AQA
Realising potential

GCSE
Mathematics

8300/3F: Paper 3 (Calculator) Foundation

Report on the exam

June 2022

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Summary

Overall performance compared to last year

There was an improved overall performance compared to June 2019. 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. However, 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. It was apparent at times that some students did not have access to or use a calculator or the necessary mathematical equipment.

Topics where students excelled

- Money problem
- Interpreting information from a bar chart
- Completing a frequency tree

Topics where students struggled

- Providing a reasoned argument
- Probability from frequency tree
- Explanation of properties of a regular polygon
- Building a formula from a number machine
- Calculation of mean from a line chart
- Packing tennis balls into a cylinder problem
- Evaluating results involving estimated probability
- Trigonometry, calculation of an angle in a right-angled triangle
- Percentage increase from a two-way table
- Roots of quadratic equation and turning point from a quadratic curve
- Area and perimeter of a compound shape
- Vector addition
- Ratio problem
- Speed, distance, time

Multiple choice questions

Which questions did students find most accessible

Questions 1, 2, 4 and 10(a) were answered well showing a good understanding of percentage, factors, algebraic simplification and naming a polygon.

Which questions did students find least accessible

Questions 3, 12(c), 18 and 29 were less well answered.

$\frac{9}{10}$ was a common incorrect answer for question 3, $6w + 8$ and $6w + 5$ were common incorrect choices for question 12(c), c and d was a common incorrect answer for question 18 and $3.5 \leq \text{mass} < 3.6$ and $3.55 \leq \text{mass} \leq 3.65$ were the most common incorrect choices for question 29.

Individual questions

Question 5

Part (a) was well answered by the majority of students, with some students incorrectly stating the appropriate unit of mass for a pound coin as kilograms or pounds.

Part (b) was reasonably well answered with the very large majority able to correctly add together the times. However, many often then left the answer as 2 hours 30 minutes or truncated the answer to 2 hours or rounded the answer up to 3 hours.

Question 6

A problem solving question involving money and purchasing items which was very well answered by the very large majority of students. Some students stopped at £4.80 not realising that they needed to work out the number of pens after using money to buy the eight rulers.

Question 7

Part (a) appeared to be a straightforward reading from a bar chart and completing a statement about the relationship between the number of silver and gold medals. It was poorly answered by most students, with bronze stated as an incorrect answer. The numerical answers of 2 and 1.5 also common.

Part (b) was very well answered by the very large majority of students who were able to read from the bar chart. Some solely listed medals and a small minority just focused on bronze medals.

Part (c) was not well answered with many students unable to clearly articulate a valid reason why the total number of medals cannot be 25. Many were unable to distinguish between even and equal in their statements.

Question 8

This question was reasonably well answered and a good discriminator with the marks spread evenly. The most common error was for students to incorrectly subtract 0.8 litres or 800 ml from 5.6 litres or 5600 ml rather than add to achieve 6.4 litres or 6400 ml. Many students stopped part way through their working at 0.8 litres, 800 ml, 6.4 litres, 6400 ml or 0.4 litres without knowing the next correct step to achieve 400 ml. Some students achieved 400 ml using an incorrect method by subtracting 5600 ml from 6000 ml.

Question 9

Part (a) was very well answered by the large majority of students, with some following through an incorrect answer in time exercising less than 1 hour or in exercise taken No.

Part (b) was not well answered by the majority of students with common incorrect answers being $\frac{8}{35}$, $\frac{27}{58}$, $\frac{1}{27}$ and $\frac{1}{35}$

Incorrect use of ratio notation, eg 27 : 35, was also fairly common.

Question 10

Part (b) was very poorly answered, with many varied incorrect explanations as to why the polygon was not regular, such as it looks unusual or slanted or simply stated how many sides it had. Successful responses tended to be brief and focused on either the sides or angles not being equal or the same.

Part (c) was not well answered. Students were generally more successful with 2 as a correct answer for the number of lines of symmetry of shape X than with 4 for the order of rotational symmetry of shape Y. Common incorrect answers for the number of lines of symmetry of shape X were 4 and 6, and common incorrect answers for the order of rotational symmetry of shape Y were 0, 1 and 2.

Question 11

Part (a) was very well answered. An incorrect calculation of $58 + 26 \div 21$ with an answer 59.23…, from not finding the sum of $58 + 26$ before dividing, was the most common incorrect answer.

Part (b) was very poorly answered, with a significant number of non-attempts. Students had difficulty with building an algebraic formula: common answers were $d = c \times 3 - 5$ and $c \times 3 - 5 = d$ with students not using fully processed algebra to give $d = 3c - 5$. Common incorrect answers were $3c - 5$, $3c - 5d$ and $d + 5 \div 3$.

Question 12

Part (a) was reasonably well answered. Some candidates incorrectly adding the x terms but subtracting the y terms whereas others added the y terms as y^2 with some incorrectly combining xy terms.

Part (b) was well answered and a good discriminator with the marks spread evenly. 425 was often embedded in the method as $625 - 425 = 200$, and some candidates stopped at 200 or 625 unsure of how to proceed to the correct answer.

Unfortunately, after the exam we found that there was a misprint on question part (c). This mistake only affected the A3 36pt question paper that was downloaded from Centre Services on the day of the exam – the standard and all other versions of the modified papers were correct. To make sure no students were disadvantaged by this mistake, we've given all students who sat the above modified version of the paper the mark available for this question.

Question 13

This question was reasonably well answered, and the very large majority of students achieved one correct response. The most common response was to answer True for both statements.

Question 14

In part (a), the calculation of how many students played more than 2 games question, students answered reasonably well. The common incorrect answers were 5, 13 and 4.

In part (b), the calculation of the mean from the line chart question, students answered very poorly and had difficulties interpreting the line chart to calculate the mean. 48 was seen commonly, but few students progressed with common incorrect errors being 48 ÷ 5, 48 ÷ 15, 20 ÷ 5 and 15 ÷ 5

Question 15

Both parts of this question were not well answered.

The most common incorrect answer in part (a) was to stop at 360 as the multiple of 60 closest to 400 rather than state 420 correctly. Some students indicated 420 in their working but answered 7.

In part (b), the majority of students answered 6. The most common incorrect answers were 2 or 3. Some students made errors in listing factors of 12 or 18, whilst others listed multiples of 2, 3 or 6. Venn diagrams were seldom seen.

Question 16

Students found the problem solving concept of this question very difficult to interpret and, consequently, the question was very poorly answered. The most common misconceptions were to divide 40 by 3.5 or multiply 6 by 3.5 ignoring the need to calculate the diameter of the tennis ball as 7 cm. Some students attempted irrelevant area and volume calculations in an attempt to substantiate a conclusion.

Question 17

Part (a) was well answered with common incorrect answers of 4096, 10^9, 153 (from 128 + 25), 10^{14} and 1280.

Part (b) was not well answered, with most students not able to process the fourth root of a number. The most common incorrect answers were 576, 1.9 (from square root of 20736 four times), 5184 (from 20736 ÷ 4) and 429981696 (from 20736^2).

Question 19

Parts (a) and (b) of this question were not well answered, and a significant number of students did not attempt both question parts.

In part (a), some students plotted points but did not join them with a straight line. The most common answer was to plot points at (2,7) and (10,35) and join the two points with a straight line. The most common incorrect graphs were from (2,7) to (10,15) or (0,0) to (10,40), and some students drew vertical lines from the x-axis to their values for juice.

In part (b), many students were successful if a straight-line graph was drawn in part (a), either with the correct value of 17.5 or follow through from their straight line. If no straight line was drawn in part (a), students were generally unsuccessful in part (b).

Question 20

This question was poorly answered with the majority of students trying to calculate probabilities or to compare numbers without stating the greater number of throws by Bianca as being more accurate.

Question 21

This trigonometry question was poorly answered and there were a significant number of non-attempts. A minority of responses correctly identified tangent as the trigonometric ratio. Of those who did correctly identify tangent, many used incorrect notation which was sometimes recovered by a correct answer. Some students used the adjacent divided by the opposite to work out 21.8°, with others attempting Pythagoras to work out the hypotenuse without further progression.

Question 22

This percentage increase from a two-way table percentage question was poorly answered with a significant number of non-attempts. A small proportion of students correctly calculated the 80% percentage increase using 9 divided by 5, or 4 divided by 5, to respectively achieve 1.8 or 0.8. A build up method to 80% was commonly seen. The majority of students worked out the total hours for the weekends as 5 and 9, and some correctly worked out the difference as 4 but did not progress further. The most common incorrect answers were 4, 40%, $\frac{4}{9}$, $\frac{4}{14}$ and $\frac{5}{9}$

Question 23

Parts (a) and (b) of this question were poorly answered by the very large majority of students, and a large number of students did not attempt the question parts.

In part (a), common incorrect answers were -1 and -5 with 0 and 5 and also -5 and 5. Some answered with coordinate pairs $(-1, 0)$ and $(5, 0)$ or $(0, -1)$ and $(0, 5)$.

In part (b), a small minority identified the x-coordinate of the turning point as 2 but $(2, -7)$ was a common incorrect answer from trying to read the y-axis scale rather than substitute into the equation of the quadratic graph.

Question 24

This question was a good discriminator with the large majority of students gaining some credit. There were a significant number of non-attempts. The majority of those scoring worked out the difference of 3 in the arithmetic progression or that 256 was the 8th term in the geometric progression. Some students incorrectly answered 81 instead of the correct 82nd term. Of those students who correctly answered 82, few formed the equation $3n + 10 = 256$ but instead used the numerical method of $(256 - 10) \div 3$.

Question 25

The majority of students found this common question challenging and it was poorly answered. A common misconception was to solely add up the given sides, and, in some cases, to multiply them. Very few students worked with areas to achieve either 12 cm or 10 cm. Of those who did, many incorrectly labelled the diagram with lengths of 10 cm and 8 cm rather than 12 cm and 10 cm.

Question 26

This question was very poorly answered, with common incorrect answers arising from misconceptions of how to calculate with column vectors. Common incorrect answers were $\begin{pmatrix} 9 \\ 10 \end{pmatrix}$ from $3 \times \frac{1}{6} + \frac{2}{5}$, $\begin{pmatrix} 17 \\ 30 \end{pmatrix}$ from $\frac{3}{18} + \frac{2}{5}$ and $\begin{pmatrix} 9 \\ 33 \end{pmatrix}$ from $\begin{pmatrix} 3 \\ 18 \end{pmatrix} + \begin{pmatrix} 6 \\ 15 \end{pmatrix}$

Question 27

This ratio problem involving two different forms of ratio calculation was poorly answered but proved a good discriminator of those with creditworthy work. The majority of students did not differentiate between the information provided and used the same method for both sets of calculations. Of those who correctly calculated $330 \div 5 = 66$ and then $66 \times 2 = 132$ for freezer A, most incorrectly calculated $294 \div 10 = 29.4$ and then $29.4 \times 3 = 88.2$ for freezer B. Other common errors were to just compare the individual or total values in the ratios eg $3 + 2 = 5$, $7 + 3 = 10$ so B or 3 is bigger than 2 so B or 7 : 3 is more than 3 : 2 so B.

Question 28

The majority of students found this common question challenging at this tier. The question was very poorly answered and there were a large number of non-attempts. The problem solving nature of this question proved difficult for students, with the mixture of a compound measure and the conversion of units between seconds and hours and m/s and km/h. A very small minority of students were able to correctly answer Tom following correct comparisons. A further minority only gained credit for a first step of substituting into the speed = distance ÷ time formula, or a rearranged format, and many progressed no further than $200 \div 24$ or $200 \div 28$ or 28.8×24.

A significant number of students tried to compare a speed with a time. This was seen in particular with Tom's speed of 8.3 m/s with the value of 6.9 "time" for Adil in alternate method 4.

Further support

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