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Examiners' Report/ Principal Examiner Feedback

Summer 2015

Pearson Edexcel International GCSE
Mathematics B (4MB0)
Paper 02R

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General Points

Some parts of questions proved to be a challenge to a number of candidates and centres would be well advised to focus some time on these areas when preparing candidates for a future examination.

In particular, to enhance performance, centres should focus their candidate's attention on the following topics, ensuring that they read examination questions very carefully.

- Simplifying algebraic expressions which involve quadratic expressions will always factorise. (Question 2)

- Correctly identifying the number of elements in the subsets of a Venn diagram. (Question 4)

- Conversion of a time, in minutes, to a time in hours. (Question 6)

- Determining a conditional probability from a tree diagram. (Question 7)

- Correctly interpreting a given ratio when evaluating vectors. (Question 10 (a))

In general, candidates should be encouraged to identify the number of marks available for each part of a question and allocate a proportionate amount of time to each part of the question.

Candidates should also be reminded that if they are continuing a question on a page which does not relate to the question that they are answering, they must say "Continuing on page..."

It should be pointed out that the methods identified within this report and on the mark scheme may not be the only legitimate methods for correctly solving the questions. Alternative methods, whilst not explicitly identified, earn the equivalent marks. Some candidates use methods which are beyond the scope of the syllabus and, where used correctly, the corresponding marks are given.

Details of Marking Scheme and Examples of, and Report on, Candidates' Responses

Question 1

Despite the vast majority scoring well on this matrix question, a significant minority (8%) did not know how to multiply together two matrices with, in many cases, the matrix **A** being added to the matrix **B**. Some good work was spoiled by poor multiplication and poor equation solving. In particular, $3p-6=-12$ which earned method, was reduced on a significant minority of scripts to $p=-3$.

Question 2

A significant minority of candidates either did not know how to begin with this question or simply got no further than turning the second fraction upside down and multiplying. Such candidates then multiplied out the numerator to get a quartic and then proceeded no further. The overwhelming successful students however did realise that they needed to factorise the numerators and did so successfully. Nearly 75% of candidates achieved full marks on this question.

Question 3
Part (a) asked the candidate to give the internal volume in cm^3. However, this was misinterpreted by a significant minority of candidates as 1.5 m^3 was often seen. This was often recovered in part (b) and many correct answers of 2 hours were seen. Candidates who simply divided an answer of 1.5 to part (a) by 12500 and then by 60, whilst earning method, should have realised that a time of 0.000002 hours was an 'impossible' time and that something was wrong with their calculations. Just over 60% of candidates did score full marks on this question.

Question 4
Whilst just under 60% of candidates achieved full marks on this question, of those that didn't, many placed 27 in $A \cup B'$. This was often followed by a correct value of 16 in $A \cup B$ and an incorrect value of 10 in $B \cup A'$. The value 7, representing $(A \cup B)'$ was often seen but, curiously, so was the value 60 seen. Whatever values were seen on the candidates' diagrams, many recovered in part (b) as the mark available was a follow through mark. Only 3% of candidates scored no marks at all for this question.

Question 5
One third of candidates got no further than part (a) and, as often happens when there is a negative index, this was poorly differentiated. A significant number of incorrect answers seen were either $1-\frac{4}{x^2}$ or $\frac{4}{x^2}$. Of those who couldn't differentiate correctly, it seemed they still knew the result had to be set equal to 17 thus earning method. A minority of candidates substituted 17 into their answer and consequently earned no marks at all for part (b). Of those candidates who did progress well in this question, 20% did not answer the question as set as they gave a second set of coordinates where $x < 0$. These candidates lost the final mark. Overall, just over 35% of candidates achieved full marks on this question.

Question 6
This question really tested the candidates, abilities in a number of ways as each part of the question challenged a significant number of candidates. In part (a), the candidate was expected to draw, on their grid, the three straight lines representing the journey of the first motorist. The first challenge was to work out the time taken (45 minutes) for the first part of the journey and a number of errors were seen here. Despite errors on this first mark, many were able to pick up the remaining two marks as they were follow through marks. Finishing the first motorist's journey at Nevers at 11:45 am did, however, prove problematic for some candidates. Whilst there were a significant number of correct answers in part (b), a significant minority of candidates did not convert their 96 minutes for the journey time correctly to hours (1.36 hours was often seen) and 82.4 km/h proved a popular, but erroneous answer.
In part (c), many candidates drew the second journey in the wrong direction – starting at Beaune rather than Nevers. As long as the journey started at 9:30 am and lasted two hours, it was possible to pick up at least one mark here. The final two marks in part (d) were follow through marks and despite some incorrect graphs, many marks were awarded here for correctly interpreting values from their intersection. A value of zero (obtained from the second journey being in the wrong direction) for the distance from Autumn did not earn the final mark. Just over a quarter of candidates earned full marks on this question.

Question 7

About 10% of candidates did not complete the probability tree diagram correctly. Many of these candidates treated the question as 'with replacement' and, as a consequence, were unlikely to pick up more than method marks for the remainder of the question. Part (b)(i) was generally done well with many correct answers seen. However, part (ii) saw a significant number of candidates giving only two of the three required probabilities and $\frac{28}{55}$ proved to be a popular, but erroneous, answer. Part (c) was set as a discriminator for the more able candidates and it was pleasing to see that nearly 20% of candidates showed correct method leading to the correct conclusion. As many who got this part of the question correct, just as many gave false arguments, often arriving at a probability close to 0.3 which was then conveniently rounded to the required answer of 0.3.

Question 8

Despite this type of question being quite common in recent years, there were still a significant number of candidates who could not give the correct expressions for the required average times to mark one Question **A** and one Question **B**. As a consequence, $\frac{x}{60}$ and $\frac{x+27}{60}$ were common, but erroneous, answers for part (a) and for part (b). Despite this, there were many correct answers for these two parts of the question. Part (c) proved to be a challenge for some candidates in that the value '2' was added to the wrong side of the equation meaning that, despite the follow through mark, this mark was lost by these candidates. Part (d) enabled candidates to get back on track as the required quadratic was given to them. However, candidates could only achieve all three from a correct answer to part (c). Many candidates found the correct answer of $x = 45$ with little or no working seen – suggesting that the work was done by calculator. This, in itself, was not a problem for candidates as full marks were given but, for future reference, candidates may be asked to show all their working with such problems and would gain no marks where no work is shown at all. Despite this value found in part (e), part (f) proved to be quite a challenge for many candidates as they did not seem to know what the *x* they had found actually represented. As a consequence, $\frac{60}{("45"-27)}$ was commonly seen as a response to this part of the question. Just under 44% of candidates achieved full marks on this question.

Question 9

Candidates taking this paper are usually well-drilled with non-right angled triangle geometry and this question proved to be no exception with the vast majority (86%) scoring half marks or more. Parts (a) and (b) generated a multitude of correct solutions with only the occasional error seen. In part (c) the vast majority knew they had to use the area formula $\frac{1}{2}abSin\ C$ and they could also find one of the other angles correctly, earning two marks in the process. However many mistakes were made in finding the other side that was required for the formula with quite a few candidates using methods erroneously based on using the properties of a right angled triangle. As a consequence up to four marks were lost here and only 43% of candidates scored full marks.

Question 10

This question proved to be quite a discriminator with a spread of candidates across all marks. Just over 6% did not score at all on this question but the vast majority were able to score some marks on part (a). The only issue seemed to be incorrect interpretations of the given ratios with $\frac{1}{4}\mathbf{a}$ and $\frac{3}{7}\mathbf{b}$ proving to be popular, but erroneous, answers to the first two parts of the question. Given what was asked to be shown in part (c), such candidates should have realised their mistakes and rectified them. Once part (d) had been found, many candidates were able to find the values of the two parameters by comparing components of vectors. The significant number of candidates who were successful with this bears testimony to centres drilling their candidates well in the process of comparing the components of equal vectors. Part (f) proved to be the discriminator as many candidates did not seem to link the properties of a cyclic quadrilateral to the given length of $|\mathbf{a}|$. Those that had the ratios incorrect in part (a) had difficulty in achieving an y marks here and a number of candidates struggled to understand the notation that $|\mathbf{b}|$ = y so gave answers that set $|\mathbf{b}|$ equal to numbers rather than using *y*. Overall, a quarter of candidates achieved full marks on this question.

Question 11

Whilst only 22% of candidates obtained full marks on this question, all but a very few candidates scored some marks. Part (a) was done well with many correct answers seen. Part (b) however proved to be a challenge as a significant number of candidates although realising that the perimeter was 3*x* + 4*x* + the hypotenuse, made a fundamental error in determining the hypotenuse as $\sqrt{3x^2+4x^2}$ and $\sqrt{7}x$ was a popular, but erroneous answer for the hypotenuse. As a consequence of this error, only method marks were available for parts (c) and (d). The majority of candidates picked up marks for their table and graph with many good curves seen. In part (g), most candidates used their graph at 120 and got two values of *x* from the intersection but many did not know what to do with these values in order to actually answer the question.

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