

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.

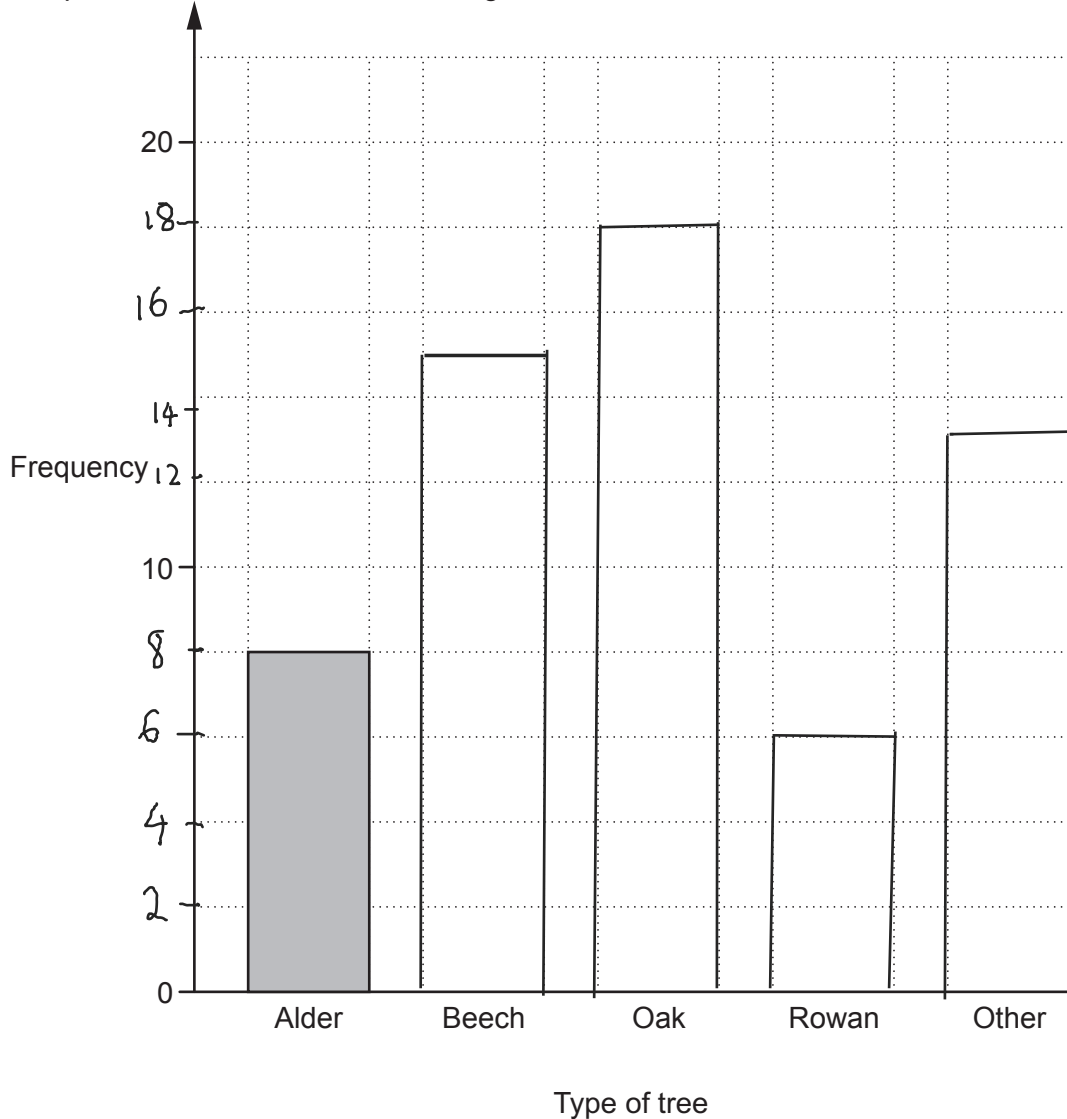
Complete the table.

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

5+1

[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?

$$\frac{18 \text{ oak}}{60 \text{ total}} \times 100$$

$$= \frac{3}{10} \times 100$$

(c) 30 % [2]

- 2 (a) Work out.

(i) $\frac{6\frac{1}{2} + \frac{3}{4}}$ $= \frac{13 \times 2}{2 \times 2} + \frac{3}{4}$

$$\frac{26 + 3}{4}$$

(a)(i) $\frac{29}{4}$ [1]

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

$$63 \div 7 = 9$$

$$9 \times 4 = 36$$

(ii) 36 [2]

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

$$\frac{4}{5} \times 4 = \frac{36}{45} \quad \frac{7}{9} \times 5 = \frac{35}{45}$$

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

$\frac{4}{5}$ is bigger

..... [2]

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

$$\frac{1}{5} = 0.2$$

$$\frac{1}{4} = 0.25$$

in between
0.21, 0.22, 0.23,
0.24

(c) $\frac{21}{100}$ or $\frac{11}{50}$, $\frac{23}{100}$, $\frac{6}{25}$ [2]

$$\frac{1}{22}, \frac{24}{100}$$

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

This is Nathan's working.

$10 \times 12.4 = 12.40$ ✗ $20 \times 12.4 = 24.80$ $3 \times 12.4 = 37.2$ $23 \times 12.4 = 24.80 + 37.2 = 62$
--

Nathan's working is incorrect.

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

10×12.4 is not 12.40 it is 124

$$20 \times 12.4 = 248$$

$$3 \times 12.4 = 37.2$$

$$23 \times 12.4 = 248 +$$

$$37.2$$

$$285.2$$

$$285.2$$

[3]

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

Cinema tickets Buy 3 tickets and get a ticket free

They each pay £6.45.

How much does a ticket cost?

4 friends: £6.45 each

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

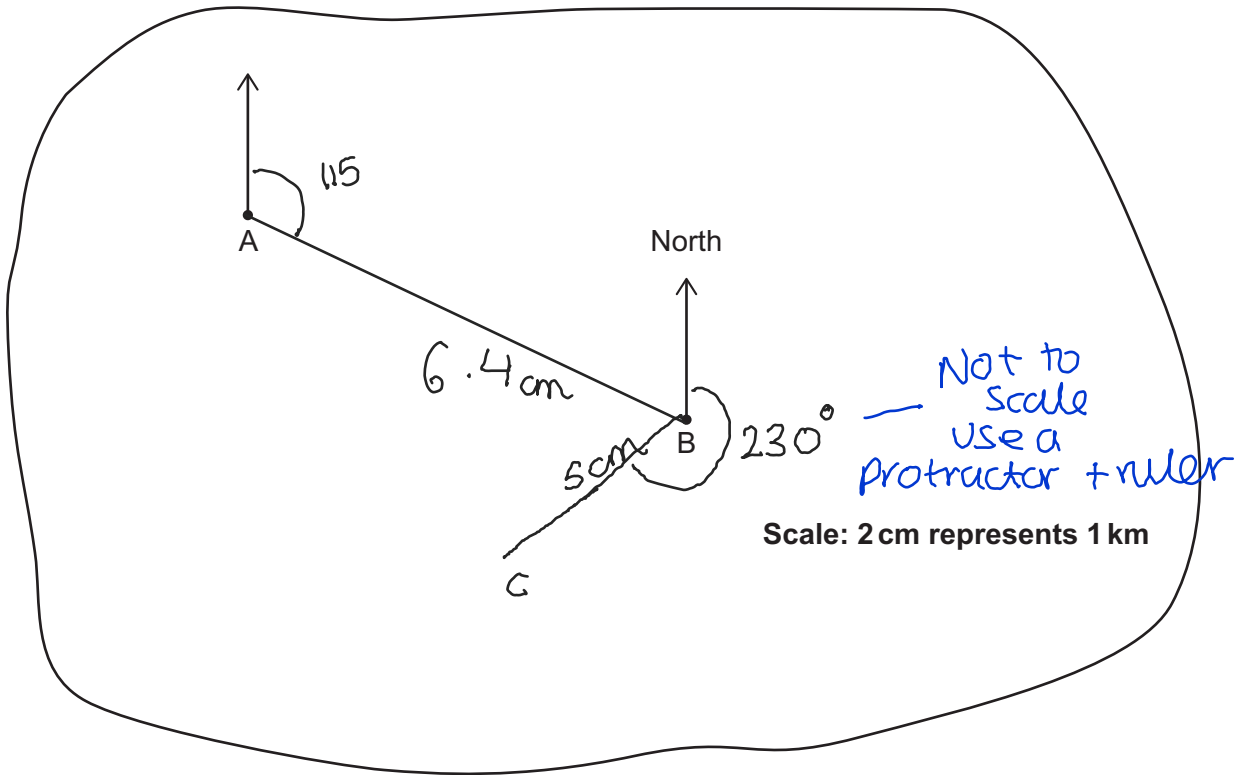
for 3 tickets and
1 free

1 tickets costs $25.80 \div 3$

$$3 \overline{) 25.80} \begin{array}{r} 8.60 \\ \underline{3} \\ 2 \\ \underline{6} \\ 2 \\ \underline{6} \\ 0 \end{array}$$

(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. x32
2cm : 1km
6.4cm : 3.2 [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. [2]

5 (a) Multiply out.

$$\begin{aligned} & \overbrace{3x(x+2y)} \\ &= 3x^2 + 6xy \end{aligned}$$

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

(b) Solve.

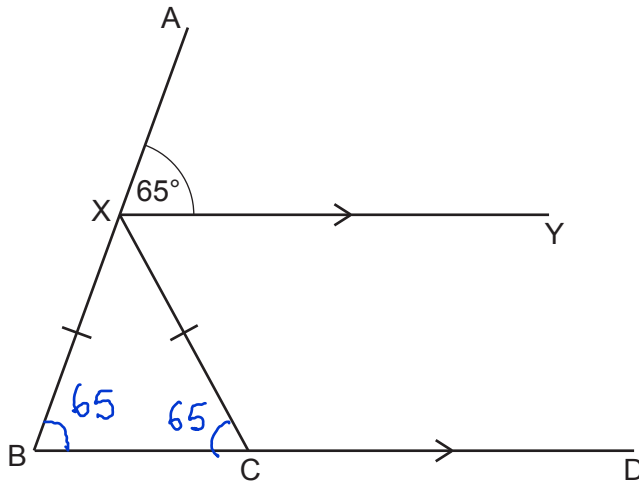
(i) $7x = 28$
 $\div 7$
 $x = 4$

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

(ii) $\frac{x}{3} - 2 = 9$
 $+2$
 $\frac{x}{3} = 11$
 $\times 3$
 $x = 33$

(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 angles are equal [1]
(F)

- (b) Work out angle BXC.

Give a reason for each angle you work out.

$$\angle XCB \text{ is } 65^\circ$$

$$\begin{aligned} \angle BXC &= 180 - 65 - 65 \\ &= 180 - 130 \\ &= 50 \end{aligned}$$

base angles in isosceles triangle are equal

Angles in a triangle add to 180°

(b) 50 ° [4]

8 (a) Evaluate.

(i) $\sqrt{121}$ $11 \times 11 = 121$

(a)(i) 11 [1]

(ii) 4^{-2}
negative power = reciprocal $\frac{1}{4^2} = \frac{1}{16}$ (ii) $\frac{1}{16}$ [1]

(b) Work out.

$$(9 - 3 \times 2)^2$$

BIDMAS so multiply first

$$= (9 - 6)^2$$
$$= 3^2 = 3 \times 3$$

(b) 9 [2]

(c) Fill in the power.

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

[1]

$$\underline{5} \times \underline{5} = 25$$
$$25 \times \underline{5} = 125$$
$$\begin{array}{l} 1 \\ 3 \end{array} 5s$$

- 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?

$$7 \times 5 = 35 \text{ hours a week}$$

$$35 \text{ hours} = \cancel{£}420$$

$$1 \text{ hour} = \underset{\downarrow \div 35}{12}$$

$$35 \overline{) 420} \begin{array}{r} 12 \\ \underline{35} \\ 70 \\ \underline{70} \\ 0 \end{array}$$

(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.

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

..... Because it reduces 1 day from 5 to 4.
 $\frac{1}{5} = 0.2 = 20\%$, which is the same [1]
 as the reduction

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

① $7 \times 4 = 28 \text{ hours a week}$
 $28 \times £12 = 280 + 56 = £336$

or

② 20% of 420

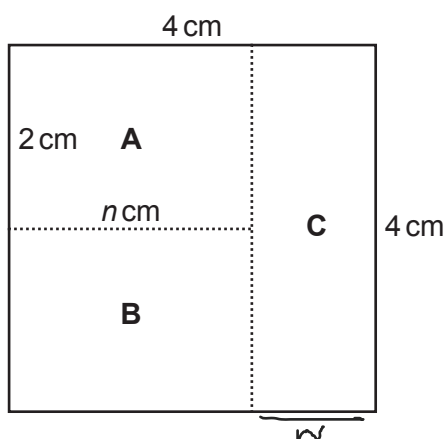
$$10\% = 42$$

$$20\% = 84$$

$$\begin{array}{r} 3 \cancel{4}20 \\ - 84 \\ \hline 336 \end{array}$$

(b)(ii) £ 336 [2]

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



Not to scale

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**.

(ii) $2n$ cm² [1]

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

Work out the value of n .

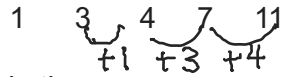
$$\text{Area of B} = 2n$$

$$\begin{aligned} \text{Area of C} &: 4 \times (4 - n) \\ &= 16 - 4n \end{aligned}$$

$$\begin{aligned} 16 - 4n &= 2n \\ &+ 4n \\ 16 &= 6n \\ \frac{16}{6} &= n \end{aligned}$$

(b) $n = \frac{8}{3}$ [3]

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



Write down the next two terms in the sequence.

$$11 + 7 = 18$$

$$18 + 11 = 29$$

(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. 5th 4th

$$3^{\text{rd}} \text{ Terms : } 50 - 31 = 19$$

$$2^{\text{nd}} \quad \quad \quad : 31 - 19 = 12$$

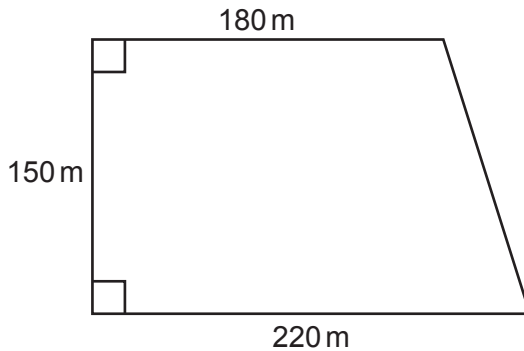
$$1^{\text{st}} \quad \quad \quad = 19 - 12 = 7 \quad \quad \quad 7 \quad \quad \quad \text{(b) [2]}$$

(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.

..... $y - x$ x y $x + y$ $x + y + y$
 $x + 2y$ [3]

- 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.



Not to scale

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

Give a reason why he may have done this.

There are no complicated decimals to be calculated
so it's easier to find area and perimeter [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.

Area of Trapezium: $\frac{1}{2} \times (a+b) \times h$
 $= \frac{1}{2} (180+220) \times 150 = \frac{1}{2} (400) \times 150$
 $= 200 \times 150 = 30,000\text{m}^2$
 Convert to hectares

$\begin{matrix} \times 3 & & \times 3 \\ \swarrow & & \searrow \\ 1 & : & 10,000 \\ 3 & : & 30,000 \end{matrix}$

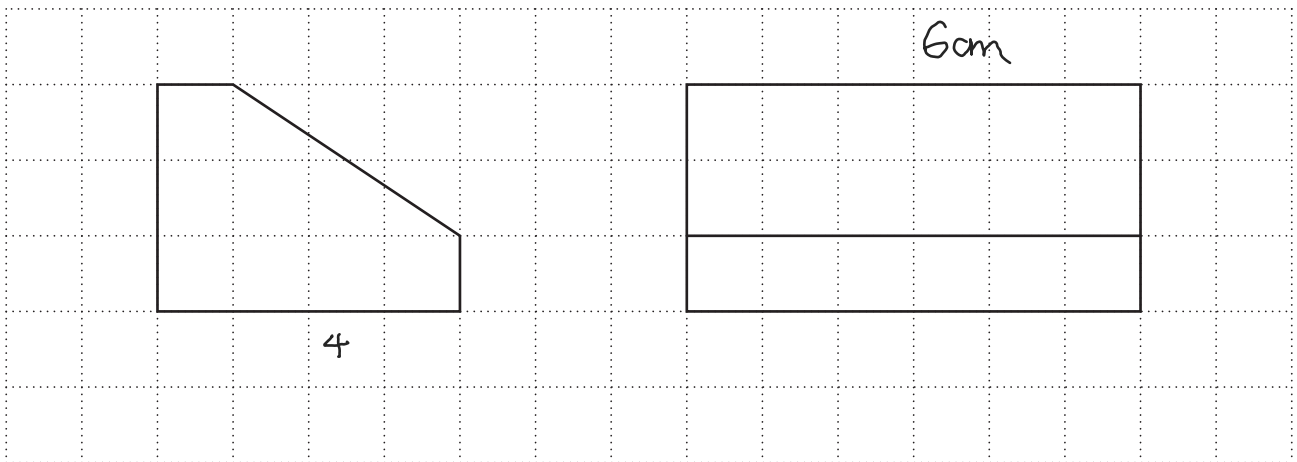
Kilograms of wheat

3×6400

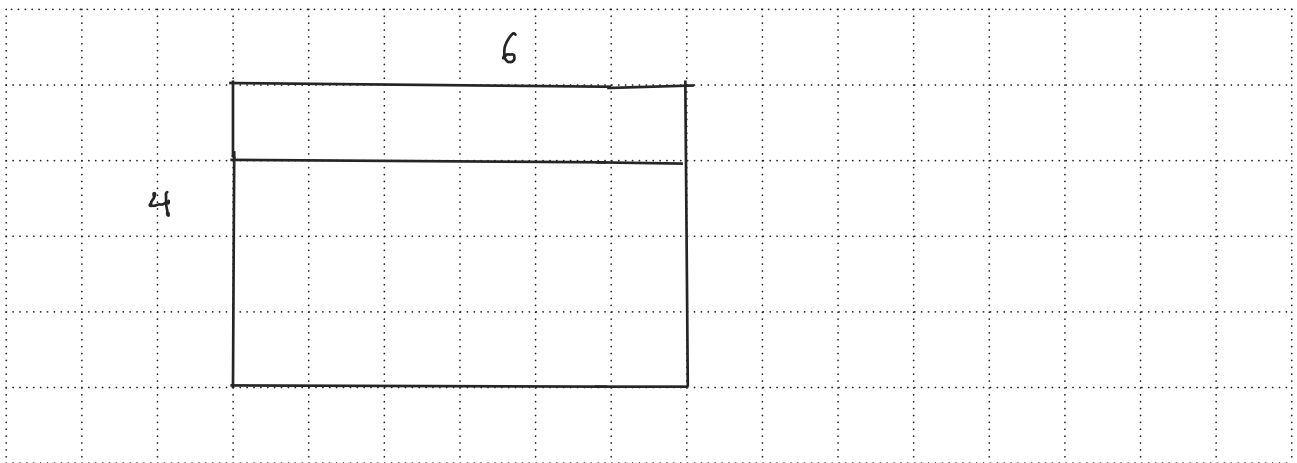
$= 19200\text{ kg}$

(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.

Area of cross section : 9 whole squares = 9cm^2

Length : 6 squares = 6cm

Volume : $6 \times 9 =$

(b) 54 cm^3 [3]

14 Work out $\frac{2}{15} \times \frac{15}{22}$.

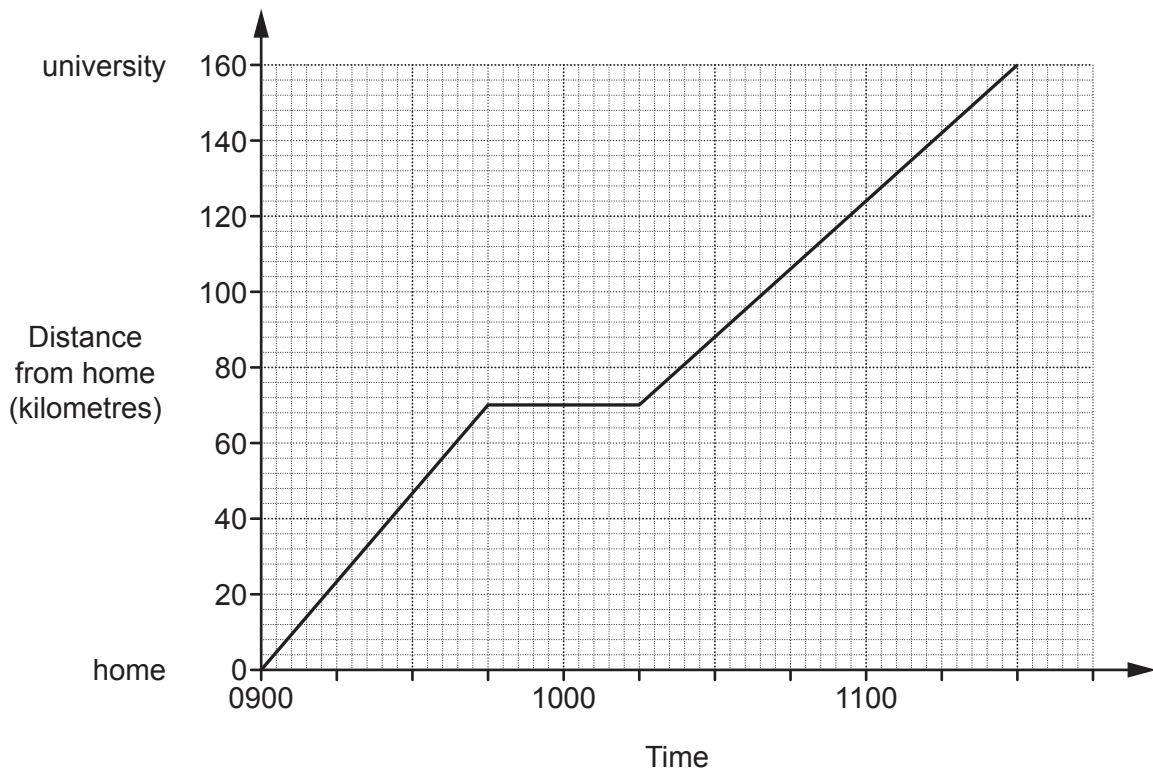
Give your answer in its lowest terms.

$$\frac{2}{15} \times \frac{15}{22} = \frac{2}{22} =$$

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

..... [2]

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



Calculate Mia's average speed for the whole journey.

$$\text{Average speed} = \frac{\text{complete distance}}{\text{total time}}$$

$$\text{Time} : 9:00 \rightarrow 11:30 = 2.5 \text{ hours}$$

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

$$\text{speed} = \frac{160}{2.5} = \frac{640}{10}$$

$$64$$

..... km/h [3]

- 16 Last year, Katie earned £16200.
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.

$$\begin{array}{r}
 \text{Loan Repayments : earnings} \\
 \hline
 6400 \quad : \quad 16200 \\
 \div 100 \\
 64 \quad : \quad 162 \\
 \div 2 \\
 32 \quad : \quad 81
 \end{array}$$

$$32 \approx 30$$

$$81 \approx 80$$

$$\begin{array}{r}
 30 : 80 \\
 \div 10 \\
 3 : 8
 \end{array}$$

Yes, her approximation is correct

[3]

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

$$y = 7x - 3$$

$$y + 3 = 7x$$

$$\frac{y + 3}{7} = x$$

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

(b) Factorise.

(i) $x^2 - xy$ - x is factor in both

$$x(x - y)$$

$x^2 \div x = x$ $-xy \div x = -y$

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

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

2 number Add to 8
Multiply to 12
6, 2

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

x 76 76 y

What were her scores for the four games?

Mode most common is 76

Range = 10

Mean $\frac{\text{Total}}{\text{Freq}} = \frac{\text{Total}}{4} = 75$

2 scores are 76

$y - x = 10$ ①

Total = 300

$x + 76 + 76 + y = 300$
 $x + y = 148$ ②

69 76 76 79

[4]

$$\begin{array}{r} x + y = 148 \\ -x + y = 10 \\ \hline 2y = 158 \\ y = 79 \end{array}$$

$79 - 10 = 69$

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

- men : children = $11 : 3 \times 2$
- women : children = $5 : 2 \times 3$

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

$$\begin{array}{l} \text{men : children} \\ \underline{22 : 6} \end{array}$$

$$\begin{array}{l} \text{women : children} \\ \underline{15 : 6} \end{array}$$

(a) 22 : 15 [2]

(b) There are 36 children in the village.

Find the total population of the village.

Ratio: men : children : women

$$22 : 6 : 15$$

$$132 : \begin{array}{c} \downarrow \times 6 \\ 36 \end{array} : 90$$

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

(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	<u>8</u>
Trainers	5
Other	4

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

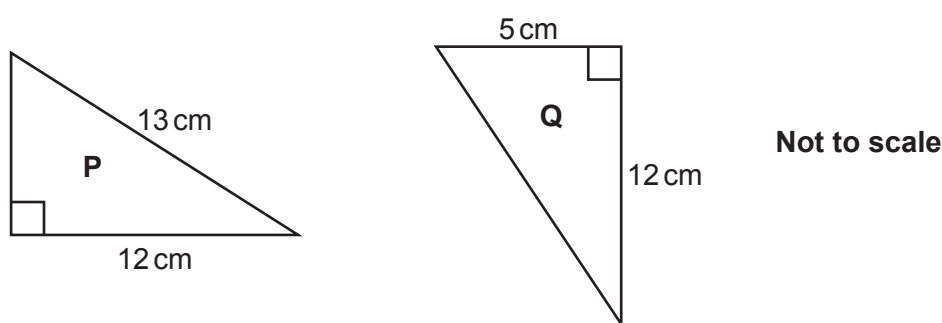
How many pairs of sandals should he buy?

Write down any assumption you make about his sample.

$$\frac{8}{50} \xrightarrow{\times 20} 160 \xrightarrow{\times 20} \frac{160}{1000} = 160 \text{ pairs}$$

Assumption: The 50 ppl are 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]

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

Triangle P : $a^2 = 13^2 - 12^2$

$$a^2 = 169 - 144$$

$$= 25$$

$$a = 5$$

On both triangles, the shorter sides are both 5cm and 12cm

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

By SSS, all lengths are the same therefore the triangles are congruent. [1]

END OF QUESTION PAPER

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