Examiners' Report

Principal Examiner Feedback

Summer 2022

Pearson Edexcel International GCSE

In Mathematics B (4MB1)

Paper 01

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Introduction

In general, this paper was well answered by the majority of students. Some parts of the paper did prove to be quite challenging to some students, such as the 'show that' algebra of question 18, the modulus of question 20, the possibility of a larger and smaller triangle *ABC* in question 24 and the more challenging questions 25, 26 and 27.

In particular, to enhance performance, centres should focus their student's attention on the following areas:

- Showing clear working, particularly when it is requested in the question eg question 14, question 18 and question 25
- Students should work in the appropriate working space eg for question 25 part (a) should be in the working space for (a) and part (b) in the appropriate space for this part.
- Annotate diagrams as these are often marked eg question 23
- Make sure they have appropriate equipment for a Mathematics examination eg for question 8 and question 21

In general, students 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. In addition, students should also be advised to read the demands of the question very carefully before attempting to answer. 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 students use methods which are beyond the scope of the syllabus and, where used correctly, the corresponding marks are given.

Report on Individual Questions

Question 1

A straightforward question with many candidates scoring both marks. Curiously, there was a minority who only managed to score one mark.

Question 2

Despite many correct answers, the common incorrect methods were either $\frac{12.5\times 22}{3}(=91.7)$ or $\frac{12.5\times 3}{22}(=1.70)$

Question 3

At least the vast majority shaded out two squares only. Slightly more than 50% scored full marks.

Question 4

The majority of errors here were in either incorrect signs (+/-) or an incorrect power of t in the final statement. Generally done well (as we might expect from a cohort with a tradition of good algebraic technique.) some errors occurred when students continued to simplify after they found 'u'.

Question 5

Much correct work seen in candidates producing the improper fractions. If the final mark was not picked up it was down to the fractional part of the answer not being simplified or the student leaving their answer as an improper fraction when the question is asked for 'a simplified mixed number'.

Question 6

Many candidates showed good algebraic manipulation and many full marks were seen here. Failure to achieve this score however still resulted in many candidates scoring one mark as a consequence of only one error or an incomplete factorisation.

Question 7

The two major reasons why candidates did not score full marks here was for either a premature approximation ($\frac{6.4}{0.67}=9.55$) or using minutes, rather than hours as the denominator ($\frac{6.4}{40}=0.16$)

Question 8

Candidates need to be reminded that certain mathematical equipment could be required for this paper. Clearly, for some candidates, they had no access to a protractor and, consequently, could only write down $\frac{\theta}{360}\times 150$ for no marks. Some candidates worked out the fractions $\left(\frac{360}{150}=2.4 \text{ or } \frac{360}{5}=72\right)$ but went no further. Again, for no marks. There were the obvious misreads (red instead of the blue sector for 23°). Not rounding the final answer to a whole number was another common error. Despite these problems, this question was done well by a significant number of candidates.

Question 9

The most common error seemed to be in multiplying out the left hand side of the equation resulting in an incorrect $2x+7$. The ft mark allowed these candidates to pick up the next mark for rearranging their equation. Overall, a well answered question by the majority.

Question 10

It was pleasing to see that there were very few scripts where elements were repeated. However, one could not help feeling that a significant number of candidates were simply guessing where to put the values. As a consequence, the scores for this question covered the range with no clear modal value. (Certainly, a score of 4 did not predominate).

Question 11

The most popular approach by candidates seemed to be setting up an equation in terms of the colour red $(r+2r+3r+0.25=1)$. Interestingly, it was seen that $6r$ was incorrectly replaced by $5r$ on some scripts. Some premature approximations in candidate's calculations meant that not as many as one would have liked achieved full marks with a value of 0.498 often seen. It was clear on some scripts that candidates did not always understand the principles of probability as final answers were sometimes given which were greater than one.

Question 12

Despite the opportunity to re-write the given list in order, very few candidates did so. Indeed, the most popular, but erroneous, answer simply followed where the candidate found the mean of the middle two items of the given list resulting in a final answer of 1.705×10^{14}.Of all the questions on this paper, this probably produced the most diverse, but incorrect methods: identifying the sum of the correct pair of terms but not dividing by 2; summing all four terms and either dividing by 2 or by 4; determining the index power as 182 (13 × 14); or what was perceived to be the 'best' incorrect answer of all (which earned two of the three marks): $\frac{3.2\times 10^{14}+1.1\times 10^{15}}{2}=2.15\times 10^{29}$. As a consequence, the correct answer was only seen on a minority of scripts.

Question 13

Usually well answered with a correct result of $x/2$ often seen. Some candidates then went on to substitute $x = -4$ for their 'final' answer of -2. Unusually for an algebra question, this extra working was ignored and such candidates scored full marks. Despite many correct answers the most popular incorrect method seemed to be cancelling down terms in the numerator and denominator rather than factorising. Such candidates earned no marks.

Question 14

Many candidates correctly identified two pairs of equal angles with the correct reasoning of 'alternate angles'. The final mark proved to be more elusive however as a significant number of candidates focused on angles in a triangle and angles on a straight line rather than the commonality of angle *ACB*.

Question 15

Part (a) seemed to be better answered than part (b). However, many candidates did not use an understanding of powers effectively and some even went as far as to determining the integer value of each number and then trying to factorise. Many arithmetical errors were seen as a consequence and the required answer was not often seen by these candidates. A curiously observed answer on a few scripts was 2644 which was a result of $3^5 + 7^4$. Part (b) was often ruined by candidates giving a choice and then not choosing or choosing the wrong value. Again, not understanding that for a square root, all index powers needed to be even. Unfortunately for some candidates, *B* came before *C* and the calculator value of the square root of *B* showed a whole number. The power of 7 being odd should have set 'alarm bells' but this was ignored by a significant number of candidates as their response to the demand of the question resulted in the square root of *B*.

Question 16

Whether it was addition or multiplication of matrices, most candidates knew what to do and showed their working. Indeed, there would have been much more correct answers if it had not been for arithmetical mistakes made by a significant number of candidates. Part (a) tended to be correct, part (b) invariably meant that candidates scored at least one of the two marks available.

Question 17

Probably around 40% of students gained fully correct answers here. A significant number of candidates did not know how to tackle this question and of those that did, determining the value of r proved problematic. Of those who did get a correct value of r, many did not seem to understand the concept of 'perimeter' and often correctly worked out the arc length but did not add on two radii for the required answer.

Question 18

A really challenging question with less than 15% getting it completely correct. Of those that did score 1 mark, this was achieved invariably by a correct representation of $p - 1$. Rationalising $\frac{1}{p}$ proved too much for many candidates and, as a consequence, led to the small number who achieved full marks.

Question 19

Interestingly, as many candidates seemed to score one mark as scored full marks. These amount to about 40% each. The candidates who achieved only one mark did not seem to understand how to determine the scale factor and then the requirement to square up for the required area. A frequently seen incorrect answer was 931.7 which was the result of $\frac{1000}{1331} = \frac{700}{x}$.

Question 20

The majority of candidates did not know what to do with this question and either left it blank or made wrong assumptions as to what was meant by the modulus of the vector **a**. Common errors seen were $(x-2)\times\sqrt{2x} = \sqrt{5}$ and $\sqrt{(x-2)^2 - (\sqrt{2x})^2} = \sqrt{5}$. Of those who did have a correct first line, some incorrectly determined that $\left(\sqrt{2x}\right)^2 = 4x^2$. Giving both answers or just simply giving the decimal values meant the last mark was lost. Overall, not a well answered question.

Question 21

Whilst there was evidence of incorrect angle bisectors constructed and drawn, the major reason for zero marks on these scripts was as a direct result of a lack of a pair of compasses. Indeed, at least one candidate resorted to hand drawing (unsuccessfully) arcs on their diagram. With a pair of compasses, candidates had a chance (and about 10% scored full marks.)

Question 22

About 10% of candidates scored full marks on this question and whilst there were many correct answers to part (a) there were still a significant number of candidates who could not work out the correct gradient of the line. Some candidates spoilt their solution by putting L = …in their solution. Even with no offering of an answer in part (a) a few candidates seemed to be able to pick up two marks for $y \geq 2$ and $y \leq x$.

Question 23

It seems that a significant number of candidates do not know the intersecting chords equation and the most that was achieved by many candidates was one mark was for CE = 12 cm. BE was harder as quite a few were stuck at this stage. Those who reached the correct answer were able to spot 7.5^2-4.5^2=BE^2. Most students who found BE used the addition of areas of different triangles to find the final answer. A minority used the formula for a kite area in their solutions.

Question 24

It seems that a significant number of candidates simply recalled the formula for the area of a non-right angled triangle, substituted the values given in the question and arrived at the erroneous answer of 19.5 cm^2. As a consequence, such candidates earned no marks. What the vast majority of candidates did not realise is that from the data given, two triangles can be constructed. Most who did successfully determine an area found the larger area (38.7 cm^2) and as a result achieved only 4 out of a possible 6 marks. Quite a discriminator as very view achieved full marks here.

Question 25

A significant number of candidates wrote down the required answer (2/30 for part (a). But for many, this is as far as they got. Combining events in probability questions is never easy but with the added issue of algebraic terms, this caused many to either answer part (b) poorly or not at all. Many issues had to be overcome not the least being interpreting the question as a 'with replacement' problem and terms such as $\frac{n}{25} \times \frac{25-n}{25}$ proved to be popular, but erroneous, expressions. Where the candidate did approach the question from a 'without replacement' strategy, many scripts showed only one term equating to 1/3. Interpreting *the probability one orange sweet and one yellow sweet is 1/3,* seemed to channel a significant number of candidates into writing down $\frac{n}{25} \times \frac{25-n}{24} = \frac{1}{3}$ and ignoring the fact that there are two ways of drawing out this colour combination of sweets. If any marks were obtained in this part of the question they were invariably for one correct compound probability statement and the subsequent method mark for solving their quadratic equation. Indeed, full marks was a rare event and was probably only seen on about 10% of scripts.

Question 26

Part (a) was done reasonably well (although for many candidates, this part of the question was their only success). Some tried, unsuccessfully, at using the remainder theorem and some lost one mark because of their erroneous arithmetic. The clue in part (b) was the beginning of the demand: 'Express $\frac{f(x)}{2x+1}$ in the form…' and many wrote down the cubic divided by $2x + 1$ and then proceeded to cancel down (incorrectly) or simply did not proceed any further. For those who did use the remainder theorem correctly, many scored full marks in this question by arriving at the expression $(x+2)^2 - 13$. A correct answer in part (b) led many to the required answers in part (c) although some candidates missed giving the value of $x = -1/2$.

Question 27

The last question on the paper presents its own problems not least in running out of time and there were a significant number of no responses. For those that did attempt the question, many incorrect starts were made to part (a) with either trying to factorise *s* or simply dividing *s* by *t* proved to be popular. At least one candidate managed to differentiate s correctly and then, rather than equating to zero, did a form of integration and the following was observed: $\left[3(9)^2 - 36(9) + 81\right] - \left[3(0)^2 - 36(0) + 81\right] = -81$. Some other candidates determined the correct quadratic for the velocity but rather than equating to zero, decided that their quadratic had to be < 9. Despite all of these 'problems', there were a significant number of correct answers of $t = 3$ (although the last mark was lost if $t = 9$ was included.)

Many candidates seemed to believe that using an answer arrived at in one part of the question should be used in subsequent parts. As a consequence, many scripts showed (incorrectly) $s(3)$ (=108), $s(3)/3$ (= 36) and even $v(3)$ (=0) Indeed, some candidates worked out an expression for the acceleration $(6t - 36)$ correctly and still substituted t = 3. The final sting in the tail for the candidate expecting to achieve full marks was the negative speed which needed to be given as a positive answer.

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