



**GCSE**

**Mathematics**

8300/3F Paper 3 (calculator) Foundation

Report on the Examination

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# Contents

The below table is interactive. You can press the control button click on the title of the question to go directly to that page.

Contents Page	
Summary	3
Individual questions	4
Further support	10

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# Summary

## Overall performance compared to last year

There was no evidence of time pressure with most students able to complete the whole paper. Some of the questions that were common with the Higher tier proved challenging for students on this tier. Students were rewarded for good use of mathematics shown at different levels of ability. Students did not always show working when instructed to do so and some used non-calculator methods, particularly in percentage questions.

## Topics where students excelled

- Amount as a fraction of total problem
- Frequency Tree
- Complete scatter diagram
- Angle reasoning
- Expanding a single bracket
- Write ratio and simplify
- Fraction from a ratio
- Sequence pattern (drawing)
- Pythagoras' theorem
- Sampling (commenting)

## Topics where students struggled

- Edges of a solid
- Number machine deduction (with two sets of inputs and outputs)
- Reflected coordinates (in a given line)
- Ratio in form  $1 : n$
- $n$ th term problem solving
- Percentage decrease problem
- Draw an elevation
- Speed and time conversion problem
- Mean, pie chart and percentage problem
- Compound percentage change

# Individual questions

## Question 1a

This completing a bar chart question was answered very well by the very large majority of the students with an accurately drawn bar.

## Question 1b

This question was answered very well by the majority of the students with a correct answer of 9. However, some misread and used the 'village hall' value to incorrectly work out  $13 - 5 = 8$ .

## Question 2

The ordering negative numbers question was answered very well by the very large majority of the students. A common incorrect answer was showing the values in reverse order  $3 -1 -5 -7$  with others listing incorrectly as  $-1 -5 -7 3$ .

## Question 3a

The correct answer of 23 was given by the very large majority of students.

## Question 3b

This question was answered reasonably well by many of the students. The most common incorrect answers included students writing an  $n$ th term rule term of the sequence instead of describing the term-to-term rule with  $6n - 1$  or  $n + 6$ , other incorrect answers were 6 and 'increasing by 6'. Some students misinterpreted the question providing explanations eg 'you add the same amount each time'.

## Question 4

Many students answered this coin problem well and selected the correct four coins with their units. A significant number of students did not include the units for the coins.

## Question 5

This question was answered very well by the majority of students.

## Question 6a

The question was answered very well by the very large majority of students.

## Question 6b

Many students correctly identified 8 edges on a square-based pyramid however a significant number confused edges for faces and incorrectly answered 5.

## Question 6c

The majority of students answered correctly that a cone has one vertex. A common misconception was to state that a cone has no vertex with an answer 0.

### Question 7a

This question was answered well by the majority of students.

The most common misconception was to disregard the number machine and write out the calculation  $12 - 4 \times 5 = -8$  in the working lines and write  $-8$  in the output oval.

### Question 7b

This question was answered well by the majority of students.

The most common misconception was to disregard the number machine and write out the calculation  $7 + 4 \div 2 = 9$  in the working lines and write  $+4$  in the first rectangular box of the number machine.

### Question 7c

Many students correctly completed the number machine. Common incorrect pairs of operations for one set of the input and outputs were  $\times 5$  and  $-12$  or  $\times 5$  and  $-22$  or  $\times 4$  and  $-7$ . The most common error involved students providing separate operations for each of the two inputs and outputs with  $\times 3$  and  $-2$  listed alongside another pair of operations.

### Question 8

A well answered question where the majority of students answered correctly to achieve  $\frac{7}{10}$ . Most students were able to achieve a correct total of £10 with some then unable to deal with the fraction part of the question. Common incorrect answers were  $\frac{3}{10}$  and  $\frac{3}{7}$ .

Errors with mixed units were common which were often not recovered with  $80 + 2.20 + 7$  incorrectly achieving 89.20 as a total.

### Question 9

The question was answered very well by the large majority of students. Most students showed intermediate values of 25 or 343 for part marks if a correct final answer was not achieved, however a significant number of students used their calculator incorrectly and just wrote final incorrect answers of either  $22\sqrt{2}$  or 31.146 from  $\sqrt{625+7^3}$  and 46 from  $\sqrt{625} + 7 \times 3$ .

### Question 10

Many students answered this frequency tree question well with those who made an error with one oval value correctly following through calculations for the other ovals. The most common incorrect answers were not being able to calculate  $0.20 \times 6850$  for 20% of the home fans wearing a scarf to achieve 1370 and using the incorrect pair of ovals for the 2319 fans wearing a scarf.

1550 was answered mostly correct for the away fans value however, a significant number of students had difficulty with the last two lines of the question and simply divided the home and away fans values equally between each of the scarf ovals, for home and away, achieving either 3425, 3425 or 775.5, 775.5.

### Question 11a

This question part was answered well where students had to correctly write down the coordinates of the third vertex of the right-angled triangle. The most common errors were (2, -1) and (2, 1) from difficulties with a negative coordinate and (-2, 4) where both  $x$  coordinates were used from points A and C.

### Question 11b

This question part was answered poorly where students had to identify the coordinates of a point after reflecting point C in the line  $x = 6$ . Common incorrect answers were (4, 1) reflecting in the  $y$  axis,  $(-4, -1)$  reflecting in  $x$  axis and  $(6, -1)$  using the point on the reflection line at  $y = -1$ .

Some students transposed the  $x$  and  $y$  coordinates in either or both parts with  $(-1, -2)$  and  $(-1, 8)$ . Those students who labelled the axes correctly had the greatest success.

### Question 12a

Part (a) of this completing a scatter diagram question was answered well. Some students had difficulty with plotting the final point which was often plotted at  $(9, 42)$  whilst others had difficulty reading the graph scale and incorrectly plotted at  $(8, 39)$  and  $(8.5, 41)$ . The most common error on labelling was to leave the label entirely blank or to omit the (km) units.

### Question 12b

The identification of correlation type and strength was answered reasonably well in part (b). Students more often had success identifying 'positive' as the correlation type than 'strong' as the correlation strength.

Common incorrect answers for the correlation type were 'increasing', 'going up(wards)', 'linear' whilst some described the correlation eg 'the further the distance, the longer the time'.

The most common incorrect answers for the correlation strength were 'weak', 'positive' and 'medium strength' whilst some students wrote a numerical value.

### Question 13

This angle reasoning question was answered well by many of the students. A significant number of students did not provide a mathematical argument to substantiate that  $y$  was not half of  $x$  omitting to show  $107 \div 2 = 53.5$  or  $53 \times 2 = 106$  or  $107 - 53 = 54$ . Some students ticked 'Yes' as the wrong answer after correct working.

### Question 14

A well answered question where the majority of students answered correctly with  $6x + 24$ . Errors were common with either incorrectly adding together the two terms inside the bracket as  $10x$  and then multiplying by the 3 achieving  $30x$  or correctly expanding the bracket to  $6x + 24$  but then incorrectly adding the terms for  $30x$ .

Some students attempted further work trying to solve  $6x + 24 = 0$

### Question 15

In this expression problem students had to correctly identify expressions to complete the statements. It was answered well but the most common incorrect answers included:

- $4 + 5x = 9x$
- $y \times 2 = y^2$
- $3 - 2t = t$  or  $2 - 2t = t$

## Question 16

This problem solving best buy question was answered reasonably well. Students commonly were successful with shop A achieving 9.6 or 960 but  $4 \times 5 \times 0.64 = 12.8$  was a common wrong answer. For shop B, a common misconception was to multiply the pack of 3 tins price by 7 to buy 21 tins rather than buying 6 packs and 2 separate tins to total 20 tins.

Common errors included using 10% of £1.70 as the pack price, applying the 10% reduction to the price of the separate tins and many incorrectly used a non-calculator approach and did not utilise a calculator method for 90% of the pack price with  $0.90 \times 1.70 = £1.53$  before multiplying by 6 and then adding the price of two separate tins without the discount.

Errors with mixed units were common and some students used incorrect money notation in their final answer with incorrect answers of 0.82, 0.82p and 82 seen.

## Question 17a

This question was answered well. The most common incorrect answers were

- 12 : 18 without simplification or only part simplified eg 6 : 9
- 12 : 30 with or without a simplified answer of 2 : 5

Some students did not write ratios but showed values 12 and 30 or  $\frac{12}{30}$  and then went on to answer with a ratio of 2 : 5 which did not qualify for follow through as no initial ratio was shown.

## Question 17b

A reasonably well answered question by the majority of students.

The most common incorrect answer was  $\frac{3}{8}$ . Students were generally successful with  $\frac{3}{11}$  when they wrote SWG : SNWG = 3 : 8 and total students = 11.

## Question 17c

This question was not answered well and there were a significant number of non-attempts. Instead of solely writing 2.25 as the value of  $n$ , some students wrote 1 : 2.25 on the answer line, which was condoned.

Common incorrect answers included simplifying 4 : 9 incorrectly to 1 : 3, 1 : 4 or 1 : 6 and writing 4 + 9 to answer 13 or  $4 \times 9$  to answer 36.

## Question 18a

The large majority of students correctly drew Pattern 4 with a 4×4 square with 4 squares at each corner. Common errors included a 4×3 rectangle or a 5×5 square with the correct 4 squares at each corner. It appeared that some students had an initially incorrect pattern drawn in pen and then attempted to correct it by crossing out an incorrect pattern or individual lines.

## Question 18b

This nth term problem solving question was answered very poorly by the large majority. Common incorrect answers were

- $n = 22$  or 22.271 from solving  $n^2 + 4 = 500$
- 494 from  $22^2 + 4$
- $23^2$

This question had the largest number of non-attempts on the paper.

## Question 19

A reasonably well answered question where the majority of students understood how to start a Pythagoras question and worked with both  $24^2$  and  $31^2$ . Many correctly added  $24^2$  and  $31^2$  to achieve 1537 but then some were unsure how to proceed further, often dividing by 2 or sometimes 100. Some gave an answer of 39, which was condoned. A number of students attempted to answer with trigonometry, however accurate drawing was not generally seen as an attempt. There were a significant number of non-attempts.

## Question 20

This sampling question was answered reasonably well by the majority. Common errors included referring only to the flats and being too vague with a response eg 'not tested all of them', which would not be a sample.

Very few students correctly referred to the data being biased or incorrectly answered that the data sample was too small although some attempted to calculate the proportion of flats sampled eg only  $\frac{45}{72}$  or 0.625 of flats sampled.

## Question 21

This question was answered reasonably well. The correct answer was marginally the modal response of 'the identity was true for all values of  $x$ ' however almost the same number of students answered incorrectly with 'the identity was true for some values of  $x$ '.

## Question 22

This A03 percentage decrease problem was answered reasonably well. Some students misunderstood that the three bulleted conditions were linked to 'the cost per day'. Common misconceptions and incorrect answers were

- calculating the hire cost as  $24.50 \div 5 = \text{£}4.90$  per day, often with a final answer of 17 days
- correctly working out 20% of 24.50 but then using  $\text{£}4.90$  as the reduced price rather than  $0.80 \times 24.50 = \text{£}19.60$
- correctly calculating  $5 \times 24.50 = \text{£}122.50$  and  $\text{£}19.60$  but then not continuing or calculating  $259.70 - 122.50 = \text{£}137.20$  but not then dividing by 19.6
- correctly calculating the 7 additional days but then not adding on the first 5 days

Build-up methods were often unsuccessful with addition errors in working.

## Question 23

Many students did not answer this draw an elevation question well and there were a significant number of non-attempts. Very few calculations using the volume of the cuboid were seen. The majority of students recognised that they needed to draw a rectangle with a width of 7 cm or a height of 2 cm but most of them did not achieve both a width of 7 cm and a height of 2 cm. Some students incorrectly attempted a 3D drawing.

## Question 24a

This A03 speed and time conversion problem solving question was not answered well.

The very large majority of students followed a method working in metres to calculate the time to travel 1.5 km showing  $1500 \div 50 = 30$  and  $30 \times 40 = 1200$  or  $50 \div 40 = 1.25$  and  $1500 \div 1.25 = 1200$ . A very small number of students worked in km.

Many students made conversion errors incorrectly using 100 seconds in a minute with  $1200 \div 100$  followed by an incorrect answer of 12 minutes.

However, after incorrectly using the main misconception of  $1.5\text{ km} = 150\text{ m}$ , students then generally worked with proportion to achieve a correct follow through answer of 2 minutes.

### Question 24b

This question was answered reasonably well. The significant modal response was the correct answer of 'it is greater than the answer to part (a)', but a notably large number of students misinterpreted that time would increase with a slower constant speed to answer incorrectly with 'it is smaller than the answer to part (a)'.

### Question 25

The majority of students correctly calculated the mean. However, the question was answered poorly with the large majority of students unable to correctly calculate Amy's percentage of the phone vote from the pie chart. The most common incorrect answer after correctly calculating the mean was  $4 \times 8.5 = 32$  and  $32 + 162 = 196$ . Another common error was to calculate the proportion  $\frac{162}{360}$  or 0.45 but not convert to 45% with an incorrect final answer of 34.45. There were a significant number of non-attempts.

### Question 26

A very small minority of students correctly answered this compound percentage change question with a large number of non-attempts. The most common misconception was to incorrectly calculate  $14 \times 5.1 = 71.4$  with very few students attempting to use the compound interest formula. There were few attempts using an initial value of a house to calculate the increased value of a house after one year or one compounded after 14 years.

### Question 27

This A03 population density problem solving question was answered reasonably well and a good discriminator between the more able students. The majority of students used the methods followed in Alt1 or Alt2 of the mark scheme.

Common part methods included

- solely converting 7 square miles to square km with  $7 \times 2.6 = 18.2$
- solely calculating Town A population density with  $84\,000 \div 7 = 12\,000$  and then incorrectly comparing with 4695

Common errors included

- $84\,000 \div 2.6 = 32\,308$  without a comparable calculation for Town B
- $4695 \div 2.6 = 1806$

A number of students misread 84 000 and used 8400 either in written calculations or in using their calculator with answers of 1200 and 461.5.

Some students ticked Town A or did not make a choice after correct working with two comparable values.

There were a significant number of non-attempts.

# Further support

## **Mark ranges and award of grades**

Grade boundaries and cumulative percentage grades are available on the [results statistics](#) page of our website.

## **Enhanced Results Analysis (ERA)**

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# Contact us

Our friendly team will be happy to support you between 8am and 5pm, Monday to Friday.

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