CM Question Reports

C2 - 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 54 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	58	51	45	39	33	< 33

Question 1

This question was shown to be relativity straightforward for most candidates. The most frequent method was to draw a 3-4-5 triangle and deduce the desired trigonometric ratios from there. Other candidates attempted to use identities, which proved to be equally successful. This question had a mean mark of 3.4.

[1] The *relative difficulty* is a comparison of the observed difficulty of this paper and existing C2 papers, an inspection of the distribution of the marks achieved in those papers and the grade boundaries that were consequently set.

Question 2

Most candidates also found part (a) of this question fairly routine. Some good workings were seen in use of the binomial theorem and, where the workings were clear and logical, it was rare for them to not gain full credit here. Common mistakes were seen in the coefficients of each term and general arithmetic slips. Some candidates chose to write out Pascal's triangle and it was distressing to see the largely asymmetrical nature of - what they considered to be - Pascal's triangle. Part (b) was a good discriminator. As expected, weaker candidates lost marks by simply factorising out a 2, without considering the significance of the power of eight. In part (c), once again, candidates with clear and logical workings scored fruitfully. It was a shame to see algebraic errors - particularly in this question where the answer was given so that candidates could work towards it.

Question 3

Some candidates made very poor progress in part (a). The fact that a table was not given seemed to cause many issues, with some candidates not being able to identify what values to compute in order to use the trapezium rule. Other candidates, however, showed a strong, intuitive understanding of this approximation, eloquently finding the width of each strip, drawing a table of values and then using the standard formula. Despite this, part (b) was answered well, with most candidates recognising that this would be overestimate and giving a suitable written or diagrammatic explanation. Weaker candidates left this part blank and a significant amount of crossing out suggested that such candidates had succumbed to 'guess work'.

Question 4

All candidates scored one mark in part (a), with 78% of candidates scoring both. The most common (and expected) error was down to signs. Part (b) also seemed to be straightforward for many candidates, but some candidates had errors in the expansion of their brackets which led to some very complex quadratics - in both a literal and mathematical sense! It seemed as though the few marks available for part (c) was a deterrent for some candidates. The use of the cosine rule was most commonly used by candidates, although it may have been quicker if candidates had used a geometric argument instead. Part (c) was often left blank or part-answered and had a mean score of 0.8/2. Candidates who answered part (c) seemed to find part (d) relatively straightforward, making use of the formula $\frac{1}{2}ab\sin\theta$. However, it was still possible to work out the area of the triangle without having answered part (c), which many candidates seemed to miss. Part (e) was similar to part (d) in that candidates did not attempt it because they hadn't attempted part (c). Where correct answers were seen, they were very eloquent indeed! The modal mark for this question was 7 followed closely by full marks.

Question 5

50 of the candidates scored the mark in part (a), with 2 of the candidates who didn't score giving an answer of 1.012, suggesting that they had misread the question. In part (b), almost all candidates scored the first method mark but many did not realise that the power should be 4 (rather than 3) and thus sacrificed the accuracy mark here. Likewise, in part (c), it was common for candidates to write the equation as $34000 \times 0.988^{N-1}$, which only allowed them to access 1 out of the 3 marks. Part (d) (i) entwined this geometric series with an arithmetic series and 72% of candidates scored both marks here. In part (ii), the wrong numbers were often multiplied together or the right numbers were multiplied incorrectly - once again proving surprising considered the facility to use a calculator in this paper. Although many candidates had deduced that it was effective in part (e), some failed to give a justification or a contextual justification. It is yet to be said, however, that many pleasant solutions that scored full marks were seen.

Question 6

This question was one of the best scoring questions on the paper, with many candidates demonstrating their thorough knowledge of logarithms. The toughest aspect of this question seemed to be the change of base involved. Most candidates used the formula in the formula booklet to change the base of one of the logarithmic terms, although better candidates used their intuition instead. The mean mark here was 5.6/7.

Question 7

All candidates who sat this paper scored both marks on part (a). However, it is very disappointing to see that only 38% of candidates could correctly show that their derivative was > 0 for all x. It is C1 knowledge that completing the square gives you the minimum (or maximum) point of a quadratic curve, yet only a few candidates made us of this. Frivolous attempts to use the discriminant were often seen. Part (c), on the other hand, was done well amid the cohort. Candidates were aware that if there are no stationary points on the curve, then their derivative $\neq 0$ and then used the discriminant to show this. Other candidates (mainly those who were successful in (b)) used completing the square to show that the equation had no solutions. In part (d), candidates were expected to use what they had learnt about the function in the earlier parts to sketch the curve. When attempted, this was usually correct and, due to the scale, a straight line was also expected.

Question 8

Question 8 seemed to be quite a successful ending to the paper for many candidates. It tested whether or not candidates could deal with a significant level of trigonometric manipulation, relative to the expectation for C2, and most candidates seemed to deal with it well. The first part was done very well with most candidates using the two identities they knew to arrive at the final result. Some candidates started with the RHS, which proved to be a lot tougher (and unsuccesful!). Part (b) looked complex, but, when broken down, could be reduced to a standard trigonometric equation to be solved. Errors were seen in manipulation and, quite commonly, ignorance to the $2x$ that was involved.

Overall Comments

On the whole, this paper definitely proved to discriminate well between stronger and weaker candidates. Almost 60% of candidates scored a mark in the range 45-55/75. This paper did show that many candidates could express their ideas very eloquently and were able to appreciate a context and use their knowledge to ‘break down’ unfamiliar question types. This paper also showed, however, that candidates are not as confident in tackling unstructured questions (such as Question 3) as they are in more structured questions, suggesting an underlying weakness in their mathematical understandings. More practice on such questions should be encouraged. Yet it goes without saying that the most fundamental piece of advice is that this exam allows the use of a calculator - use it.

crashMATHS
2015-16