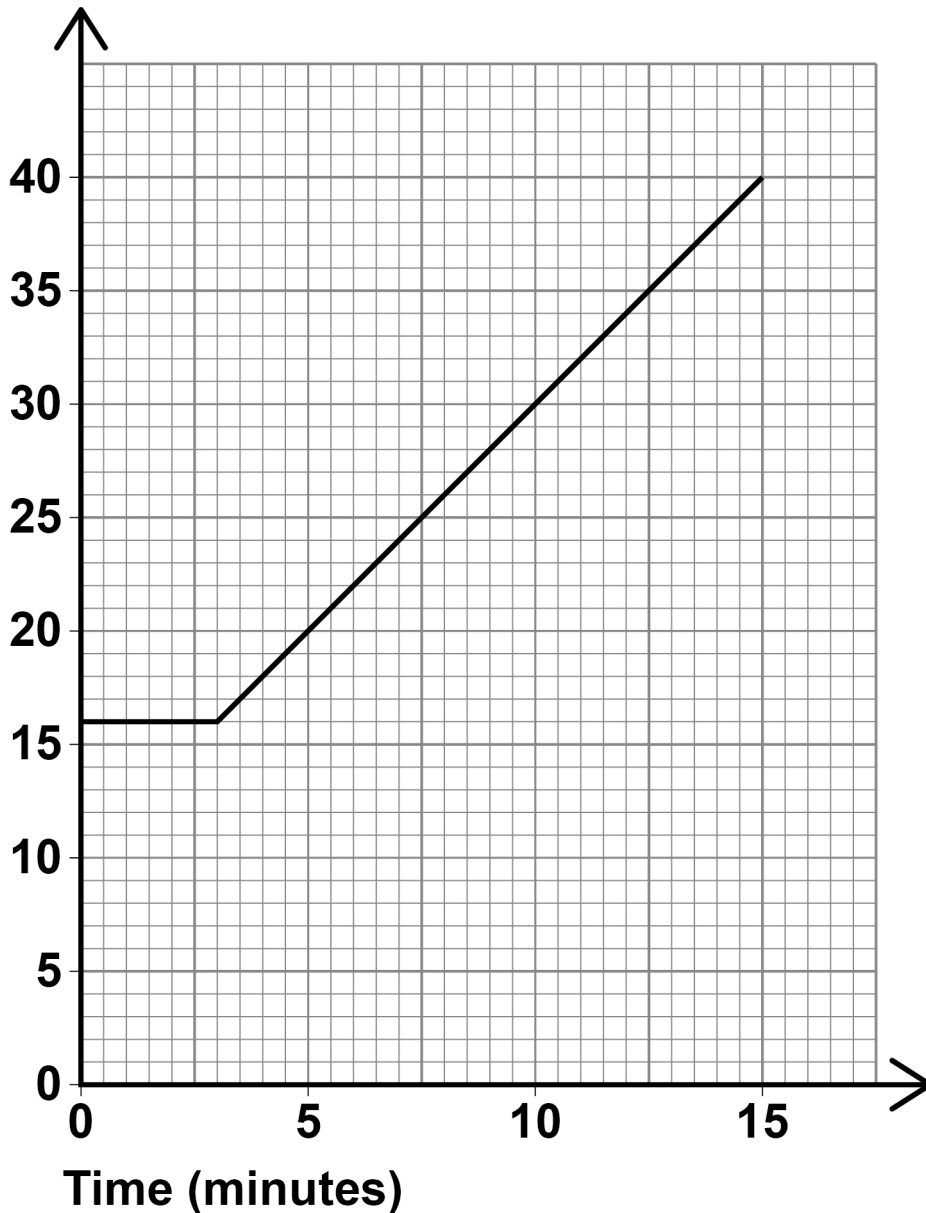
[Turn over]



11 (b) The tank is refilled with water from a tap.

The graph shows the amount of water in the tank AFTER the leak is stopped.

Water in tank
(litres)



Complete this report by writing a number in each answer space. [3 marks]

REPORT

_____ minutes after the leak is
stopped, the tap starts to refill the tank.

The rate at which the tank refills is
_____ litres per minute.

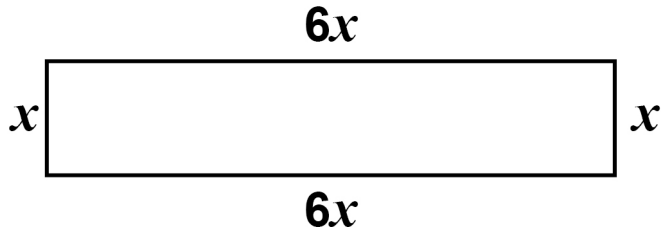
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8



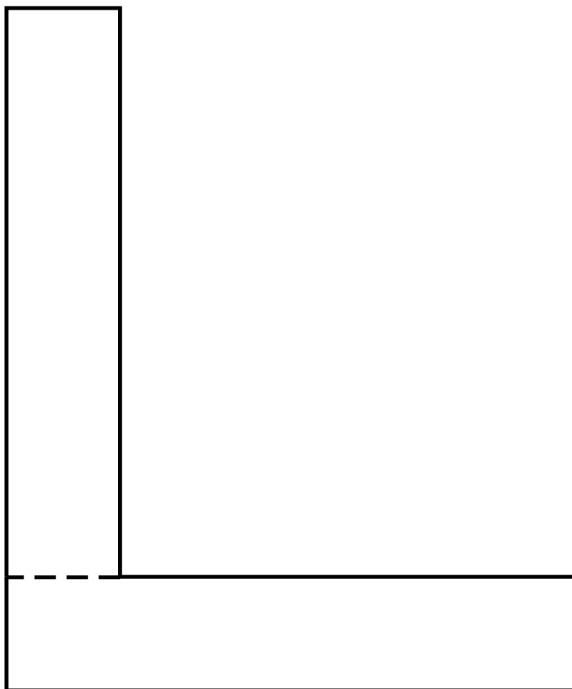
12 The length of this rectangle is 6 times the width.

The diagram is not drawn accurately.



Two of these rectangles are joined, with no overlap, to make this L-shape.

The diagram is not drawn accurately.



The perimeter of the L-shape is 98.8 cm

Work out the value of the perimeter of ONE of the rectangles. [4 marks]

[illegible]

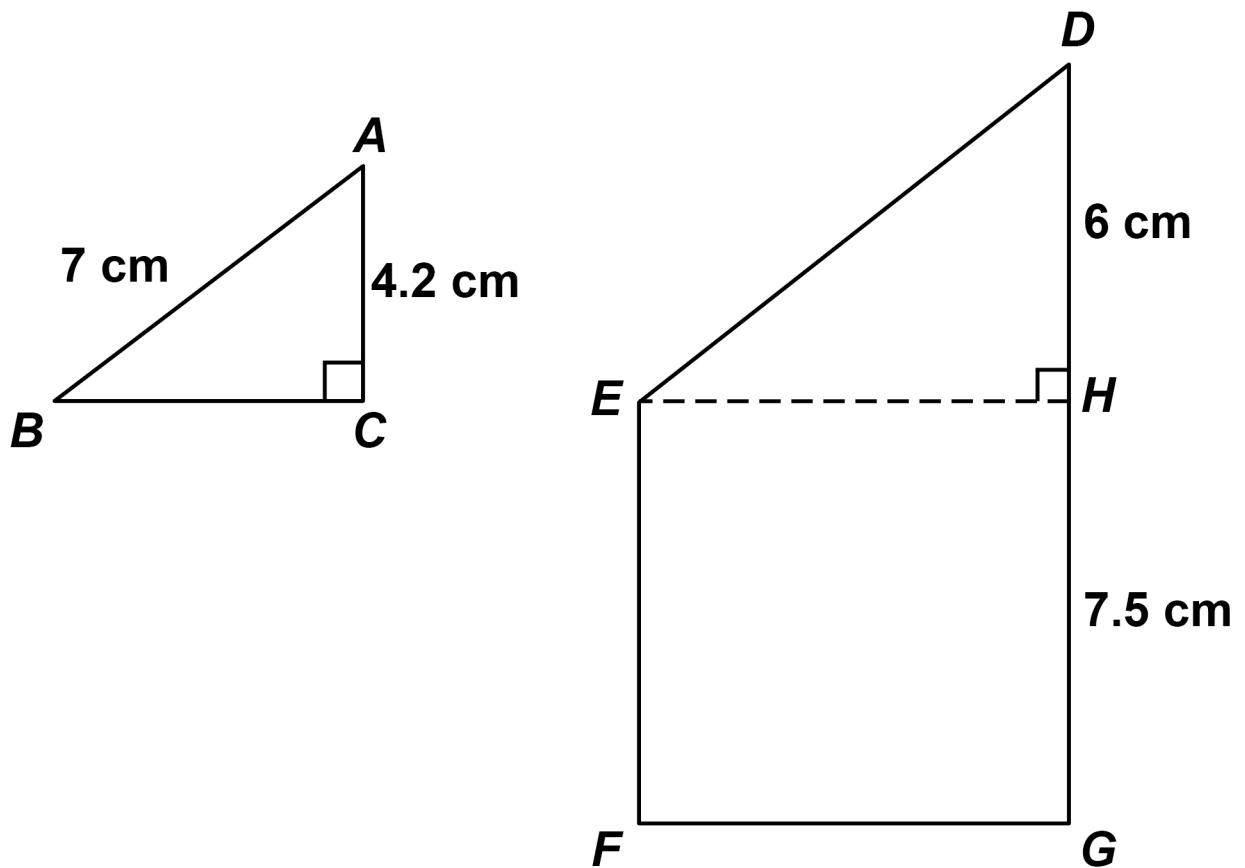
Answer **cm**

[Turn over]



- 13 Trapezium $DEFG$ is formed by joining triangle DEH to rectangle $EFGH$.

The diagram is not drawn accurately.



ABC is similar to DEH .

Work out the area of $DEFG$. [5 marks]



9

14 Fred bought an apartment for £137 500

He made 8% profit when he sold the apartment.

He used all of this profit to pay 40% of the deposit on a house.

The deposit was one sixth of the price of the house.

Work out the price of the house. [4 marks]

Answer £

15 **Circle the correct statement. [1 mark]**

$$1 \text{ m}^2 = 100 \text{ mm}^2$$

$$1 \text{ cm}^2 = 100 \text{ mm}^2$$

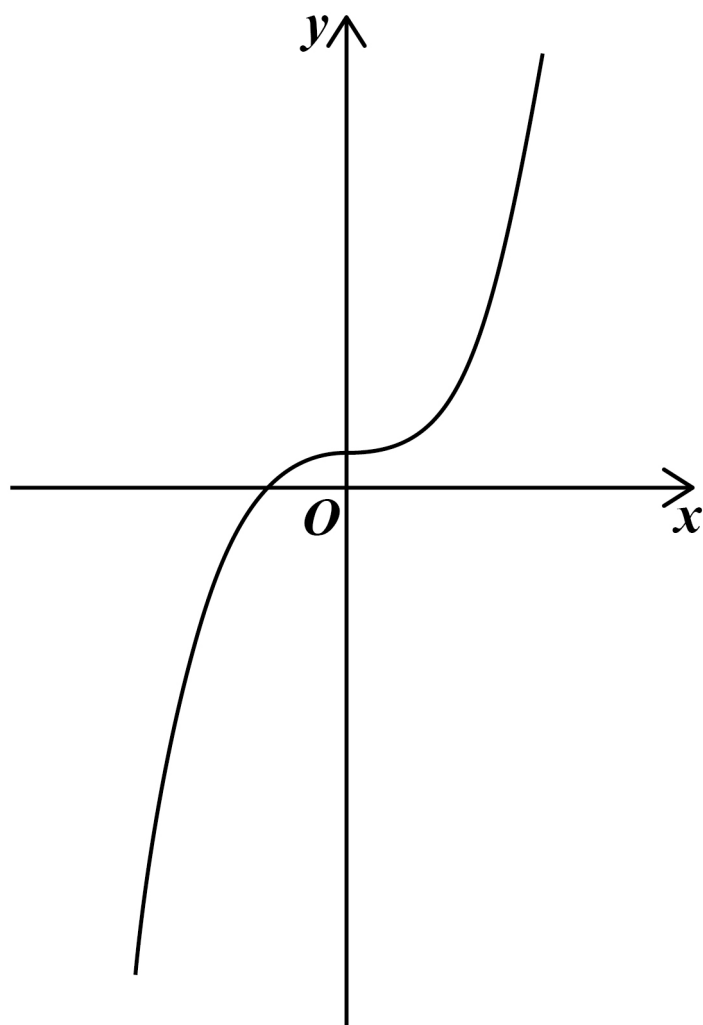
$$1 \text{ m}^2 = 100 \text{ cm}^2$$

$$1 \text{ km}^2 = 100 \text{ m}^2$$

[Turn over]



16 Here is a sketch of a graph.



Circle the possible equation of the graph.
[1 mark]

$$y = x^2 + 1$$

$$y = \frac{1}{x} + 1$$

$$y = x^3 + 1$$

$$y = 1 - x^2$$

- 17 A sequence of numbers is formed by the iterative process

$$u_{n+1} = \frac{20}{u_n + 3} \quad \text{where } u_1 = 1$$

Work out u_3

Circle your answer. [1 mark]

$$\frac{40}{11}$$

$$\frac{5}{2}$$

7

5

[Turn over]

7

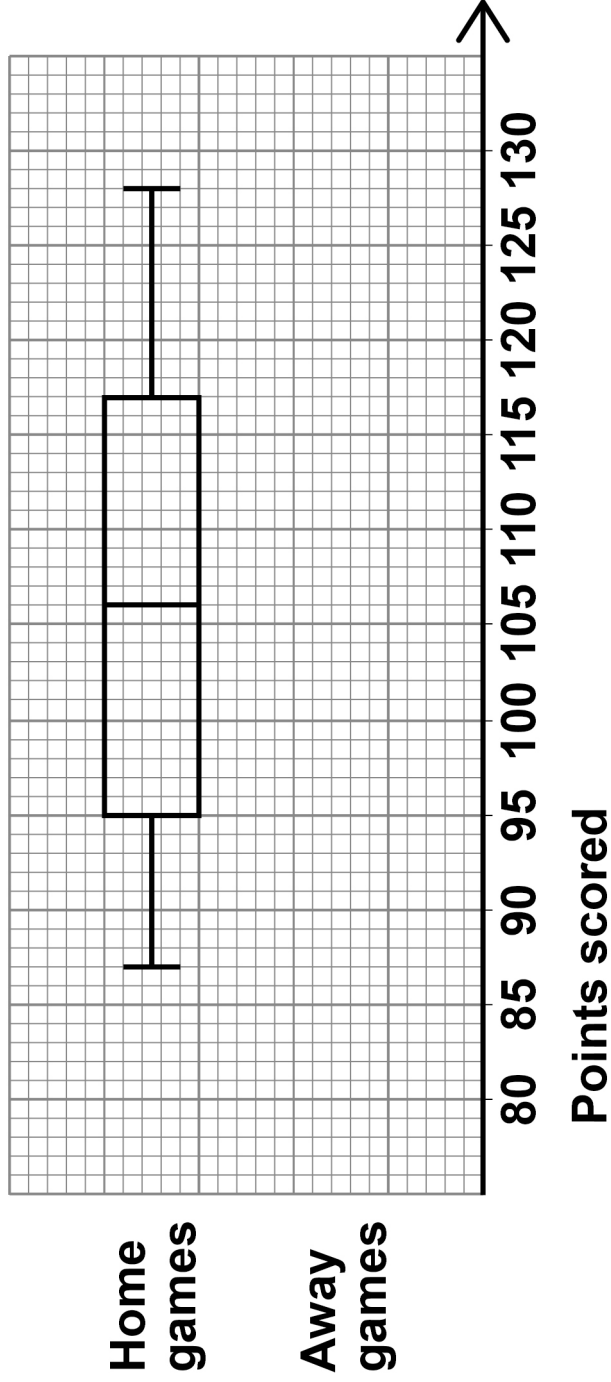




18

A basketball team plays 19 home games and 19 away games.

The box plot shows information about the points the team scored in HOME games.



Here are the points the team scored in the 19 AWAY games.

85	89	93	95	96	96	98	98	98	99
100	103	105	107	109	110	114	119	126	



18 (a) On the grid, draw a box plot for the away games. [4 marks]

18 (b) On average, did the team score more points in home games or away games?

Use ONE statistical measure to support your decision. [1 mark]

[Turn over]

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18 (c) Was the number of points scored more consistent in home games or away games?

Use ONE statistical measure to support your decision. [1 mark]

[Turn over]

- 19 Using the quadratic formula, or otherwise, solve $3x^2 + x - 5 = 0$ [2 marks]

Answer _____

8



BLANK PAGE

[Turn over]



- 20 A vending machine has a different item in each section.**

It sells

7 drinks, 3 of which are juice

5 snacks, 2 of which are fruit bars

11 meals, 4 of which are salad.

One drink, one snack and one meal are chosen at random.

Show that the probability of getting a juice, a fruit bar and a salad is MORE than 5% [3 marks]

[Turn over]



21 $f(x) = \frac{3x+9}{5}$ and $g(x) = 6x - 1$

21 (a) Show that $gf(2)$ is an integer. [2 marks]

21 (b) Show that $f^{-1}(8)$ is NOT an integer. [2 marks]

[illegible]

[Turn over]

7



22 Factorise fully $x^3 - 49x$ [2 marks]

Answer

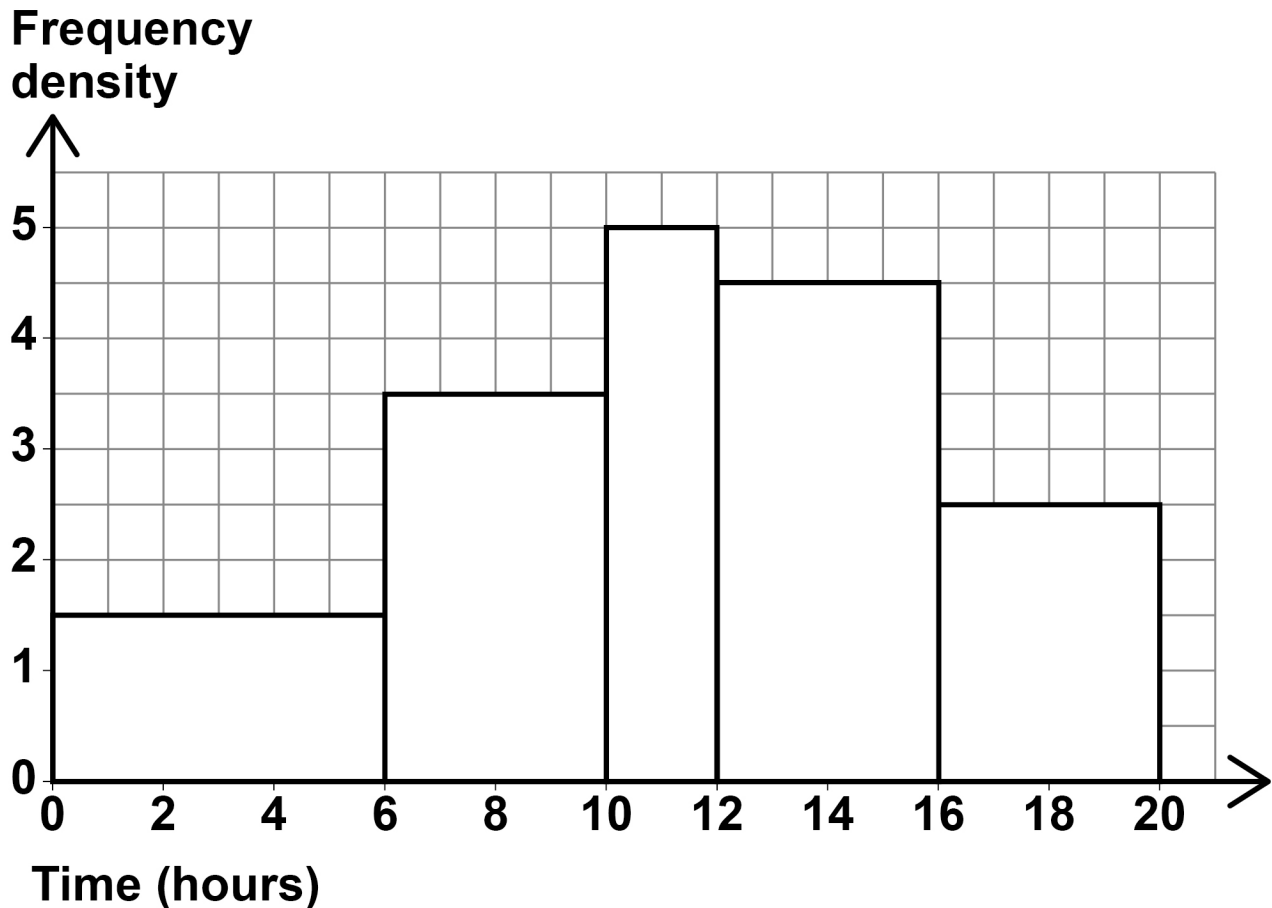
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[Turn over]



- 23** 61 students recorded how many hours they spent revising for a test.

The histogram represents the results.



- 23 (a)** Work out an estimate of the mean time the 61 students spent revising.

You may use the table, on the opposite page, to help you. [4 marks]



Time, x (hours)	Frequency	Midpoint	
$0 \leq x < 6$			
$6 \leq x < 10$			
$10 \leq x < 12$			
$12 \leq x < 16$			
$16 \leq x < 20$			

Answer _____ hours

[Turn over]



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23 (b) Give a reason why the answer to part (a), on pages 42 to 43, is an estimate. [1 mark]

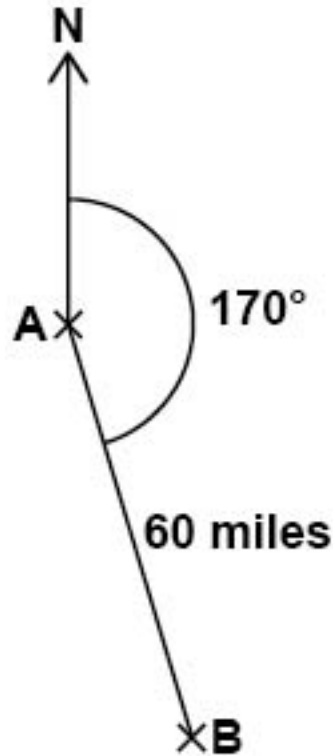
[Turn over]

7



24 B is 60 miles from A on a bearing of 170°

The diagram is not drawn accurately.



A ship sails from A on a bearing of 247°

It travels at a constant speed of 23 mph for $1\frac{1}{2}$ hours.

Is the ship now closer to B than it was when it left A?

You must show your working. [5 marks]

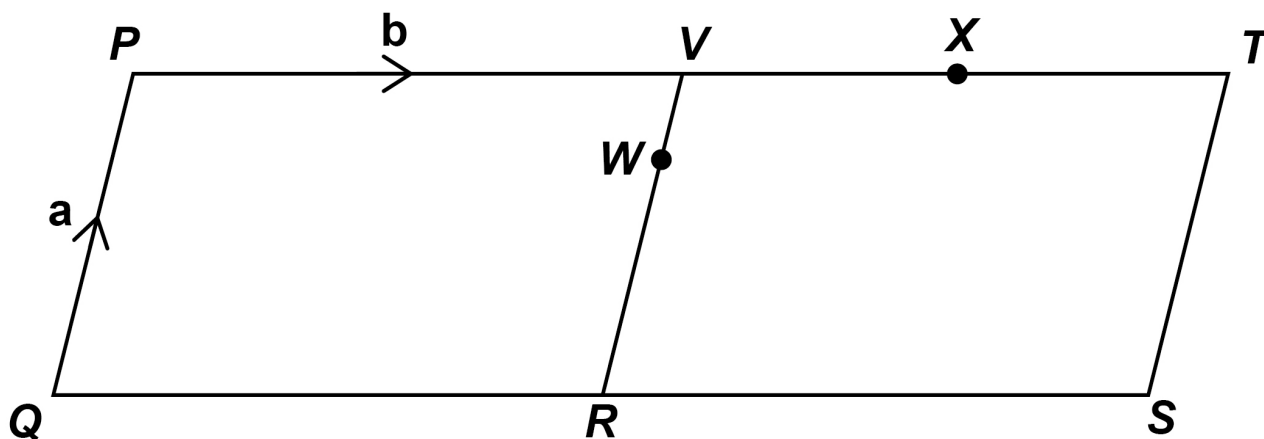
[illegible]

[Turn over]



- 25 Two congruent parallelograms, $PQRV$ and $VRST$, are joined.

The diagram is not drawn accurately.



$$\overrightarrow{QP} = a \quad \overrightarrow{PV} = b$$

X is the midpoint of VT .

$$VW : WR = 1 : 2$$

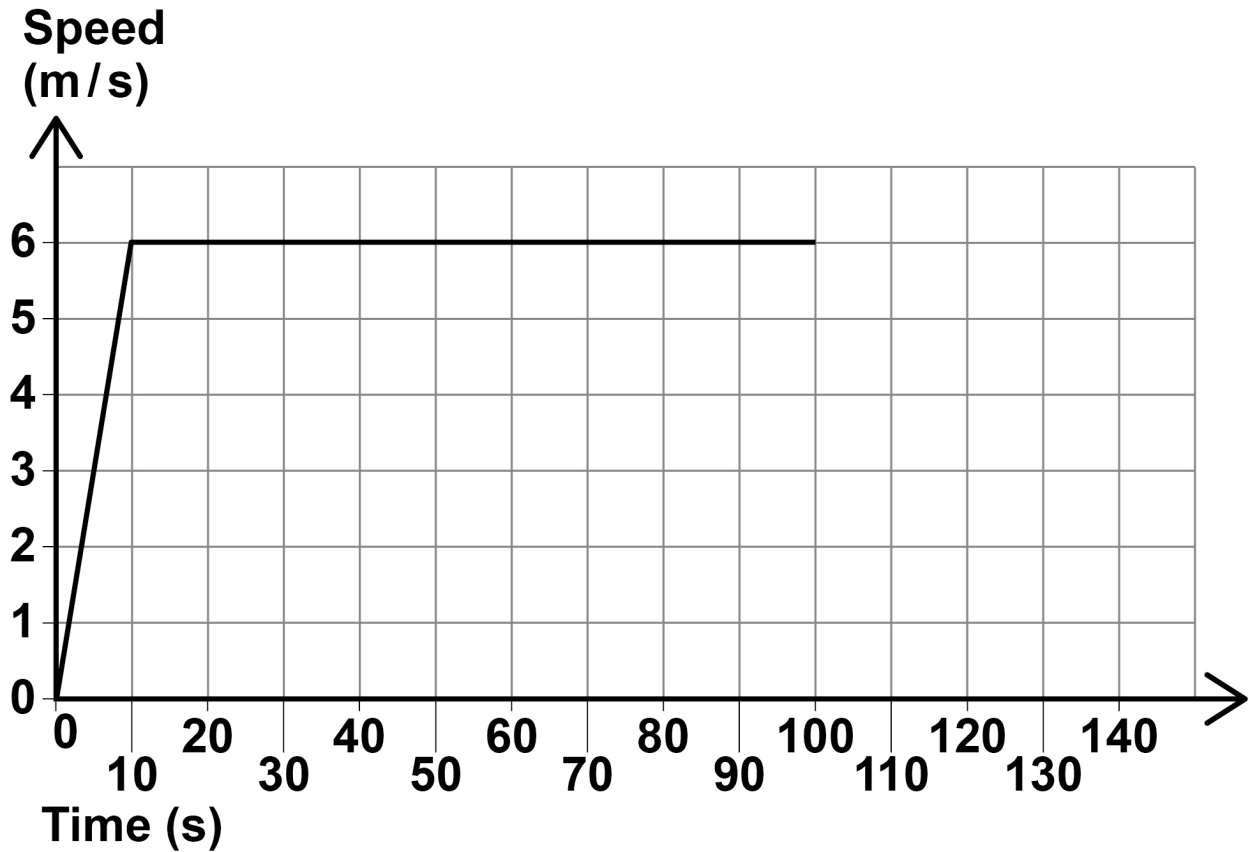
Prove that Q , W and X lie on a straight line.
[3 marks]

8



26 Helena ran an 800-metre race in 140 seconds.

The speed-time graph represents the first 100 seconds of her run.



Helena ran the last 40 seconds with constant deceleration.

Work out her speed as she finished the race.
[4 marks]

[illegible]

Answer _____ **metres per second**

[Turn over]



- 27 In a class there are
 n boys
a total of 25 students.

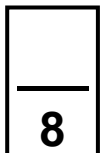
Two of the students are chosen at random.

The probability that both students are boys is $\frac{7}{20}$

Work out the value of n . [4 marks]

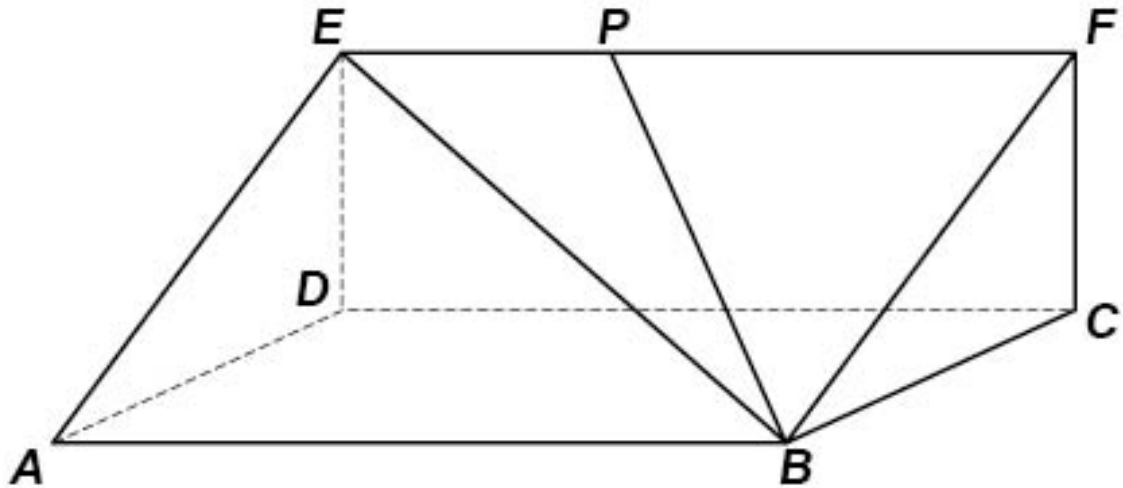


[Turn over]



28 *ABCDEF* is a triangular prism.

P is a point on *EF*.



EB = 29 cm

Angle *EBP* = 35°

Angle *EPB* = 114°

Work out the length of *EP*. [2 marks]



Answer _____ cm

END OF QUESTIONS

2



Additional page, if required.

Write the question numbers in the left-hand margin.

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Additional page, if required.

Write the question numbers in the left-hand margin.

[illegible]

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For Examiner's Use	
Pages	Mark
4–6	
8–13	
14–17	
18–21	
22–25	
26–29	
30–34	
36–39	
40–45	
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50–53	
54–55	
TOTAL	

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