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Pure Core 2

Report on the Examination

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General

The new form of Question Paper/Answer Booklet continued to be used to good effect with candidates' work being better organised than on some previous occasions. There was sufficient space for almost every candidate to set their work out (even with corrections) apart from Question 5. It would have helped considerably if candidates had avoided writing solutions to a question in the working space provided for a different question. Candidates who filled the working space for Question 5 before answering all parts of the question should have used supplementary sheets to continue their answer. There was no obvious indication that candidates were short of time to complete the paper. In general the paper proved to be more demanding than some recent past papers.

There were a number of questions which asked candidates to show a printed result. A significant number of candidates failed to score the available marks in such questions. A simple statement of the result at the end of their solutions would have given many of these candidates a better chance of scoring the final mark. Teachers may wish to emphasise the following point to their students in preparation for future examinations in this unit:

- When asked to show or prove a printed result candidates should be aware that sufficient working and detail and correct notation must be shown to convince the examiner that the solution is valid. Care should be taken to ensure that the final line of the solution matches the printed result and, if the printed result is then to be used in a later part, it is quoted accurately.

Question 1

This opening question provided a confident start for most candidates with correct answers often seen to both parts.

In part (a) most candidates recognised the relevance of the sine rule and were able to rearrange it correctly. However, giving a convincing conclusion of $\theta\,(\text{or } A) = 64^{\circ}$ to the nearest degree was lacking in a minority of cases, either as a result of inadequate intermediate accuracy being shown, or simply the lack of an appropriate left-hand side of the equation.

In part (b) many candidates calculated the area of the triangle correctly. It was encouraging to see many of those candidates who could not answer part (a) applying good examination technique and making use of the printed result for the size of the angle in their solutions for part (b).

Question 2

There were many correct answers to parts (a) and (b)(i) with the majority of candidates having learnt the correct formulae for the area and arc length of a sector.

In part (b)(ii) most candidates found the correct values for the perimeter and k but a far higher proportion than expected of these candidates did not write a concluding statement linking the two parts and so failed to score the final mark.

Question 3

The majority of candidates answered part (a) successfully using the binomial expansion, Pascal's triangle or expanding brackets. Those candidates who wrote the expansion using the binomial coefficient notation from the formulae book did not always convince the examiner that they knew how to correctly evaluate the combinatorial coefficients.

In part (b)(i) very few candidates scored full marks with a large number of attempts seen where the numerator and denominator were integrated separately. Those candidates who realized the need for negative indices generally scored well. Most candidates picked up the method mark in the final part of the question for dealing with the limits in a correct manner. A few candidates just stated the correct answer for the definite integral without showing any working. Such an approach gained no credit as it did not explicitly indicate the use of 'Hence'.

Question 4

Graphs were drawn correctly by the majority of candidates and the correct vector given for the translation. There are still too many candidates, though, who use alternative words for 'translation' such as "move" or "shift" which are not accepted.

In part (c)(i) the justification of the transformation of the index equation was more of a challenge even to the high grade candidates. A substantial number of candidates simply replaced 4^x with $(2^x)^2$ which gained no credit as it was basically what they had to show. More were successful in showing that $2^{x+2} = 4Y$ by inserting the intermediate stage $= 2^x \times 2^2$. The final part was only done well by better candidates with many misusing the laws of logs at the outset as illustrated by '$\log 4^x - \log 2^{x+2} = \log 5$'. Of those who did solve the printed quadratic equation in Y, equated the values to 2^x and solved for x, where possible, only a minority gave a conclusion for the "show that" that there was "only one real solution".

Question 5

Many candidates did not have enough room to complete this question in the space available, often because of over-elaborating their answer to part (b)(ii).

Part (a) was answered correctly in the majority of cases.

Part (b)(i) was also done well, with only a small number making slips with signs, or square-rooting when they should have squared.
Part (b)(ii) had only 1 mark allocated and a request to "write down" the required equation. Although approximately 25% of the candidates did write down the correct equation, $x = 4$, of the normal at the maximum point, a far more popular but wrong answer was $y = 8$. Many other candidates produced half a page of working to reach an equation of a line which was neither vertical nor horizontal.

It was pleasing to see a much better response in part (c)(i) with many more finding the correct equation of the normal at P, although many failed to reduce it to a form with positive integers a, b and, in particular, c. It was not uncommon to see the final answer left as '$2x + 3y = \frac{99}{4}$', just one step away from the correct answer '$8x + 12y = 99$'. In general, only the more able candidates, who made good use of the given diagram to show that the normal at M was vertical, gained credit for their answers to part (c)(ii) of the question.

Question 6

Part (a) was answered well with most candidates using the trapezium rule with the correct number of strips and values substituted correctly. The most common errors were using degrees instead of radians and incorrect use of brackets.

Most candidates recognised that the required transformation for part (b) was a stretch, but were less sure of the direction and/or scale factor.

In part (c) the most common approach was to attempt to write the given equation in terms of $\tan x$ with varying degrees of success. Although some very good solutions were seen, a common wrong method is illustrated by '$2\tan x = 1$, $2x = 0.785, 3.93,\ldots\ldots\ x = 0.393,\ 1.97,\ \ldots\ldots$' Those who correctly reached either $\sin^2 x = \frac{1}{5}$ or $\cos^2 x = \frac{4}{5}$ rarely scored more than one of the four marks because they forgot to consider both the positive and negative roots of these equations.

Question 7

Most candidates scored two marks out of five for this question on sequences. They were able to form the equation, '$48 = 60p + q$', linking u_1 and u_2 and then used the printed value of p in order to find q. More able candidates wrote down a second equation using the information about the limit of u_n, by replacing both u_{n+1} and u_n by 12 in the given formula, and then solved their simultaneous equations correctly to find the values of p and q. Sadly there are still candidates who consider, incorrectly, this topic to be a test on infinite geometric series.

In part (b), approximately 60% of the candidates scored the mark for finding the value of u_3.

Question 8

Expansion of the brackets was tackled in most cases, but with many sign and numerical slips, particularly failing to square the "3". Most candidates knew they might need to use the identity $\sin^2\theta + \cos^2\theta = 1$, but did not always use it in a constructive fashion. Giving θ a numerical value to find the relevant integer earned no credit in this trigonometrical proof question.

Question 9

A very large percentage of the candidates who attempted this question found the correct value for the sum to infinity in part (a).

In part (b) the majority of candidates got the correct 6th term but a large proportion felt that evaluating using a calculator (rather than changing to powers of 2 and 3) was an appropriate way of showing that $12\left(\frac{3}{8}\right)^5$ and $\frac{3^6}{2^{13}}$ were equal. Only a very small minority of candidates confused the 6th term with the sum to 6 terms.

In part (c)(i), many candidates could state the general formula for the nth term but a significant minority failed to substitute the necessary values. A number of candidates, without proof, used either their answer to part (b) or the given answer in part (c)(ii) to write down their answer in terms of powers of 2 and 3. There were relatively few fully correct solutions to part (c)(ii) though quite a few did pick up some marks.

Starting with their u_n from part (c)(i) a common error was to think that $\log ab$ was $\log a \times \log b$ rather than $\log a + \log b$ or to take the power to the front of it all. This meant that the correct use of a further log law was often the only mark that was gained. Many who correctly applied two laws of logarithms then struggled to write their expression in terms of $\log 2$ and $\log 3$ only. Although rare, there were some excellent solutions seen which differed from the candidates' normal approach.

One such approach, for full marks, is illustrated by '$u_n = 12 \times \left(\frac{3}{8}\right)^{n-1} = 32 \times \frac{3^n}{8^n} = \frac{2^5 \times 3^n}{2^{3n}}$;

$u_n = 3^n \times 2^{5-3n}$;

$log_a u_n = log_a 3^n + log_a 2^{5-3n} = n\, log_a 3 + (5-3n) log_a 2 = n\, log_a 3 - (3n-5) log_a 2$'

Credit was given to those candidates who presented the last two stages of the above solution but, without the first of the three stages at some point in their solution to Question 9, only half marks could be awarded.

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