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Mathematics MPC2

(Specification 6360)

Pure Core 2

Report on the Examination

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General

The combined question-paper answer book was again used to good effect, with candidates' work being generally very well organised. There was less evidence of candidates answering in the wrong working space than had been the case in May 2011 and it was pleasing to see that candidates who did require extra working space after crossing out earlier attempts had received a relevant AQA supplementary answer booklet to complete their solution.
In general, the paper seemed to be answered very well with no obvious indication that candidates were short of time to complete the paper. It was clear that candidates found this paper to be more straightforward than the previous one in May 2011.

Question 1

This question provided most candidates with a very good start to the paper. The two most common errors, made by the very small minority of candidates who failed to score full marks on the question, were to use the wrong formula, $A = r^2\theta$, for the area of the sector or to incorrectly rearrange $21.6 = 18\theta$ to obtain $\theta = \frac{5}{6}$.

Question 2

This question, which tested the use of the trapezium rule, was again a good source of marks for most candidates. In part (a), the two most common mistakes were treating $\frac{2^x}{x+1}$ as $\frac{2x}{x+1}$ or failing to write the final answer to three significant figures, as illustrated by $\frac{193}{30}$. It was rare to find a candidate who could not recall how a better approximation to the value of the integral could be obtained using the trapezium rule.

Question 3

This question on fractional indices caused candidates more problems than expected. In part (a), the two most common wrong answers for $\sqrt[4]{x^3}$ were $x^{\frac{4}{3}}$ and x^{12}. In part (b), a significant number of candidates failed to either split the numerator or multiply both its terms by x raised to the appropriate negative fractional power.

Despite the given form of the answer, $x^p - x^q$, it was not a rarity to see final answers left in the form $1 - x^2 - x^{\frac{3}{4}}$.

Question 4

This question, which examined trigonometry based around the cosine rule etc, was another good source of marks for most candidates. In part (a), many used the given area to convincingly show that the length of AC was 16 metres, and then, in part (b), applied the cosine rule correctly to find the correct value for BC. Some less able candidates attempted to use Pythagoras's Theorem to find BC. In part (c), it was clear that many candidates did not appreciate that the smallest angle was opposite the side with the smallest length. A significant number of solutions consisted of applying the sine rule twice to find both angle B and angle C , even in preference to using the sum of the angles of a triangle to find the size of the remaining angle.

Question 5

In part (a)(i), most candidates recognised that the transformation was a stretch, but the details of the stretch were not as well known. A common error was to state the scale factor as 6 rather than the correct scale factor $\frac{1}{6}$. Part (a)(ii), finding a suitably simplified expression for $g(x)$, proved to be one of the least well answered parts on the paper. The most common wrong approach was to just subtract 3 from the expression inside the bracket and simplify to get $\left(-2+\frac{x}{3}\right)^6$. The expected error, replacing x by $x+3$, was also seen quite regularly. More able candidates, who correctly replaced x by $x-3$, did not always simplify the resulting expression correctly to an acceptable form. In part (b), most candidates successfully applied the binomial theorem as far as finding the binomial coefficients 15 and 20. A significant proportion of these candidates went on to reach the correct answers, though a number of others failed to identify the required coefficients completely or to give $\frac{15}{9}$ in its simplest form. A significant minority could not cope with the additional powers of $\frac{1}{3}$.

Question 6

Part (a) was a good source of marks for most candidates, with the formula for the sum of an arithmetic series being well understood and the necessary stage(s) needed in proving a printed answer being appreciated. Part (b) was also well answered, though a number of candidates wrongly used u_5 as $a+5d$ or, worse still, used the formula for S_5, the sum to five terms. Not all candidates who obtained the two correct linear equations were able to correctly solve them simultaneously.

Part (c), as expected, proved to be the least well answered part of the question, with a number of candidates making no attempt to answer it. Those candidates who failed to replace $\sum_{n=1}^{25} u_n$ by 3500 rarely made any progress. The most common error was to replace $\sum_{n=1}^{25} u_n$ by 325, presumably obtained by applying the irrelevant formula $\sum_{r=1}^{n} r = \frac{1}{2}n(n+1)$, which appears in the formulae booklet.

Question 7

This question, which tested the 'exponentials and logarithms' section of the specification, resulted in a good spread of marks. Although there were many correct sketches of $y=\frac{1}{2^x}$ seen in solutions to part (a), there were almost as many that were sketches similar to that of $y = 2^x$. Another common incorrect sketch was one which was obtained by reflecting $y = 2^x$ in the x-axis.

Part (b) was generally answered well, although some candidates failed to pick up the final mark because they either left their final answer in the form $-x = 0.322$ or did not give the value of x to at least the required degree of accuracy. Of those who were less successful, some displayed poor algebraic skills or believed incorrectly that cross multiplying led to an equation of the form $10^x = 4$.

Part (c) proved to be demanding, with most candidates failing to obtain the correct expression for y in terms of a and b, although the majority of candidates were awarded partial credit for applying log laws correctly. A typical misconception is illustrated by $2\log_a b + 3\log_a y = 5\log_a by$. Those candidates who were the most successful usually applied no more than one log law (or used $\log_a a = 1$) per line of working to reach, for example, $\log_a b^2 y = 1$ and then stated $b^2 y = a$ before completing by rearranging to obtain $y = ab^{-2}$.

Question 8

In part (a), it was clear that many candidates could recall the relevant identity, but rearrangement of $2\sin\theta = 7\cos\theta$ into a correct form for applying the identity caused more difficulty than usual.

In part (b)(i), most candidates scored the method mark, but insufficient care in reaching the acceptable form of the printed answer resulted in the loss of the accuracy mark; for example, answers which involved a mixture of x s and θ s were seen, as well as those which omitted the '= 0'. In part (b)(ii), almost all candidates realised the need for using part (b)(i) and reached the correct quadratic equation. However, poor factorisation or failing to realise that that the roots of the equation after applying the quadratic formula represented the values of $\cos x$, rather than x, led to a significant loss of marks. There were however a substantial number of fully correct solutions which displayed a much better understanding of this type of question than has been the case in similar questions in a number of previous papers.

Question 9

This final question proved to be less demanding than has been the case in many of the past papers for this unit. Even the unstructured final part of the question produced a significant number of fully correct solutions from the candidates. Parts (a) and (b)(i) were found to be very straightforward with most candidates scoring heavily. It is worth recording that a number of candidates in part (b)(ii) failed to give sufficient justification for taking the gradient m to be -8. With the answer given, it was not acceptable to just state that the gradient is -8 without some clear indication that this value came from the value of $\frac{dy}{dx}$ when $x = 8$. In part (c), the most common loss of a mark was through failing to simplify $\frac{3}{\left(\frac{8}{3}\right)}$ correctly. The error of integrating $x^{\frac{5}{3}}$ to get a term in the form $kx^{\frac{7}{3}}$ was penalised more heavily.

In part (d), those who found the area of the triangle by solving the equations of OP and AP simultaneously to find the coordinates of P and then using $A = \frac{1}{2}bh$ were generally much more successful than those who attempted to use integration, as their limits were frequently incorrect: 0 to 8 in both cases rather than 0 to 3.2 for OP and then 3.2 to 8 for AP. It was also surprising to see a significant minority of candidates finding the lengths of OP and AP and the angle OPA and then using $\frac{1}{2}ab\sin C$ to find the area of the triangle; although a valid approach it took much more time and usually led to rounding errors. The method for finding the area under the curve was well understood but errors in part (c) frequently resulted in the area under the curve being greater than the area of the triangle: a clear error which should have been spotted by reference to the diagram.

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the Results statistics page of the AQA Website. UMS conversion calculator www.aqa.org.uk/umsconversion