AQA

Surname _____

Forename(s) _____

Candidate signature _____

I declare this is my own work.

GCSE MATHEMATICS

H

Higher Tier

Paper 2 Calculator

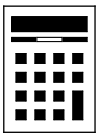
Shadow paper based on November 2022 question paper

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.

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	
TOTAL	

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

Do not write outside the box

1 Work out $\dfrac{5^4 - 15}{\sqrt{961} - 336}$

Circle your answer.

[1 mark]

0.2 $\quad$ -2 $\quad$ 2 $\quad$ -0.2

2 Work out $(2.1 \times 10^5)^3$

Circle your answer.

[1 mark]

6.3×10^8 $\quad$ 6.3×10^{15} $\quad$ 9.261×10^8 $\quad$ 9.261×10^{15}

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

Circle the coordinates of the y-intercept..

[1 mark]

(4, 0) $\quad$ (0, 4) $\quad$ (0, –7) $\quad$ (–7, 0)

Do not write outside the box

4 $m \times n^3 = p$

Circle the correct expression for m.

[1 mark]

$\frac{p}{n^3}$ $\frac{p}{n^{-3}}$ $\left(\frac{p}{n}\right)^3$ $\frac{p}{\sqrt[3]{n}}$

5 Written as the product of prime factors,

$10\,584 = 2^3 \times 3^3 \times 7^2$

and

$54\,432 = 2^5 \times 3^5 \times 7$

Work out the highest common factor (HCF) of 10 584 and 54 432

Give your answer as an integer.

[2 marks]

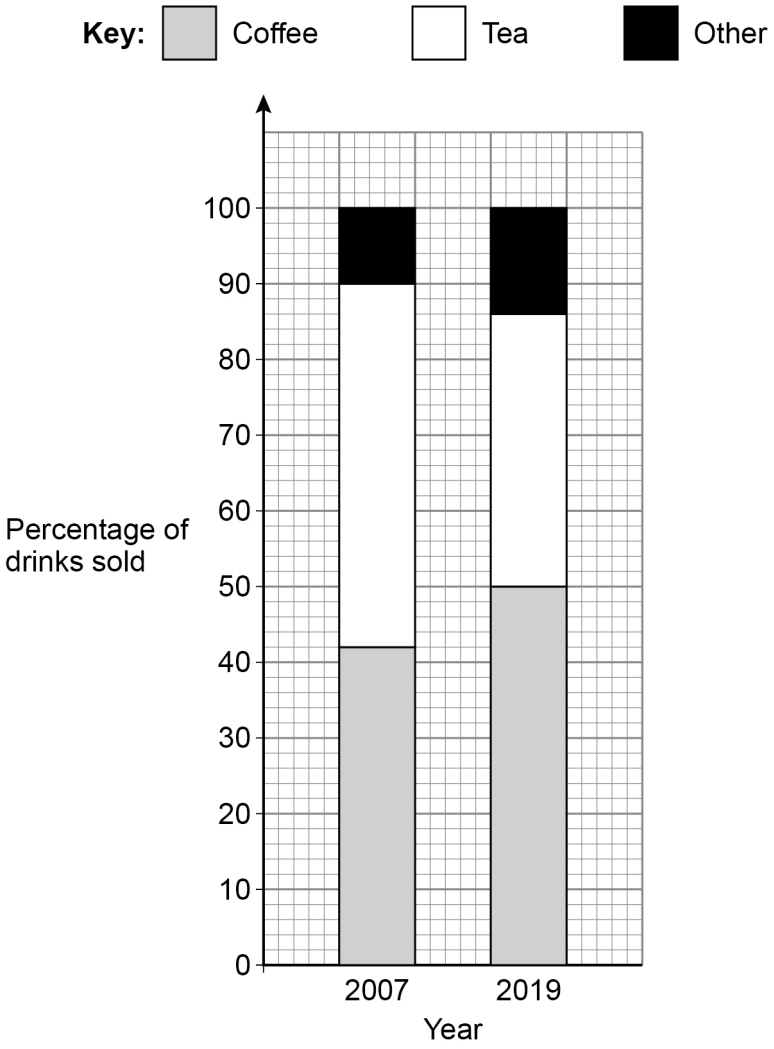
Answer _____

6

Turn over ►

Do not write outside the box

6 The composite bar chart shows information about the **percentage** of drinks sold by a café in 2007 and 2019



6 (a) In 2019 the café sold a total of 36 000 drinks.

How many **more** coffees than teas were sold?

[2 marks]

Answer _____

Do not write outside the box

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

Tick a box.

☐ Yes ☐ No ☐ Cannot tell

Give a reason for your answer.

[1 mark]

7 (a) k is a whole number between 10 and 20

The square root of k is 4, to the nearest whole number.

Work out the **smallest** possible value of k.

[2 marks]

Answer _____

7 (b) Firoz tries to solve $x^2 = 121$

He says,

"The only possible value of x is 11"

Give a reason why he is **not** correct.

[1 mark]

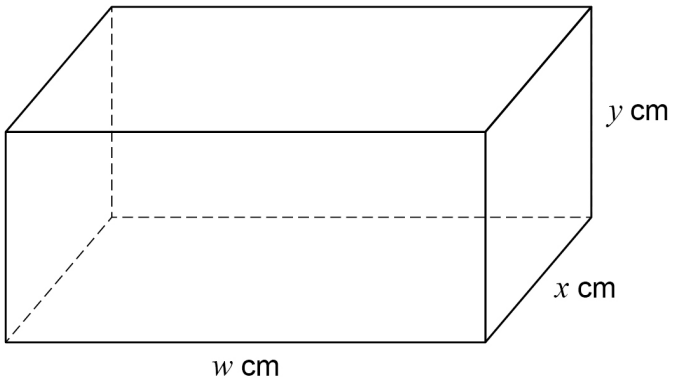
6

Turn over ►

Do not write outside the box

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 60 cm

The volume is **greater** than 110 cm^3

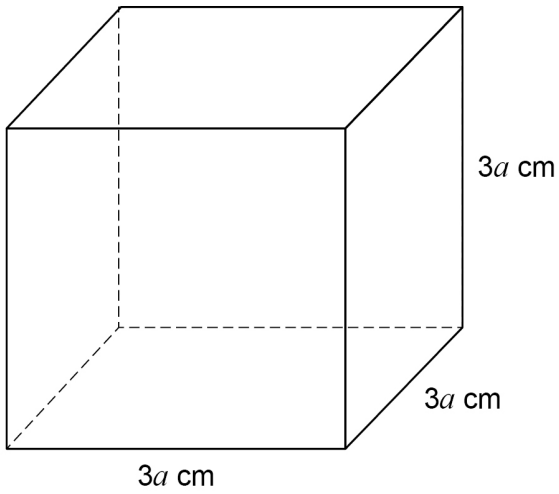
Work out the set of values for w, x and y.

[2 marks]

$w =$ _____ $x =$ _____ $y =$ _____

Do not write outside the box

8 (b) Here is a solid cube.



Circle the expression for the **total** volume in cm^3

[1 mark]

$9a^3$ $27a^3$ $54a^3$ $81a^3$

9 The 50th triangular number is 1275

The 51st triangular number is 1326

Work out the 52nd triangular number.

[1 mark]

Answer _____

4

Turn over ►

Do not write outside the box

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

The new sequence starts

9 12 15 18

The nth term of sequence A is $n + 2$

Work out the nth term of sequence B.

[4 marks]

Answer _____

11 A tank contains 50 litres of water.

11 (a) Water leaks out of the tank at a rate of 1.4 litres per minute.

The leak is stopped after 15 minutes.

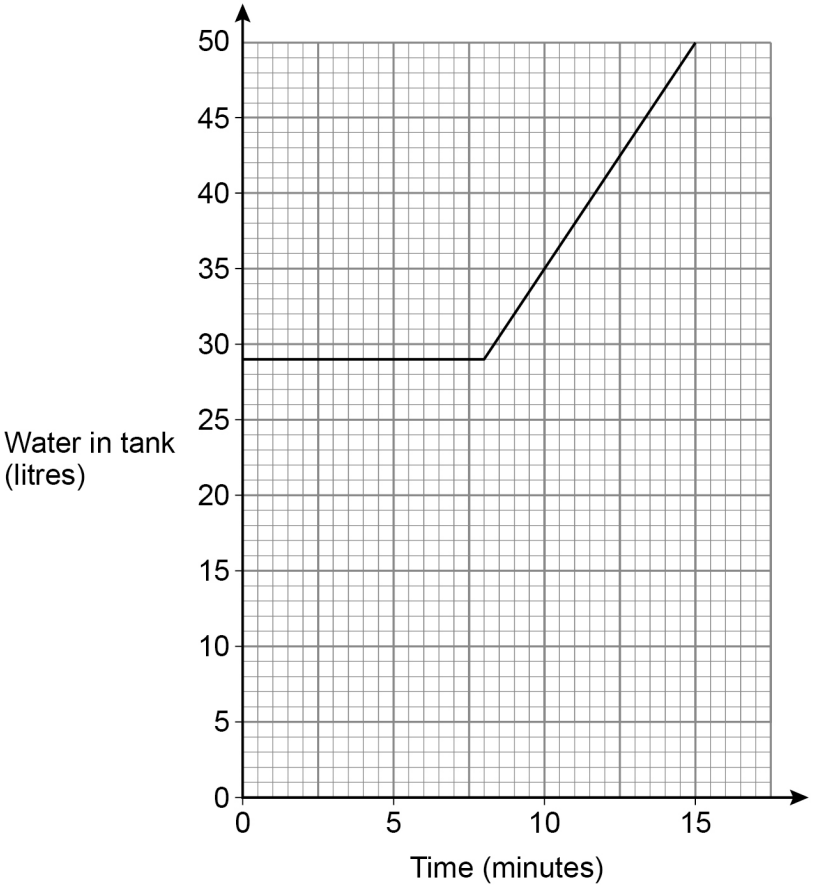
Show that, when the leak is stopped, the tank contains 29 litres of water.

[1 mark]

Do not write outside the box

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.



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.

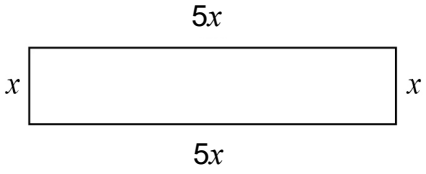
The rate at which the tank refills is _____ litres per minute.

8

Turn over ►

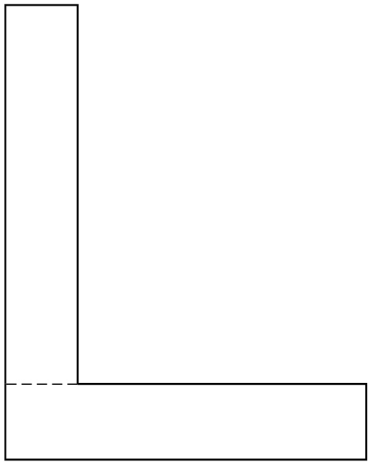
Do not write outside the box

12 The length of this rectangle is 5 times the width.



Not drawn accurately

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



Not drawn accurately

The perimeter of the L-shape is 92.4 cm

Work out the value of the perimeter of **one** of the rectangles.

[4 marks]

Answer _____ cm

Do not write outside the box

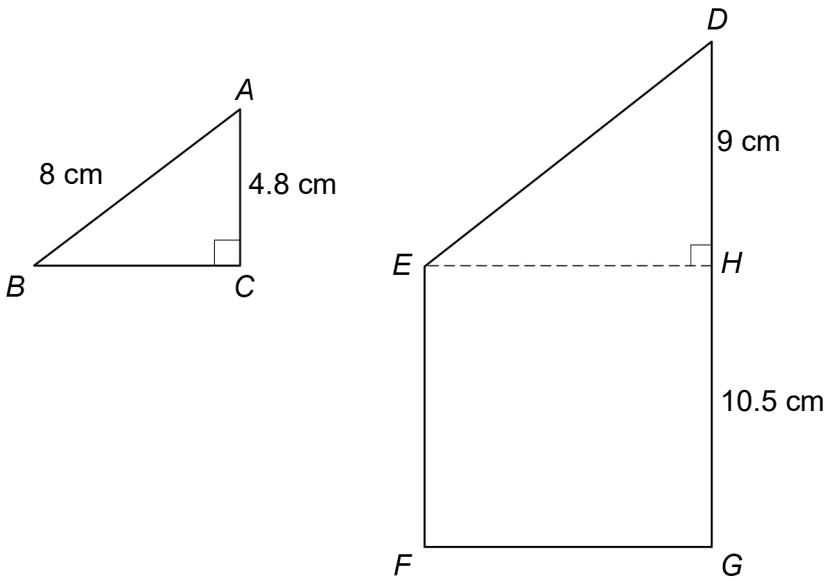
13 Trapezium *DEFG* is formed by joining

triangle *DEH*

to

rectangle *EFGH*.

Not drawn accurately



ABC is similar to *DEH*.

Work out the area of *DEFG.*

[5 marks]

Answer _____ cm^2

9

Turn over ►

Do not write outside the box

14 Fiona bought a painting for £14 250

She made 12% profit when she sold the painting.

She used all of this profit to pay 30% of the deposit on a caravan.

The deposit was one fifth of the price of the caravan.

Work out the price of the caravan.

[4 marks]

Answer £ _____

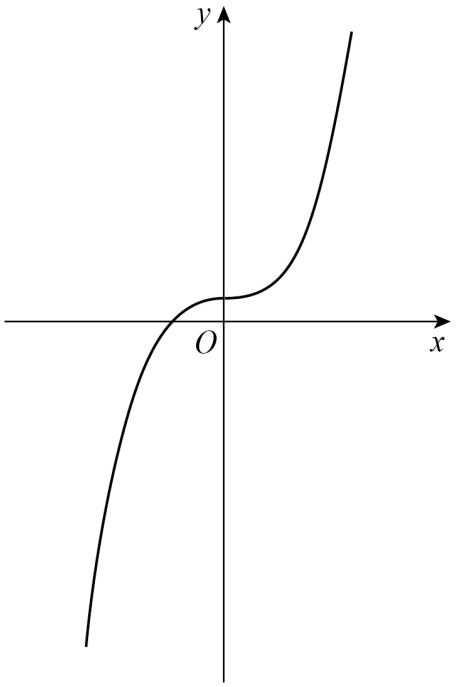
15 Circle the correct statement.

[1 mark]

$2\ km^2 = 400\ m^2$ $2\ m^2 = 400\ mm^2$ $2\ cm^2 = 400\ mm^2$ $2\ m^2 = 400\ cm^2$

Do not write outside the box

16 Here is a sketch of a graph.



Circle the possible equation of the graph.

[1 mark]

$y = x^2 + 2$ $y = \frac{1}{x} + 2$ $y = x^3 + 2$ $y = 2 - x^2$

17 A sequence of numbers is formed by the iterative process

$$u_{n+1} = \frac{20}{u_n + 3} \quad \text{where} \quad u_1 = 5$$

Work out u_3

Circle your answer.

[1 mark]

$\frac{40}{11}$ $\frac{5}{2}$ 8 $\frac{20}{11}$

7

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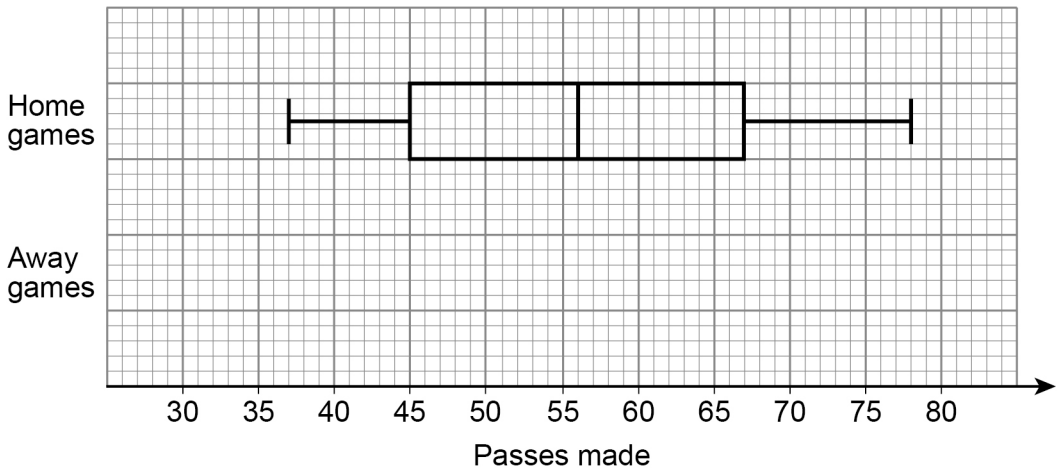
18 A basketball team plays 19 home games and 19 away games.

The box plot shows information about the number of passes she made in **home** games.



Here are the passes she made in the 19 **away** games.

35 39 43 45 46 46 48 48 48 49

50 53 55 57 59 60 64 69 76

18 (a) On the grid, draw a box plot for the passes made in away games.

[4 marks]

Do not write outside the box

18 (b) On average, did the footballer make more passes in home games or away games?
Use **one** statistical measure to support your decision.

[1 mark]

18 (c) Was the number of passes made more consistent in home games or away games?
Use **one** statistical measure to support your decision.

[1 mark]

19 Using the quadratic formula, or otherwise, solve $5x^2 + 3x - 7 = 0$

[2 marks]

Answer _____

8

Turn over ►

Do not write outside the box

20 A supermarket offers a meal deal consisting of one drink, one snack and one sandwich.

It sells

8 drinks, 5 of which are juice

7 snacks, 3 of which are fruit bars

10 sandwiches, 4 of which are vegan.

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

Show that the probability of getting a juice, a fruit bar and a vegan sandwich is **more** than 10%

[3 marks]

Do not write outside the box

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

21 (a) Show that fg(3) is an integer.

[2 marks]

21 (b) Show that $f^{-1}(6)$ is **also** an integer.

[2 marks]

7

Turn over ►

Do not write outside the box

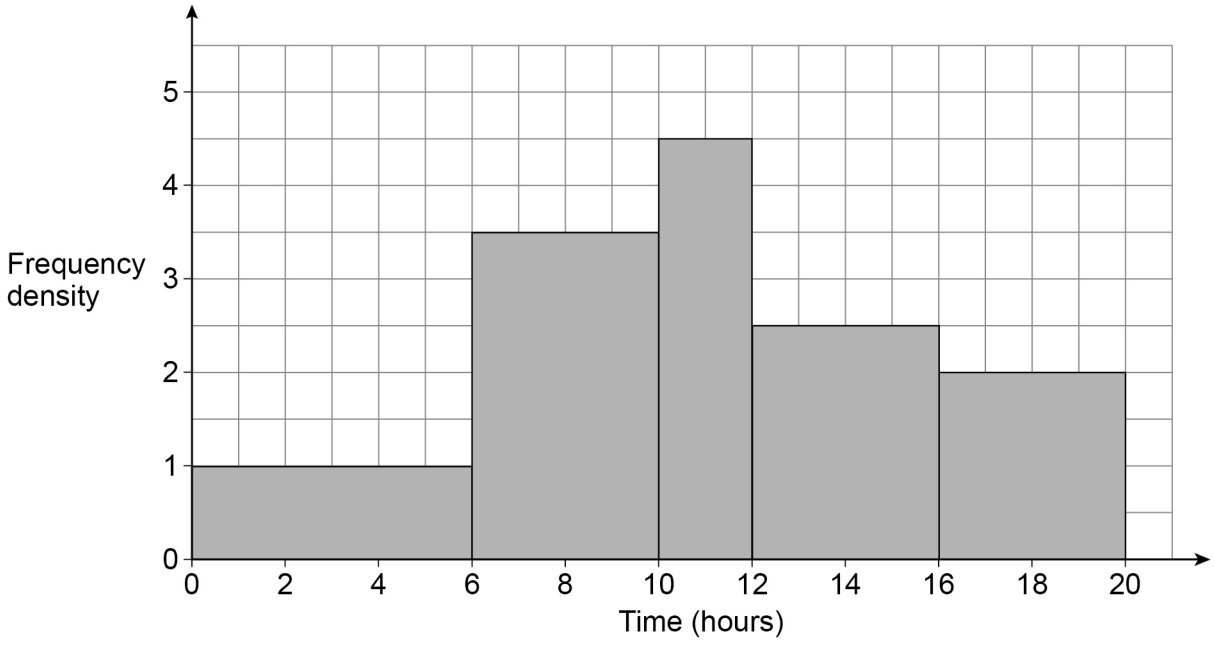
22 Factorise fully $x^3 - 81x$

[2 marks]

Answer _____

23 47 hospital employees recorded how many hours they spent working one day.

The histogram represents the results.



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23 (a) Work out an estimate of the mean time the 47 hospital employees spent working.

You may use the table to help you.

[4 marks]

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

Answer _____ hours

23 (b) Give a reason why the answer to part (a) is an estimate.

[1 mark]

7

Turn over ►

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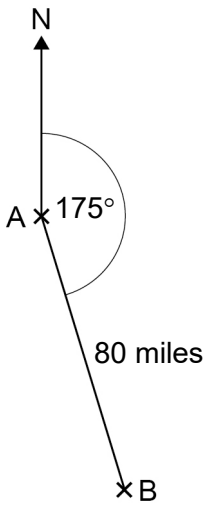
24 B is 80 miles from A on a bearing of 175°

Not drawn accurately



A car travels from A on a bearing of 250°

It travels at a constant speed of 15 mph for $1\frac{1}{2}$ hours.

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

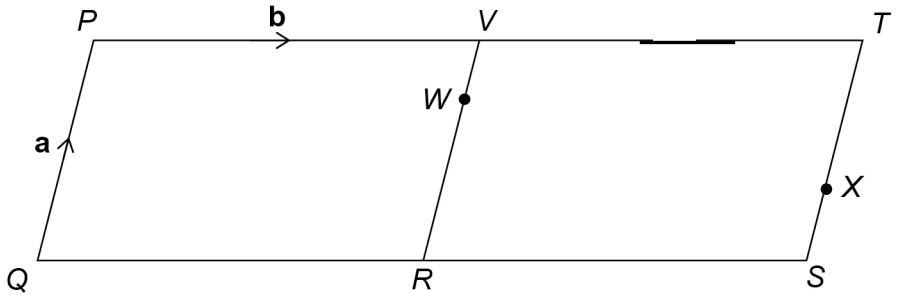
You **must** show your working.

[5 marks]

Do not write outside the box

25 Two congruent parallelograms, *PQRV* and *VRST*, are joined.

Not drawn accurately



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

$VW : WR = 1 : 2$ and $TX : XS = 2 : 1$

Prove that *P, W* and *X* lie on a straight line.

[3 marks]

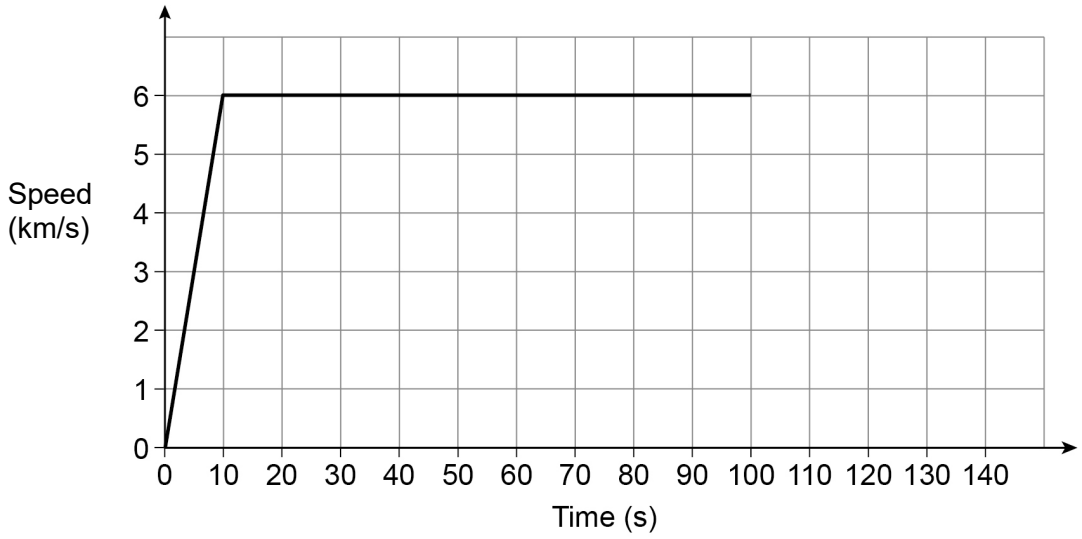
8

Turn over ►

Do not write outside the box

26 A rocket was launched and travelled 750 km in 140 seconds.

The speed-time graph represents the first 100 seconds of the rocket's journey.



The rocket fell to earth in the last 40 seconds with constant deceleration.

Work out the speed of the rocket as it finished its journey.

[4 marks]

Answer _____ kilometres per second

Do not write outside the box

27 At a school assembly there are

n girls

a total of 45 students.

Two of the students are chosen at random.

The probability that both students are girls is $\frac{7}{11}$

Work out the value of n.

[4 marks]

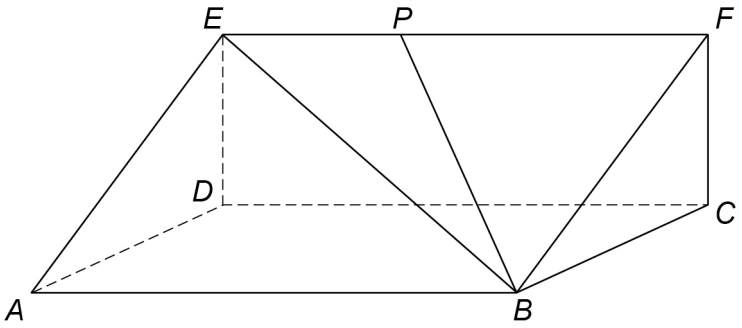
$n =$ _____

8

Do not write outside the box

28 *ABCDEF* is a triangular prism.

P is a point on *EF*.



EB = 32 cm

Angle *BEP* = 29°

Angle *EPB* = 124°

Work out the length of *PB*.

[2 marks]

Answer _____ cm

END OF QUESTIONS

2

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ANSWER IN THE SPACES PROVIDED

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