Qualification Accredited

Oxford Cambridge and RSA

GCSE (9–1)

Examiners' report

MATHEMATICS

J560

For first teaching in 2015

J560/01 Summer 2022 series

Version 1

Contents

Introduction

Our examiners' reports are produced to offer constructive feedback on candidates' performance in the examinations. They provide useful guidance for future candidates.

The reports will include a general commentary on candidates' performance, identify technical aspects examined in the questions and highlight good performance and where performance could be improved. A selection of candidate answers is also provided. The reports will also explain aspects which caused difficulty and why the difficulties arose, whether through a lack of knowledge, poor examination technique, or any other identifiable and explainable reason.

Where overall performance on a question/question part was considered good, with no particular areas to highlight, these questions have not been included in the report.

A full copy of the question paper and the mark scheme can be downloaded from OCR.

Advance Information for Summer 2022 assessments

To support student revision, advance information was published about the focus of exams for Summer 2022 assessments. Advance information was available for most GCSE, AS and A Level subjects, Core Maths, FSMQ, and Cambridge Nationals Information Technologies. You can find more information on our website.

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Paper 1 series overview

This paper is the first of 3 papers for the GCSE Mathematics Foundation level.

This paper expects candidates to use a calculator; many candidates who did not made arithmetic errors often on relatively simple calculations.

Responses that required a written statement to justify or explain situations often did not score due to a lack of understanding of the question or language skills. Candidates need to work out the nature of the response required and write concisely.

Candidates generally scored well on the early low mark questions – averages and range, types of number, angles, calculator use. Some scored close to full marks on the first eight questions.

Some missed straightforward marks on graph work due to inaccurate plotting of points, drawing of curves, and not using a sharpened pencil. A minority tried drawing a curve with a ruler.

Handwriting was generally legible but on occasion, some answers were difficult to read.

Challenging topics included error bounds, areas and volumes (use of given formulae), vectors, factorising, ratio problems, percentages, inequalities and multi-step calculations.

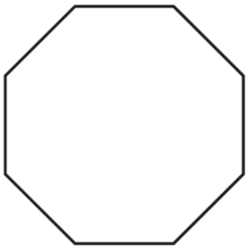
Candidates need to be aware of whether their answers are reasonable or not, in the context of the question. For example, in Question 14 (a), 3000kg was sometimes given for the weight of a turkey.

While many longer answers were clearly set out, others lacked organisation and clarity.

Candidates who did well on this paper generally did the following:	Candidates who did less well on this paper generally did the following:
• attempted all the questions • presented work in a clear, structured manner and logical way leading to their solutions especially in the longer questions and those which required 'correct working' to access full marks • demonstrated good calculator skills • wrote figures and symbols clearly and unambiguously.	• did not pick up key points and information from the questions often using values given in a variety of arithmetic operations without fully understanding what was required • did not always use a calculator; instead they often used inefficient non-calculator methods leading to arithmetic errors • did not use given formulae, either from the formulae sheet (e.g. area of circle) or from the question (e.g. volume) • did not show their working clearly when required.

Question 1 (a)

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

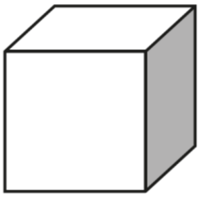


(a) .... **[1]**

Candidates generally identified the polygon correctly, with a wide variety of different spellings. Where incorrect, candidates mostly gave the name of a different polygon; hexagon and pentagon being the most common.

Question 1 (b)

(b) How many edges does a cube have?



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

Although correct answers were seen, 8 was a common error.

Question 2 (a)

2 Here is a list of numbers.

6 9 2 12 3 8 3

(a) Write down the mode.

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

Candidates generally did well on this question. However, common errors were finding the mean, median and range.

Question 2 (b)

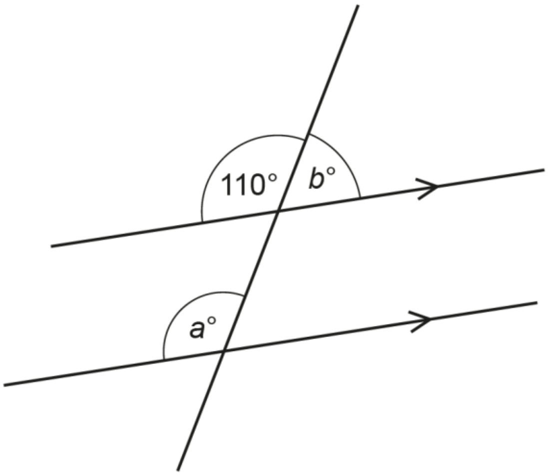
(b) Work out the range.

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

This part was not as well done as part (a). Occasionally candidates subtracted 3 from 6 (being the first and last numbers in the list) but this was uncommon. The most common error was missing the 2 as the lowest number and subtracting 3 from 12 to give an answer of 9.

Question 3 (a)

3 The diagram shows a pair of parallel lines.



Not to scale

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

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

Responses showed a good level of understanding across the whole ability range. The two most common errors were to either transpose the answers to (a) and (b) or to give both angles as 70° due to some confusion between alternate and corresponding angles. Some gave the angle at (a) as 120° showing that they had used a protractor despite the "not to scale" comment. Only a small number of diagrams were annotated.

Question 3 (b)

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

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

Question 4

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.

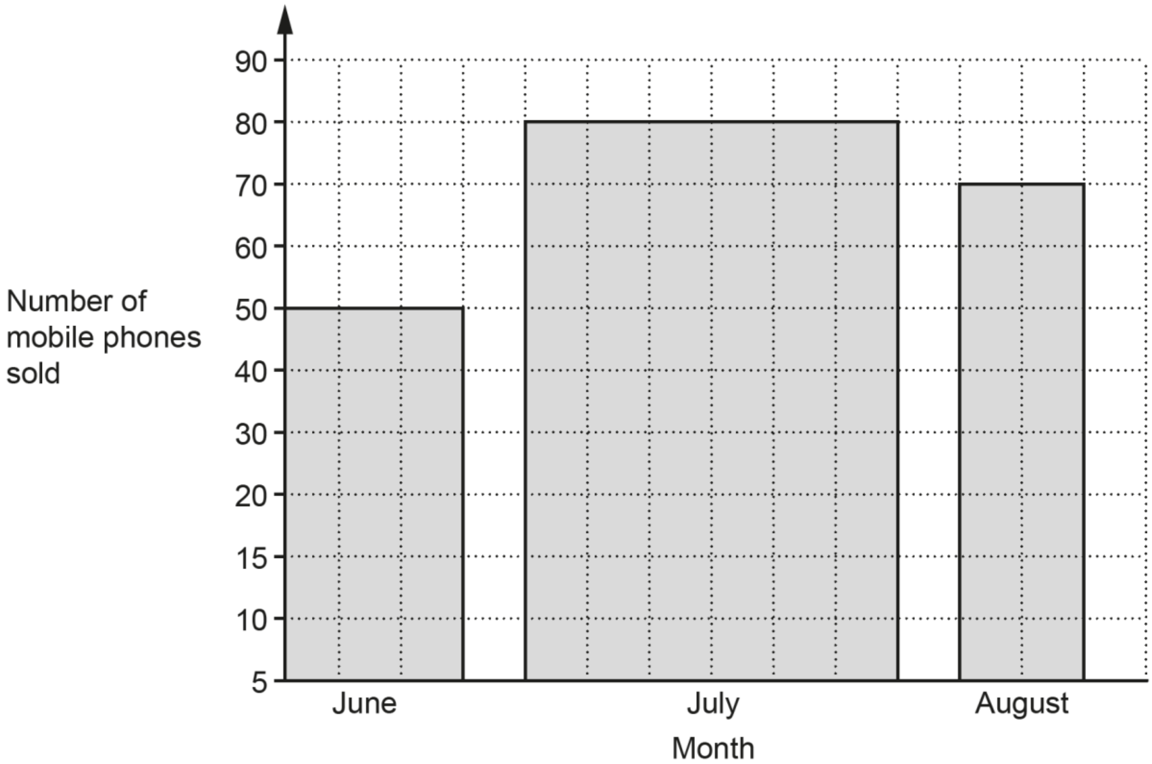
.... because ....

.... **[2]**

A large majority of candidates were able to score M1 having applied a correct method. Many candidates were then able to interpret their answer correctly and score both marks. However some did not gain the second mark due to an incomplete explanation, e.g. "No, because 73 x 8 = 584" without relating the figures to boxes or pencils.

Question 5

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 ....

....

2 ....

.... **[2]**

Candidates who gave accepted responses generally identified the width difference, or noticed the scale changed from 5s to 10s, although many stated the graph axis did not start at 0. Some candidates did not read the question properly and discussed what they saw as problems with the experiment, for example 'the shop isn't open the same length every month'. Some incorrect answers referred to the type of mobile phone not being named, the fact that only 3 months were on the graph or stated that the graph did not have a title.

Question 6 (a)

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.

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

The majority of candidates had 8 as the cube number and scored the mark.

Question 6 (b)

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

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

Many correctly stated either 23 or 83. Some misread the question and tried to make a calculation using the digits which resulted in a prime number, e.g. 3 + 8 = 11.

Question 6 (c)

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

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

A very small number showed working to determine which value was closer to 300 (283 or 328). A small number of candidates used digits other than 2, 3 and 8.

Question 7 (a)

7 **(a)** Simplify.

$t + 5t - 4t$

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

This was generally answered well. Many candidates identified like terms correctly and followed addition and subtraction rules for combining these. The most common error was to only collect the positive terms resulting in an answer of $6t - 4t$.

Question 7 (b)

(b) Factorise.

$x^2 + 2x$

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

Many correct answers were seen. Some candidates did not identify the common factor. For those who did attempt factorisation, the most common error was trying to factorise into two brackets.

Question 8

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

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

.... , ... , ... , ... **[2]**
smallest

Candidates who converted the values to a comparable form often gained both marks. However the common error was not writing $\frac{9}{17}$ to at least 4 decimal places, leading to confusion when comparing to 52.9%. Many candidates scored 1 mark for three values in the correct order.

Exemplar 1

52.9%	$\frac{530}{1000}$	$\frac{9}{17}$	0.5209
0.5290	0.53	0.5294	

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

The work is clearly set out showing the values converted to a comparable form and correctly ordered on the answer line.

Question 9

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.

.... **[3]**

This question proved to be one of the least accessible on the paper. Few established that yellow made up two thirds of the tiles and equated 18 to 1/3. The most common response was a value of 12 (from 36 ÷ 3) followed by 36 + 12 = 48.

Question 10

10 Work out, using your calculator.

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

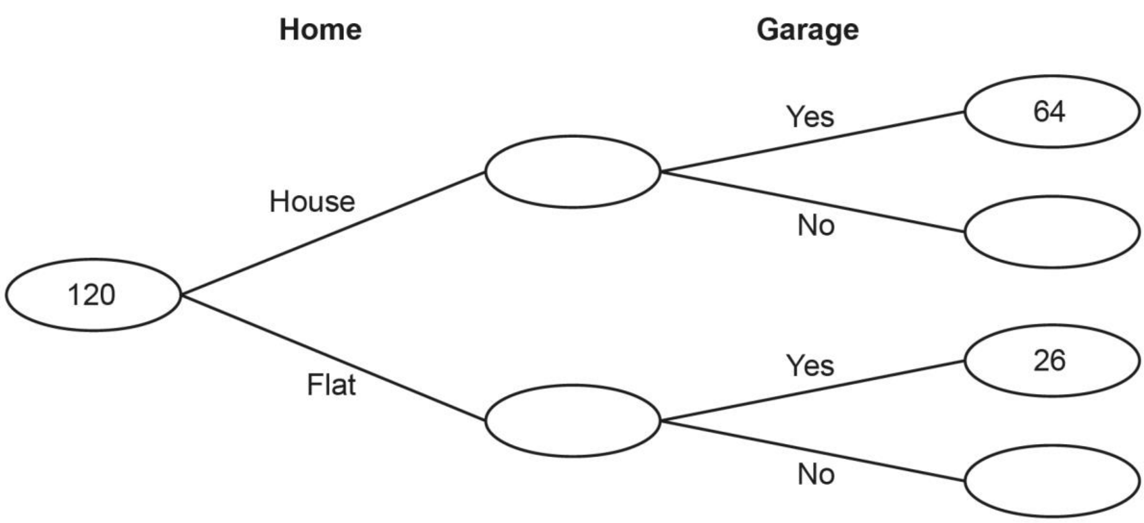
.... **[2]**

A straightforward calculator question, with many candidates scoring 2 marks. As calculators automatically apply the correct order of operations the B1 mark (for 3906.25) was seldom awarded.

Question 11 (a)

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.



(a) $\frac{5}{8}$ of the homes are houses.

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

Candidates who found the first value of 75 correctly, generally proceeded to full marks. If this was not calculated correctly, candidates usually scored 2 marks for their 45 and for having values that added to 120.

Question 11 (b)

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

....

.... **[2]**

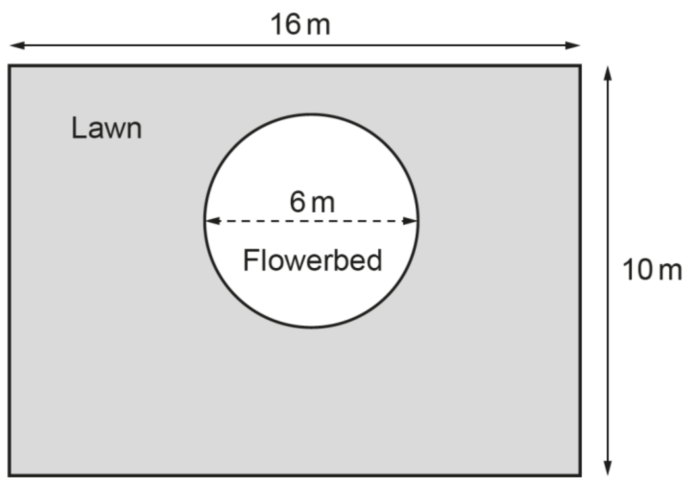
Many candidates scored full marks here, showing where 90 had come from, and then showing this was equivalent to 75%. Some candidates did not fulfil the 'show that' aspect of the demand, instead simply stating that 75% of 120 was 90, without showing the calculation required.

Question 12

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.

Not to scale



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

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

Most candidates attempted this question and the majority gained at least M1 for the area of the rectangle. Several found the area of the circle correctly but errors included using the diameter instead of the radius and doing π x 6² or 3 x π² or π x 6. Most who did correctly find both areas then did subtract. A lack of understanding of area or area calculations used was demonstrated by those who had found the areas of the rectangle and the circle but then went on to add the areas rather than subtract. A small number of candidates found the perimeter rather than the area.

Question 13 (a)

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?

(a) £ .... **[4]**

Most candidates set out their work clearly and gave the correct answer, scoring full marks. Those who were unable to reach the correct answer almost always scored 2 or 1 mark(s) for a partially correct method.

Question 13 (b)

(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.

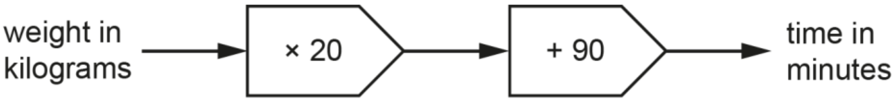
What is the lowest possible **total cost** of their tickets?

(b) £ .... **[4]**

Many correct responses were seen. Some chose to sum the values first, others worked with individual amounts and then totalled them. A common error was to subtract 0.15 from the values.

Question 14 (a)

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



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

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

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

Many candidates gave the correct answer. A small number did not use the function machine in reverse.

Question 14 (b)

(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.

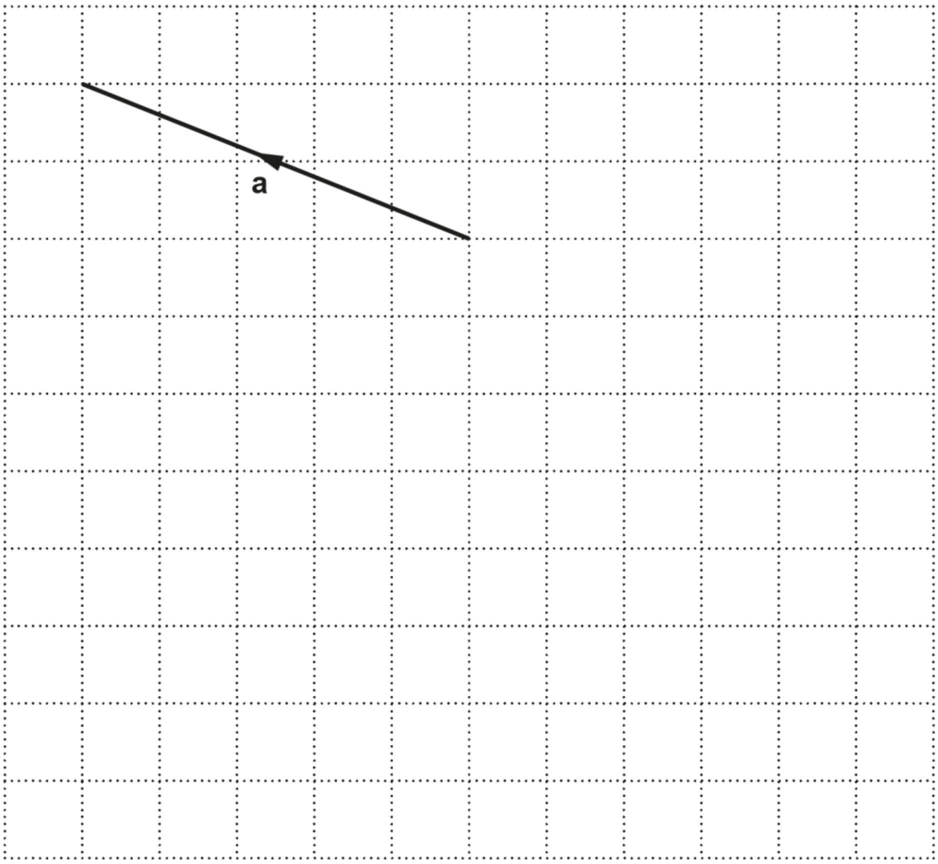
(b) .... **[5]**

Many candidates were able to do the time conversion and the subtraction to score full marks. Many were able to correctly convert 210 minutes to 3.5 hours. A small number made errors and common conversions were 2 hours 10 minutes or 3.3 hours.

Candidates need to check their answers are reasonable in the context of the question.

Question 15 (a)

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



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

(a) $\begin{pmatrix} \quad \\ \quad \end{pmatrix}$ .... **[2]**

Many candidates showed little knowledge of vectors and did not make an attempt at either part of this question. Answers seen included the numbers in the wrong order and sign errors. Some candidates displayed their solution as a fraction.

Question 15 (b)

(b) On the grid above, draw the vector $^{-}\mathbf{a}$. **[1]**

Very few correct answers were seen. A few candidates drew the correct line but omitted the arrow. A common incorrect answer was to draw the reflection of the line given.

Question 16

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

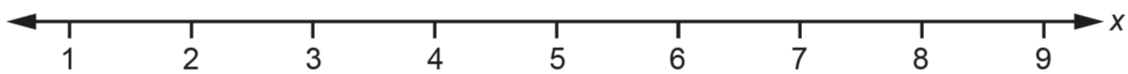
How much money does Alex receive?

£ .... **[3]**

One successful approach to this was using a bar model. Some did realise the need to divide £150 by 3. The most common error was to link the £150 to the 5 parts Blake had in the ratio and found that one part was equal to £30, leading to the common incorrect answer of £60.

Question 17

17 Solve $2x + 5 \geqslant 11$.
Show your solution on the number line.



[4]

Some candidates gained full marks on this question. The hardest part for most candidates was displaying a solution. Some candidates were able to find the critical value of 3 but did not write it as an inequality.

Question 18 (a)

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

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

The majority of candidates who used standard form notation gave the correct answer. The most common error in part (a) was 605×10^4 as the answer.

Question 18 (b)

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

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

Many candidates gave the correct answer. Some clearly knew how to deal with the negative power. Others wrote the given digits with zeros in front, they then went on to use loops as a counting method, some using this method did not make it clear where the decimal point was in their answer.

Question 19

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.

£ .... **[3]**

Misconception

This question was not well answered. Many scored 0 as they worked out 17% of £149.40 and added it on giving an answer of £174.79. There were a lot of attempts to work out their percentage in stages rather than divide by 0.83.

Exemplar 2

17% x ~~€~~ 149·40 = €25·398

€149·40 + €25·398 = €174·80

£ 174·80

Finding 17% of £149.40 was a common error. Many candidates had not read this question carefully to determine what was required.

Question 20

20 This list represents four numbers.

127 x $x + 1$ $2x$

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

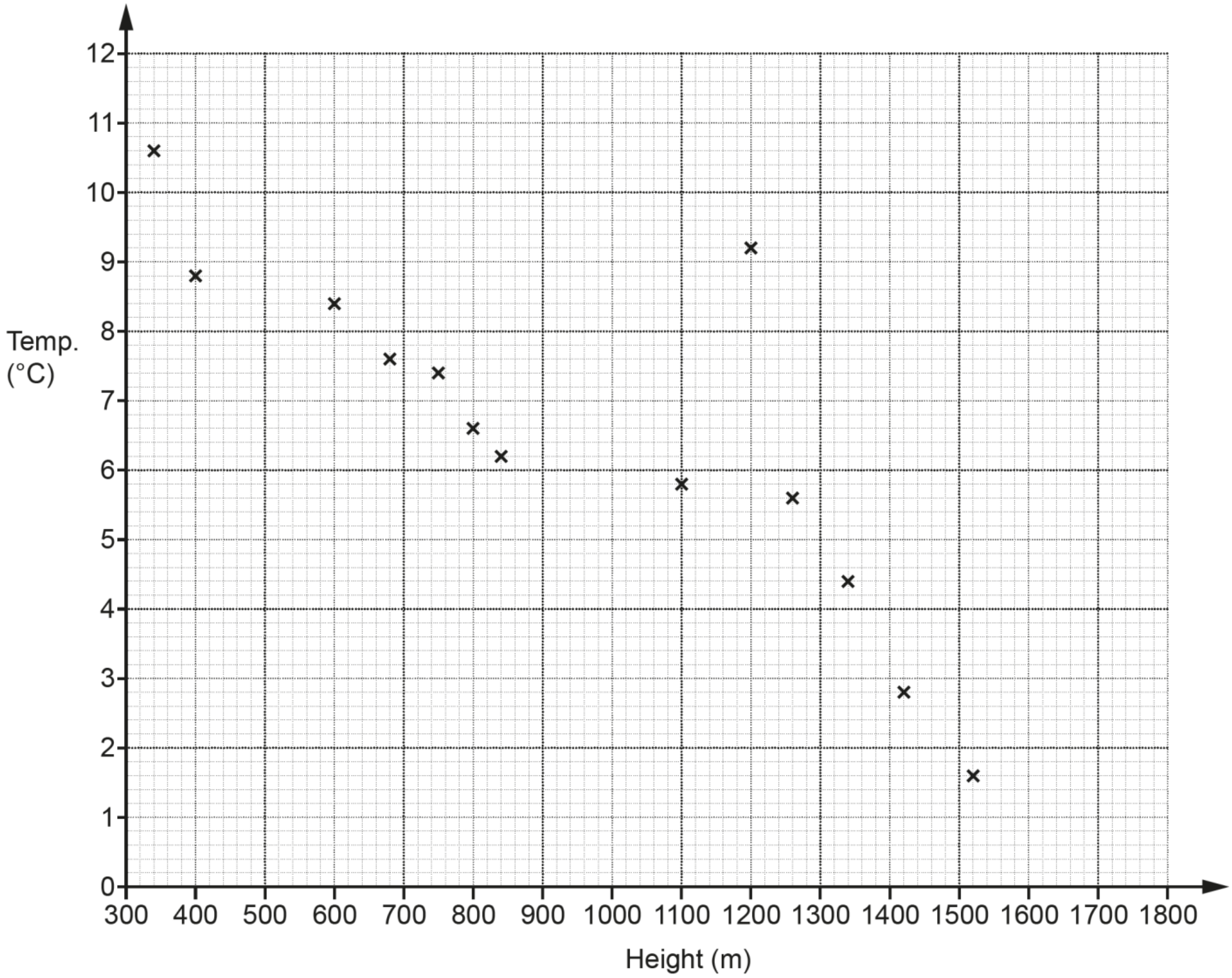
Work out the numbers.
You must show your working.

127 .... **[5]**

A variety of approaches were seen leading to the answer. A successful approach by some candidates was to form and solve an equation, others gained success using different approaches including trial and improvement. Many candidates were able to calculate the total as 720 to gain 1 mark. Several candidates did not attempt this question. Some wrote 127, x, $x + 1$ and $2x$ straight onto the answer line with no attempt to show any working.

Question 21 (a)

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



(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]

Many candidates scored both marks for correctly plotting the points. Some could not use the scale correctly and lost marks as a result.

Question 21 (b)

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

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

Many candidates stated the correlation was negative. Some described the relationship rather than the correlation. Occasionally the correlation was described as downward, decreasing, and other incorrect descriptions.

Question 21 (c)

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

(c) .... °C **[2]**

Many candidates drew a ruled line of best fit and gave a reasonable estimate of the temperature. Some gave an estimate without drawing a line. A small number just joined up the points on the graph.

Question 21 (d)

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

Those who answered this question almost always answered it correctly. However, there were a lot of non-responses.

Question 21 (e)

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

....

.... **[1]**

Many candidates did not realise what was required to answer this question. Comments often referred to the fluctuating nature of the data or that the results may not be accurate, or there is no data at 1800.

Question 21 (f)

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

(f) .... % **[3]**

Candidates who understood what was required usually gained all 3 marks. Others gained a mark for finding that there were six heights whose temperature was under 6˚C, but were unable to proceed further. Of those who wrote a fraction the majority were able to correctly convert this to a percentage.

Question 22 (a)

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

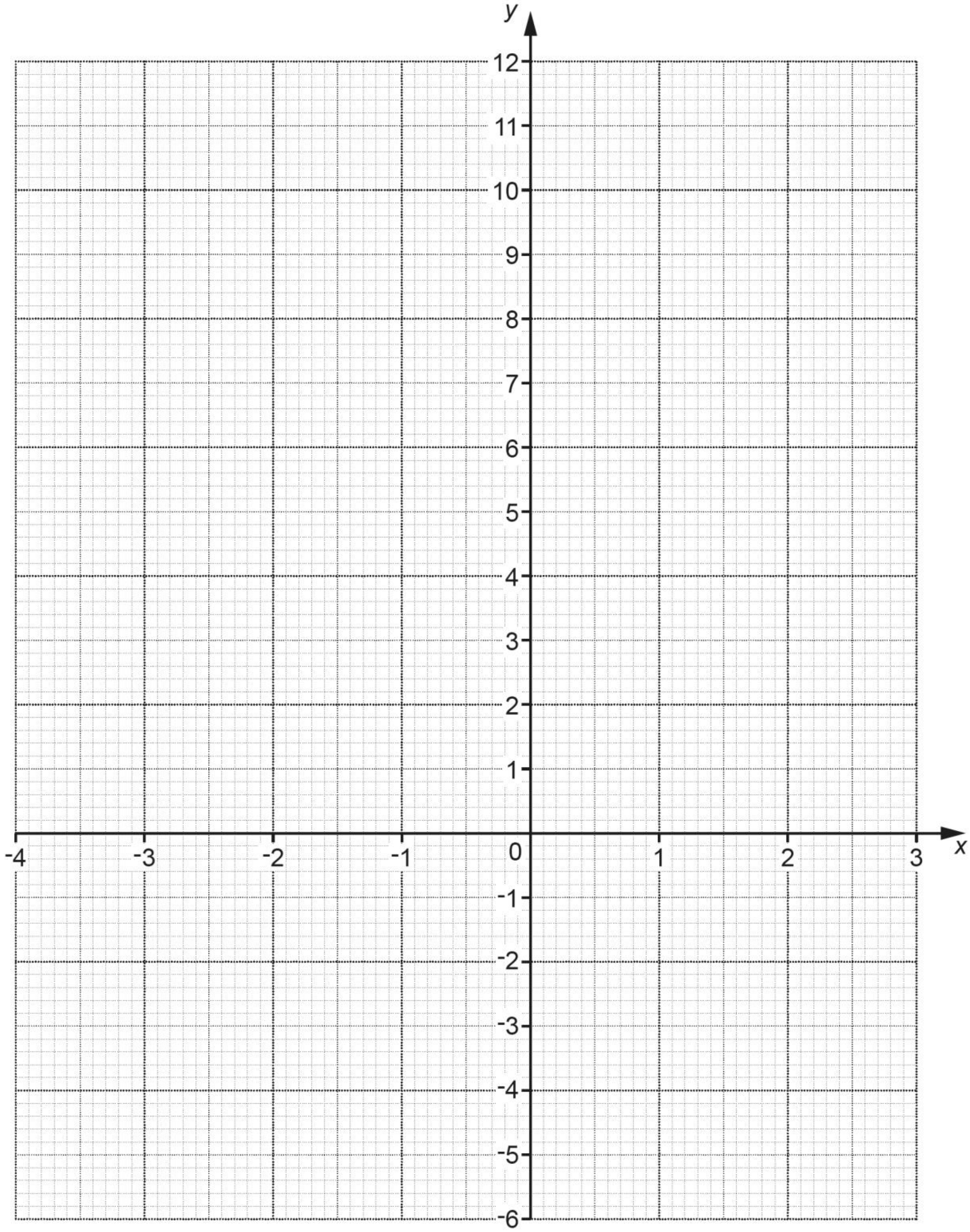
x	-4	-3	-2	-1	0	1	2	3
y		4	-1	-4		-4	-1	4

[2]

Several fully correct answers were seen. Many candidates scored 1 mark, usually for -5. The first value was often -11 or 21 from incorrectly dealing with the negative sign.

Question 22 (b)

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



[3]

Many fully correct answers were seen. Those who attempted this question usually scored at least 1 mark for plotting the given points, with many plotting all the points and gaining 2 marks. Several did not join the points or did so with straight lines. Curves at times were feathered or missed the plotted points and for those who had errors they were not aware of the shape or symmetry of the quadratic curve they were aiming for.

Question 22 (c)

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

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

Candidates who realised the need to use the graph often gave the correct answer(s). With curves not drawn, candidates could not use their graph to solve the equation. Some did attempt to use algebra to work out values despite the question stating "use your graph".

Question 23 (a)

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.

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

Some candidates were able to give the correct answers. Several scored 1 mark, usually for the lower bound of 24.5. 25.4 was a common error for the upper bound.

Question 23 (b)

(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.

.... because ....

....

.... **[3]**

Several candidates realised the need to use their upper bound. Some did not realise the connection between parts (a) and (b). The most common error was to use 25 as the upper bound, regardless of their upper bound in part (a). Many just did the calculation and did not give a reason.

Question 24 (a)

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.

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

Fully correct responses were rare. Where such responses were seen, candidates demonstrated excellent organisational and communication skills. Several candidates who attempted this question gained 1 or 2 of the method marks, mainly for the correct time conversion.

Question 24 (b)

(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)**?

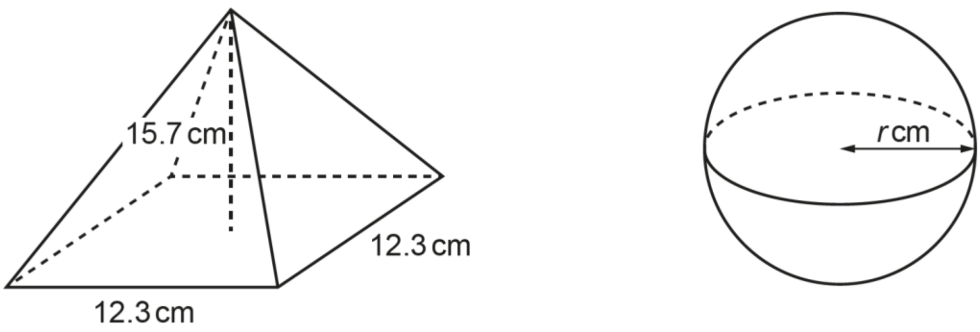
....

.... **[1]**

Many candidates found this question challenging. Some candidates understood the number of days would change but could not decide in what way. Some commented on the speed of the dig rather than the time. A significant number of candidates did not attempt this question.

Question 25

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 $V = \frac{4}{3}\pi r^3$.]

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

A small number of candidates achieved a correct solution for this question with correct working and gained 5 marks. Many made an attempt and several scored 2 marks for correctly showing how to calculate the volume of the pyramid but did not make any further progress. A common error was using 12.3 rather than 12.3 squared. A small number did equate the volume of their pyramid to the given formula for the volume of the sphere, but were then unsure of the next step.

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