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GCSE (9–1)

Examiners' report

MATHEMATICS

J560

For first teaching in 2015

J560/03 Summer 2024 series

Version 2

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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 that 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 3 series overview

This cohort of candidates appeared better prepared for the assessment than last summer.

The more successful candidates attempted almost all of the questions. Less successful candidates still worked through much of the paper, although with a significant number of later questions not attempted.

Some very well-organised and concise solutions were seen and many candidates showed working to support their answers.

Many candidates gained a significant number of marks in the early questions and also on those questions set in an 'everyday' context.

Candidates appeared confident in changing the form of a value so that numbers could be compared (e.g. changing a fraction to a decimal, or percentage), but less successful candidates sometimes struggled with the comparisons (for example in Question 13 (a), where some thought that 0.625 was greater than 0.64, presumably because of the extra decimal place).

A significant number of candidates chose to change fractions to their decimal form in order to carry out processes (such as finding a fraction of an amount), rather than working with the fraction. Often they then used a rounded decimal and so lost accuracy.

When asked to plot and draw a graph (Question 16 (a)), a surprising number of candidates only plotted points and did not draw a curve. Some incorrectly used a ruler to join points on a curve. Most candidates would benefit from using a sharper pencil.

Many candidates used very time-consuming basic techniques to solve relatively simple processes, such as division. When $20 \div 1.19$ was required (Question 8), long lists were often seen of additions of 1.19, or subtractions of 1.19 from 20. It wasn't unusual for these to also lead to errors. Candidates should be familiar with using their calculator effectively to carry out processes such as division.

Most candidates did not understand the process of a geometric proof.

Candidates need to develop abstract thinking skills and how to apply algebra to everyday situations. Most could not apply algebra in the context of a 2-dimensional problem.

When giving reasons to explain a situation, many were poorly expressed and often incoherent. Most candidates appeared to not know what an 'assumption' was.

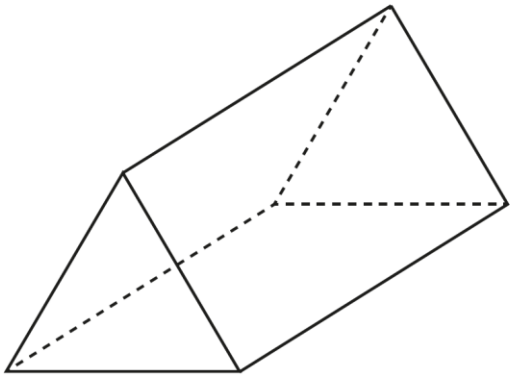
Some candidates did not understand key mathematical vocabulary.

Candidates who did well on this paper generally:	Candidates who did less well on this paper generally:
• showed clear, logical working, using some annotation and units, while also deleting any incomplete or abandoned methods • responded clearly to the demands of each question, suggesting that the questions had been read carefully and the solution planned • wrote concise reasons when asked for an explanation • scored well on the early parts of the paper and avoided careless mistakes • were practised in standard mathematical techniques and could apply these accurately • demonstrated good calculator skills • were suitably prepared with problem solving techniques for longer questions • were familiar with algebraic rules and used them correctly • used multipliers to find percentages rather than non-calculator methods • worked confidently with fractions and divisions rather than using inefficient or trial and improvement methods • understood and could use mathematical definitions and vocabulary • plotted points accurately using a sharp pencil, drawing a curve through the points • wrote clearly and carefully, with legible letters and numbers • knew metric conversion factors and could apply them.	• wrote disorganised working, with no clear choice of method leading to the answer • did not appear to have read the questions carefully and did not plan solutions • wrote imprecise statements when asked for an explanation • made errors on the early questions • were not aware of algebraic rules • used lengthy non-calculator techniques to find percentages and used repeated subtraction for divisions, when the calculator could be used efficiently to save time and avoid errors • could not apply formulae from the formulae sheet correctly in the context of the question • did not have a ready knowledge of standard techniques to approach questions • plotted points imprecisely using a blunt pencil, • connected plotted points with an inaccurate curve or straight lines, or did not connect the points at all • were unsure of mathematical definitions • did not write clearly and legibly • did not know metric conversion factors.

Question 1 (a)

1 **(a)** Write down the mathematical name of this solid.
Choose from the list in the box.

cone	cube	cylinder	prism	sphere

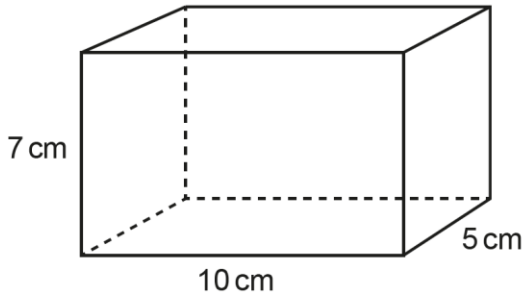


(a) ..... **[1]**

This question was almost always correctly answered. A very few candidates chose 'cone' or 'cylinder'.

Question 1 (b) (i)

(b) The diagram shows a cuboid.



(i) How many edges does the cuboid have?

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

A fairly significant number of candidates did not answer this correctly. 8 was a common incorrect answer, perhaps through confusing 'edges' with 'faces', but 9, 10 and 11 were also seen.

Question 1 (b) (ii)

(ii) The cuboid has dimensions 10 cm, 7 cm and 5 cm.

Work out the volume of the cuboid.

(ii) ..... cm^3 **[2]**

Most candidates showed working for this question. The best candidates showed the whole calculation and gave the correct answer. Some did it in stages.

Common errors were to instead calculate the cuboid's surface area, or to sum all the lengths of edges around the cuboid (presumably from confusion with perimeter), both of which involved lengthy calculations.

70 and 35 (from the area of single faces) as well as 22 were also common wrong answers.

Some candidates found the volume of 350 and then divided by 2.

Question 2

2 This table shows the weight of each ingredient used to make 5.5 kg of concrete.

Complete this table to show the weight of each ingredient used to make 44 kg of the same concrete.

Ingredient	Weight (kg)	Weight (kg)
Cement	1	8
Gravel	3	
Sand	1.5	
Total weight	5.5	44

[2]

A significant number of candidates answered this correctly, though often not showing any working.

A common error was to give 18 and 18, but there was no discernible pattern to the wrong answers. Some values given did not sum to 36.

A surprisingly large minority did not attempt the question.

Question 3 (a) (i)

3 **(a)** Use your calculator to work out.

(i) 6^4

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

This was almost always correct, though a very few gave responses such as 10, 18, 24, 72 or another number.

Question 3 (a) (ii)

(ii) $\sqrt{529}$

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

This was often correct. There was no clear pattern to the few wrong answers.

Question 3 (b)

(b) Complete this statement to make it correct.
Give your answer as a number in ordinary form.

$\sqrt[3]{\quad\quad\quad\quad\quad} = 12$

[2]

Candidates often scored 2 marks here. Very few showed working; those that did generally wrote 12 × 12 × 12 or, rarely, 12^3.

Less successful responses didn't show recognition of the cube root; 36 (from 12 × 3) and 144 were common errors.

Question 4

4 A watch costs £207.50.
The exchange rate is 1 dollar ($) = £0.83.

Calculate the price of the watch in dollars ($).

$ ..... **[2]**

Around half the candidates got the correct answer. The common error was to multiply by the exchange rate, leading to 172.225.

Question 5 (a)

5 (a) Work out $\frac{2}{3}$ of 103.

Give your answer correct to **1** decimal place.

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

Most candidates scored at least the method mark here for having '103 × 2', '103 ÷ 3' or '$\frac{2}{3}$ × 103'. Some candidates however had incorrect calculations such as '103 × 3' or '103 ÷ 2'.

Many responses chose to work in decimals from the start and made attempts to convert $\frac{2}{3}$ to a decimal. This was often truncated or rounded and accuracy was lost.

Candidates should be aware that statements such as '$\frac{2}{3}$ of 103' will not score a method mark as no operation is shown.

Assessment for learning

Candidates should practice using fractions on the calculator.

Question 5 (b)

(b) Write 400 metres as a fraction of 2 kilometres.
Give your answer in its simplest form.

(b) ..... **[3]**

A large number of candidates did not get this right, very often due to incorrect kilometre to metre conversions. 200 metres was a popular conversion, leading to fractions such as '$\frac{400}{200}$'.

Others did not convert and both '$\frac{2}{400}$' and '$\frac{400}{2}$' were seen.

Some candidates gained **B2** for '$\frac{400}{2000}$', with either incomplete or no further simplification.

Assessment for learning

Candidates need to be familiar with metric conversions.

Question 6 (a)

6 Finley and Gabi share £14 in the ratio 1 : 3.

(a) Write down the letter of the correct calculation to work out **Gabi's** share.

A: $\frac{1}{3} \times 14$ B: $\frac{3}{1} \times 14$ C: $\frac{3}{4} \times 14$ D: $\frac{4}{3} \times 14$

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

Many candidates gave the correct answer of C. Some wrote their calculation on the answer line rather than the letter, but this was accepted if correct.

The common incorrect responses were A and D, but B was also given by some.

Question 6 (b)

(b) Work out **Finley's** share.

(b) £ ..... **[2]**

Candidates who chose the incorrect answer in part (a) often did not get this right, but many gave the correct answer.

'$\frac{1}{3}$ × 14' was a common incorrect method. Some responded with 10.50.

Question 7

7 A circle has radius 8 cm.

Work out the area of the circle.

..... cm^2 **[2]**

Many candidates gained at least the method mark here for $8^2\pi$ and many gained the second mark for correctly evaluating their formula.

Common incorrect methods included $8\pi^2$, $4^2\pi$ and $16^2\pi$, as well as calculations of the circumference.

Question 8

8 Kai buys some keyrings.
Each keyring costs £1.19.
Kai pays with a £20 note and buys the largest number of keyrings possible.

How much change should Kai receive?

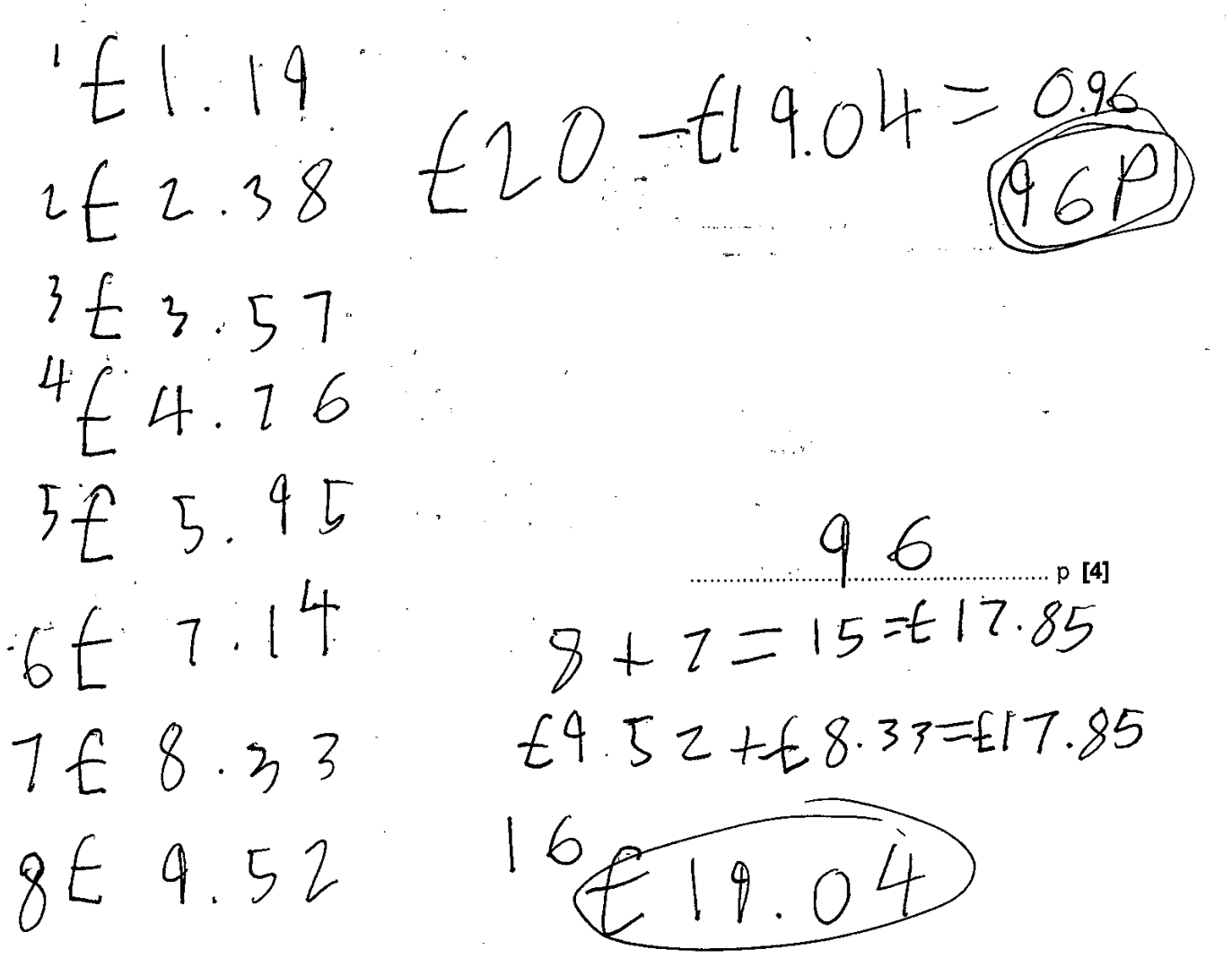
..... p **[4]**

A significant number of candidates continue to struggle with dividing. Many carried out repeated addition of 1.19, sometimes making errors along the way. Some may have carried out the division on their calculator and were unsure how to interpret the answer 16.8067... so attempted addition instead, but candidates ought to be familiar with interpreting values.

Some candidates calculated '20 ÷ 1.19 = 16.81…', but then treated this as the cost of the keyrings rather than the number of keyrings. This lead to calculations such as '20 – 16.81', or they added 1.19 to their 16.81.

Some carried out the division and then responded '16'. Candidates should ensure they have carefully read the question.

Exemplar 1



This exemplar demonstrates the inefficient method of repeated addition. The candidate does reach the correct answer in the end, but even though they skip ahead to the cost of 15 and 16 keyrings rather than carry on the individual counting, they will still have cost themselves quite a bit of time in this method.

Assessment for learning

Candidates need to practise efficient calculator methods and become familiar with using them, as well as interpreting their results.

Question 9 (a)

9 When Layla walks to school she always takes 28 minutes.
When Layla cycles to school her speed is double her walking speed.

(a) One day Layla leaves home at 0820 and cycles to school.

Find the time that Layla arrives at school.

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

A significant number of candidates correctly answered this and most showed their working. Good understanding of time, distance and speed was demonstrated, as well as usually time given in a correct format too. Candidates were rarely awarded 1 mark out of the 2 since most that reached the B1 for '14 [minutes]' carried on to a fully correct answer.

Less successful responses treated 'doubling speed' as 'doubling time', leading to a common incorrect response of 09:16.

Poor arithmetic and careless errors were seen occasionally both here and the following part (b).

Question 9 (b)

(b) On another day Layla cycles half-way to school.
She walks the rest of the way at her normal walking speed.

Find how many minutes Layla takes to get to school on this day.

(b) ..... minutes **[3]**

Quite a number of candidates correctly found the journey time as 21 minutes from 7 + 14, but a significant number made mistakes with halving and doubling.

Many of those who in part (a) had the incorrect response '09:16' did manage to calculate the correct times here and gained full marks. Those who had made other misconceptions in part (a) generally did not score here, but a few who had given clear working in (a) did pick up 'Follow Through' marks.

A common incorrect method was to halve the cycle time yet not halve the walking time.

08:41 (from 08:20 + 21) or the correct 'Follow Through' time were sometimes given as answers, but rarely.

Stronger responses clearly labelled 'walking time' and 'cycling time' and showed how they found them, which helped them avoid confusion.

Question 10 (a)

10 (a) Simplify.

$h \times h \times h \times h$

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

Many correct answers were seen. Common errors were $4h$ (or $h4$), h^3 and 4^h. Sometimes H was used, but condoned.

Question 10 (b)

(b) Factorise fully.

$3fg + 12g$

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

Correct solutions were in the minority here.

Partial factorisations were seen, almost always $3(fg + 4g)$ and very rarely $g(3f + 12)$.

A number of candidates extracted $3g$ as a common factor but gave the answer $3g(f + 12)$.

Most candidates did not demonstrate knowledge of factorisation and showed misunderstanding of algebraic rules. Answers such as $36fg$ or $15fg^2$ were common.

Assessment for learning

Candidates need to be familiar with standard algebraic processes.

Question 11 (a)

11 Choose a word from this list which best describes each statement.

Equation	Expression	Formula	Identity	Inequality	Term

(a) $x^2 + 3x + 2$ **(a)** ..... **[1]**

Fewer than half the candidates correctly identified this as an 'Expression'. A large number chose 'Equation', even despite the lack of an equals sign.

Question 11 (b)

(b) $(x+1)(x+2) = x^2 + 3x + 2$ **(b)** ..... **[1]**

Few recognised this as an 'Identity'. 'Equation' and 'Formula' were popular incorrect answers.

Assessment for learning

Candidates need to know and be familiar with algebraic words.

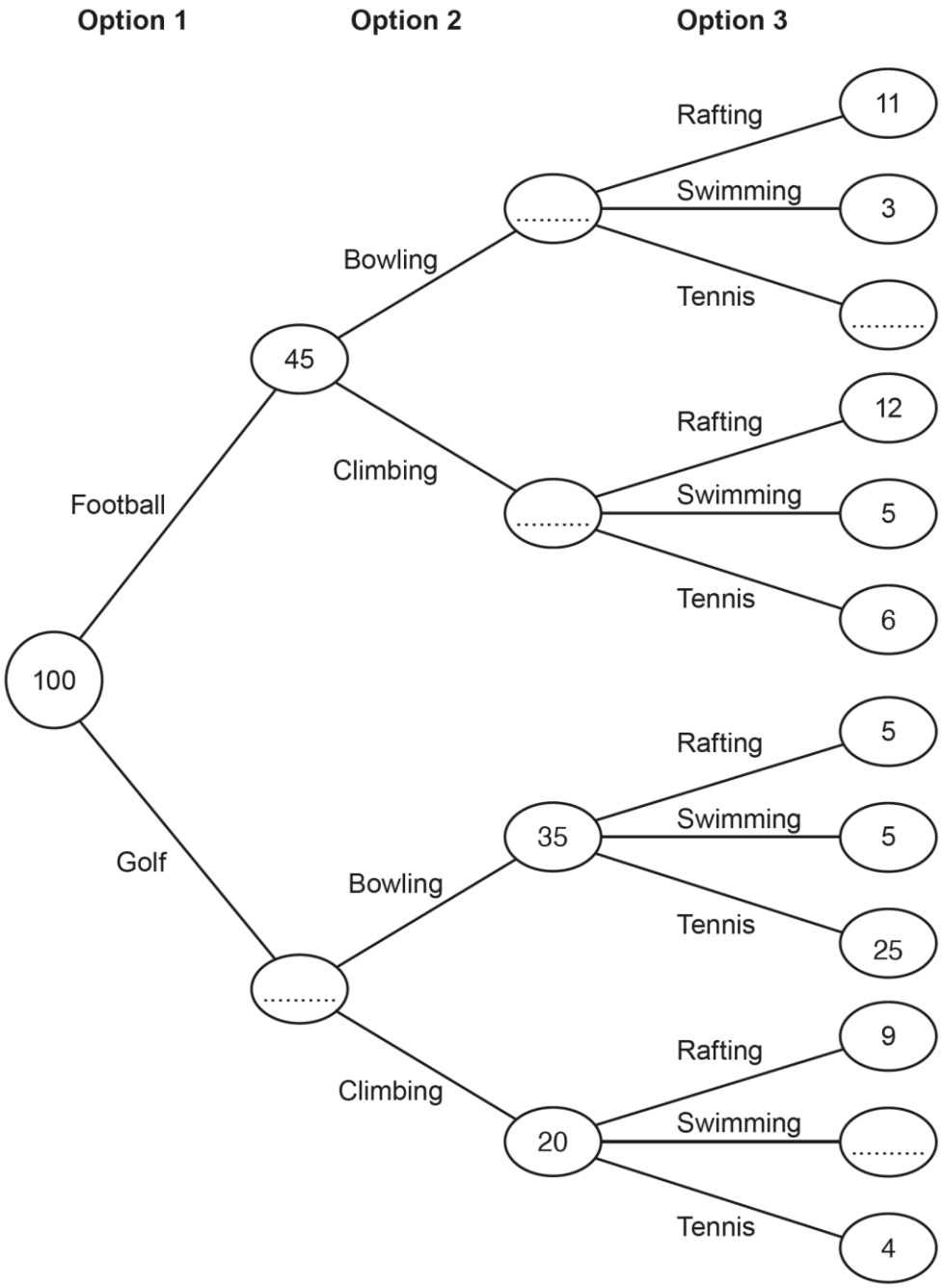
Question 12 (a)

12 At an adventure park, all children participate in three activities, choosing exactly one activity from each of three options.

Option	Activity
1	football or golf
2	bowling or climbing
3	rafting or swimming or tennis

On one Monday morning, 100 children visited the adventure park.

The frequency tree shows the number of children choosing some of the activities.



(a) Complete the frequency tree. **[3]**

Many candidates gained 3 marks for a correctly completed tree. A few made numerical slips when calculating some of the entries. A small number of candidates placed values in the wrong place, such as placing '55' where the value should have been '22'. Some interchanged '22' and '23' in their respective positions.

A tiny minority did not attempt the question.

Question 12 (b)

(b) Which was the most popular activity out of rafting, swimming and tennis?
Show how you decide.

..... because .....

.....

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

Many correct answers were seen. 'Show how you decide' indicated that working or values were needed to score and most candidates followed this request. Some however placed their totals not in the answer space, but anywhere around the tree or even beside the initial table.

Examiners followed through from the candidate's tree and so many scored full marks here despite making errors in part (a).

A few candidates only showed the highest total, not considering that to show which was the most popular activity it would be necessary to show all three totals.

Question 12 (c)

(c) One of the 100 children is picked at random.

Find the probability that this child chose bowling.

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

Many correct answers were seen. Follow through could be awarded where candidates had an incorrect tree.

Some candidates just responded with '57', which scored 1 mark.

Candidates generally gave their answer as a fraction, but quite a few decimals were seen and a couple of percentages. A few candidates gave their answer as a ratio or in words (e.g. 'Fairly likely') and these scored 0 marks.

Question 12 (d)

(d) Alex says

45% of all children coming to the adventure park choose football.

What assumption has Alex made?

.....

..... **[1]**

Most candidates did not get a mark. Many answers restated the comment in some way or gave suggestions such as that Alex assumed each person was 1%, or that they all turned up, or that football was very popular, or that they didn't want to play golf.

Many seemed to not understand what an assumption was. There was very little understanding that Alex had assumed the sample represented the preferences of all people at the adventure park.

Assessment for learning

Candidates need to practise giving concise reasons and presenting these for peer consideration.

Question 13 (a)

13 Jane and Kofi both have the same number of newspapers to deliver.

By 8 am
- Jane has delivered 64% of her newspapers
- Kofi has delivered $\frac{5}{8}$ of his newspapers.

(a) Who has delivered the greater proportion of their newspapers?
Show how you decide.

..... because .....

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

This was usually well answered. Candidates understood the need to compare the figures in a similar form and the most common conversion was $\frac{5}{8}$ to 62.5%. Some chose to convert $\frac{5}{8}$ to 0.625, but then they also needed to convert 64% to 0.64 to make the comparison; a few did not do this and presented comparisons between 0.625 and 64% (presumably assuming that further work was not needed to make a decision, but where there is a 'Show…' request then comparable figures need to be explicitly stated to gain all marks).

A few candidates tried to change 64% to a fraction, generally getting as far as $\frac{64}{100}$ however then often not having a method to get $\frac{5}{8}$ to a comparable form. Candidates gained B1 for converting one of the values correctly, even if they made no further progress.

A few candidates just chose Jane because '64% is more than $\frac{5}{8}$', but offered no evidence for this and so scored 0 marks.

Question 13 (b)

(b) Work out the smallest possible number of newspapers that Jane must deliver.

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

Very few correct answers were seen. Most methods were inappropriate, involving finding fractions or percentages of values.

Common incorrect answers were 64, 36, 62.5, 1.5 and 37.5, among others.

Very few candidates understood that the number of papers needed to be a value where both 64% and 62.5% of it would result in an integer.

Question 14

14 A number, n, is given as 2.6, truncated to 1 decimal place.

Complete the error interval for n using a number and a symbol.

..... $\leqslant n$ ..... 2.7 **[2]**

This was rarely answered correctly. Many didn't recognise the need for both one number and one symbol. Candidates often seemed unsure about truncating and instead responded as if the number had been rounded.

2.6 was rarely given on the first answer line, with 2.5, 2.55 and 2.65 seen on a few occasions.

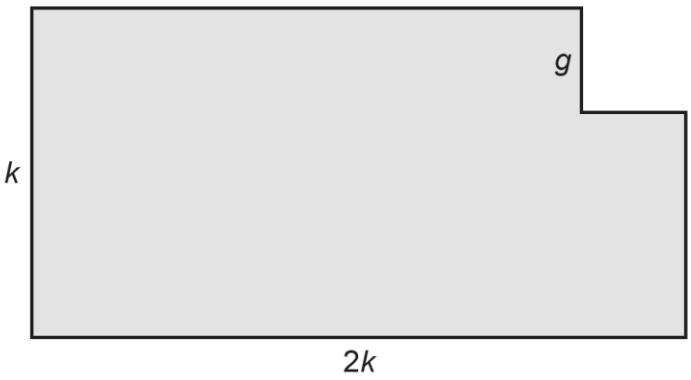
On the second answer line, a number was often given, or sometimes both a number and a symbol. Incorrect symbols often seen here were =, > and ≤. Placing 2.6 above the n was also quite common.

Many did not respond at all.

Question 15 (a)

15 In this question all measurements are in centimetres.

The shaded shape is made by cutting a square from the corner of a rectangle.



The width of the rectangle is k.
The length of the rectangle is $2k$.
Each side of the square is g.

(a) Write down the relationship between the length and the width of the rectangle.

..... **[1]**

A reasonable number of candidates gave the correct answer in some form.

Uncredited responses included 'They both have k', 'The width is double', 'It is double', 'It is half', '$2 \times k$' and 'They are the same'. Many seemed unsure about what the question was requesting.

Question 15 (b)

(b) Find an expression for the area of the shaded shape.
Give your answer in its simplest form.

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

Candidates found writing an expression extremely challenging and few logical attempts were seen (successful attempts approached the area as a rectangle minus a square). A significant number did not attempt this question.

Some candidates appeared to not recognise that a rectangle's opposite sides must have equal length, although $2k \times k$ was sometimes seen as the answer.

Often expressions contained powers greater than 2 (such as $2k^2 - g^4$), or numerical values, or were solely numeric. Products of k and g (such as $2k^2g$) or sums of k and g (such as $2k + k + g$, or $2k^2 + g$) were frequently seen.

Question 15 (c) (i)

(c) (i) Find an expression for the perimeter of the shaded shape.
Give your answer in its simplest form.

(c)(i) ..... **[3]**

Responses here were similar to those of the previous part and candidates demonstrated the same lack of security with algebraic representation.

Very few candidates realised by inspection that the perimeter must be $6k$ and was independent of the value of g.

A significant number did not attempt this question.

Question 15 (c) (ii)

(ii) Find the value of k when the perimeter of the shaded shape is 62.4.

(ii) $k =$ ..... **[2]**

Many candidates showed no clear strategy to solve the problem. A few gained M1 for writing their answer to (c) (i) = 62.4, but if that contained g they found themselves unable to make further progress.

62.4 ÷ 2 or 62.4 ÷ 4 were popular incorrect methods. A very few candidates took 62.4 to be the value of k and tried to work out the perimeter.

Assessment for learning

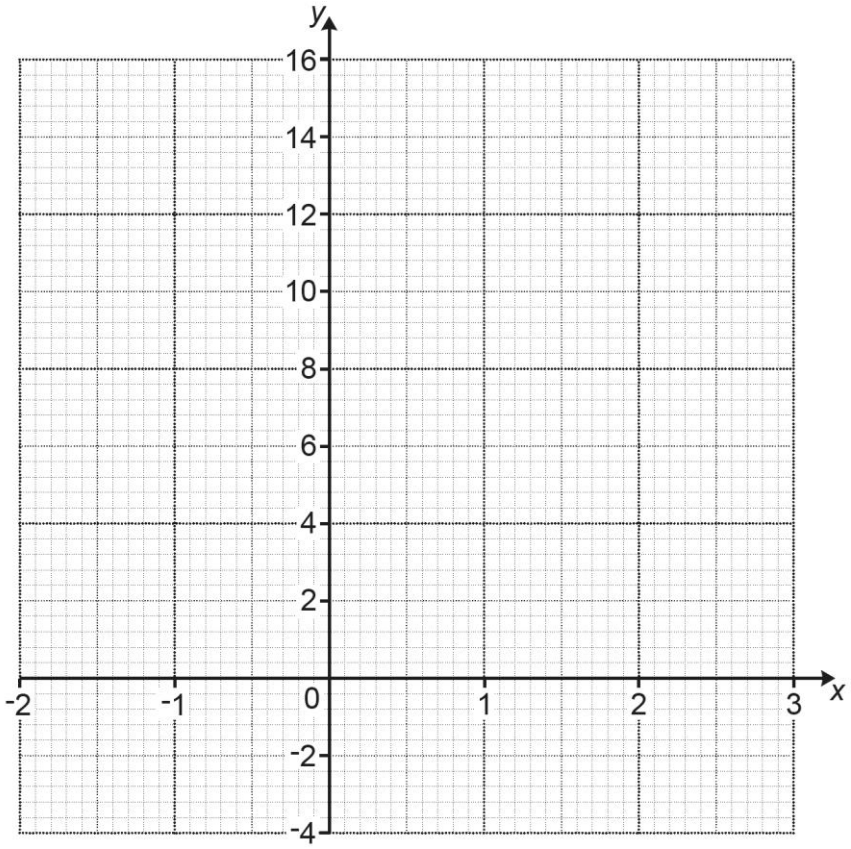
Candidates need to be confident with generalising common situations.

Question 16 (a)

16 Here is a table of values for $y = 2x^2 - 3x$.

x	-2	-1	0	1	2	3
y	14	5	0	-1	2	9

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



[3]

Many candidates plotted the points yet did not join them with a curve. A few tried to use straight lines.

Many did not correctly plot the points within a half-square accuracy (particularly the point at (1, -1), possibly because of the proximity of the '1' label on the *x*-axis). Some points were plotted using very blunt pencils.

The few curves that were seen were often not accurate and missed the plotted points by more than a half square vertically or horizontally.

A surprising number of candidates made no attempt to plot the points and did not respond at all.

Assessment for learning

Candidates need to practise accurately plotting points and how to then draw a curve through them.

Question 16 (b)

(b) Use your graph to find the x-coordinates of the points where the graph of $y = 2x^2 - 3x$ crosses the line $y = 6$.

(b) $x =$ ..... and $x =$ ..... **[2]**

Many candidates could not score marks here as they had not drawn a graph in part (a). A few did draw the horizontal line $y = 6$ to earn B1, but a very few candidates drew $x = 2$ instead.

Where lines did exist, reading was often inaccurate; readings were often taken to be at the nearest integer point (for example, if their graph crossed the line where the x-coordinate was -1.2, it would be given as -1). Some responses seemed to be the intercepts of their curve with the x-axis, while others gave responses that seemed unrelated to the graph they had drawn.

Question 17

17 Riley invests some money in a savings account that pays 4% simple interest per year.
After 5 years the total interest that Riley's investment has earned is £360.

Find the total value of Riley's investment after 5 years.
You must show your working.

£ ..... **[5]**

In this 'You must show your working' question, more successful candidates organised and/or annotated their work so that it was clear that they were using a correct method to answer the question.

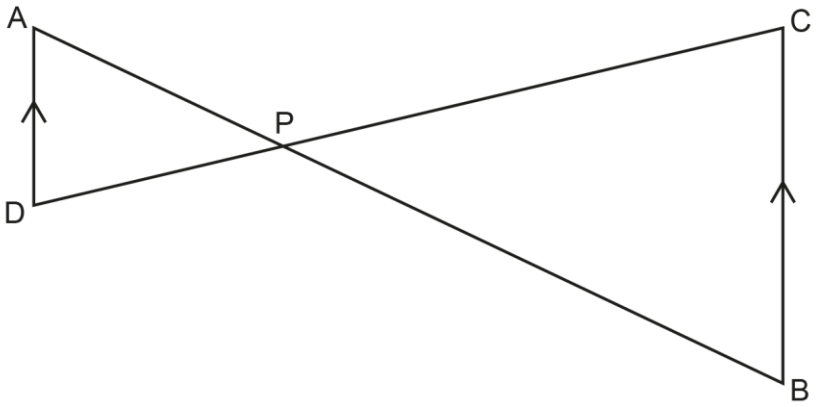
Misreads and misinterpretations were common. Many candidates attempted compound interest, which received zero marks. Others misinterpreted the information and began by finding 4% **of** 360, which is an incorrect method. This however did lead to 14.40 and then 72, which is also a value that appeared in correct methods and so examiners were looking to the method used to award marks.

Similarly, some candidates just wrote 5 × 360 = 1800 with no supporting evidence. As this can come from the incorrect assumption '£360 per year for 5 years', again examiners needed to look to supporting evidence to know that a correct chain of reasoning had been used.

Some candidates mixed incorrect attempts with correct ones without distinguishing which they favoured, or which had been used to reach the final answer. Candidates are advised to cross out rejected working and to practise setting out answers logically.

Question 18

18 The diagram shows two straight lines AB and DC that intersect at P.
DA is parallel to BC.



Complete these statements to show that triangle PAD is similar to triangle PBC.

Angle .....ADP..... = angle .....BCP..... because they are .....alternate..... angles

Angle .....APD..... = angle ..... because they are ..... angles

Angle ..... = angle ..... because they are ..... angles

Triangle PAD is similar to triangle PBC because .....

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

Very few correct answers were seen to this question. Some candidates correctly identified BPC (or CPB) in the first row and a few of those gave the correct reason '[vertically] opposite'; repeating 'alternate' was however common. There was no mark for the reason if the angles were incorrectly identified.

Most candidates did not seem secure in their knowledge of alternate, opposite, corresponding, and co-interior angles (often using words such as parallel, adjacent, acute, and congruent instead). A very small number used two letters to try to describe an angle and others gave three letters that actually referred to straight line, like CPD. Many candidates were awarded 1 mark (the B1 for getting the first angle correct), but quite a few received 0 marks.

A very few candidates got the first 3 marks but were then not able to justify the decision concisely. Imprecise answers such as 'All the angles are the same' or 'It's an enlargement' were often given.

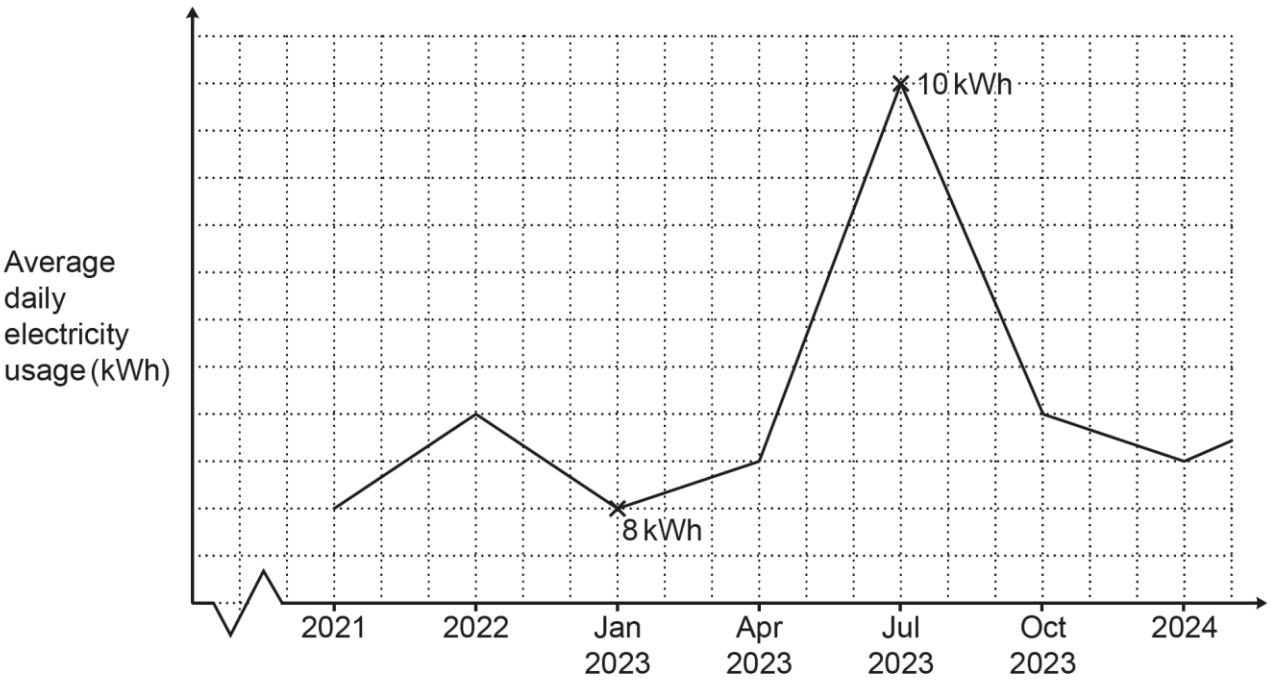
Many seemed unprepared for a geometric 'proof' such as this and the answer space was often left blank.

Assessment for learning

Candidates need to be familiar with simple proofs and the use of geometric terms to justify decisions.

Question 19

19 The graph shows a household's average daily electricity usage, in kilowatt hours (kWh).



Give **two different** reasons why this graph is misleading.

Reason 1: .....

.....

Reason 2: .....

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

This is the first of the questions that also appeared on this year's Higher paper J560/06.

Many candidates were able to gain a mark, but while most candidates were able to identify a cause for the graph being misleading, there was commonly trouble expressing ideas clearly enough to score a mark. Imprecise answers such as 'It hasn't any numbers' didn't score, whereas something like 'The vertical axis hasn't any numbers' or '…hasn't a scale' would have gained a mark. Some referred to the vertical axis as the *y*-axis, which was condoned (and some wrote 'the left side').

Other statements not credited included 'The graph doesn't start from 0', 'The bottom line isn't straight' and 'It's got months'.

Candidates should be encouraged to write concise statements and not use 'it' when they need to refer to something specific. Candidates should practise interpreting a graph and writing coherent and descriptive statements.

Some candidates tried to interpret what they read from the graph.

Exemplar 2

Reason 1: daesnt always go up in month as it went up in year:

Reason 2: daesnt start at the beggining of the graph: **[2]**

This exemplar illustrates a pair of reasonably articulate reasons, though neither is wholly satisfactory.

The first reason was condoned and awarded a mark. Although they don't explicitly say they are describing the horizontal axis, they have written enough that it can be discerned.

The second reason is vague and does not mention what it is describing.

Question 20

20 The word MATHEMATICS is spelt using tiles.

The tiles are put into an empty bag.

One at a time, 99 children each take a tile at random from the bag.
They record the letter and then put the tile back in the bag.

Work out how many times the letter M is expected to be taken from the bag.

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

A number of candidates gave efficient and effective responses to this 'expected frequency' question. Others had less efficient strategies, but many candidates gained at least 1 mark.

Quite a few gained the B1 for $\frac{2}{11}$ or the M1 for $99 \div 11$.

Some candidates wrote $\frac{2}{11} \times 99$, but did not complete the calculation (though others had $99 \div \frac{2}{11}$). A very few responded with $\frac{18}{99}$, which was awarded 2 marks.

Some candidates tried to convert $\frac{2}{11}$ into a decimal to work with and ended up rounding, thus losing accuracy. Sometimes the probability $\frac{1}{10}$ was seen.

A number of candidates responded '9', but did not show the calculation that it came from.

Less successful candidates tried a listing approach but were often unable to interpret their extensive lists.

Some wrote 99×2, leading to a common incorrect response of 198, while others had $99 \div 2 = 49.5$, with answers of 49, 49.5 or 50 seen.

Question 21 (a) (i)

21 1 cm on a map represents 150 km in real life.

(a) Below is part of the map showing City A and City B.

Heidi is planning to walk from City A to City B for charity.

Heidi measures the straight-line distance on the map from City A to City B accurately as 5 cm. Heidi says she will walk from City A to City B at an average speed of 2.5 km/h for 10 hours per day.

(i) Use this information to work out how many days Heidi needs to complete the walk from City A to City B.

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

This question saw many candidates score marks and a number of well-organised responses were seen.

Most candidates were able to find the distance between the cities (750 km), although a few ignored the given length and measured the line themselves.

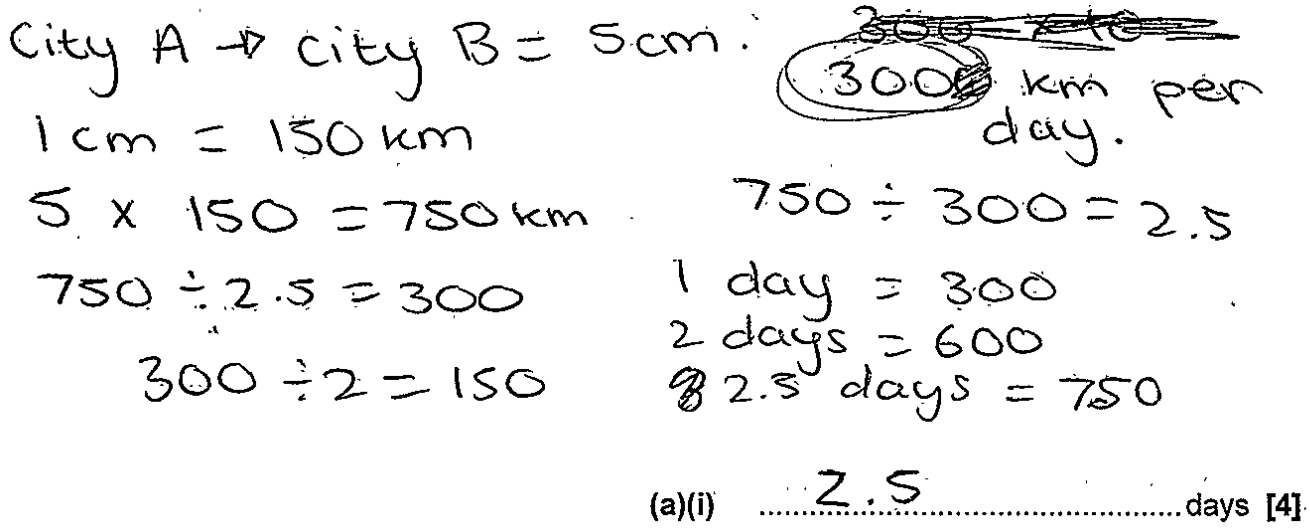
Many candidates worked out the distance Heidi would travel per day and a few labelled this in their working.

The most common approach was to divide the total distance by the distance to be travelled per day, reaching 30 days if done correctly.

Some candidates struggled with the number of zeros to use and 3 was sometimes seen rather than 30.

Some candidates used 24 hours rather than 10 hours to calculate their distance travelled per day, or as well as the 10. Others became confused with the number of hours in a day and found themselves lost after a promising start.

Exemplar 3



This exemplar demonstrates a partially annotated solution. The initial work on the left-hand side is correct, but the annotation (and, perhaps consequently, understanding) breaks down as it progresses and moves to the right side.

The values initially calculated are used to reach the answer and so M1M1 for the initial work stands.

Question 21 (a) (ii)

(ii) Explain why the information used in part **(i)** is likely to give an underestimate for the number of days Heidi needs to complete the walk.

.....

..... **[1]**

This received a very poor level of responses. Most answers focused on something related to the speed, not realising that things such as tiredness and stops were already accommodated in the 'average' speed.

It was a very small number of candidates who realised that the reason for the likely underestimation was that the route taken would probably not be a straight line and therefore the distance travelled would be greater.

Question 21 (b)

(b) Yoshi writes the scale of the map, 1 cm represents 150 km, as the ratio 1 : 150.

Explain Yoshi's error and write the scale correctly in the form 1 : *n*.

Yoshi's error is .....

.....

The correct answer is 1 : ..... **[2]**

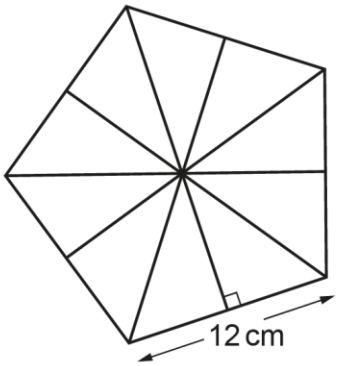
Similar to Questions 12(d) and 19, many candidates had some idea about what they wanted to say but found it very difficult to express their ideas clearly or effectively.

Simply 'The distances were not expressed in the same unit' would have sufficed, but instead many answers used 'they' without stating what they were referring to, for example 'They are not the same'. 'The cm and km are mixed up' or 'The numbers are too big' were also typical.

Most candidates made errors with the conversion of centimetres and kilometres and very few correct ratios were seen.

Question 22 (a)

22 The diagram shows a regular pentagon made using ten congruent right-angled triangles.
The length of one side of the pentagon is 12 cm.



Not to scale

(a) Show that the area of the pentagon is 247.75 cm^2, correct to **2** decimal places. **[6]**

Many candidates did not attempt this question. Very few candidates realised that this was a trigonometry question, although sin/tan/cos did appear written on a few scripts.

Those candidates who realised that they must calculate the vertical height of one of the triangles using trigonometry were usually successful and demonstrated a correct method, though many rounded their figures prematurely and so received 5 marks only. Candidates should be given practice in a variety of different problems and contexts that require the use of trigonometry.

It was sometimes incorrectly assumed that the shape could be treated as five equilateral triangles with sides of 12 cm, or that that the vertical height of each triangle was 6 cm.

Seeing '12 × 12 × 12 × 12 × 12' was not uncommon.

A very few candidates engaged in a circular argument, starting out with 247.75 and then working back to reach 247.75 again, but these scored 0.

Question 22 (b)

(b) The regular pentagon is the base of a pyramid.

The pyramid has volume $450\,\text{cm}^3$.
The perpendicular height of the pyramid is h cm.

Calculate the value of h.

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

(b) $h =$ ..... **[3]**

A few candidates rearranged the given formula to create an equation and then substituted in the given values to work out a value for the height. Some of these however did not correctly rearrange the formula or they rounded prematurely, resulting in an answer that was out of range.

Most candidates wrote $\frac{1}{3} \times 450 = 150$ and went no further. Some substituted 12 (the length of a side of the pentagon) into the formula for the volume of a pyramid.

A few tried inefficient trial and improvement methods, but very few made any progress; this approach is rarely recommended.

Question 23 (a)

23 (a) Two numbers, A and B, are written as the product of their prime factors.

$A = 2 \times 3 \times 7^2$
$B = 2^3 \times 7$

Find the lowest common multiple (LCM) of A and B.
Give your answer as an ordinary number.

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

A small number of correct responses were seen here, mostly working out that A = 294 and B = 56 and then some form of listing.

Some multiplied 294 and 56 to get a common multiple, but it wasn't lowest.

Very few candidates appeared familiar with using the prime factors to find the LCM. Most ignored the prime factor decompositions after 294 and 56 had been calculated, working instead from those values.

Some Venn diagrams were seen, although not always correct. Good Venn diagrams often led to the correct answer.

Factor trees were sometimes seen for 294 and 56, but were ineffective for this question.

Many confused Highest Common Factor (HCF) with LCM. A common error was to find the HCF and responses of 7 (or sometimes 2 or 14) were quite common.

A large number of candidates omitted this question.

Question 23 (b)

(b) A number, R, is written as the product of its prime factors.

$R = 2 \times 3^2 \times 5 \times k$, where k is a prime number.

The highest common factor (HCF) of R and another number, P, is 26.

Find the value of k.

(b) $k =$ ..... **[2]**

Only a small number of correct answers were seen.

A common approach was to work out $2 \times 3^2 \times 5 = 90$, but many were then unsure what to do next.

The same confusion between HCF and LCM persisted here and 2 was sometimes given as a response.

Some factor trees and lists of prime numbers were seen.

A few candidates wrote 26 as the product of its prime factors but were unsure how to use the result.

A number of candidates used a method of trials with k being a prime number, occasionally reaching 13.

Again, a large number of candidates omitted this question.

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