CM Question Reports

C1 - Practice Paper A

This report

When writing my papers, I author questions for particular purposes and to help tease out key ideas and skills. This report will examine the reasoning behind the different questions of this paper and, based on the cohort of students that sat this paper, the strengths and weaknesses that were brought out.

This particular paper was sat by 42 students and the distribution of marks, along with my estimated perception of the relative difficulty of the paper[1], gave rise the following grade boundaries:

Grade	A	B	C	D	E	U
Mark	62	55	48	41	35	< 35

Question 1

This was intended to be an easy and familiar start to the paper. It was answered correctly by 34 students and the two most common errors included incorrect expansions of the bracket (forgetting to distribute the negative sign) or omissions of the constant of integration. A few candidates differentiated here and one candidate did a mixture of both!

Question 2

Once again, this question was not included to create many difficulties and, for many, it proved fruitful for them. For this type of question, my advice would be to retain a clear and logical method to prevent candidates from misreading their own handwriting or falling susceptible to arithmetic slips. The average mark on this question (4.3) suggested that it was just as successful as the first question and that candidates are confident when manipulating surds. The most common errors were because of poor arithmetic.

[1] The *relative difficulty* is a comparison between this paper and existing C1 papers, an inspection of the distribution of the marks achieved in those papers and the grade boundaries that were consequently set.

Question 3

Part (a) of this question was well answered in most cases. The shape of a cubic graph seems to be well known, but, in the case of a repeated root, its shape is less well understood. Some candidates ignored the repeated root completely and drew a cubic with three intersections with the coordinate axis. Some candidates forgot to label the coordinates of intersection of the curve onto their sketches, which led to a loss marks that could have been easily achieved otherwise. While on the whole the graph was well drawn, some attempts were quite unclear. Candidates should be reminded that while an artistic level of sketching is not necessary, ambiguous curves and markings are not acceptable.

Part (b) was intended to be a fruitful source of marks - and indeed it proved so. Many candidates understand the link between differentiation and the gradient of a curve and answered this part of the question with great success. Where this question was not done correctly, it was usually due to errors with the substitution of the -1 or incorrect differentiation. There was an interesting attempt to apply the product rule by one candidate, but unfortunately incorrect. If sitting C1, it is usually easier to use basic differentiation methods.

Most of the candidates who scored full marks in part (b) of the question went on the score full marks in part (c) too. Of those who didn't, errors included finding the reciprocal of their (b) (as if to work out the gradient of a normal) or, as seen many times across the paper, sign errors.

Question 4

This disguised quadratic question was answered less well than anticipated. The most common route was a substitution, which was generally performed correctly. However, 38% of those who did perform this substitution did not undo their substitution to find the value of x. When candidates attempted to solve this question without a substitution, many attempts were unsuccessful. Quite a few candidates struggled to factorise the disguised quadratic - perhaps because of its large coefficients - and attempted to use the formula or complete the square. Of those candidates who reached the stage

$$3^x = 81$$

$$3^x = 9$$

a surprising number of candidates tried to use logarithms for $3^x = 81$, which wasn't successful in the cases this was seen in. 21 candidates scored full marks on this question and the mean mark was 3.2.

Question 5

This was a high scoring question amid the majority of candidates. Many correctly evaluated a_3 and a_4 and went on to show the required result. Candidates who incorrectly evaluated a_3 and a_4 did themselves favours when they gave thorough workings that allowed method marks to be confidently ascribed to their workings. Those who succeeded in part (a) usually went on to score full marks in part (b) too, apart from a few who made arithmetic slips. Some candidates seemed too reliant on recurrence relations that link two terms, rather than three, and consequently struggled to make any headway on this question, which was a shame.

Question 6

The purpose of this question was to test differentiating skills in more lateral ways. Many found part (a) fairly simple, although some went to the extent of expanding the double bracket, failing to realise that $x - 2x = -x$. The differentiation and working out for this part was to a good standard.

Part (b) was designed to be tougher and this certainly proved to be the case. Good candidates factorised the numerator and denominator and reduced the given expression to a more familiar form. Others struggled to make any progress. It should be noted that, when given more complex expressions to differentiate in C1, candidates should try to use their mathematical skills to simplify them into more approachable ones. They are certainly not expected to apply the quotient rule - as some courageously attempted to apply here with little success.

Question 7

Many candidates are confident with inequalities, but this question attempted to test their understanding of these in a less familiar context. The context itself had very little relevance and so it was certainly a shame when some of the candidates seemed to be rapt by it and struggled to see past it. On the whole, though, 74% seemed to deal with this unstructured question very well and score full marks. As a note, it should be encouraged that candidates draw a 'sign' diagram or a graph when solving quadratic inequalities - guess work was seen far too often to be counted as mere anomalies. Some candidates managed to solve the two inequalities but then struggled to complete the question, but overall this was certainly a good discriminator.

Question 8

As with all coordinate geometry questions, a diagram is always helpful. Those who did draw a diagram seemed to score higher than those who didn't. This question also had a lot going on, so breaking it down was even more important. Most of the candidates correctly worked out the gradient of l_2 and then went on the work out the equation of the straight line. The main error for most candidates was incorrect arithmetic, particularly when trying to evaluate the distance BC. Where mistakes were made, the presence of ft marks led to many candidates still being able to score well. This question was more concerned about the method involved and so follow through marks were made available. Once again, though, it must be stressed that candidates can often be their own enemies - those who did not draw clear diagrams or had ambiguous/confused workings were just not as credible as those who did.

Question 9

This question was designed to challenge candidates and, like question 7, offer opportunities for more intelligent thinking. Nonetheless, it proved to be one the most highest scoring questions on the paper and many candidates seemed to be very familiar with the concept of the discriminant. Above 85% of the candidates scored the first three marks of the question, suggesting strong algebraic skills and intuition for the need to make y the subject. Most errors were seen during the evaluation of the discriminant, which lead to the loss of both of the accuracy marks since the question had already given the required conclusion. The method of completing the square was less frequently seen, but when it was (in about 4 scripts) it was correctly used. It is to be stressed that in 'show that' questions, candidates **must** show all of their working and ensure that their working is thorough. When important stages are missed, it adds to uncertainty in the examiner's mind about whether the candidate truly is applying the correct maths or just 'skipping steps' because they know the right answer.

Question 10

Question 10 is fairly typical of a C1 exam. The only difference here was the distractor that was the ax^2 in the equation of the curve. The majority of candidates dealt with this well. On the whole, not much issue was seen with this question and the performance showed confidence with this style of question.

Question 11

This question required a bit more mathematical competency than most questions on this topic. Candidates had to be familiar with basic percentages - synoptic from GCSE - to be able to tackle this unstructured question. A lot of careless errors were seen during the substitution of numbers into the formula for the sum of an arithmetic series. Other candidates also quoted and substituted into the sum of an arithmetic formula correctly, but then did not make any progress, struggling to realise how to find out the value of n. However, despite this, there were many full solutions and this proved to a very simple question for candidates with good intuition and understanding of arithmetic series.

Overall Comments

The difficulty of this paper seemed to be typical of that of a standard C1 exam - which was the intention. The inclusion of more unstructured questions, however, did allow for greater discrimination between more and less able candidates and for candidates who had taken the time to understand their content to shine. I think that candidates need to ensure they take with their arithmetic in this exam as it seemed to cost many - otherwise good - candidates far too many marks than it really should have.

crashMATHS
2015-16