AQA
Realising potential

GCSE
Mathematics

8300/3F: Paper 3F (calculator) Foundation

Report on the exam

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Summary

This was the first series with changes made to the assessment. Multiple-choice questions were removed from the start of the papers and efforts were made to ensure that more of the beginnings of the papers were accessible to all. We have worked hard to ensure that ramping of demand, wording of questions and the contexts used are appropriate. This has led to an increase to some of the grade boundaries. As a result we feel students were better able to demonstrate their mathematical knowledge and appeared to have a more positive examination experience.

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 very challenging for students on this tier. Students were not always able to access some of the questions, but they were rewarded for good use of mathematics shown at different levels of ability. Students did not always show working when instructed to do so.

Topics where students excelled

- Solving simple equations
- Mode, median and range calculations
- Term-to-term rules of a sequence
- Distance-time graph
- Rates of pay problem
- Simplifying expressions
- Inequality problem solving
- Number problem with proportion
- Ratio problem with money

Topics where students struggled

- Ratio of angles around a point problem solving with AO2 ‘show that’ reasoning
- Explanation or comparison AO2 questions involving geometrical reasoning
- Area problem with comparison of the area of a triangle and a rectangle
- Compound percentage decrease
- Quadratic table of values and plotting a quadratic graph
- Interpreting a pie chart in the context of an AO3 problem solving question
- Trigonometry calculation of a missing side
- Estimation with rounding to one significant figure
- Explanation AO2 question involving estimation
- Factorising quadratic expression
- Solving a bracketed quadratic equation

Individual questions

Question 1a

This simple solving an equation question was answered very well by the very large majority of the students.

Question 1b

This simple solving an equation question was answered very well by the very large majority of the students.

Question 1c

This simple solving an equation question was answered well by the majority of the students, however a common incorrect answer was $x = 2$ following a misconception to divide both sides of the equation by 4

Question 2a

The correct modal answer of 4 was given by the large majority of the students.

Question 2b

Many students correctly ordered the list of numbers and identified the correct median of 9, however some missed a value in the reordering process.

Common misconceptions were:

- attempting to calculate the mean by summing the numbers and then dividing by the number of values
- identifying the middle value of the unordered list of numbers

Question 2c

The question was answered well by many students identifying the range as 3, however some students left the range unevaluated as $15 - 2$

There were a significant number of students who it appeared were unsure how to calculate the range and incorrectly gave the mode, or median values or attempted to calculate the mean.

Question 3a

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

Question 3b

Many students correctly completed spinner diagrams. The most common error was to split up spinners into sections but leave them unlabelled.

Other common errors included:

- leaving a section of a spinner empty
- labelling number spinner R1, R2, R3, B1, B2, B3, …,
- labelling number spinner with only 1, 2, 3
- labelling both spinners with red, green, blue.

Question 4

This change of units question was answered reasonably well by many of the students.

A significant number of students did not convert correctly between metres and centimetres using incorrectly 1 m = 10 cm or 1 m = 1000 cm.

Some students stated units in their working eg 950 cm, 0.2 m or 40 cm but many failed to state the correct units with their answer of 910 cm or 9.1 m.

Question 5a

Many students answered this term-to-term rule of a sequence by correctly working forwards using the given operations. However, some only calculated the second term as 15 or went one term too far giving an answer of 345.

A common misconception was not to follow the stated term-to-term rule but to calculate $4 - 1 \times 5$ as -1 and $-1 - 1 \times 5$ as -6.

Question 5b

In this term-to-term rule of a sequence problem students had to correctly work backwards with inverse operations. It was answered reasonably well but there were different misconceptions with some working forwards with the given operations to answer 35.

Other misconceptions achieved the special case values:

- by using the inverse operations in the wrong order $50 - 20$ then $\times 2 = 60$
- by working backwards using one incorrect operation 50×2 then $+ 20 = 120$
- by working backwards using one incorrect operation $50 \div 2$ then $- 20 = 5$.

Question 6a

This distance-time question was answered very well by the very large majority of the students who correctly read the graph to answer 7 km.

Question 6b

This distance-time question was answered very well by the very large majority of the students who correctly read the graph to answer 15 minutes.

Question 6c

This distance-time question was answered reasonably well. The most common incorrect answer was a graph which ended at (10.57, 0) without any working shown, so that it was impossible to distinguish whether a calculation or drawing error had been made.

20 + 3 or 23 was commonly seen in working followed by 10.23 or 10.53 as incorrect times and some showed 10.58 in working but did not correctly plot the distance-time graph.

Question 7

A well answered question where the majority of students answered correctly to achieve £314 in this rates of pay problem. Errors were common with calculating incorrectly the extra hours for Saturday as 4 and Sunday as 3 to achieve one of the special case totals of £325.80 or £337.60.

A significant number of students misread their own calculated values eg 25 × 10.20 = 255 then 225 + 59 = 284 or misread the value on their calculator eg 25 × 10.20 = 225.

Other misconceptions were to subtract the 5 extra hours from 25 eg 20 × 10.20 = 204 or to use the hourly rate of £10.20 throughout eg 25 × 10.20 + 5 × 10.20 = 306.

Question 8

This question was answered reasonably well. A significant number of students did not convert correctly between kilograms and grams instead using 1 kg = 100 g.

Many students either calculated correctly 60 + 70 + 85 = 215 or 1 ÷ 5 = 0.2 or 1 ÷ 4 = 0.25 but did not proceed further with a correct conversion to achieve 0.215 or 200 and 215 for comparison.

Question 9

This selecting types of angles question was answered reasonably well, the main error was selecting incorrectly ‘always true’ or ‘sometimes true’ for ‘one of the three angles of a triangle is reflex’.

Question 10a

The majority of students simplified the expression correctly. Others answered incorrectly $p3$, $2p2$, $2p^2$ or $p \times p \times p$. There was also some very indistinct notation which made it difficult to decipher between $p3$ and p^3.

Question 10b

This simplifying by collecting like terms question was answered well by the majority of students.

The most common incorrect answer involved students not retaining the original sign with the term particularly with $-a$ becoming a in subsequent rearrangement of terms.

Common errors for the a term were:

- 3a + a = 4a
- $3a + a = 3a^2$
- $3a - a = 3$
- $3a - a = -2a$.

Common errors for the c term were:

- 5c – 6c = – c,
- 5c + 6c = 11c2
- 5c + 6c = 11c but then –11c used in answer.

Question 11

This AO2 reasoning 'show that' question involving the ratio of angles around a point was answered reasonably well with the majority of students achieving working worthy of one mark.

The most common successful approach was $360 \div 9 = 40$ and $40 \times 7 = 280$ with $360 - 280 = 80$ and 80 : 280 to 2 : 7 also often seen.

Partial solutions often failed to link 80 : 280 to 2 : 7 or omitted to show a calculation of $40 \times 2 = 80$ or $40 \times 7 = 280$ or did not relate to 360° around a point with $360 - 280 = 80$ or $80 + 280 = 360$.

Question 12a

This inequality notation question was answered well by the majority. A common misconception was a pair of integer numbers with a difference of 6 where both values did not meet the inequality criteria eg $c = 10$ and $d = 4$ with d not satisfying $d < 4$.

Question 12b

A very well answered question by the large majority on the topic of inequalities with words. Common incorrect answers were $w = 1.3$ and $x = 1.3$ or $w = 1.5$ and $x = 1.1$ where the value for x did not meet the criteria for 'x is greater than 0 and less than 1'.

Question 13

This AO2 explain question involving a decision about two lines being parallel was answered very poorly by students. Correct explanations were seldom seen but most often based on the fact that the 95º and 105º angles should be 'the same' for the lines to be parallel. A common misconception was to state incorrectly that the lines were parallel.

Question 14

This selecting types of algebra terminology question was not answered well.

Students were mostly able to match $4b > 20$ correctly to an inequality but many had difficulties with matching $5a = 20$ to an equation, often matching to formula and $2c + c \equiv 3c$ to an identity, often matching to equation. It appeared that there was a misconception of knowledge with the difference between an identity and an equation.

Question 15

This question was well answered by the large majority of students. Those students who were not successful generally did not know how to attempt the problem by starting with the mass of the small bags and attempted incorrect calculations with the given information.

Question 16

Many students did not answer this area problem question well. Many students were unable to correctly calculate the area of the triangle often using base $\times$ height = 192 cm^2 from which some achieved SC1 with 25.6 cm for the length of the rectangle. Another misconception was attempting to work with the perimeter rather than the area of the rectangle after an attempt at calculating the area of the triangle.

Question 17

This identifying types of sequences question was answered reasonably well.

Many students were able to identify one correct sequence with the small majority of those identifying correctly both correct sequences. It appeared that generally more students were able to identify the linear sequence than the Fibonacci-type sequence.

Question 18

A poorly answered question with many students unable to form a correct method to calculate the compound percentage decrease either from using a compounded multiplier of 0.96^5 or by repeated individual compound calculations of subtracting 4% of the previous reduction.

The most common misconception was to calculate correctly $0.04 \times 1\,000\,000$ as 40 000 but then adopted a simple decrease method of $1\,000\,000 - 5 \times 40\,000$ to achieve an answer of 800 000 from an incorrect method.

Question 19

This AO2 explanation question involving the comparison of cuboid surface areas was answered poorly with the minority of students attempting to give a statement correctly stating that the surface areas were not in the ratio 1 : 2.

The most common incorrect answer was 'Yes' ticked with a comment based on 'cuboid B is made up of 2 of cuboid A'.

Question 20a

This quadratic table of values question was answered poorly. Students had the most success working with $x = 1$ and calculating with $y = 1^2 + 2 \times 1$ and $y = 1 + 2$ to correctly achieve $y = 3$.

The most common misconception involved working with $x = -2$ and then calculating incorrectly with $y = -2^2 + 2 \times -2$ and $y = -4 - 4$ to achieve $y = -8$.

Some students simply followed an incorrect sequence of 3, 2, 1, 0, -1 by writing 2 with $x = -2$ and -1 with $x = 1$ in the table of values.

Question 20b

The majority of students correctly plotted three points for the first method mark, but few drew a smooth quadratic curve through the five correct points.

Of those who correctly plotted the five correct points the most common errors were:

- connecting the correct points with straight line sections
- drawing the quadratic graph with a sharp point at the minimum point
- drawing the smooth quadratic curve and not being in tolerance through the correct points
- drawing the smooth quadratic curve with short vertical sections at $x = -2$ or $x = 1$
- drawing the smooth quadratic curve with breaks and 'branch lines' or double lines.

Question 21

This ratio problem solving question was answered reasonably well and a good discriminator of the most able students. The majority of students used the method followed in ALT1 of the mark scheme. Unfortunately some students did not make a decision after correctly reaching £437.50

The most common misconception used an incorrect method of 2450 ÷ 5 = 490 often seen alongside 2450 ÷ 2 = 1225 with students not knowing how to correctly apply ratio in a problem-solving situation.

Question 22

A very small minority of students achieved a fully correct solution on this AO3 interpreting a pie chart question with a significant number of non-attempts. The majority of students were able to calculate correctly the angle for Saturday as 255º but the most common misconception was to equate the 80º angle for Friday with the given 132 people.

The problem-solving nature of working out the difference in the angles between Thursday and Friday as 55º and then equating with the given 132 people was challenging for most students but of those who did achieve '55º = 132', most were then able to successfully scale both sides of the equation to achieve '255º = 612'.

Question 23

This trigonometry question involving the use of the tangent function was answered very poorly with a significant number of non-attempts. Those students who correctly labelled the three sides of the right-angled triangle as Hypotenuse(H), Opposite(O) and Adjacent(A), then selected O and A as the two sides with given information and selected tangent were generally successful.

The most common misconception involved students just writing down a calculation involving any trigonometric function with the given values of 58 and 46 used incorrectly as either angles or lengths eg $x = 58 \times \tan(46)$.

Some students incorrectly manipulated after writing a correct equation eg $\tan(58) = \frac{x}{46}$ followed by $x = \frac{\tan(58)}{46}$.

Question 24a

A very small minority of students correctly answered this estimation question with a significant number of non-attempts.

The most common misconception was not to use estimation but calculate with the exact values.

Others misunderstood rounding to one significant figure as rounding to one decimal place and incorrectly worked with 8.34 as 8.3 and 10.21 as 10.2.

A minority of students incorrectly rounded 10.21 to one significant figure as 10.0 or 10.00.

Some students worked with an exact value to calculate $\left(\sqrt[3]{8.34}\right)^2 = 4.11$ and then rounded 4.11 to 4 and achieved $\frac{1}{4 \times 10} = \frac{1}{40}$ from an incorrect estimation method using an exact value.

Question 24b

A very poorly answered AO3 question on deduction of the estimation from part (a) had a large number of non-attempts.

The most common incorrect answer involved stating that ‘estimates meant rounding up’ and very few made reference to the estimates being in the denominator nor that the exact values had been rounded down in the denominator.

Question 25a

This factorising a quadratic expression was answered very poorly with a significant number of non-attempts.

The most common misconception involved students attempting to collect like terms and there were few attempts trying to work out two numbers with a product of 15 and a sum of 8. Of those who did identify the two numbers as 3 and 5, there were some who wrote the two brackets with incorrect notation as $(x + 3) + (x + 5)$.

Question 25b

A very poorly answered question with a significant number of non-attempts on solving a quadratic equation with double brackets equated to zero.

Common misconception were:

- showing the correct solutions embedded within the double brackets eg $(-2 + 2)(4 - 4) = 0$
- writing 2 and -4 as an incorrect pair of solutions
- writing only one solution of -2, usually after $2 - 4 = -2$.

Further support

Mark ranges and award of grades

Grade boundaries and cumulative percentage grades are available on the results statistics page of our website.

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