Questions matter

GCSE
Mathematics
8300/3F: Paper 3 (Calculator)

Report on the examination

Version: 1.0
November 2024

Further copies of this report are available from aqa.org.uk

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.

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.
In general, students performed similarly on this paper to June 2024, but significantly better than in November 2023.

Topics where students excelled

- Showing data on a composite bar chart
- Reasoning problem involving time
- Reasoning calculation involving division
- Calculating input and output values using a number machine
- Numerical problem solving including a metric length conversion
- Solving a simple fractional equation
- Numeric manipulation on a number diagram
- Median calculation
- Reading and calculating values from a Venn diagram
- Fraction and ratio problem solving
- Percentage of an amount problem solving
- Plotting and drawing a time-series graph and using to make a prediction
- Identifying mistakes in a numerical calculation with a descriptive evaluation

Topics where students struggled

- Simplifying an algebraic expression
- Proportional calculation
- Ordering fractions
- Reading information from a composite bar chart
- Solving a linear equation with a bracket
- Algebraic manipulation on a number diagram
- Line and rotational symmetry of a 2D shape on a grid
- Two stage compound percentage calculation
- Drawing the plan of a 3D shape with scale
- Drawing the elevation of a 3D shape with scale
- Money problem including limits of accuracy
- Writing a formula from a description of costs
- Ratio problem
- Co-ordinate problem from intersecting straight lines
- Identifying mistakes in a volume of a hemisphere calculation

Individual questions

Question 1a

This calculation of a quarter of an amount question was answered very well by the very large majority of the students however a very small minority incorrectly calculated 4% of the amount.

Question 1b

This squaring a value question was answered very well by the very large majority of the students with a very small minority incorrectly multiplying by 2 or giving the answer 19 × 19.

Question 2

The simplifying to an individual algebraic term was well answered but a significant number of students incorrectly showed y^3 as the incorrect term for $y + y + y$.

Question 3a

The correct answer of 3.84 in correct money notation was given by the very large majority of students. Some used incorrect notation of £3.84p, which was condoned. The most common incorrect answers used 0.96 × 12 = 11.52 (forgetting to divide by 3) and 96 × 3 = 288.

Question 3b

The context of the simple proportional calculation affected some students' interpretation of the problem by not spotting the common factor of 10 to divide £21.50 by 10 to achieve £2.15 as the correct answer. A common misconception was 21.50 ÷ 60 without a final multiplication by 6. Some did the correct operations of 21.50 ÷ 60 × 10 but incorrectly rounded after the division and lost the accuracy mark.

Question 4a

The very large majority of students answered this ordering decimal numbers question very well. Of those who answered incorrectly the most common incorrect answer was 0, –1, 1.8, 2.

Question 4b

This ordering fractions question with one mixed number fraction was reasonably well answered. The most common incorrect answer was $\frac{1}{4}$, $3\frac{1}{10}$, $\frac{1}{2}$, $\frac{7}{8}$ with $3\frac{1}{10} = 0.3$ incorrectly stated. Unfortunately a significant number of students indicated incorrectly that $\frac{1}{2}$ was less than $\frac{1}{4}$ after correct conversions to 0.5 and 0.25 respectively to incorrectly answer $\frac{1}{4}, \frac{1}{2}, \frac{7}{8}, 3\frac{1}{10}$.

Question 5a

This reading a value from a composite bar chart was answered well by the majority.

Question 5b

This evaluating from a composite bar chart was answered well by the majority. Some students incorrectly answered March or gave an incorrect answer of February and March.

Question 5c

This calculation and representing data on the composite bar chart question was very well answered by the large majority. Most correctly calculated 5 but then common errors were to show the overall height of the bar at 15, incorrectly show 5 walk and 15 cycle, place 5 walk at the top of the bar or to not show any shading or labelling.

Question 6

The question was answered very well by the very large majority of students with the most common approach to correctly calculate 7.35 am as the arrival time.

Question 7

This reasoning calculation involving division was answered very well by the very large majority of students. The most common approach was $15 \times 1.30 = 19.50$ with the correct answer 15. Some calculated 16×1.30 to show this was over £20. Build up methods were still quite common indicating that a significant number of students did not have access to a calculator or used a non-calculator approach that often included an error.

Question 8a

This using a number machine question given the input was answered very well by the very large majority of students. Of the few errors, the most common was to work backwards through the number machine with 10 as the output with $10 - 3 = 7$ and $7 \div 2 = 3.5$. Others incorrectly calculated $10 + 3 = 13$ and $13 \times 2 = 26$.

Question 8b

This using a number machine question given the output was answered very well by the large majority of students. The most common misconceptions were to use 17 as the input and work forwards with $17 \times 2 = 34$ and $34 + 3 = 37$ with others disregarding the number machine with 17 as the output working backwards with inverse operators and BIDMAS to calculate $17 - 3 \div 2 = 15.5$.

Question 9

The question was answered well by the majority of students. Most students showed correct calculations to work out the total length of bread as 168 mm but then incorrectly converted, with the most common being to multiply by 10 to incorrectly answer 1680 cm. Some students correctly converted to 19.8 cm but then incorrectly truncated with an answer 19 cm. Others included the two crusts within the 14 slices showing $12 \times 12 + 2 \times 15 = 174$ with an answer 17.4 cm.

Question 10a

Many students answered this fractional linear equation well. The most common misconception was to not recognise the inverse operation and divide 15 by 3 with an answer 5.

Question 10b

A reasonably well answered solving linear equation with bracket expansion question.
Students dividing by 4 first generally had more success from $2d - 5 = 7$ to correctly answer $d = 6$
Those who expanded the bracket sometimes introduced an error by only multiplying the first term in the bracket to achieve $8d - 5 = 28$ but then correctly followed through with an answer $d = 4.125$
Other misconceptions were to multiply both sides of the equation by 4 to achieve $8d - 20 = 112$ whilst some incorrectly subtracted 20 from right hand side after a correct expansion of $8d - 20 = 28$ to show $8d = 8$ and then follow through with an answer $d = 1$.

Question 11a

This question part was answered very well by the very large majority of students where they had to correctly write down the two missing values in the number diagram of 21.5 and 29.5.

Question 11b

This question part was answered very well by the large majority of students where they had to work backwards through the number diagram identifying 14 in the circle and the operation +9 in the square. The most common incorrect answer was to omit the + operator and only write 9 in the square. Other students did not show +9 and 14 but showed two values with operators to make +9 eg +4 and +5 in the square and circle indicating 5 + 4 + 5 + 11 = 25.

Question 11c

Part (c) of this number diagram question involving algebraic manipulation and solving was not well answered by the large majority of students.
There were a significant number of misconceptions including:

- $a + 3a = 28 + 2a = b$ from copying the diagram without further correct working
- $a + 3a = 28$, $a = 7$ for M1A1 then $2a = b$, $2 \times 7 = 14$, $b = 14$
- $28 - 3 = 25$, $a = 25$, $b = 28 + 2$ or $28 + 2a = 30$ or $30a$ and answer $b = 30$ or $30a$
- $a + 3a = 28$ for M1 then incorrect working with $28 - 3a = 25a$
- $3a = 28$, $a = 9.3$ with correct follow through answer $b = 46.6$ for B1ft.

Question 12

This identification of the median from an unordered list question was well answered by the majority after successfully ordering the integers and locating the middle number in the list. Common errors included:

- not ordering the numbers and just selecting the middle value 2
- totalling the given values and working out the mean
- omitting one value, often 11, from an ordered list
- an error in ordering values from smallest to largest
- selecting two numbers in the middle eg crossing out 3 numbers on the left and 4 on the right, identifying 7 and 8 as the middle numbers with an answer 7.5.

Question 13a

A well answered question where the majority of students answered correctly with one vertical and one horizontal line of symmetry. Some students drew incorrect diagonal crosses whilst others drew two vertical lines or two horizontal lines.

Question 13b

Part (b) of this question on shading squares to achieve rotational symmetry order 4 was poorly answered with many students shading existing squares rather than new squares outside the original shape. Common errors were:

- shading four additional squares to extend the top and bottom horizontal bars
- shading above and below the top and bottom bar end squares
- filling in the two white squares to achieve a 5 × 3 shaded rectangle.

Question 14a

This question part was answered very well by the very large majority of students where they had to correctly write down the intersection value of 3 from the Venn diagram.

Question 14b

This question part was answered very well by the very large majority of students where they had to correctly write down the value of 12 from the reception section, but not including the trainer section, from the Venn diagram. The most common incorrect answer was 15 from the total of the reception section.

Question 14c

A reasonably well answered question where the very large majority of students correctly identified either the total of people who can work as a trainer or the total of all the people. Common errors included:

- not including 3 in those working as a trainer and answering $\frac{17}{37}$
- not including 5 in the total of all people and answering $\frac{20}{32}$
- answer $\frac{17}{20}$ from only considering the trainer section of the Venn diagram
- some students did not include 3 in either those working as a trainer or in the total of all people giving an incorrect answer of $\frac{17}{34}$.

Question 15

This problem solving fraction and ratio problem was well answered by the majority of students. Students commonly were successful with calculating $\frac{3}{8} \times 120 = 45$ for those walking.

The most common misconceptions were:

- correctly calculating 25 and 50, showing 25 : 50 and then selecting 25 for those travelling by car
- correctly calculating $120 - 45 = 75$ for those cycling and travelling by car but then incorrectly working those travelling by car as $\frac{75}{2} = 37.5$
- not calculating for those cycling and travelling by car but incorrectly using $\frac{45}{3} = 15$ for those cycling with 30 for those travelling by car
- starting incorrectly with $\frac{120}{2} = 60$ for those travelling by car
- correctly calculating 45 and 75 but then stating $45 + 30 = 75$, so 30 : 45 for cycle : car.

Question 16

This percentage decrease multi-step problem with different decrease rates was answered reasonably well. The very large majority of students were successful with calculating a first percentage reduction of either 10% or 15%. A very common misconception was to calculate both 10% and 15% of 8600 and then subtract both from 8600 to incorrectly answer £6450.
Another common error was $0.15 \times 8600 = 1290$, $0.1 \times 1290 = 129$, $8600 - 1290 - 129 = £7181$
It was also common to see use of non-calculator methods rather than using a calculator with decimal multipliers.

Question 17

In this expression problem students had to correctly match algebra with the correct description.
It was answered reasonably well with the most frequent correct matches being for the equation and the inequality.
It was common for:

- the inequality algebra to be incorrectly matched with the expression description
- the identity algebra to be incorrectly matched with the equation description.

Question 18

This percentage of an amount problem solving question was well answered and a good discriminator of the more able students.
Many students used non-calculator build up methods to calculate percentages without success.
The most common misconceptions were:

- $3.4 \times 5 = 17$ and $25 - 17 = 8$ with answer 0.32 or 32%
- $3.4 \times 5 = 17$ and $25 - 17 = 8$ with answer 8% or 80%
- $3.4 \times 5 = 17$ and $25 - 17 = 8$ and $25\% \times 8$ with answer 2%
- $3.4 \times 5 = 17$ and 17×5 with answer 85%.

Question 19a

The question was answered very well with the very large majority of students correctly plotting at least two points and a large majority of students correctly plotting all three points and joining with single straight lines.
A significant number of candidates did not use a ruler to draw straight lines with some students joining their points with hand drawn curved lines. Accuracy was also an issue with either not plotting the points correctly or attempting to join them with their line missing their points.

Question 19b

The question was answered very well with the very large majority of students correctly stating a value in the given range.

Question 20a

A poorly answered question where a significant number of students incorrectly drew a rectangle or an attempt at replicating the 3D drawing. Very few students drew the correct circle, but some students correctly scaled 40 m to 4 cm. A number of students drew rectangles with horizontal sides 4 cm and vertical sides 5.5 cm in both parts (a) and (b). It appeared that many students did not understand how to draw a plan of the building.

Question 20b

A poorly answered question where a significant number of students incorrectly drew a rectangle with curved corners or an attempt at replicating the 3D drawing. A number of students drew the correct rectangle, whilst others only correctly scaled either 40 m to 4 cm or 55 m to 5.5 cm. It appeared that many students did not understand how to draw a front elevation of the building.
There were a significant number of non-attempts.

Question 21

This area and perimeter ratio problem solving question was answered reasonably well and was a good discriminator of the more able students. Some had difficulty with the difference between area and perimeter and worked out the area of both rectangles as 40 cm^2 and answered 1:1.
The most common misconceptions were:

- after correctly calculating 40 and 4 some were then unable to calculate a perimeter
- attempting to work with similar shapes and a scale factor eg $\frac{10}{8} = 1.25$
- calculating the perimeters of A as 26 cm and B as 28 cm but not answering in a ratio
- incorrectly stating $x = 7$ after showing $8 + 2 = 10$ and $5 + 2 = 7$.

Question 22

This money problem including limits of accuracy was not well answered by the large majority of students. The very large majority successfully calculated $6 \times 1.89 = 11.34$ but then just stated 'Rosie has enough with 66p left' rather than dealing with the bounds of accuracy aspect of the question.

Question 23

Many students did not answer this write a formula question well.
Common misconceptions and incorrect answers were:

- $2m \times 4$ instead of $2m + 4$
- $2pm + 4$ using $2pm$ for £2 per mile
- £$4fc$ used for £4 fixed charge
- including a £ sign in their answer eg £$2m$ + £4 or $m \times 2$ + £4
- using word miles instead of algebra in an attempt at a formula eg $C = 4 + 2 \times$ miles
- further incorrect work after a correct formula eg $C = 2m + 4$ with $2 + 4 = 6$ or $4 \times 2 = 8$
- substituting into a correct formula eg $C = 2m + 4$ with $2 \times 3 + 4 = 10$

There were a significant number of non-attempts.

Question 24a

This AO3 ratio problem solving question was answered very poorly.
Some students successfully calculated $912 \div 15.2 = 60$ but did not then proceed correctly to increase the number of teachers by 2.
Common misconceptions were:

- increasing the ratio 15.2 : 1 by 2 in some incorrect way eg 15.2 : 3 or 15.4 : 1
- 17.2 : 1 was a common incorrect answer
- dividing 912 in either the given ratio of 15.2 : 1 or a ratio they had increased by 2
- incorrectly writing a ratio 912 : 60 without further correct work
- incorrectly calculating 60 × 2 = 120 with an answer 120 : 1

There were a significant number of non-attempts.

Question 24b

This evaluation of a calculation question was answered well. The most common response was 'need 8 teachers'. The most common misconceptions were:

- commenting on the answer of 7.2, or the 0.2 part, instead of evaluating the rounding
- misunderstanding that '10 or fewer' meant that there should be groups of equal size and the group size could be 10 or fewer which resulted in students incorrectly calculating the number of teachers required for groups of 6, 8 or 9 students.

Question 25

The question was answered very poorly with some students mixing up x and y values.
Some students wrote down (−2, 4) without drawing any lines.
Some students wrote down (−2, −2) and (4, 4) drawing the line $y = x$ between (−2, −2) and (4, 4).
The most common errors or incorrect answers were:

- drawing $x = -2$ as $y = -2$ and $y = 4$ as $x = 4$
- drawing triangle with vertices (−2, 0), (0, 0) and (0,4)
- (2, 0), (0, −2) and (0, 4) with triangles drawn between the points.
- (−2, 0), (0, 0) and (0, 4) with triangles drawn between the points.

There were a significant number of non-attempts.

Question 26

A very small number of students correctly answered by identifying two mistakes from the calculation of the volume of a hemisphere question.

The most common incorrect identification of mistakes in the calculation were:

- Inclusion of an incorrect value for the volume alongside identification of mistakes.
- Unclear whether π refers to the calculation or the answer eg 'there is no π'
- Reference to π in the answer eg 'hasn't included π in her answer'
- Value of π stated in their reason eg 'she hasn't used π as 3.14'
- Reference to radius cubed eg 'she forgot to cube the 3' or 'she hasn't properly cubed it' or 'she multiplied 7.5 by 3 instead of squaring it'
- Reference to hemisphere eg 'she divided by 2 when it's not written in the equation' or 'she shouldn't of divided by 2 because 7.5 is the radius not the diameter' or 'she's using the formula for a sphere not a hemisphere'
- Incorrect units eg cm or cm^2

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)
Use our exam results analysis tool to create and customise as many different reports for comparison as you like.

Professional development
Attend one of our feedback courses where you can review example responses from students and commentaries from our examiners.