Pearson

Examiners' Report
Principal Examiner Feedback

November 2017

Pearson Edexcel GCSE (9 – 1)
In Mathematics (1MA1)
Higher (Calculator) Paper 2H

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GCSE (9 – 1) Mathematics – 1MA1
Principal Examiner Feedback – Higher Paper 2

Introduction

The time allowed for the examination appears to have been sufficient for students to complete this paper.

Most students seemed to have access to the equipment needed for the exam.

The paper gave the opportunity for students of all abilities suited to entry at higher tier to demonstrate positive achievement. Though it was to be expected that most of the students presented for this resit opportunity were of modest ability, it is disappointing to report that there seemed to be a significant number of students who scored very few marks. They may have been more appropriately entered for the foundation tier paper. It was rare for students to make successful attempts at most of the questions on the paper. Few students were able to work confidently on Q18 to Q23.

Many students set out their working in a clear, logical manner. It is encouraging to report that students who did not give fully correct answers often obtained marks for showing a correct process or method.

Report on individual questions

Question 1

There were many fully correct solutions seen. Where full marks were not achieved, one mark was often awarded for a correct expansion of the brackets. Unfortunately this was frequently followed by an incorrect attempt to isolate ether the terms in x or the constant terms, the constant terms presenting the greater difficulty. Some students wrongly expanded the brackets as $3x - 1$ but were then able to get some credit for the next stage in the manipulation of their equation.

Question 2

Students almost always earned some credit for a correct start to the processes needed by either finding how much Emily paid for one bottle of water or how much she got for selling all twelve bottles of water. Finding the percentage profit proved a greater challenge to most students, a common error being to use $\frac{0.36}{6}$ or $\frac{5.64}{6}$ instead of $\frac{0.36}{5.64}$ or $\frac{6}{5.64}$. A number of the students who did use a correct fraction and got 1.0638 or 106.38 were unable to interpret this as a 6.38% percentage profit.

Question 3

For those students who realised that they needed to use the formula for the circumference of a circle, and could recall it, this question proved to be straightforward. It was surprising to see that a significant number of students instead opted to divide the diameter by 8 to give 10 as their answer.

In part (b) students who stated that the total distance or that the number of points remained constant were awarded the mark available. It was encouraging to see that this part of the question was answered quite well, sometimes even after an incorrect response to part (a). Students generally gave a clear decision coupled with a clearly expressed reason. Where this was not the case, students often referred to larger and smaller gaps between the points. Students who thought that the mean distance would change used the reason that the points would not now be equally spaced.

Question 4

This question discriminated well between students of different abilities. The weakest students merely rephrased the question, for example by writing B = 2Y. Students going no further than this could not be awarded any marks. Most students did gain some credit for their attempts for writing down a ratio linking the number of cubes for at least two of the three colours. More able students wrote down a correct ratio linking all three colours. A common error was the use of the incorrect ratio Y : B : G = 1 : 2 : 4 leading to the incorrect answer, $\frac{1}{7}$. An alternative strategy used by many students was to assign particular numbers of cubes to satisfy the conditions given and work from these. $\frac{2}{22}$ was a commonly seen acceptable answer as an alternative for the correct probability in its simplest form, $\frac{1}{11}$. The general marking guidance given in the mark scheme states that probabilities given correct to at least 2 decimal places are also acceptable, so 0.09 was also accepted as a final answer.

Question 5

Students found part (a) involving the rotation of the trapezium more accessible than part (b) where they had to translate the shape. However, it was disappointing to see the number of responses to part (a) where the trapezium A was placed in an incorrect quadrant and examiners were left wondering why more students had not used tracing paper to help them. Part (b) was not well done.

Question 6

Most students were successful in parts (a) and (b) of this question. In part (a) the most common incorrect response was "3" with "8" occurring quite frequently as a response in part (b).

Part (c) was not well answered. Only a small proportion of students stated that 100^a can be written as 10^{2a} or that 1000^b can be written as 10^{3b} or that 100 = 10^2 and 1000 = 10^3 and scored the mark for a first stage in the reasoning needed. Few students were able to complete this part of the question by showing that the product $10^{2a} \times 10^{3b}$ leads to the given result.

Question 7

A good number of students did realise that this problem required the use of Pythagoras' theorem and trigonometry but were not always able to apply them correctly. Students who realised that using Pythagoras' theorem was the most efficient way to start the problem usually gained the first 2 marks, although some students calculated $7.5^2 + 6^2$ instead of $7.5^2 - 6^2$. A common error was for students to subtract 10 from 24 to find the missing base length of the right angled triangle needed to find angle *CDA*. Students who clearly showed a correct use of trigonometry to find angle *CDA* were awarded a process mark even if they had used an incorrect value for this length, for example 14. It was encouraging to see a good number of fully correct solutions to this multi-step question.

Question 8

A large proportion of students were successful with this question. However, many students were unable to apply the correct order of operations and did not apply the square root to the full numerical expression or were unable to use their calculator to get a correct value for the expression within the square root. Students are advised to give themselves more practice using the bracket function on their calculator. Some students omitted to calculate the square root altogether and simply gave their final answer as 7.5958…

Part (b) of the question was done surprisingly badly. A significant number of students simply truncated their answer to part (a) to 2dp, and often those students applying rules for rounding not only increased the second decimal place by one but also their first decimal place by one. A significant number of those students rounding 7.597… gave their final answer as 7.6, instead of the correct 7.60 .

Question 9

Fully successful solutions to this question involving inverse proportion were not common. Most of the students who did score full marks found the total number of hours needed for the 5 cleaners to clean all the rooms in the hotel (5×4.5), then divided by 3 to find the number of hours needed by each of the 3 cleaners. Of those students who successfully calculated the 7.5 hours, most of them correctly rounded this to 8 before calculating what each cleaner was paid. However, a significant minority of students calculated $7.5 \times £8.20$ and scored 2 of the 3 marks available.

Weaker students often used direct proportion and did not question why 3 cleaners would take less time than 5 cleaners to clean all the rooms in the hotel.

Question 10

This question discriminated well between students. Many students could state the time interval when the speed was greatest and a good proportion of those students were able to explain why, usually referring to the gradient of the lines. However a significant number of students misunderstood what the question required in part (a). The question asked for "two times" between which the speed was greatest. Some students interpreted this as a request for two answers and gave the two time intervals 0 - 20 and 20 - 60. Students who scored the marks in part (a) were often successful with part (b) of the question. However, answers to part (b) were often marred by errors made in reading accurately from the graph with many students using "380" instead of "360".

Question 11

There were very few fully correct answers to the problem posed by this question. A significant minority of students realized that the sector angle was needed and some students started to work with the areas of the circles. One mark was awarded for this.

Question 12

Many students were able to score 1 mark for calculating the size of an exterior angle of the regular polygon ($360 \div 12$) or for calculating the size of an interior angle ($1800 \div 12$) and about a half of these students were able to complete the question correctly to find the required angle. Evidence of confusion between exterior and interior angles was relatively rare. A significant number of students gave their final answer as 150, suggesting, possibly, that they didn't understand the angle notation used.

Question 13

Part (a) was a straight forward application of compound growth. It was well answered by a good proportion of students but a surprising number of students did the calculation long-hand by calculating eight separate increases of 2%. Of those students who used the more concise method of using a multiplier, some used 1.2 instead of 1.02

A significant number of students did not give their final answer correct to the nearest £100. The most common error in this part of the question was to treat the problem as a simple interest calculation.

Part (b) of the question was found to be more demanding and only a small minority of students were able to set up the problem correctly, for example by writing down an equation such as $250\,000 \times y^6 = 325\,000$. Rather than dividing 325 000 by 250 000 to find a multiplier for the 6 year period, students often starting by working out the difference (75 000) in these amounts and then could make no further progress. A significant number of those students who did follow a correct method to find the correct multiplier for one year (1.045) did not then go on to interpret this in terms of a yearly percentage increase (4.5%). Trial and error approaches were sometimes successful but often lead to poor accuracy in the final answer.

Question 14

This question discriminated well between the more able students. Many of these students scored 1 or 2 marks for drawing 2 or 3 lines correctly. Where 2 of the three lines were drawn correctly it was often $y = 2x$ which was incorrect or not attempted. Students who drew all 3 lines correctly more often than not opted for the closed region bounded by these lines rather than the open region satisfying the three inequalities given. Weaker students could often only draw the line $y = 1$ correctly. Some students did not attempt to answer the question.

Question 15

For part (a) of this question examiners expected students to make a decision about whether Tracey is correct and then explain that the numbers 8 and 7 needed to be multiplied, and not added, to work out the different number of ways of choosing a main course and a dessert. The question was quite well answered with many students giving clear and concise answers though some responses were too vague to be awarded the mark. For example, some students merely stated that there would be more than 15 ways with no further explanation.

Many different approaches to work out the total number of games played were seen in part (b) of the question. Some students used a listing method or a diagram, equivalent to adding the integers from 1 to 11 inclusive. Students who used a multiplication method often calculated 12 × 11 and did not take into consideration that this would include each team playing each other team twice. "132" was consequently a commonly seen incorrect answer. Examiners were able to give some credit for this answer. Other incorrect responses seen included 144 (12 × 12), 72 ($\frac{12\times12}{2}$), 78 (12 + 11 + …+ 1) and 24 (12 + 12).

Question 16

Few students obtained full marks. The direct approach of taking square roots of each side of the equation was rarely seen. A more common approach was for students to expand and simplify $(x-2)^2$, then use the quadratic formula. Some students who expanded $(x-2)^2$ seemed to run out of steam and did not attempt to solve their resulting equation. Another very common error seen was for students to expand $(x-2)^2$ as x^2-4 and find a value or values of x from the resulting two term quadratic equation. Some students who worked accurately gave only one correct value for x (usually 3.73).

Question 17

The majority of students drew frequency diagrams for part (a) this question, usually with bars of the correct width. Of those students who correctly calculated and used frequency density, some did not label the vertical axes correctly. Class intervals were sometimes used on the horizontal axis (rather than a linear scale).

In part (b) some students were able to calculate 123 by using the table even when they had drawn a frequency diagram in the first part of the question. A significant number of students, having calculated 123 correctly, did not then go on to express this as a fraction of 150. Some students who had drawn a correct histogram attempted to calculate the probability in part (b) from frequency densities.

Question 18

The value of k required in this question involving an iterative process was 0.98 "98%" was not an acceptable answer. Some students did more than was expected and used the iterative process to calculate the value of V_1.

Question 19

There were a small number of excellent proofs seen usually using gradients to show that the lines were parallel. Students who attempted the question but could not provide a full solution often gained one mark for a correct method to calculate the coordinates of at least one of the points M or N. Students often drew a diagram but without further work, these could rarely be awarded any marks.

Question 20

Some students were able to score one mark for calculating the area of the sector or for identifying a right angle between a radius and a tangent or two marks for both. A significant number of students wrote down a correct expression for the area of a circle of radius 10 cm but then did not work out the correct fraction of the circle. Few students were able to give a correct method to find a length in order to calculate the area of the kite. There were a relatively small number of fully correct answers.

Question 21

Only a small minority of students calculated the correct probability in part (a). In fact, not many students were even able get as far as multiplying three probabilities together and those that did often calculated $(\frac{1}{3})^3$ or equivalent. Some students attempted to use tree diagrams but these were usually incomplete or incorrect.

In part (b) a few students were able to set up a hypothetical number of counters in the bag, usually 5 red, 5 blue and 5 yellow counters and then calculate a probability for comparison. Most of these students clearly stated their decision based on a correct comparison of probabilities. However, when comparing fractions, some students did not write them in a suitable form by using the same numerators or the same denominators or by converting the fractions to decimals.

Question 22

Though there were some fully correct answers, these were rarely seen. Few students were able to set up the required simultaneous equations, though some were able to score marks for $3a + b = 20$, $g(1) = a + b$ or for $f^{-1}(33) = 6$. Some students confused $f^{-1}(x)$, with $\frac{1}{f(x)}$.

Question 23

The vast majority of students could make no progress with this question designed to test top grade students. Some students confused the geometric sequence with an arithmetic sequence and involved addition of the terms (rather than multiplication).

For part (b) there were again few attempts worth any credit with some students starting their working by using their calculator to write down the value of $7 + 5\sqrt{2}$ as a decimal.

The best students gave clear, concise and full solutions to this question.

Summary

Based on their performance in this paper, students should:

- practise solving linear equations.
- learn standard techniques such as working out values in problems on compound growth by using a multiplier method.
- carry out a common sense check on the answers to calculations, so for example you should expect the number of hours each of 3 cleaners need to clean all the rooms in a hotel to be more than the number of hours that each of 5 cleaners need to clean the same number of rooms.
- use tracing paper to help in questions involving rotations.
- check any readings taken from graphs to make sure scales on the axes have been interpreted correctly.

Grade Boundaries

Grade boundaries for this, and all other papers, can be found on the website on this link:
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