Qualification Accredited

Oxford Cambridge and RSA

GCSE (9–1)

Examiners' report

MATHEMATICS

J560

For first teaching in 2015

J560/01 November 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.

Paper 1 series overview

This calculator paper is the first of the three papers taken by Foundation candidates for J560 GCSE (9-1) Mathematics.

Some candidates demonstrated their knowledge and skills well, with clearly set out working and answers. Questions 1 to 12 were generally answered by most candidates but a significant number did not attempt the later questions.

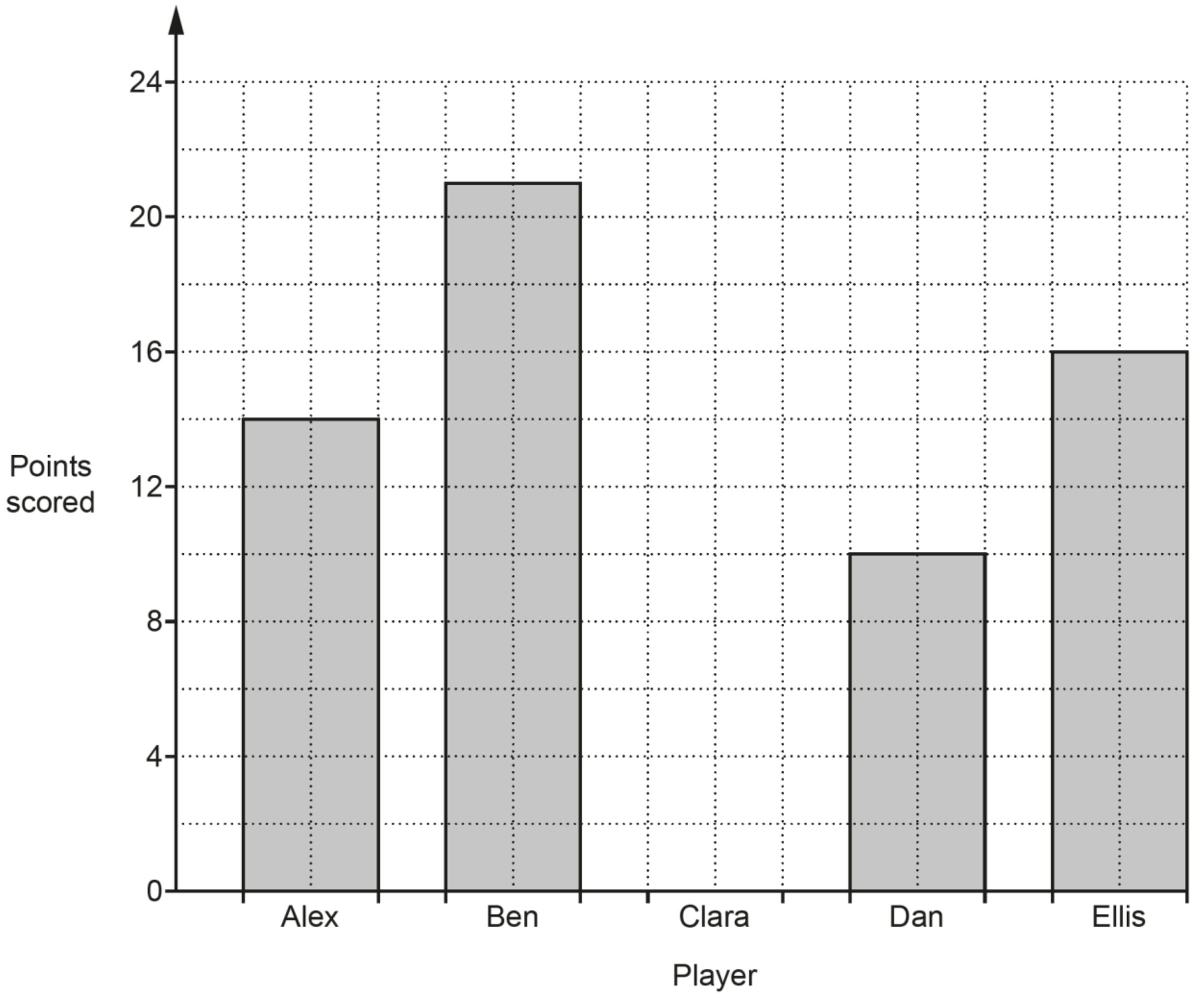
Paper 1 is a calculator paper and candidates should be encouraged to use a calculator, many did not, which resulted in marks not being given due to arithmetic errors. Algebraic work proved more of a challenge with most struggling with the rearrangement of formulae and many misunderstandings with substitution into the velocity formula. Scale drawing questions were particularly inaccessible with a large percentage of candidates making no attempt to answer these questions.

Written responses were often difficult to read and sentences were not well structured. Some candidates seemed to have difficulty in forming numbers correctly and marking often required some browsing of other responses to confirm the number they had presented (for example, letter ‘a’ often looking like a 9 and confusion between 9 and 4 or between 1 and 2 or 7). Responses requiring working frequently presented as working that was illogical and difficult to follow.

Candidates who did well on this paper generally did the following:	Candidates who did less well on this paper generally did the following:
• showed enough working to gain method marks • attempted most of the questions • set out their work in a clear and logical order • used a calculator efficiently.	• missed key points and information from questions, using values from the question in a variety of arithmetic operations without fully understanding what was required • showed less ability with algebra skills • gave too many choices of method in multi-step problems • did not attempt all questions.

Question 1 (a)

1 The bar chart shows the number of points scored by some quiz players.



(a) How many points were scored by Ellis?

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

Most answers were correct.

Question 1 (b)

(b) How many more points were scored by Alex than Dan?

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

Most answers were correct.

Question 1 (c)

(c) Clara scored 13 points.

Complete the bar chart to show this information. **[1]**

Most answers were correct.

Question 2 (a) (i)

2 **(a)** Write down each of the following.

(i) An even number between 11 and 17.

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

This was the most successfully answered part of the question and possibly of the paper. Almost all candidates could write down an even number between 11 and 17.

Question 2 (a) (ii)

(ii) A square number between 15 and 35.

(ii) .... **[1]**

16 and 25 were seen in fairly equal numbers. There were no particularly common wrong answers. A small number of candidates gave answers of 4^2 or 5^2 without evaluation.

Question 2 (a) (iii)

(iii) The cube root of 64.

(iii) .... **[1]**

The term 'cube root' was not well understood. Giving the square root of 64 was much more common. 64^3 was evaluated and given as the answer by some candidates.

Question 2 (b)

(b) 3 is a factor of 51.

Find a factor of 51 between 10 and 20.

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

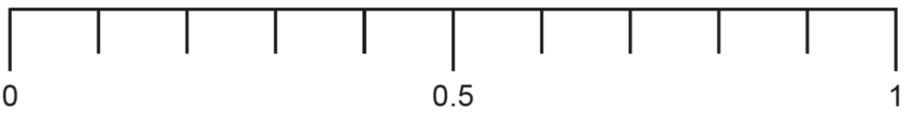
The hint that '3 is a factor of 51' may have led to the high success rate in this question. A small number of candidates produced a factor tree comprising of 51, 3 and 17 but did not give an answer.

Question 3 (a)

3 Amit has 10 toy cars in a box.
4 are red, 3 are blue, 2 are white and 1 is black.
Amit takes a toy car at random.

Mark with an arrow (↓) the probability that the toy car is

(a) red,



[1]

Part (a) proved to be a more difficult concept than part (b). 0.6 and 0.8 were common errors.

Question 3 (b)

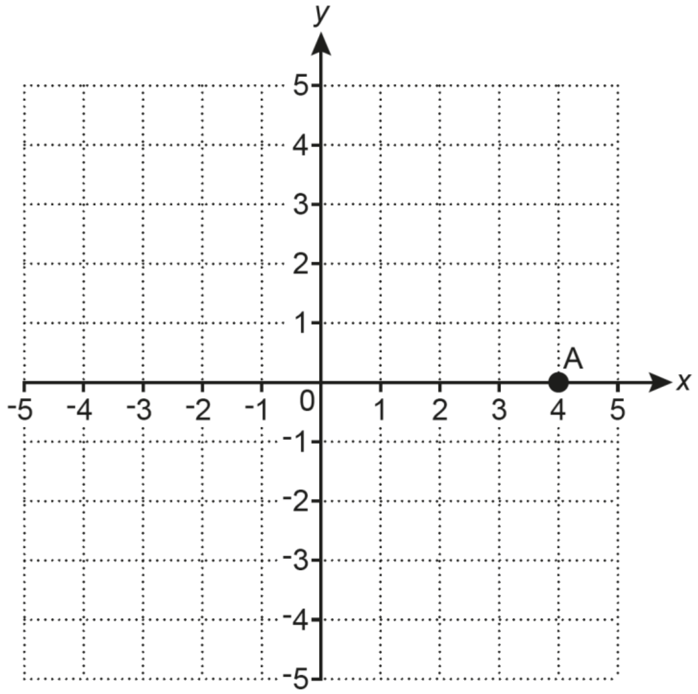
(b) green.

[1]

Most candidates gave the correct answer for this part.

Question 4 (a)

4 Point A is shown on this grid.



(a) Write down the coordinates of point A.

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

Most candidates answered part (a) correctly. The common error was transposing *x* and *y* coordinates.

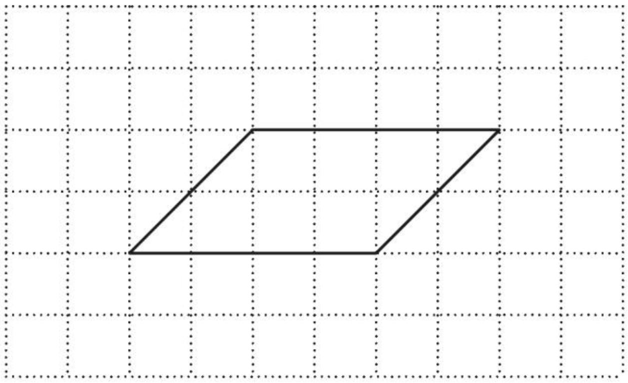
Question 4 (b)

(b) Plot point B on the grid at (3, ⁻3). **[1]**

The most common error was to plot a point at (-3, 3).

Question 5 (a)

5 **(a)** The diagram shows a parallelogram.



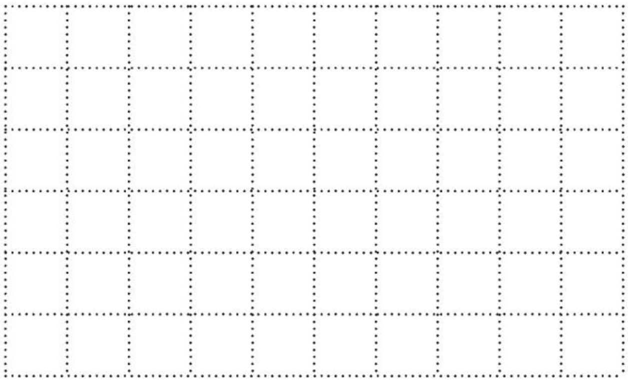
The parallelogram has rotation symmetry of order 2.

Mark the centre of rotation with a cross (X). **[1]**

Most candidates scored the mark for plotting the centre correctly with a minority placing the centre of rotation at one of the corners. Some simply gave the diagonals.

Question 5 (b)

(b) On the grid below, draw a four-sided shape that has rotation symmetry of order 4.



[1]

The majority answered correctly by drawing a square. A variety of wrong answers were seen, a rectangle being the most common.

Question 6 (a)

6 Use one of these symbols $<$, $=$ or $>$ to make each statement true.

(a) 0.8 .... $\frac{4}{5}$ **[1]**

Question 6 (b)

(b) 4^2 .... 9 **[1]**

Both parts were well answered.

Question 7

7 Morgan makes 15 cakes.
Each cake needs a piece of ribbon 18 cm long for decoration.

Ribbon is only sold in rolls of 1.2 metres, which can then be cut into 18 cm pieces.
One roll of ribbon costs 92p.

Calculate the cost of the ribbon that Morgan must buy to decorate the 15 cakes.
You must show your working.

£ .... **[4]**

Almost all candidates attempted the question. While a full clear method was sometimes lacking, sufficient working was shown to enable the credit of full marks for the correct answer in almost every instance. The mark scheme's two methods were seen with similar frequency. Those who started by finding the total length of ribbon required (15 × 18 = 270) were more likely to continue with clear method or reasoning, such as one roll = 120 cm, two rolls = 240 cm, three rolls = 360 cm, so 3 rolls required. Candidates who found the number of cakes that could be decorated with one roll (120 ÷ 18 = 6.67) often struggled to fully justify why 3 rolls were needed.

A common error was to assume each cake needed one roll, leading to 15 × 92p = £13.80. For others, a common starting point was to find 92 × 15 (the cost of one roll of ribbon, multiplied by the number of cakes), suggesting that these candidates had not interpreted all the information given in the question and so were unable to identify all the necessary calculations to solve the problem.

Misconception

? In problems where a quantity of material is needed for a particular purpose, the quantity purchased may have to be more than required and there may be some left over. In Question 7, some candidates did not realise the need to buy full rolls.

Question 8

8 Blake changes £450 into dollars.
£1 is worth 1.34 dollars.

Blake says

450 ÷ 1.34 = 335.82
Therefore, £450 is worth 335.82 dollars.

Is Blake correct or incorrect?
Give a reason for your decision.

Blake is .... because ....

.... **[1]**

The most successful answers identified that the error in the given calculation was to divide rather than multiply. Many candidates could not express the given information correctly in words, so phrases, such as 'a dollar is worth more than a pound', were very common. Some candidates only checked the given calculation and stated 'correct'.

Question 9 (a) (i)

9 **(a)** Simplify.

(i) $5r - 7t - 3r + 2t$

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

Several candidates were able to give the correct response for 2 marks. For others, the negatives proved a problem. Common responses such as $2r$ +– $5t$, $2r - 9t$ and $2r + 9t$ scored 1 mark.

Question 9 (a) (ii)

(ii) $a \times a \times a \times a \times a$

(ii) .... **[1]**

There were many correct answers with 5a being a frequent wrong answer. 5a^5 was also seen.

Question 9 (a) (iii)

(iii) $7b^5 \div b$

(iii) .... **[1]**

This part was not as well answered as the first two parts, common incorrect answers were 7b, and 7^5.

Question 9 (b)

(b) Factorise.

$4a - 12b$

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

Many correct answers were seen. Candidates who did not know how to factorise often combined the terms in several ways with –8ab being the most common, others included 48ab.

Question 10 (a)

10 (a) One morning Harper records the first 50 vehicles to pass the school gate.
Harper's results are shown in this table.

Type of vehicle	Number
Car	31
Lorry	3
Motorbike	7
Van	9

Use Harper's results to estimate the probability that the next vehicle will **not** be a motorbike.

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

Candidates often knew that probability adds up to 1 (or 100%) and usually added up the groups other than motorbike to 43. Many were then able to express this in the correct form for 2 marks. Incorrect answers included $\frac{7}{50}$, 43% and $\frac{1}{4}$.

Question 10 (b)

(b) One afternoon Reece records some vehicles that pass the school gate.
$\frac{2}{5}$ of the vehicles they record are cars.

For Reece's results, write down the ratio of cars to not cars.
Give your answer in its simplest form.

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

This part was less well answered than the first part. Candidates sometimes tried to link it to the results from part (a) and did not always understand the connection between a fraction and a ratio. 2 : 5 was a common incorrect response.

Question 11 (a)

11 Write a number in each box to make each statement true.

(a) $\square - 7 = -11$ **[1]**

Answers seen were mainly correct. The most common incorrect responses were 4, 18 and –18.

Question 11 (b)

(b) $\dfrac{3}{\square} \div 2 = \dfrac{3}{10}$ **[1]**

Many correct answers were seen, with the most common error being 20.

Question 11 (c)

(c) $\dfrac{\square}{\square} \times \dfrac{2}{3} = \dfrac{3}{5}$ **[1]**

This part was less well answered, with a variety of fractions seen. A denominator of 15 was common.

Question 12 (a)

12 Here are the first four terms of a sequence.

7 15 23 31

(a) Write down the next term of the sequence.

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

Generally, answers were correct.

Question 12 (b)

(b) Explain how you worked out your answer.

.... **[1]**

Mainly correct responses were seen. A small number just stated they had found the difference but did not say that it was 8. Others mentioned 8 but did not say that they had added this to the previous term.

Question 12 (c)

(c) Explain why 80 is **not** a term in this sequence.

.... **[1]**

A wide variety of responses were seen here. Candidates who stated that all the terms in the sequence were odd, but 80 is even, almost always gave a clear enough explanation to score the mark.

Many opted to take a more complex approach by looking at the difference and using it to find further terms in the sequence. These were sometimes successful, but many gave only partial explanations that did not fully explain why 80 does not appear.

Question 13

13 At the end of each day, a driver works out the mean distance they have driven so far that week.

At the end of 5 days, the mean distance they have driven is 185.5 miles per day.
At the end of 6 days, the mean distance they have driven is 190 miles per day.

Work out how many miles the driver drove on the sixth day of that week.

.... miles **[4]**

Few fully correct answers were seen. Although many started with the correct first steps of multiplying the mean distances by the relevant number of days to reach the total miles, this work was frequently abandoned. Of those who realised that they needed the total number of days many gave the final answer as 1140, from 190 × 6, without reference to the first 5 days. Others added the two 'miles per day' values together and then divided by 2 showing some understanding of mean but not in this context. Most had no real understanding of what the question was asking, and most candidates seem to consider that mean is always 'add together and divide by how many there are'. Some candidates divided by 5 or 6.

Question 14

14 Box A contains 56 books.
Box B contains 75 books.

Ling has read $\frac{5}{7}$ of the books in box A.
Ling has also read the same number of books in box B.

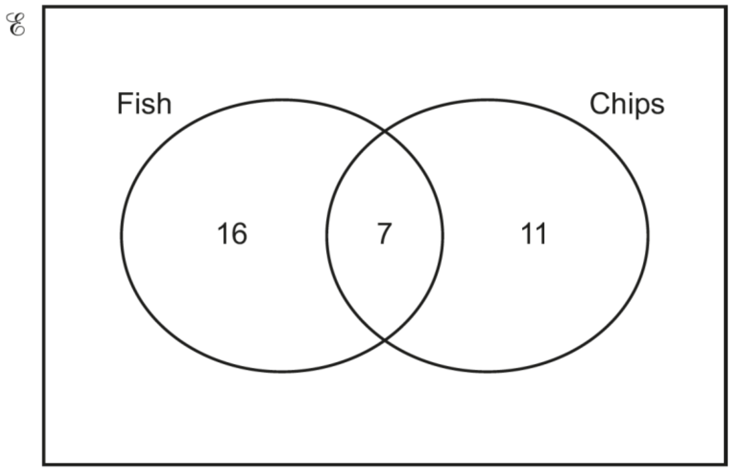
Work out the fraction of the books in box B that Ling has read.
Give your answer as a fraction in its lowest form.

.... **[3]**

Candidates were often able to find the number of books read for box A as $\frac{5}{7} \times 56 = 40$. This interim answer was not used by many in subsequent working. Instead, they started again, finding $\frac{5}{7}$ of 75 = 53 books read for box B, leading to a final answer of $\frac{53}{75}$.

Question 15 (a)

15 A researcher asked 53 customers leaving a fish and chip shop what they had bought.
The Venn diagram shows some of the results.



(a) How many customers bought chips but not fish?

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

Most candidates gave the correct answer though answers of 4 and 18 were seen.

Question 15 (b)

(b) Complete the Venn diagram to show the number of customers who did not buy fish or chips. **[2]**

Most correctly added 19 to the diagram, with a wrong value of 34 also seen. Where slips in arithmetic arose, those who showed their method earned a mark. Only a very small number calculated 19 but did not add it to the diagram.

Question 15 (c)

(c) One of the 53 customers is chosen at random.

Write down the probability that this customer bought fish.

(c) .... **[2]**

Many scored both marks, the most common incorrect answer was $\frac{16}{53}$.

Question 16 (a)

16 (a) Rearrange this formula to make *d* the subject.

$f = 5d + 4$

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

Few correct answers were seen, the majority were unable to complete the first step correctly, with many shuffling the values and variables around to make a new formula without showing any understanding of algebraic rearrangement. Some showed a correct first step, for example writing '− 4' next to the formula but were unable to execute this correctly. The 4 was rarely subtracted from both sides, division by 4 was frequently seen.

Question 16 (b)

(b) Use the formula

$v = u + at$

to find the final velocity, when

- the initial velocity is 5 m/s
- the acceleration is 7.5 m/s^2
- the time is 6 seconds.

(b) .... m/s **[2]**

Although some candidates were able to give the correct answer, many were unable to answer this question. Most realised that *a* represents acceleration and *t* is time, but many did not know what *u* and *v* stand for. Confused by the units of acceleration, some squared 7.5 when substituting. Very few candidates gained just a method mark here as those who used the correct method almost invariably went on to arrive at the correct answer to score both marks.

Question 17

17 The density of gold is 19.3 g/cm^3.
Sam has a gold nugget of volume 7.5 cm^3.

Calculate the mass of the gold nugget.

.... g **[2]**

Candidates who understood the relationship between mass, density and volume were able to give the correct answer. A common error was to divide rather than multiply. Candidates also included the units in their calculation, cubing the quantities in error.

Misconception

? A unit of measurement defines the magnitude of a quantity. Units of measurement may contain index notation, such as acceleration (m/s^2), volume (cm^3) and density (g/cm^3). Some candidates mistakenly include the index notation in their calculation.

Exemplar 1

$19.3^3 \times 7.5^3 = 3032883.422$

3032883.422 g **[2]**

This exemplar shows the misconception of including the units in the working.

Question 18

18 In 2019, comet A and comet B were both seen from Earth.
Comet A is seen from Earth every 84 years.
Comet B is seen from Earth every 105 years.

Find the next year when both comets will be seen from Earth.

.... **[4]**

Most candidates were able to make a correct start with many going on to reach the correct answer. Some found the LCM but stopped at that point and did not use it to find the year when both comets would next be seen. The most common approach was to list years, but many made arithmetic errors. Candidates who made separate lists of years for Comet A and Comet B were much more likely to be successful than those who presented a combined list of years in chronological order, or those who set working out in no clear order. A small number of candidates misunderstood the question and gave the 2 years that the comets would next appear.

Exemplar 2

A = 84, 168, 252, 336, $\underline{420}$

B = 105, 210, 315, $\underline{420}$, 525, 630

.................420................. **[4]**

This candidate has clearly found the LCM and scored 3 marks. Had they added this to 2019 they would have scored 4 marks.

Question 19

19 Eve is counting the photos on her phone.
The ratio of the number of photos of her family to photos of her friends is 3 : 7.
She has 450 photos of her family.
80% of the photos of her friends include Jack.

Work out how many of the photos of her friends include Jack.

.... **[4]**

Many candidates knew how to start this question, dividing 450 by 3 for M1, but often did not progress further. Some managed to obtain 1050 for M2. A common misconception was to add the parts of the ratio together and then divide 450 by 10.

Question 20

20 Rowan invests £4000 at a rate of 3.5% per year compound interest.

Calculate the value of Rowan's investment after 5 years.
Give your answer correct to the **nearest penny**.

£ .... **[3]**

Many candidates gave the correct answer and gained full marks, others did not give their answer to the nearest penny. Other common errors included the use of 3.5^5, 1.35 and finding the interest for one year and multiplying by 5 (simple interest). Candidates that calculated the compound interest using a year-by-year approach often made more errors than those that used the formula. Candidates should be encouraged to use their calculator efficiently to answer questions of this type.

Exemplar 3

$$P\left(1+\frac{r}{100}\right)^{n}$$

$$4000\left(1+\frac{3.5}{100}\right)^{5}$$

$$= 4750.745$$

£ 4750.745 **[3]**

Candidates should make sure they answer the question fully. The final mark was not given as the answer had not been given to the nearest penny.

Question 21 (a)

21 The table below shows the approximate population of three countries in 2020.

Country	Population
China	1.44×10^9
Kiribati	1.19×10^5
Tuvalu	1.18×10^4

(a) Calculate the approximate total population of Kiribati and Tuvalu in 2020.
Give your answer in standard form, correct to **3** significant figures.

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

130800 was a very common interim or final answer but many candidates then struggled to round to 3 sf and put this into standard form – some could do one of these steps but very few could do both correctly. Most candidates changed the two populations into ordinary form, often correctly, but then frequently made an error in column alignment when adding. The few candidates who stayed in standard form were generally more successful. Candidates should be encouraged to use their calculator to answer questions of this type.

Question 21 (b)

(b) Show that in 2020 the population of China was approximately 120 000 times the population of Tuvalu. **[2]**

Most converted the values into ordinary form, often stopping at this point with no further processing. The second method on the mark scheme was the most frequently seen and the most successful ($1.8 \times 10^5 \times 120\,000$). This was followed by the first method (population of China ÷ population of Tuvalu). There were only a few instances of the third method occurring (population of China ÷ 120 000). Subtraction rather than division in the first method was common.

Question 22

22 A theatre has an adult price and a child price for their shows.

A group of 4 adults and 5 children paid a total of £136.
A group of 3 adults and 2 children paid a total of £81.

Work out the price for one adult and the price for one child.
You must show your working.

Price for one adult £ ....

Price for one child £ .... **[5]**

Very few candidates attempted the algebraic route, preferring some incomplete trial and improvement. There was often no logical starting values and very few candidates substituted values into both conditions. A large number tried to make some progress by dividing the amounts (136 and 81) by various combinations of adults and children, e.g., 136 ÷ 9 or 81 ÷ 5. The most common mark was SC1 from two values in the answer that satisfied one of the conditions.

Question 23

23 An examination has three papers.
Paper 1 is marked out of 60.
Paper 2 is marked out of 40.
Paper 3 is marked out of 100.
The three marks are added together to form the total mark out of 200.

A student scored 65% on Paper 1 and 70% on Paper 2.

Find the mark they need to get on Paper 3 to achieve 64% of the total marks.
You must show your working.

.... **[5]**

Most correctly found the marks scored in paper 1 and paper 2. Many went on to calculate 128 as the total mark required from 200. Candidates who found 128 (64% of 200) usually obtained the correct answer of 61. Many used 64% of 100 rather than 200 and assumed that this was the answer they needed.

Question 24

24 B is 12 km due east of A.
C is south-east of A and on a bearing of 225° from B.

Complete the diagram to show the positions of A, B and C.
Show clearly the values of all three angles in triangle ABC.

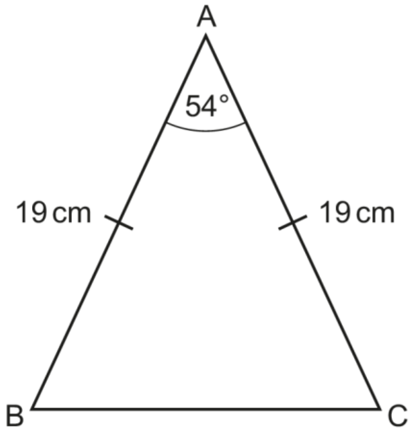
Scale: 1 cm represents 2 km

[4]

There was a high omission rate on this question. Candidates who attempted this question often demonstrated insufficient knowledge of the points of the compass and the equivalent bearings.
Some candidates were able to mark the position of point B as 6 cm east of point A. A small number of these candidates also found a possible location for point C, either from A or from B but extremely rarely from both. The fully correct solution of an accurate isosceles triangle with angles marked was completed by only a very small number of candidates.

Question 25

25 The diagram shows an isosceles triangle, ABC.



Not to scale

AB = AC = 19 cm.
Angle BAC = 54°.

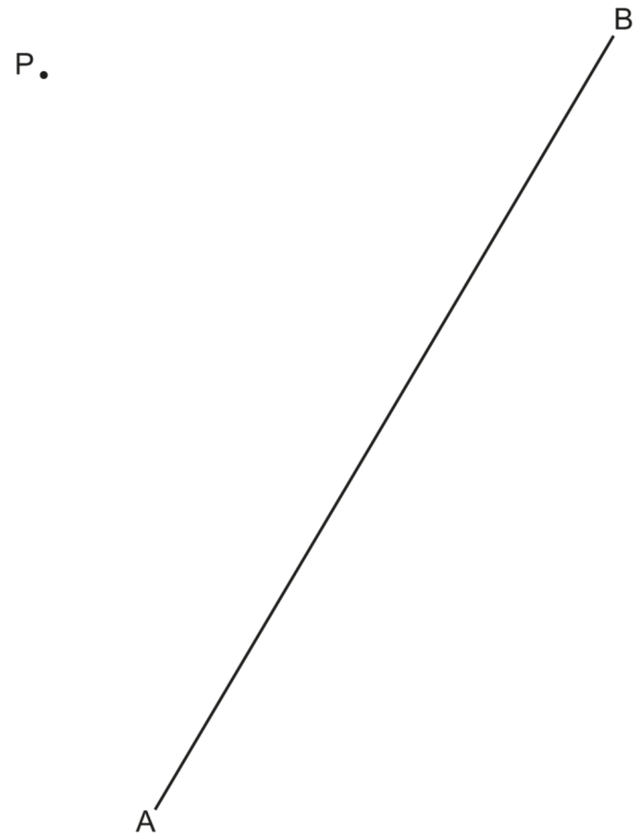
Calculate the length of BC.
You must show your working.

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

Many candidates did not attempt this question. Of those who did very few gained any marks as few realised the need to use trigonometry. The majority of candidates saw the isosceles triangle and calculated the size of the base angles.

Question 26 (a)

26 (a) Construct the perpendicular from the point P to the line AB.

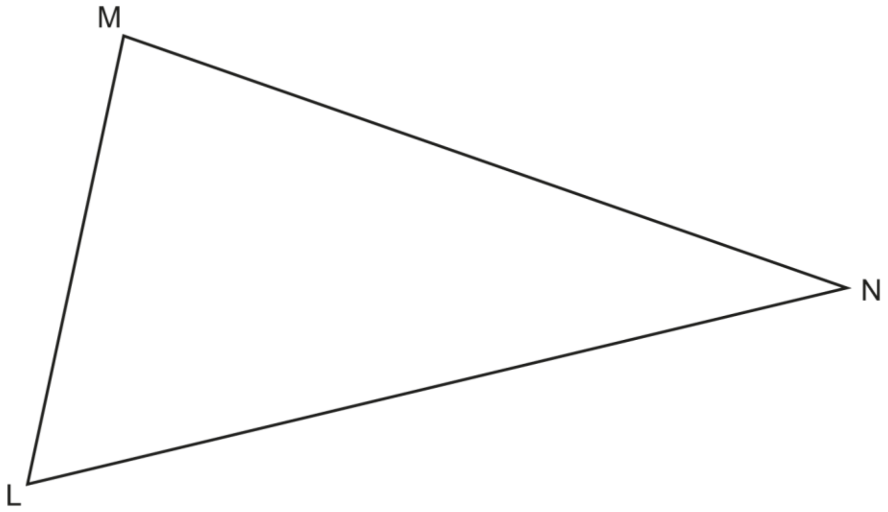


[2]

This question had a high omission rate. Of those who attempted this question, a small number drew a ruled line from P but most of these were not perpendicular to the line AB and often met the line at approximately its mid-point. Others drew a line through P that was parallel to line AB and a drawing of triangle APB was also quite common. It was very rare to see any construction arcs that could be considered as having been used to construct the perpendicular.

Question 26 (b)

(b) The diagram shows a field LMN.



A tree is to be planted in the field so that it is

- the same distance from the fences MN and ML

and

- the same distance from corner M as from corner N.

Show, by construction, whether this can be done or cannot be done.

This .... be done. **[5]**

This part also had a high omission rate. Very few could interpret the information given in the question as requiring angle bisector and perpendicular bisector constructions. A small number produced some ruled lines but these were almost always inaccurate, and these candidates often drew attempts to bisect all angles or all sides. Other candidates marked a point within the triangle without any justification for its location. Productive construction arcs were extremely rare. Several candidates responded 'can' or 'cannot' without attempting the construction.

Question 27

27 A bag contains 35 balls.
Each ball is either red or green.
The ratio of red balls to green balls is 3 : 2.

Work out the smallest number of balls of each colour that have to be added to the bag so that the ratio of red balls to green balls becomes 7 : 3.
You must show your working.

Number of red balls added to the bag = ...

Number of green balls added to the bag = ... **[5]**

Of the few candidates who made any reasonable attempt at this question most established that the bag had 21 red and 14 green balls, though some only calculated 35 ÷ 5 = 7. Correct answers of 14 and 1 were very rare as few could progress from this point. An additional B1 was scored by many for one of the pairs of acceptable numbers in the ratio 7 : 3 (usually 49 and 21 or 28 and 7).

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