Examiners' Report

Principal Examiner Feedback

January 2021

Pearson Edexcel International GCSE

In Mathematics B (4MB1)

Paper 01

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International GCSE Mathematics – 4MB1

Principal Examiner Feedback – 4MB1 01

Introduction

While examiners did report many excellent responses to questions, some candidates did seem under-prepared for this paper with examiners reporting many blank responses to the later questions on the paper.

To enhance performance in future series, centres should focus their candidates' attention on the following topics:

- Problems involving geometry (especially when reasoning is required)
- Questions that involve the demand to show either all working or clear algebraic working (most notably questions 1, 10, 12, 13, 18, and 21 on this paper)
- Histograms
- Upper and lower bounds
- Unstructured algebraic questions
- Sequences in context

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. In addition, candidates 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 candidates 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

Generally, this question was answered well although many candidates lost a mark by failing to give the final answer as a mixed number as instructed and instead left their answer as $\frac{15}{8}$.

Some candidates used 32 or 16 as the common denominator rather than 8. Instances were seen where the candidate had used a calculator to determine the answer and had then attempted to set out working simulating a process. A relatively common error seen was converting the given values to $\frac{25}{8}-\frac{9}{4}$, i.e., multiplying the numerator of the original fraction by the whole number.

Question 2

A common approach incorrectly used in this question was to multiply percentage values together to determine the solution, for example, 0.48×0.8, or 0.42×0.52. Some candidates assumed that Year 7 meant a value of 7 and determined 7×0.52 as part of their solution or $\frac{7}{8} \times 42\%$. In some cases, candidates worked out the percentage of Year 7 who walked correctly but stopped at this point, suggesting they had not fully read the question carefully. There was a much higher than expected number of candidates scoring no marks or not attempting this question.

Question 3

Most candidates correctly stated that $180(n-2)=176n$ or directly calculated $\dfrac{360}{180-176}$ to find the required number of sides of the polygon. The most common errors were to state that $180(n-2)=176$ or to believe that the number of sides of the polygon was equal to either $\dfrac{360}{176}$ or $\dfrac{180}{176}$.

Question 4

Almost all candidates correctly substituted the values of *A* and *t* and obtained the correct value of *Q*. The most common error was to obtain an answer of 4 which came from $Q = 10-(-2)(3) = 10-6 = 4$.

Question 5

The most common errors in this question were candidates who multiplied the two left hand matrices prior to finding a solution for *x*, so therefore ignoring the addition sign. Some candidates assumed that they had to calculate the determinant of one of the matrices and then use this to find an inverse before applying this to the right-hand matrix to determine a solution. Several candidates lost a mark due to inaccuracy in one or more of the terms in the left-hand matrix found after adding the two matrices together (and before setting up a linear equation in *x*): most commonly the issue would be with the bottom right term 1 – *x* which would be stated as – *x*.

Question 6

Often in this question the median was taken as either 3 or another value (and therefore not an expression in *p*). The most challenging part of this question (to a significant number of candidates) was in determining an expression for the median. Overall, setting out an expression for the mean in terms of *p* was much more successful although examiners did note instances of the mean being written as $\dfrac{1.5 \times 2 \times p \times 19.5}{1.5+2+p+19.5}$. Some candidates struggled in multiplying through to clear the denominator while another common error was placing the 3 on the wrong side of the equation. However, those candidates who correctly stated that $\dfrac{1.5+2+p+19.5}{4} = 3\left(\dfrac{2+p}{2}\right)$ usually went on to obtain the correct value for *p*.

Question 7

Although extremely well answered, several examples were seen where candidates multiplied all the lengths given and stated this as the required area. A variation on the above was to square each of the lengths and then add. Some candidates broke the composite shape into three components to solve. A common error was to believe that the area was given by $(14+8)\times(12+9)$.

Question 8

Both parts of this question were generally well answered. In part (a), some candidates set out to affirm why Paul's statement must be correct rather than address the requirement of the question to explain why the statement might not be correct. Explanations were seen indicating that wages had decreased as a result of the percentages being applied. The most common error in part (b) was to calculate 4.4% of £7.83 and subtract this value from £7.83 giving the incorrect answer of either £7.48 or £7.49.

Question 9

Some candidates assumed that length *CD* was 5 noting a 3,4,5 right-angled triangle. Several candidates worked out the area of the triangle rather than the angle requested in the question and some candidates lost marks through rounding too early in their working.
A significant number of candidates used the Cosine Rule on either triangle *ABC* or triangle *BCD* to determine the missing angle.

Question 10

Most candidates who attempted this question were able to correctly factorise the numerator but did not see the opportunity to factorise the denominator and thus simplify the expression further.
Often the expression would be factorised correctly (and simplified), but no explanation provided.
A common issue was cancellation of the *n* in the numerator against the denominator to "simplify" the expression. Worryingly, some candidates set the expression equal to zero and attempted to solve for *n*.
Several candidates gave examples of values for *n* = 1, 2, 3 and then based their conclusion on these outcomes (which scored no marks as algebraic working was required).

Question 11

Part (a) was generally well answered by candidates; some alternative (incorrect) solutions presented were: $(x-1)^2$, $x(x-1)$, x^2+x+1 , $1(x^2-1)$
Part (b) of the question was not answered well with most candidates either providing no response or showing no real understanding of how to approach the solution despite completing part (a).

Question 12

Although a relatively straight-forward question on bounds this question was not answered well.
The Upper Bound for 2800 was often determined as 2805, however, determining the lower bound for the denominator was much less secure. The value 1600 was often seen reworked as 1650 (or 1750) possibly reflecting the statement that the value was to 3 significant figures.
A common solution seen by examiners was $\frac{2800}{1600}$ = 1.75 with the final value sometimes adjusted by 0.5.

Question 13

This question was generally well managed, although there was evidence of candidates using a calculator to determine the solution (with the correct answer often appearing with no working). If issues were encountered by those who attempted the question by showing all their working these normally arose in multiplying out the denominator to get to 13 – 11. Some candidates stated that $\sqrt{143}+\sqrt{143}=\sqrt{286}$ or multiplied the given expression by $\frac{\sqrt{13}-\sqrt{11}}{\sqrt{13}-\sqrt{11}}$.

Question 14

Most candidates who attempted this question on conditional probability were able to determine that 0.1×0.05 was a correct initial step in determining the probability that Jill travelled to work by train but were then unable to progress. The data was often accurately presented in a Tree Diagram, but most candidates were then unable to work with the information. Probabilities were still seen that were sometimes greater than 1 which should have been indication that a mistake somewhere had been made.

Question 15

Both parts of this question were answered extremely well with the most common incorrect answer in part (a) being $5x-2y$. In part (b), most candidates obtained the correct coefficient of 8 but if the power was incorrect it was most often stated as 9 rather than the correct 6.

Question 16

Both parts of this question were answered extremely well too. Candidates are reminded though to read the question carefully as some, after factorising the quadratic expression in part (b), went on to ‘solve’ it by putting it equal to zero.

Question 17

Part (a) of this question was well answered, although several candidates gave their answer as 16.8×10^{110} rather than in standard form. It was also noted by examiners that 168×10^{110} was also a common response. Some candidates added rather than multiplied the values provided. In part (b), candidates often first determined that the solution was 218×10^{54} but then continued by presenting their answer in standard form as 2.18×10^{56} ignoring the direction given in the question that k and n were integers. Several candidates elected to multiply rather than add the two values given in this second part therefore repeating their answer from part (a).

Question 18

This question on solving simultaneous equations was generally answered correctly by candidates, although some lost marks by not giving their answers exactly (as fractions) but instead working in decimals to only 1 or 2 decimal places. There was a slight preference amongst candidates to use substitution as the method of solving as against elimination of terms.

Question 19

Part (a) of this question was generally answered well with candidates substituting 3 into the expression, equating to zero and then solving for a. Some candidates did attempt to base the solution on long division (which scored no marks) as the question specifically asked for use of the factor theorem. Other examples seen were substitution of (x – 3) into the expression for f(x). In part (b), the main approach was use of long division, although a few candidates did look to develop a quadratic by repeated use of the factor (x – 3). Some candidates focussed on $x^3 - 8$ only factorising the expression as $x(x^2 - 8) - 3$ to get their answer. The fraction $\frac{x^3 - 8x - 3}{x - 3}$ was also put forward by some candidates as the solution.

Question 20

Construction of an accurate bisector of the angle (in part (b)) was the most secure aspect of candidates' solutions. Some candidates restricted the area *R* by the construction lines used for the angle bisector. Some candidates would correctly complete parts (a) and (b) but then shade the region at the top left of the triangle for (c). Several examples were seen where the bisector of angle *C* was taken to be a line to the midpoint of *AB*.

Question 21

This proved to be a very challenging question for candidates although some creative solutions were also seen where candidates added lines to the diagram to enable correct use of theorems to determine the required angle. The final mark was often lost by candidates for not giving the final reason for determination of the angle as 20^{O}, where this had been determined through using the sum of angles in a triangle added to 180^{O}. Angle *ABC* was most correctly stated as 90^{O} although a few candidates also assumed angle *AED* was 90^{O} too.

Question 22

Candidates presented a range of formulae for the volume of a cone in both parts: where correct candidates would generally score full marks in part (a). Examples of incorrect formulae seen were: $\frac{1}{2}\pi rh + \pi r^2$, $\frac{1}{3}\pi rh$, $\frac{1}{3} \times base \times height$, $\frac{1}{2}\pi r^2 h$.
Rounding to 3 significant figures was not done well, with 2094.39 often seen rounded to 209 or 209.43. In part (b), several candidates assumed $r = 10$ for the volume of the cone to be deducted.

Question 23

This question on histograms was either handled extremely well or poorly/left blank by candidates. A common omission was a scale on the frequency density axis. Very few candidates set out any working supporting values entered in the table.

Question 24

Generally, part (a) was answered well by most candidates who attempted the question. Some candidates determined fg(x) not gf(x) as requested. Some candidates stopped working after determining the value of the expression $x^2 - 2$. Some candidates determined fg(x) as an expression in x and then set this equal to 6 and solved for x. Part (b) was generally answered well by most candidates, with the most challenging part being the expanding of $(x - 3)^2$ correctly, with some incorrectly writing this as (x + 3)(x – 3). Part (c) was found to be challenging to most candidates with only a small number of correct answers seen by examiners. Finally, in part (d), candidates who attempted this part would often start with $y = x^2 - 6x + 7$ and progress to $y - 7 = x^2 - 6x$ but get no further.

Question 25

This question discriminated well. A common error was to assume angle *ANE* was 90^O and then use Pythagoras Theorem to resolve the rest of the calculations required to achieve an (incorrect) answer. Accuracy of calculations was a common issue in determination of *AN* with inappropriate rounding used during the process of working out values. Another common (and slightly worrying) error was to assume that angle *NAB* was half angle *EAB*. Part (b) was generally successful where a candidate had completed part (a) correctly.

Question 26

It was pleasing to note that many candidates appreciated the need to differentiate the given expression to find an expression for the particle's velocity in part (a). Some candidates reached the point of $10t - 3t^2 = 0$ but were then unable to solve for *t*. Some candidates incorrectly elected to solve $5t^2 - t^3 = 0$. Another common error was to calculate the second derivative and solve this equal to zero. Finally, in part (a) many candidates did not give the exact value of *T* as requested.
Part (b) of the question was not generally answered well. Often candidates gained the initial mark for stating/showing that s(0) = 0 and s(5) = 0 but failed to see the relevance of their answer to part (a) in answering this part.

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