A-LEVEL

Mathematics

MPC2 – Pure Core2

Report on the Examination

6360

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General

Presentation of work was generally good, although for a minority of students there was a lack of brackets in some of their expressions. Students had the opportunity to score marks throughout the paper, with the demanding parts appearing at the ends of the later questions. The vast majority of students seem to have had the time to tackle all that they could.

Teachers may wish to emphasise the following point to their students in preparation for future examinations in this unit:

- When asked to describe a single transformation that maps one graph onto another it is important to relate the equation of the transformed graph directly to the equation of the original graph. So, for example, in Q6(c), $\sin(5x+10)$ should be written as $\sin 5(x+2)$ before comparing with $\sin 5x$.

Question 1

The majority of students scored well on this question which tested trigonometry. The most common error in part (a) was to use the wrong formula $bc \sin A$ for the area of the triangle. In part (b) a small minority of students misquoted the cosine rule, using $\sin 47^\circ$ in place of $\cos 47^\circ$, perhaps forgetting that the general form of the cosine rule is given in the formulae booklet. Some other students did not take the square root and left their final answer as 87.2.

Question 2

Most students integrated the three terms correctly in part (a) and generally showed a good understanding of Pascal's triangle or the binomial expansion in parts (b). The evaluation of the definite integral in part (c) caused more difficulty than expected with a surprisingly large minority of students who either just substituted the limits into their expansion from part (b)(ii) with no integration attempted or just substituted the limits into their answer for part (a) forgetting to include the integration of the term $3x$ in the expansion.

Question 3

A very high proportion of students quoted and used the correct formulae for the sum to infinity and the second term of the geometric series to score all the marks in parts (a) and (b). Part (c) proved to be much more of a challenge. Again many students were able to write down the formula for the 12th term but only a small proportion of these were able to go beyond $54 \times \left(\frac{2^3}{3^2}\right)^{11}$ to show that the term could be written as $\frac{2^{34}}{3^{19}}$. A significant minority just scored the first method mark for an approximate value $14.78\ldots$ for the 12th term.

Question 4

In part (a) most students obtained the correct expression for $\frac{dy}{dx}$ but for other students the incorrect differentiation of $\frac{1}{x^2}$ as $-2x^{-1}$ was the most common error seen. Students who lost marks in part (a) frequently scored all three marks in part (b) as a full follow through mark scheme was applied. A minority of students gave the equation of the tangent to the curve at P instead of the normal but in general, part (b) was well answered. Part (c), as expected, was more of a challenge although some excellent solutions were seen. The most common error was to substitute $-12x$ for y in $y = \frac{1}{x^2} + 4x$ with the other common error being to equate their expression for $\frac{dy}{dx}$ from part (a) to 0 neither of which gained any marks.

Question 5

Although many students scored the method marks for using the correct formulae for the area of the sector and for the arc length in this unstructured question, fully convincing correct solutions were not common. A common error, having reached the correct equation $r^2\theta = 24$ after using the area of the sector formula, was to write $r\theta = \sqrt{24}$. A minority of students multiplied their expression for the perimeter by 4 and equated the result to the arc length instead of applying the relevant given information correctly. Those who did reach the correct equation, $3r\theta = 2r$ seemed reluctant to cancel the r to obtain $\theta = \frac{2}{3}$, presumably because it was the value of r that was required.

Students who performed this step generally went on to find the correct value for r in a convincing manner to score all 6 marks.

Question 6

Most students drew a correctly shaped sine graph in part (a) but a significant number either had stationary points with x-coordinates too far away from 90 or 270 or omitted to show knowledge of $-1 \le \sin x \le 1$. There were many correct answers given for part (b) but the most common error was to state the scale factor of the stretch as 5 instead of $\frac{1}{5}$. In contrast there were relatively few correct answers to part (c) but a large minority did gain partial credit for their common wrong answer 'Translation $\begin{bmatrix} -10 \\ 0 \end{bmatrix}$'.

Question 7

Use of trigonometric identities and solving trigonometric equations remains a challenge for a significant minority of students. In part (a) many students used the correct identity $\cos^2 x + \sin^2 x = 1$ at some point in their solution but incorrect cancellation left a significant proportion of students unable to gain any further credit for using the other identity $\tan^2 x = \frac{\sin^2 x}{\cos^2 x}$. The wording of part (b) invited students to use the result of part (a) by replacing x by 2θ which was not always recognised. Those that correctly started the solution by writing $\tan^2 2\theta = \frac{2}{3}$ frequently either ignored the power 2 or forgot to include the ± when taking the square so lost half the solutions of the equation. Premature approximation also resulted in loss of marks as some students rounded, for example, 50.76 to 51 before dividing by 2 and writing 26 instead of 25 for the value of θ.

Question 8

Some weaker students mixed up the formula for the sum to n terms of an arithmetic series and the formula for the nth term of the series but in general most students scored most of the marks for parts (a) and (b). Part (c) was more difficult and a significant proportion of students scored no more than two marks, for finding the value of the first term and for writing an inequality (or equation) using $a + (n-1)d$ to obtain a value for k. Students were expected to give a justification for their value of k but a significant number of students failed to realise that k had to be an integer. Those more able students who used $k = 31$ usually obtained the correct answer, 1953, for the sum using a variety of valid methods.

Question 9

In part (a) most students wrote down the correct equation $3 \times 12^k = 6$ and those who then divided both sides by 3 before taking logarithms normally obtained the correct value for k. Unfortunately there was a significant minority of students who took logarithms first and proceeded to work with a wrong equation, normally either $\log 6 = \log 3 \times \log 12^k$ or $\log 6 = \log 36^k$. Most students applied the trapezium rule correctly in part (b) with many worked accurately to obtain the correct two significant figure value. Part (c) required some lateral thinking and it was pleasing to see a higher proportion of students than expected applying the translation correctly and then using the point (0, 0) to obtain the correct value for p. In the final part of the question average ability students normally scored the first two marks by forming a correct equation, taking logarithms of both sides and applying a law of logs correctly. The remaining three marks were dependent on students being able to write, for example, $\log_2 12 = \log_2 3 + \log_2 4 = \log_2 3 + 2$. Although excellent fully correct solutions were seen, in general only the more able students managed to score more than two marks in this final part of 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.

Converting Marks into UMS marks

Convert raw marks into Uniform Mark Scale (UMS) marks by using the link below.

UMS conversion calculator www.aqa.org.uk/umsconversion