.CG Maths.
Worked Solutions

OCR Oxford Cambridge and RSA

F

Friday 20 May 2022 – Morning

GCSE (9–1) Mathematics

J560/01 Paper 1 (Foundation Tier)

Time allowed: 1 hour 30 minutes

You must have:
• the Formulae Sheet for Foundation Tier (inside this document)

You can use:
• a scientific or graphical calculator
• geometrical instruments
• tracing paper

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.
• Use the π button on your calculator or take π to be 3.142 unless the question says something different.

INFORMATION
• The total mark for this paper is **100**.
• The marks for each question are shown in brackets **[ ]**.
• This document has **24** pages.

ADVICE
• Read each question carefully before you start your answer.

Turn over

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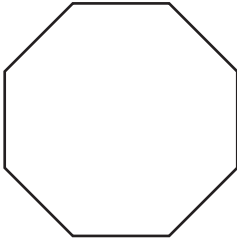
If you find any mistakes or have any requests or suggestions, please send an email to curtis@cgmaths.co.uk

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Answer **all** the questions.

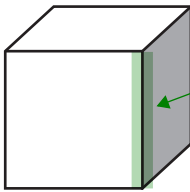**1** **(a)** Write down the mathematical name of this polygon.

Octagons are polygons which have 8 sides

(a) .... Octagon .... **[1]**

(b) How many edges does a cube have?

This is an edge

(b) .... 12 .... **[1]**

2 Here is a list of numbers.

6   9   2   12   3   8   3

(a) Write down the mode.

3 appears twice. This is more than any other number so it is the mode

(a) .... 3 .... **[1]**

(b) Work out the range.

12 − 2   *Range = largest - smallest. The largest is 12 and the smallest is 2*

(b) .... 10 .... **[2]**

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3 The diagram shows a pair of parallel lines.

Not to scale
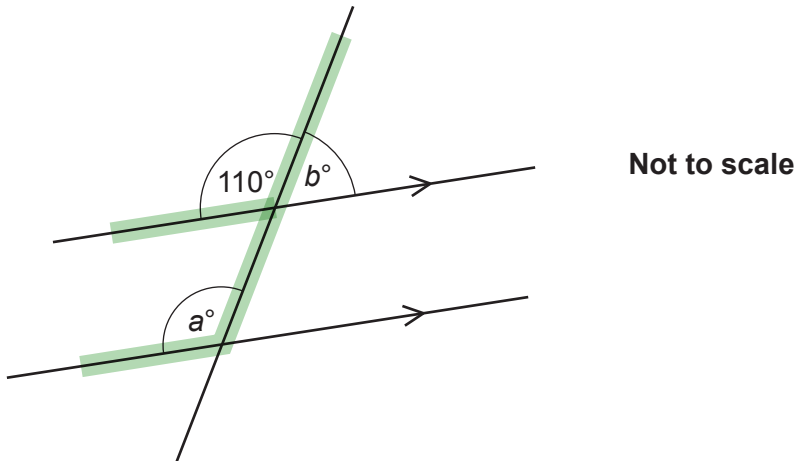
(a) Write down the value of *a*.

Corresponding angles are equal. The insides of the F-shape highlighted on the diagram are corresponding angles

(a) $a =$ ....110.......... **[1]**

(b) Write down the value of *b*.

Angles around a point add up to 180°.
Subtracting the 110° from 180° leaves angle b

(b) $b =$ ....70.......... **[1]**

4 Jamie has some empty boxes.
Each box can hold 73 pencils.
Jamie has 590 pencils.

Jamie says that eight boxes are needed to hold all of the pencils.

Is Jamie correct?
You must show your working.

$590 \div 73 = 8.08...$

Dividing the 590 pencils by the 73 in each box works out how many lots of 73 the 590 is and therefore how many boxes are needed

8 isn't enough as 590 is more than 8 lots of 73. The number of boxes needs to be rounded up to the next whole number, which is 9

No .... because ......9 boxes are needed...

.... **[2]**

Turn over

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5 This graph shows the number of mobile phones sold by a shop in June, July and August.
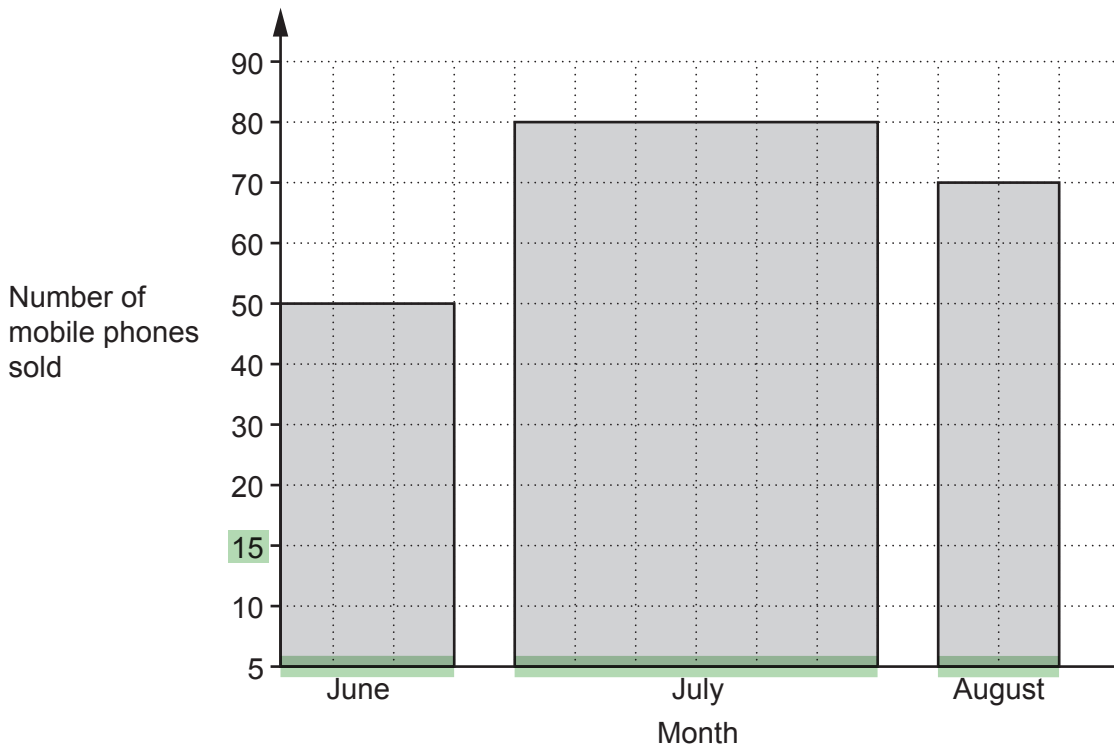
Give **two** reasons why the graph is misleading.

1 Bars are different widths ⟨ The bars on a bar chart need to be the same width ⟩ ....

....

2 The scale doesn't go up by the same amount between each number ....

.... ⟨ The scale goes up in 10s but then includes 15, which is 5 more than 10 ⟩ .... **[2]**

⟨ It is also misleading that the scale doesn't start with 0 ⟩

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6 Ashley has these three number tiles.

| 2 | 3 | 8 |

(a) Which one of Ashley's tiles shows a cube number?
Write the number on the blank tile on the answer line.

2^3 = 2 x 2 x 2 = 8, so 8 is a cube number

8

(a) .... **[1]**

(b) Write down a two-digit prime number that can be made using two of Ashley's tiles.

Prime numbers are only have 2 factors, themselves and 1. Factors are whole numbers which a number can be divided by to get a whole number result

2 3

(b) .... **[1]**

(c) Write down the three-digit number closest to 300 that can be made using all three of Ashley's tiles.

$300 - 283 = 17$

283 is the largest number less than 300 which can be created. Working out that the difference between 283 and 300 is 17

$328 - 300 = 28$

328 is the smallest number greater than 300 which can be created. Working out that the difference between 328 and 300 is 28

There is less of a difference between 283 and 300 compared to 328 and 300. Therefore 283 is the closer of the two options

2 8 3

(c) .... **[1]**

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7 **(a)** Simplify.

$t + 5t - 4t$

> Collecting like terms. 1 + 5 - 4 = 2 so t + 5t - 4t = 2t

(a) .... 2t .... **[1]**

(b) Factorise.

$x^2 + 2x$

> The highest common factor of both terms is x. This is brought out, the two terms are divided by it and the result is left in a bracket

(b) .... $x(x+2)$ .... **[1]**

8 Write the following in order of size, smallest first.

52.9% $\frac{530}{1000}$ $\frac{9}{17}$ 0.5209

52.90%   53%   52.94%   52.09%

> Converting the fractions and decimal into percentages by multiplying them by 100. Writing any decimals to 2 decimal places. This makes them easy to compare

.....0.5209.... , ...52.9%.... , ...$\frac{9}{17}$.... , ...$\frac{530}{1000}$....**[2]**

smallest

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9 A pattern is made out of blue tiles and yellow tiles.

$\frac{1}{3}$ of the tiles are blue.

There are 36 yellow tiles.

Work out the **total** number of tiles.

If 1/3 are blue, 2/3 must be yellow as 1 lot of tiles subtract 1/3 of the tiles is 2/3 of the tiles

$36 \div 2$ ← Dividing the 36 yellow tiles by 2 works out 1/3 of the tiles

18×3 ← Multiplying 1/3 of the tiles by 3 works out the total number of tiles

.... 54 .... **[3]**

10 Work out, using your calculator.

$$\sqrt{17.5^2 + 60^2}$$

Type it into the calculator exactly as it is above

.... 62.5 .... **[2]**

Turn over

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11 120 new homes are built in a village.
Each home is either a house or a flat.
Each home either has a garage or does not have a garage.
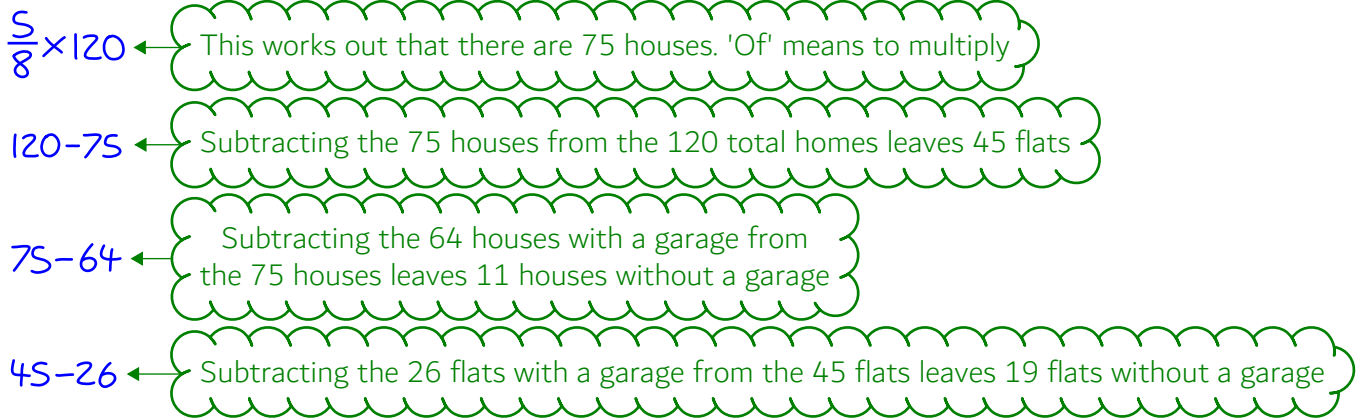64 of the houses have a garage and 26 of the flats have a garage.
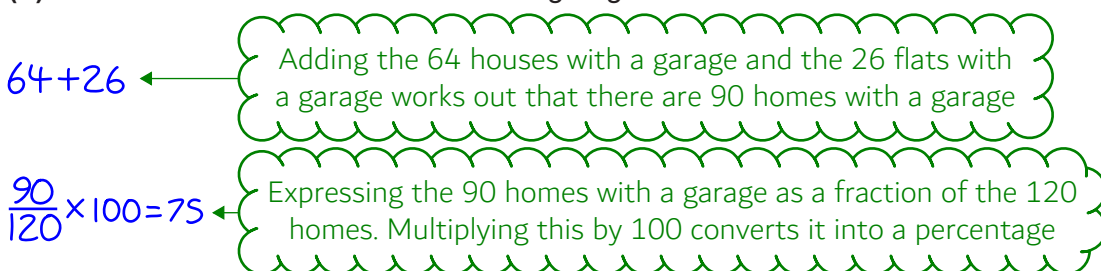
This frequency tree shows the above information.

Home **Garage**

Yes — 64

House — 75

No — 11

120

Yes — 26

Flat — 45

No — 19
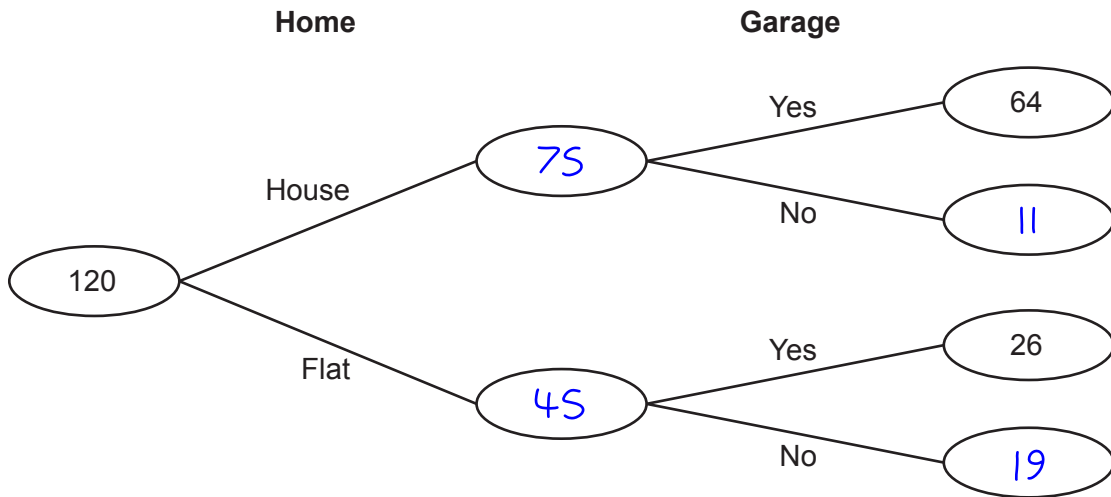
(a) $\frac{5}{8}$ of the homes are houses.

Complete the frequency tree. **[4]**

$\frac{5}{8} \times 120$ ← This works out that there are 75 houses. 'Of' means to multiply

$120 - 75$ ← Subtracting the 75 houses from the 120 total homes leaves 45 flats

$75 - 64$ ← Subtracting the 64 houses with a garage from the 75 houses leaves 11 houses without a garage

$45 - 26$ ← Subtracting the 26 flats with a garage from the 45 flats leaves 19 flats without a garage

(b) Show that 75% of the homes have a garage.

$64 + 26$ ← Adding the 64 houses with a garage and the 26 flats with a garage works out that there are 90 homes with a garage

$\frac{90}{120} \times 100 = 75$ ← Expressing the 90 homes with a garage as a fraction of the 120 homes. Multiplying this by 100 converts it into a percentage

[2]

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12 The diagram shows Kai's garden.
The garden is a rectangle, 16 m by 10 m.

It has a lawn and a flowerbed.
The flowerbed is a circle of diameter 6 m.

16 m   **Not to scale**

Lawn

6 m

Flowerbed

10 m
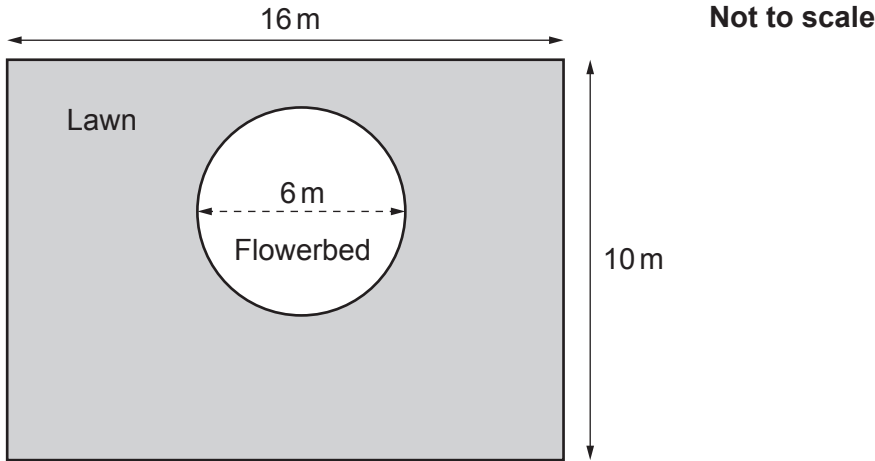
Work out the area of Kai's **lawn**.

$16 \times 10 = 160$ — Area of rectangle = length x width. Multiplying the length of the garden by the width of the garden works out that the area of the garden is 160m^2

$6 \div 2$ — Radius is half of the diameter. So dividing the diameter by 2 works out that the radius of the flowerbed is 3m

$\pi \times 3^2$ — Area of circle = π x radius^2. So the area of the flowerbed is 9π m^2

$160 - 9\pi$ — Subtracting the area of the flowerbed from the area of the garden leaves the area of the lawn

............................131.7............................ m^2 **[4]**

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13 Here are the ticket prices for a zoo when bought at the gate.

Adult	£22
Child	£18
Family ticket (2 adults and up to 4 children)	£80

(a) Mr and Mrs Khan take their four children to the zoo.
They buy their tickets at the gate.

How much do Mr and Mrs Khan save by buying a family ticket?

$22 \times 2 = 44$ ← Multiplying the price of an adult ticket by 2 works out that the price of 2 adult tickets is £44

$18 \times 4 = 72$ ← Multiplying the price of a child ticket by 4 works out that the price of 4 child tickets is £72

$44 + 72$ ← Adding the price of 2 adult tickets and the price of 4 child tickets works out that Mr and Mrs Khan would spend £116 if not buying a family ticket

$116 - 80$ ← Subtracting the price of a family ticket from what they would have spent works out the difference and therefore how much they save

(a) £ .... 36 ...... **[4]**

(b) All ticket prices are reduced by 15% if bought online rather than at the gate.
Mr and Mrs Morris take their one child to the same zoo.
They buy their tickets online.

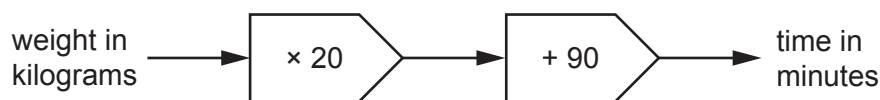What is the lowest possible **total cost** of their tickets?

$44 + 18$ ← Adding the price of 1 child ticket to the price of 2 adult tickets works out that they would spend £62 if not buying the family ticket. This is cheaper than the family ticket so this is the cheapest way of buying the tickets

$62 \times \dfrac{100-15}{100}$ ← Subtracting the 15% from 100% expresses the percentage the cost decreases to when buying online. Putting this over 100 converts it into a fraction. Multiplying the £62 by this fraction reduces it by 15%
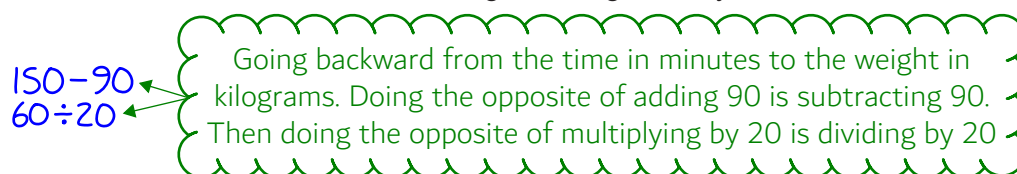
(b) £ .... 52.70 .... **[4]**

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14 Here is a rule to work out the time, in minutes, needed to cook a turkey.

weight in kilograms → [× 20] → [+ 90] → time in minutes

(a) Ling's turkey takes 150 minutes to cook.

Use the rule to work out the weight of Ling's turkey.

150−90
60÷20

Going backward from the time in minutes to the weight in kilograms. Doing the opposite of adding 90 is subtracting 90. Then doing the opposite of multiplying by 20 is dividing by 20

(a) .... 3 .... kg **[2]**

(b) James cooks a different turkey.
His turkey weighs 6 kg.
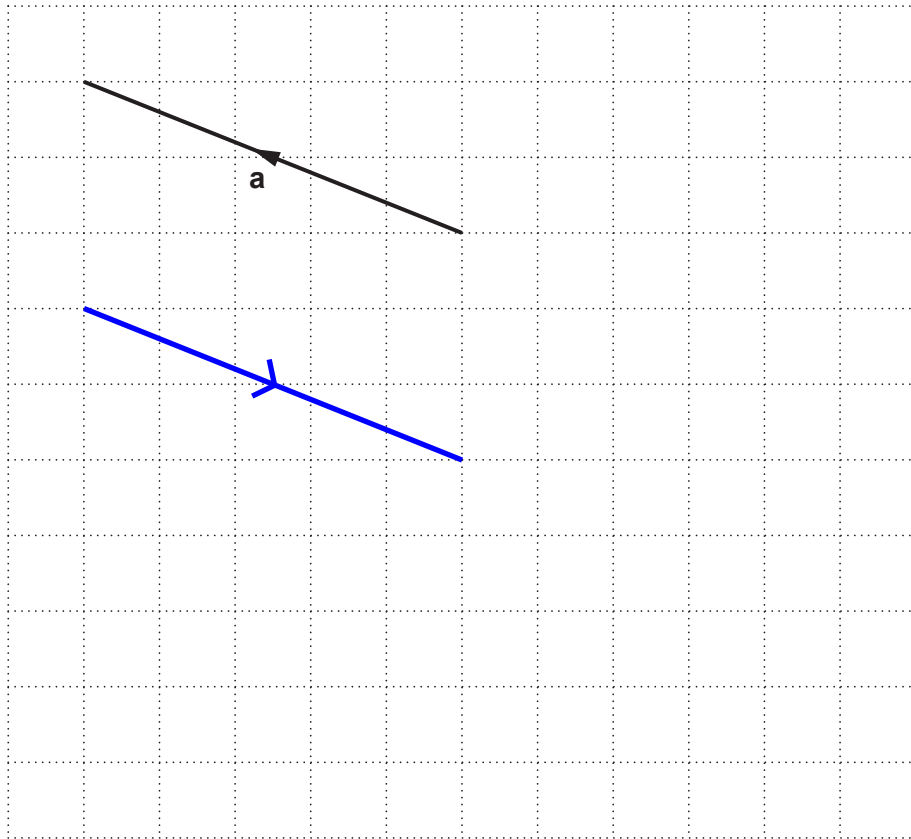James wants to take his turkey out of the oven at 1:15 pm.

Use the rule to work out at what time James should put his turkey in the oven.
You must show your working.

6×20
120+90

Multiplying the weight in kilograms by 20 then adding 90 works out that it should take 210 minutes

13°15'−0°210°

Subtracting the 210 minutes from 1.15pm. Using 13.15 (which is 1.15pm in 24 hour time) as 210 minutes is more than 1 hour 15 minutes so the result would be negative. Entering them into the calculator as sexagesimals and writing down what was put into the calculator

The answer of 9°45'0'' means 9 hours 45 minutes

(b) .... 9.45am .... **[5]**

Turn over

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15 Vector **a** is drawn on this grid.

(a) Write vector **a** as a column vector.

> The vector is going 5 to the left and 2 up. Going left is in the negative x direction and going up is in the positive y direction

$$\begin{pmatrix} -5 \\ 2 \end{pmatrix}$$

(a) .... **[2]**

(b) On the grid above, draw the vector ⁻**a**. **[1]**

> -a is the same as a but in the opposite direction

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16 Alex and Blake share some money in the ratio 2 : 5.
Blake receives £150 more than Alex.

How much money does Alex receive?

5-2 ← Subtracting the number of parts Alex gets from the number of parts Blake gets works out that Blake receives 3 more parts than Alex in the ratio

150÷3 ← The £150 is represented by 3 parts in the ratio. Dividing the £150 by the 3 parts works out that 1 part in the ratio is worth £50

50×2 ← Multiplying the value of 1 part of the ratio by 2 works out that the value of 2 parts of the ratio (which represents how much Alex receives) is worth £100

£ ....100.................... **[3]**

17 Solve $2x + 5 \geqslant 11$.
Show your solution on the number line.
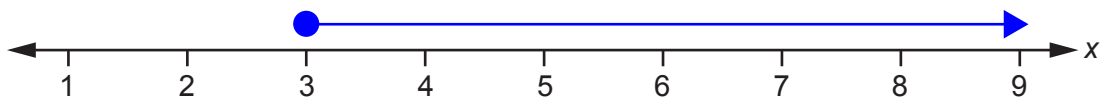
2x≥6 ← Subtracting 5 from both sides eliminates the +5 on the left and gets the x term on its own

x≥3 ← Dividing both sides by 2 eliminates the 2 on the left and gets x on its own. This is now solved

The filled circle above 3 means that it can be equal to the 3. The arrow going to the right means that it can be greater than the 3

[4]

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18 **(a)** Write 6 050 000 in standard form.

(a) ....$6.05×10^6$.......................... **[1]**

(b) Write 4.58×10^{-3} as an ordinary number.

(b) ....0.00458.......................... **[1]**

19 A coat is on sale in a shop at a special price of £149.40.
The shop says this is a saving of 17% on their normal price.

Work out the shop's normal price for the coat.

$100-17$

$149.40÷83$

$1.8×100$

£ ....180.......................... **[3]**

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20 This list represents four numbers.

127   x $x + 1$ $2x$

The **mean** of the four numbers is 180.

Work out the numbers.
You must show your working.

$127+x+x+1+2x$ ← Expressing the total of the four numbers by adding the expressions together

$\dfrac{4x+128}{4}$ ← Simplifying the expression by collecting like terms then dividing by 4 to express the mean. Mean = total ÷ number, where total is the total of all of the numbers and number is how many numbers there are

$x+32=180$ ← Dividing both the 4x and 128 by 4 expresses the mean in terms of x, which must be equal to the actual mean of 180

$x=148$ ← Subtracting 32 from both sides eliminates the +32 on the left and gets x on its own. So x is 148. This is the second number

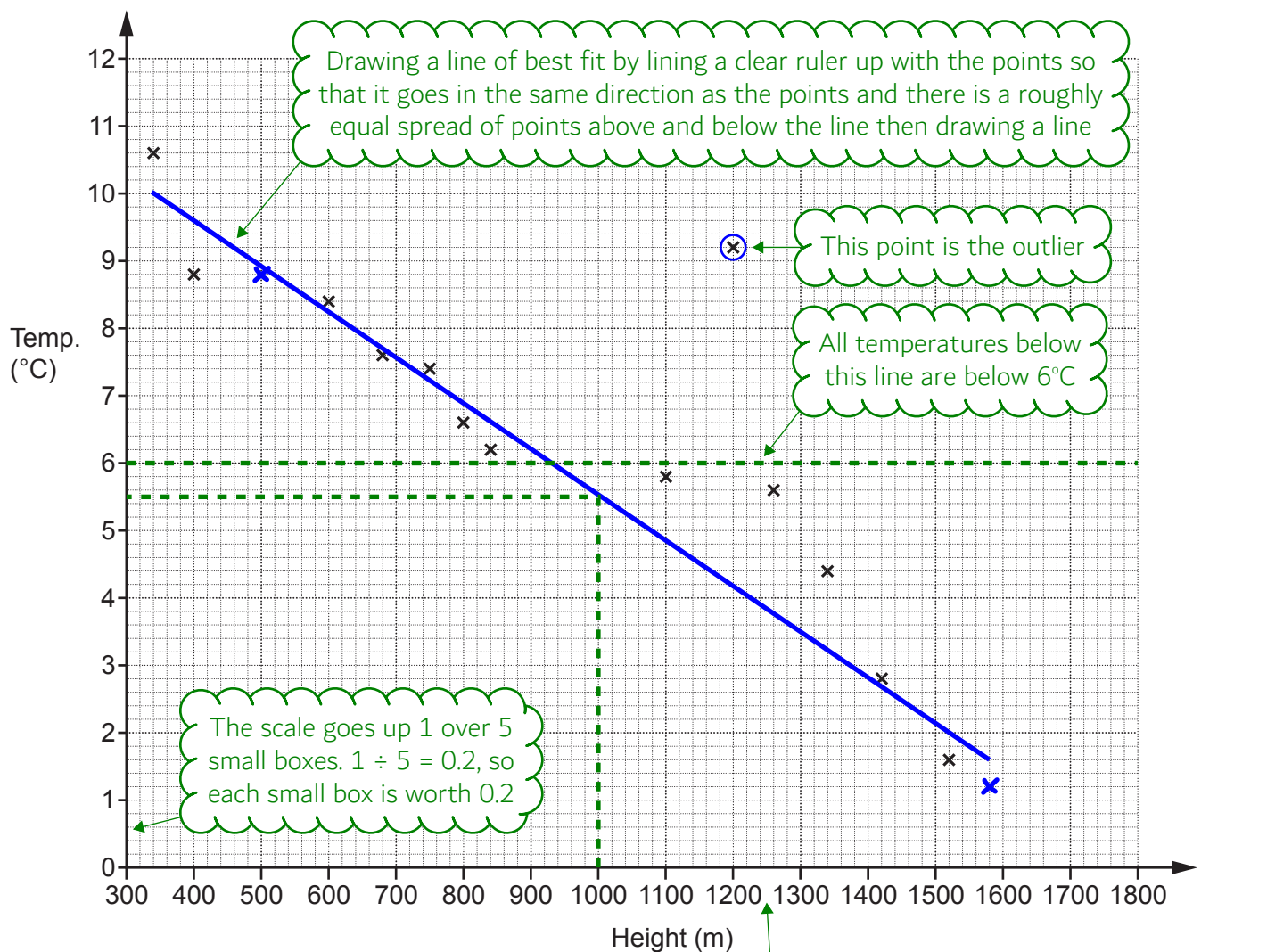$148+1$ ← This works out that the third number (x + 1) is 149

2×148 ← This works out that the forth number (2x) is 296

127 .... 148 .... 149 .... 296 ....**[5]**

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21 The scatter diagram shows the midday temperature at 13 different heights on a mountain.

Drawing a line of best fit by lining a clear ruler up with the points so that it goes in the same direction as the points and there is a roughly equal spread of points above and below the line then drawing a line

This point is the outlier

All temperatures below this line are below 6°C

The scale goes up 1 over 5 small boxes. 1 ÷ 5 = 0.2, so each small box is worth 0.2

The scale goes up 100 over 5 small boxes. 100 ÷ 5 = 20, so each small box is worth 20

(a) The table has the information for 2 more heights.

Plot these on the scatter diagram.

Height (m)	500	1580
Temperature (°C)	8.8	1.2

[2]

(b) Describe the type of correlation shown in the scatter diagram.

(b) .... Negative .... **[1]**

As the temperature decreases as the height increases

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(c) By drawing a line of best fit, estimate the temperature at 1000 m.

(c) .... S.S .... °C **[2]**

(d) Circle the outlier on the scatter diagram. **[1]**

(e) Explain why using the scatter diagram to estimate the temperature at 1800 m may be unreliable.

Outside the range of the data
....

The data given only goes up to 1580m. The trend may not continue

.... **[1]**

(f) Find the percentage of the 15 temperatures which are below 6 °C.

$\frac{6}{15} \times 100$

6 out of the 15 temperatures are below 6°C. Expressing this as a fraction. Converting it into a percentage by multiplying by 100
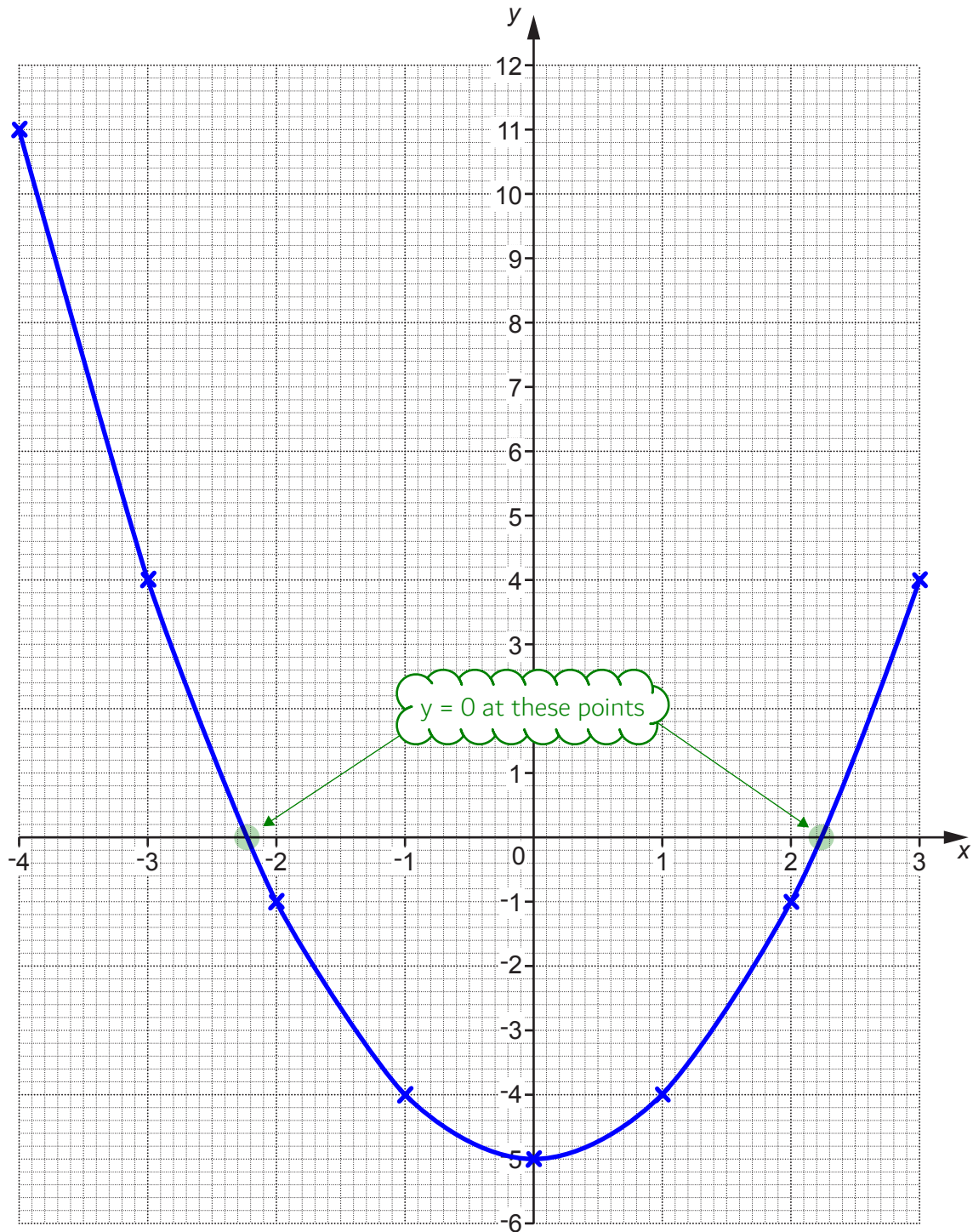
(f) .... 40 .... % **[3]**

Turn over

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22 (a) Complete this table for $y = x^2 - 5$.

x	-4	-3	-2	-1	0	1	2	3
y	11	4	-1	-4	-5	-4	-1	4

Using table mode. f(x) = x² - 5. Start: -4. End: 3. Step: 1

[2]

(b) Draw the graph of $y = x^2 - 5$ for the values of x from -4 to 3.

y = 0 at these points

[3]

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(c) Use the graph to solve the equation $x^2 - 5 = 0$.
Give your answers to **1** decimal place.

It is basically asking what x is when y = 0

(c) $x =$ ....2.2........ or $x =$ ....−2.2........ **[2]**

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23 Four friends are going on holiday together.
They each take a suitcase.
The weight of each suitcase is 25 kg, correct to nearest kilogram.

(a) Complete the error interval for the weight, *w* kg, of **one** suitcase.

$25 \pm \frac{1}{2}$

Adding and subtracting half of the resolution works out the upper and lower bound. The resolution is 1 as it is correct to the nearest 1 kilogram

(a) ....24.5....... $\leqslant w <$ ....25.5....... **[2]**

(b) The friends must pay extra if the total weight of their four suitcases is more than 102.4 kg.

Can the friends be certain that they will **not** have to pay extra?
Show how you decide.

$25.5 \times 4 = 102$

Multiplying the upper bound of 1 suitcase works out that the upper bound of all 4 suitcases is 102kg

.......Yes....... because ....102 < 102.4.......

The 102kg is less than the 102.4kg. So they can be certain that they will not have to pay extra

[3]

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24 A machine can dig, on average, 2 cm of tunnel each minute.
It operates 24 hours each day.

(a) Work out how many days it should take to dig a tunnel of length 3.5 km.
Give your answer to the nearest day.

$S\frac{d}{t}$ ← Speed = distance ÷ time. Writing this as a formula triangle

3.5×1000 ← The speed is in cm per minute. The distance needs to be in cm to be compatible with this. Converting the 3.5km into metres using the fact there are 1000m in 1km

3500×100 ← Converting 3500m into centimetres using the fact there are 100cm in 1m

$350000 \div 2$ ← From the formula triangle, time = distance ÷ speed. The distance is 350000cm and the speed is 2cm per minute

$175000 \div 60$ ← Converting the time in minutes into hours using the fact there are 60 minutes in an hour

$2916.\dot{6} \div 24$ ← Converting the time in hours into days using the fact there are 24 hours in a day

The answer of 121.5... is rounded to the nearest day

**(a)** .... 122 .... days **[4]**

(b) The machine actually digs an average of 2.5 cm of tunnel each minute for most of the time and an average of 1.5 cm each minute for the rest of the time.

How would this affect your answer to part **(a)**?

It would be less
.... As the speed is more by 0.5cm per minute for most of the time .... **[1]**
and is less by 0.5cm per minute for some of the time. Both
differences are the same but it is more for more of the time

Turn over

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25 The diagram shows a square-based pyramid and a sphere.
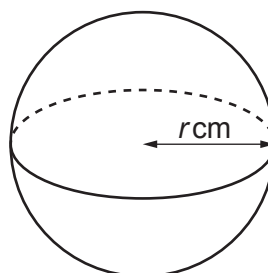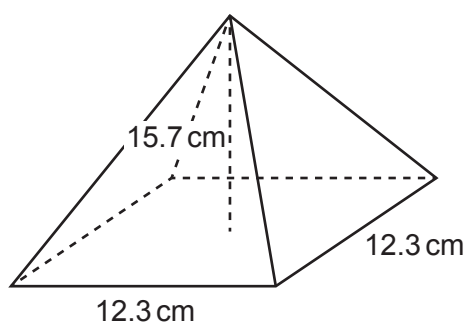
The pyramid has base length 12.3 cm and perpendicular height 15.7 cm.
The sphere has radius r cm.

The pyramid and the sphere have the same volume.

Work out the radius of the sphere.
You must show your working.

[The volume of a pyramid is $\frac{1}{3}$ × area of base × perpendicular height.

The volume V of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

$$\frac{4}{3}\pi r^3 = \frac{1}{3} \times 12.3^2 \times 15.7$$

Setting the volume of the sphere equal to the volume of the pyramid. The base is a square. Area of square = length²

$$r = \sqrt[3]{\frac{\frac{1}{3} \times 12.3^2 \times 15.7}{\frac{4}{3}\pi}}$$

Rearranging to find r by dividing both sides by 4/3 and π then cube rooting both sides

.... 5.7 .... cm **[5]**

END OF QUESTION PAPER

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