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GCSE (9-1)

Examiners' report

MATHEMATICS

J560
For first teaching in 2015

J560/06 Summer 2018 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. 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 can be downloaded from OCR.

Paper J560/06 series overview

J560/06 is the third and final paper in the higher tier of the GCSE (9-1) Mathematics specification.

Use of calculators

In this paper it is expected that calculators will be used. It is important that accuracy is maintained in calculations and also with values which are transferred between processes.

The breadth of content examined, and the distribution of marks allocated to AO1, AO2 and AO3, are similar to J560/04 and J560/05.

To do well on this paper, candidates need to be confident and competent in all of the specification content. They also need to be able to:

- use and apply standard techniques (AO1)
- reason, interpret and communicate mathematically (AO2)
- solve problems within mathematics and in other contexts (AO3).

Questions 1, 2, 3, 5 and 9 were also set on the foundation tier paper J560/03.

Candidate performance overview

Candidates who did well on this paper generally did the following.

- Performed almost all standard techniques and processes accurately. Q1(b), Q2(a), Q3, Q7(a), Q7(b)(ii), Q14(a), Q15, Q17, Q21.
- Usually interpreted and communicated mathematics accurately. In particular, information presented in words or diagrams was understood and correct notation was used when presenting a mathematical argument. Q1(c), Q2(b), Q4, Q5(b), Q7(b)(i), Q8, Q9, Q10, Q18, Q20.
- Produced clear solutions to multi-step tasks. Q5(a), Q6, Q11, Q12, Q19.

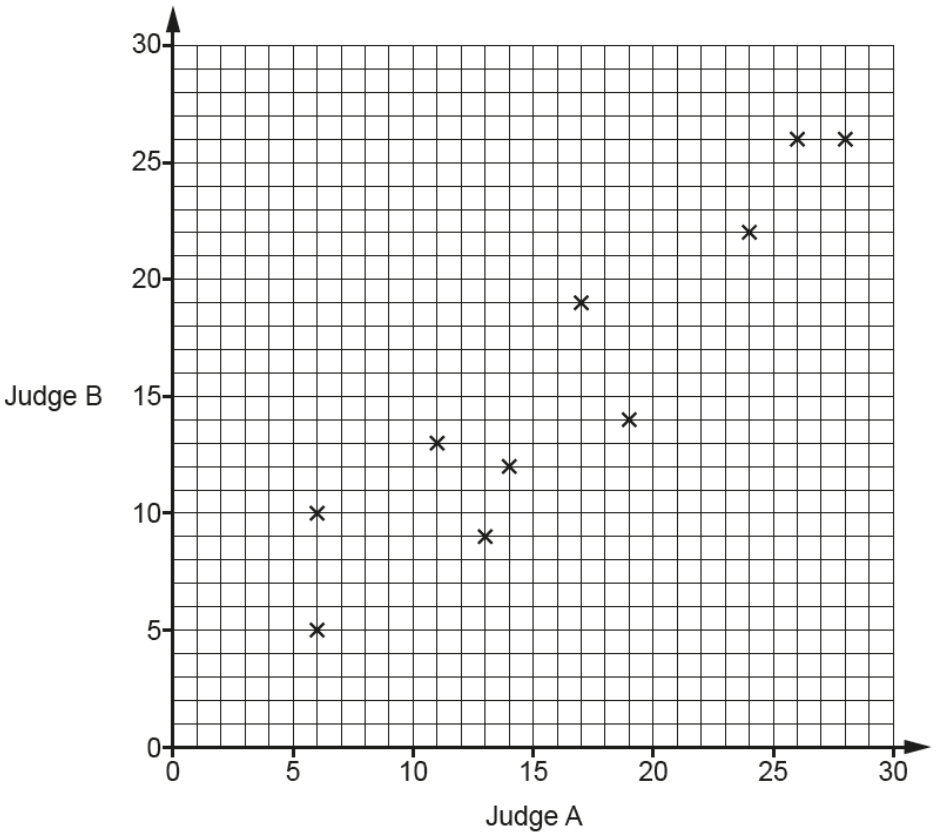
Candidates who did less well on this paper generally did the following.

- Made errors in performing low-grade processes. Q7(b), Q8(b).
- Produced responses that lacked notation of an appropriate standard. Q5(b), Q5(c).
- Showed poor setting out of multi-step tasks. Q5(a), Q11, Q12, Q14(a).
- Misinterpreted questions and information or did not follow instructions. Q1(a), Q1(b), Q8, Q13.

There was no evidence that any time constraints had led to candidates underperforming.

Question 1(a)

1 In a dance competition, two judges each award scores out of 30.
The scatter diagram shows the scores awarded to the first 10 dancers.



(a) Here are the scores for the next two dancers.

Judge A	21	7
Judge B	18	8

Plot their scores on the scatter diagram. **[1]**

Two thirds of the candidates plotted both points correctly. The most common mistake was to misinterpret the table, plotting (21, 7) and (18, 8) instead of (21, 18) and (7, 8).

Question 1(b)

(b) Dancers who are awarded a score of more than 20 by **both** judges receive a medal.

For the 12 dancers, express the ratio of medal winners to non-medal winners in its simplest form.

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

Candidates needed to extract information from the scatter diagram, present it as a ratio and then simplify. A variety of skills were required and no specific guidance was given. The question, therefore, focuses on AO2 and AO3, although the final simplification step is straightforward processing.

The full range of marks was seen, with nearly half of the candidates scoring full marks and about one fifth making an attempt but scoring zero.

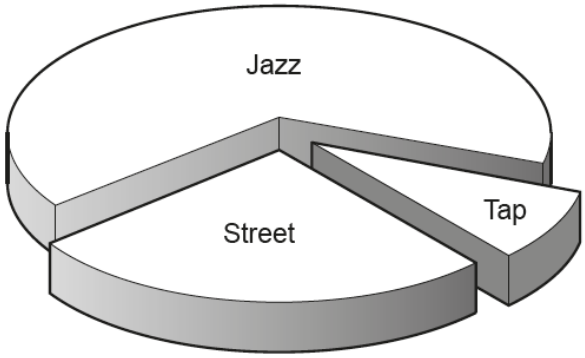
Candidates should have identified 3 medal winners and, ideally, expressed this in a ratio of 3 : 9 before simplifying to 1 : 3. However, it was not a requirement for 3 : 9 to be seen. Candidates who gave just an answer of 1 : 4 scored zero whereas, if they had shown the interim step of 3 : 12, they would have scored one mark for the identification of the 3 medal winners.

A few candidates misinterpreted or misread the demand as being an award of more than 20 by either judge receiving a medal. If 4 : 8 was seen and simplified, then a special case mark was credited.

Question 1(c)

(c) This chart shows the types of dance performed by the 12 dancers.

3 performed a street dance, 8 performed a jazz dance and 1 performed a tap dance.



Why is this diagram misleading?

.....

.....

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

Few correct responses were seen. Candidates should have commented on the distortion caused by the 3D nature of the diagram, such as the wedge at the front appearing to be larger than 90˚.

Question 2(a)

2 The police record the speed of vehicles passing a speed checkpoint.
The speeds are recorded in the table below.

Speed (s mph)	Number of vehicles		
$0 < s \leqslant 20$	5		
$20 < s \leqslant 40$	8		
$40 < s \leqslant 50$	37		
$50 < s \leqslant 60$	47		
$60 < s \leqslant 80$	3		

(a) Calculate an estimate of the mean speed of the vehicles.

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

This is a very standard 'mean of grouped data' question. The full range of marks was seen, with about one third of the candidates scoring full marks and one third scoring zero.

Candidates scored one mark for identifying the midpoints of the speed intervals, and one mark for finding the sum of the products of the midpoints and number of vehicles. They could then score a further method mark for dividing their total by their overall number of vehicles. One arithmetic error was permitted in the award of the method marks.

Some candidates mistakenly calculated frequency densities or cumulative frequencies. They could still score a mark if showing the midpoints, but otherwise these candidates scored zero.

Question 2(b)

(b) Explain why it is not possible to use the information from this table to calculate the **exact** value of the mean speed.

.....

.....

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

This mark was scored by about half of the candidates. Responses needed to refer to the exact speeds as not being given. Merely stating that midpoints had been used in the calculation was insufficient.

Question 3

3 A newborn baby has an approximate mass of 3.5 kilograms.

A human cell has an approximate mass of 2.7×10^{-11} grams.

Use these values to estimate the number of human cells in a newborn baby.
Give your answer in standard form, correct to 2 significant figures.

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

Candidates needed to perform a unit conversion and a division. The answer then needed to be rounded and presented in standard form. Although there are a number of steps, the order in which to perform them is clear and each should be a straightforward routine process. Therefore, the focus of the assessment is AO1. This question was also on J560/03, and so is viewed as being grade 4/5.

The full range of marks was seen. Just over one quarter of the candidates scored full marks and just under one quarter scored zero. Many candidates performed unnecessary processing in which they made errors, such as in changing the mass of the human cell into ordinary form or trying to perform the division using the rule of indices on the exponents. There was clearly a reluctance amongst the candidates to use the standard form facility on scientific calculators. $3500 \div (2.7 \times 10^{-11})$ would have produced $1.296\ldots \times 10^{14}$, scoring 4 marks and just needing to be written correct to 2 significant figures for the final mark.

Omitting the unit conversion, or using an incorrect conversion factor, was common. This should lead to an answer of the form 1.3×10^{n}, scoring 3 marks.

Question 4

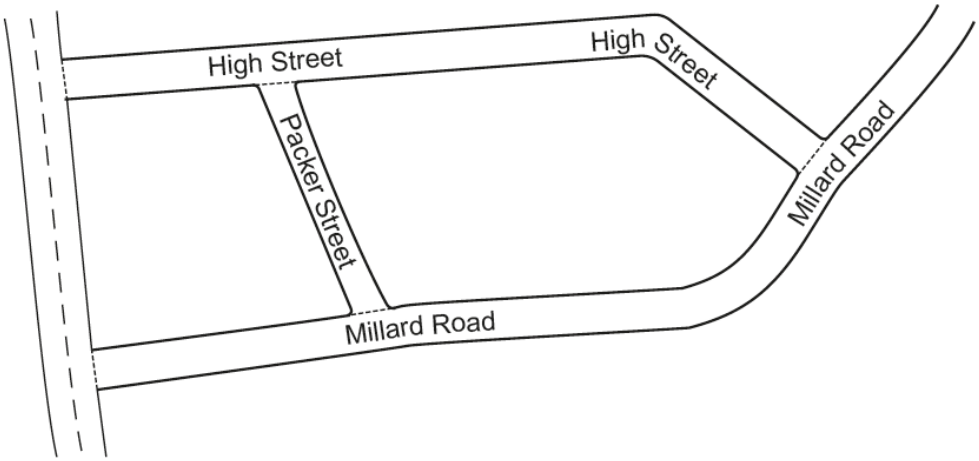
4 Use the symbols $<$, $\leqslant$, $=$, $>$, or $\geqslant$ to complete this statement.

If $x = 4.7$, **truncated** to 1 decimal place, then 4.7 ..... x ..... 4.8 **[2]**

The distribution of marks was fairly uniform, with limited difference in the outcome by ability. > and ≥ appeared almost as often as ≤ and <, suggesting limited understanding of their use in this context.

Question 5(a)

5 This map shows part of a village.



Neil knows that Packer Street is 180 m long in real life.

(a) Neil measures the map.

He says

> Packer Street is 3.5 cm long.
> High Street is 11.2 cm long.
>
> Therefore, I calculate that High Street is 576 m long in real life.

Use Neil's figures to show that the answer to his calculation is correct. **[3]**

This is a "show that" question and so has an element of AO2. Also, there are different approaches that the candidate must decide upon (AO3) and then the question becomes a routine process (AO1).

In a "show that" question, it is very important that candidates present a full method. Most candidates appeared to know a valid approach, and may have achieved full marks if asked to just work out the length of the High Street (AO3 and AO1). However, here they are told to "show" the answer and so the assessment objectives and mark scheme expectations change.

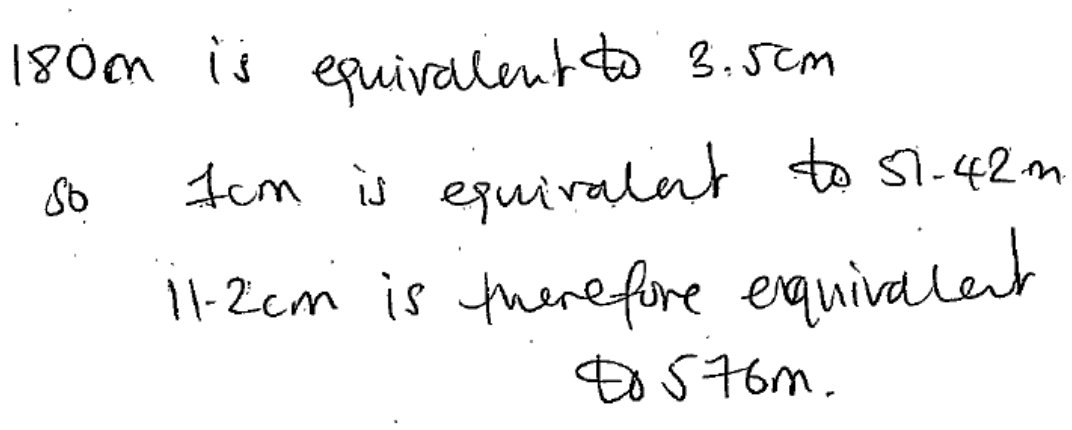
There were various acceptable approaches but the most common was to find a scale factor using Packer Street (180 ÷ 3.5) and then to multiply this by 11.2 to give 576 for the High Street.

Some candidates rounded their scale factor and thus did not achieve a final answer of 576. Sometimes they went back to their scale factor and recovered.

About two thirds of the candidates scored full marks. Marks lost by other candidates were often because of a lack of a full, clear method.

Exemplar 1

1 mark



Although this candidate has an answer of 576 m, they have been told that and therefore must show full and complete working. The 51.42 is an indication that some working has taken place and the first two lines help imply that a division may have taken place. M1 is credited for this. There is no evidence of how or why 11.2 cm should be equivalent to 576 m. To score any more marks, 51.42 × 11.2 needed to be seen.

Question 5(b)

(b) Jodie measures the same map.

She says

> I think Packer Street is longer than Neil's measurement of 3.5 cm.
> Therefore, High Street must be longer than 576 m in real life.

Is Jodie's reasoning correct?
Show how you decide.

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

Most successful candidates chose a measurement greater than 3.5 cm and repeated the calculation in part (a). This produced an answer of less than 576 m. This scored full marks if accompanied by a correct conclusion.

Responses that did not include a supporting calculation were less clear and successful, and many also came to the wrong conclusion.

Nearly half of the candidates scored full marks, and half scored zero.

Question 5(c)

(c) On another map, Packer Street is 2.4 cm long.

Express the scale of this map in the form 1 : *n*.

(c) 1 : ..... **[2]**

Candidates needed to set up and simplify the ratio 2.4 cm to 180 m. Few candidates wrote down a ratio and most went direct to a division, often the wrong way round. The majority of candidates did not perform a unit conversion, and so an answer of 75 rather than 7500 was common.

Only about 10% of candidates scored full marks.

Question 6

6 In a box of mixed nuts, the total number of almonds, cashews and peanuts is 1025.
The ratio of almonds to cashews is 1 : 3.
The ratio of cashews to peanuts is 5 : 7.

Calculate the number of cashews in the box.

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

Candidates needed to combine the two given ratios into one triple ratio. They were not told to do this and so there was a high problem solving, AO3, demand.

Over half of the candidates scored zero but a quarter scored full marks. As on June 2018 J560/06, the best responses showed clear presentation using columns to find the number of cashews.

Large numbers of candidates simply added three or four of the given ratios. There was no follow through for the subsequent work.

Question 7(a)

7 The probability that any postcard posted in Portugal on Monday is delivered to the UK within a week is 0.62.
The probability that any postcard posted in Portugal on Friday is delivered to the UK within a week is 0.41.

(a) Anna is on holiday in Portugal.
She posts 15 postcards to the UK on Monday.

How many of her postcards can she expect to be delivered within a week?

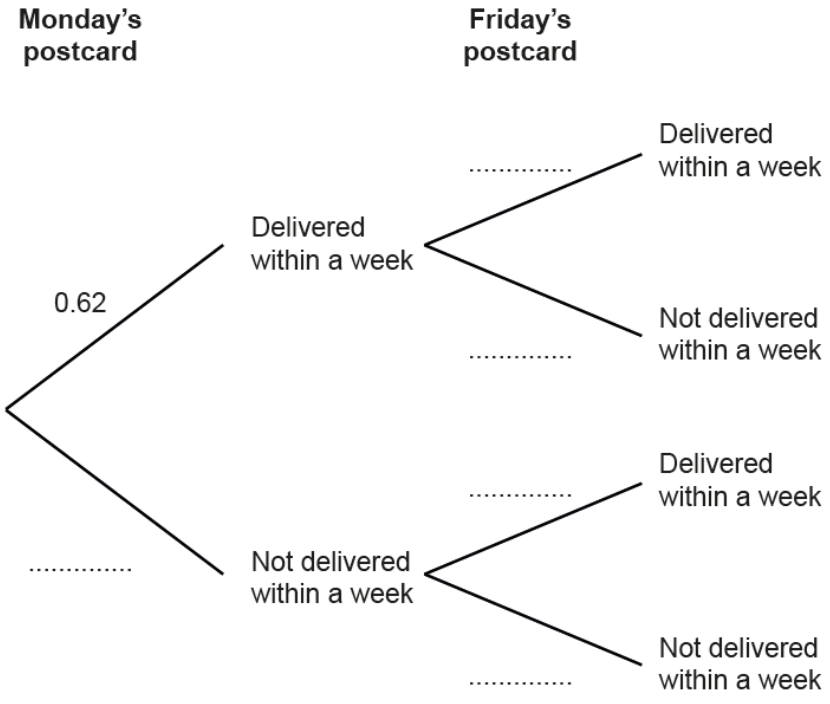
(a) ..... **[2]**

Candidates answered this question well. About three quarters scored both marks, whilst many others scored one mark for 15 × 0.62 = 9.3 but did not interpret this in the context as 9 postcards.

Question 7(b)(i)

(b) Sergio is in Portugal.
He posts one postcard to the UK on Monday.
He posts another postcard to the UK on Friday.

(i) Complete the probability tree to show the possible outcomes for the postcards.



[2]

Completion of a tree diagram involves communicating information and is AO2.

About two thirds of candidates completed the tree diagram correctly, whilst most of the others scored zero. Lower ability candidates often gave pairs of branches that did not sum to 1.

Question 7(b)(ii)

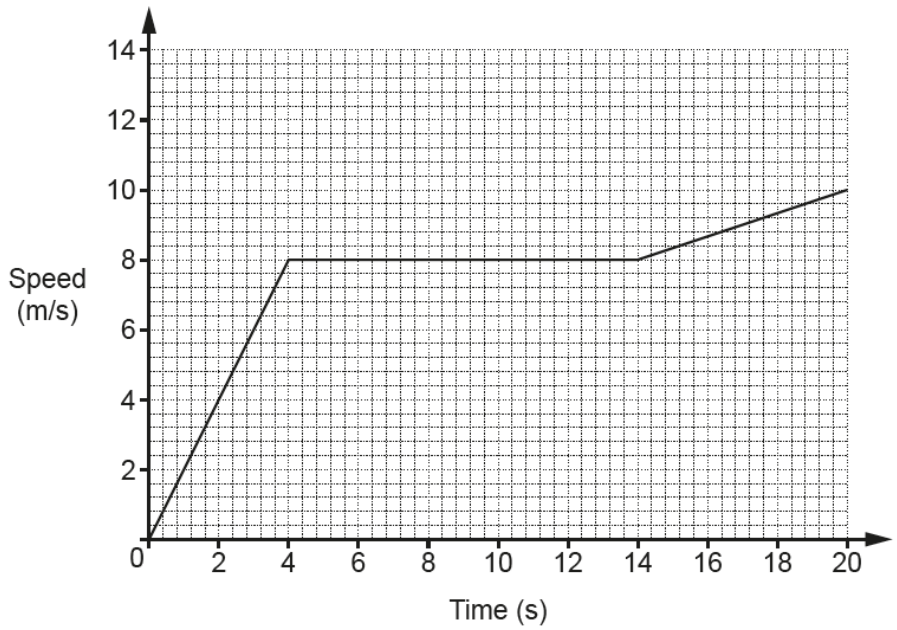
(ii) Calculate the probability that only one of Sergio's postcards is delivered within a week.

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

Using a tree diagram to find probabilities of combined events has been examined many times in the past. However, more than half of the candidates scored zero. Many of these attempts lacked any multiplication of probabilities. About a quarter of the candidates scored full marks.

Question 8(a)(i)

8 The graph shows the speed of a cyclist during 20 seconds of a journey.



(a) Find the acceleration of the cyclist

(i) for the first 4 seconds

(a)(i) ..... m/s^2 **[2]**

To achieve success across the parts of this question candidates needed to be able to interpret a speed-time graph (AO2). They needed to understand how acceleration, distance and speed are represented and then perform the appropriate calculations accurately.

Responses suggested that candidates were either well prepared for all parts of the question or they were unfamiliar with this type of graph, even though similar had appeared on June 2018 J560/06.

About half of the candidates scored full marks, and the other half scored zero. It was rare for a correct method to be accompanied by an incorrect answer. Nearly all candidates identified that 8 and 4 were crucial numbers to be used in obtaining the acceleration but only half found the gradient. Some had the gradient inverted and others found 8 × 4.

Question 8(a)(ii)

(ii) between 4 seconds and 14 seconds.

(ii) ..... m/s^2 **[1]**

With just one mark allocated, candidates might take the clue that no working out is needed. About half of the candidates gave the correct answer of 0. The others did a variety of irrelevant calculations.

Question 8(b)

(b) Work out the distance travelled by the cyclist during the 20 seconds.

(b) ..... m **[4]**

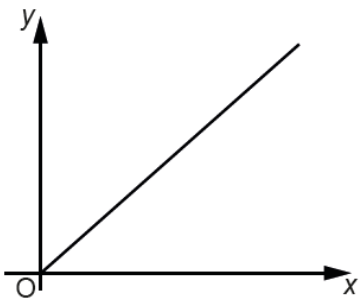
In contrast with June 2018, when more than half of the candidates scored full marks for finding a similar area under the graph, here more than half scored zero.

The answer, 150, was almost always obtained in a lengthy manner via two rectangles and two triangles – the trapezium between 14 and 20 seconds being split into a rectangle and triangle. It was rare to see the area of a trapezium being found in one step. Many candidates made errors in finding the area of the triangles.

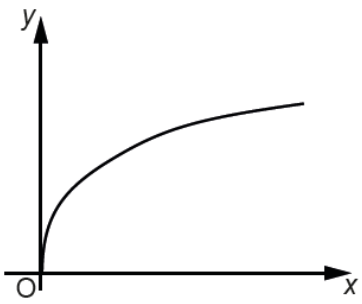
Question 9(a)

9 These graphs show different relationships between the variables x and y.

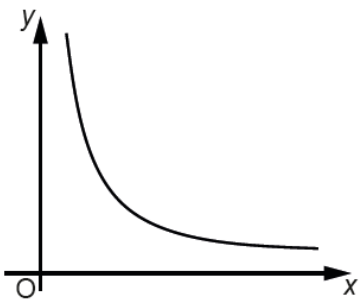
Graph **A**



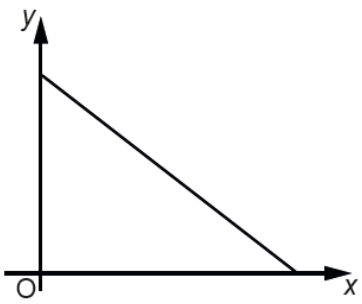
Graph **B**



Graph **C**



Graph **D**



Identify the graph which shows the following.

(a) y is directly proportional to x.

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

About 90% of the candidates recognised the graph for direct proportion.

Question 9(b)

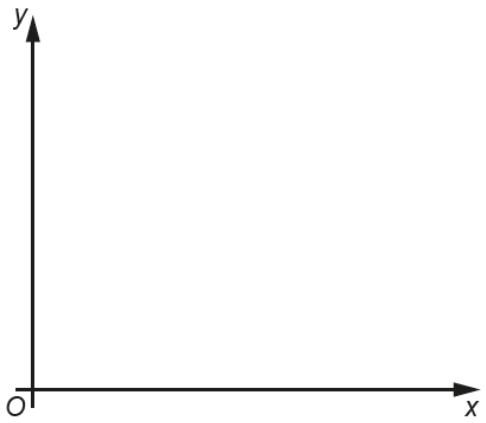
(b) y is inversely proportional to x.

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

About 50% of the candidates recognised the graph for inverse proportion. Graph D was the most common incorrect answer.

Question 10

10 Sketch a graph which shows that y is directly proportional to x^2.



[2]

About half of the candidates drew an increasing graph through (0, 0) but many of these were straight lines or had incorrect curvature. These often scored one mark.

Question 11

11 A regular polygon has n sides.
The polygon's interior angle is 5 times the size of its exterior angle.

Find n.

$n =$ ..... **[5]**

To answer this unstructured question successfully, candidates needed to combine techniques from shape and algebra. It provided assessment of both AO1 and AO3.

Higher ability candidates usually earned all 5 marks. Good solutions were characterised by working that was clearly laid out and easy to follow. Other attempts were often muddled and difficult to follow, with some requiring a lot of interpretation to determine the candidate's method.

The most concise and successful responses used an algebraic approach by saying the exterior angle = x and the interior angle = $5x$. The sum of the two angles ($6x$) was equated to 180 and x found to be 30. Finally, $\frac{360}{30}$ gave 12 sides.

Other attempts used trial values for n in the formulae $\frac{360}{n}$ and $\frac{180(n-2)}{n}$. Often this approach was abandoned but was still awarded some credit.

20% of candidates scored full marks, but 15% made no attempt and a further 35% scored zero.

Exemplar 1

5 marks

regular polygon has n sides

interior angles = 5 x size of exterior

$10 - 2 = 8 \times 180 = \frac{1440}{10} = 144$

180 - 144 = 36

$\frac{144}{36} = 4$ = 4 times

$11 - 9 = 2 = 9 \times 180 = \frac{1620}{11} = 147.27$

$\frac{147}{33}$ 4.4545

$n =$ 12 [5]

$12 - 2 = 10 = \frac{1800}{12} = 150$

$\frac{150}{30} = 5$

30 x 5 = 180 = interior angle of 12 sided shape

30 = exterior angle

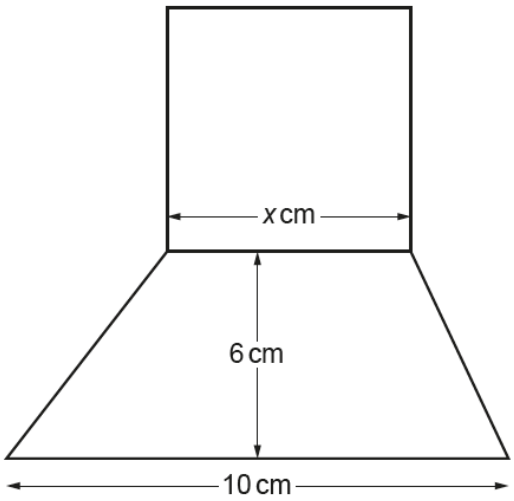
This response comes from a candidate who did not score particularly well overall. However, here they scored full marks. It is one of the clearer solutions that used trial and improvement.

Starting with $n = 10$, they used $\frac{180(n-2)}{n}$ in stages to find the interior angle. This scores M1. They then find the exterior angle using exterior angle = 180 – interior angle, scoring another M1. Most candidates stopped at this point, scoring 2 marks.

This candidate continues by performing a check to see whether $\frac{\text{the interior angle}}{\text{the exterior angle}} = 5$. This scores another M1. Realising that this is not true for $n = 10$, they then try $n = 11$ and $n = 12$. They eventually find an exterior angle of 30° with an interior angle of 150°, which scores A1. They correctly interpret that as being the solution required, meaning $n = 12$.

Question 12

12 In the diagram, the square and the trapezium share a common side of length x cm.



Not to scale

The area of the square is equal to the area of the trapezium.

Work out the value of x.

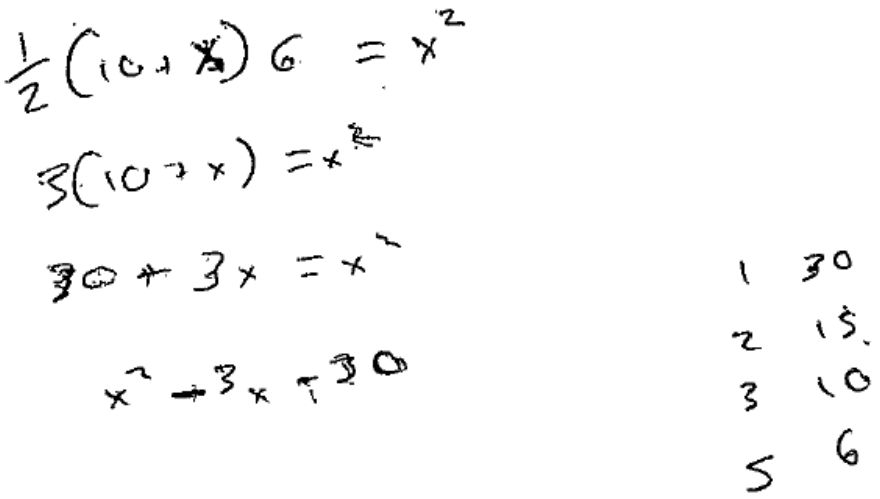
$x =$ ..... **[6]**

Candidates needed to know the area of a square and of a trapezium, to be able to set up a quadratic equation, rearrange that equation to zero, and solve it using the quadratic formula or by other means. Finally, they needed to realise that the formula produces two values for x but only the positive one is valid in this context. Although there is a lot of algebraic technique involved, there are also accessible elements of shape at the beginning. The question provided assessment of AO1 and multi-strand AO3 because of the problem solving decisions, mixed content and interpretation required.

About 10% of candidates scored full marks and 60% scored zero. Other candidates usually scored a mark for a correct expression for the area of a trapezium, even if they had not applied that formula in question 8(b). Some scored a further mark for equating the area of the trapezium with the area of the square, but were unable to correctly rearrange to reach $x^2 – 3x – 30 = 0$. Those with this quadratic usually solved it and interpreted the answers correctly.

Exemplar 1

2 marks

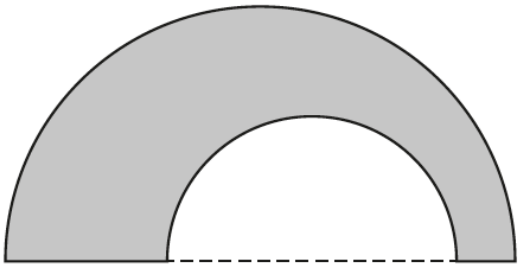


The expression for the area of the trapezium is correct and, on its own, would score M1. Instead, M2 is credited because it is equated to the area of the square. M3 is not achieved because the rearranged quadratic is not set "= 0". The remaining 3 marks were for solving the quadratic.

Although this response is sufficiently clear, candidates should be discouraged from overwriting + signs with – signs as the scanned image may not always show up their intention. Instead, candidates should cross through the error and then rewrite the correct version.

Question 13

13 The shape below is formed from two semicircles and a straight line.



Not to scale

The radius of the large semicircle is 8 cm.
The radius of the small semicircle is t cm.

Find an expression, in terms of t, for the **exact perimeter** of the shaded shape.

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

Candidates needed to break the perimeter into three sections and then add the parts together.

Expressions for each section were seen in fairly equal frequency but few candidates obtained all three correctly. Each correct expression from $\frac{16\pi}{2}$, $16 - 2t$, $\frac{2t\pi}{2}$ or equivalents was credited 1 mark to a maximum of 2. Full marks required the summation of all three.

About 20% of candidates omitted the question and many others used the formula for the area of a circle rather than the circumference.

Question 14(a)

14 (a) Without using a calculator, show that $0.\dot{1}\dot{9}$ can be written as $\frac{19}{99}$. **[3]**

This is a "show that" question and so has an element of AO2. Therefore, as in question 5(a), it is very important that candidates present a full method.

About a quarter of the candidates scored full marks. They usually labelled the recurring decimal as x, found $100x$ and then subtracted to obtain $99x = 19$. The method needed to be completed in full, with all lines of working shown and correct. Some candidates dropped marks because at some stage the expression on one side of the equals sign was not consistent with the numerical value written on the other side. Leaving gaps and then jumping straight to 19, for example, was quite common.

Question 14(b)

(b) Explain how $\frac{19}{99} = 0.\dot{1}\dot{9}$ can be used to find $\frac{19}{990}$ as a decimal and write down its value.

.....

..... $\frac{19}{990}$ = ... **[2]**

Candidates needed to give a mathematical explanation, which is AO2.

Only a minority realised that they just needed to divide both sides of the given statement by 10. The majority ignored the instruction and hint that they should be able to just write down the answer. Instead, they tried to repeat the method used in (a).

Question 15

15 Use the formula $x_{n+1} = \frac{(x_n)^3}{30} + 2$ with $x_1 = 2$ to calculate x_2 and x_3.
Round your answers correct to 4 decimal places.

x_2 = ... and x_3 = ... **[3]**

At grades 7-9, candidates are expected to use subscript notation, and so this is a routine question at that level. It is AO1 processing.

Most candidates scored zero or omitted the question. However, those scoring marks did include some of the lower achieving candidates who were able to substitute 2 into the expression. The answer is a recurring decimal, and writing this correct to 4 decimal places caused accuracy errors for many candidates.

Question 16

16 A £1 coin weighs 8.75 g, correct to the nearest 0.01 g.
Mitul weighs the contents of a large bag of £1 coins.
The coins weigh 2.63 kg, correct to the nearest 10 g.

Mitul says

> I am sure that the bag contains exactly £300 because, using bounds,
> 2625 ÷ 8.755 = 299.8 to 1 decimal place.

Show that Mitul may not be correct.

.....

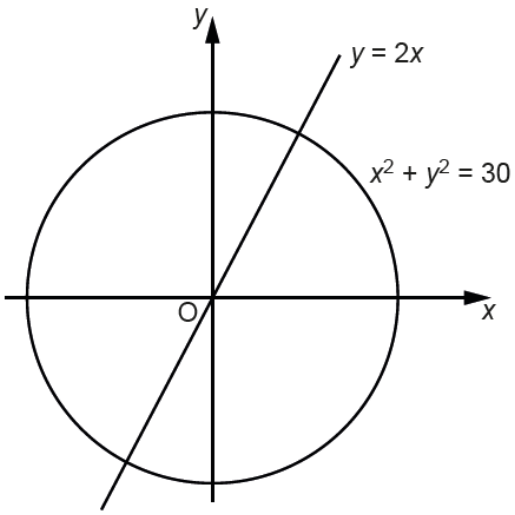
..... **[3]**

Candidates needed to identify appropriate values to use in a correct calculation that led to an answer greater than 301. They also needed to make a unit conversion at some stage. Individually, each step is a standard technique, but the lack of any structure or guidance gives the question some AO3. The question also asks for a comment on Mitul's statement, which is AO2.

It was not necessary to use bounds, although most successful candidates did so via 2635 ÷ 8.745 = 301[.3…]. The answer then needed to be interpreted, such as "Mitul may not be correct as it is possible to have £301". Calculation answers that were less than 301 and subsequently rounded up were not accepted.

Question 17

17 Find the exact coordinates of the two intersections of the line $y = 2x$ and the circle $x^2 + y^2 = 30$.



Not to scale

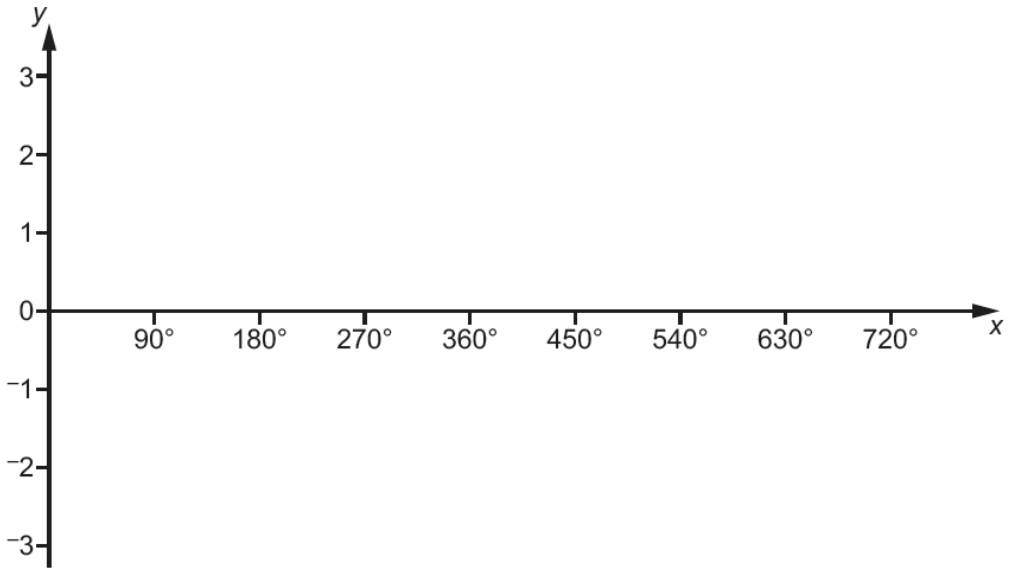
(..... , ...) and (..... , ...) **[5]**

40% of candidates omitted the question. Candidates needed to realise, rather than be told, to solve a pair of simultaneous equations, and so the question had an element of AO3. The actual solving was routine AO1.

Candidates making a start usually, and sensibly, substituted $2x$ for y in the circle equation. However, brackets were often omitted resulting in the equation $3x^2 = 30$ rather than $5x^2 = 30$. More able candidates with the correct equation were often able to find the exact coordinates as requested.

Question 18(a)

18 (a) Sketch the graph of $y = \cos x + 1$ for $0° \leqslant x \leqslant 720°$.



[3]

About 40% of the candidates scored some marks either for a cos curve, or for correct *x* values or *y* values at the maximum and minimum points.

Question 18(b)

(b) Explain why the equation $\cos x + 1 = 2.7$ has no solutions.

.....

.....

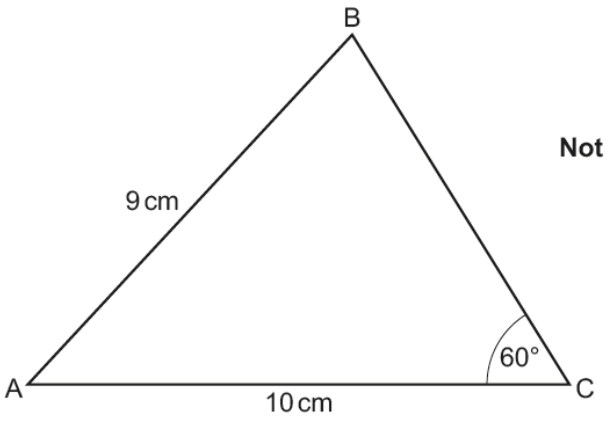
..... **[1]**

Only the most able candidates scored this mark. Candidate responses needed to be clear that the maximum value of cos*x* + 1 is 2 and 2.7 is greater than 2.

Question 19

19 In this triangle:

- AB = 9 cm
- AC = 10 cm
- BC > 5 cm
- angle BCA = 60°
- angle ABC < 90°.



Not to scale

Calculate the area of triangle ABC.

..... cm^2 **[6]**

No guidance is given on how to proceed and so the focus of the assessment is AO3, together with some AO1 processing of standard grade 7-9 techniques.

Different approaches were seen and applied successfully. One method involved the cosine rule leading to a quadratic in terms of length BC. This needed to be solved by the quadratic formula, giving BC as 7.45 and then the area of the triangle could be found using $\frac{1}{2} \times 10 \times \textit{their} 7.45 \times \sin 60$. Alternatively, the sine rule was used to find angle ABC, followed by angles in a triangle to obtain angle BAC as 45.8°. The area was then found using $\frac{1}{2} \times 9 \times 10 \times \textit{their} \sin 45.8$.

The question differentiated well between the top 20% of candidates. Others had little idea on how to make progress or applied right angle trigonometry to a triangle that does not have a right angle.

Question 20(a)

20 (a) **b** is a vector.

Given that $\mathbf{b} + \begin{pmatrix} 5 \\ 2 \end{pmatrix}$ is parallel to $\begin{pmatrix} 2 \\ 1 \end{pmatrix}$, find two possible answers for **b**.

(a) $\mathbf{b} = \begin{pmatrix} \quad \\ \quad \end{pmatrix}$ or $\begin{pmatrix} \quad \\ \quad \end{pmatrix}$ **[3]**

The question gave no guidance and so has elements of AO3 in its assessment. Candidates also needed to infer that "parallel to $\begin{pmatrix} 2 \\ 1 \end{pmatrix}$" means vectors that are multiples of $\begin{pmatrix} 2 \\ 1 \end{pmatrix}$. This inference is AO2.

There were an infinite number of possible correct answers but most candidates did not find any. $\begin{pmatrix} 1 \\ 1 \end{pmatrix}$ and $\begin{pmatrix} 3 \\ 2 \end{pmatrix}$ were the most frequently seen correct responses. Most attempts lacked formality or a logical approach. For example, solving $\mathbf{b} + \begin{pmatrix} 5 \\ 2 \end{pmatrix}$ = any multiple of $\begin{pmatrix} 2 \\ 1 \end{pmatrix}$ would give a solution.

Question 20(b)

(b) Given that

$$m\begin{pmatrix}4\\1\end{pmatrix}+n\begin{pmatrix}5\\2\end{pmatrix}=\begin{pmatrix}12\\6\end{pmatrix}$$

find the value of m and the value of n.

(b) $m =$ .....

$n =$ ..... **[5]**

Candidates needed to make the decision to set up and solve a pair of simultaneous equations. The decision making is AO3 and the solving is AO1.

About 15% of the candidates scored full marks, whereas almost all others scored zero.

Question 21

21 Show that $\frac{5x}{x+5}+\frac{25}{x-7}-\frac{300}{(x+5)(x-7)}$ simplifies to an integer. **[6]**

Candidates needed to decide on an approach to deal with three fractions and so there is some AO3 here. It is a "show that" question, and so AO2 is also being assessed. There is then a lot of routine algebraic processing, and so most of the marks are AO1.

Nearly half of the candidates made some progress with this question, although only about 5% achieved full marks.

Many scored the mark for cross-multiplying, although errors were often made in the simplification. The mark for the common denominator of the first two fractions was also often credited. There was no reward for merely expanding $(x + 5)(x – 7)$ as it was an unnecessary step towards the solution. After introducing the third fraction, candidates who reached the correct numerator of $5x^2 – 10x – 175$ had scored 3 marks, with many having 4 marks if the common denominator was seen. The final 2 marks were for correct factorisation of the numerator and simplification of the resulting fraction to the answer of 5.

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