AQA

Questions matter

AS

Mathematics

7356/2 Paper 2

Report on the Examination

7356
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General

This year's paper was more accessible than in 2023 with a rise in the average score. There were excellent responses to all the multiple-choice questions, along with good work seen in Q3, Q5 and Q7(a) in Section A, as well as Q14 and Q15(a) in Section B.

Students found Q6, Q7(b), Q10(b), Q10(c) in Section A, as well as Q15(b), Q15(c), Q16a(ii) and Q16(b) in Section B, more challenging.

As was mentioned in last year's report, it is important for students to look for the links between parts of questions such as in Question 6.

If students make more than one attempt at a solution, they should not cross out work until they know they have a correct method, because all attempts can then be considered by the marker.

Many students recalled the formulae for gradient, mid-point, and distance between two points incorrectly.

Students answered the questions based upon the Large Data Set with more confidence than has often been the case previously.

Section A Pure

Question 1

Over 75% of students obtained the correct answer.

Question 2

Around 95% of students obtained the correct answer.

Question 3

This question was generally well done, with around two-thirds of all students obtaining full marks, with good knowledge of laws of logarithms. Some students thought that $\log_a 72 - \log_a 9 = \dfrac{\log_a 72}{\log_a 9}$, and various other errors were made by students who misapplied laws of logs. Students would often benefit from writing down the laws before applying them in a question.

Question 4

Unsimplified correct answers were given full marks.

In part (a), the majority of students gave the correct answer.

In part (b), there was some confusion with the stretch in the y-direction, with some students writing the incorrect $4y = 8\sin x$.

Part (c) was the most challenging transformation, with various incorrect equations given such as $y = 8\sin 2x$ and $2y = 8\sin x$.

Question 5

Most students seemed very familiar with the idea of a counter example and made good progress in this question. The most commonly seen substitutions were $n = 3$, 6 or 9. For the 'fully justify your answer,' the final mark required a clear statement showing how the non-prime number factorised eg $39 = 3 \times 13$.

Question 6

This question was challenging, although there were accessible marks in part (b)(ii).

In part (a) many students were able to write out the x^2 term but made little further progress.

Part (b) just required $3^6 = 729$ to be stated to verify that $n = 6$.

In part (b)(ii), the results from parts (a) and part (b)(i) could be used. Substituting $n = 6$ into the result from part (a) gave $3^6 \times a^2 \times 6 \times 5 = 87480$ which led to $a^2 = 4$. The question stated that the coefficient of x was negative, so the final answer was $a = -2$, but many students missed this reasoning.

Question 7

In part (a) errors included:

- using the formula for the gradient upside down
- sign errors calculating the gradient
- using an incorrect method to find the mid-point, or not using the mid-point at all.

In part (b) students had to recognise that because the diameter of the circle was along the x-axis, the centre of the circle was the x-intercept of the perpendicular bisector at $(-3, 0)$. The radius was then the distance from $(-3, 0)$ to either point *A* or point *B*. Many students used an incorrect formula to calculate this distance.

Question 8

The first three marks were obtained by over 75% of students. However, the final two marks required careful working and explanation and were much more challenging.

Proving there were no stationary points began from

$$\frac{dy}{dx} = 3x^2 + 15 + \frac{18}{x^2}$$

Some students successfully argued using $x^2 > 0$ that $\frac{dy}{dx} \neq 0$.

Others rearranged $3x^2 + 15 + \frac{18}{x^2} = 0$ to $3x^4 + 15x^2 + 18 = 0$

They could then solve this quartic in x or quadratic in x^2 to conclude there were no real solutions for x, followed by a statement that the curve has no stationary points.

Question 9

In part (a) students had to form a pair of simultaneous linear equations by substituting $(1, 2)$ and $(9, 2)$ into the given equation. If they assumed that $a = 4$ to find $b = 5$, this only scored 1 mark.

In part (b), the required shaded area could be obtained by finding

$$\text{Area of rectangle} - \text{Area under the curve between } x = 1 \text{ and } x = 9$$

The area under the curve was $\frac{32}{3}$ and a significant number of students then stated that the shaded area was $\frac{1}{2} \times \frac{32}{3}$, presumably because this gave the required answer, but this did not gain the mark.

Some students translated the original curve down 2 units to move the shaded area below the axis and evaluated $\int_1^9 (x - 4\sqrt{x} + 3)\,\mathrm{d}x$ to obtain $-\frac{16}{3}$. A final statement that the area was $\left|-\frac{16}{3}\right|$ as it is below the axis completed a neat way of doing this question.

Question 10

In part (a)(i) some students made errors applying the laws of logs, whereas others did not give enough working to justify the 'show that.'

In part (b)(i) only a few students differentiated correctly.

In part(b)(ii), because it was given in the question that when $t = 5$, $F = 9200$ only an appropriate value of k multiplied by 9200 was accepted for the rate of change.

In part (c) substituting the value of $t = 30$ into the formula did give over a billion followers of the singer. However, students then needed to explain that this number was unrealistic with any suitable supporting comment.

Section B Statistics

Question 11

Over 95% of students gave the correct answer.

Question 12

About two-thirds of students gave the correct answer.

Question 13

This question was answered very well. Some students did not round the decimals they obtained for the number of students in each stratum. In part (b) any appropriate reason was accepted as an advantage of using a stratified random sample, eg “unbiased” or “representative”.

Question 14

About half of students obtained full marks, but there was a significant majority who were unable to make any meaningful progress.

In part (a), the mean of X had to be equated to the variance of Y: the formulae for mean and variance are in the formulae booklet, but many students seemed unaware of this.

Part (b) was very well done.

Question 15

Students have become very good at finding unknown probabilities in the probability distribution of a discrete random variable, and almost 90% of students correctly obtained $p = 0.2$.

In part (b), a significant number of students recognised that ‘1 and 2’ and ‘0 and 3’ gave three flowers but did not then consider that these options could occur in the reverse order.

Part (c)(i) was not well done. Two assumptions that were accepted were independence or that the plants must be representative of the population. Comments about the probabilities remaining constant were not accepted, nor were non-statistical comments about growing flowers.

In part (c)(ii), students were given a mark for arguing the assumption of independence either way; for example, the plants may be grown in identical conditions and therefore the number of flowers that grow on each plant may not be independent. However, there could be independence as the plants are chosen randomly from a large batch and are not dependent on each other to produce flowers. Only a small minority of students made an appropriate comment about their assumption.

Question 16

Only 60% of students found the mean correctly and only a third obtained the correct standard deviation, despite the relevant formula being in the formulae booklet.

In part (b) students were more aware of the contents of the Large Data Set. In part (b)(i) students had to state that the claim may be, or is, incorrect with a valid reason, such as not every region of the UK, or not every make of car, is included in the data set. In part (b)(ii) over half of students stated one of the correct emissions, although many students stated petrol, diesel or even fuel.

Question 17

Many students correctly quoted the distribution to be used. A significant number incorrectly found and used $\mathrm{P}(X = 7)$ or $\mathrm{P}(X > 7)$.

Students must make an explicit comparison with the significance level and then should make a comment about H_0 followed by a conclusion of the form "there is insufficient evidence to suggest that the proportion of vegan customers at the café is greater than 8%."

Errors noted included:

- expressing H_0 and H_1 incorrectly, usually by not using p
- rejecting H_0 after the correct comparison $0.102 > 0.05$
- poorly worded conclusion using 'number of' rather than 'proportion of' or not using the context fully.

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the Results Statistics page of the AQA Website.