Examiner's Report
Principal Examiner Feedback

Summer 2018

Pearson Edexcel International A Level
In Core Mathematics C12 (WMA01/01)

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Students seemed to have been very well prepared for this examination. Many questions were well answered with questions 4, 5, 8, 9, 10, 11 13, 14 and 15 providing most discrimination. Algebraic skills were tested in questions 4 and 11, and this proved to be a major challenge for many. Overall, there seemed to be fewer cases where students had used their calculators to produce answers to questions that required full methods.

Question 1: Mean mark 4.1 out of 5

This was a very straightforward opening question. In part (a) the *y* value, 0.25, was almost always correct. The majority of students also scored full marks for part (b). However, the most common mistakes made were with the value of h (typically 15/6 instead of 3) and with incorrect placement of brackets (specifically where the outer brackets were not included). Allowances were made on the scheme to give partial credit for answers containing either or both of these errors. Answers using separate trapezia were rarely seen and only a small minority were of students were unfamiliar with the trapezium rule.

Question 2: Mean mark 5.1 out of 6

Another fairly straightforward question as long as the students handled the indices and signs correctly. In part (a) most students were able to use Remainder Theorem correctly by setting $f\left(\frac{1}{2}\right)=1$ and arrive at the given equation without mistakes. Those that tried long division were rarely successful as they needed to proceed to a remainder in terms of a and b and equate this to 1. Other unsuccessful attempts were as a result of equating $f\left(\frac{1}{2}\right)=0$ or failing to provide sufficient steps to show development of $a + 4b = 28$. Centres do need to emphasise the significance of the requirement "Show that…" in questions. In part (b) most students started by attempting $f(-1)=17$ but sign errors sometimes led to an incorrect equation and hence incorrect values for a and b. The most common mistakes were on processing $(-1)^3$ or on equating $f(-1)$ to 17 rather than – 17. As before, algebraic long division very rarely met with success.
All in all, this question did not trouble most students.

Question 3: Mean mark 5.1 out of 6

Another straightforward question. For part (a), the overwhelming majority of students found the gradient of l_1 correctly. The most common errors, however, were to divide the wrong way around, or to make a sign slip, for which partial credit was allowed. A significant majority scored full marks in part (b) for the equation of l_2. Students who had made a slip in (a) were able to score two method marks in (b) for using the correct method for gradient of a perpendicular line and also for finding the equation of a straight line. Only a very small minority found the equation of the line *AB* rather than the perpendicular to *AB* as required.
The method of using $y - y_1 = m(x - x_1)$ was commonly seen and very successful, whilst some students preferred the $y = mx + c$ approach.

Question 4: Mean mark 3.8 out of 5

(a) Many students found the use of indices difficult although most realised that the power $\frac{1}{2}$ required the square root of 64 and 25. However many had difficulty with the negative power and failed to multiply the indices to achieve the required answer $\frac{5x^{-3}}{8}$. The most common mistake was leaving the final answer as $\frac{5}{8x^3}$ which was not of the required form.
(b)A larger proportion gained both marks in this section with $64x^4$ being the most common wrong answer. However, a significant number did not appreciate the significance of the brackets, finding $25y^{2/3}$ instead.

Question 5: Mean mark 4.8 out of 7

Most students did well on part (a) of this question on the binomial expansion. Errors were common and sometimes careless, but failure to square or cube the three or a failure to simplify the coefficients were widely seen. Part (b), however, caused more problems with many students demonstrating little understanding of what was required. Students struggled to find a value for x or did not even try. Those who did find $x = 0.1$ often failed to substitute it into their expansion or resorted to their calculators and gave 1.8044 as their answer.

Question 6: Mean mark 5.3 out of 7

Logarithms continue to be a topic that test even the best students but this question was answered well by many students. Most students secured the first mark by applying the power law correctly. The majority of these students then went on to use either the subtraction law or, in a few cases, the addition law. The next step proved to be the most challenging with many students unable to connect the 2 with the base 5. Removing logs was handled well, particularly if the three log rules had been applied correctly. However, a significant number had applied the subtraction law before dealing with the power law and hence lost a number of marks. The solving of a three- term quadratic was tackled well by nearly all students. Nearly all answers were left as a simplified a surd which was the required format with only a small number rejecting a correct answer erroneously.

Question 7: Mean mark 6.7 out of 8

Question 7 required the use of the formulae for Arithmetic Progressions. Nearly all students recognised that this was an AP and not a GP. There were cases where students used a GP formula but these were rare. For part (a) nearly all gave the next three terms correctly with a small number making careless arithmetic slips. A good proportion identified the correct value for the common difference in (b) and quoted the term formula correctly. The most common error was in processing this to achieve the correct answer, as many failed to deal with the -5 in $3 + 99 \times -5$ and many gave 97 as their solution. A few students also lost marks by taking $a = -2$ in conjunction with $n = 100$, instead of using $a = 3$. The sum formula was usually quoted and used correctly in part (c) with some using $S_n = \frac{n}{2}(a + l)$, thus utilising their answer to (b). The most common mistake was again in processing the -5 within the correct formula and giving 5000 as their solution.

Question 8: Mean mark 4.9 out of 7

In part (a), whilst most students were able to identify a, b and c for the quadratic expression, some were unsure of the inequality to be used, starting with $b^2 - 4ac > 0$. With the correct inequality, however, most were usually successful in their subsequent algebraic manipulation, reaching the given result by changing the inequality when they divided by -1 or -4. Most solved the quadratic equation successfully in part (b) to find the correct critical values, but a few lost the accuracy mark because they had used their calculators to obtain decimal answers. Even with the help of a diagram, however, it was common to see students choosing the wrong 'regions' for the solution of the inequality. The final mark was sometimes lost through the use of inappropriate notation.

Question 9: Mean mark 4.6 out of 9

This question on Geometric Progressions proved to be challenging with very few achieving full marks. Part (a) was straightforward with many identifying the common ration as 1.06 and using the Geometric Progression term formula with n = 8. The most common mistakes were either not showing the solution 18.04 before stating that the answer was approximately 18 or failing to conclude with a statement that the answer was approximately 18 as required. In (b) the students who used the correct GP sum formula with 1200 struggled to manipulate this in order to find the value of N. A significant proportion could not rearrange to make 1.06^N the subject.

The majority managed to solve an equation of the form $r^N = k, k > 0$ but very few had the correct answers following poor manipulation or incorrect formulae. Too many started with the term formula. Even more errors were seen when the correct solution of 33.4 was truncated to 33 or left as the required answer rather than concluding that the 34th day was required. Very few students understood what was required for part (c) with most using 33 or 34 in a term formula rather than calculating S_{33} and subtracting from 1200.

Question 10: Mean mark 6.9 out of 10

This question on arc length and area of sector formulae caused students some difficulty. In part (a) a very significant minority of the students confused arc length and chord. Many of these, however, did manage to calculate the chord XZ when answering part (b). Those who answered part (a) correctly usually used the cosine rule, but other appropriate trigonometrical methods were seen. Mistakes with the cosine rule were rare and most students gave the sufficiently accurate answer of 3.63. Many students gained full marks in part (b), although a few lost accuracy by rounding the value of (π – 1.3) to 1.8. Wrong formulae for arc length were occasionally seen, with arcs and sectors sometimes confused. In part (c) the usual method was to add the area of the triangle to that of the sector. Some students managed to find only one of the relevant areas correctly. Sometimes the triangle area formula ½$absinC$ was not known or was incorrectly applied and sometimes the wrong angle (1.3) was used for the sector *ZOY*.

Question 11: Mean mark 5.9 out of 10

This question proved to be difficult for many students. In part (a) the manipulation of algebraic fractions is still clearly a weakness for many students, with the 2 often brought up into the numerator. Most students, however, were able to integrate the $-5x$ term correctly for at least one mark. A surprising number of students failed to find the value of the constant of integration, despite often writing $+c$ in their answer. It was also clear that a significant number of students were getting mixed up with the notation, as a number differentiated rather than integrating in part (a). Most students, however, were well equipped to tackle the demands of part (b) and full marks were quite common. The most common error here was finding the equation of the normal rather than the tangent.

Question 12: Mean mark 6.8 out of 10

This question on Trigonometric Equations was, on the whole, well done with many students able to score highly. (i) Nearly all students rearranged the equation to give sin(x + 65) = $-\frac{2}{5}$ and followed this with either + or $-$ 23.6^0. The majority also proceeded to subtract 65 from their answers and found the two answers 138.6 and 271.4^0 only. The most common mistakes were in not being able to identify the correct two angles for invsin$(-2/5)$ or from a failure to subtract 65^0 from them both. In part (ii) a large number of students correctly replaced $\sin^2\theta$ with 1 - $\cos^2\theta$ and continued to solve the quadratic successfully. However, some did not find all 4 solutions, or left inaccurate answers such as 0.722 instead of 0.723.

Question 13: Mean mark 5.3 out of 10

A small number of students could not attempt this question at all. A further, more significant, number scored only on parts (a), (b) and (c). In part (b), finding the equation of the circle with centre at the origin, sometimes proved challenging. Worryingly, in (b), a few students assumed the equation of a circle might be of the form $y = mx + c$. A common error was to write $x^2 + y^2 = \sqrt{250}$ rather than $x^2 + y^2 = 250$. If students successfully found the equation of the circle they were able to go on to attempt part (d), often successfully. Common problems occurred where their algebraic manipulation did not result in a three- term quadratic equation, in particular for those students who tried to make *y* the subject of the equation of the circle, often simplifying the resulting equation incorrectly. For those that did make good progress through the question, some failed to show the substitution to find the second coordinate and some neglected to write their answers in exact form.

Question 14: Mean mark 9.4 out of 15

This question was generally done well, but relatively few were able to achieve full marks. In part (a) most students were able to expand the brackets and find a correct expression for $f'(x)$ but slips in the expansion cost accuracy marks. Most solved a 3- term quadratic to find the other root but those with the incorrect quadratic rarely spotted their mistake here. The majority continued to find a value for *y* but too many did not give an exact answer as required by the question. Part (b) required the equation of f (*x*+1) but many failed to write their answer as an equation leaving out f (x + 1) =… or *y* = …. even when the expression in *x* was correct. Hence very few students earned this mark. If part (b) was correct, the part (c) usually yielded two straightforward marks. Otherwise, one out of two marks was common here. A similar trait was seen in part (d) for students not gaining the marks in part (a). One out of two was very common for writing (1,0). A disappointing number also failed to gain full marks on part (d). Most drew a positive cubic graph in a different position to the one given. However, many did not have the maximum point in the second quadrant, a minimum point on the *x*-axis and a graph in the correct three quadrants with the majority drawing the maximum point on the *y*-axis. The last mark was for a minimum point at (1,0) and intercept at (-1.5, 0) and was usually well done. This proved to be a discriminating question

Question 15: Mean mark 5.8 out of 10

The last question on the paper was also discriminating with very few fully correct solutions.
There were two approaches to part (a). Students could either find the area under the curve and subtract it from the area of the trapezium or subtract the equations of the curve and straight line and then integrate between -2 and 4. Those that recognised the trapezium and calculated its area and integrated the curve between -2 and 4 were more successful. Students who tried to subtract the pair of equations often made careless errors with signs either before or after integrating.
Part (b) proved to be very difficult with many students unable to identify the required area. Many integrated the curve between 4 and 5 but didn't manage to find the area of the correct trapezium. The most common errors were using the curve to find a vertex of the trapezium rather than the straight line. Others failed to add the area found in (a) or had inexact answers. Hence part (c) was often incorrect following mistakes in (a) and (b).

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