Pearson

Examiners' Report
Principal Examiner Feedback

November 2018

Pearson Edexcel GCSE (9 – 1)
In Mathematics (1MA1)
Foundation (Calculator) Paper 2F

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

Introduction

It was pleasing to see that the majority of students made attempts at most, if not all, of the questions on the paper. Students appeared to be confident on shorter questions with clear demands but found problem solving questions and questions where they were expected to give reasons for an answer more challenging. There was evidence that some students hadn't adequately revised, resulting in some elementary mistakes even within the early questions.

Students generally showed working, especially in the longer questions. A lot of the working was easy to follow but in the case of multi-step problems students did not always set out their working clearly and logically; this is not only unhelpful to the examiner but also to the student when they are trying to continue or check their own process. Students should be encouraged to show their working in a logical manner when answering multi-step problems.

Although this is a calculator paper it was evident that quite a few students chose to work out calculations without using a calculator. Many basic arithmetic errors were seen.

Students need to read the questions carefully. There were a significant number of responses in which students did not answer the question that had actually been asked in spite of doing all the necessary calculations. There were also many responses where figures given in the question had been misread.

Geometry questions were generally not well answered. Finding the area of a triangle in question 13 and the area of a trapezium in question 24 caused difficulties for many students. The number of fully correct descriptions of the transformation in question 16 was surprisingly small and most students were not able to use angles on parallel lines to find the size of angle x in question 22.

Report on individual questions

Question 1

This question was answered well with many students able to write down the value of the 4 in 542.3. The most common incorrect answer was tenths.

Question 2

Many students wrote down a square number that is also an odd number with the most common correct answers being 9 and 25. Some students gave an answer such as 3^2 which gained no credit unless it was evaluated in the working. Most incorrect answers were odd numbers such as 3 and 5 that are not square numbers.

Question 3

Although many students changed 4560 g into 4.56 kg in part (a) answers of 45.6 and 456 were very common.

Slightly fewer students were able to change 7.3 m into 7300 mm in part (b). The most common incorrect answers were 730, 73 and 0.73.

Question 4

This question was answered quite poorly with fewer students than might have been expected able to work out the cube root of 64. Some students with the right idea gave the answer as 4^3 and lost the mark. The most common mistake was to work out the square root instead of the cube root.

Question 5

The majority of students were able to write 0.31 as a fraction.

Question 6

This question was well answered. Many students were able to write the decimals in order of size and conversions to decimals were often shown in the working space. When the correct order was not given some students gained the method mark for listing any three of the fractions in order or for converting at least two of the fractions into decimals. Some incorrect answers were based on ordering the numerators or ordering the denominators. In some cases students attempted to compare by drawing diagrams, but this was generally unsuccessful.

Question 7

In part (a) many students simplified the expression correctly. A few students gave only partially simplified expressions, e.g. $6m - 2m$ or $m + 3m$.

Part (b) was also answered well. Some students did not simplify $2 \times n \times p \times 4$ fully, giving answers such as $2n \times 4p$ or $8 \times n \times p$, and did not gain the mark.

Question 8

This question was generally answered well with many students multiplying 18.8 by 14 to find the real distance between Manchester and London. A few went on to multiply by 100 or by 1000 and lost the accuracy mark. A surprising number of students split the multiplication into two parts and first worked out 18 × 14. At this stage the method mark could be awarded. Unfortunately many could not complete the method and attempts to work out 0.8 of 14 were often unsuccessful. Some students could not use the scale correctly and divided 18.8 by 14 and there were others who did not use the scale at all and multiplied 18.8 by a power of 10.

Question 9

In part (a) many students were unable to explain why 21 is not a term of the sequence because they didn't know how to use the *n*th term. Nevertheless, some very good full explanations were seen. The most common approach was to show that the 5th term is 19 and the 6th term is 22. Some students formed the equation $3n + 4 = 21$ and solved it to show that n would not be an integer. Many students gave a partial explanation and scored one mark. Common partial explanations included finding just one term of the sequence, stating that 21 is a multiple of 3 and interpreting the *n*th term as multiplying by 3 and adding 4. Incorrect explanations were usually due to the *n*th term being interpreted wrongly. A common mistake was to state that the sequence goes up in 4s and some students wrote out the sequence 7, 11, 15, 19, 23.

A wide range of approaches were seen to continue the sequence in part (b) and these included the use of both conventional and creative (or unconventional) term to term rules. Students who continued the sequence using a standard rule of doubling or increasing the difference by 1 were often successful at generating two correct terms and explaining the rule used. Students who used this approach often gave an ambiguous statement or a contradictory *n*th term rule and subsequently lost a mark. Students should check that their rule works for each of the given terms and their continuation, particularly if attempting to state an *n*th term rule. For the students who used a more creative approach of +1 then +2, the common loss of a mark was due to not showing that their rule repeated itself every two terms.

Question 10

Part (a) was answered very well. Some students misread the question and worked out the input when the output is 8.

Part (b) was also answered very well. Some students found flow diagrams useful. The incorrect answer 28.4 was given by some students and scored no marks unless supported by working of $28 + 2 \div 5$. Another common mistake was to subtract 2 (instead of adding 2) before dividing by 5. Some students used 28 as the input and worked out the output as 138.

Question 11

Most students were able to gain the first mark for working out 30% of £80 as £24 and the majority then went on to give the correct answer. Some students added £80 to each bonus before subtracting but this did not affect the final answer. Having worked out Adam's bonus as £24 some students could not complete the method correctly. A common mistake was to subtract £24 from £80 rather than from the £28 comparative bonus and then find the difference between £56 and £28 or give £56 as the final answer. A relatively small number of students could not work out 30% of £80 and gained no marks at all.

Question 12

After working out 49 – 20 = 29 to find the number of blue counters most students gave the correct answer of 29/49. There were a surprising number of answers of 29/40 which scored one mark for the numerator of 29. However, an answer of 29/20 scored no marks because the numerator is larger than the denominator. Incorrect answers were often the result of using 29 incorrectly, e.g. writing the answer as 20/29 or as 1/29, or not using it at all. It was pleasing to note that there were relatively few students who gave a likelihood rather than a probability as the answer.

Question 13

Part (a) was answered quite poorly. As a first step, most students either found the square root of 81 or divided 81 by 4. Unfortunately, far too many took the latter approach, often giving 20.25 as the final answer, and gained no marks. Many of those who found the square root of 81 went on to find the perimeter of the square but some did not and 9 was often given as the final answer.

Rather surprisingly the number of fully correct responses seen in part (b) was very similar to the number seen in part (a). Many students gained one of the three marks. Some students gained the first method mark for finding the area of the triangle but could not use the area correctly to find the area of the parallelogram. A very significant number of students worked out the area of the triangle as 9 × 16, forgetting to divide by 2. These students could still gain the second method mark for using their area of the triangle correctly to find the height of the parallelogram, generally reaching an answer of 24. A number of students forgot to multiply the area of the triangle by 5 to find the area of the parallelogram. Others did not know how to find the area of a parallelogram and couldn't get any further after multiplying by 5.

Question 14

Responses to part (a) demonstrated a wide variation of knowledge regarding the use of probability language in an appropriate way. Whilst many students were able to explain clearly that the probability for each outcome is the same or one sixth, some contradicted their correct statement by using incorrect probability terminology such as "even chance". A small number of students failed to state a decision with their explanation and a larger than expected number of students gave an incorrect decision of "yes" alongside an explanation based upon 3 being half 6 and assuming that the probability related to this multiplication fact.

Very few students were successful in part (b). The correct decision of "no" was made by many students but in most responses it was supported by an incorrect explanation. The most common mistake was to state that the probability should be 2/12 because there are 12 outcomes with two chances of getting a 6. A large number of students explained that the probability will be 1/6 because the probability of getting a 6 is 1/6 on each throw. There were other students who made the wrong decision and stated that Andy is correct because 1/6 + 1/6 = 2/6.

In part (c) the majority of students listed the 12 correct combinations. These were written in a variety of ways with words and with abbreviations. It was pleasing that many of the lists were systematic and written in a logical order. Those that did not use such a logical approach were more likely to miss out or repeat combinations. Failure to gain at least one mark was usually due to students failing to appreciate that the outcomes should be pairs – a common incorrect answer was H, T, 1, 2, 3, 4, 5, 6.

Question 15

Many students gained the first mark for making a correct start. Most often this was dividing 75 by 5 to work out that Remi received £15 interest each year. Multiplying 600 by 5 was also a common first step. Some students were able to complete the method by working out that 15 is 2.5% of 600 and a few got as far as 0.025 and scored 2 marks. Many more were either unable to continue and gave 15 as the answer or continued with incorrect working. Some students started by working out that 75 is 12.5% of 600 but often did not complete the method. A common incorrect first step was to divide 600 by 5 and assume that Remi invested £120 each year. Some students divided 600 by 15.

Question 16

This is a standard question of a type that students should be very familiar with yet it was answered surprisingly poorly. Far too many students failed to describe the transformation as a reflection. Answers such as "flipped" and "mirrored" were very common and unacceptable. Many of the students who did describe it as a reflection failed to get both marks. Some wrote "reflection" and nothing else. Many attempted to describe the reflection but could not identify the mirror line as the x-axis or the line $y = 0$. Some students wrote "the line x". It was not uncommon to see "reflection" with an angle or a vector or with coordinates. Some students described the transformation as a rotation. Very few students gave more than one transformation - this has been a common failing in the past.

Question 17

This question was answered very well with most students gaining at least two of the three marks. It was pleasing that working was generally well set out and easy to follow. The most widely used approach was to work out the number of kilograms of cement, sand and stone in the bags that Adrian already has. Some students chose to work out the number of bags of cement, sand and stone that are going to be used. Many students were then able to interpret their values to reach a correct conclusion that Adrian needs to buy 2 bags of stone. When the final mark was lost this was sometimes because students listed the total numbers of bags that Adrian will use instead of what bags he needs to buy. Other errors at this stage included stating that he needs to buy more stone without specifying the number of bags and giving a non-integer number of bags.

Question 18

Some good explanations were seen in part (a). Many students identified that Bill had used an incorrect multiplier and explained that he should have used 1.03 or that he had increased 150 by 30% rather than by 3%. Statements that he should have used 0.03 or that 3% is 0.03 were accepted since the student had identified that the multiplier was wrong. Instead of focusing on the multiplier some students increased 150 by 3% and explained that Bill is wrong because his answer should have been 154.5. These explanations were also accepted. Many answers were incomplete and didn't explain why Bill's method is wrong, e.g. "he needs to find 3% and subtract it from 150" or "he needs to find 1% and multiply it by 3". Others were simply incorrect, e.g. "he increased 150 by 13%, not by 3%" or "he should have used 0.3" or "he should have divided not multiplied".

Part (b) was answered quite poorly with many students unable to complete the statement correctly. Although many could decrease 150 by 3% they did not know how to do so using a suitable multiplier in a single stage calculation. A common incorrect answer was 150 × 0.03 = 4.5, often with 150 − 4.5 = 145.5 written underneath. Some students wrote 150 × 0.3 = 45 or 150 × −3% = 145.5.

Question 19

Part (a) was generally answered quite well and it was pleasing that many students used an algebraic approach to solve the equation. The first step was usually expanding the bracket with hardly any students choosing to divide both sides by 3. Most of those who expanded the bracket to get $3x - 12 = 12$ went on to give the correct solution. A few students, though, went from $3x - 12 = 12$ to $3x = 0$. Attempts to expand the bracket were not always successful and common mistakes were $3x - 4 = 12$ and $3x - 12 = 36$.

Students who demonstrated knowledge of factorisation in part (b) did not always factorise the expression correctly. Some students identified $3b$ as the common factor but made a mistake inside the bracket, e.g. writing $3b(3b - b)$, and scored 1 mark. Partial factorisations such as $3(3b - b^2)$ and $b(9 - 3b)$ were quite common and scored 1 mark but in many responses with 3 or b identified as a factor the terms inside the bracket were not correct. Many students did not understand what was required and attempted to 'simplify' the expression, giving answers such as $6b^2$.

Question 20

Many students scored 3 of the 4 marks in part (a) for correctly placing the eight numbers in sets A, B and C. Common mistakes included writing 20 and/or 8 in more than one region and writing three 8s in the intersection of all three sets. The outside region, $(A \cup B \cup C)'$, proved to be much more problematic. It was very common to see either no numbers at all in this region or duplicates of numbers that had already been placed inside the circles or all numbers listed. It should be emphasised to students that each number in the universal set should appear just once in a Venn diagram.

In part (b) many students scored one mark for the correct denominator of 12 or for a denominator (usually 8) that followed through correctly from their Venn diagram. Common incorrect denominators were 25 and 11. A correct numerator was seen less frequently and it was evident that many students were unable to identify the region $A \cap B$.

Question 21

It was encouraging that most students identified the incorrect line of best fit or the problem with the scale on the height axis and many students identified both things wrong with Sean's answer. Some students wrote down two statements about the line of best fit and scored only one mark. A number of answers were given that received no credit. These included explanations that the scales should started at 0; that the axes are the wrong way round; that there is no *x* or *y*; and that there is no title. Some students stated that the height axis should start from 170, not from 140. Although this might give a better scatter graph it is not an error with the graph provided.

Question 22

Many students made a start by using angles on a straight line to find that angle *BEG* = 45º and then failed to make any further correct inroads into this problem. For the first method mark students needed to use parallel lines to find an angle, e.g. angle *ABE* = 70 º. Instead of using angles on parallel lines many students made incorrect assumptions about other angles. It was common to see angle *ABE* = 35 º or angle *EBG* = 110º (thinking it was alternate to angle *DEB*) or angle *ABE* = 110º. Some students attempted to use angles on parallel lines but incorrectly identified the angles that are equal, believing angle *ABE* to be equal to angle *BEG* for example, and scored no marks. The students who used angles on parallel lines correctly were usually able to find the size of angle *x*. It was disappointing that relatively few students achieved the C mark for giving one reason linked to parallel lines and one other reason. Some gave no reasons at all. When reasons were given they often did not include a reason linked to parallel lines or were incomplete, e.g. "triangle = 180", and did not include a reference to angles. Many students were not able to give clear statements relating to parallel lines with the correct naming of the types of angles. Some students incorrectly named alternate angles or co-interior angles as corresponding whilst some students used the unacceptable terms "Z angles" and "C angles" in their reasons rather than "alternate angles" and "co-interior angles" or "allied angles".

Question 23

Most students treated part (a) as a simple interest question rather than as a compound interest question and could score at most 1 mark. Those that did work with compound interest often chose to work out each year individually and made the question more 'labour intensive' than it needed to be. There was a lot of premature rounding of values with this approach which led to inaccurate answers.

Calculations such as 2000×1.025^3 and 1600×1.035^3 were not as widely used as might have been expected. Students do need to ensure that they use the correct multiplier; a mistake made by some was using 1.25 instead of 1.025. Many of the students who did show a complete compound interest calculation for both accounts then gave an incorrect conclusion because they based their decision on the total amount in each account instead of on the total interest that each person received.

Students who had concluded in part (a) that Ben will get the most interest were in a position to answer part (b) without any further calculation. Quite a few students did make a statement such as "No, Ben already gets the most so he will get even more" and scored 1 mark. When calculations were carried out in part (b) these were usually simple interest calculations and no credit could be given.

Question 24

Although there were relatively few fully correct solutions to this multi-step problem many students did gain at least one mark. Many students could not find the area of a trapezium correctly but even so they were still able to access three of the process marks. After finding a floor area, a common approach was to work out that each tin covers an area of 10 m^2 and divide their area by 10 to find the number of tins needed. Some students divided their area by 2 to find the number of litres needed and then divided by 5 to find the number of tins needed. A common mistake was to divide by 2 or by 5 but not by both. It was disappointing to note that a small number of students used a divisor of 4 instead of 2 for paint coverage because they misunderstood the notation $2m^2$. After a process to find the number of tins students often went on to multiply £16.99 by a non-integer value and lost a process mark. Some students showed incorrect working to find the total cost based on finding the cost of 1 litre of paint. A small number of students used a different approach, starting with the £160 John has to spend and working out the floor area that can be covered with the tins he can buy. Many responses had little or no structure to the working with calculations scattered over the page. Students who worked logically and structured their answer generally scored better.

Question 25

Working out the value of d proved to be beyond most students on this Foundation tier paper and many did not even attempt to answer the question. Those that did make an attempt often started by finding that the difference in the y coordinates is 6. Most students then simply added 6 to the x coordinate and gave an answer of 11. A few students, though, used the 6 and the gradient to work out the difference in the x coordinates as 2 and they were usually able to complete the solution. Some students wrote down $y = 3x + c$ as a first step and a few started with $(15 - 9)/(d - 5)$ but in both scenarios fully correct solutions were rare. A significant number of students attempted to draw a grid and mark the given coordinates and line on it and in some cases they were able to find correct values or the final answer and could gain credit for this. Correct answers of $d = 7$ were sometimes given with no working shown

Question 26

Those students that appeared to know a method for expanding two sets of brackets often achieved at least one mark in part (a). Mistakes were sometimes made with the signs. It was quite common to see the brackets expanded as $10x - 15x + 4x - 6$, which scored 1 mark for 3 correct terms with signs, or even as $10x - 15 + 4x - 6$, which scored no marks. An expansion of $10x^2 - 15x + 4x - 6$ did not always lead to the correct answer as some students were unable to simplify $-15x + 4x$ to $-11x$. It was disappointing to see that some students attempted to expand by adding rather than by multiplying.

Part (b) was not answered very well. Many of those that did attempt to factorise into two brackets did not find two numbers which both multiplied to give 3 and added to give 4. Answers such as $(x + 3)(x + 4)$ and $(x - 1)(x + 4)$ were quite common. The fact that the expression being factorised has only '+' signs should have been of assistance to students. Many students did not put the expression into double brackets at all but used some form of single bracket factorisation such as $x(x + 4) + 3$.

Question 27

Part (a) was answered quite well with many students knowing how to write a number in standard form. Incorrect answers were often of the form $a \times 10^n$ with a usually containing the digits 7547. Some students gave an answer of the form 7.547×10^n with an incorrect value of n.

Students were more successful in part (b). Incorrect answers did usually contain the digits 342, with either an incorrect number of zeros or with the decimal point incorrectly placed.

In part (c) it was pleasing that many students gave the correct answer, usually in standard form but sometimes as an ordinary number and often with no intermediate working. Those that didn't get the correct answer often scored 1 mark for correctly evaluating the numerator as 154 100 000. The division of 154 100 000 by 5×10^{-8} resulted in an incorrect answer of 0.3082 when the numbers were entered into the calculator without brackets around 5×10^{-8}. Many students, though, made hard work of this question which could have been done easily with the correct use of a calculator. Those who converted to ordinary numbers before doing the calculation often got into difficulties, particularly with the denominator.

Summary

Based on their performance on this paper, students should:

- know and be able to use area formulae for triangles and trapezia
- practise giving reasons for answers using correct mathematical vocabulary, particularly for transformations and angle questions and in the context of probability
- understand the difference between simple interest and compound interest and know how to use multipliers to simplify percentage calculations
- practise completing Venn diagrams and learn the necessary set notation
- read each question carefully and ensure that they answer the question asked
- structure their working clearly, particularly when solving multi-step problems

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