GCSE

MATHEMATICS

8300/3F: Paper 3 (Calculator) Foundation

Report on the exam

November 2022

Contents

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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 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

- angle facts
- solving equations
- linear sequences
- straight line graph
- negative numbers
- frequency tree
- congruent shapes
- proportion problem

Topics where students struggled

- enlargement
- mode, mean and probability from vertical line chart
- scale problem
- proportion problem
- conversion problem
- describe relationship and line of best fit
- area of trapezium and triangle
- money and ratio
- density
- Fibonacci sequence and nth term
- gradient problem
- relative frequency and ratio
- semicircle length and average speed
- mean and ratio

Multiple choice questions

Which questions did students find most accessible

Questions 1, 3, 4 and 14 were answered well showing a good understanding of compass directions, decimals on a number line, identifying angle types and edges of a polygon.

Which questions did students find least accessible

Questions 2, 19, 27 and 29 were less well answered.

$c = d + 6$ was a common incorrect answer for question 2, $n \geqslant 2$ and $n < 2$ were common incorrect choices for question 19, $\times\frac{2}{3}$ was a common incorrect answer for question 27 and $c = \frac{1}{2}d$ was the most common incorrect choice for question 29.

Individual questions

Question 5

Both parts of this question were well answered.

In part (a) some candidates incorrectly showed answers outside the range, both prime and non-prime, whilst others wrote a variety of numbers other than 29 and 31 in the range 25 to 35

In part (b) many candidates incorrectly wrote a square number answering 121, 144 or 256, other common incorrect answers were 150, 200 and 250. Some candidates answered 5^3 or 6^3 without evaluating to a cube number.

Question 6

Part (a) was well answered. Some candidates incorrectly answered 180 – 43 = 137, 90 – 43 = 47 or 360 – 43 = 317

Parts (b) and (c) were very well answered. In part (c) a small number of candidates incorrectly stated 51 + 74 = 125

Question 7

Part (a) was very well answered although some candidates left an embedded answer without evaluating. The most common incorrect answers were 0 and –12

Part (b) was well answered with the most common incorrect answers being 7 and –7

Question 8

This question was reasonably well answered with those candidates converting to percentages usually being successful. A common misconception often occurred in decimal conversions with an incorrect order of 0.7, 0.72, 0.705, although those candidates showing decimals to 3dp usually achieved a fully correct answer.

Question 9

Both parts (a) and (b) were very well answered. In part (b) some candidates incorrectly plotted (0,3) at (1,3) or (3,0) with others drawing the line out of tolerance at (0,3), (2,7) or (4,11).

Part (c) was reasonably well answered with a common misconception of not reading the y value for $x = 3$ from their part (b). Another common incorrect answer was 0

Question 10

Both parts (a) and (b) were very well answered with a common error being to incorrectly evaluate a correct example.

Part (c) was reasonably well answered with the common misconception that doubling is multiplying the number by itself with examples of common incorrect answers 0^2, 0 × 0 and –5 × –5

Question 11

This question was well answered and a good discriminator with the marks spread evenly. The most common errors were 480 – 96 – 64 – 32 = 288 instead of 384, 24 and 456 in the 1st two ovals after incorrectly calculating 20% as 480 ÷ 20 = 24, halving rather than working with thirds with 48 and 48 in the 2nd two ovals, 64 and 32 the wrong way round in the 2nd two ovals, converting $\frac{2}{3}$ into 66.6% and working with decimal values.

Question 12

This question was reasonably well answered with 2015 and 2016 common incorrect answers. There were many errors in listing and an incorrect method was 4 + 3 = 7 and 2019 – 7 = 2012

Question 13

The question was not well answered. Common incorrect explanations were the input and output should be swapped, 3 and 5 should be swapped without reference to the operations and inverse operations should have been performed. Some candidates stated $x + 3$ was $3x$ so that $y = 3x \times 5$ was being formed with others explaining a mistake with the equation rather than the function machine.

Question 15

Part (a) was very well answered with the large majority of candidates correctly using the given line. A common error was to use a correct height of three squares but show a horizontal length of 3 or more squares.

Part (b) was not well answered with the large majority of candidates attempting to draw an enlargement in the same orientation as C. The most common incorrect answers placed the vertex 1 square right, left, up or down from the correct position.

Question 16

Part (a) was not well answered with the most common incorrect answer of 7 from the largest frequency. 3, 5 and 10 were fairly common incorrect answers.

Part (b) was very poorly answered. Common misconceptions were to add the number of visits as 1+2+3+4+5 and then divided by 5 or 6 or to incorrectly calculate 40 divided by 6. Of the minority of candidates who correctly calculated the sum of their products many still incorrectly divided by 5 or 6

Part (c) was very poorly answered. The most common incorrect answer was $\frac{10}{40}$ from the misconception of visiting once rather than at least once. Some candidates incorrectly wrote probabilities using either incorrect ratio notation eg 33:40 or in words eg 33 out of 40 rather than correctly as a fraction or equivalent decimal or percentage.

Question 17

This scale problem question was very poorly answered. The majority of candidates scored the first method mark for 8 × 1.65 but did not successfully then divide by 3.8. Of those who achieved 3.474 many did not score full marks due to incorrectly rounding to the nearest cm by giving an incorrect answer of 3.5

Question 18

A reasonably well answered question and a good discriminator with the marks spread evenly.

3630 ÷ 4 = 907.5 was a common incorrect first step.

3630 ÷ 11 = 330, 330 × 4 = 1320 and 140 × 9 = 1260 and Yes was a common misconception as was 140 × 9 = 1260 and 2500 – 1260 = 1240

Question 20

Part (a) was reasonably well answered, however a number of candidates did not score the accuracy mark due to incorrect money notation with a final answer of 22.5 after a correct calculation. A common misconception was 27 × 1.20 = 32.40. Some candidates attempted to use a build-up method, eg 22 × 1.20 = 26.40 and 23 × 1.20 = 27.60, which rarely lead to a correct answer.

Part (b) was not well answered with the majority of candidates showing two correct and one incorrect operation. The most common correct method used was 168 ÷ 8 = 21 followed by 21 × 5 = 105 and 105 ÷ 14 = 7.5.

Common misconceptions involved uncertainty in when to divide and multiply by given values. Common incorrect answers included 168 ÷ 5 = 33.6, sometimes followed by 33.6 ÷ 12 = 2.4, 14 × 5 = 70 followed by 168 ÷ 70 = 2.4, 5 ÷ 8 = 0.625 followed by 0.625 × 14 = 8.75 then 168 ÷ 8.75 = 19.2 or 8 ÷ 5 = 1.6 followed by 1.6 × 168 = 268.8 then 268.8 ÷ 14 = 19.2

Question 21

Part (a) was reasonably well answered with common incorrect answers simply restating the question answering positive correlation or commenting on height and mass having similar values.

Part (b) was not well answered with a large number of candidates either not drawing a line of best fit or drawing the line out of tolerance. Of those who drew a line of best fit the large majority went on to read correctly from their line of best fit. Some candidates misread the scale on the axes.

Question 22

A very poorly answered question. Many candidates did not breakdown the compound area into a triangle and a trapezium. A small minority of candidates correctly calculated the area of the triangle but few knew how to correctly calculate the area of the trapezium. Common misconceptions were 70 as the area of the triangle and attempting to calculate the area of the shape as a whole without dividing it into a trapezium and a triangle. Some candidates incorrectly used a Pythagoras' theorem calculation.

Question 23

This question was not well answered and a good discriminator with the marks spread evenly. A very common correct method with an incorrect evaluation of $1.5 \times 72 = 36$ was very common with candidates incorrectly keying in $1\frac{1}{2}$ as a mixed number fraction on a calculator. A common misconception was that $1\frac{1}{2}$ of 72 is one half of 72 and $1\frac{1}{2}$ of $72 = 36$ was a common incorrect method and evaluation. Some candidates started with $1\frac{1}{2} = 0.5$ again from incorrect use of a calculator.

Question 24

A very poorly answered question. A common misconception involved incorrect calculations using incorrect Density Mass Volume triangles rather than using the dimensions of density to derive the correct formula $\text{Density} = \dfrac{\text{Mass}}{\text{Volume}}$

3.6×10 and 3.6×100 were common incorrect attempts in converting to grams. A significant number of candidates calculated $3600 \div 7.87 = 457.4$ but did not compare with the volume of the statue to make a decision.

Question 25

Part (a) was very poorly answered with a significant number of non-attempts. Very few candidates used a formal method by setting up an equation to solve the problem. The majority of candidates managed to achieve 40 by taking the 1st term from the 4th term, with some then correctly dividing by 2 to achieve 20, others showed 33 + 20 = 53 or 73 – 20 = 53 with a final answer of 53

Part (b) was very poorly answered with a significant number of non-attempts. Only a small minority of candidates correctly identified that $n = 1$ and then followed with a correct explanation. A common error was using $n = 0$ or stating that n^2 is not always greater than n without a correct value of $n = 1$ being stated.

Question 26

Candidates found the problem-solving concept of this gradient question very difficult to interpret and consequently the question was very poorly answered with a very large number of non-attempts. The most common method of scoring was where candidates gave a correct pair of coordinates for P and Q or indicated both $x + 4$ and $y – 5$ without fully accessing the gradient problem.

Question 28

A very poorly answered question with a very large number of non-attempts. Some candidates achieved 153 and 147 from incorrect methods of 128 + 25 = 153 and 122 + 25 = 147. There were a number of common misconceptions, 128 × 0.49 = 62.72 and 122 × 0.49 = 59.78 with some adding these to the original values, 62.72 + 128 = 190.72 and 59.78 + 122 = 181.78, 0.49 × 50 = 24.5 and 0.51 × 50 = 25.5 with some adding these to the original values, 24.5 + 128 = 152.5 and 25.5 + 122 = 147.5

Question 30

This semicircle length and average speed question was very poorly answered with a very large number of non-attempts. Very few candidates were able to correctly calculate the running track length, but many had success with a speed calculation. The most common incorrect answers were 45 + 75 = 120 and 120 ÷ 18 = 6.6 or 6.66 or 6.67 and 45 × 75 = 3375 and 3375 ÷ 18 = 10.416 often with incorrect rounding to 10.42. Candidates were generally not successful with the final stage of rounding to 2sf, correct methods were incorrectly rounded to 2dp with 8.08 or 8.09 shown as final answers, 6.6 recurring was incorrectly rounded to 2sf as 6.6

Question 31

A reasonably well answered question with a significant number of non-attempts. Common misconceptions included 1.8 ÷ 1.92 = 0.9375, 24 ÷ 20 = 1.2 and there were errors in evaluating one of 24 × 1.8 = 43.2 or 20 × 1.92 = 38.4

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