Pearson Edexcel

Examiners' Report
Principal Examiner Feedback

October 2020

Pearson Edexcel International A Level
In Pure Mathematics 1 (WMA11)

Paper: 01 Pure Mathematics 1

General

This paper proved to be a good test of candidates' ability on the WMA11 content and it was pleasing to see many candidates demonstrating what they had learned, despite the extraordinary situation that some may be experiencing. Candidates did find some questions challenging, although this did not appear to be due to time. Overall, marks were available to candidates of all abilities and the parts of questions that proved to be the most challenging were 2(b), 5(ii), 6(c), 7(a) and 8(c).

A number of candidates appeared to lack exam technique and an understanding of the terminology 'show that'. Candidates also needed to read questions carefully, so they knew how to present a final answer in the required form. Highlighting key points in a question, checking (if time allows) and re-reading questions to check they had included everything required could be helpful. It was pleasing, however, to see candidates working more confidently in radians such as on question 2.

Report on individual questions

Question 1

This was a generally well answered question with a large number scoring full marks. Usually candidates were able to find correct values for b and c, although some struggled with finding the coefficient of a.

Question 2

This question proved to be challenging for several candidates, which was surprising for an early question on the paper. This was due to misunderstanding the transformation required. Candidates were still, however, able to score highly overall.

In part (a), many candidates achieved the first two marks but lost the final A mark. Many candidates lost this mark because they were unable to find the value of c as they made both numerical and sign errors. There were some very precise, short, and clear solutions from more able candidates. However, long, and often incorrect attempts were common.

In part (b), a significant number of candidates solved $\mathrm{f}(x)=0$ which did not demonstrate any understanding of the translation of the function. Some then subtracted the 7 from the constant term so many found the correct y intercept. Candidates who completed part (a) correctly and used this form of the equation were often more successful at obtaining the correct roots. Some candidates correctly used $-4+12x-2x^2=0$ to find the x intercepts but then divided by 2 or -2 when attempting to find the height of the triangle. A diagram might have helped some candidates. The difference between the two roots, to find the length of the base of the triangle confused some as they thought $3-\sqrt{7}$ was a negative number. The final answer needed to be given as a surd, whereas some had worked in decimals throughout.

Question 3

This proved to be a straightforward question for many candidates with a significant number gaining full marks.

In part (a), most candidates used the correct formula for the area of a sector. Many lost a mark by either failing to show sufficient working to arrive at a given answer, or by using an incorrect variable (usually θ). Occasionally degrees were used, with most using a correct formula.

Part (b)(i) was generally well answered. A small number of candidates used degrees, usually correctly. Those who attempted to add the area of the two obtuse angled triangles to the given area generally made fewer errors than those attempting to add the areas of the isosceles triangle to the segment. Common errors included using $\frac{\pi-1.6}{2}$ for angle *COA* and forgetting to add the given area of the sector to their two triangles. A few candidates incorrectly assumed that the entire shape was a sector of a circle with radius 8 or *AC*.

Part (b)(ii) was generally well attempted with most candidates recalling and using the cosine rule correctly, although a few failed to square root their answer. Some forgot to add the arc *AB* to their two straight sides to correctly find the perimeter.

Question 4

The majority of candidates made a good attempt at this question with many achieving full marks. Most chose to substitute for y in the second equation to obtain a quadratic in x, which was usually correct. A significant number failed to show their full algebraic method to solve the quadratic and consequently lost marks. The factorised form often did not match their stated quadratic equation, e.g., $10x^2+18x-4=0$ became $(5x-1)(x+2)=0$ without the intermediate step $5x^2+9x-2=0$ when the question stated that all stages of working should be shown. Others stated solutions with no working shown. Those who used the quadratic formula were expected to show their coefficients substituted correctly to gain full marks. Most who found values for x substituted to find the corresponding values for y accurately.

Question 5

Candidates found this question particularly challenging, with very few scoring full marks. Whilst the first part was relatively straight standard, it was the part (ii) which seemed to be a discriminator between candidates.

In (i), candidates were usually able to sketch $y = \mathrm{f}(x+2)$ with few problems. Occasionally slips were made when indicating the coordinates of where the curve cuts or touches the coordinates axes, but most scored full marks. Candidates struggled much more with $y = \mathrm{f}(-x)$ and had not realised it was a reflection in the y-axis. Often the local minimum was still in the third quadrant or was on the y-axis, which meant only one mark could be scored.

Part (ii) was rarely answered correctly. Typically, candidates thought that $k = \sqrt{3}$, having assumed that the maximum point of the graph was on the y-axis. It was surprising that few substituted in $x = 0$, $y = \sqrt{3}$ into the equation of the curve and then attempt to deduce k from the resulting equation. Part (b) was much more successful, however, with many being able to find the exact value of p. Sometimes it was in degrees, which was condoned, and many went onto find the value of q.

Question 6

This question proved to be one of the most challenging questions on the paper with few scoring full marks.

In part (a), most candidates correctly applied the method of finding a gradient from two given points successfully. There were some candidates that chose to set up simultaneous equations from $y = mx + c$ with the points A and B, which seemed to result in more errors. Typically, the majority of candidates scored both marks, with only those who did not fully simplify the fraction, found the equation of the line AB, but not identifying the gradient, or those who mixed up their x and y coordinates missing out on both marks.

In part (b), the majority of candidates found the midpoint of AB, used the gradient of a perpendicular line and successfully found the equation of l. However, they rarely gave the equation in the required form, where each coefficient was required to be an integer. It was those candidates who did not use the correct process to find a midpoint, or present their answer in the required form with all integer coefficients, that lost marks. Some just tried to find the equation of the line AB in this part.

The majority of candidates failed to score more than 2 of the 5 marks available in part (c). Most candidates were able to apply Pythagoras' Theorem to obtain the length of AB and this was then used correctly in the formula for the area of triangle to obtain MC. Successful candidates had often produced a sketch of the information presented, whereas a lack of a diagram with the question, was a stumbling block for weaker candidates. A significant number of candidates gave up after finding *MC* or attempted to set up a pair of simultaneous equations but did not proceed to an equation in one variable. There were various attempts at different methods to find the possible points, with the majority using the equation of a circle centered at the midpoint of *AB* with radius 5 and their *l*. The majority of these are to be congratulated on demonstrating accurate algebraic skills. Other candidates who did not score full marks, this was usually because the candidates assumed that *AB* was 12, they applied the Pythagorean triple 3,4,5 from the origin, rather than from the midpoint of *AB* or they applied the Pythagorean strategy, but reversing the +3 and +4

<u>Question 7</u>

This question seemed to result in many scoring well in the later parts, but struggling with part (a).

In part (a), many candidates did not appreciate the graph was of the reciprocal type and consider points of intersection, or alternatively recognise the given curve as a horizontal translation of the negative reciprocal shape. Candidates could have tried to find where the graph had intercepts with the coordinate axes which would have helped them to sketch the reciprocal graph in the correct quadrants, had they appreciated that $x = 2$ and $y = 0$ were the two equations of the asymptotes. A lot of positive reciprocal, cubic and quadratic curves and even straight lines were seen. Trying to plot several points was also common. Some found the correct y intercept, but because they did not have a sketch they were unable to score. Very few candidates labelled both asymptotes and $y = 0$ was often omitted.

Part (b) was answered well by candidates. Candidates were usually able to set the line = curve, multiply by $(2-x)$ and collect all terms on one side of the equation. A good proportion of attempts gained at least the first three marks. The last mark was usually lost for absence of brackets and/or slips. Most quoted $b^2 - 4ac > 0$ before using it and > was usually used before the final line.

Part (c) was generally answered well and for some it was the only part of this question that they attempted. Some candidates demonstrated the outside region on a diagram or a number line correctly but failed to write the correct inequalities. A few used 'and' instead of 'or' and x instead of k losing the final mark.

Question 8

Most candidates found parts (a) and (b) of this question very accessible but many did not make any meaningful attempt in part (c).

In part (a), most candidates were able to expand the brackets and differentiate the resulting expression correctly. There were a few sign slips, but the majority of candidates who lost marks on this proof question did so because of poor notation, missing $y = ...$, $\frac{\mathrm{d}y}{\mathrm{d}x} = ...$ or brackets. A few candidates used the product rule to differentiate y, usually correctly.

Part (b) was mostly well-attempted and answers gaining full marks were common. However, some candidates showed a lack of understanding that $\frac{\mathrm{d}y}{\mathrm{d}x}$ needed to be used for the gradient, with some finding the second derivative. Others used a changed gradient, often attempting the perpendicular.

In part (c), $\frac{\mathrm{d}y}{\mathrm{d}x} = 0$ was occasionally seen, but those candidates who equated the gradient to 20 generally gained full marks, even if they did not discount their other solution of $a = 6$.

Question 9

This was a straightforward question on integration involving fractional indices, however, the vast majority of candidates lost at least 2 of the 6 marks available. Almost all candidates were able to demonstrate their understanding by integrating the $27x^2$ term correctly, although a good number of candidates failed to include the constant of integration or left it as "+c" .For those candidates who did not score full marks, it was usually down to them not being able to correctly simplify the fraction into separate terms using the correct laws of indices.

The most common error seemed to be the incorrect sign for the third term, which was due to the subtracting the fraction. Many candidates struggled to simplify the coefficients of the terms with fractional indices, some stopped since they had forgotten the constant of integration, whilst others did not realise they had sufficient information to proceed to find the value of the constant. A small number even differentiated the expression instead.