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Mathematics 6360

MPC2 Pure Core 2

Report on the Examination

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General

Presentation of work was judged to be even better than last year. Most candidates answered the questions in numerical order and completed their solution to a question at a first attempt. The vast majority of candidates appeared to have sufficient time to attempt all the questions in the 90 minutes.

Once again, too many candidates had not been reminded to complete the boxes on the front cover to indicate the numbers of the questions they had answered. Teachers may wish to emphasise the following points to their students in preparation for future examinations in this unit:

- Expressions of the form integer/fraction should be simplified, for example, in Question 1b(i), $\frac{3}{\frac{3}{2}}$ should be simplified to 2.
- Write down formulae before substituting values.
- Read the question carefully. For example, in Question 4(b), 'the sum of the second term and the seventh term is 13' means $u_2 + u_7 = 13$; it does not mean $S_2 + S_7 = 13$.
- Always check that your final answer matches the required form stated in the question. For example, in Question 5(b), the final answer should be given as $x - 2y + 6 = 0$ and not left as $y = \frac{1}{2}x + 3$.
- The notation used for the trapezium rule as printed in the formulae booklet should be understood. The limits give the start and end values. For example, in Question 6(b), the number of ordinates to be used is given as 4 (y_0, y_1, y_2 and y_3) with $y_0 = y(0)$ and $y_3 = y(6)$.
- Where a question uses the word 'Hence' it is the candidate's responsibility to show the examiner sufficient working to indicate that earlier working/results have been used. For example, in Question 7(c)(ii), nothing more than the two correct values 155° and 335° (presumably straight from a calculator) gains no credit.
- The correct terminology should be used when describing geometrical transformations. 'Translation' was required in Question 7(d). 'Tr.' is **not** an acceptable alternative for 'Translation'.

Question 1

Most candidates were able to correctly simplify the given expressions although $x^{\frac{9}{4}}$ was a common wrong answer in part (a)(iii) for the simplification of $\left(x^{\frac{3}{2}}\right)^2$. The majority of candidates displayed a good understanding of integration but a significant proportion of the entry left their answer to part (b)(i) in the form $\frac{3}{\frac{3}{2}}x^{\frac{3}{2}}$. The final mark of three required the answer to be simplified further and the constant of integration present. The majority of candidates showed sufficient working in part (b)(ii) to show that they had used their answer to part (b)(i) and so gained the method mark, but a significant minority failed to evaluate $2\times 9^{\frac{3}{2}}$ correctly.

Question 2

The majority of candidates presented correct solutions to parts (a) and (b) although the value 36 for the common ratio appeared more often than expected. In part (c)(i), although many candidates applied the correct formula for the sum to 12 terms of the geometric sequence, others focused on the form of the printed answer and replaced n in the general formula by k. Most of these candidates failed to gain any marks for this part because they did not use $n = 12$. A very common error was '$-4(1-4^{12}) = -4+16^{12}$' which resulted in the answer '$k = 24$'. Sign errors were also common. In general, only the most able candidates were able to see how to use the earlier parts to answer part (c)(ii) and even some of these failed to evaluate their expression to reach the correct value 67108848.

Question 3

This question proved to be a good source of marks for most candidates. A small minority of candidates failed to gain the marks in parts (a) and (b) because either they showed insufficient detail in their solution or they worked in degrees with some premature approximation at an earlier stage. Others quoted incorrect formulae; in particular $r^2\theta$ was sometimes stated for the area of the sector. The required method for finding the area of the shaded region in part (c)(i) was generally well understood. However, in a minority of cases full marks were not gained due to calculators being set in degree mode.

The final part, using the cosine rule, was usually well answered, although a few could not manipulate the arithmetic correctly, some used degree mode and, perhaps more alarmingly, some candidates thought the cosine rule (as stated in the question) involved the used of sin(1.4). Candidates should be aware that the cosine rule is in the AQA formulae booklet.

Question 4

Those candidates who used the formula $S_n = \frac{1}{2}n\left[2a+(n-1)d\right]$ generally went on to show sufficient detail to reach the printed answer in part (a). Part (b) was answered less well with a significant minority interpreting 'the sum of the second term and the seventh term is 13' as $S_2 + S_7 = 13$ instead of $u_2 + u_7 = 13$. It was also quite common to find candidates correctly finding the equation $2a + 7d = 13$ but then not realising that this equation needed to be solved simultaneously with the given equation in part (a) to find the value of a and the value of d. A few candidates clearly misread 'seventeenth' for 'seventh' in the question but the resulting penalty was not substantial.

Question 5

This question proved to be a good source of marks for many candidates although the expansion in part (b) was quite frequently incorrect with $\left(\frac{2}{x}\right)^2$ being written as $\frac{4}{x}$ or as $\frac{2}{x^2}$. Most candidates displayed good differentiation skills in part (c) and even more realised that the answer to part (d) required evaluation of their answer to part (c) when $x = 2$. Even though the majority of candidates knew how to find the equation of the normal it was very common to find a mark lost in the final part of the question because candidates were unable to rearrange their answer in to the form stated in the question.

Question 6

This question also proved to be a good source of marks for a majority of candidates. Normally part (a) was answered correctly but there were also signs of poor examination technique. Candidates who just wrote down the *y*-coordinate of P as '3' scored no marks but those who wrote '$3(2^0+1)=3$' scored 1 of the 2 marks available. Responses to the trapezium rule question were mixed with many candidates scoring full marks but a greater number of candidates failing to pick up even the method mark. The two main method errors involved either the use of seven ordinates rather than the required four or the use of $x = 0, 1, 2, 3$ only.

In part (c)(i) a significant number of candidates were unable to gain the mark because they wrote 3×2^x as 6^x. Many candidates gained the 2 method marks for using logarithmic rules but a significant minority failed to round 2.5849 correctly to three significant figures. The wrong answer 2.59 was seen more than expected.

Question 7

Candidates usually have difficulty with trigonometry and this session was no exception. Sketching of the graph of $y = \tan x$ was generally not done well and perhaps illustrated the over-reliance on calculators for graphical work. Surprisingly the first branch, between $x = 0^o$ and $x = 90^o$, was missing in a significant number of sketches. In part (b) candidates were expected to be able to just write down the two values by first noting by inspection that $x = 61$ was a solution. Instead many gave the incorrect solutions tan61 and tan241.

Candidates' solutions to show that tan $\theta = -1$ in part (c)(i) were often unconvincing. The examiners were generally looking for a division by $\cos\theta$ before or after a rearrangement.

Part (c)(ii) starts with the word 'Hence' so those candidates who only gave the answers 155^o and 335^o gained no credit. Those candidates who spotted the link and indicated '$\tan(x-20^o) = -1$' generally went on to gain full marks, although some others subtracted (instead of added) 20 from their answers to part (c)(i). A common error was to start by writing '$\sin(x-20)+\cos(x-20) = \sin x - \sin 20 + \cos x - \cos 20$' from which candidates never recovered even after a page of working.

Many candidates gained at least 1 mark for their description of the geometrical transformation in part (d). The final part of the question was answered well by the above average candidates but some left their answer as $f(4x)$ which was not awarded the mark. A substantial number of candidates gave the answer as $4f(x)$.

Question 8

Many candidates correctly used the laws of logarithms to write $\log_a 3(2n-1)$ but then made an error in expanding the brackets either before or after eliminating the logarithms. A surprising number of candidates reached the correct equation '$n = 6n - 3$' but were then unable to solve it correctly. Some candidates rearranged the given equation to have 0 on one side but these candidates often made an error in their subsequent work when trying to eliminate the logarithm. Weaker candidates started by writing '$\log_a n = \log_a 3 + \log_a 2n - \log_a 1$' and so scored no marks for part (a).

Those candidates who attempted part (b)(i) generally obtained the correct expression, although the usual wrong answers such as 3^a or $\log 3a$ were still seen.

In part (b)(ii) a significant number of above average candidates scored the first two marks for '$\log_a(y/8) = 4$', but, surprisingly, some candidates who had answered part (b)(i) correctly could not eliminate the logarithm to find y in terms of a. Those candidates who tried to multiply by x or log x at an earlier stage often got themselves into a mass of incorrect algebraic work.

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the **Results statistics** page of the AQA Website.