AQA
Realising potential

GCSE
Mathematics

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

Report on the exam

November 2020

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Summary

Overall performance compared to last year

Due to the extenuating circumstances which made this year's 're-sit' cohort unusual the statistical measures for this component were very different to those of 2019. The mean, median and quartiles were all noticeably higher, indicating that the candidates were trying to improve their results across the range of grade boundaries rather than the usual concentration on grades 4 and 5.

There was no discernible difference in the difficulty of the paper, and although the last question attracted the greatest number of non-attempts it is likely that this was due to the difficulty of the question rather than any time constraints.

Topics where students excelled:

- Converting an improper fraction to a decimal
- Correlation
- Working out the terms of a geometric progression
- Explanation involving a ratio
- Criticising a solution of a quadratic equation
- Adding algebraic fractions
- Evaluating a number to the power zero

Topics where students struggled:

- Evaluating a combination of indices and roots
- Surds
- Difference of two squares
- Equation of a graph after a translation

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Multiple choice questions

Which questions did students find most accessible

Students found question 1 to be the most accessible multiple choice question, which over three quarters choosing the correct option. Questions 2, 4 and 19 were also well answered, with over half of the students correct on each one.

Which questions did students find least accessible

Question 3 proved the most challenging of the first four questions, with nearly two thirds of the students choosing an incorrect option. 1000 and 10 000 were the equally popular incorrect answers. Question 15 was not well answered, with 6 : 1 being the modal answer and attracting more than twice as many answers as the correct answer of 1 : 6

Common misunderstandings

Question 10b

Many students took the third term to be $10p$, possibly failing to consider that p actually means $1p$.

Question 14a

It was common for students to multiply the bases by the coefficient of 18, for example starting their work by writing $36^{10} \times 3 \times 5^{6}$

Question 14b

Students often divided both terms in the numerator by 2. It was also very common to see students trying to evaluate 2^{7} and 11^{3}. Even when they achieved this successfully they were usually unable to work out the correct answer.

Question 23

Students often thought that opposite angles in a cyclic quadrilateral are equal.

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Individual questions

Question 5

This question did not prove to be as accessible as its position in the paper suggested. While over half of the students identified the correct trigonometric function and ratio the majority of those failed to give the correct answer.

Question 6

This was the best-answered question on the paper. Virtually every student picked up at least one mark, and a large majority were fully correct.

Question 7

This question was well answered. After working out that there were 44 guitar players, and that 11 of them also sang, the most common error was to put 11 in the intersection and 44 in G only (instead of 33).

Question 8

There were many fully correct answers to this question, but about a quarter of the students started by dividing 6.5 by 9 instead of multiplying. Inevitably this meant they received no marks.

Question 9a

This question was well answered, with the most common error being to treat this as an arithmetic progression and give the answer –2 and 10.

Question 9b

Most students were able to gain credit on this question with many students commenting on the fact that there were only 28 vehicles represented on the chart or criticising the inconsistent spacing. However, some students gave an ambiguous response about the heights and said that the vertical axis needed to go to 30. Occasionally, students repeated the same criticism.

Question 10

This question was well answered. Students who failed to score any marks usually started by dividing 2400 by 3 and by 5. A fair proportion of students stopped at 900 and 1500, failing to evaluate the monthly payment, and others who worked out 250 also divided 900 by 6, then added to get a final answer of 400.

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Question 11

Most students had the right idea of how to approach this question, but many went wrong arithmetically with either the multiplication of 0.275 by 3 or the movement of the decimal point due to the tenfold increase in the denominator.

Question 12a

Most students gave correct working to show that the radius was 6. Some students who had the right idea lost the mark by incorrect notation, eg $21 \div 7 = 3 \times 2 = 6$, which was not allowed on this AO2 question.

Question 12b

This question proved to be fairly challenging, with some students using the area formula instead of the circumference formula and losing all the marks. Common errors were forgetting to divide the smaller circumference by 4 and forgetting to add the two radii of the quarter circle. Many students lost a mark by confusing the terms which were coefficients of pi with purely numerical terms.

Question 13a

Although approximately a quarter of the students were fully correct a large proportion scored no marks, often concentrating on expanding the given algebraic expression.

Question 13b

This question was well answered, with most students simply saying that 2 should be –2. Unfortunately, some lost the mark by also saying that 7 should be –7.

Question 14a

This question was also very poorly answered. Many students started by multiplying two or more of 18, 2, 3 and 5.

Question 14b

This question was also very poorly answered. Most students adopted a purely numerical approach, which usually went wrong when evaluating 128×1331

Question 16

Nearly three quarters of the students failed to score on this question, indicating that iterative processes is a poorly-understood topic. Those students who did understand that the working required was simple substitution usually found the first answer correctly, but often made an arithmetic error when dividing by –0.5

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Question 17

While many students knew that 3 and 20 were the pivotal numbers in this question, most failed to incorporate them into the correct equation. A common incorrect answer was $h = n + 3$

Question 18

Various approaches were adopted here, and most would have been successful without algebraic errors. Those students who doubled the second equation and then subtracted the two equations made errors due to the x terms being on different sides of the equations. Those who tried to rearrange the second equation almost always arrived at $4x + 2y = -7$ instead of $2y - 4x = -7$, which made further progress impossible.

Question 20a

This question was well answered. The common incorrect answers were 0 and 7.

Question 20b

A fair proportion of students dealt successfully with either the negative part of the index or the fractional part, scoring at least one mark. A significant number, however applied the 'one over' rule of dealing with a negative index to the fractional index itself, starting with $32^{\frac{5}{3}}$, from which no marks could be gained.

Question 21

This question was fairly well answered. The two common errors were to read $3\sqrt{23}$ as $\sqrt[3]{23}$ and to evaluate 2.1^4 as 8.4.

Question 22a

Approximately half of the students knew how to get started with this question, but many of them went wrong due to incorrect substitution and/or incorrect writing of the equation. Several students who had started with $y = kx^3$ omitted the index from their final equation.

Question 23

This question was a good discriminator, with a fair proportion of students on each mark. Over half of the students scored the first two marks, usually by equating the sum of the four angles to 360 and working out the value of x. Many lost the final two marks by substituting that value into the individual expressions, adding them, and showing, due to arithmetic errors, that the sum was not 360.

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Question 25

Approximately one third of the students scored all 4 marks on this question, but of the others few scored any marks. A common error was to follow the pattern in the heights of the bars and draw the required bar with height 5.

Question 26a

This question was well answered by about half of the students. Of the others, a fair proportion made no attempt. A common error was to evaluate $\sqrt{7}\ \sqrt{7}$ as 49.

Question 26b

This question was less well done than part (a), although a similar proportion made no attempt. Those students whose first move was to multiply 10, 80 and 18 often made arithmetic errors, and a common conceptual error was to change $2\sqrt{10}$ to $\sqrt{20}$

Question 27

While a fair proportion of the students scored at least one mark here only those with full understanding of the relationship between the ratios of length and area scored both marks. Many students gave the same answer to both parts, often scoring one mark.

Question 28

Approximately one third of the students scored a mark by identifying the common factor of 4 or giving the expression as the difference of two squares (with coefficients 12 and 2), but few did both for full marks.

Question 29

Few marks were scored on this question, and there was a large number of non-attempts. The few students who started with $(x-4)^3$ often lost one or two marks by making algebraic errors and/or forgetting to add the 6 at the end.

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Mark ranges and award of grades

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