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GCSE (9–1)

Examiners' report

MATHEMATICS

J560

For first teaching in 2015

J560/01 Summer 2023 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 which caused difficulty and why the difficulties arose, whether through a lack of knowledge, poor examination technique, or any other identifiable and explainable reason.

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

A full copy of the question paper and the mark scheme can be downloaded from our secure Teach Cambridge site (https://teachcambridge.org).

Paper 1 series overview

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

Candidates' ability to make appropriate use of a calculator was variable and is an area for improvement. Many still use non-calculator methods. Less confident candidates often appeared to avoid the use of the division key, instead trying to find a multiplier that worked or using repeated addition. Marks were often lost because of premature approximation, truncation or rounding, which then lost the accuracy required. In particular, fractions like $\frac{1}{3}$ and $\frac{1}{6}$ caused problems. Candidates could make better use of the fraction function [*a*/*b*] on their calculators and thus work in fractions rather than decimals.

Candidates generally scored well on the 1 and 2 mark questions up to Question 13 (a).

Challenging topics and contexts included showing an inequality on a number line, ratio problems, percentages and multi-step problems where two starting points needed to be brought together.

Candidates need to be aware of whether their answer is reasonable or not in the context of the question.

While many longer answers were clearly set out, some shorter questions lacked organisation and clarity.

Candidates who did well on this paper generally:	Candidates who did less well on this paper generally:
• attempted all questions without leaving answer spaces blank • wrote figures, symbols and words clearly and unambiguously • were confident in the use of a calculator and were able to fully understand the implications of the answers they obtained • showed clearly structured responses that displayed evidence of working at each stage gaining many methods marks • used and understood correct mathematical language, such as median, range and surface area.	• presented their work in a disorganised way that lacked a clear route through to a solution • either had no access to a calculator or did not use one effectively • did not explain responses in written form • showed little or no working • left a large number of questions unanswered • gave a choice of conflicting responses • rounded values too soon while working through a method, leading to a lack of accuracy in final answers.

Question 1 (a)

1 Here is a list of numbers.

8 11 19 26 39 49 65 114

From this list, write down

(a) an even number,

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

This was the most successful part of this question, with 8 being selected in the majority of responses. A few candidates gave all three correct values.

Question 1 (b)

(b) a square number,

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

Many gave the correct answer, the common incorrect responses were 8 and 11 with a small number choosing square numbers that were not in the list.

Question 1 (c)

(c) a factor of 57.

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

Many candidates gave the correct answer. However there was the usual confusion between factors and multiples with many giving 114 as their answer. A small number of candidates answered with a factor of 57 that was not in the list, such as 3, 1 or 57.

Question 2

2 Kai has four differently numbered cards.

- The range of the numbers is 14.
- The median of the numbers is 9.
- All the numbers are prime numbers.
- The lowest number is 5.

Work out the numbers on the cards.
Write the numbers in order of size.

5 (*lowest*) ..... , ... , ... , ... **[3]**

Many different combinations of values were seen in responses to this question. Many candidates were able to find the maximum value of 19, though others instead gave the range 14 as their maximum. Candidates were less successful in finding values to satisfy the other two criteria of a median of 9, and four different prime numbers ≥ 5. Often, they could satisfy one of the criteria, but not both.

[5], 9, 9, 19, or [5], 7, 13, 19, or [5], 7, 11, 13 were common partially correct answers.

Question 3 (a)

3 Here are the first four terms of a sequence.

5 12 19 26

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

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

The majority of candidates were successful at answering this part of the question.

Question 3 (b)

(b) Explain how you worked out your answer.

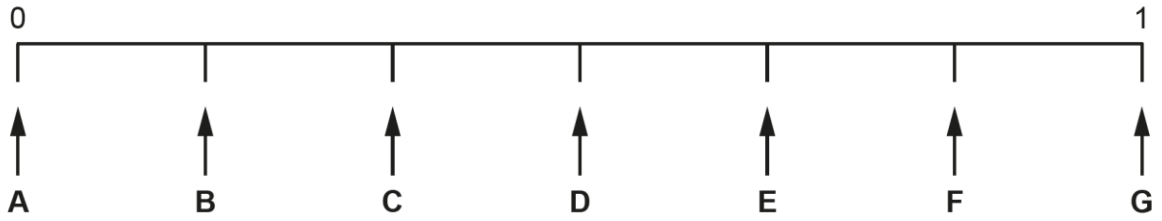
..... **[1]**

Many candidates gave the correct answer to this question. Common errors were to give the *n*th term rule. This alone is not an 'explanation' of how they got their answer, but if they went on to show the *n*th term being used for the 5^{th} term then they were given the mark for an explanation. Another mistake was just to explain the method for any sequence and not explain what they had actually done; they referred to finding the difference, but not what the difference was.

Question 4 (a)

4 A fair six-sided dice, numbered 1 to 6, is rolled.

The diagram shows a probability scale.



Which arrow shows the probability that the dice

(a) lands on 5,

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

Only more able candidates managed to score marks in all parts of this question. Some candidates gave fractional answers. The most common incorrect answers to part (a) were E and F, presumably as candidates identified their positions with the number 5 on the dice.

Question 4 (b)

(b) lands on 7,

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

This was the most successful part of the question, with many correct answers seen.

Question 4 (c)

(c) lands on a number greater than 2?

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

Many responses contained the four letters D, E, F and G, presumably corresponding with the numbers on the dice greater than 2.

Question 5 (a)

5 **(a)** Write 0.17 as a fraction.

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

Only a few incorrect answers were seen for this question, for example $\frac{17}{10}$, $\frac{7}{10}$ or $\frac{1}{7}$.

Question 5 (b)

(b) Write 0.04 as a percentage.

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

This was less well answered than part (a). The common errors were 0.4, 40 and $\frac{1}{25}$.

Question 5 (c)

(c) Write $\frac{7}{8}$ as a decimal.

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

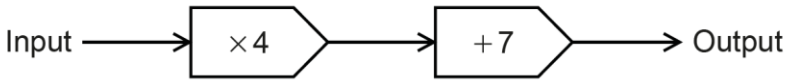
This question was generally answered well, with the majority using their calculator correctly in performing the conversion.

Assessment for learning

Rounded or truncated answers were sometimes given, without the full answer being shown first in the working space.

Question 6 (a)

6 Here is a function.



(a) Find the input when the output is 87.

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

The majority of candidates gave the correct answer to this question.

Question 6 (b)

(b) The input is x and the output is y.

Write an equation for y in terms of x.

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

Many candidates scored 2 marks. The common error was to confuse x and y.

Question 7 (a) (i)

7 **(a)** Work out.

(i) 3^5

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

This question was well answered, suggesting efficient use of a calculator.

Question 7 (a) (ii)

(ii) $\sqrt[3]{2744}$

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

This part of the question proved to be more challenging. A common error was to use square root rather than cube root and sometimes multiplying the result by 3 to arrive at 157.149. An answer of $42\sqrt{14}$ was also quite common.

Question 7 (b)

(b) Find the value of y.

$384 = 6 \times 4^y$

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

The majority of candidates obtained at least 1 mark, usually for 384 ÷ 6 if they didn't go on to get both marks. Further division by 4 gave a common incorrect response of 16. A significant number carried out 6 × 4 as a first step.

Question 7 (c)

(c) Write 3^{-1} as a fraction.

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

Many correct answers were seen for this question. The common errors were $\frac{33}{100}$, $-\frac{3}{10}$ and 0.333.

Question 8

8 450 g of flour costs £1.44.

Work out the cost of 1 kg of this flour.

£ ..... **[2]**

Candidates who used a complete calculator method usually gave the correct answer. Many candidates made the question harder by doubling £1.44 to get the cost of 900 g, then struggled to work out how to find the cost of the remaining 100 g.

Question 9

9 A farmer keeps sheep in a rectangular field measuring 120 m by 180 m.
The farmer can keep up to 20 sheep per hectare in the field.
1 hectare is 10 000 square metres.

Work out the maximum number of sheep the farmer can keep in the field.

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

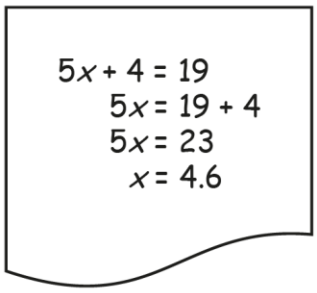
The majority of candidates made an attempt to answer this question. Candidates who scored well on this question were most often the ones who had a logical structured approach to their answer and showed all steps taken. Most candidates realised that since the field was rectangular they needed to multiply the sides together and many did so correctly to reach 21 600. At this point, some then proceeded correctly by dividing by 10 000 to reach 2.16 hectares. Some attempted to subtract 20 000, but often did not show the remaining figure of 1600 that was needed along with this to score the M1 mark. Candidates who showed 21 600 ÷ 10 000 = 2.16 and rounded this to 2 fared better, but often did not show 2 × 20 = 40.

Of the few candidates who did correctly carry out 2.16 × 20 to get to 43.2, some did not realise the 'difficulty' in having 0.2 of a sheep and gave 43.2 as the answer, while others incorrectly rounded up to an answer of 44. Those who took the approach of finding that each sheep required 500 m^2 usually reached a successful conclusion.

Question 10 (a)

10 (a) Finley is asked to solve the equation $5x + 4 = 19$.

Finley's working is shown below.



Write down the error that Finley has made.

.....

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

Many candidates realised the error, however some just showed how to solve the equation without pointing out the error as required.

Question 10 (b)

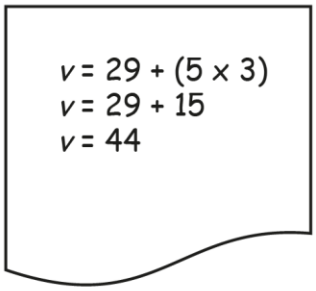
(b) Charlie is asked to use the formula

$v = u + at$

to find the initial velocity, when

- the acceleration is $5\,m/s^2$
- the final velocity is $29\,m/s$
- the time is 3 seconds.

Charlie's working is shown below.



Write down the error that Charlie has made.

.....

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

Not many candidates were able to give the correct reason. Many referred to the acceleration and stated that it needed to be squared (almost certainly due to confusion with the units for acceleration). Other candidates referred to the use of brackets.

Question 11 (a)

11 Cookies are made using these ingredients.

Ingredients

Makes 24 cookies

240g butter
360g sugar
2 eggs
240g flour
170g cranberries
100g white chocolate

(a) How many eggs are needed to make 48 cookies?

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

Most candidates gave the correct answer of 4 to this question.

Question 11 (b)

(b) How much sugar is needed to make 6 cookies?

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

The majority of candidates gave the correct answer of 90. The most common incorrect answer was 60.

Question 11 (c)

(c) Ashley has 520 g of cranberries and plenty of the other ingredients.
Ashley thinks this is enough to make at least 80 cookies.

Is Ashley correct?
Show working to support your answer.

..... because .....

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

The more able candidates used a complete method, however some rounded prematurely, leading to an answer outside the required range of accuracy and scoring 2 marks. A common error was candidates believing only complete batches of 24 cookies could be made.

Question 11 (d)

(d) Darcie makes 100 cookies.
They are put into packets, each holding 6 cookies.
Each packet of 6 cookies is sold for £1.35.
Darcie sells all of these packets.

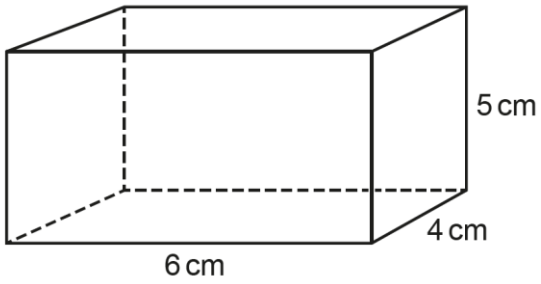
Work out how much money Darcie receives.

(d) £ ..... **[3]**

Many candidates gave the correct answer. Several candidates ignored the context by using 16.6 or 17 complete packets of cookies rather than 16 complete packets, but often still scored 2 marks.

Question 12

12 Work out the surface area of the cuboid.



..... cm^2 **[3]**

Many candidates calculated the volume correctly. Presentation was sometimes unclear. For example, 4 × 5 = 20 and then 20 × 6 = 120 is ambiguous, it could be calculating six faces of area 4 by 5, or a volume calculation performed in two steps. A better response (although still incorrect) was 4 × 5 = 20, 20 × 2 = 40, with 5 × 6 = 30, 30 × 4 = 120 and then 40 + 120 = 160. Despite the presence of 120, it is clear from the presentation that that it represents the area of four faces each with area 30.

Assessment for learning

Present working clearly. Words or annotations on a diagram may help to clarify working.

Question 13 (a).

13 Kareem runs 2460 metres in 8 minutes.

(a) Calculate his average speed in metres per minute.

(a) ..... m/min **[2]**

Generally, this question was well answered, with most candidates knowing they had to divide distance by time and successfully getting the answer of 307.5.

Question 13 (b)

(b) Kareem says

This means I can run 6150 metres in 20 minutes.

Write down **one** assumption Kareem has made.

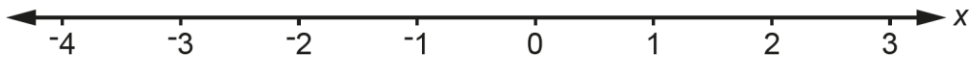
.....

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

Some candidates struggled to articulate themselves fully to get an assumption that was correct. For those who did, 'will not get tired' and 'will not stop' were common correct responses. Few candidates considered external factors such as the weather or the route.

Question 14

14 Show the inequality $x > -2$ on this number line.



[2]

There seemed to be an understanding that -2 was a key value, but many were unaware of how to record this on the diagram. When an open circle was placed correctly at -2, the majority went on to score the full 2 marks. A variety of alternative annotations were seen, including an arrowhead above -2, a closed circle, an additional circle at the right-hand end of a line, a mark/arrow above the correct point with no line, as well as arrows pointing in the wrong direction.

Question 15

15 Finley has 72 sweets.
Finley gives

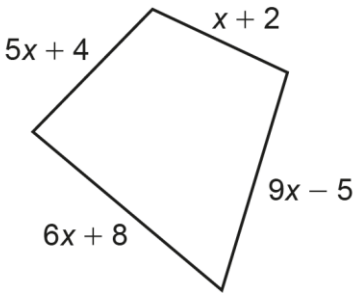
- 25% of the sweets to Alex
- $\frac{1}{6}$ of the sweets to Umi.

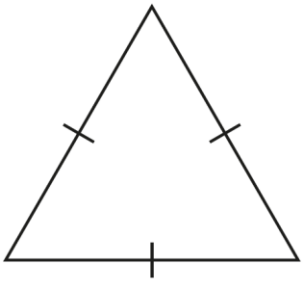
Show that Finley has $\frac{7}{12}$ of the sweets left. **[4]**

Many correct answers were seen, usually with clear working that was easy to follow. The mark scheme's main method was the most common seen, with many candidates scoring 4 marks. Sometimes, only 3 marks could be given because either 42 or the final equivalence were assumed rather than shown. Other methods were also used.

Question 16

16 The diagram shows a quadrilateral and an equilateral triangle.
The perimeter of the quadrilateral is equal to the perimeter of the equilateral triangle.





Not to scale

Find an expression for the length of one side of the equilateral triangle.
Give your answer in terms of x in its simplest form.

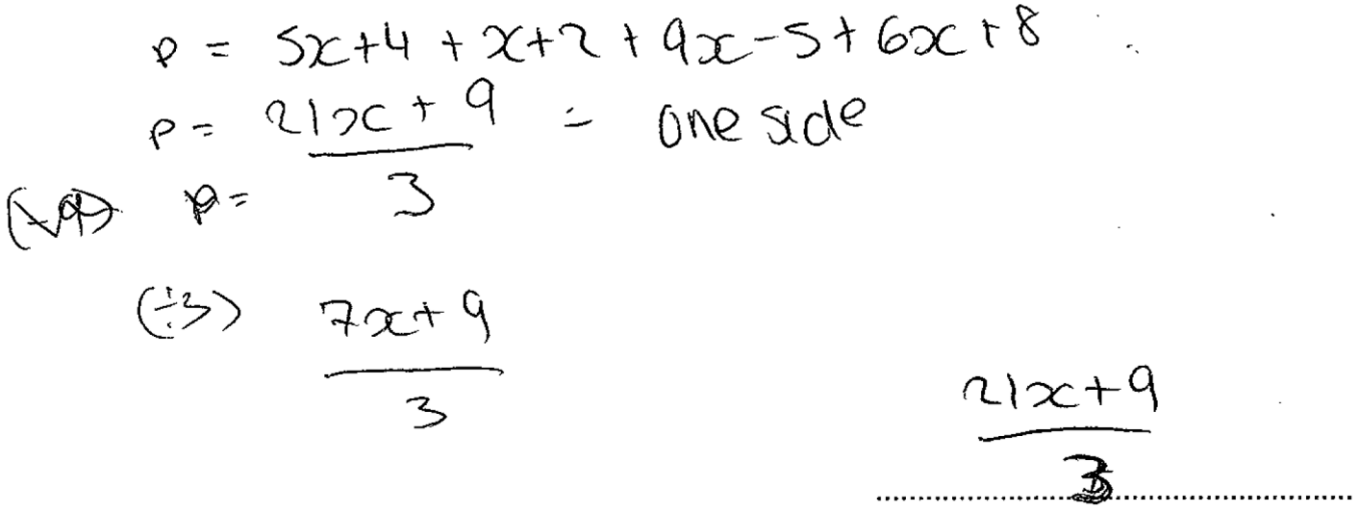
..... **[4]**

There were few fully correct answers for this question and a significant number of candidates did not attempt it. Candidates should be encouraged to attempt all questions. Some candidates listed all the expressions but didn't attempt to add them together. Several did this correctly and scored 2 marks for $21x + 9$. Some knew they had to divide by 3 and scored the third mark for writing this.

Misconception

A common misconception is that $5x + 4$ can be simplified to $9x$, etc.

Exemplar 1



This response has shown correct working for 3 marks. Had they correctly divided by 3, they would have scored all 4 marks.

Question 17

17 Multiply out and simplify.

$(3x + y)(x + 2y)$

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

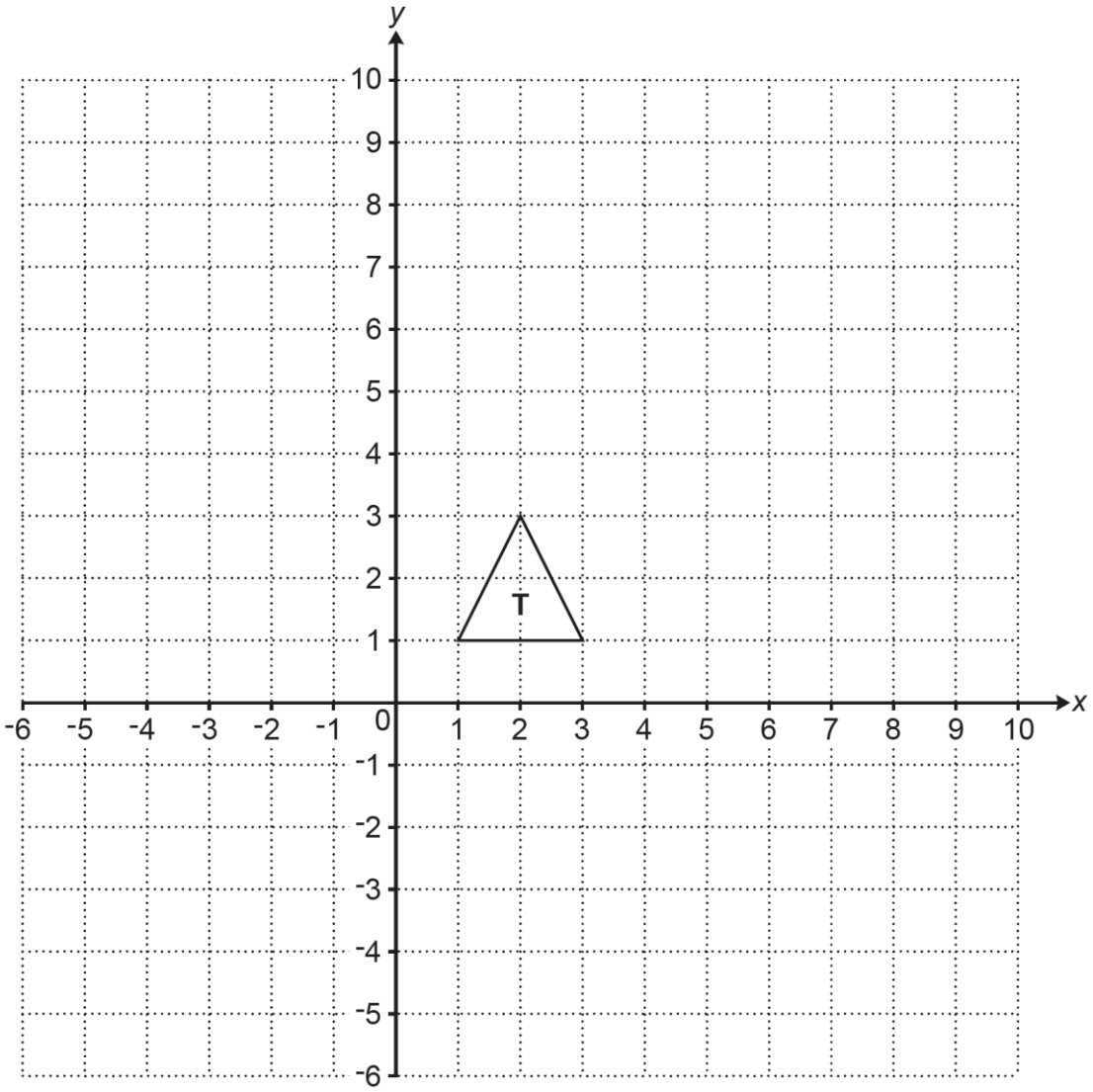
Many candidates gave four terms in their expansion, with the $3x^2$ and $2y^2$ expressions often correct. A common error was to simplify $3x \times 2y$ to $5xy$. Even with the four correct terms, candidates frequently were unable to collect like terms together correctly, with various products of the four terms being attempted.

Misconception

A common misconception was simply to add the terms in the brackets, giving so $4x + 3y$.

Question 18 (a)

18 Triangle **T** is drawn on a coordinate grid.



(a) Triangle **A** is translated by $\begin{pmatrix} 6 \\ -3 \end{pmatrix}$ to give triangle **T**.

Draw and label triangle **A** on the grid. **[2]**

Most candidates understood how to do a translation; however, errors were made when actually counting and occasionally the translated triangle ended up in the wrong position. Several translated triangle T itself by $\begin{pmatrix} 6 \\ 3 \end{pmatrix}$, which scored B1.

Question 18 (b)

(b) Triangle **T** is rotated through 90° anticlockwise about (0, 0) to give triangle **B**.

Draw and label triangle **B** on the grid. **[2]**

Most candidates seemed to understand the concept of a rotation. Common errors were rotating in the wrong direction or around the wrong point.

Question 18 (c)

(c) Triangle **T** is reflected in the line $y = -1$ to give triangle **C**.

Draw and label triangle **C** on the grid. **[2]**

This part was least well done. Common errors were reflecting the wrong triangle or reflecting in one of the axes rather than the line $y = -1$ as required. Candidates who reflected in the line $x = -1$ scored 1 mark.

Question 19

19 Calculate.

$\sqrt{5.2^2 - 4.8 \times -6.3}$

Give your answer correct to **3** significant figures.

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

Those who understood how to use their calculator usually scored at least 1 mark. Some candidates did not round their answer to 3 significant figures as requested (often rounding to 3 decimal places; a common final answer was 7.568).

Question 20

20 The price of petrol decreases from £1.32 per litre to £1.02 per litre.

Calculate the percentage decrease in the price.

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

Many students attempted this question, but it was not well answered by the majority. Often students simply calculated the difference as 0.30 and gave an answer such as 0.3%, 3% or 30%. Some scored M1, but few M2s were given. Those who did score 3 marks usually showed their correct fraction multiplied by 100. An occasional negative value was seen for the 3 marks.

Question 21

21 Trams to the airport leave every 50 minutes.
Trams to the beach leave every 35 minutes.
A tram to the airport and a tram to the beach leave together at 9:30 am.

When is the next time that two of these trams leave together?

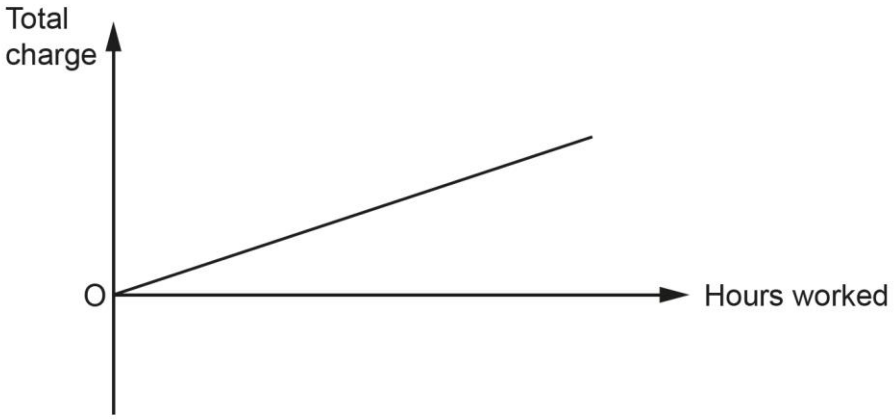
..... **[4]**

Although there were many correct answers, most candidates only listed the subsequent departure times of the trams (which was awarded B2 if they listed at least 3 times for each). Many did not go to the next step of identifying the common time. Most correct answers were from listing times, rather than finding the LCM and adding it on to 9:30 am. Some found the correct LCM of 350 minutes, but then interpreted this as 3 hours 50 minutes rather than 5 hours 50 minutes.

Question 22 (a)

22 Hiro and Taylor are both electricians.
Hiro **does not** charge to visit a house but charges a fixed rate per hour for the work needed.

This graph shows the relationship between the hours worked and the total charge made by Hiro.



(a) Explain how this graph shows that Hiro's total charge is directly proportional to the hours worked.

.....

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

Few candidates gave an explanation identifying that the graph was a straight line from the origin. Some did state that it was a straight line. Many thought the question was related to scatter graphs.

Question 22 (b)

(b) Taylor **does** charge to visit a house and charges the same fixed rate per hour as Hiro for the work needed.

On the axes above, draw a graph to show the relationship between the hours worked and the total charge made by Taylor. **[2]**

Many candidates did not attempt this part of the question. Those who did make an attempt often drew a diagonal line from the origin. A common misconception seemed to be that the line should be steeper (perhaps confusing the fixed charge with a higher rate).

Question 23 (a)

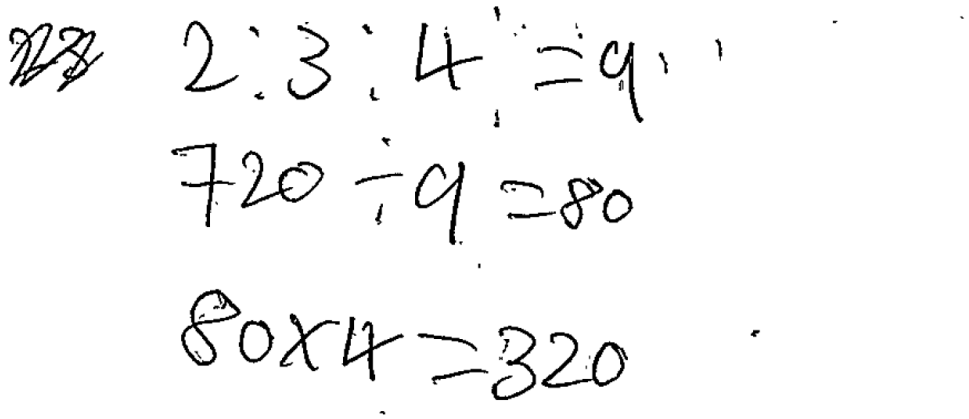
23 **(a)** Eve, Jack and Ling share some money in the ratio 2 : 3 : 4.
Jack gets £720.

Work out how much Ling gets.

(a) £ ..... **[2]**

Many candidates scored full marks here. The most common error was to use £720 as the total amount shared by Eve, Jack and Ling, i.e. starting with $\frac{720}{9}$ = 80 and usually ending with an answer of £320. Some candidates showed competence with ratios, but many needed to read or interpret the question more carefully.

Exemplar 2



(a) £ 320

This candidate has used £720 as the total amount shared, not the share received by Jack. A careful rereading of the question and/or underlining key terms can helps students avoid misinterpretations such as this.

Question 23 (b)

(b) Amir, Beth and Casey share some money in the ratio 3 : 5 : *c*.
Casey's share is $\frac{2}{3}$ of the total.

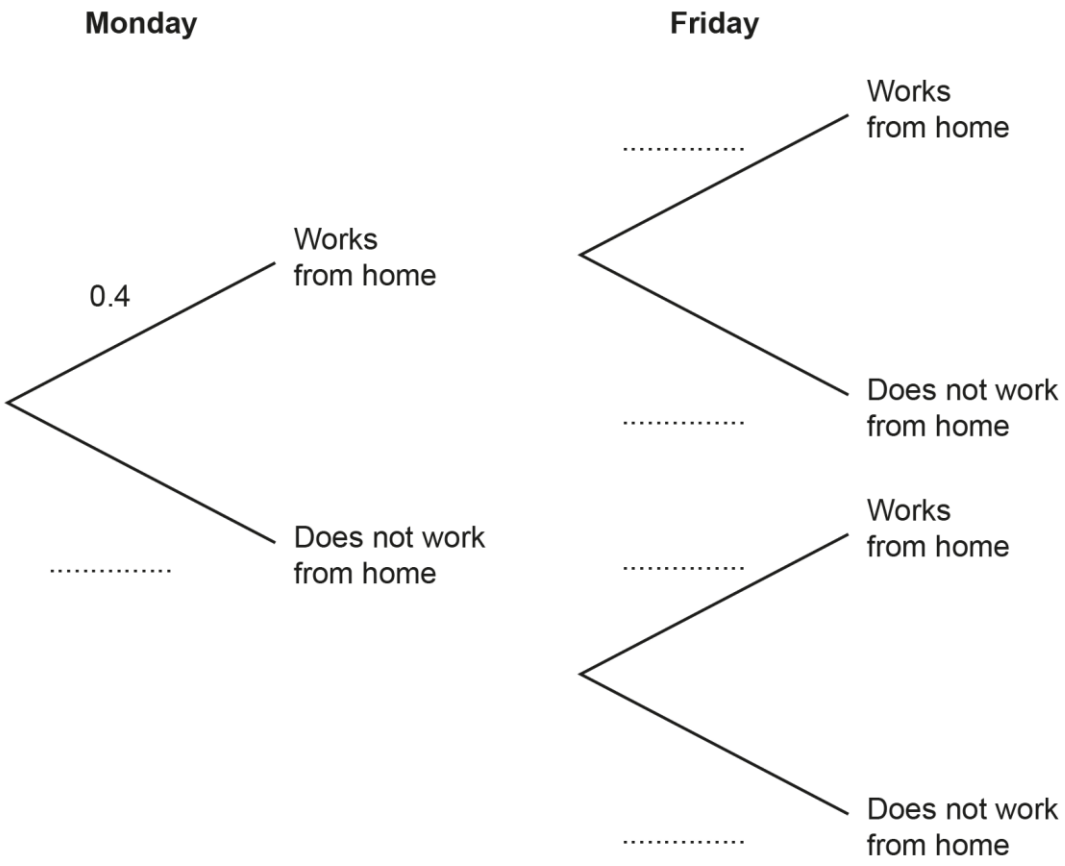
Find the value of *c*.

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

This part of the question was not well answered. Successful candidates linked $\frac{1}{3}$ with 3 + 5 and that since Casey gets $\frac{2}{3}$, this leads to 2 × 8 = 16.

Question 24 (a)

24 The probability that Sam works from home on Monday is 0.4.
The probability that Sam works from home on Friday is 0.2.



(a) Complete the tree diagram. **[2]**

The majority of candidates were able to access the first mark for 0.6 on Monday. The majority of errors were made on the second set of branches of the diagram. Some just repeated 0.4 and 0.6 from the first 2 branches, while others just put 0.2 on the top branch.

Question 24 (b)

(b) Work out the probability that Sam works from home on Monday but does not work from home on Friday.

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

The majority of candidates scored zero marks for this question. Those who attempted it often added together their probabilities rather than multiplying them. Where marks were given, this was normally 2 marks for a correct response. Very few candidates scored M1 for showing 0.4 × 0.8. Candidates could be awarded 2 marks through correct follow through, but this was rare as candidates that hadn't completed (a) correctly often made little progress with (b).

Question 25

25 A six-sided numbered spinner is thrown 50 times.
The score for each throw is recorded.
Some of the results are shown in the table.

An 8 was thrown f times.
An unknown number on the spinner is represented by n.

Score	Frequency
1	12
3	2
5	9
6	16
8	f
n	4
Total	50

The mean score of the 50 throws is 5.5 .

Find the value of f and the value of n.

$f =$.....

$n =$.....

[4]

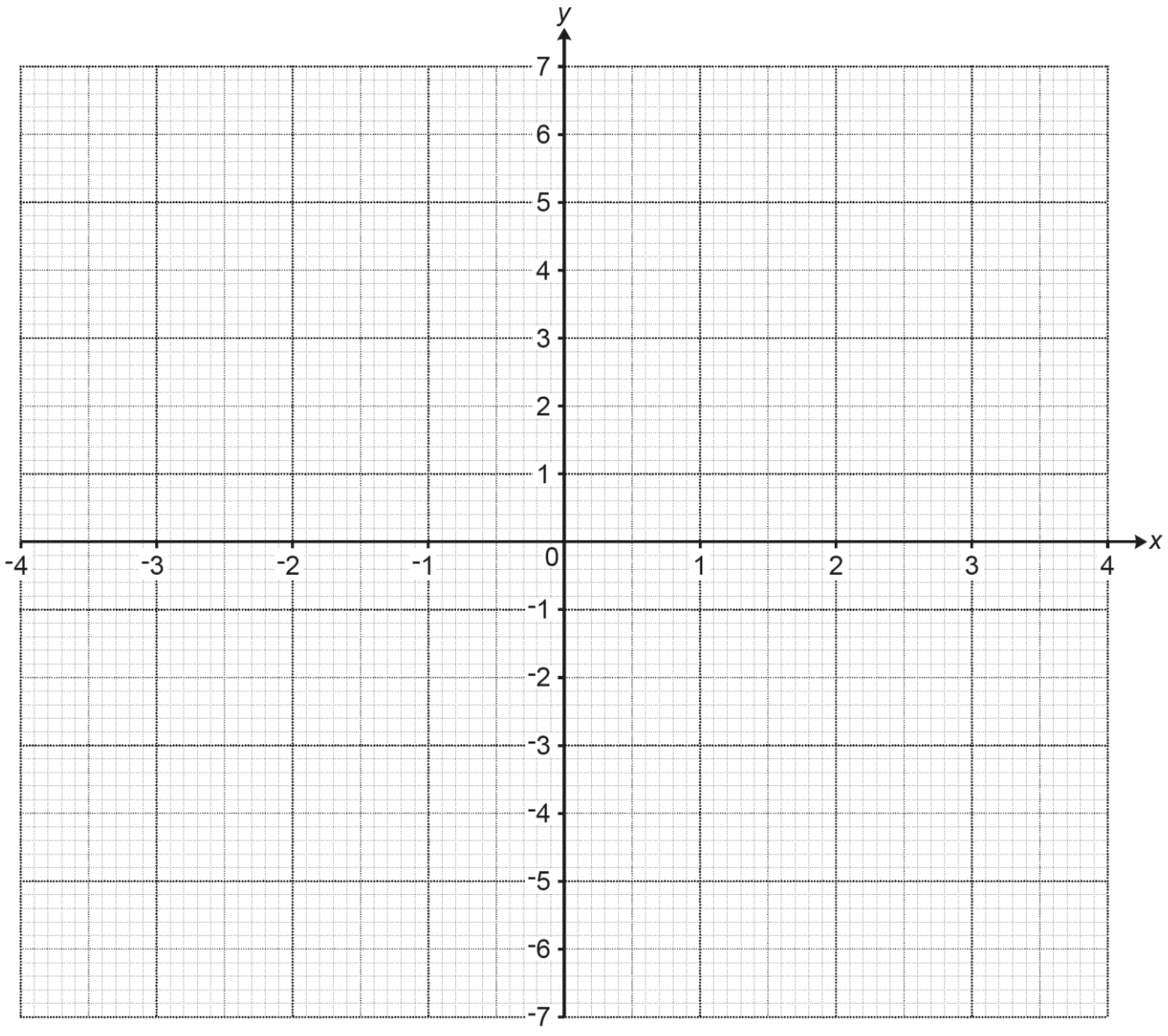
A large number of candidates found the correct value for f (i.e. 7), but very few were able to progress further. The most common response for n was 10. Only a small number showed 215 and even fewer 275.

Question 26 (a)

26 Here is a table of values for $y = \frac{6}{x} - 2x$.

x	-4	-3	-2	-1	1	2	3	4
y	6.5	4	1	-4	4	-1	-4	-6.5

(a) Draw the graph of $y = \frac{6}{x} - 2x$ for $-4 \leqslant x \leqslant 4, x \neq 0$.



[3]

Many candidates plotted 7 or 8 points accurately but did not draw a curve through their points. Of those that did, many joined the two separate sections. A large number of candidates did not attempt this question.

Question 26 (b)

(b) Use your graph to find the positive solution of $\frac{6}{x} - 2x = 0$.

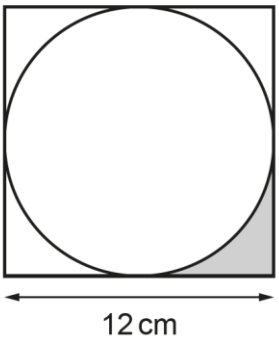
Give your answer to **1** decimal place.

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

Of those that had drawn a graph, very few were able to relate the solution to the equation as being the positive *x*-intercept of their graph.

Question 27

27 The diagram shows a circle inside a square of side 12 cm.



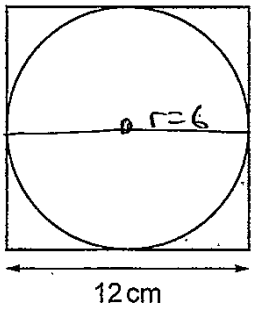
Work out the percentage of the square that is shaded.
You must show your working.

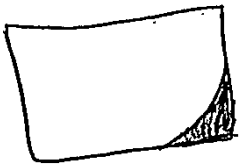
..... % **[6]**

Many candidates made an attempt at this last question, with some scoring all 6 marks and several scoring 4 (for finding the area of the square, the area of the circle and do the correct subtraction, scoring M1, M2, M1).

Most candidates making a genuine attempt at the areas of the square and the circle gave responses that could be awarded marks. Common errors included the use of the perimeter of the square or the circumference of the circle, use of a radius of 12 cm, or an incorrect formula for the area of a circle (despite it being included on the formulae sheet given to students this series).

Exemplar 3



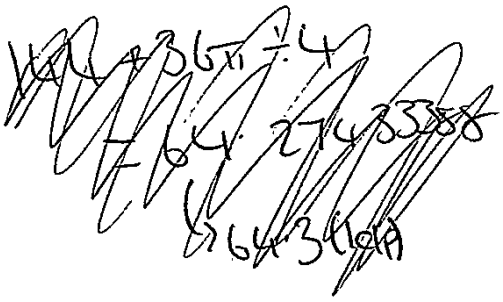


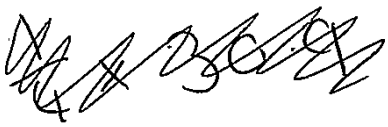
Work out the percentage of the square that is shaded.
You must show your working.

A $=12\times12=144\text{cm}^2$

A $=\pi\times6^2=36\pi\text{cm}^2$

$30.90(2\text{dp})\text{cm}^2$





The candidate has shown the area of the square, the area of the circle and the subtraction to score 4 marks.

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