AQA
Realising potential

# GCSE
# Mathematics

**8300/2F: Paper 2 (Calculator) Foundation**

Report on the exam

June 2022

# Contents

# Summary

## Overall performance compared to last year

There was an improved overall performance compared to June 2019. Most students were able to access many of the questions and were rewarded for good use of mathematics at different levels of ability. Many students used build-up methods, not the most sensible approach on a calculator paper, and these were often inaccurate or incomplete. Some students did not set out their solutions clearly, and numbers were often written ambiguously, occasionally leading to them miscopying their own handwriting.

## Topics where students excelled

- Decimals on a number line
- Units of time
- Money problem
- Reading coordinates
- Digits problem
- Best buy
- Mean problem
- Percentage reasoning

## Topics where students struggled

- Improper fractions
- Range with mixed units
- Equation of a horizontal line
- Scale drawing interpretation
- Ratio $n$ : 1
- $y$-intercept and gradient
- Combining probabilities

# Multiple choice questions

## Which questions did students find most accessible?

Question 1 was very well answered with students showing a good understanding of decimals on a number line. The most common wrong answer was 1.4

Question 3 was also very well answered showing a good recall of units of time. Here, the common incorrect response was 300.

## Which questions did students find least accessible?

In Question 17(a), almost as many students chose the answer $x \leqslant 7$ as gave the correct answer.

Question 19(a) was poorly answered with many students giving the answers (2, 1) and (1, 2).

## Common misunderstandings/distractors

The common incorrect response for Question 2 was $a$.

In Question 4, the common incorrect responses were diameter and radius.

Although Question 11b was quite well answered, a lot of students gave the response 'It is more than the answer to part (a)'.

In Question 24, the common incorrect response was $x$ is 20% of $y$.

# Individual questions

## Question 5

Part (a) was not very well answered, and the common wrong answers were $\frac{14}{9}$, $\frac{4}{9}$ and $\frac{9}{4}$.

Part (b) was better answered but many gave a rounded decimal.

In part (c), 3, 2.80 and 28.4 were common errors.

## Question 6

The first question requiring some problem-solving skills was very well answered with most giving a fully correct solution. Some students worked out a correct total price that was not the cheapest. Some students only worked out the cost of the cleaning fluid and did not add on the cost of the machine hire, giving an answer of £46. Not all students appeared to be using a calculator because some arithmetic errors were seen.

## Question 7

This question differentiated well. There were lots of quadrilaterals drawn, many with a right angle at *B* and/or a line parallel to *AB*. However, many were rectangles or parallelograms. Some students used incorrect lengths for the sides or did not complete the quadrilateral by joining to *A*. Occasionally a quadrilateral of the right form was drawn with the right angle at *A* rather than at *B*. Weaker responses were unruled and often lost accuracy.

## Question 8

Although many students knew to add on the 650, a large number subtracted 200 from 650. Occasional errors were seen in the change of units. Some students scaled 850 to 29.75 in order to match the scaling from 200 to 7.

## Question 9

Part (a) was generally well answered. The most common error was to work out that she needed 6 hours on Friday and say that was a 6 pm finish. Some thought 5 pm to 8 pm was 4 hours, and some made arithmetic errors but often followed through correctly. Sometimes the working was unclear with students not showing each step of their working.

In part (b), some students attempted to give a correct reason but then showed an incorrect calculation that negated their answer. Some thought the error was that she should have worked out $3 \times 4 + 2 = 14$. Some only mentioned the need to use BIDMAS without explaining that meant adding the brackets first. Some students said the brackets were in the wrong place. However, a large proportion commented correctly that she needed to add the brackets first or showed the correct calculation.

## Question 10

The most common overall error was to swap all the coordinates and write them in the form $(y, x)$. A repeated error of this type was not repeatedly penalised.

Part (a) was very well done.

In part (b), which was also well answered, some gave the midpoint of *BC* while others gave (10, 6) presumably from the coordinates of *B*.

In part (c) students generally had a $y$-coordinate of 1 but $x$ was various values, usually 6, 5, 4 or 3. Those who drew the parallelogram on the grid performed better.

## Question 11(a)

There was a low number of fully correct solutions for this multi-step question. Some students gave correct working as far as the cost of the shirt (£16) but then gave this as their answer. The most common error was to work out the correct cost of the sports equipment (£120) but then divide this by 3, giving an answer of £40, although some did subtract to give an answer of £80. A large number of students decided to try to convert to percentages and immediately introduced a premature approximation error. The values needed to be to at least 2 significant figures for the method marks but some truncated further and used eg 30% for a third. Weaker responses started by subtracting five-sevenths from £168 to get £167.29 and usually continued with this misconception.

## Question 12

Part (a) was very well answered. Some showed the answer as a product of the two digits or with the two digits separately.18 was a common wrong answer.

In part (b), many students showed the calculation with the two digits or the two digits separately. Some thought that the digits 52, for example, with answer 10 met the requirement. Occasionally, three digits were used eg the answer $10 \times 0$ was seen.

In part (c), there were many correct answers using all the possible values. Common wrong answers were 10 by 8, 90, $11 \times 7$ and numbers greater than 70 eg 71 or 72.

In all parts, a small number of students misunderstood or missed the given example and answered with subtractions, eg $1 - 1$ , for part (b).

## Question 13

The vast majority of students worked out the cost of 480 tea bags of each type and subtracted with many giving a fully correct solution. A few arithmetic errors were seen, despite a calculator being allowed, but most students showed their working so could gain the marks for method. Some students assumed that this was a standard best buy question and launched into finding two comparable prices, not realising that they then needed to scale up to 480 tea bags. Weaker responses simply subtracted the two given prices.

## Question 14

This question was well answered, and the vast majority of students correctly matched at least two of the expressions.

## Question 15

This question was not particularly well answered, although a small proportion of fully correct responses was seen. Weaker responses only added or subtracted the given numbers. Some changed the units, most often to centimetres but occasionally to metres. Most of the attempts in centimetres remembered to change back for the final answer. Many gained a mark for a correct scale factor, but often this was used incorrectly. Sometimes accuracy was lost due to premature approximation, and some students did not show their method before they truncated. Methods using build-up, as well as being less efficient, were usually unclear or incomplete, often missing the final part of the full conversion. Some halved or quartered 7 and then were unsure how to get to 2.5 so added or subtracted a bit.

## Question 16

Few students showed their working out for the angles which could have helped them score even if their drawing accuracy was poor. It was common to see an angle of 110 (presumably $90 + 20$) for the Yes sector. Some just plotted 15 or 25 degrees for No and 20 degrees for Yes. Many realised that the No sector should be 90 and gained that mark. Quite a few weak responses did not use a ruler. Most labelled the pie chart but sometimes muddled up the sectors.

## Question 17 (b) and (c)

Foundation students found the required algebra challenging.

Part (b) was very poorly answered. Many students started by adding $2d$ and 1 to make $3d$ and then multiplied by $3c$ to get $15cd$ or added $3c$ to get $8cd$. $10cd + 5$, $10cd + 5$ and $10cd + 6c$ were also common incorrect answers but did gain credit for simplifying the first term correctly.

Common incorrect answers in part (c) were 49, $49x$, $3x + 4$, $7x(3 + 4)$ or using two brackets such as $(x + 3)(x + 4)$.

## Question 18

Common wrong methods in part (a) included working out $\frac{9}{11}$ as a percentage or working out the percentage of children. Some arithmetic errors were seen with $9 \times 5 = 40$ being the most frequent. Occasionally the answer was left as 0.45 rather than changing to a percentage.

In part (b) many students were able to work out that 16% of the people were from France and some were able to work out the correct ratio. However, a reasonably high number then rounded to the nearest integer (because the question was about people) and lost the accuracy in the $n$ : 1 ratio. Those who just subtracted 68% from 100%, sometimes managed to pick up a mark for simplifying a ratio to the form $n$ : 1 correctly.

## Question 19

Part (b) was the least well-answered question on the paper with (3, 8) and (8, 3) being common wrong answers.

In part (c), common wrong answers were $5x$, 10 and 20.

## Question 20

In part (a), many correctly worked out that the probability of Jose not passing was 0.2. The most common errors for Maria were to put 0.1 and 0.1 on the bottom two branches (to add up to the 0.2 that they had filled in) or to swap the probabilities on the bottom two branches to give the tree diagram some symmetry on the right-hand branches.

Part (b) was poorly answered with many adding the two probabilities and giving an answer of 1.2 or just stating one of the probabilities from part (a).

## Question 21

Many fully correct responses showing one of the relevant calculations were seen, often with no working so presumably from trial on their calculator. Some listed the prime numbers between 10 and 20 and some listed at least three cubes. Weaker responses started by working out the cube root, or the cube of 2125, and usually made no progress. Sometimes the lists of primes included non-primes, usually 15. There was a high proportion of blank responses.

## Question 22

Many correct solutions were seen, usually from realising they needed a total of 450 and subtracting the numbers for the first 4 days. Those who started by averaging the first four days, or by adding to 340 and dividing by 5, usually made no further progress, although complete solutions using these methods were very occasionally seen. Students who used a trial method often did not show their working, and some left the correct answer embedded in a calculation and gave the answer 90. Weaker responses looked at the increasing sequence of numbers and guessed a value which was usually between 100 and 105.

## Question 23

This question differentiated well. Most students managed to work out the words per minute or words per second. Those working with words per minute seemed more able to go onto the appropriate second calculation. Those working with words per second often multiplied by 1534 and made no further progress. Students who scaled from essay words to report words usually had the full correct method but tended to introduce premature approximation so lost accuracy. The most common answer by far was 29 minutes 50 seconds from interpreting 29.5 incorrectly but 29 minutes 5 seconds was also seen. Build-up methods, which are a very inefficient way of approaching a question like this, usually fell short with most students getting close to the final result but unable to reach the exact number of words needed. This meant that they frequently scored zero for this approach because they had an incomplete method.

## Question 25

In part (a), the most common incorrect answers were the frequency, 33 or 3.63 from 120 ÷ 33. The values were sometimes given as 33 : 120 or 33 : 87. Those who gave the answer as a fraction were usually more successful, whereas those who tried to give it as a decimal or percentage sometimes did not give the full exact value or omitted the % symbol.

Students found part (b) particularly challenging, and many had incomplete build-up methods often stopping at 24, the most frequent incorrect answer, using 480 total calls. Some lost accuracy through truncation and then rounded their final answer in an attempt to correct it. Students should keep the full value on their calculator to avoid such errors. Other common wrong answers were 83.3 from 500 ÷ 6, or 30 from 5 days of 6 sales, or 42 from 7 days of 6 sales.

## Question 26

Most students worked out the full totals, usually correctly, and compared £105 and £102. Some students realised it was sufficient to work out that the printer was £8 cheaper, but the hard drive was £5 more expensive so saved themselves time. Some worked out a 20% reduction rather than an increase for the hard drive. However, this was very well answered for a common question at this stage of the paper.

## Question 27

Many students did not use Pythagoras' theorem or trigonometry so made no progress with the area of the rectangle, usually just using 30 as the width. Often, they added side lengths or also added in 90 or 180 from the angles of the triangle. Those who did use Pythagoras' theorem were often successful, although a minority subtracted the squares of the sides. Sometimes the area of the triangle was the only part that students worked out correctly. In contrast, sometimes the triangle area was just omitted, or the wrong sides were used and, fairly commonly, the area had not been halved.

## Question 28

There was a high proportion of blank answers for this question, and those who did answer it often showed little understanding of the rules of algebra. There was a lot of unclear working, often no equals sign anywhere, and many careless mistakes made when collecting terms. In the weakest responses, $10x - 5$ became $5x$ and $6x + 9$ became $15x$. Some students attempted to rearrange terms before expanding the brackets.

However, some students did manage to either expand correctly or collect terms correctly and sometimes then gave a correct follow through answer.

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