Qualification Accredited

OCR
Oxford Cambridge and RSA

GCSE (9–1)

Examiners' report

MATHEMATICS

J560

For first teaching in 2015

J560/05 Summer 2024 series

Version 1

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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 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 5 series overview

This non-calculator paper is the second of three papers taken by Higher tier GCSE (9-1) Maths candidates. Generally candidates were correctly entered at this tier. Most of the questions appeared to be accessible and there was no evidence to suggest that candidates were unable to attempt every question in the time available. Overall marks awarded for the paper covered the full range available.

In general, candidates were able to show a good level of mathematical communication in their work. When faced with questions that require a written statement to justify or explain a situation, most candidates now consider the nature of the question and write their response concisely, using correct mathematical terms.

Candidates should be encouraged to clearly display their working with full calculations shown. Where working was well ordered, clearly communicated and concise, often most or all marks could be given. Where examiners were presented with working scattered over the page and a choice of methods without clear indication of which one is to be considered, marks were lost. Candidates that annotate diagrams and highlight key words and instructions had more success.

Topics that candidates appeared to be more secure with included describing correlation, identifying an outlier, drawing and using a line of best fit, estimation and density, problem solving involving a perimeter, vector notation and expanding three brackets.

The topics that were less secure included calculations involving fractions, inverse proportion, understanding the connection between the linear and volume scale factor of similar shapes, simplifying expressions with fractional coefficients, cube-rooting expressions and finding the points of intersection of a line and curve.

Candidates who did well on this paper generally:	Candidates who did less well on this paper generally:
• performed standard calculations and routines, following the required rubric • showed clear, concise and step by step methodology on multi-mark questions • used appropriate terminology and precision when asked to give reasons for answers • gave responses in the form requested in the question • were able to use algebra effectively, both in standard routines and to solve problems.	• showed a more random approach in working, including using trial and improvement on some multi-mark questions • had weaker skills, knowledge and understanding of the specification, including the recall of key terminology, formulae and routines • were unable to use correct terminology or correctly interpret notation used • made errors in numerical evaluations, especially when performing calculations with fractions and decimals.

Question 1

1 Work out.

$1.2 \div 0.03$

.... **[2]**

There were many correct responses, but also a number of candidates that struggled to deal with the place value in this division. Many showed a correct initial method to create an equivalent division, for example multiplying both values by 100 to give 120 ÷ 3 and then showed the value 40. Some however then spoiled this by a 'reverse' adjustment at the end, for example dividing 40 by 100 to give a final response of 0.4.

Question 2 (a)

2 Kai has these four number cards.

0	2	5	9

Kai takes two of the cards at random without replacement and finds the positive difference between the two numbers.

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

		First card			
	Difference	0	2	5	9
Second card	0		2	5	9
	2	2		3	
	5	5			
	9	9			

[2]

The vast majority of candidates answered this part correctly. There was a common misconception with the shaded cells and many candidates filled them in with zeros, but this was condoned by examiners. Some candidates made errors by writing the negative difference, while a few others added the pairs of numbers.

Question 2 (b)

(b) Find the probability that Kai takes two cards with a difference that is an even number or a factor of 10.

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

This part was not answered as well as part (a). Followed through was given from an incorrect table in part (a), including if they had written zeros in the shaded cells. The most common incorrect response was $\frac{6}{16}$ from candidates counting all the cells. Many candidates who had written zeros in the shaded cells overlooked that zero is an even number. Some double-counted each 2 since it is both an even number and a factor of 10, leading to incorrect responses of $\frac{8}{12}$.

Question 3 (a)

3 **(a)** Ryan makes a journey of 200 miles from his home to the coast.

$\frac{1}{10}$ of the journey is on roads with a speed limit of 40 miles per hour.

40% of the journey is on roads with a speed limit of 50 miles per hour.

The remainder of the journey takes a time of 1 hour 30 minutes.

Ryan leaves home at 08 50 and does not exceed the speed limits on the journey.

Find the earliest time that Ryan could arrive at the coast.

You must show your working.

(a) .... **[6]**

There were many correct responses here and candidates generally showed well organised working to support their response. Occasionally an error was made when calculating 80 ÷ 50 to find the time taken on the 50 miles per hour section, but where working was shown they could gain credit for showing the correct division. Some found 1.6 hours for this section of the journey, but then struggled to convert it to hour and minutes (for example, writing 1.6 hours = 1 hour 6 minutes). Errors were also made in adding the time intervals to the 08:50 start time.

A few candidates misinterpreted the question and treated $\frac{1}{10}$ and 40% as proportions of the time taken for the journey rather than proportions of the distance travelled. This generally led to candidates adding 1 hour 30 minutes twice to 08 50 and a final response of 11:50.

Question 3 (b)

(b) Write down an assumption you have made when working out the answer to part **(a)**.

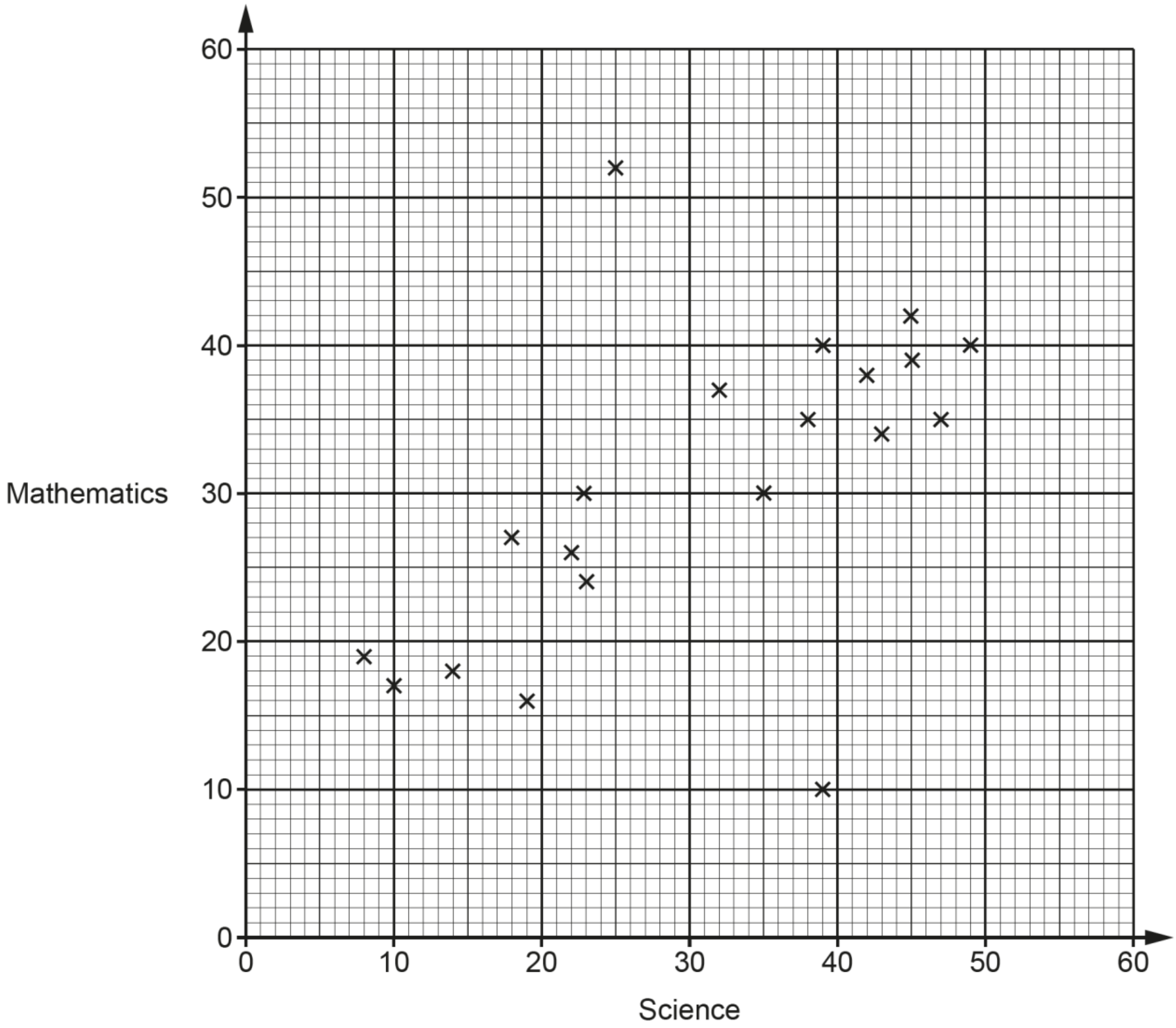
....

.... **[1]**

Many candidates answered this well. The majority gave assumptions such as Ryan did not stop, or was not delayed, or that he travelled at the speed limits throughout. A number of candidates gave an insufficient reason, such as 'there was no traffic' without a link to not being delayed, or that he travelled at constant speed without linking it to the speed limits.

Question 4 (a)

4 The scatter diagram shows the test scores for 20 pupils in Science and Mathematics.



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

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

Almost all candidates gave a correct response of positive correlation.

Question 4 (b)

(b) One pupil took the Science test but was then ill during the Mathematics test and had to leave early.

On the scatter diagram, circle the point that is most likely to represent this pupil. **[1]**

Almost all candidates recognised the correct outlier.

Question 4 (c)

(c) By drawing a line of best fit, estimate the test score in Mathematics for a pupil who scored 28 in the Science test.

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

Most candidates were able to draw a ruled line of best fit and read off the correct value from their line.

A few candidates drew a short line that did not extend the full length of the plotted line, or more commonly drew an incorrect line through the origin.

Assessment for learning

Candidates should be aware that a line of best fit should be ruled and extend at least as far as the minimum and maximum points plotted on both axes.

Question 4 (d)

(d) Explain why using the scatter diagram to estimate the test score in Mathematics for a pupil who scored 60 in Science may be unreliable.

....

.... **[1]**

There were many correct responses where candidates referenced that the trend may not continue beyond the given data, or that the score of 60 was beyond the range of the data provided on the scatter diagram.

Responses that were not acceptable commonly referred to the ability of a pupil rather than the data. For example, 'Just because they are good at Science, they may not be as good at maths'. Some also gave an incomplete explanation such as 'There is no data' rather than saying that there is no data in that particular area around 60 marks.

Question 4 (e)

(e) Find the percentage of the 20 pupils who scored less than 30 marks in **both** Science and Mathematics.

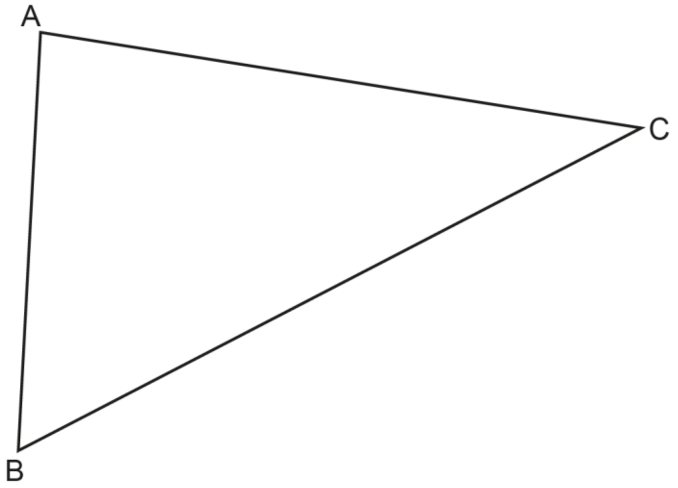
(e) .... % **[3]**

This was very well answered. Those that wrote $\frac{7}{20}$ and then converted to a fraction over 100 were generally more successful. A few attempted a formal division of 7 by 20 and then multiplied by 100; this approach was less successful owing to some errors being made in the division, but method marks were given.

Those that had an incorrect fraction (for example $\frac{8}{20}$) were given partial credit for converting their fraction to a percentage correctly.

Question 5

5 Triangle ABC is drawn below.



Using a ruler and compasses only, construct and shade the region which is closer to AB than AC. **[3]**

Many recognised that the required region involved constructing the bisector of angle BAC and shading to the left of the bisector; most who attempted this gave an accurate construction and earned full marks. Errors included drawing the perpendicular bisector of BC (or another length) as well as drawing a line from point A to the midpoint of BC.

Question 6

6 A bronze ornament has a volume of 198 cm^3.
The density of bronze is 8.9 g/cm^3.

By rounding each value correct to one significant figure, work out an estimate for the mass of the bronze ornament.

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

This question was very well answered. Some incorrectly rounded 8.9 to 10, leading to a final answer of 2000. Others divided rather than multiplied. Partial credit was given for rounding correctly to 200 and 9, as well as for multiplying their rounded or unrounded values.

Question 7

7 A bottle contains $1\frac{3}{4}$ litres of cordial.
To make orange squash, 1 part of this cordial is mixed with 7 parts of water.
Cups that can hold $\frac{1}{6}$ of a litre are completely filled with this orange squash.

Work out the maximum number of cups that can be filled from the bottle of cordial.
You must show your working.

.... **[6]**

This question was attempted by the vast majority of candidates, but with mixed success. There were two methods that proved to be the most efficient and successful approaches.

The first of these was to identify that each cup required $\frac{1}{8}$ of $\frac{1}{6}$ = $\frac{1}{48}$ litres of cordial and then converting $1\frac{3}{4}$ into $\frac{84}{48}$, from which it could be identified that the bottle had enough cordial to make 84 cups.

The second approach was to work in equivalent ratios, taking the ratio 1 : 7 and scaling it to $\frac{7}{4}$: $\frac{49}{4}$, followed by adding the parts of the ratio to arrive at 14L of squash, then finally multiplying this by 6.

A number of candidates attempted to work in decimals or in millilitres rather than with fractions and although method marks were often scored by these, the resulting answers were rarely accurate enough to score full marks (due to the challenge of dividing values by recurring decimals using non-calculator methods).

A number of candidates struggled to make a start. Others had quite disordered working with unstructured calculations written all over the page, which in many cases were presented without selection of a particular method to be marked.

Assessment for learning

When completing a multi-step question such as this, it's advisable for candidates to annotate steps and work in a structured fashion, so that they can keep track of which steps are left to take.

In a non-calculator paper, working with fractions is usually more accurate than attempting to convert them and work with decimals instead.

Misconception

A common misconception is that when attempting to multiply a fraction by a whole number, some candidates multiply both the numerator and denominator by the whole number. This results in an equivalent fraction instead of a multiplied fraction.

Question 8 (a)

8 **(a)** y is directly proportional to x.

Write down the percentage increase in y when x is increased by 100%.

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

Most candidates answered this question correctly. Incorrect answers included 50% or 200%.

Question 8 (b)

(b) z is inversely proportional to x.

Write down the percentage decrease in z when x is increased by 100%.

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

Candidates generally struggled with this part. Common incorrect responses were 100%, $^{-}100$% and 0%.

Question 9

9 The following kinematics formulas may be used in this question.

$v = u + at$

$v^2 = u^2 + 2as$

A particle has an initial velocity of 0 m/s.
The particle accelerates uniformly at 3 m/s^2 for 4 seconds.

Find the distance travelled by the particle in the 4 seconds.

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

Almost all candidates attempted this question, although some did not get further than finding *v.* A minority were able to give the correct answer and showed correct working. One of the main issues was uncertainty of what the different variables represented, for example substituting the given values into the first equation to get 0 = *u* + 3 × 4. Others used *speed* = *distance* ÷ *time* instead of the given formulae, for which no credit was given.

Of those that found *v* and then correctly substituted into the second equation to find *s,* a number obtained 24 yet went on to do a further calculation, such as 24 × 4 to then give a final distance of 96 m.

Misconception

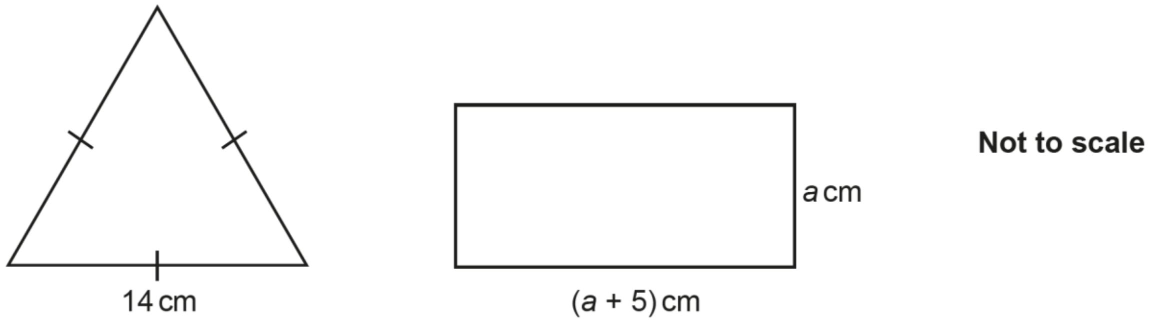
? A proportion of candidates were not able to identify what *u*, *v*, *a*, *s* and *t* represent. There was particular confusion between *u* and *v*.

Misconception

? Some candidates did not recognise that (because the particle has constant acceleration) the given kinematic formulae need to be used. The *speed* = *distance* ÷ *time* formula is only to be used if there is no acceleration.

Question 10

10 The diagram shows an equilateral triangle and a rectangle.



The equilateral triangle has the same perimeter as the rectangle.

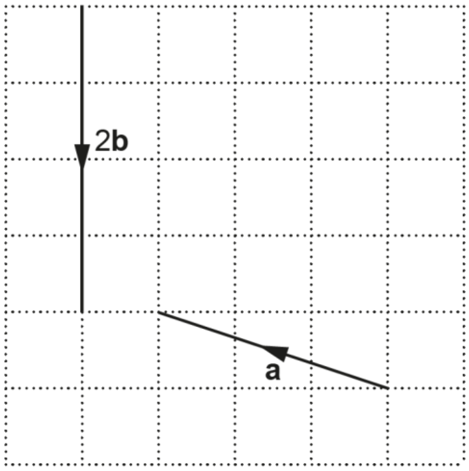
Find the value of *a*.

a = ... **[4]**

This was very well answered by the vast majority of candidates. Most worked algebraically by setting up an equation and then solving it, however a few worked numerically and were also successful (often achieving full marks). A few candidates made arithmetic errors in finding the perimeter, or they worked with area rather than perimeter. Those candidates that set up and solved a linear equation in *a* were given credit for solving it, even if the equation had an incorrect element when it was set up.

Question 11 (a)

11 Vector **a** and vector 2**b** are drawn on this grid.



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

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

This was correctly answered by the vast majority of candidates. The most common errors were to omit the negative sign from the horizontal component, or to write the components the wrong way around. A few candidates incorrectly included a fraction line in their vector answer.

Misconception

Candidates clearly understand the concept of horizontal and vertical components, however they must make sure that they pay attention to the direction of the vector as well as the order of the components in the column vector.

Question 11 (b)

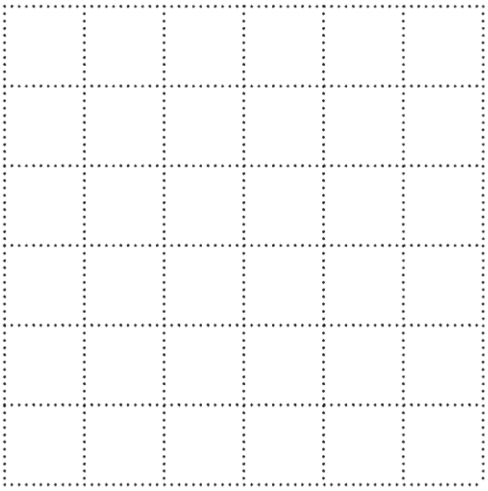
(b) Write a column vector that is different in direction but has the same length as vector **a**.

(b) $\begin{pmatrix} \\ \end{pmatrix}$ **[1]**

This question was answered correctly by almost all candidates. Of the few errors that were made, some candidates added one to a component and subtracted one from the other component, presumably with a misconception that this would retain the length while changing the direction.

Question 11 (c)

(c) On the grid below, draw the vector **a** – **b**.



[3]

Candidates found this more challenging than parts (a) and (b). Those candidates that drew the vectors **a** and −**b** to show **a** + (−**b**) were often successful with this question. Some candidates drew these two vectors, but did not then join them together to make the resultant vector **a** – **b**. Those that wrote down the subtraction of the column vectors were also generally successful, although there were some sign errors seen when performing the calculation. Some correctly showed a line for **a** – **b**, but did not include a direction arrow; these were given 2 out of the 3 marks available.

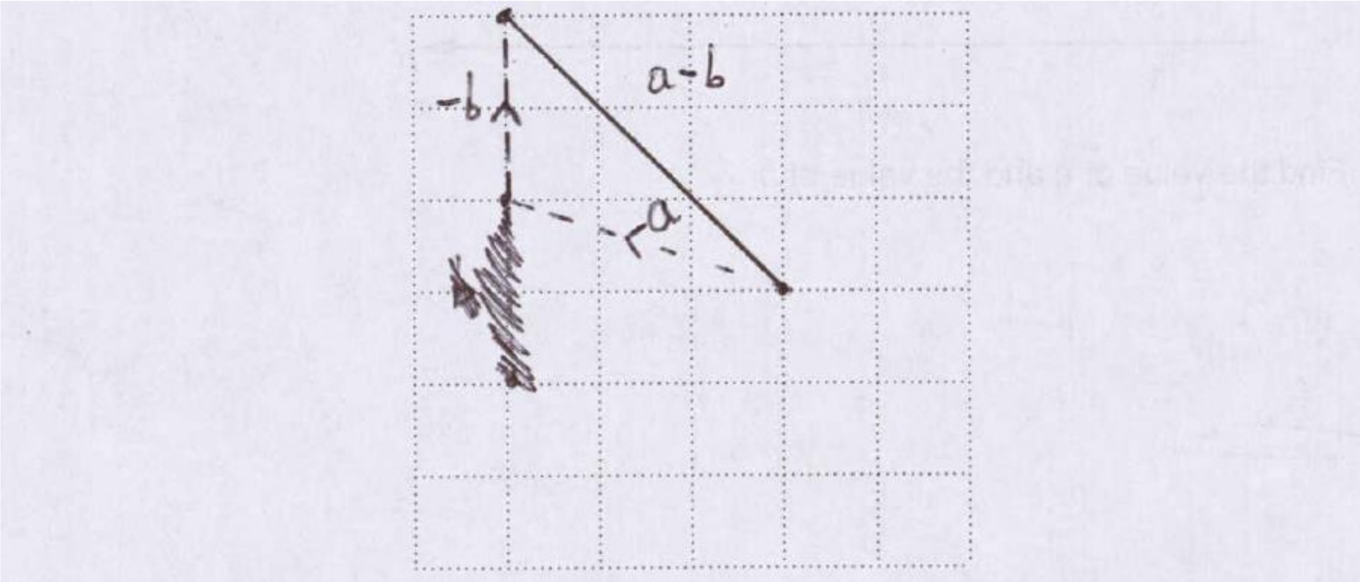
Assessment for learning

Candidates should be encouraged to show the steps in their method (either drawing or calculation), so that part marks can still be given if an error is made. When drawing the difference of two vectors **a** – **b**, consider it as **a** + (−**b**) and hence draw **a** followed by (−**b**).

Misconception

A vector must have a directional arrow. It is not sufficient to just draw a straight line.

Exemplar 1



In this example the candidate draws a triangle of vectors, but does not place a direction arrow on the vector **a – b**. The response is otherwise correct, so 2 out of the 3 marks are given.

Question 12 (a)

12 (a) Sasha invests £1000 at a rate of 5% per year compound interest.
Sasha says

After one year, my investment will get £50 in interest and will be worth £1050.
Therefore, after two years, my investment will get another £50 in interest and will be worth £1100.

Is Sasha correct?
Give a reason for your answer.

.... because ....

.... **[1]**

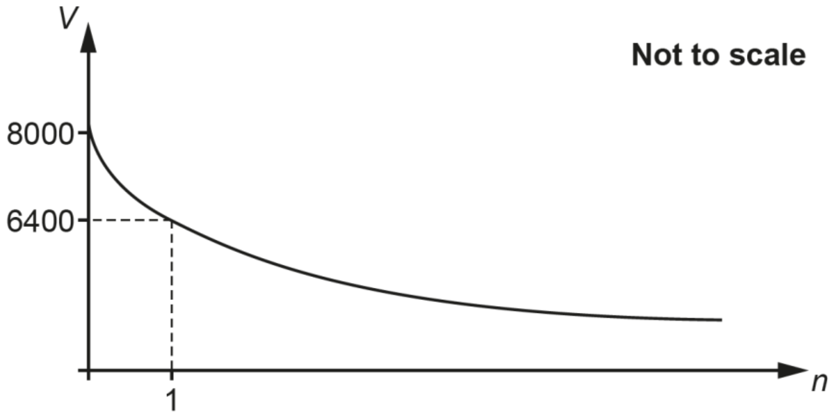
Most candidates were able to explain that compound interest means that the interest is based on the balance at the start of each year rather than the original investment. The strongest responses referred to the calculation for the interest in the second year (either 5% of £1050 or just that the interest would be £52.50). Some candidates did not explain their reasoning fully enough, for example saying that Sasha was using simple interest rather than compound interest, but without any further explanation about the difference between these two types of interest.

Question 12 (b)

(b) Sasha buys a car.
The value, £V, of the car after n years is given by the formula

$V = a \times b^n$.

The graph shows some information about the value of the car.



Find the value of a and the value of b.

(b) $a =$ ....

$b =$ .... **[4]**

There were some excellent responses, but only a minority of candidates gained full marks in this part. Many obtained one mark by substituting a relevant value into the formula and writing 6400 = $a \times b$, or realising that a = 8000. Some attempted to go further and showed the calculation 6400 ÷ 8000, but didn't reach the correct value for b. A few calculated 8000 ÷ 6400 instead and gave the value of b as 1.25, which would have resulted in an increasing value rather than a decreasing value.

A number of candidates did not understand how to make a start or how the equation related to the values on the graph.

Assessment for learning

Candidates should be encouraged to recognise that a multiplier above 1 increases the initial value. If they need to decrease a value, the multiplier should be less than 1.

Misconception

Some candidates did not appreciate that at year $n = 0$, $b^0 = 1$ and so using $8000 = a \times b^0$ the value for a can be directly found as 8000.

Question 13

13 Solve the inequality.

$x^2 - 100 \geqslant 0$.

.... **[3]**

The vast majority of candidates scored at least one mark on this question, but only a few gained all three. Those that took the square root of 100 were less likely to get 2 solutions as many took only the positive root, leading to $x \geq 10$. There was some awareness of the difference of two squares to get two solutions, but very few managed to get the inequalities correctly afterwards. It is important that candidates keep the correct inequality sign throughout their working and particularly when writing the final response.

Question 14

14 Here are the first four terms of a sequence.

$\frac{2}{5}$ $\frac{4}{9}$ $\frac{6}{13}$ $\frac{8}{17}$

Find the *n*th term of the sequence.

.... **[3]**

Most candidates either gained full marks or did not score. Many realised that the numerator had a difference of 2 and the denominator a difference of 4, then wrote $\frac{2n}{4n}$. A very common error was to then cancel this fraction and give $\frac{1}{2}n$. Many candidates appeared unfamiliar with finding expressions for the numerator and denominator separately.

A few candidates gave the correct response in working yet gave $\frac{1}{2}n + 1$ or equivalent as the final response. Partial credit was given to those who gave a correct expression for the numerator or the denominator in working.

Question 15

15 Expand and simplify.

$(x+3)(4x+1)(x-2)$

.... **[3]**

This question was very well answered, with candidates right across the ability range scoring well. Candidates were generally confident with the expansion of brackets. A few tried to expand all 3 brackets at the same time and candidates should be reminded that a much more successful approach is to expand a pair of brackets first, then deal with the third bracket. The grid method was used very successfully by many, with work set out clearly and methodically.

Candidates should take care when transferring terms from line to line, both in their working and also to the answer line. Transcription errors were made by some that prevented full marks being given, particularly with indices.

Question 16

16 Two prisms, A and B, are mathematically similar.

The ratio of the volume of prism A to the volume of prism B is 8 : 27.
The height of prism A is 6 cm.

Work out the height of prism B.

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

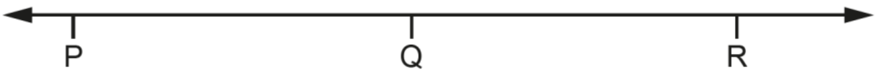
Most candidates found this question challenging. The most common error was to just directly apply the given ratio to the height of prism A, leading to $6 \times \frac{27}{8}$ or similar. Those that found the correct linear scale factor (2 : 3) usually scored all 3 marks. Those that converted $\frac{27}{8}$ or $\frac{8}{27}$ to a decimal often had difficulty in then finding the cube root, with some candidates attempting the square root or dividing by 3 instead.

Misconception

For similar shapes, the ratio of volumes is not equal to the ratio of lengths. Candidates were often unable to establish the correct relationship between the volume scale factor and the length scale factor.

Question 17

17 The diagram shows a number line.



$P = 1.\dot{2}$ and $Q = 1\frac{2}{3}$.

Q is the midpoint of PR.

Find the value of R.
Give your answer as a mixed number in its simplest form.
You must show your working.

.... **[5]**

The majority of candidates used a fraction-based approach here. Most doing this were able to convert $1.\dot{2}$ to $\frac{11}{9}$ and then many correctly found the difference between the fractions P and Q, which they then added to Q to find the value of R. Some mixed up the values of R and Q, while others found P as $\frac{11}{9}$ and then added it to $\frac{5}{3}$ to get their final answer.

A good strategy employed by some was to use the given number line to illustrate their working and it was common to see values and their differences written on the number line.

Candidates that used a decimal-based approach were less successful, since they encountered more difficulties both dealing with the recurring decimal numbers and retaining sufficient accuracy within their method. Candidates using terminating decimals such as 1.2 and 1.6 instead of recurring values limited the marks that could be achieved.

Assessment for learning

Centres can help candidates by exploring non-routine recurring decimal problems. Many candidates demonstrate strong knowledge of how to convert a recurring decimal to a fraction but would benefit from using recurring decimals in other contexts.

Question 18

18 A sphere has radius x cm.
A cone has radius R cm and height $2R$ cm.

The volume of the sphere is equal to the volume of the cone.

Write R in terms of x.

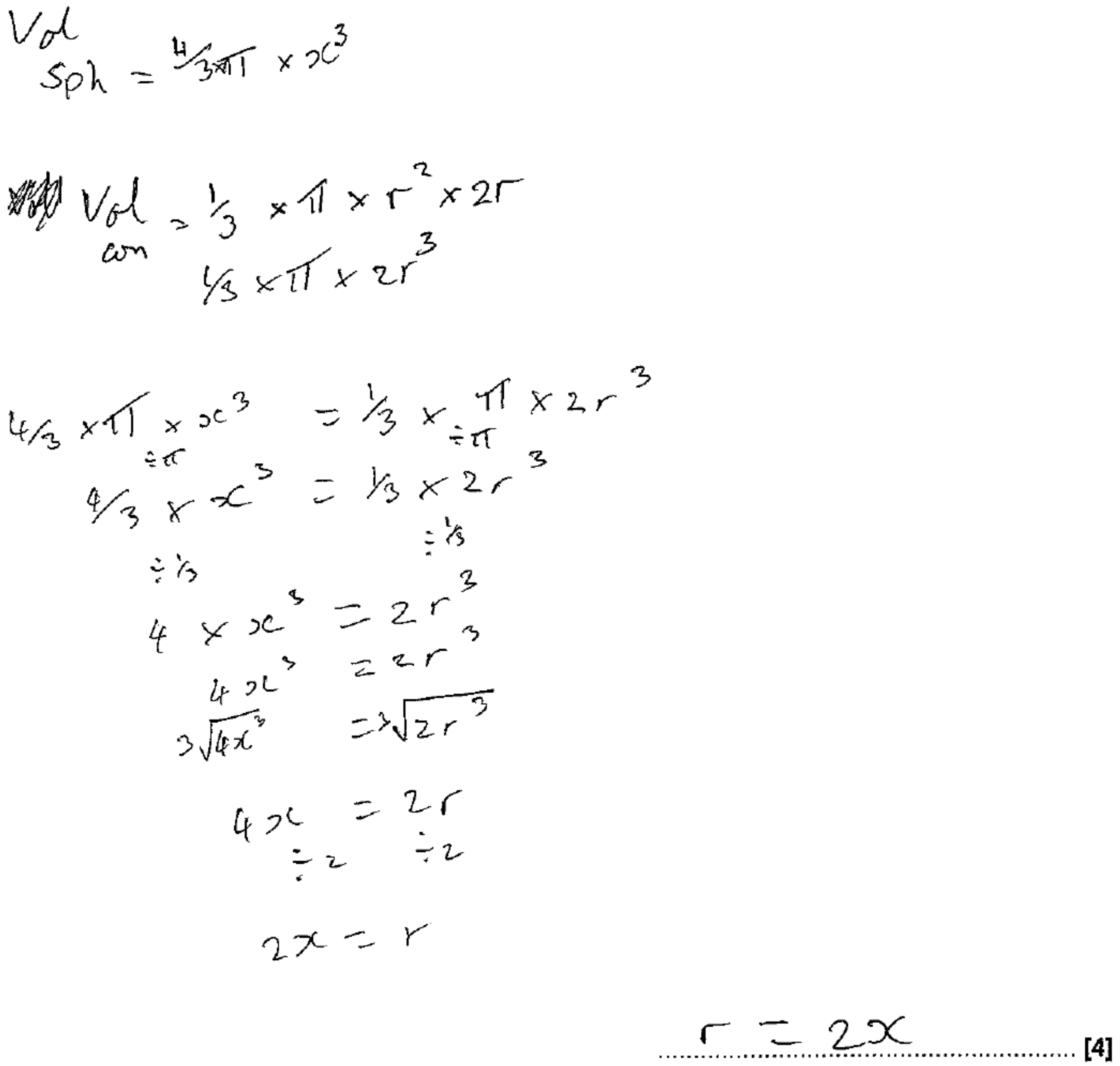
[The volume V of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.
The volume V of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

.... **[4]**

Many candidates were able to score some marks on the question, but only a few gave a fully correct response. Candidates often scored 2 marks by correctly substituting R and $2R$ into the cone formula and x into the sphere formula and then equating them, but they generally struggled to simplify further. A common error was not simplifying $R^2 \times 2R$ within the formula for the volume of the cone. Many were also unable to simplify the fractions and so struggled to reach $2x^3 = R^3$.

Those that did reach $2x^3 = R^3$ were sometimes unable to deal with the cube root correctly and gave final a response of $2x = R$.

Exemplar 2



In this example the candidate shows a correct method as far as $4x^3 = 2R^3$, which earns 3 method marks. Following this they attempt to cube root but do it incorrectly. The mistake seen here was one made by a number of candidates.

Question 19 (a)

19 (a) Describe fully the **single** transformation that is equivalent to:

- a rotation of 20° anticlockwise about the origin, followed by
- a rotation of 70° clockwise about the origin.

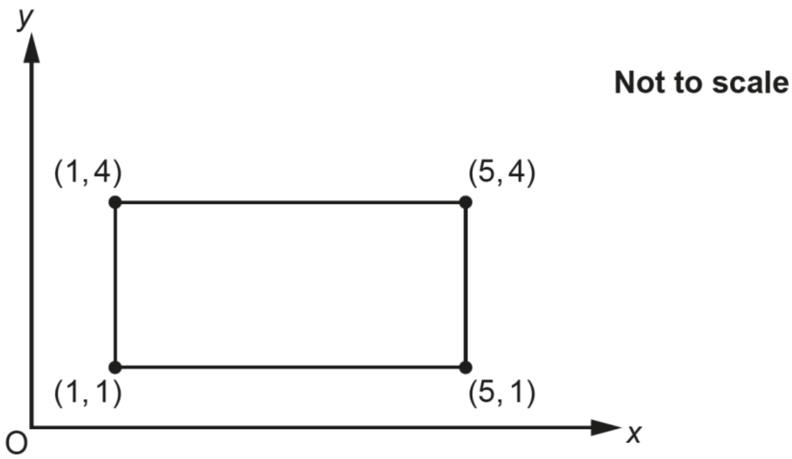
....

.... **[2]**

Candidates answered this part well. Most gave a complete description of the transformation. Others were given partial credit for either stating rotation around the correct centre, or for giving the correct angle and direction of the rotation.

Question 19 (b)

(b) The diagram shows the coordinates of the vertices of a rectangle.



The rectangle is reflected in the line $y = 4$.

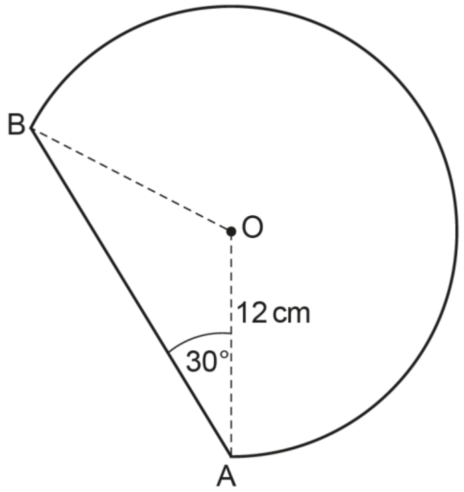
Write down the coordinates of the vertices of the rectangle that are invariant.

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

There were many correct responses, but a significant number of candidates seemed uncertain with the term 'invariant'. Answers with one coordinate, four coordinates and coordinates other than the four vertices of the rectangle were given by some.

Question 20

20 The shape below is part of a circle, centre O and radius 12 cm.
Angle OAB = 30°.



Not to scale

Work out the perimeter of the shape.
Give your answer in its simplest terms in the form $a\sqrt{b} + k\pi$.
You must show your working.

.... **[7]**

This proved to be a challenge for many candidates. Those who annotated the diagram tended to be more successful.

For the major arc length, a number did not identify 240° as the angle for the sector. Errors included finding the full circumference, using the minor sector angle 120° or using the area formula for the sector. More successful responses were methodical and showed clear working leading to the correct arc length 16π.

Most candidates attempted to calculate the length of AB and there were a number of methods seen. The most concise method was using 12cos30 to get $6\sqrt{3}$ and then multiplying by 2, which gave an answer presented as a simplified surd. Some found the height of triangle OAB first by using sin30 to get 6 cm, then used Pythagoras' theorem to find $\frac{1}{2}$AB before multiplying by 2. Those that used the sine rule to find the length of the chord AB did not always know the value of sin120 and hence struggled to complete the calculation. Similarly, the candidates who used the cosine rule did not always know the value of cos120, or incorrectly used cos30 or 2cos60 instead of cos120.

For many attempting the length AB, there was working all over the page showing multiple attempts without any selection of a final method, which led to the inability to award method marks.

Question 21

21 Work out the coordinates of the intersection of the graphs of $y = 5 - 2x$ and $y = 3x^2$.
You must show your working.

(………………., ……………….) and (………………., ……………….) **[6]**

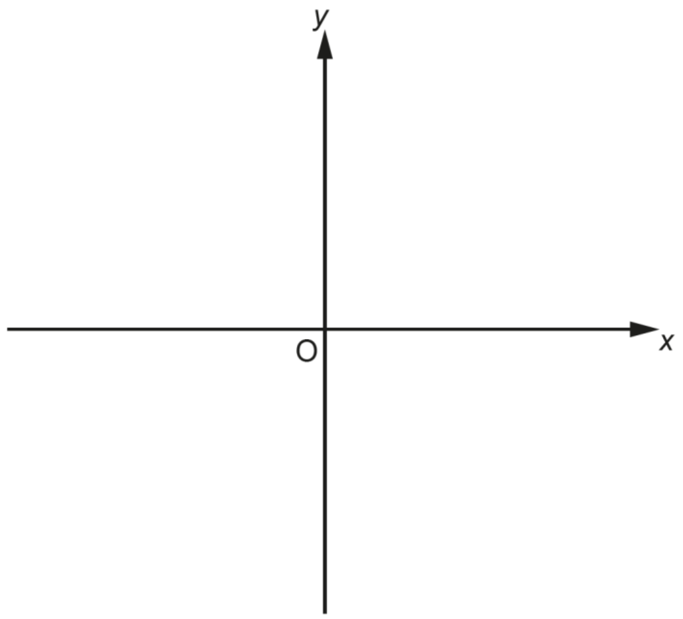
This question proved challenging for many candidates, but there were a number that answered it perfectly. Those that combined the given equations to form the correct quadratic equation almost always went on to factorise correctly and obtain at least one correct pair of solutions for x or one correct coordinate.

Most did not attempt to combine the two given equations and often a graphical approach was attempted instead, with candidates tabulating values for the two graphs. This often led to the solution (1, 3), for which they were credited.

A few unwisely attempted to set up an equation in y, which proved much more difficult and was rarely successful. A number of candidates made no attempt at the question.

Question 22 (a)

22 (a) Sketch the graph of $y = 8^x$.
Indicate any values where the graph crosses the axes.



[2]

Some candidates had a good knowledge of the shape of the graph and were able to draw a reasonable sketch with an indication that it passed through (0, 1). One mark was given to those that sketched an increasing exponential graph without the correct point, as well as those that sketched an incorrect graph with an indication that it passed through (0, 1).

The majority of candidates demonstrated little knowledge of the shape of the graph. There were a wide range of incorrect sketches involving ruled lines, parabolas, cubics and reciprocals.

Question 22 (b)

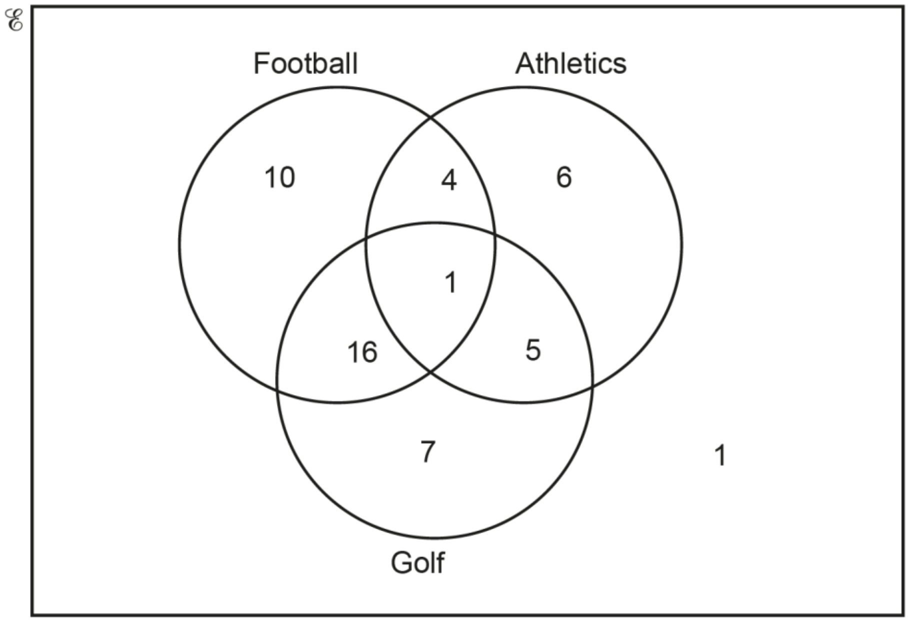
(b) Sketch the graph of $y = \cos x$ for $0° \leqslant x \leqslant 360°$.
Indicate any values where the graph crosses the x-axis.

[2]

Some candidates had a good knowledge of the shape of the cosine graph and drew a reasonable sketch, indicating that it passed through 90 and 270 on the x-axis. Some knew that the graph started at (0, 1), but made errors with the period and/or the amplitude of the curve. A number sketched the graph of $y = \sin x$.

Question 23 (a)

23 In a survey, 50 people are asked which sports they watch.
The results are shown on the Venn diagram.



(a) One person is chosen at random from those that watch athletics.

Find the probability that this person watches **only one** other sport.

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

This part was answered quite well and many achieved at least 1 mark here (for 1 mark, candidates could give a fraction with either 9 as the numerator or 16 as the denominator).

Errors included giving a fraction with a denominator of 50 or including people from sets other than athletics.

Question 23 (b)

(b) Two of the 50 people are chosen at random.

Show that the probability that one of them watches **only** football and the other watches **only** golf is $\frac{2}{35}$. **[3]**

This part proved challenging for many. The common error was to treat the choice of the two people as independent events rather than dependent events and the calculation $\frac{10}{50} \times \frac{7}{50}$ was common. Those that recognised the probabilities as $\frac{10}{50}$ and $\frac{7}{49}$ or equivalents invariably went on to find the product and earn at least 2 marks. A number did not consider the other pair $\frac{7}{50}$ and $\frac{10}{49}$, however.

More able candidates simplified the probabilities before or during multiplication and avoided a more complex calculation.

A number of candidates omitted this part.

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