Questions matter

GCSE
Mathematics
8300/3H: Paper 3 (Calculator)

Report on the examination

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Summary

Overall performance compared to last year

The paper was of a similar demand to last year and students were able to attempts nearly all questions consistently. There was no evidence of a shortage of time to answer the paper.

Topics where students excelled

- Reciprocal of a fraction
- Completing and using a time series graph
- Writing a formula
- Best buy comparison
- Factorising a two-term cubic
- Completing a tree diagram
- Rearranging a formula
- Using the sine rule

Topics where students struggled

- Drawing a plan view of a shape
- Understanding remainders
- Using a tree diagram to obtain probabilities
- Proportionality in context
- Drawing a histogram
- Probability without replacement

Individual questions

Question 1

Most students gave the correct answer of 0.3 but some misunderstood the question and only converted the fraction to 3.33 without taking a reciprocal.

Question 2(a)

This question was answered accurately by the majority of students with values plotted correctly on the graph and points joined with ruled straight lines. Some students misread the vertical scale, omitted to join their points or drew freehand lines which were outside the accepted tolerance.

Question 2(b)

An answer within the acceptable range was given by nearly all the students. Misreading the vertical scale was the most likely cause of an incorrect answer.

Question 3(a)

Only a minority of students gained full marks, and most were unable to visualise the plan view of the cylinder. Some circles were drawn that did not take into consideration the scale or were completed poorly freehand. Many front elevations of the cylinder were drawn instead of the plan. Attempting to draw a net was a common misconception.

Question 3(b)

Significantly more fully correct answers were seen for this part of the question. Neat rectangles using the correct scale and in the correct orientation were drawn predominantly. Not adhering to these two criteria were the main reasons for losing marks.

Question 4

Most students gained some marks on this question, but a low number went on to be awarded full marks. Common errors and misconceptions included:

- finding 11.34 and comparing to/subtracting from 12 to give 0.66 left over, with no consideration of the lower bound
- using an incorrect lower bound, for example 11.49
- only using a value greater than 12.

Question 5

The majority of students gave a fully correct answer using correct notation. Full marks were not awarded if a £ sign was included in the final formula.

Question 6

This question was answered very well with a significant majority of responses gaining full marks. Most students used Alternative method 1 and presented their working out clearly and concisely. Separate labelled calculations for each shop with a clear final choice being made were frequently seen. Some students were unable to work out how to calculate the cost of six shirts using the information given for Shop C. A common error for Shop B was finding the 25% reduction for one shirt (£3.10) and then only multiplying that price by six.

Question 7(a)

A disappointing number of students gained no marks on this question especially considering its position on the paper. Common errors included:

- using 15.2 + 1 or 15.2 + 2 at the first step
- finding 60 and not progressing with the addition of two teachers
- calculating 60 × 2 instead of 60 + 2 after scoring the first method mark
- subtracting 2 from the number of students
- writing the final answer as 14.7 recurring.

Question 7(b)

Most students correctly stated that '8 teachers were needed' or 'Lexi should have rounded up'. The most common incorrect answer was 'you cannot have 0.2 of a teacher'.

Question 8

A minority of students gained full marks on this question. Many others were awarded part marks and a surprising proportion did not score. Some students did not use the axes to help them and it was rare for these responses to score. Common errors included:

- x and y lines were reversed on the plot
- x and y values were reversed in the coordinates

A popular incorrect answer was (0, 0), (–2, 0) and (0, 4).

Question 9

This question was answered poorly with relatively few students scoring any marks. It was apparent that many students did not understand how to start the question or the relevance of using multiples of 12. Some students tried to set up equations and solve them. Those who scored one mark often gave positive and negative values, for example 13 and –13.

Question 10

The majority of students gained some marks on this question. Those who scored two marks generally missed out on the accuracy mark owing to a poorly drawn curve. Common errors included:

- values calculated for the table not giving a product of 60 (25, 20 and 15 often given)
- joining the points with straight lines
- curve not passing through a plotted point
- curve going straight down from (1, 60) to beyond (1, 50)
- curve going to the left of Time taken = 1 hour line.

Question 11

A significant number of correct answers were given for this question. Some students gained one mark for partially factorising the expression. Students who did not score a mark generally attempted to factorise into two brackets or merge the two terms into one.

Question 12

This question was generally well answered, with most students scoring at least one mark. Those who used a year-by-year approach often lost accuracy over the eight calculations and then did not gain the accuracy mark. Some good responses were seen using precise and concise methods that were set out clearly. Common errors included:

- using simple interest
- using 0.88 (12% reduction) instead of 0.988
- not giving the final answer to 3 significant figures.

Question 13

Most students attempted this question using Alternative method 1 and gave combinations of notes that summed to at least £30. Relatively few responses gained full marks as incorrect or incomplete lists were common. Progression from a list to a probability was often missing. Some students summed the notes to £85 and then gave a probability where the denominator was 85.

Question 14(a)

The tree diagram was completed correctly by a significant proportion of students. The main error occurred for Section B where the probabilities of 0.78 and 0.22 on the top branch were repeated on the bottom branch. Some incorrect fractions were written on the tree diagram when decimals were not used.

Question 14(b)

It was disappointing how few students achieved full marks on this question and a surprisingly large number scored no marks. One mark was available for multiplying any probability for Section A with any probability for Section B. Some students worked with numbers of people which followed Alternative method 2. Common errors and misconceptions included:

- only working out 40% of 5000 – this would not be worth 4 marks on a calculator paper at this level of demand
- adding probabilities from the Fail branches then × 5000 × 0.4
- missing out the (Fail, Fail) combination completely.

Question 15

Student responses for this question were evenly spread between the marks of 1, 2 and 3 discriminating across the range of ability. Those who scored only one mark generally linked the third equation to the correct answer.

Question 16

This question was answered correctly by a good proportion of students with many others gaining part marks. Common errors included:

- not squaring both sides of the equation as the first step
- just swapping the positions of x and y
- not multiplying each term by 2 and getting $x = 2y^2 - 1$ as the answer

Question 17

The context of the question may have confused some students as considerably fewer than expected scored full marks with more than half of the cohort gaining no marks. Some students interpreted the question as requiring a linear distance-speed-time calculation. Common errors and misconceptions included:

- choosing an incorrect proportionality relationship, for example $d \propto \sqrt{t}$
- subtracting 20 from 300 and then using 280 to evaluate t
- assuming the velocity was 10 ms^{-1} and giving the total time as 30 seconds
- calculating the correct answer then adding on 2 seconds
- using a trial and improvement approach

Question 18

This question was answered poorly, with a small proportion of students gaining full marks and relatively few scoring part marks. Students had either learnt the topic correctly or had not. Common incorrect methods included:

- calculating fx products using the midpoints
- drawing a bar chart, frequency polygon or cumulative frequency graph
- calculating frequency density values using products of values, for example 6 × 5

Some unorthodox vertical scales were chosen by students which made accurate drawing of the histogram difficult, for example a scale of 1 cm for 0.3 frequency density.

Question 19

A significant proportion of students gained full marks on this question. There were many examples of good setting out, correct rearranging of the formula and answers given to an appropriate number of decimal places. Common errors made by students who did not gain full marks included:

- attempting to use right-angled trigonometry
- incorrect substitution of values into the sine rule
- incorrect rearranging of the sine rule after scoring the first method mark.

Question 20

Just under half the cohort gained full marks which was pleasing to see at this stage of the paper. Some students attempted to solve the expression and then substitute values into brackets. A variety of standard methods were used, all of which provided a similar level of success.

Question 21

This question was answered very poorly, and was the worst performing question on this paper. Only a handful of students gained full marks with the significant majority not scoring. However, most students attempted the question rather than leaving it unanswered. There were two main errors that commonly occurred. Firstly, 'without replacement' was overlooked, and secondly, the importance of 'Ashley's first disc is red' was misunderstood or ignored. Consequently, many responses used denominators of 25 and/or included the red discs in any calculation.

Question 22

The majority of students attempted this high demand question, with varying amounts of success. The question discriminated across the range of abilities with more than half of the responses scoring two or more marks. After scoring the first method mark, common errors included:

- calculating 1200 × 17.3 instead of 1200 ÷ 17.3
- being unable to correctly rearrange the formula to $r^3 = ...$
- working out $\sqrt[3]{69.3(...)}$

Question 23

Students scored more highly on this question than expected with just under half the cohort gaining at least one mark. Some students misread the vertical scale and used values in the formula which gave them non-integer answers. Drawing a tangent, or line connecting two points on the graph, then working out a gradient were common errors.

Question 24

This high demand question requiring the solution of a quadratic and a linear equation simultaneously was above the target level for most students in this November cohort. However, some fully correct answers were seen using good algebraic notation, concisely and neatly presented. Alternative method 1 was used in all but a handful of responses. Trial and improvement was attempted by some students, but this rarely led to correct coordinates. Common errors included:

- equating the equations correctly but then making errors in gathering terms onto one side
- completing the square or solving the equation for the curve alone

Further support

Mark ranges and award of grades
Grade boundaries and cumulative percentage grades are available on the results statistics page of our website.

Enhanced Results Analysis (ERA)
Use our exam results analysis tool to create and customise as many different reports for comparison as you like.

Professional development
Attend one of our feedback courses where you can review example responses from students and commentaries from our examiners.