

GCSE (9–1) Mathematics

J560/02 Paper 2 (Foundation Tier)

Thursday 8 June 2017 – Morning

Time allowed: 1 hour 30 minutes



You may use:

- Geometrical instruments
- Tracing paper

Do not use:

- A calculator



First name										
Last name										
Centre number						Candidate number				

INSTRUCTIONS

- Use black ink. You may use an HB pencil for graphs and diagrams.
- Complete the boxes above with your name, centre number and candidate number.
- Answer **all** the questions.
- Read each question carefully before you start to write your answer.
- Where appropriate, your answers should be supported with working. Marks may be given for a correct method even if the answer is incorrect.
- Write your answer to each question in the space provided.
- Additional paper may be used if required but you must clearly show your candidate number, centre number and question number(s).
- Do **not** write in the barcodes.

INFORMATION

- The total mark for this paper is **100**
- The marks for each question are shown in brackets [].
- This document consists of **20** pages.

Answer **all** the questions.

1 George recorded all the different types of tree in a wood.

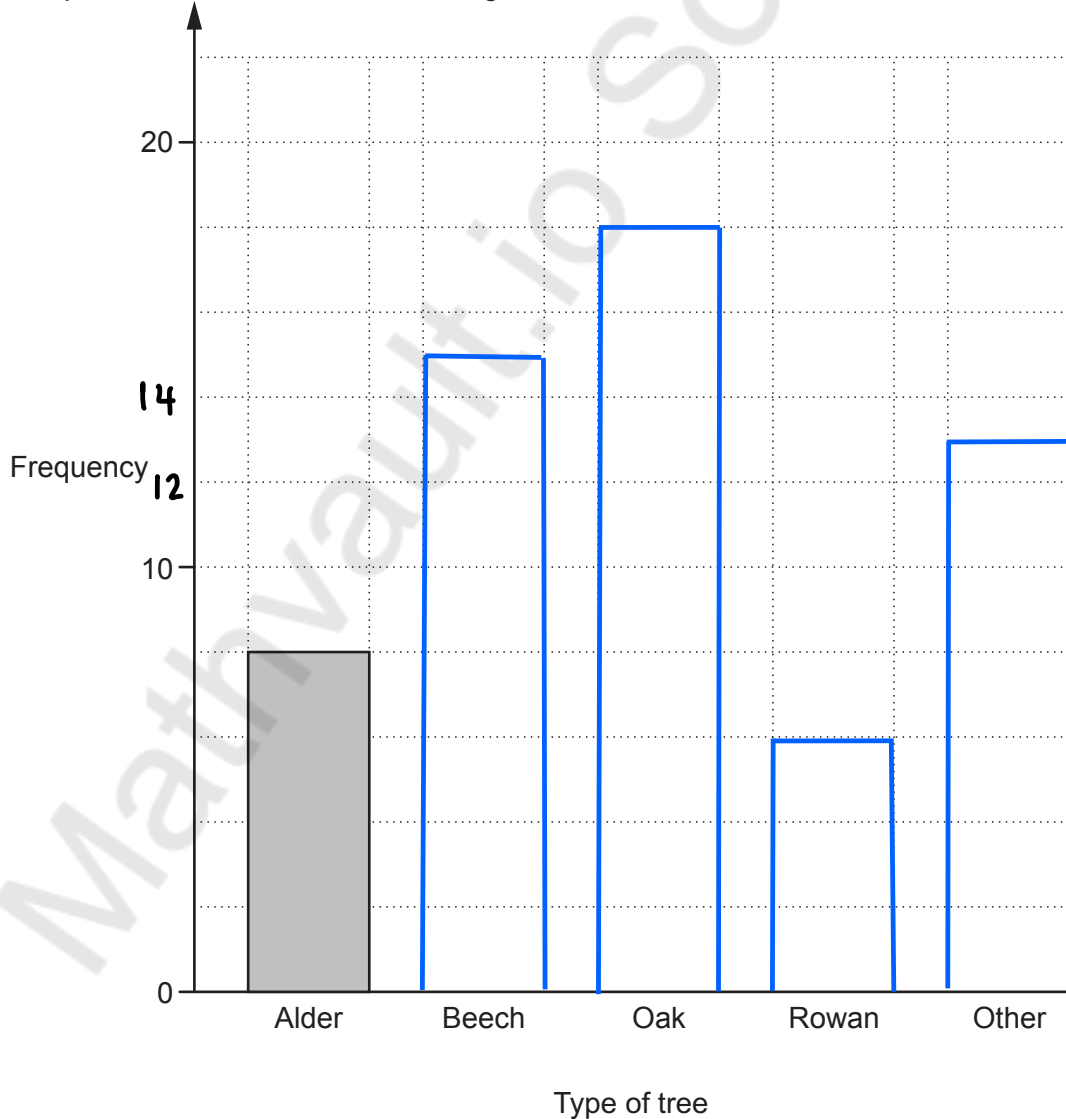
(a) His results are shown in this table.

Complete the table.

Type of tree	Tally	Frequency
Alder	III	8
Beech		15
Oak	III	18
Rowan	I	6
Other	III	13

[2]

(b) Complete the bar chart to show George's results.



[2]

- (c) George found 60 trees altogether in the wood.

What percentage of the trees were oak trees?

$$\frac{18}{60} \begin{array}{l} \div 6 \\ \div 6 \end{array} = \frac{3}{10} \begin{array}{l} \times 10 \\ \times 10 \end{array} = \frac{30}{100} = 30\%$$

(c) 30 % [2]

- 2 (a) Work out.

$$(i) \quad 6\frac{1}{2} + \frac{3}{4} \qquad 6\frac{2}{4} + \frac{3}{4} = 6\frac{5}{4} \qquad \frac{5}{4} = 1\frac{1}{4} \qquad 6 + 1\frac{1}{4}$$

$$\frac{1}{2} \begin{array}{l} \times 2 \\ \times 2 \end{array} = \frac{2}{4} \qquad \frac{1}{7} \begin{array}{l} \times 7 \\ \times 7 \end{array} = \frac{1}{7}$$

(a)(i) [1]

- (ii) $\frac{4}{7}$ of 63

$$\frac{1}{7} \text{ of } 63 = 63 \div 7 = 9$$

$$\frac{4}{7} \text{ of } 63 = 9 \times 4 = 36$$

(ii) 36 [2]

- (b) Show that $\frac{4}{5}$ is bigger than $\frac{7}{9}$.

$$\frac{4}{5} \begin{array}{l} \times 9 \\ \times 9 \end{array} = \frac{36}{45} \qquad \frac{7}{9} \begin{array}{l} \times 5 \\ \times 5 \end{array} = \frac{35}{45}$$

$$\frac{36}{45} > \frac{35}{45}$$

..... [2]

- (c) Find a fraction which is bigger than $\frac{1}{5}$ and smaller than $\frac{1}{4}$.

$$\frac{1}{5} \begin{array}{l} \times 8 \\ \times 8 \end{array} = \frac{8}{40}$$

$$\frac{1}{4} \begin{array}{l} \times 10 \\ \times 10 \end{array} = \frac{10}{40}$$

(c) $\frac{9}{40}$ [2]

- 3 (a) Nathan works out 23×12.4 without a calculator.

This is Nathan's working.

$10 \times 12.4 = 1240$	$= 124$
$\times 2$	$\times 2$
$20 \times 12.4 = 24.80$	$= 248$
$3 \times 12.4 = 37.2$	
$23 \times 12.4 = 24.80 + 37.2 = 62$	
$248 + 37.2$	

Nathan's working is incorrect.

Explain the error that Nathan has made and work out the correct answer.

$$\begin{array}{r} 248.0 \\ + 37.2 \\ \hline 285.2 \end{array}$$

When multiplying 10 by 12.4, he has not moved the digits to the left. The answer should be 285.2.

[3]

- (b) Four friends buy cinema tickets using this offer.

<p>Cinema tickets</p> <p>Buy 3 tickets and get a ticket free</p>

They each pay £6.45.

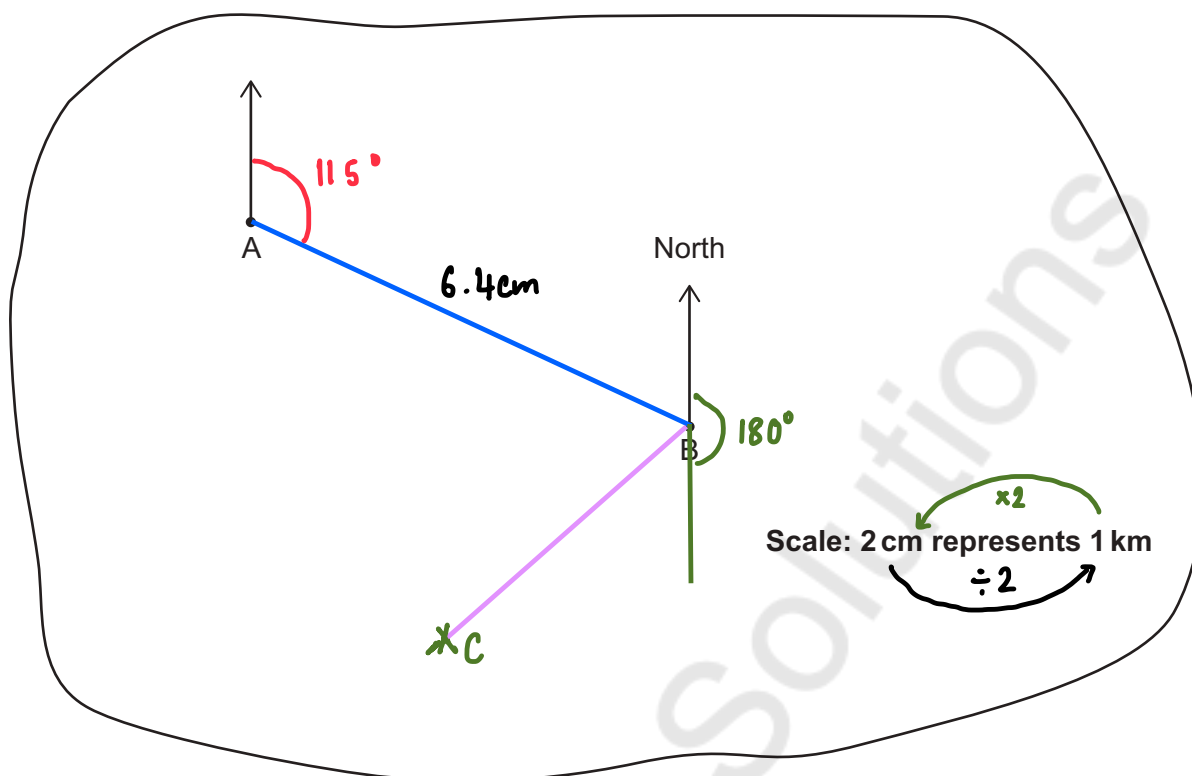
How much does a ticket cost?

$$\begin{array}{r} 6.45 \\ \times 4 \\ \hline \text{£ } 25.80 \end{array}$$

$$\begin{array}{r} 8.60 \\ 3 \overline{) 25.80} \end{array}$$

(b) £ 8.60 [3]

- 4 A and B are two farms on this map.



Use the map to complete these sentences.

- (a) (i) The distance from A to B is **3.2** km. [2]
 $6.4 \div 2 = 3.2$

- (ii) The bearing of B from A is **115** °. [1]

- (b) C is another farm.
 C is 2.5 km from B on a bearing of **230**°.

Mark and label the position of C on the map with a cross.

$$\begin{array}{r} 230 \\ - 180 \\ \hline 50 \end{array}$$

$$2.5 \times 2 = 5\text{cm}$$

5 (a) Multiply out.

$$3x(x+2y)$$

$$3x^2 + 6xy$$

(a) $3x^2 + 6xy$ [2]

(b) Solve.

(i) $7x = 28$

$$\div 7 \quad \div 7$$

$$x = 4$$

(b)(i) $x = 4$ [1]

(ii) $\frac{x}{3} - 2 = 9$

$$+2 \quad +2$$

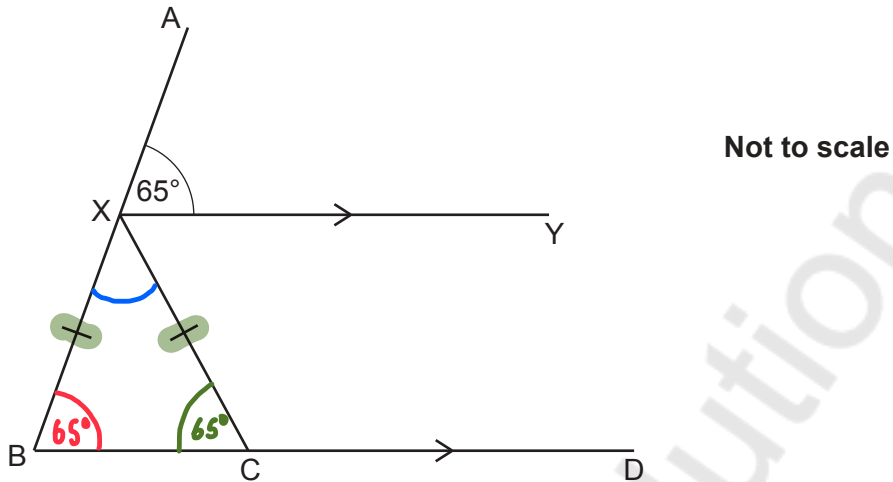
$$\frac{x}{3} = 11$$

$$\times 3 \quad \times 3$$

$$x = 33$$

(ii) $x = 33$ [2]

- 6 XY and BD are parallel lines.
X is a point on AB and C is a point on BD.
 $XB = XC$.



- (a) Complete this sentence.

Angle $XBC = 65^\circ$ because *corresponding* [1]

- (b) Work out angle BXC.

Give a reason for each angle you work out.

Angle $XCB = 65^\circ$ Base angles in an isosceles are equal.

$$\begin{aligned} \text{Angle } BXC &= 180 - (65 + 65) \\ &= 180 - (130^\circ) \\ &= 50^\circ \end{aligned}$$

Angles in a triangle sum to 180°

(b) **50** $^\circ$ [4]

- 7 There are **20 coins** in a pot.
The coins are 1p, 2p, 5p and 10p.

A coin is taken at random from the pot.

- The probability that it is a 1p coin is $\frac{3}{10}$.
- The probability that it is a 2p coin is $\frac{2}{5}$.

The total value of the coins in the pot is 57 pence.

Work out how many of each type of coin there are in the pot.

1p coins

$$\frac{3}{10} \times 20 = \frac{60}{10} = 6$$

$$6 \times 1p = 6p$$

2p coins

$$\frac{2}{5} \times 20 = \frac{40}{5} = 8$$

$$8 \times 2p = 16p$$

5p & 10p coins

$$57p - 6p - 16p = 35p \text{ left}$$

$$20 - 6 - 8 = 6 \text{ coins left}$$

$$5p \times 5 = 25p$$

$$10p \times 1 = 10p$$

$$\underline{\quad\quad\quad}$$

$$35p$$

1p **6** , 2p **8** , 5p **5** , 10p **1** [4]

8 (a) Evaluate.

(i) $\sqrt{121}$

$$11^2 = 11 \times 11 \\ = 121$$

(a)(i) 11 [1]

(ii) 4^{-2}

$$\frac{1}{4^2} = \frac{1}{16}$$

(ii) $\frac{1}{16}$ [1]

(b) Work out.

$$(9 - \underbrace{3 \times 2})^2 \\ (9 - 6)^2 \\ 3^2$$

(b) 9 [2]

(c) Fill in the power.

$$5^{\boxed{3}} = 125$$

[1]

$$5 \times 5 = 25$$

$$25 \times 5 = 125$$

$$5 \times 5 \times 5 = 125$$

$$5^3 = 125$$

- 9 Lillian works 7 hours each day for 5 days a week. She earns £420 each week.

(a) How much does she earn per hour?

$$\begin{aligned} \text{Total hours} &= 7 \times 5 \\ &= 35 \end{aligned}$$

$$35 \overline{) 420}$$

(a) £ **12** [3]

- (b) Lillian decides that she is going to work 7 hours each day for **only 4 days** a week. Her earnings are to be reduced by 20%. Lillian thinks that this reduction is reasonable.

$$20\% = \frac{20}{100} = \frac{1}{5}$$

(i) Explain why a reduction of 20% is reasonable.

..... **20% is one day.**

..... [1]

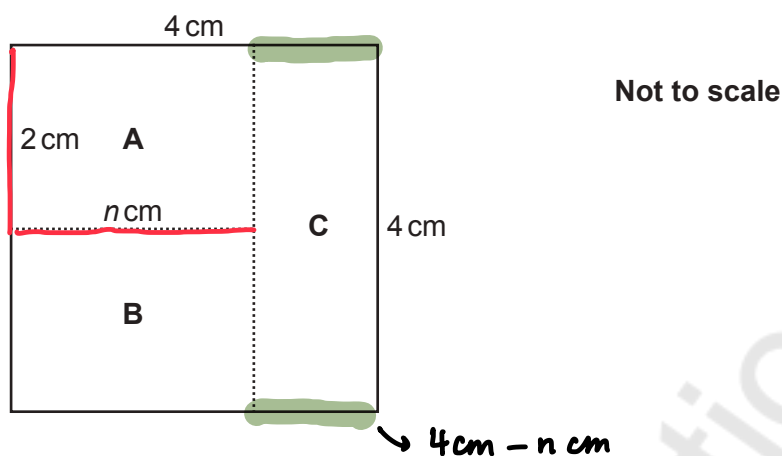
(ii) How much will Lillian earn working 4 days a week?

$$\begin{aligned} &20\% \text{ of } 420 = \cancel{84} \\ \times 2 \left(\begin{aligned} &10\% = 42 \end{aligned} \right. & \left. \begin{aligned} &\nearrow \times 2 \end{aligned} \right) \end{aligned}$$

$$\begin{array}{r} 3 \text{H} 2 \text{I} 0 \\ - 84 \\ \hline 336 \end{array}$$

(b)(ii) £ **336** [2]

- 10 A square is divided into three rectangles, A, B and C.



Rectangle A has length n cm and a width of 2 cm.

Rectangle C has length 4 cm.

- (a) (i) Write down an algebraic expression for the width of rectangle C.

(a)(i) $4 - n$ cm [1]

- (ii) Write down an algebraic expression for the **area** of rectangle A.

$$\begin{aligned} A &= l \times w \\ &= 2 \times n \\ &= 2n \end{aligned}$$

(ii) $2n$ cm² [1]

- (b) The three rectangles all have the **same** area.

Work out the value of n .

$$\begin{aligned} \text{Rectangle C area} &= l \times w \\ &= 4(4 - n) \\ &= 16 - 4n \end{aligned}$$

$$\begin{aligned} 2n &= 16 - 4n \\ + 4n & \quad + 4n \end{aligned}$$

$$\begin{aligned} 6n &= 16 \\ \div 6 & \quad \div 6 \\ n &= \frac{16}{6} \end{aligned}$$

(b) $n = \frac{16}{6}$ [3]

- 11 (a) These are the first five terms in a Fibonacci sequence.

1 3 4 7 11 **18** **29**

Write down the next two terms in the sequence.

$$7 + 11 = 18$$

$$11 + 18 = 29$$

(a) **18** , **29** [1]

- (b) In a different Fibonacci sequence the fourth term is 31 and the fifth term is 50.

Work out the first term in this sequence.

$$\begin{array}{cccccc} \underline{7} & \underline{12} & \underline{19} & \underline{31} & \underline{50} & \\ \nearrow & \uparrow & \nwarrow & & & \\ 19-12=7 & & 31-19=12 & & 50-31 & \end{array}$$

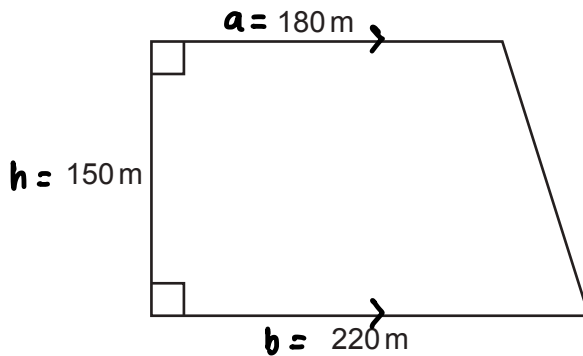
(b) **7** [2]

- (c) The second and third terms in the following Fibonacci sequence are x and y .

Write down algebraic expressions for the first, fourth and fifth terms.

$$\begin{array}{ccccccc} \dots \underline{y-x} \dots & & x & & y & & \dots \underline{x+y} \dots & & \dots \underline{x+2y} \dots & & [3] \\ & & \uparrow & & & & \uparrow & & & & \\ & & y-x & & & & y+x+y & & & & \end{array}$$

- 12 A farmer has a field that is in the shape of a trapezium. He measures the field so that he can work out the area. He puts his measurements on this diagram of the field.



- (a) The farmer has rounded his measurements to two significant figures.

Give a reason why he may have done this.

To make it easier to work out the area of the field. [1]

- (b) The field produces 6400 kilograms of wheat per hectare. One hectare is $10\,000\text{m}^2$.

Work out how many kilograms of wheat the field produces.

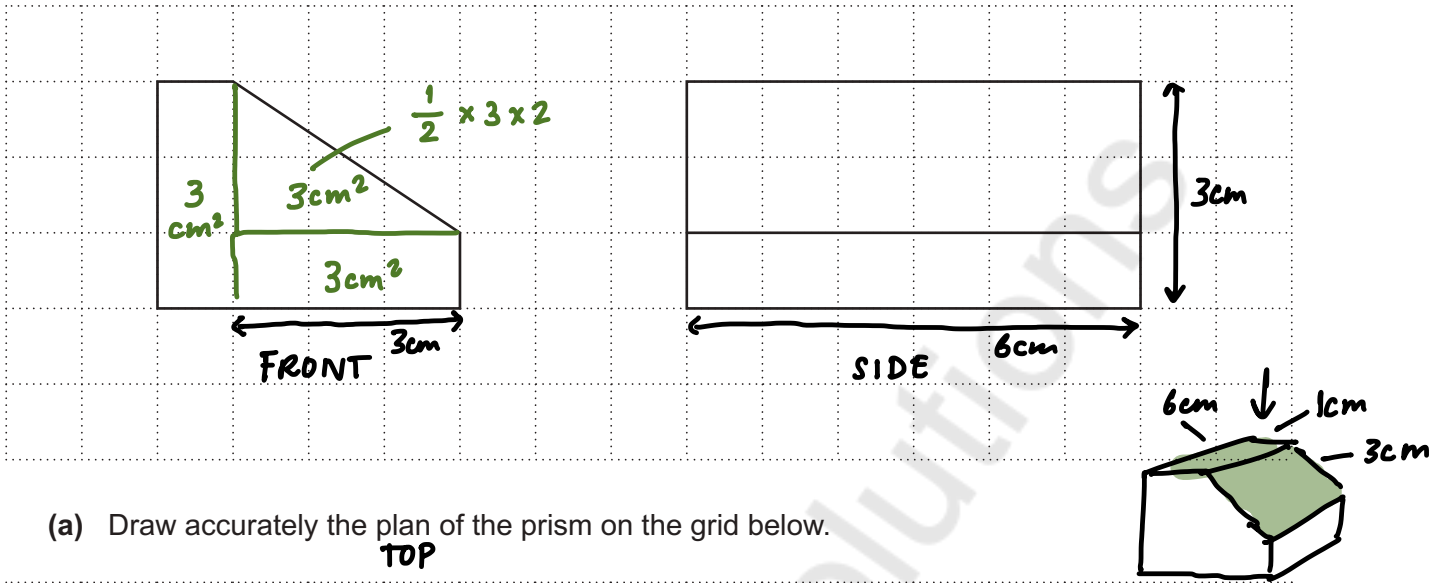
$$\begin{aligned}
 \text{Area of a trapezium} &= \frac{1}{2}(a+b) \times h \\
 &= \frac{1}{2}(180+220) \times 150 \\
 &= \frac{1}{2}(400) \times 150 \\
 &= 200 \times 150 \\
 &= 30,000 \text{ m}^2
 \end{aligned}$$

$$\begin{aligned}
 \text{Hectares} &= 30,000 \div 10,000 \\
 &= 3
 \end{aligned}$$

$$\begin{array}{r}
 \text{Wheat} = 6400 \\
 \times \quad 3 \\
 \hline
 19200
 \end{array}$$

(b) 19,200 kg [5]

13 The front and side elevations of a prism, with a pentagon as its cross section, are drawn on this one-centimetre square grid.

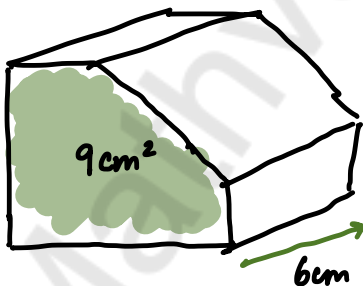


(a) Draw accurately the plan of the prism on the grid below.



[2]

(b) Calculate the volume of the prism.



$$\begin{aligned} \text{Volume} &= 9\text{cm}^2 \times 6\text{cm} \\ &= 54\text{cm}^3 \end{aligned}$$

(b) 54 cm³ [3]

14 Work out $\frac{12}{15} \times \frac{15}{22}$

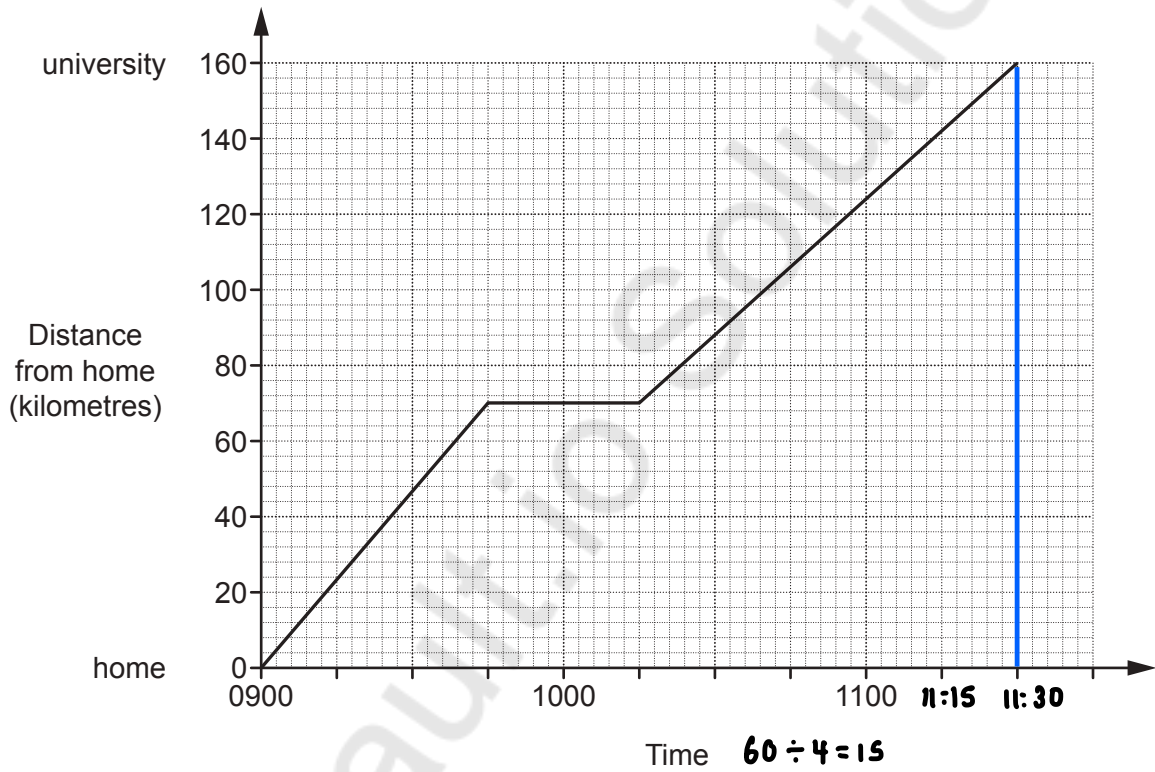
Give your answer in its lowest terms.

$$\frac{1}{1} \times \frac{1}{11} = \frac{1}{11}$$

$$\frac{1}{11}$$

..... [2]

15 The graph shows Mia's journey from her home to university.



Calculate Mia's average speed for the whole journey.

$$S = \frac{D}{T}$$

$$D = 160 \text{ km}$$

$$T = 2 \text{ h } 30 \text{ m}$$

$$= 2.5 \text{ h}$$

$$S = 160 \div 2.5$$

$$1600 \div 25$$

$$25 \overline{) 1600}$$

$$64$$

..... 64 km/h [3]

- 16 Last year, Katie earned £16 200.
Her total loan repayments were £6400.

Katie estimates that the ratio of her loan repayments to her earnings is approximately 3 : 8.

Is she correct?
Show your reasoning.

$$\begin{array}{r}
 6400 : 16200 \\
 \div 100 \qquad \qquad \qquad \div 100 \\
 64 : 162 \\
 \div 2 \qquad \qquad \qquad \div 2 \\
 32 : 81 \\
 \approx 30 : 80 \\
 \div 10 \qquad \qquad \qquad \div 10 \\
 3 : 8
 \end{array}$$

Yes.

[3]

17 (a) Rearrange the equation to make x the subject.

$$\begin{aligned}
 y &= 7x - 3 \\
 +3 & \quad +3 \\
 y + 3 &= 7x \\
 \div 7 & \quad \div 7 \\
 \frac{y+3}{7} &= x
 \end{aligned}$$

(a) $x = \frac{y+3}{7}$ [2]

(b) Factorise.

(i) $x^2 - xy$

HCF = x $x \times x = x^2$
 $x \times y = xy$

$x(x - y)$

(b)(i) $x(x - y)$ [1]

(ii) $x^2 + 8x + 12$

$\frac{+2}{\quad} \times \frac{+6}{\quad} = 12$

$\frac{+2}{\quad} + \frac{+6}{\quad} = 8$

$(x + 2)(x + 6)$

(ii) $(x + 2)(x + 6)$ [2]

18 Jenny played four games of golf.
 For these games her modal score was 76 and her mean score was 75.
 Her range of scores was 10.

What were her scores for the four games?

$$\begin{array}{r}
 76 + 76 + \text{high} + \text{low} \\
 \hline
 4 \\
 \times 4 \\
 \hline
 152 + \text{high} + \text{low} = 300 \\
 -152 \qquad \qquad -152 \\
 \hline
 \text{high} + \text{low} = 148
 \end{array}$$

$$\begin{array}{r}
 \text{high} - \text{low} = 10 \\
 + \qquad \qquad + \qquad + \\
 \text{high} + \text{low} = 148 \\
 \hline
 2\text{high} = 158 \\
 \div 2 \qquad \qquad \div 2 \\
 \text{high} = 79
 \end{array}$$

$$2 \sqrt{158} \begin{array}{r} 79 \\ \hline \end{array}$$

$\text{low} = 79 - 10 = 69$

..... 69 76 76 79 [4]

19 The population of a village is in the following ratios.

- men : children = 11 : 3
- women : children = 5 : 2

(a) Find the ratio men : women.
Give your answer in its simplest form.

$$\begin{array}{cc} m : c & w : c \\ 11 : 3 & 5 : 2 \\ \times 2 & \times 2 \quad \times 3 \quad \times 3 \end{array}$$

$$22 : 6 \quad 15 : 6$$

$$\begin{array}{cc} m : w : c & m : w \\ 22 : 15 : 6 & 22 : 15 \end{array}$$

(a) 22 : 15 [2]

(b) There are 36 children in the village.

Find the total population of the village.

$$\begin{array}{ccc} m : w : c \\ 22 : 15 : 6 \\ \times 6 & \times 6 & \times 6 \\ 132 : 90 : 36 \end{array}$$

$$\begin{array}{r} 132 \\ 90 \\ + 36 \\ \hline 258 \end{array}$$

(b) 258 [3]

- 20 George is the manager of a shoe shop. He samples 50 of his customers and asks them about the **one** style of shoe they would buy next. The table shows his results.

Style of shoe	Number of customers
Laced shoes	18
Boots	15
Sandals	8
Trainers	5
Other	4

George buys 1000 pairs of shoes with the number of each style based on his survey results.

How many pairs of sandals should he buy?

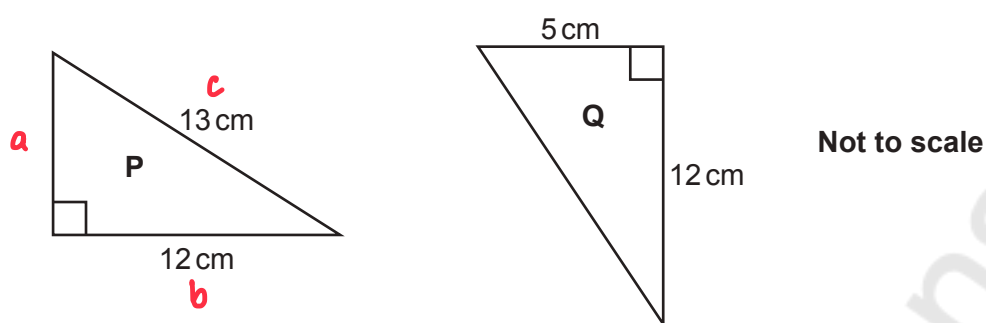
Write down any assumption you make about his sample.

$$\frac{8}{50} \times \frac{1000}{1} = \frac{8000}{50} = 160$$

$$5 \overline{) 8000} \begin{array}{r} 160 \\ \underline{5000} \\ 3000 \\ \underline{2500} \\ 500 \\ \underline{500} \\ 0 \end{array}$$

160 pairs assuming that the sample of 50 is representative of the whole population. [3]

21 Triangles **P** and **Q** are right-angled.



- (a) Show that the two shorter sides in triangle **P** have the same lengths as the two shorter sides in triangle **Q**. [3]

$$a^2 + b^2 = c^2$$

$$a^2 + 12^2 = 13^2$$

$$-12^2 \quad -12^2$$

$$a^2 = 13^2 - 12^2$$

$$a^2 = 169 - 144$$

$$a^2 = 25$$

$$\sqrt{\quad} \quad \sqrt{\quad}$$

$$a = 5$$

Two shortest sides in both triangles are 5cm and 12cm.

- (b) Explain why the two triangles are congruent.

.....The sides are the same length (SSS).....

..... [1]

END OF QUESTION PAPER

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