GCSE

Mathematics

8300/1H: Paper 1 (Non-calculator) Higher

Report on the exam

June 2022

Contents

Summary

Overall performance compared to last year

The performance was better than that in 2019, with a rise of over 8% in the mean mark from June 2019.

Topics where students excelled

- Standard form
- Tree diagrams
- Solving equations with algebraic fractions
- Working out terms of a sequence
- Recurring decimal to fraction

Topics where students struggled

- Constructions
- Inverse proportion
- Algebraic simplification involving factorisation
- Probability
- Transformation of graphs

Multiple choice questions

Which questions did students find most accessible

The students were comfortable with all of the multiple-choice questions.

The most successful was question 19a, with 86% of answers correct. Question 3 also had over 80% success rate, with question 1 having over 70% and questions 2 and 16 having over 60%.

Which questions did students find least accessible

Question 4 had just less than 50% success rate; it was the only one under 50%.

Common misunderstandings

On most of the multiple-choice questions, the correct answer was clearly the most commonly chosen, although, on question 4, option 3 was chosen almost as many times, and on question 25a option 3 was a clear second favourite.

Individual questions

Question 5

Nearly 80% of students answered this question correctly. The most common error was leaving the answer as 400 000 .

Question 6a

Over 60% of students were correct with this question. A common error was to ‘cancel’ the 3s when dividing, getting the answer 1^5. A fair proportion of students tried to immediately convert both numbers into normal form and divide. While this was feasible it rarely, if ever, was successful in practice.

Question 6b

Over 60% of students were correct with this question. While most students understood that the indices had to be added they often also multiplied the bases, starting off with 32^{10}, which led to no marks.

Question 7

This question was answered much more successfully than other recent questions where written criticisms must be made. Students who didn’t gain marks generally either repeated their criticism (eg ‘the circle for French should be labelled’ and ‘the circle for Art should be labelled’) or made an arithmetic error when discussing the numbers (eg adding them up to 109 rather than 99). Another common mistake was to say that 16 should be 41 which probably came from failing to read the information carefully rather than not understanding Venn diagrams.

Question 8

Just over half of the students completed this question correctly. Many simply took the total amounts for the time periods of £450 and £250 and simplified them. Others took the cumulative totals of £450 and £700 and did likewise. At the most basic level, some used 30 hours and 10 hours and 10 hours and simplified that. On all of these, the last mark could be scored, so only 7% of students failed to score a mark on this question.

Question 9a

Over three quarters of students were correct on this question, with $\frac{3}{5}$ and $\frac{1}{2}$ the most common correct answer. Some students were quite creative with their use of negative which was acceptable.

Question 9b

Just over half of the students answered this question successfully. The most common answers were 0.3 and 0.2 and 0.6 and 0.1. By far the most common incorrect answer was 0.03 and 0.02

Question 10

Most students had struggled to approach this question. It was common for students to try to draw perpendicular lines from the midpoints of *AB* and *BC*, and all sorts of lines and arcs were often superimposed. Few seemed to understand that the angle bisector was required.

Question 11

This question was well answered, with over three quarters of the marks awarded. Very few students used perimeter instead of area, and the most common errors were arithmetical, with 15^2 regularly calculated incorrectly.

Question 12

Both parts were well answered. In part (a), over three quarters of answers were fully correct, with the main error being to give just the numbers on the tree diagram rather than the probabilities. Students were perhaps confused with frequency trees. In part (b), over two thirds of the marks were awarded. There was a follow through for incorrect values on (a), but this was rarely awarded.

Question 13

This question was very well answered, with over 80% of answers fully correct. The most common error was to get $\frac{60}{75}$ when multiplying the right-hand side by 15, multiplying the denominator as well as the numerator.

Question 14

As is usual with inverse proportion questions, this was not answered particularly well. Students who thought about the total number of days' work that was required were usually successful, but many incorrect strategies were used. One was to start by dividing 15 by 8 and another was to think that the answer was three quarters of 15. A fairly large number of students who correctly worked out that 20 students were needed forgot that the question asked how many **more** workers were needed.

Question 17

This question discriminated well, although relatively few students received full marks. The modal method was to read off at 50 (13) and 60 (30) and say 'Yes because 30 is more than twice 13'. This received 1 mark for correct reading of values. Some students thought that 50s were measured from 50 to 59, whereas you are 59 throughout that year. This allowed them to score two marks with correct readings and subtraction.

Question 18

Although it looks intimidating this question is quite accessible, and over half of the marks were awarded. Most students gained at least one mark for expanding the expression on the right, although for many they could go no further. Very few students actually wrote down equations for a, b or c which may have gained them extra marks when their mental arithmetic let them down.

Question 19b

Most students correctly judged that y must be negative, but there was a fairly even split for the three options for x.

Question 20

Over one third of the students sailed through this question with very efficient working. Of the others, a fair proportion multiplied the x across for 1 mark, but few got further than that. Many students started by subtracting the 9 from y which led to zero marks.

Question 21

Students did better on this question than on most previous vector problems, with over half of the marks awarded. Few students wrote down the vectors or paths that they were using in vertex form, and this could have helped to eradicate many errors. This question had the highest number of non-attempts on the paper, indicating, perhaps, that those students were unfamiliar with the topic.

Question 22

This question was answered well, with over two thirds of the marks awarded. While arithmetic errors curtailed the marks of many students, those who scored zero usually tried to convert the given decimals and went wrong when multiplying, for example, the first by 10 and getting 6.8686… rather than 6.888…

Question 23

There was a good response to this question, with over half of the marks awarded. About one third of students who drew the correct lines lost a mark due to using incorrect dashing. Common incorrect lines drawn were $x = 1$, $y = 3$ and $y = x$.

Question 24a

This was well answered, with nearly 80% of students scoring at least one mark (some leaving their answer unsimplified). Those who went wrong often made the common error of subtracting the numerators and denominators to get $\frac{-5}{-3a}$.

Question 24b

This question discriminated well, although over 40% of the students failed to score. Of the three factorisations required, the one that was missed most often was of $y^2 - 3y$. Students who failed to factorise at all often tried to multiply everything out, often leading to lengthy and incorrect algebra. Others immediately cancelled y^2 in the numerator and denominator.

Question 25b

Although most students realised that they needed to work out the area under the graph only about half managed to do it successfully. Many simply multiplied 20 by 50, and those who split it into two triangles and a rectangle often either forgot to halve the length times the height in the triangle formula or got the length of the rectangle part wrong.

Question 26

This was not well answered, with very few students taking a systematic approach. Those who realised that she could win on her first turn by throwing a 3 picked up a mark, and some worked out that there were two ways to win on her second go. There was much random addition and multiplication of probabilities, with often no explanation of what they referred to.

Question 27

Approximately one third of students realised where the curve should be, but over one third of them lost a mark due to inaccurate drawing. Those who scored zero often drew a rotation of the given curve in the bottom left corner or a reflection in the y-axis or a vertical translation of the given curve.

Question 28

Over 70% of the students knew at least one of the trig values, but less than one fifth were able to complete the question successfully. There were many arithmetic errors when multiplying and dividing with surds, and a fair proportion of the students did not square the expression the in brackets.

Further support

Mark ranges and award of grades

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Tel: 0161 957 3852

Email: maths@aqa.org.uk

aqa.org.uk