GCSE

Mathematics

8300/3F: Paper 3 (Calculator) Foundation

Report on the exam

November 2021

Contents

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 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
- Number cards problem
- Systematic listing
- Calculation proof of an integer solution problem solving

Topics where students struggled
- Completion of a bank statement
- Scale drawing
- Area of a triangle and area of a circle
- Table of values and plotting a quadratic graph
- Construction of triangle using a protractor
- Scatter graph
- Sum of expressions from perimeter of shapes
- nth term problem solving
- Similar shapes
- Unit conversion of pressure
- Mean and range problem solving
- Plan and Elevation on a centimetre grid from an isometric drawing
- Prime number and percentage problem solving
- Interior angle of polygon

Multiple choice questions

Which questions did students find most accessible

Questions 1, 2, 4, 16(a) and 22 were answered well showing a good understanding of one-step linear equations, ordering decimals, power of 10 values, locus from a point and limits of accuracy.

Which questions did students find least accessible

Questions 3, 21 and 25 were less well answered.

$x - \dfrac{1}{2}$ and $\dfrac{1}{2} - x$ was a common incorrect answer for question 3, circumference and tangent were common incorrect choices for question 21 and 8, 6 and 4 were the most common choices for question 25.

Individual questions

Question 5

A poorly answered bank statement question. Most candidates were unsure whether to add or subtract following a credit or a debit on the balance. There were a significant number of non-attempts which indicated that a significant number of candidates were not familiar with a bank statement.

Question 6

A problem-solving question involving numbers that multiply to 12 was not well answered. Some candidates were able to match one of the conditions to gain a product of 12 but few were unable to match both criteria.

Question 7

A very poorly answered addition and subtraction question in the context of height above sea level. The most common incorrect answers were 145 – 59 = 86, 145 + 59 = 204 with some candidates achieving a correct first step by subtracting 145 from 217 to achieve 72 but then incorrectly continued with 72 – 59 = 13.

Question 8

Part (a) was very well answered by the very large majority of candidates.

Parts (b) and (c) were reasonably well answered. In part (b), candidates generally followed a pattern when making their list of pairs, however some candidates incorrectly only considered the cards 2 and 5 with the misconception of continuing their list with 5,5 and 2,2 with others introducing the context of playing cards whilst some simply made mistakes in their lists. In part (c), many followed through from their part (b) with some listing $\frac{2}{4}$ and others achieving $\frac{3}{4}$ without answering part (b).

Question 9

This question involved candidates showing that a calculation produced an answer with a whole number. The majority of candidates successfully showed fully correct calculations leading to an answer of 7, some inverted the calculation with an answer of $\frac{1}{7}$, others stopped at $\frac{2016}{288}$ without showing the next step, and a small number incorrectly multiplied the numbers of tutor groups and the numbers of students together.

Question 10

This question was not well answered with many candidates unable to proceed further than the calculation of 325 ÷ 25 = 13 for the price of each chocolate in a standard box. Some candidates calculated 50 ÷ 5 = 10 using an incorrect method for the special offer. A significant number of candidates were confused with units and (£)0.1 was often used as 1p in further working with an incorrect answer of 12p. Some candidates worked with the difference in cost between two boxes and achieved £1.50 but then incorrectly divided by 25 instead of 50 to achieve an answer of £0.06.

Question 11

Part (a) was not well answered. Many candidates only gave 1, 2 or 3 correct locations, sometimes with additional incorrect squares.

Part (b) was well answered, however some candidates showed misconceptions with incorrect answers of 1 : 36, 1 out of 36 and $\frac{1}{35}$.

Part (c) was not well answered. A correct answer of $\frac{1}{36}$ for part (b) sometimes had $\frac{1}{4}$ indicated for the corners with the incorrect option 'it is smaller' selected. A common misconception was $\frac{4}{36}$.

Question 12

Most candidates appeared to just roughly estimate and did not appear to use a ruler to measure the length of the dolphin and the whale resulting in the question being poorly answered. Of the correct solutions, 3 × 4 = 12 was the most common (with and without lengths measured). The most common incorrect answers were 3 × 3 = 9, 3^3 = 27, 3 × 5 = 15 and 3 × 10 = 30.

Question 13

Part (a) was poorly answered with the large majority applying the misconception of multiplying the base and height without division by two. Another common incorrect answer was 12.4 from adding the two side lengths of 9.8 cm and 2.6 cm.

Part (b) was very poorly answered with the large majority of candidates unable to write down the formula $A = \pi r^2$. Common incorrect answers were 11.5 × 2 = 23, π × 23, π × 11.5, 11.5^2 = 312.5 and 11.5 × 360.

Question 14

In part (a), the rate of machine working problem solving question was not well answered but a good discriminator with the marks spread evenly. The most common error was for candidates to omit a section of the calculations, some used 100 instead of 60 for minutes in an hour and many multiplied instead of dividing by four and a significant number of candidates had correct operations mixed in with incorrect operations.

In part (b), the compound unit in the context of machine rate of working was reasonably well answered although there were a significant number of non-attempts. The most common incorrect answers were to multiply by four or to multiply or divide by 60.

Question 15

Both parts of this question were very poorly answered and a significant number of candidates did not attempt the question parts.

The most common incorrect answer in part (a) was –11 for y when $x = -3$ alongside correct values for $x = 2$ and $x = 3$.

In part (b), some candidates plotted their points but did not attempt to join them up and many attempts plotted more than one point at an x coordinate. Those candidates who attempted to draw a quadratic curve had difficulty with multiple attempts, broken lines were common, curves did not pass through plotted points within tolerance and others joined the points with straight lines.

Question 16

Part (b) was very poorly answered and a significantly high number of candidates did not attempt the question part. Some candidates had partial success by drawing either a 53° angle at P or a side of 7.5 cm from P but many did not complete both. The most common incorrect answers were to draw a 53° angle at both P and Q, attempting to draw sides of length 7.5 cm from both P and Q.

Question 17

This multiplying out the bracket question was not well answered. A significant number of candidates correctly worked out one correct term, but the very large majority were not able to correctly show both terms. Some candidates continued with further incorrect simplification eg $15x^2 - 10x = 5x$, other misconceptions were $15x^2 - 3x$, $15x^2 - 2$, $8x^2 - 10x$, $15x - 10x$, $15x - 10$ and $15x - 2$.

Question 18

Parts (a), (c) and (d) of this question were very poorly answered and a significant number of candidates did not attempt the question parts.

In part (a), most candidates described the correlation rather than state the type of correlation.

Part (b) was very well answered.

In part (c), many candidates appeared to know what was required to answer the question but misinterpreted the scale and were unable to read off the correct value in tolerance.

In part (d), the most common incorrect answer was 8 and 2011 and the majority of candidates did not draw a horizontal line at £5600, of those who did most had success.

Question 19

This question was very poorly answered with the majority of candidates unable to work correctly with algebraic terms in context. Some were able to show addition of terms for the perimeters, more having success on the triangle than the rectangle, but then some were unable to correctly collect terms, with a minority correctly showing $11a + 11b$ or $10a + 12b$. The common misconceptions were to substitute numbers in for a and b then calculate a numerical value, incorrect algebraic simplification eg $2a + 3b$ shown as $5ab$ and working out the semi-perimeter for the rectangle.

Question 20

The majority of candidates found this sequence problem solving question challenging and there were a very large number of non-attempts. Some candidates attempted to show the terms in the sequence but were unable to correctly identify the 5th term as the first negative and many showed –1 as their answer. It was common for an incorrect sequence to be shown with wrong terms from a mistake in subtracting.

Question 23

This question was not well answered with a significant number of non-attempts. A small proportion of candidates correctly divided the £270 in the ratio by dividing by 3.6 and then calculated the correct difference. Some candidates correctly calculated 195 and 75 but then stopped. A significant number of candidates incorrectly divided by 2.6 and some rounded 2.6 to 2 or 3 before calculating parts of the total.

Question 24

The very large majority of candidates did not realise that they needed to work with the ratio of corresponding lengths to calculate a scale factor or to work out the ratio of sides in the same rectangle for both rectangles, in order to show the rectangles as similar shapes. The most common misconceptions were to work out areas or perimeters of the rectangles or to calculate the difference between the corresponding sides, 35 – 28 = 7 and 50 – 40 = 10 and there were a very large number of non-attempts.

Question 26

This question was a good discriminator with the majority of candidates gaining some credit. Those candidates who calculated $\frac{3}{8}$ of 480 (180) and 40% of 480 (192) usually gained further marks but there were many who struggled with working out the fractional amount. A common misconception was to ignore the 67 who visit the garden and then 480 – (180 + 192) = 108 for the museum, with another being to subtract the 67 from 480 and calculate 40% of 413. Many candidates attempted build up methods to work out 40% rather than a calculator method. A significant number of candidates worked with a decimal of a person and did not realise their mistake from the context of the question.

Question 27

The majority of candidates found this common question challenging at this tier and the question was very poorly answered. Many candidates were able to correctly calculate a first step with 198 × 0.45 = 89.1 but then incorrectly followed with 89.1 × 6.25 = 556.875 or no further work. Some made a different correct first step with 198 ÷ 6.25 = 31.68 followed by 31.68 ÷ 0.45 = 70.4. A common misconception was to do the opposite of what was required with 198 ÷ 0.45 = 440 and there were a very significant number of non-attempts.

Question 28

This question was very poorly answered and there were a very large number of non-attempts. A very small minority of candidates showed the fully correct solution of 21 and 2 but many after calculations using the mean for the sum of the other two numbers as 23 gave an answer of 22 and 1 with the misconception of using 22 and 3 from the original list for the range of 19. Of the small minority of candidates who scored many did so from the range of 19 element by giving an answer of a and 22, where $3 \leqslant a \leqslant 22$.

Question 29

The very large majority of candidates were unable to gain any credit on part (a) or part (b) of this question and there were a very large number of non-attempts. Common errors on part (a) were to attempt to draw a 3D shape, to draw a skewed plan view or to draw a rectangle with the wrong dimensions. In part (b) common misconceptions were to try and draw the shape on a diagonal on the square grid or to try to replicate the isometric drawing on the square grid or to draw a reflection of the correct plan.

Question 30

This question was very poorly answered and there were a very large number of non-attempts. A very small minority of candidates were able to write down a prime number between 20 and 30 and many candidates performed percentage calculations that did produce an integer number eg 23% of 125 = 28.75, 20% of 125 = 25 was another common misconception. Candidates again attempted to use build up in their percentage calculations rather than a calculator method.

Question 31

This question was very poorly answered and there were a very large number of non-attempts. The most common method for some candidates to gain credit was by correctly working out the external angle of the polygon as 24 but of the minority of candidates who did so many did not subtract this from 180 to calculate the internal angle with 24 as their answer. Common misconceptions were $180 - 20 = 160$ or $180 - 165 = 15$.

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Tel: 0161 957 3852

Email: maths@aqa.org.uk

aqa.org.uk