

Thursday 3 November 2022 – Morning

GCSE (9–1) Mathematics

J560/02 Paper 2 (Foundation Tier)

Time allowed: 1 hour 30 minutes



You must have:

- the Formulae Sheet for Foundation Tier (inside this document)

You can use:

- geometrical instruments
- tracing paper

Do not use:

- a calculator



Please write clearly in black ink. **Do not write in the barcodes.**

Centre number

--	--	--	--	--

Candidate number

--	--	--	--

First name(s)

Last name

INSTRUCTIONS

- Use black ink. You can use an HB pencil, but only for graphs and diagrams.
- Write your answer to each question in the space provided. If you need extra space use the lined pages at the end of this booklet. The question numbers must be clearly shown.
- Answer **all** the questions.
- Where appropriate, your answer should be supported with working. Marks might be given for using a correct method, even if your answer is wrong.

INFORMATION

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

ADVICE

- Read each question carefully before you start your answer.



Please note that these worked solutions have neither been provided nor approved by OCR and may not necessarily constitute the only possible solutions. Please refer to the original mark schemes for full guidance.

Any writing in blue indicates what must be written in order to answer the questions and get the marks. The worked solutions have been designed to show the smallest amount of work which needs to be done to answer the question.






Anything written in green in a cloud doesn't have to be written in the exam.

Anything written in orange in a rectangle doesn't have to be written in the exam and is there to show what should be put into a calculator or measured using a ruler or protractor.

If you find any mistakes or have any requests or suggestions, please send an email to curtis@cgmaths.co.uk

Answer **all** the questions.

- 1 The pictogram shows the number of students absent from a school in a particular week.

Monday	
Tuesday	
Wednesday	
Thursday	
Friday	

Key:  represents 4 students

- (a) Harper says

The pictogram shows 2 circles for Monday.
Therefore 2 students were absent on Monday.

Explain what Harper has done wrong.
Write down the correct number of students who were absent on Monday.

Harper has not multiplied the number of circles by 4 As each circle represents 4 students

.....
Correct number 8 [2]

- (b) 5 students were absent on Friday.

Complete the pictogram above to show this information.

[1]

A whole circle represents 4 students then another quarter of a circle is needed to represent 1 more student

- 2 (a) Complete each statement by writing the missing power in the box.

(i) $6 \times 6 \times 6 = 6^{\boxed{3}}$ ← There are 3 6s multiplied together so it is 6 to the power of 3

(ii) $16 = 2^{\boxed{4}}$ ← $2 \times 2 \times 2 \times 2 = 16$ [1]

- (b) Work out.

$$5^2 \times \sqrt{36}$$

$$\begin{array}{r} 25 \\ \times 6 \\ \hline 150 \end{array}$$

← $5^2 = 5 \times 5 = 25$. $\sqrt{36} = \pm 6$, as both 6 and -6 when squared give 36. Multiplying the 25 and 6 works out the value. It will be negative when multiplied by -6

(b) ± 150 [3]

- 3 Work out.

- (a) $0.35 + 6.2$

$$\begin{array}{r} 0.35 \\ +6.2 \\ \hline 6.55 \end{array}$$

← Column addition can be used

(a) 6.55 [1]

- (b) $4.8 \div 8$

$$8 \overline{)4.8}$$

← Short division can be used

(b) 0.6 [1]

- 4 (a) Write $\frac{19}{4}$ as a mixed number.

Dividing the 19 by the 4 finds that 4 goes into 19 4 times (so this is the whole number) with a remainder of 3 (which is left in the fraction)

(a) $4\frac{3}{4}$ [1]

- (b) Write $1\frac{7}{9}$ as an improper fraction.

Multiplying the 1 by the 9 then adding the result to the numerator

(b) $\frac{16}{9}$ [1]

- (c) Sam says that $\frac{7}{8}$ written as a decimal is 0.78.

Is Sam correct?

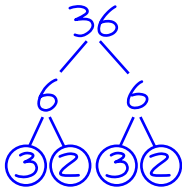
Show how you decide.

$$8 \overline{) 0.78}$$

Dividing the numerator by the denominator using short division converts the fraction to a decimal. There is no need to complete the division as it is clear that the 0.78 is incorrect as soon as it begins 0.8...

..... No because as a decimal it starts 0.8.....
 [2]

- 5 Write 36 as a product of prime factors.



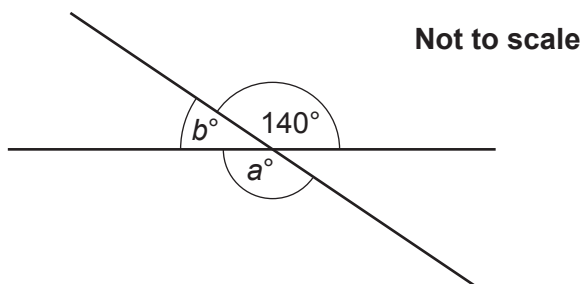
Doing a factor tree for 36. Circling the primes and not going any further than these

As a product of prime factors it is $3 \times 2 \times 3 \times 2$, which is $2^2 \times 3^2$

$2^2 \times 3^2$

..... [2]

- 6 The diagram shows two intersecting straight lines.



- (a) Find the value of a .
Give a reason for your answer.

$a = 140$ because vertically opposite angles are equal
 a is vertically opposite to the 140° angle [2]

- (b) Find the value of b .
Give a reason for your answer.

$b = 40$ because angles around a point on a straight line add up to 180°
 b and the 140° angle are angles around a point on a straight line and $180 - 140 = 40$ [2]

- 7 Find the value of $4x + 5y$ when $x = 3$ and $y = -2$.

$4 \times 3 + 5 \times -2$ ← Substituting in the values of x and y into the expression
 $12 - 10$ ← $4 \times 3 = 12$ and $5 \times -2 = -10$

..... 2 [2]

- 8 (a) Write 65% as a fraction in its simplest form.

$$\begin{array}{r} 13 \\ 5 \overline{)65} \\ \underline{020} \\ 5 \overline{)100} \end{array}$$

Percentage is out of 100 so it can be expressed as 65/100. Both the numerator and denominator can be divided by 5 to simplify the fraction. They cannot be divided by the same amount any more so 13/20 is the simplest form

(a) $\frac{13}{20}$ [2]

- (b) 25 people entered a competition.
4 of them won a prize.

Work out the percentage of people that won a prize.

$$\begin{array}{r} 004 \\ 25 \overline{)100} \\ \underline{4 \times 4} \end{array}$$

The fraction who won a prize is 4/25. Multiplying this by 100 converts it into a percentage. To multiply by a fraction, divide by the denominator then multiply the result by the numerator

(b) 16 % [2]

- (c) Increase 250 by 20%.

$$\begin{array}{r} 25 \\ \times 2 \\ \hline 50 \\ + 250 \\ \hline 300 \end{array}$$

10% as a fraction is 1/10. So dividing 250 by 10 works out that 25 is 10% of 250. Multiplying this by 2 works out that 20% of 250 is 50. Adding this to the original 250 increases the 250 by 20%

(c) 300 [3]

- 9 (a) By writing each number correct to 1 significant figure, find an estimate for 79.8×3.1 .

$$80 \times 3$$

The 7 is the first significant figure in 79.8. The 9 after causes it to round up to an 8 then everything after it is set to 0 and 0s in the decimal places are ignored. The 3 is the first significant figure in 3.1. The 1 after it causes it to round down and stay as a 3 then everything after it is set to 0 and the 0s in the decimal places are ignored

$$8 \times 3 = 24 \text{ so } 80 \times 3 = 240$$

(a) 240 [2]

- (b) Jamie works out 79.8×3.1 on a calculator.
Jamie's answer is 2473.8.

Do you think Jamie has used their calculator correctly?
Explain why.

..... No because it is not close to 240

..... [1]

- 10 Ashley has £7 to spend on fruit.
The table shows the prices.

Pineapple (each)	£1.15
Bananas (for 1 kilogram)	70p
Strawberries (for a 200g pack)	£1.30

Ashley buys 2 pineapples and 3 kilograms of bananas.
Ashley spends the remaining money on strawberries.

Work out the **mass, in grams**, of strawberries that Ashley buys.
You must show your working.

$$\begin{array}{r} 1.15 \\ \times 2 \\ \hline 2.30 \end{array}$$

Working out that the cost of 2 pineapples is £2.30

$$\begin{array}{r} 0.70 \\ \times 3 \\ \hline 2.10 \end{array}$$

Working out that the cost of 3 kilograms of bananas is £2.10. Converted the 70p into pounds first by using the fact there is 100p in £1

$$\begin{array}{r} +2.30 \\ \hline 4.40 \end{array}$$

Adding the £2.30 to work out that £4.40 was spent in total on the pineapples and bananas

$$\begin{array}{r} 7.00 \\ -4.40 \\ \hline 2.60 \end{array}$$

Subtracting the £4.40 from the £7 spent in total works out that £2.60 was spent on strawberries

$$130 \overline{) 260} \begin{array}{l} 002 \\ 260 \end{array}$$

Dividing the £2.60 spent on strawberries by the £1.30 cost of each pack works out that 2 packs of strawberries were bought. Working in pence to make the division easier

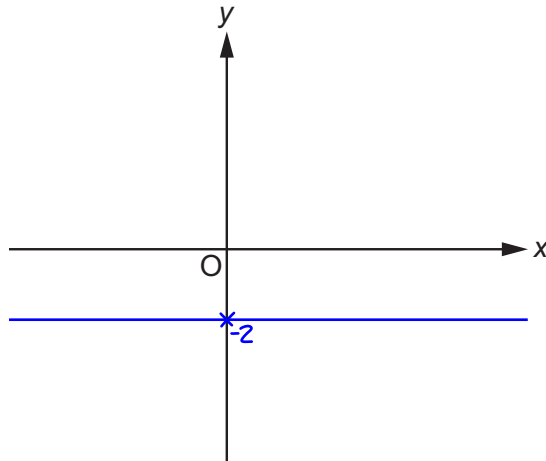
$$\begin{array}{r} 200 \\ \times 2 \\ \hline 400 \end{array}$$

Multiplying the 200 g in each pack by 2 works out that the mass in 2 packs is 400 g

.....400..... g [6]

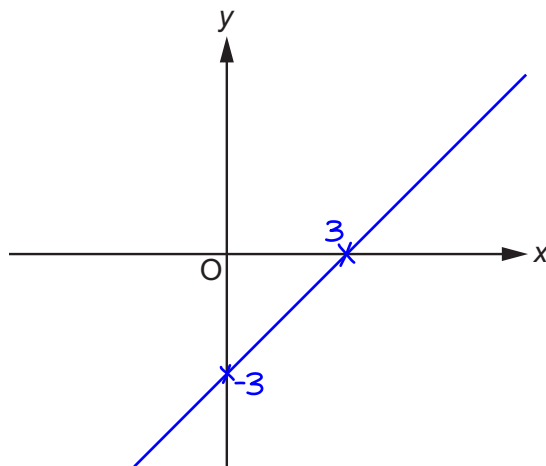
- 11 (a) Sketch the graph of $y = -2$.
Show clearly the value of any intercepts.

The y-coordinate always need to be -2



[2]

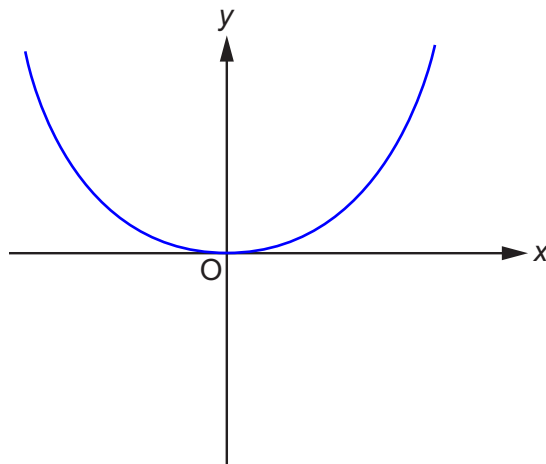
- (b) Sketch the graph of $y = x - 3$.
Show clearly the value of any intercepts.



When $x = 0$, $y = -3$, so the y-intercept must be -3. When $y = 0$, $0 = x - 3$ then adding 3 to both sides finds that $x = 3$, so the x-intercept must be 3. Drawing a straight line through both of these points

[3]

- (c) Sketch the graph of $y = x^2$.



This is a common graph so could be one which is memorised. Alternatively, doing a quick table of values then roughly plotting the points will give a sketch. Remember that squaring a negative gives a positive

[1]

12 Multiply out.

(a) $3(x+1)$

Multiplying the x by 3 and the 1 by 3

(a) $3x+3$ [1]

(b) $3d(d-2)$

Multiplying the d by 3d and the -2 by 3d

(b) $3d^2-6d$ [2]

13 Work out.

(a) $\frac{3}{7} \times 2$

There were 3 sevenths. Multiplying by 2 means there will be twice as many sevenths so there are now 6 sevenths

(a) $\frac{6}{7}$ [1]

(b) $\frac{2}{3} - \frac{1}{4}$

$\frac{8}{12} - \frac{3}{12}$

To subtract fractions the denominators need to be the same. Multiplying the numerator and denominator of $\frac{2}{3}$ by 4 and multiplying the numerator and denominator of $\frac{1}{4}$ by 3 makes both the denominators 12. The numerators can then be subtracted and the denominator stays the same

(b) $\frac{5}{12}$ [2]

14 Solve.

$$6x - 9 = 27 - 4x$$

$$10x - 9 = 27$$

Adding $4x$ to both sides collects the x on the side with the most x

$$10x = 36$$

Adding 9 to both sides eliminates the -9 on the left and gets the x term on its own

Dividing both sides by 10 eliminates the 10 on the left and gets x on its own

$$x = \dots\dots\dots 3.6 \dots\dots\dots [3]$$

15 Kai invests £600 at a simple interest rate of $r\%$ each year. After 5 years, Kai's investment is worth £690.

Find the value of r .

$$\begin{array}{r} 690 \\ -600 \\ \hline 90 \end{array}$$

Subtracting the original £600 from the £690 after the interest works out that there was a total of £90 interest over the 5 years

$$5 \overline{) 90} \begin{array}{r} 18 \\ \underline{50} \\ 40 \\ \underline{40} \\ 0 \end{array}$$

It is simple interest so the interest is the same every year. Dividing the £90 interest by the 5 years works out that the interest received each year was £18

$$600 \overline{) 18.000} \begin{array}{r} 00.03 \\ \underline{600} \\ 1800 \\ \underline{1800} \\ 000 \end{array}$$

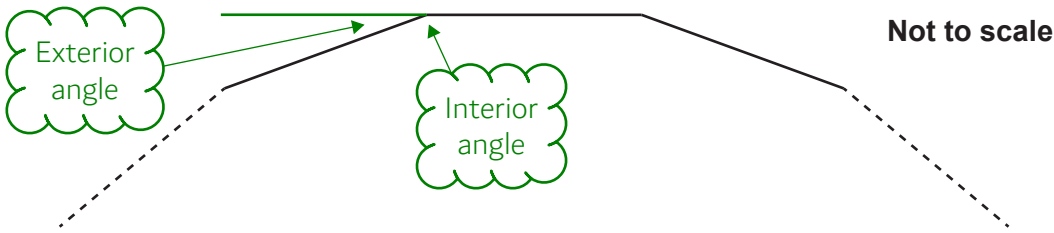
The interest as a fraction is $18/600$. Dividing the 18 by the 600 converts it into a decimal

$$0.03 \times 100$$

Multiplying the decimal by 100 converts it into a percentage

$$r = \dots\dots\dots 3 \dots\dots\dots [4]$$

16 The diagram shows part of a regular 12-sided polygon.



For this polygon, find the ratio of the size of one exterior angle to the size of one interior angle.
Give your answer in its simplest form.
You must show your working.

$$\begin{array}{r} 030 \\ 12 \overline{)360} \end{array}$$

All of the exterior angles on any polygon add up to 360° . So dividing 360° by the 12 exterior angles works out that each one is 30°

$$\begin{array}{r} 180 \\ - 30 \\ \hline 150 \end{array}$$

Each exterior angle lies around a point on a straight line with an interior angle so they must add up to 180° . Subtracting the exterior angle from 180° works out that each interior angle is 150°

$$30:150$$

Writing the ratio of the size of one exterior angle to the size of one interior angle

$$3:15$$

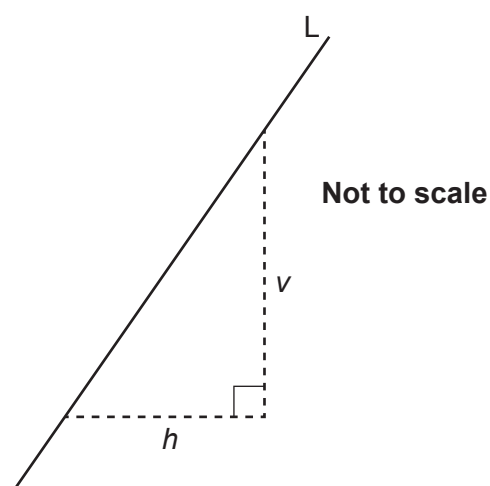
Simplifying the ratio by dividing both sides by 10

Simplifying the ratio by dividing both sides by 3. It cannot go any simpler as 1 and 5 cannot be divided by the same amount to get smaller whole numbers

..... 1 : 5 [5]

Turn over

17 A straight line, L, is shown below.



(a) Write down the ratio $v : h$ when the gradient of line L is 4.

Gradient = (change in y)/(change in x). v is the change in y and could be 4. h is the change in x and could be 1

(a) 4 : 1 [1]

(b) Find the gradient of line L as a fraction in its simplest form when $v : h = 14 : 6$.

$\frac{14}{6}$

Gradient = (change in y)/(change in x). v is the change in y and could be 14. h is the change in x and could be 6

Simplifying by dividing both the numerator and denominator by 2. It cannot go any simpler as 7 and 3 cannot be divided by the same amount to get smaller whole numbers

(b) $\frac{7}{3}$ [2]

18 Find all the possible integer values that satisfy the inequality $4 \leq 2x < 10$.

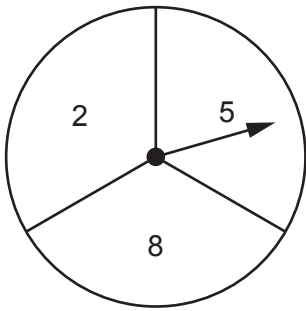
$2 \leq x < 5$

Getting x on its own in the middle by dividing all sides by 2

x must be greater than or equal to 2 and less than 5. Integers means that it cannot be a decimal or fraction

..... 2, 3, 4 [3]

- 19 Azmi has a fair spinner numbered 2, 5 and 8.



Azmi spins the spinner twice and adds the two scores to get a total.

- (a) Complete the table to show all of the possible totals.

		First spin		
		2	5	8
Second spin	2	4	7	10
	5	7	10	13
	8	10	13	16

Handwritten notes in green clouds:

- $2 + 8 = 10$ (pointing to the cell containing 10 in the row for second spin 2 and first spin 8)
- $5 + 8 = 13$ (pointing to the cell containing 13 in the row for second spin 5 and first spin 8)
- $8 + 2 = 10$ (pointing to the cell containing 10 in the row for second spin 8 and first spin 2)

[1]

- (b) Find the probability that the total is a square number.

The possible totals which are square numbers are 4 (as $2^2 = 2 \times 2 = 4$) and 16 (as $4^2 = 4 \times 4 = 16$). This is 2 out of the 9 possible totals

(b) $\frac{2}{9}$ [2]

- 20 Layla and Jamal open a box of sweets.
Layla and Jamal share all of the sweets in the ratio 2 : 3.

(a) Write down the fraction of the sweets that Layla receives.

2 + 3 = 5 and this is the total amount of parts. Layla gets 2 out of the 5 parts

$\frac{2}{5}$

(a) [1]

- (b) Layla eats some of **her** sweets.
She is then left with 18% of the sweets that were in the box.

Work out the percentage of **her** sweets that Layla has eaten.

$$\begin{array}{r} 020 \\ 5 \overline{)100} \\ \underline{10} \\ 00 \\ \underline{00} \\ 00 \end{array}$$

Percentage is out of 100 so dividing 100 by 5 works out that 1/5 is 20%

$$\begin{array}{r} 20 \\ \times 2 \\ \hline 40 \end{array}$$

Multiplying 20% by 2 works out that 2/5 is 40%

$$\begin{array}{r} 40 \\ - 18 \\ \hline 22 \end{array}$$

Layla had 40% and now has 18% of the sweets that were in the box. Subtracting the 18% from the 40% works out that she had eaten 22% of the sweets in the box

$$\frac{22}{40}$$

Expressing the 22% which she had eaten as a fraction of the 40% she started with

$$\frac{11}{20}$$

Simplifying the fraction by dividing both the numerator and denominator by 2

$$\frac{55}{100}$$

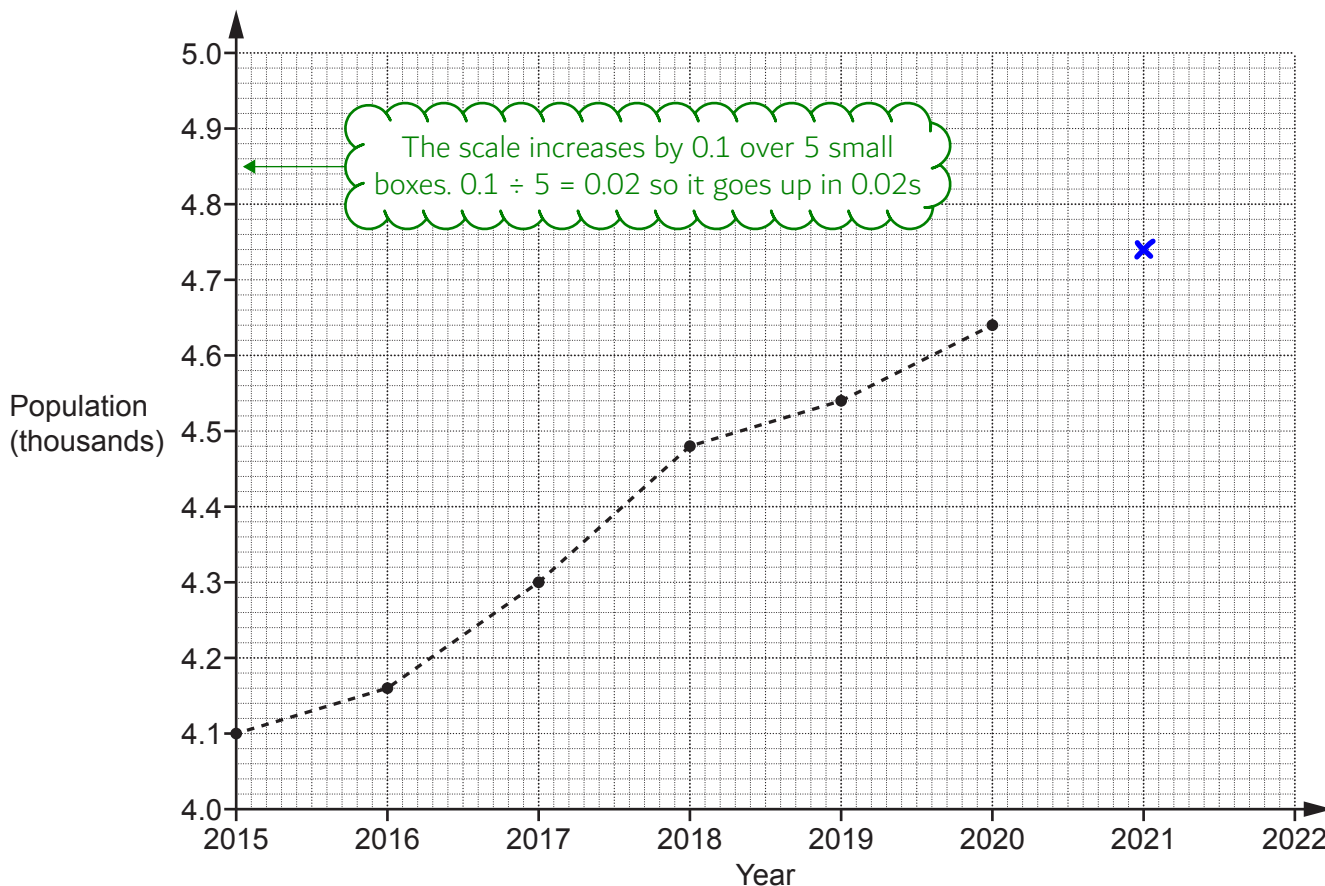
Making the denominator of the fraction 100 by multiplying both the numerator and denominator by 5

Percentage is out of 100 so 55/100 must be 55%

55

(b) % [4]

21 The graph shows information about the population of a village.



(a) The population of the village in 2021 was 4740. Plot this point on the graph.

4.74 thousand

[1]

(b) Work out the increase in the population of the village between 2016 and 2018.

$$\begin{array}{r} 4.48 \\ -4.16 \\ \hline 0.32 \end{array}$$

The population in 2016 was 4.16 thousand. The population in 2018 was 4.48 thousand. Subtracting these works out the increase

$$0.32 \times 1000 = 320$$

(b) 320 [2]

(c) Rowan says that there was a huge increase in the population of the village between 2015 and 2020.

Describe how Rowan may have been misled by the graph.

The vertical scale does not start at 0

So it looks like a huge increase but it has only increased from 4100 to 4640

[1]

(d) Blake says that the population of the village will be greater than 4800 in 2022.

Write down an assumption Blake has made.

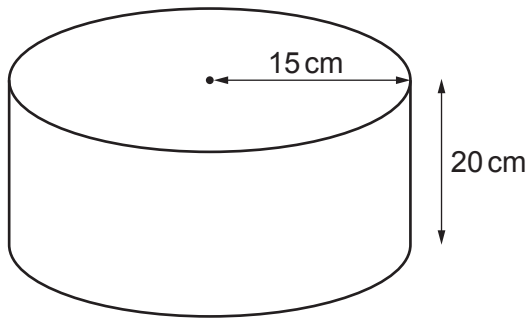
The population will continue to increase at a similar rate

The rate is how quickly it increases

[1]

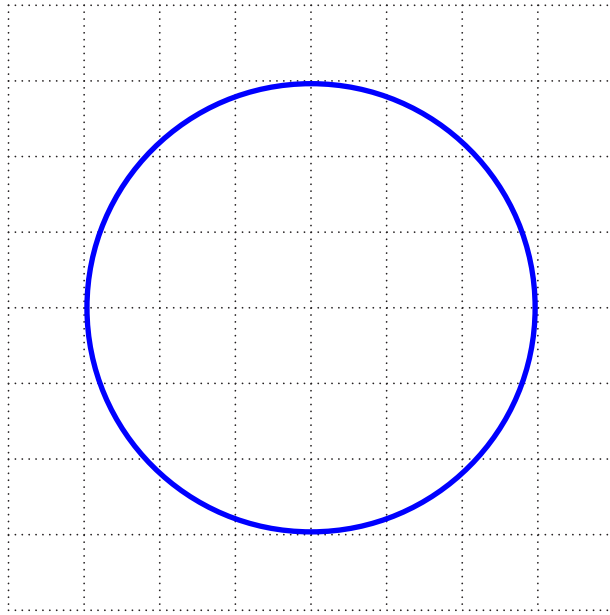
Turn over

22 The diagram shows a cylinder with radius 15 cm and height 20 cm.



Not to scale

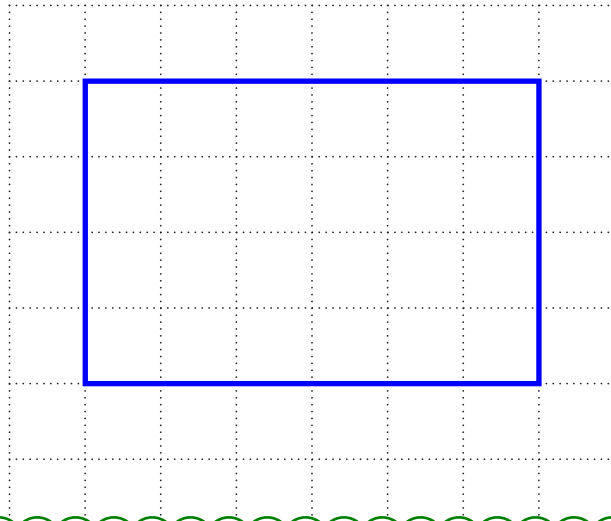
- (a) On the grid below, draw the plan view of the cylinder.
Use the scale 1 cm represents 5 cm.



The plan is a 2D representation of what is seen from above.
 $15 \div 5 = 3$ so the radius of 15 cm is represented by 3 cm

[2]

- (b) On the grid below, draw the front elevation of the cylinder.
Use the scale 1 cm represents 5 cm.



The front elevation is a 2D representation of what is seen from the front. The diameter is 30 cm and is represented by 6 cm. The height is 20 cm and is represented by 4 cm

[2]

- 23 A student says that they have placed the following values in order starting with the smallest.

$$\left(\frac{1}{10}\right)^2$$

$$\sqrt{0.25}$$

$$4^{-1}$$

Has the student done this correctly?
Show how you decide.

$$\left(\frac{1}{10}\right)^2 = \frac{1}{100}$$

1/10 is squared by squaring the numerator and squaring the denominator. $1^2 = 1$ and $10^2 = 100$

$$\sqrt{0.25} = \sqrt{\frac{1}{4}} = \frac{1}{2}$$

0.25 is 1/4 as a fraction, which is square rooted by square rooting the numerator and square rooting the denominator. $\sqrt{1} = 1$ and $\sqrt{4} = 2$

$$4^{-1} = \frac{1}{4}$$

A negative power means to do the reciprocal. This can be done by doing 1 over

No because 4^{-1} is smaller than $\sqrt{0.25}$

[4]

- 24 Alex has a bag containing 3 blue beads and 5 green beads.
There are no other beads in the bag.

Alex takes a bead at random from the bag, puts it back, and then takes another bead.

Alex says

The probability that the two beads are the same colour is less than 50%.

Is Alex correct?

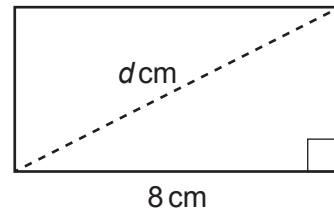
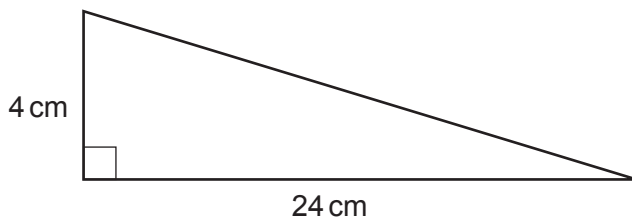
Show how you decide.

You may use this tree diagram if you wish.

First bead	Second bead
$\frac{3}{8} \times \frac{3}{8} + \frac{5}{8} \times \frac{5}{8}$	<div style="border: 1px solid green; border-radius: 15px; padding: 5px; background-color: #e0ffe0;"> <p>Blue AND blue OR green AND green. AND means to multiply the probabilities. OR means to add the probabilities. There are 8 beads in total. 3 out of the 8 beads are blue and 5 out of the 8 beads are green</p> </div>
$\frac{9}{64} + \frac{25}{64}$	<div style="border: 1px solid green; border-radius: 15px; padding: 5px; background-color: #e0ffe0;"> <p>The fractions are multiplied by multiplying the numerators and multiplying the denominators</p> </div>
$\frac{34}{64}$	<div style="border: 1px solid green; border-radius: 15px; padding: 5px; background-color: #e0ffe0;"> <p>The fractions have the same denominators so can be added</p> </div>
<div style="border: 1px solid green; border-radius: 15px; padding: 5px; background-color: #e0ffe0; width: fit-content; margin: 0 auto;"> <p>50% as a fraction is $\frac{1}{2}$. $\frac{32}{64}$ would be $\frac{1}{2}$ and $\frac{34}{64}$ is more than this</p> </div>	

..... No because the probability is $\frac{34}{64}$, which is more than 50%

- 25 The diagram shows a right-angled triangle and a rectangle.



Not to scale

The triangle and rectangle have the same area.

Calculate the length, d cm, of the diagonal of the rectangle.
You must show your working.

$24 \div 2$ ← Area of triangle = $\frac{1}{2} \times \text{base} \times \text{height}$. Half of the base is 12 cm

12×4 ← Multiplying the 12 cm by the height of 4 cm works out that the area of the triangle is 48 cm^2

$48 \div 8$ ← Area of rectangle = base \times height. Dividing the area by the base of 8 cm works out that the height of the rectangle is 6 cm

$a^2 + b^2 = c^2$ ← The base and height of the rectangle and d form a right-angled triangle. Pythagoras' Theorem can be used to work out d

$8^2 + 6^2$ ← Substituting the 8 cm for a and the 6 cm for b as these are the shorter sides

$\begin{array}{r} 64 \\ +36 \\ \hline 100 \end{array}$ ← $8^2 = 64$ and $6^2 = 36$

$\sqrt{100}$ ← d is the longest side of the right-angled triangle so is c in Pythagoras' Theorem. $100 = c^2$. Square rooting both sides finds c

$d = \dots\dots\dots 10 \dots\dots\dots \text{cm}$ [6]

END OF QUESTION PAPER