AQA

AS LEVEL
MATHEMATICS

7356/1 Paper 1
Report on the Examination

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Section A Pure Maths

Question 1

80% of students chose the correct answer. No option was left unchosen.

Question 2

75% of students chose the correct answer. No option was left unchosen.

Question 3

80% of students scored at least one mark by identifying the correct binomial coefficient or forming an appropriate equation using the binomial expansion. When forming their equation, a number of students failed to square a and so obtained only one value, rather than the two requested in the question. Over 40% of students scored all three marks by correctly solving the equation to obtain two correct exact values. Those students who scored two marks either had the wrong binomial coefficient, but still solved their quadratic equation correctly to obtain two exact values, or found only the positive correct value for a.

Question 4

60% used a valid trigonometric identity to start the solution and score the method mark. Three quarters of these then manipulated the equation successfully to obtain a correct squared trigonometric ratio. Only 20% obtained both exact values for $\tan\theta$ with typical errors being decimal answers or not taking the square root to obtain two values.

Although part (a) was more challenging than expected, 50% of students still scored at least one mark in part (b) by correctly finding at least two solutions in the stated interval. Only 20% of students found all four solutions.

Question 5

70% of students correctly wrote $x\sqrt{x}$ as a single power of x before differentiating. Those who did not do this tried to differentiate x and $\sqrt{x}$ separately and combine their derivatives in some way. Almost all who rewrote correctly then differentiated correctly to obtain a valid answer. Any subsequent work to write the answer in terms of $\sqrt{x}$ was ignored.

Part (b) proved far more challenging even with the first mark being awarded for simply rearranging the given equation of the line *L* to isolate the x or y term in order to identify 3 as the gradient for the second mark. 80% of students scored the first mark with half of these then obtaining the second mark. Many students did not connect parts (a) and (b) correctly. A common error at this point was to write $\frac{3}{2}x^{\frac{1}{2}} + k = 3$ and then no further progress was possible because of the inclusion of k. Just under 20% of students scored all five marks.

Question 6

Part (a) linked back to GCSE work on completing the square and almost 90% of students scored at least one mark, most often for the value of a. Around three quarters of students correctly identified two of the constants, with half of them obtaining all three.

Part (b) stood alone because the correct answer could be obtained by using the quadratic equation solver on a calculator, without reference to the completed square form. 70% obtained the correct answer, with some being awarded a follow through mark from their answer to part (a) and others starting afresh. If part (a) was used, then an error was often made with the sign of the y-coordinate.

Part (c) proved most challenging and, even with follow-through marks allowed, only 30% of students identified the transformation needed, although most of these then applied the correct transformation to obtain the new curve.

Question 7

This question was structured to help candidates who find the concept of differentiation from first principles difficult and part (a) started well with over 70% of students scoring both marks. Many chose to work with $(x+h)(x+h)(x+h)(x+h)$ rather than using the binomial expansion, but could obtain full marks for this method.

Only a quarter of students gave a valid expression for the gradient of the line *PQ*, even allowing for following through an incorrect expansion in part (a).

A similar proportion scored at least one mark in part (c), most often for reference to the limit, although sometimes for explaining or showing how to simplify the earlier expression. Only a sixth of students gained both marks.

The responses to this question indicated that some students would benefit from more practice to help them understand the vocabulary and process of differentiation from first principles.

Question 8

Almost three quarters of students gained the first method mark by integrating at least one term correctly, usually the '6'. Almost 60% of students correctly rewrote $\frac{12}{\sqrt{x}}$ and integrated to obtain a fully correct expression, and around half of candidates then substituted limits clearly and showed how to obtain the stated expression. Integration proved challenging for a number of students, who attempted either to differentiate or to substitute the given limits into the integrand.

Part (b) also proved challenging. Just over half of students made the link between area and integration. Some did not link part (a) to part (b) and so restarted. Many set up an equation, but then did not know how to solve it, or if they did spot a disguised quadratic they confused themselves by writing statements such as " let $\sqrt{a} = a$" and then ended with $a = 3$, not realising they needed to square the value. The correct equation in a could be solved using the equation solving feature on a calculator without realising it was a disguised quadratic. Some students' understanding of positive and negative values in relation to areas was not secure and only around an eighth of students completed a fully correct answer.

Question 9

The responses to this question varied widely. Part (a) proved most successful, with over 90% of students drawing a correct curve through the three points with a maximum point at *B*.

In part (b), just over 20% of students drew a correct curve through the three points with a minimum point at B. The difficulty here was in realising that the curve had more than one turning point, so some students just redrew what they had before or ignored the requirement to go through the three points.

Part (c) proved most challenging, with less than 5% of students drawing a curve through the three points which was stationary at B but was not a turning point. It was hoped students would recognise and use a key feature of the graph of $y = x^3$ which is a very familiar example of a curve with a gradient of zero, at $x = 0$, which is not a turning point. Some again redrew previous answers.

Question 10

Part (a) was an unusual question testing an exponential growth model, but students responded well and almost 80% scored at least one mark, usually for identifying who was correct but sometimes for showing how the Kaya had obtained £8000. However, only a quarter of students gained both marks; for two marks to be awarded, explanations needed to be precise.

Part (b) was a standard type of question and, although over 50% scored at least one mark, the manipulation skills of logarithms and exponentials proved challenging for many. Students who solved $12000 = 18000\mathrm{e}^{-k\times 2}$ directly using the equation solver on a calculator to obtain $k = 0.20273$ and then solved $10000 = 18000\mathrm{e}^{-0.20273t}$ in the same way to obtain the final answer were more successful. A third of students achieved full marks.

Question 11

This was the most demanding of the Pure questions, following the trend that coordinate geometry questions are rarely well answered. In part (a) only 60% of students identified either the centre or radius correctly and just a half obtained both marks. Errors varied but it was largely the y-coordinate of 0 that was incorrect with other errors including reversed coordinates, the radius being given as 31 and inaccurate subtraction.

For part (b)(i), just over a quarter of candidates gave a valid reason why the origin was inside the circle with the majority comparing appropriate distances.

In part (b)(ii), only 14% of students made an appropriate start to score the first mark. Very few students scored all four marks.

Section B Mechanics

Question 12

90% of students chose the correct answer. No option was left unchosen.

Question 13

Only 50% of students chose the correct answer, indicating problems using Newton’s second law with vectors. No option was left unchosen.

Question 14

Students were reasonably confident with using the constant acceleration equations and more than half of students chose $s = ut + \frac{1}{2}at^2$ and substituted in $u = 0$, $t = 4$ and $a = g$. Some did not appreciate that $u = 0$. Whilst a numerical value for g should not have been used, this could be recovered in a correct final statement. Using $s = 0.8h$ was the most significant difficulty and only 30% of students scored further marks.

40% of students correctly answered part (b) by stating that h would be lower due to air resistance.

Question 15

Secure understanding of velocity-time graphs continues to be an issue for some, although part (a) showed that students do understand that the gradient gives the acceleration, with 80% gaining this mark.

Part (b) caused more issues; students needed to clearly identify the areas they were using to obtain the required displacement. Many tried to use areas, with many incorrectly using inappropriate triangles and/or trapeziums. Those who used an equation of constant acceleration to find the displacement in the first 4 seconds were often more successful. Almost 60% scored at least one mark for choice of a partially correct method but the success rate fell to around 30% for the second mark and 20% for all three marks. There were many attempts to give the correct value of 62 metres from incorrect methods.

Question 16

There were fewer attempts this year to apply constant acceleration equations to a variable acceleration problem. Some students realised the need for calculus but then integrated in part (a) and differentiated in part (b) to score 0 marks. In part (a) around two thirds of students scored two marks either by differentiating fully correctly or by differentiating at least one term correctly and evaluating their answer correctly. 35% of students correctly obtained an acceleration of -0.08 ms^{-2}, with some omitting units or the negative sign. The correct value of the acceleration could have been found directly on a calculator using the numerical derivative feature, with no working out needed.

In part (b), just over half of students scored at least two marks either by integrating fully correctly or integrating partially correctly and substituting appropriate limits. Around 40% of students progressed further and scored all four marks. Full marks could have been obtained by evaluating the definite integral $\int_0^2 0.9 + 0.16t - 0.06t^2 \, dt$ directly on a calculator, as some students did.

Question 17

This question proved challenging, suggesting that many students need to gain a better understanding of vector concepts. The non-attempt rate was high in part (b) of this question. However, part (a) was done well, with 70% obtaining the correct magnitude of the resultant force.

Only one third of students then obtained a correct vector expression in part (b)(i).

This led to difficulties with part (b)(ii) with less than 10% scoring at least one mark and fewer still obtaining both marks. Understanding of parallel vectors and what that means algebraically was weak. Students needed to realise that they could either form a pair of simultaneous equations or that equivalent ratios could be used to form a linear equation.

Question 18

Although the context of this question should have been familiar, there was an unusual twist here with a model being used where the tension was related to the driving force. It was the non-standard element of this that caused the most difficulty. Around a half of students attempted to use $F = ma$ to form an equation modelling the motion of the car, the van or the whole system, and just over a third obtained a fully correct equation. Errors included wrong signs, mismatched masses with forces and missing terms. Around a quarter of candidates formed two fully correct equations.

The final two marks proved to be challenging, with less than 10% eliminating R, and half of these finding the correct value of k.

Despite their difficulties with part (a), a third of students stated a correct assumption in part (b) that was not already given in the question.

Mark Ranges and Award of Grades

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