Examiners' Report

Principal Examiner Feedback

January 2018

Pearson Edexcel International GCSE

In Mathematics B (4MB0) Paper 01R

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Paper 01R

Introduction to Paper 01R

In general, this paper was well answered by the overwhelming majority of students. Some parts of questions did prove to be quite challenging to a few students and centres would be well advised to focus some time on these areas when preparing for a future examination.

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

- Reasons in geometric problems
- Symmetry (both reflective and rotational)
- Probability
- Finding a position vector from given (position and directional) vectors
- Unstructured trigonometry questions (including bearings)
- Applications of differentiation
- Representing a solution set on a number line

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

The vast majority of students correctly factorised $2x^3 - 6xz + x^2z - 3z^2$ as $(2x+z)(x^2-3z)$ although a small minority gave an incomplete answer of $2x(x^2-3z)+z(x^2-3z)$ (or equivalent) or only a took a factor out of three of the four terms, for example, $x(2x^2-6z+xz)-3z^2$.

Question 2

The vast majority of students knew how to find a common factor from the numbers given and most of these correctly gave the Highest Common Factor as 18. Only a handful of students confused Highest Common Factor with Lowest Common Multiple (LCM) and an answer of either 4284 or 77112 was therefore only infrequently seen.

Question 3

The vast majority of students correctly calculated the number of kilometres per gallon that David's car used on the journey with the most common error being a failure to realise that all three values (that is the 960, 91 and 4.55) needed to be used.

Question 4

Finding the number of lines of symmetry or the order of rotational symmetry from a given diagram continues to be a challenge to many, and only about half of all students were successful here.

Question 5

Nearly all students correctly calculated the length of the largest side of the field. The two most common errors were to either work out one of the other two lengths or to only calculate $\frac{748}{2+7+8}$ (which is the value of only one part of the given ratio).

Question 6

While the vast majority of students correctly calculated the area of the square as 16 a number failed to correctly find the area of the quarter circle (and it was common to see $2\pi r$ being used as the formula for the area of a circle). A number of students failed to give their answer to the required 3 significant figures.

Question 7

A number of students failed to read the question carefully and instead gave the size of the interior angle. While the majority who found the correct answer used the most efficient method of calculating $\frac{360}{24}$ a number used the slightly more complicated but equally correct method of calculating $180-\frac{180(24-2)}{24}$.

Question 8

While nearly all students correctly found the 8^{th} and 12^{th} terms of the sequence a small minority failed to read the question carefully and failed to find the difference between these two terms.

Question 9

Although the modal mark on this question was full marks a number of students failed to apply the intersecting secants theorem properly. Instead of equating the products of the corresponding segments a number incorrectly assumed that $BC\times 10=12\times 8.$ Of those students who did correctly state that $(BC\times 10)\times 10=(12+8)\times 8$ a small minority failed to solve this equation correctly.

Question 10

It was slightly disappointing to note that many students failed to realise that there were 5 scenarios in which the sum of the two rolls would be 6; the most common incorrect answers were by those students who only considered (1, 5), (2, 4) and (3,3) **or** (1, 5), (2, 4), (4, 2) and (5, 1). One of the main conceptual errors in this question was for a minority of students to assume that the numbers on the faces somehow would be part of the solution and therefore an answer involving $\left(\frac{1}{6}\times\frac{5}{6}\right)+\left(\frac{5}{6}\times\frac{1}{6}\right)+\left(\frac{2}{6}\times\frac{4}{6}\right)+\left(\frac{4}{6}\times\frac{2}{6}\right)+\left(\frac{3}{6}\times\frac{3}{6}\right)$ was relatively common.

Question 11

While over half of the students correctly calculated the modulus of $\overrightarrow{OY}$ as 5 a number did so from incorrect working with many incorrectly stating the position vector representing the point *Y* as $\begin{pmatrix}-3\\4\end{pmatrix}$.

While it was pleasing to note that very few students added the two given vectors in their attempt to the find $\overrightarrow{OY}$ a number failed to read the question carefully and instead only found the position vector and not the corresponding modulus.

Question 12

This question proved to be quite challenging for more than half of all students. Many either did not begin, made incorrect assumptions about the diagram or left off (or misquoted) valid reasons. Not realising that the lengths of the two sets of tangents from outside the circle are equal in length was the main initial error. A number of students achieved the correct answer of 75° but from incorrectly applying the alternate segment theorem which gave them 60° for angle *DCB* and 45° for angle *ACE*.

Question 13

This question was answered extremely well with nearly all correctly squaring both sides to give $4x^2+45=9x^2$ and from there nearly all students went on to solve correctly for *x*. The two most common errors seen by examiners were to incorrectly square root the left-hand side (giving $2x+\sqrt{45}$) or incorrectly squaring the right-hand side as $3x^2$. On this occasion a final answer of $x=\pm3$ was condoned even though *x* could not have been negative (regardless of the given statement in the question that *x* was positive).

Question 14

This question proved to be the most challenging question on the paper with over 70% of students failing to score any marks. Many students failed to realise that if the $\tan\theta=\sqrt{8}$ and θ was acute then this would imply from Pythagoras' that the hypotenuse of the right-angle triangle is 3 and therefore $\sin\theta=\frac{\sqrt{8}}{3}$ and $\cos\theta=\frac{1}{3}$. Many students incorrectly used their calculators to find θ and then tried to justify that their decimal approximation for $3(\sin\theta+\cos\theta)$ was equivalent to the exact answer of $1+\sqrt{8}$. While this was the correct exact answer their justification was neither rigorous nor mathematically sound.

Question 15

Although this question was answered well by many students a significant number failed to give sufficient working in showing how they arrived at their answer to part (b). Many students did not read the question carefully and assumed that 18 was a member of set *B* or they gave an answer of $\{3,9,15\}$ for part (b).

Question 16

Very few conceptual errors were seen in this question on matrix subtraction and multiplication. When errors did occur it was nearly always because of incorrect arithmetic when calculating the elements in either of the two required matrices.

Question 17

This question was answered well with over half the students scoring full marks. The most common error was in the failure to read the question carefully with a number assuming that y increased (rather than decreased) by 25%. The most successful method reported by examiners was by those students who realised that the percentage increase in the value of R would be given by $\left(\frac{1.05}{0.75}-1\right)\times 100$.

Question 18

It was very pleasing to note that almost two-thirds of students correctly made y the subject of the given formula. Those students who correctly removed the denominators by writing $w(5y-2x)=2(x+3y)+2(5y-2x)$ were nearly always successful. It is probably not too surprising that the most common error was in the removing of the denominators with many failing to deal with the 1 term on the right-hand side correctly. It was surprising to note that a number of students failed to simplify their final answer with a number leaving their answer as $y=\frac{2xw+2x-4x}{5w-16}$.

Question 19

For part (a) students were requested to show clear working and so it was therefore not acceptable to simply state the correct answer. These questions are designed to test the students' proficiency in carrying out routine calculations without the use of a calculator and so clear working must be shown from the initial form of the question to the final answer. It was slightly disappointing that a number of students could not give their answer in part (b) to 3 significant figures or failed to convert their answer from part (b) into standard form for part (c).

Question 20

While it was pleasing to note that just under half of all students scored full marks on this question it was slightly disconcerting the number of students who either left this question blank or failed to grasp that part (a) was testing one of the many applications of differentiation. Many students managed in part (a) to achieve the correct answer from incorrectly stating that $t+\frac{4}{t}=0$ and therefore scored no marks in this part. In part (b) many failed to realise that a difference was required with many students simply working out the position of P at B.

Question 21

Part (a) was answered correctly by nearly all students. Parts (b) and (c) fared less well with many finding the demands of forming a second equation in x and y too much. While many students did attempt to solve their simultaneous equations using a correct method (and so earning the method mark in part (c)) many either left this part blank or gave up mid-solution.

Question 22

Part (a) was answered extremely well by nearly all students with most achieving the correct answer of $-3 < x \leq 2.$ Part (b) was answered less well with many representing their solution on the number line in a way that examiners found extremely hard to follow. The almost standard way of expressing a solution on a number line is to use circles at the critical value(s) (in this case –3 and 2), leave the circle unshaded if a strict inequality is required or shaded if the critical value is part of the solution and then draw a single line between these two circles. For consistency it is very difficult in these situations to give other representations full marks.

Question 23

While part (a) was answered extremely well with nearly all students correctly differentiating both terms correctly; the most common error being in incorrectly stating 3×3 as either 6 or 27. Those students who in part (b) realised that their answer to part (a) had to be equated to the gradient of the tangent to *C* at *A* usually went on to the find the *x* coordinate of *A* correctly (although it was noted by examiners that this part was often left blank).

Question 24

It was pleasing to note that almost four-fifths of students scored full marks in this question and most used the most efficient methods in solving both parts (which in this case were the sine rule in part (a) and either the sine rule or cosine rule in part (b)). Those students who attempted to split triangle *ABC* into two right-angled triangles were usually less successful. Finally, it is really important in questions like this that students use their calculators carefully (as a number gave the size of angle *ABC* as 27.3) and some gave their answer to the nearest integer rather than the required 3 significant figures.

Question 25

In part (a) most students realised that the fraction of the tank that would be filled in 1 hour would be $\frac{1}{24} + \frac{1}{48} + \frac{1}{24x}$ although many failed to simplify this expression. In part (b) it was quite common for students to attempt to solve their expression from part (a) equal to 15 instead of realising that they needed to first multiply their expression by 15 and equate this to 1. Those that did realise this usually went on to achieve the correct answer of $x = 10$.

Question 26

The majority of students found this second question on probability much easier than the first with nearly four-fifths scoring all 7 marks. Nearly all students correctly attempted parts (a) and (b) although it was slightly surprising the number of times that examiners reported students in part (b) writing $\frac{3}{10} \times \frac{1}{10} = \frac{4}{20}$. In part (c) the most common error was a failure to realise that there were two possibilities in which Marian would be early for school (these being 'Bus and Early' or 'Walks and Early').

Question 27

Although nearly two-fifths of students scored full marks on this final question examiners noted that a number of students left this question completely blank. In part (a) most students realised that angle *ABC* was right-angled and therefore used Pythagoras' to find the direct distance between ports *A* and *C* although it was common to see the cosine rule being applied with an incorrect angle of 110°. Part (b) discriminated well with many students failing to grasp which angle was required when calculating the bearing of port A from port C (with many incorrectly finding the bearing of C from A). A number of students attempted both parts of this question by a scale drawing; hardly any were successful.