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GCSE (9-1)

Examiners' report

MATHEMATICS

J560
For first teaching in 2015

J560/01 Summer 2019 series

Version 1

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Contents

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Introduction

Our examiners' reports are produced to offer constructive feedback on candidates' performance in the examinations. They provide useful guidance for future candidates. The reports will include a general commentary on candidates' performance, identify technical aspects examined in the questions and highlight good performance and where performance could be improved. 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.

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Paper 1 series overview

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

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. Marks for the paper covered the full range.

The number of areas where no responses were offered seemed to be at a fairly low level again this year and were generally restricted to a small number of questions. It is quite clear that centres are encouraging candidates to attempt all questions.

Given that this was a calculator paper it is of some concern to note how many candidates made arithmetic errors, often on very simple calculations. It appeared that a small number of candidates did not have, or did not know how to use, a calculator.

Candidates should be encouraged to use their calculators to answer percentage questions, rather than using non calculator methods.

In using calculators many candidates continue to truncate their intermediate answers or even their final answers to an inappropriate degree of accuracy.

Use of calculators
Keep intermediate results to more accuracy than you need and round your final answer either to the accuracy requested or to a reasonable level of accuracy. Do not truncate values.

Candidates should be reminded of the need to show their method.

Read the question carefully
Important words in the question demand could be highlighted so that they are not missed or ignored.

The questions which were answered the best/worst are listed below.

Most successful topic/question	***Least successful topic/question***
• Different types of numbers (Q2) • Equivalent fractions, decimals and percentages (Q3) • Linear sequences (Q4) • Rounding/indices (Q14)	• Venn diagrams (Q7) • Finding the equation of a line (Q17(c)) • Ratio (Q19) • Length of arcs (Q24)

Many candidates appeared not to understand how to complete a Venn diagram. Finding the equation of a line proved difficult for many candidates, with some not realising an equation was required and therefore omitting '$y =$'.

When answering a 'Show that' question candidates need to realise they have to provide working leading to the given answer, rather than using the given answer in their working.

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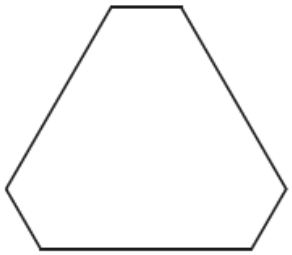
Question 1 (a)

1 **(a)** Write down the mathematical name of this polygon.



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

This was generally well answered by candidates.

Question 1 (b)

(b) Write down the order of rotation symmetry of the polygon.

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

Many correct answers were seen to this question. The most common incorrect answer was 1.

Question 2 (a) (i)

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

(i) An odd number.

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

The majority of candidates were able to give an odd number.

Question 2 (a) (ii)

(ii) A factor of 25.

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

Candidates mostly got this question correct.

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Question 2 (a) (iii)

(iii) A prime number between 20 and 30.

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

Many candidates gave a correct answer. 27 was the most common incorrect answer and some candidates gave a prime number which was not in the range required.

Question 2 (b)

(b) Show that 55 is **not** a square number. **[2]**

Most candidates scored at least 1 mark in this question.

Question 3

3 Complete this table of fractions, decimals and percentages.

Fraction		Decimal		Percentage
$\frac{1}{4}$	=		=	25%
$\frac{7}{100}$	=	0.07	=	
	=	1.3	=	130%

[3]

Most candidates displayed an understanding of conversions between fractions, decimals and percentages and scored full marks. The missing decimal (0.25) and the missing percentage (7) were particularly well answered, with 0.7% or 70% being the most common incorrect answers for the percentage. The fraction was less well done, and common incorrect answers were $\frac{13}{100}$ and $\frac{130}{1000}$.

Question 4 (a) (i)

4 Here are the first four terms of a sequence.

3 8 13 18

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

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

This was generally answered correctly.

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Question 4 (a) (ii)

(ii) Explain how you worked out your answer.

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

Many candidates gave a correct response. The most common error was not giving both a quantity and a direction.

Question 4 (b)

(b) Explain why 534 is **not** a term in this sequence.

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

Many candidates gave the answer that terms in the sequence ended in either 3 or 8. A common incorrect response was 534 is not divisible by 5.

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Question 5 (a) and (b)

5 Lev (L), Maria (M) and Nicholas (N) sit in a row of three seats.

(a) Use the table to list all the different orders in which they could sit.
One possible order is already shown in the table.
You may not need to use all the rows in the table.

Seat 1	Seat 2	Seat 3
L	M	N

[2]

(b) All possible orders in which they could sit are equally likely.

What is the probability that Lev (L) sits next to Maria (M)?

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

Many candidates listed all the different orders they could sit in a logical way. In part (b) many candidates were able to give the correct probability from their table. Common incorrect answers were to use a denominator of 18 as a result of including all entries from the table.

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Exemplar 1

Seat 1	Seat 2	Seat 3
L	M	N
L	N	M
N	L	M
N	M	L
M	N	L
M	L	N

(b) 4/6

This exemplar shows logical listing, thereby avoiding repeats and omissions, which led to the correct answer in part (b).

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Question 6 (a)

6 **(a)** Multiply out.

$4(3x+2)$

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

This question was generally answered correctly. Common incorrect responses were $12x + 6$ or $12x + 2$, or $7x + 6$ or $20x$ from an attempt to combine the terms.

Question 6 (b)

(b) Factorise.

$3c-6d$

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

Although some correct responses were seen, many candidates did not appear to understand factorisation. Common incorrect answers were $3cd$ or ^-3cd.

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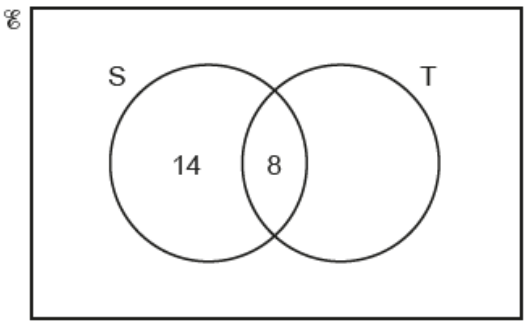
Question 7

7 A survey asked whether some students went swimming (S) or played tennis (T) last month.

- 17 played tennis.
- 11 did not go swimming and did not play tennis.
- 22 went swimming.
- 8 went swimming and played tennis.

Some of this information is shown on the Venn diagram below.



How many students were in the survey?

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

While some candidates were able to give the correct answer, a large number appeared not to understand Venn diagrams. Many put 17 in the space on the diagram not realising they had to subtract 8 first. Some did not include 11 when adding the numbers and gave the total as 31. Others wrote 58 from adding the four numbers given in the question.

Question 8

8 Kim is paid £9.40 per hour for the first 35 hours she works each week.
After 35 hours she is paid at one and a quarter times the hourly rate.

One week Kim works 42 hours.

Calculate how much she is paid for that week.

£ ..... **[6]**

Many candidates gave the correct answer. Of those who were unable to reach the correct answer, most candidates managed to score 1 or 2 marks for finding the total amount of pay for 35 hours and/or 7 as the number of extra hours worked.

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Question 9

9 Mike drinks $\frac{2}{5}$ of a litre of juice each day.

Juice costs £4.40 for a 2 litre carton and £2.60 for a 1 litre carton.

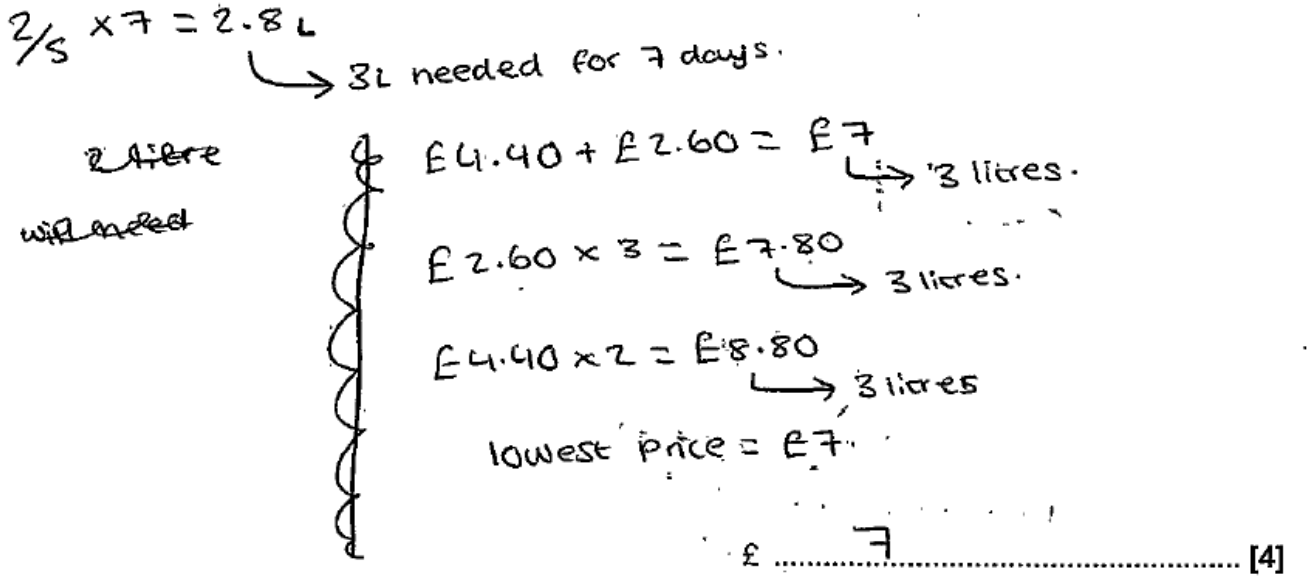
Mike buys enough juice to last for 7 days.

What is the lowest price Mike can pay for this juice?
Show how you decide.

£ ..... **[4]**

Many candidates did not appear to realise they needed to show the different combinations of ways to purchase 3 litres of juice in order to decide which was the cheapest way. Many scored 2 marks, as they did not show all the calculations needed. Some candidates incorrectly did best value for money calculations.

Exemplar 2



[4]

This exemplar shows a fully correct answer showing all possible combinations.

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Question 10

10 Mr and Mrs Wilde have five children who are all **different** ages.

- The mean age is 6.4.
- The range is 9.
- The median is 6.
- The oldest child is 12.

Work out the ages of the children.
Write their ages from youngest to oldest.

....

youngest *oldest*

[4]

Many candidates gave the correct answers and scored full marks. For those scoring part marks, the ages 3 and 12 were usually correctly placed in the first and last positions. Some candidates gave two numbers the same even though the stem of the question stated that the children are all different ages. Others did not realise the values in the second and fourth place needed to add to 11 to obtain the given mean.

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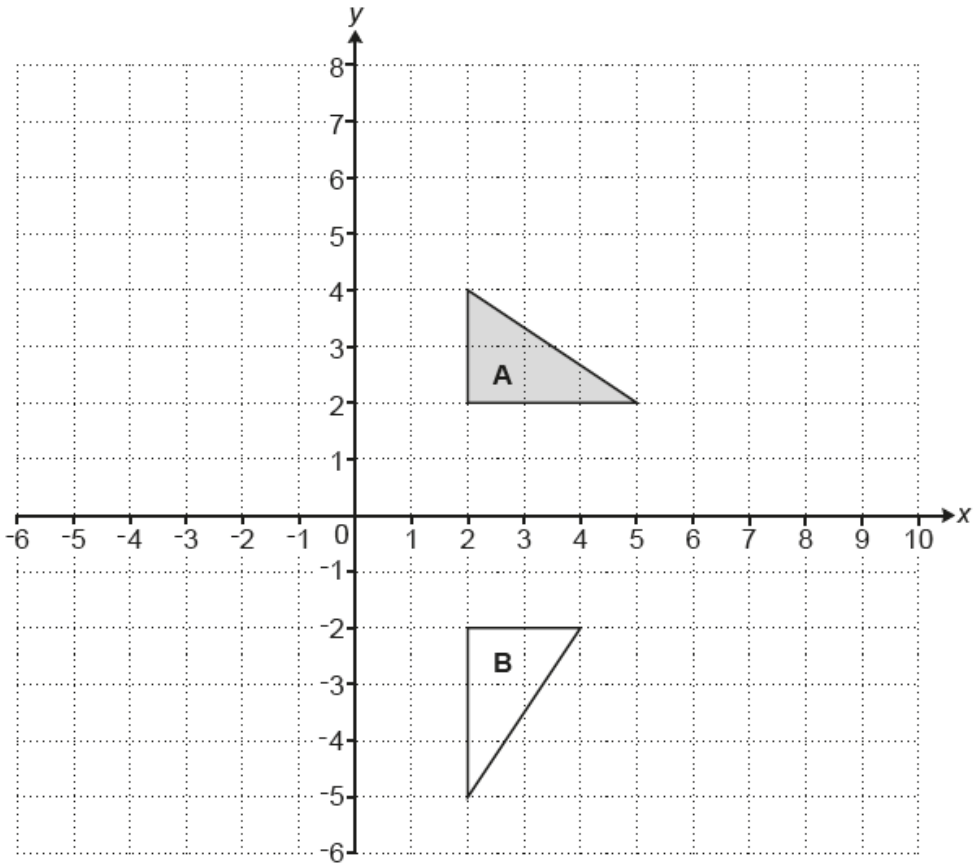
Question 11 (a)

11 Triangles **A** and **B** are drawn on the coordinate grid.



(a) Describe fully the **single** transformation that maps triangle **A** onto triangle **B**.

.....

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

Around one fifth of candidates scored all 3 marks for a correct description. The most common errors were to give 90 but not clockwise or an incorrect centre of rotation.

Exemplar 3

Rotation , 90° clockwise , (2,0) .

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

In this exemplar, the candidate had the correct transformation and the angle and direction of rotation but an incorrect centre of rotation. This scored 2 out of the 3 marks.

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Question 11 (b) (i)

(b) (i) On the grid, reflect triangle **A** in the line $x = 0$.

Label the image **C**. **[2]**

Many candidates appeared to understand the idea of a reflection although many used an incorrect line of reflection. Many appeared not to understand the meaning of $x = 0$.

Question 11 (b) (ii)

(ii) On the grid, translate triangle **A** by vector $\begin{pmatrix} -5 \\ -4 \end{pmatrix}$.

Label the image **D**. **[2]**

Many candidates understood the term translation, but could not apply the correct vector to the question. Triangle **D** appeared in various incorrect positions, the most common being 7 squares to the left and 6 squares down. Some candidates transposed the figures in the vector and moved 4 squares left and 5 squares down.

Question 12

12 Jack and Alex take rubbish to be recycled.
Jack takes 520 kilograms, 87% of which can be recycled.
Alex takes 750 kilograms, 61% of which can be recycled.

Calculate who takes the greatest amount of rubbish that can be recycled and by how much.

..... by ..... kg **[3]**

Almost 60% of candidates calculated the percentages correctly and obtained weights for the amount of rubbish recycled by both Jack and Alex. Candidates should be encouraged to use calculator methods for working out percentages.

Question 13

13 Calculate the area of a circle with radius 14 cm.

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

Most candidates attempted this question, with many producing good solutions. Common errors were finding the circumference; using the diameter rather than the radius given and squaring pi rather than the radius. A small number of candidates did not follow the instructions on the front cover of the paper to use the pi button or 3.142, some used 3.14.

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Question 14 (a) (i)

14 (a) (i) Round 356 to the nearest ten.

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

Most candidates gave the correct answer.

Question 14 (a) (ii)

(ii) Round 356.052 to 1 decimal place.

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

Most candidates gave the correct answer. Common incorrect answers were 356.05 and 356.5.

Question 14 (b) (i) and (b) (ii)

(b) Find the value of y in each of the following.

(i) $3 \times 3 \times 3 \times 3 = 3^y$

(b)(i) $y =$ ..... **[1]**

(ii) $6^3 \times 6^5 = 6^y$

(ii) $y =$ ..... **[1]**

Most candidates showed a reasonable understanding of indices although several gave the answers as 81 and 1 679 616 rather than the value of y.

Question 15 (a)

15 Anna and Paddy take part in the same fun run.

Anna completed the fun run in 2 hours.
Her average speed was 6 kilometres per hour.
Paddy completed the fun run in 90 minutes.

(a) Work out Paddy's average speed in kilometres per hour.

(a) ..... km/h **[4]**

Some correct answers were seen. Several candidates thought Paddy ran at the same speed as Anna with 4.5 and 9 being common errors. Some scored 1 mark for working out the total distance was 12 km but were unable to make further progress.

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Question 15 (b)

(b) Anna says

> Because I stopped for drinks, my average running speed was faster than 6 kilometres per hour.

Give one reason to support Anna's statement.

.....

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

Many candidates simply referred to the fact she would be rehydrated, which scored no mark.

Question 16

16 The volume of a piece of wood is 620 cm^3.
Its density is 0.85 g/cm^3.

Work out its mass.

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

Many candidates scored both marks. Those that did not usually divided the two numbers instead of multiplying them. Many had written the MDV triangle on the page. A few cubed the numbers, presumably because of the units being cm^3.

Exemplar 4

Work out its mass. V ÷ D = M

620 ÷ 0·85

= 729·411

729 g **[2]**

This exemplar shows the most common error - dividing rather than multiplying.

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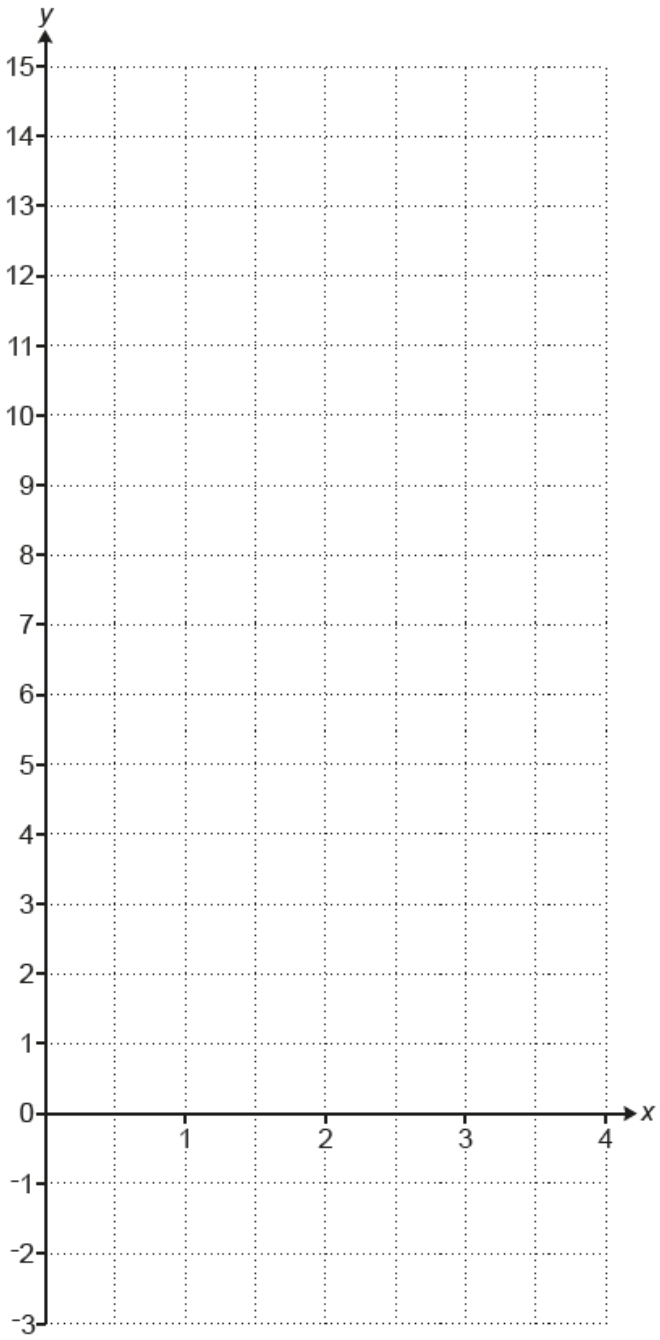
Question 17 (a) and (b)

17 **(a)** Complete this table for $y = 4x - 2$.

x	0	1	2	3	4
y	-2	2	6		14

[1]

(b) On the grid below, draw the graph of $y = 4x - 2$ for values of x from 0 to 4.



[2]

Part (a) was usually correct. Many candidates then went on to correctly draw the graph in part (b). However, a small number did not draw the line after plotting the points. Some candidates did not use a ruler, resulting in an inaccurate, freehand line.

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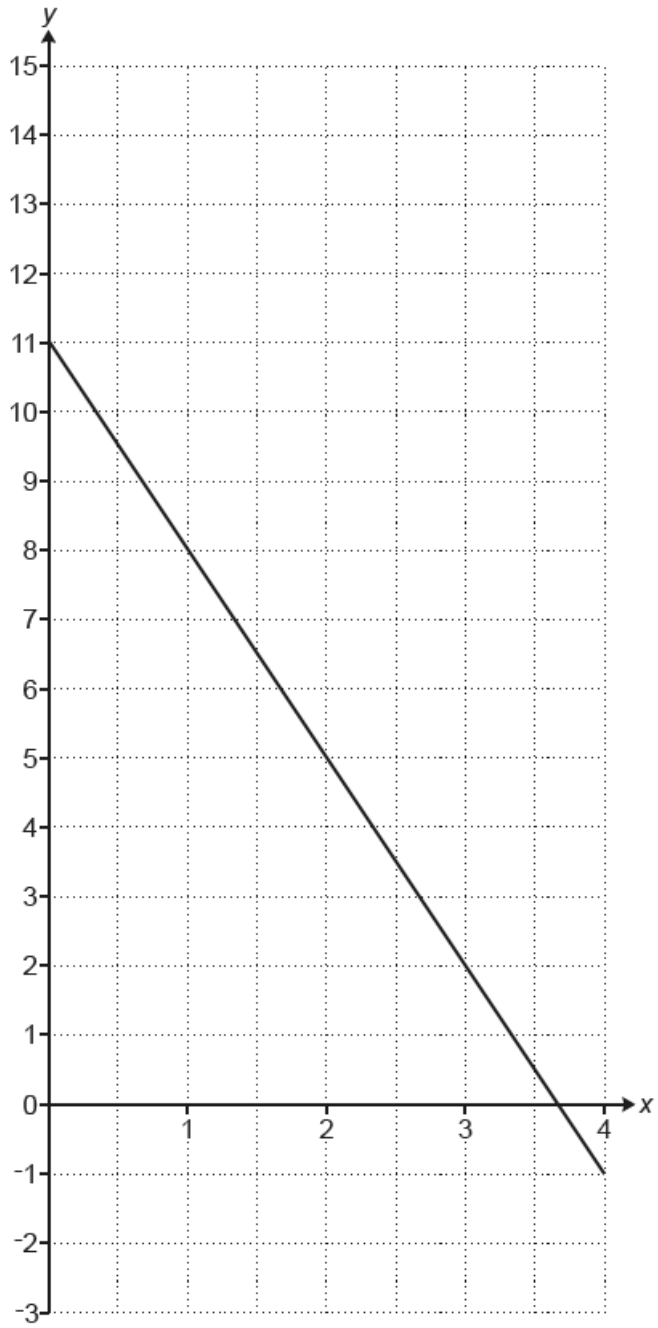
Question 17 (c)

(c) The diagram below shows part of another straight line.



Find the equation of this straight line.

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

Few candidates were able to give a fully correct answer. Several were able to find the *y*-intercept, with many going on to use this in an equation of the form $y = mx + c$. When attempting to calculate the gradient many candidates did not recognise the negative slope, or they counted squares rather than using the scales.

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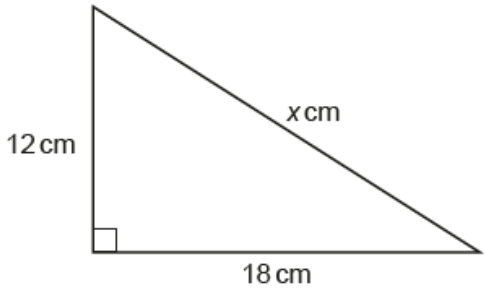
Question 18

18 Here is a right-angled triangle.



Not to scale

Work out the value of x.

$x =$ ..... **[3]**

Several candidates were able to correctly apply Pythagoras' theorem and score 3 marks. Others managed to get to 468 but did not square root this value. A common error was to add the lengths (12 and 18) to get 30. A small number of candidates attempted to use trigonometry.

Exemplar 5

Work out the value of x.

$a^2 + b^2 = c^2$

$\sqrt{c} = x$

$12^2 + 18^2 = 468$

$\sqrt{468} = 21.633307\,65$

$= 21.6$

$x =$ 21.6 cm **[3]**

This exemplar shows a fully correct answer.

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Question 19 (a)

19 (a) Anne, Barry and Colin share a prize in the ratio 3 : 4 : 5.
Colin gives $\frac{1}{3}$ of his share to a charity.

What fraction of the whole prize does Colin give to the charity?

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

Many candidates found this question challenging and few scored full marks. Some candidates had identified that they needed one third of 5 but were unable to demonstrate how they could do this mathematically. Many candidates had identified that the person – Colin – was $\frac{5}{12}$ of the overall share but were not able to see that they needed $\frac{1}{3}$ of the $\frac{5}{12}$.

Question 19 (b)

(b) Delia, Edwin and Freya share some money in the ratio 5 : 7 : 8.
Freya's share is £1600.

How much money did they share?

(b) £ ..... **[2]**

Many candidates were able to score both marks. The most common error was to divide 1600 by 20.

Question 20 (a)

20 Luke is an office receptionist.
Each day, for 60 days, he records the number of people visiting the office.

Number of people, (n)	Frequency		
$0 \leqslant n \leqslant 5$	20		
$5 < n \leqslant 10$	14		
$10 < n \leqslant 20$	11		
$20 < n \leqslant 40$	15		

(a) Calculate an estimate of the mean number of people visiting the office.

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

There were many correct answers seen. Many candidates who did not achieve full marks managed to achieve the B1 mark for the midpoints. A common error at the final stage was to divide their sum (of the midpoints multiplied by the frequencies) by 4.

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Exemplar 6

Number of people, (n)	Frequency		mid point	F x MD
$0 \leqslant n \leqslant 5$	20	x	2.5	50
$5 < n \leqslant 10$	14	x	7.5	105
$10 < n \leqslant 20$	11	x	15	165
$20 < n \leqslant 40$	15	x	30	450

$50 + 105 + 165 + 450 = \frac{770}{4} = 192.5$

(a) 192.5 [4]

In this exemplar, the candidate had correctly calculated the midpoint and multiplied it by the frequency for each row in the table, reaching the correct sum of 770. They then divided the sum by 4 marks, rather than dividing it by 60, so scored 2 marks out of 4.

Question 20 (b)

(b) Luke says the range is 40.

Explain why he may be wrong.

.....

..... [1]

Many candidates did not realise what was required and simply stated that the range is the "highest take the lowest".

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Question 21

21 James and Elizabeth buy some clothes.

James buys 5 shirts and 4 jumpers. He pays £163.
Elizabeth buys 3 shirts and 2 jumpers. She pays £89.

Assume that each shirt has the same cost and that each jumper has the same cost.

Work out the cost of one shirt and the cost of one jumper.
You must show your working.

Cost of one shirt £ .....

Cost of one jumper £ ..... **[5]**

Some candidates recognised the need to use simultaneous equations and produced clearly set out working leading to the correct answers. The candidates who did attempt to write algebraic equations almost always gained the first 2 marks. Many then made errors when finding a common coefficient. Several candidates did not attempt this question.

Question 22

22 Claudia invests £25 000 at a rate of 2% per year compound interest.

Calculate the total amount of **interest** she will have earned after 5 years.
Give your answer correct to the nearest penny.

£ ..... **[4]**

Most candidates attempted this question. Few obtained full marks as many did not read the question carefully enough and gave their answer as the total amount of money in the account, rather than the total amount of interest. Others did not give the answer to two decimal places. Candidates should be encouraged to use a calculator method, 25000×1.02^5, for these types of question rather than working out the values a year at a time. Several did score marks for the correct method. Some candidates used simple rather than compound interest.

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Question 23 (a)

23 A bus timetable shows the following information.

- A bus following route T leaves for the train station every 20 minutes.
- A bus following route A leaves for the airport every 18 minutes.
- A bus following route T and a bus following route A both leave at 8.37 am.

(a) When is the next time one of each bus is timetabled to leave at the same time?

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

This question was accessible to most candidates. Most opted for the method of adding times on until they found a match, and this was very successful for many candidates. However, errors were often seen when candidates added minutes on that took them over the hour. This was usually when candidates were adding 18 minutes rather than 20. Many scored 1 or 2 marks for listing times of one or both buses.

A few candidates attempted to use multiples rather than times. Some listed 20, 40, 60 and 18, 36, 54, but most of those who started this method did not reach 180. Some attempted to find the LCM; these candidates usually reached 180 or 360 minutes, but were not able to convert this to hours in order to reach the required time.

Question 23 (b)

(b) Write down one assumption that was necessary to solve this problem.

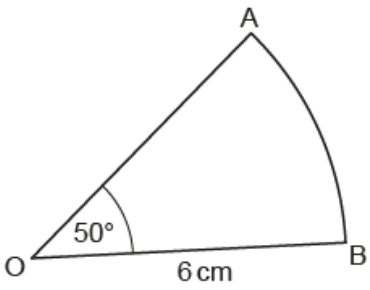
.....

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

This was generally well answered with the most common acceptable answer related to buses being on time/no delays. Some candidates did not seem to be aware what was meant by an assumption, and simply described their method for answering the question.

Question 24

24 AOB is a sector of a circle, centre O.



Not to scale

Show that the length of arc AB is 5.24 cm, correct to 3 significant figures. **[3]**

Most candidates found this question challenging and there was a high number of no responses. Of those who did attempt the question, very few candidates scored full marks. Some scored M1 for $2 \times \pi \times 6$ or M2 for the correct method but not showing the unrounded answer. A number attempted trigonometry using 50 tan6.

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Question 25

25 Bennie is 7 years older than Ayesha.
Chloe is twice as old as Bennie.
The sum of their three ages is 57.

Work out the ages of Ayesha, Bennie and Chloe.

Ayesha's age is .....

Bennie's age is .....

Chloe's age is ..... **[6]**

Most candidates made a valid attempt to solve the problem. While seeing a full algebraic method to solve was relatively rare, many candidates were able to solve the problem effectively by trial and improvement. A significant number started with 57 ÷ 3 = 19 and started their trial from there. Where there was any evidence of algebra it was frequently in terms of more than one variable, e.g. $b = a + 7$ and $c = 2b$ with little further work. Many candidates did not check that their three ages added to 57.

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