Examiners' Report

Principal Examiner Feedback

Summer 2024

Pearson Edexcel GCSE (9 – 1)

In Mathematics (1MA1)

Foundation (Calculator) Paper 3F

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GCSE (9 – 1) Mathematics – 1MA1
Principal Examiner Feedback – Foundation Paper 3

Introduction

This paper provided good coverage across the specification and allowed students the opportunity to demonstrate their ability across the grades. Plenty of success was seen across the early part of the paper as students showed confidence picking up marks in the first half of the paper.

Students generally performed best on questions involving numerical processes, for example Q13 (two-way tables), Q15 (percentages of amounts) and Q17 (recipe problem). Challenges arose when questions contained a context and with it, large amounts of text; extracting the key pieces of information and applying it using the correct mathematical processes are an area for improvement. The two questions that required a written explanation (Q18b and Q24a) also scored lowly and future cohorts should target this as an area for improvement.

In general, the use of a calculator was evident, and the standard of responses continue to improve as a result. There were still a number of students choosing not to use their calculator; it was not clear if this was by choice or due to the absence of the correct equipment. It was felt that there were fewer students giving no response to questions than in previous years.

Areas of the specification that need to be improved upon are highlighted in the list at the end of this report.

REPORT ON INDIVIDUAL QUESTIONS

Question 1

This question was answered very well with most students gaining one mark for a correct answer. The most common error was writing the answer as a decimal rather than a fraction.

Question 2

This question saw varied results; the majority of students were able to gain one mark for an answer of 8. A good portion of the cohort scored no marks, with the common incorrect answer being 80 - other incorrect responses involved multiplying by 10 or 100.

Question 3

This question was answered well with most students gaining 1 mark, usually for an answer of 30. For those who didn’t, "tenths” or “3000” were the most commonly seen incorrect answers.

Question 4

This question saw varied results; the majority of students were able to simplify correctly to reach an answer of 3*a*. Unfortunately, some commonly and incorrectly answered with "2*a"* and "12*a"* gaining no marks. Some students failed to fully simplify their answers and gave the answer of $8a - 5a$.

Question 5

This question saw mixed results, though a majority still scored the 1 mark available. Of those that did not gain a correct answer, the most common mistake was to have $\frac{1}{2}$ and $\frac{2}{3}$ in the incorrect order. A small number of students ordered the fractions from biggest to smallest, yielding no marks.

Question 6

Part (a) was answered well with the majority of students gaining 2 marks for a correct answer of 32. Of those that didn't, many gained 1 mark for a correct process e.g. 8 × 4 evaluated inaccurately, despite this being a calculator paper. Some students attempted a build-up process e.g. adding 8 lots of 4 but missed one out or included an extra 4, gaining 0 marks.

Part (b) saw more mixed results. Again most of the cohort gained 2 marks for a correct value with accompanying units, e.g. 2.5 cm. Of those that didn't, some were able to gain 1 mark for 2.5 without the correct units. A significant number of students were unable to show a correct process and gained 0 marks. Some students used the values from part (a) rather than part (b) or tried to multiply like in part (a) e.g. 4 × 10.

Question 7

Part (a) was answered well with most students gaining the 1 mark for correctly identifying "Bus" as the mode. Of those that didn't, a variety of incorrect answers were seen; with either "Car" or "9" given the most often.

In part (b) most were able to gain 1 mark for an answer of 5; of those that didn't 6 and 8 were often given as the answer or some students added rather than subtracted.

Question 8

This question saw a majority of students gain the full 3 marks. There were various ways students could achieve a correct solution and all were seen. The most common method being to find the year that Aisha turned 18 (2011) and then count up in 5's until reaching 2026 or 2031 and arriving at an answer of 'no'. Some students found the difference between 2011 and 2030 (19)

and explained or showed that 19 was not divisible by 5, which was enough to gain 3 marks - although some that found 19 missed the final mark because they did not state that 19 is not divisible by 5. Some found the difference between 2030 and 1993 but then didn't know how to work with it to gain the rest of the marks. A minority of students gained 0 marks, with the most common incorrect process seen being to start at 1993 and count up in multiples of 5. Some attempted to find the year she was 18 by repeated addition but included 1993 so ended up with an answer of 2010.

Question 9

This question was answered very well with almost the entire cohort scoring full marks. The most common process seen was to calculate the total for 5 days of ski hire, 4 days of lift passes and 8 hours of ski lessons and find the sum of the 3 totals, leading to an answer of 498. Of those that did not gain full marks, the most common errors were usually related to digits, e.g. writing down $23.5 \times 8 = 180$ instead of 188, presumably copying down incorrectly from the calculator. Some students opted to use a repeated addition method e.g. $26 + 26 + 26 + 26 + 26 = 130$; this was a successful, although not efficient, process for some students; but led to errors for the majority who used it.

Question 10

For part (a), most of the cohort provided a correct drawing of the radius. Of those that didn't, a whole variety of incorrect answers were seen, including sector, chord, diameter and tangent. It should be noted that if a student drew two radii, this was awarded 0 marks as it was unclear whether the student was drawing two radii or a sector, unless the radius had been clearly labelled as such. Some students had not properly crossed or rubbed out an incorrect response; students should make it clear to the examiner which line they wish to be considered as their answer.

Part (b) was poorly answered with few students giving the correct answer. A whole variety of incorrect answers were seen such as diameter, segment, tangent, area, arc, circumference, section, showing that this cohort need to learn the names of the parts of the circle.

Question 11

This question saw much success with most of the students scoring 2 marks. The most common method seen was to work out $45 \times 8 = 360$ then divide by 60 to reach the correct answer of 6. Common incorrect solutions were to reach 360 and be unable to convert to hours, some students treated an hour to be 100 minutes and did 0.45×8 and others attempted a build-up method of 8 lots of 45 but went wrong in the method.

Question 12

This question saw mixed results with a minority to gain 2 marks for 3 correct prime numbers. Of those that weren't awarded full marks, some gained 1 mark for 2 out of 3 correct prime numbers. Many were only able to give 1 prime number or in some cases none at all; common incorrect prime numbers were 21, 25, 27 and 39. Few students demonstrated good strategies to identify prime numbers, either by using the times tables or by tests of divisibility.

Question 13

This question was answered well with a majority of students able to gain the full 3 marks. Of those that didn't, the whole range of incorrect entries was seen from 1 up to 6. Students attempting these types of questions on future papers should be encouraged to check the totals for each column and row, as this is a way to highlight any errors they have made and can therefore be corrected. It does appear that the majority of errors were caused by arithmetic errors and incorrect use of calculators.

Question 14

Drawing pie charts is clearly an area of improvement for this cohort as a minority were able to score full marks for a correct pie chart. Some were able to gain 2 marks for all 3 angles correctly calculated or for accurately drawing one correct angle on the pie chart. Most of the cohort gained no marks and common incorrect solutions often included an incorrect or no attempt to calculate the angles and if sectors were drawn on the pie chart, the angles were the same as the frequencies (30, 10, 50) or some other incorrect values. There were indications that some students had not come equipped with a protractor and a small number of students did not use the line given or drew their angles not from the centre. A few who drew a correct pie chart forgot to label it correctly, it should be noted that labelling the sectors with the values of the angles, e.g. 120, 40, 200, is not acceptable.

Question 15

The majority of students scored 3 marks on this question for reaching two comparable figures and making a correct decision. A small number of students gained 0 marks and it was evident that they found working with percentages challenging or they showed an incorrect process such as, for example, finding 115% of 88 and 120% of 62 or 85% of 88 and 80% of 62. It should be noted that 15% × 88 is not considered a mathematical process and therefore will not gain credit unless it is accompanied by the correct figure (e.g. 15% × 88 = 13.2 would gain the mark but without the 13.2 it would not). Many students used non-calculator processes that resulted in errors in arithmetic, or the full process was not shown and therefore credit could not be awarded.

Question 16

Most students were able to give a correct answer for part (a); the most common incorrect answer seen was $4m$.

Part (b) was not answered as well, with much fewer students able to gain the full 2 marks for an answer of $5x + 2y$. Of those that didn't, some were able to gain 1 mark for either $5x$ or $2y$ or a linear expression in the form $ax + by$ where $a, b > 0$. Some students gave a correct expression but included it in a formula e.g. $T = 5x + 2y$ which gained only 1 mark as students were being assessed on their understanding of the term 'expression'. A significant proportion of the cohort scored 0 marks and the majority of these students generally did not understand the context of the question. Common incorrect solutions did not include x or y e.g. $5 + 2 = 7$ or multiplying 5 and 2 by some chosen values and finding the sum of the products.

Question 17

This question was answered well with most students able to gain the full 3 marks for 3 correct values. The most common method seen was to find the amount needed for 10 biscuits and then to add this to the amount needed for 20 biscuits or to multiply by 3. Very few students found a scale factor from 20 to 30 e.g. $30 \div 20 = 1.5$ and worked from there. A variety of incorrect methods were seen including multiplying all the ingredients by 30 or adding 10 or 60 to all the ingredients.

Question 18

For part (a), a minority of the cohort were able to produce a correct rotation. It was common to see the shape rotated by 180° with an incorrect centre; this was awarded 1 mark. A similar number of students were unable to gain any marks, common incorrect answers included reflections and translations.

Part (b) was answered less well with a small number of students gaining 1 mark for a correct explanation. For those who did gain the mark, explaining that he has reflected in $y = 3$ was the most common correct answer seen. A whole variety of incorrect answers were seen, the most common of which are highlighted in the mark scheme. Some students drew the correct reflection, but this was only awarded the mark if accompanied by an explanation such as 'it should be here'. It was clear that many students were unable to describe lines with the correct equation.

Question 19

A minority of this cohort gained 3 marks on this question; these students produced a table of values and a correct graph from there but some were seen without a table implying they used the equation of the line, gradient and intercept. Of those that didn't gain full marks, most gained no marks and many did not make any attempt to generate coordinates to be able to plot and join;

students should be encouraged to draw the table of values, those who did nearly almost always gained 3 marks. The most common errors were from finding incorrect coordinates using the negative x-values; the majority of these students only lost 1 mark as long as they plotted their points correctly and had a correct line segment through at least 3 of the correct points. Students should be encouraged to recognise that equations in the form $y = mx + c$ should produce graphs that are a straight line without a 'dog leg' or any other type of curve. If no marks were scored the most common incorrect response was simply plotting points at $(-2, 3)$ and $(3, -2)$ and joining up.

Question 20

This question was not well attempted by students. Many homed in on the statement 'Angle $BCD = 4 \times$ angle ABC' and multiplied 81 by 4 and went from there, gaining 0 marks. It is advisable for future cohorts to approach angles questions by taking in all the information given, including the diagram, and then working through systematically using the geometrical rules they know.
For the other students, 1, 2, 3, 4 and 5 marks were all awarded, with 1 and 5 being most common; those that scored 1 mark achieved $ABC = 18$ but were then unable to interpret the other information correctly and made no further progress. A few students thought that angle ABD was a right angle and hence labelled angle CBD as 72 from 90 – 18. Correct 3-letter notation was rarely seen and a significant number of students lost marks as a result. Some students misinterpreted the isosceles triangle and thought that angle BAC = angle ABC. Marks were lost by students writing the angles in the incorrect positions on the diagram thus creating a contradiction where no 3-letter notation were used for the angles in the working, with the most common being 72 being placed as angle CBD on the diagram.

Question 21

Both parts of this question saw mixed results; most students were not able to factorise correctly. Of those who gained 0 marks, many did not seem to have an idea of what factorise meant, and instead tried an incorrect simplification of the expressions. Common incorrect responses for part (a) included $-9x$ and $6(x - 2.5)$ and for part (b) it was $6m^2$.

Question 22

The full range of marks out of 3 were awarded for this question. Some students were able to gain 2 marks for a correct answer of 21; the most common methods seen were to find the factors of 63 and 105 or to find the prime factors of 63 and 105 and go from there, sometimes listing the product of prime factors and on other occasions a Venn diagram. Of those that didn't gain 2 marks, a good number gained 1 mark, often for an answer of 3 or 7 or for the correct prime factors of 63 and/or 105. Many found 3 and 7, then chose 7 as their final answer as the highest common factor of the two. The most common incorrect method seen was to find the LCM of 63 and 105 by listing multiples.

Question 23

It was pleasing to see most students pick up 1 mark for converting from an ordinary number to standard form at this late stage in the paper on (a)(i).

Part (a)(ii) saw less success with fewer gaining the mark; common errors generally focused around an incorrect number of zeros or a misinterpretation of the power of ten e.g. taking the power to be positive instead of negative.

A good portion of students were able to gain 2 marks in part (b) for an answer of 3.42×10^7. Of those that didn't, many gained 1 mark, usually for an answer of 34 200 000 or 3.42×10^n, $n \neq 7$.

Question 24

Part (a) was answered poorly with most students gaining 0 marks. Many were not able to get across that the height of the rectangle was wrong, nor could they understand that it is the perpendicular height of the prism that Rana should be using as the height of the rectangle. Many did not understand that a side elevation will make a 2D shape and a sizable number of students mistook the side elevation for the plan view, e.g. saying the dimensions of the rectangle should be 7 cm by 6 cm. Many incorrect answers were focusing on the shape of the side elevation, saying it should be a parallelogram rather than a rectangle.

Part (b) also saw very few students gain 2 marks. Some were able to gain 1 mark, usually for a 7 cm by 6 cm rectangle without a dividing line or drawing an unacceptable 'dashed' line. Most of the students scored 0 marks and a whole variety of incorrect answers were seen. Many drew a 3D shape or an incorrect rectangle or drew a rectangle which was part of a net.

Question 25

A majority of this cohort gained 0 or 1 mark on this 'compound interest' question. Many of those who gained 1 mark worked with 'simple interest' and therefore gained a mark for finding 6% of 25 000 or for one of the Special Cases in the mark scheme. Some students did work with 'compound interest' correctly and it was pleasing to see a good number of those students, once they had reached 29 775.4, understand that the answer must be an integer and give a correct answer, usually 29 775. Some students worked with both 'simple interest' and 'compound interest' figures, and chose the simple interest answer. The majority of correct answers came from using the traditional compound interest formula, marks only being lost for failing to round to a whole number. Some students arrived at the correct answer by using repeated percentage change (rather than a multiplier with power of 3), but more often than not this process led to mistakes, particularly in the last stage. A few students used the wrong multiplier e.g. 1.006 or 1.6.

Question 26

The majority of students were not able to make any progress on this question. Of those that did, one mark was often gained, usually for the 1st P1 600 ÷ 0.6 = 1000 or the 3rd P1 600 ÷ [volume], with [volume] usually being 700. A small number of students were able to work through the complete process correctly and gain a correct answer of 2; it should be noted that an answer of 2 without supportive working gained 0 marks. Some students used an incorrect formula for Density e.g. Mass × Volume.

Question 27

Part (a) saw mixed results with 0, 1 and 2 marks awarded regularly. A good number of students were able to complete the probability tree diagram correctly and gain 2 marks. Of those that gained 1 mark, completing coin B's branches incorrectly was the most common error. In part (b) few students gained 2 marks for a correct answer. Of those that didn't, most scored 0 marks and there was a huge variety of incorrect methods seen, such as 0.6 + 0.55 or showing the correct product but doing further incorrect work such as adding to another product. It should be noted that M1 could be gained for 0.6 × 0.55 only, so any additional work lost the method mark.

Question 28

A significant number of this cohort gained 0 marks on this question. It is clear that many did not know the formula for the volume of a cylinder. Of those that did not gain 0 marks, gaining 1 mark for [volume] ÷ 250 was often seen, with the most common incorrect volume used being 3000. Success beyond 1 mark was rarely seen and a minority of students were able to go on and gain 4 marks for a correct answer in the range 62 to 63.

Question 29

Part (a) saw mixed results with a similar number of students awarded 0 or 1 or 2 marks. Of those that gained 1 mark, the most common error usually related to brackets around the −5, either omitting them or putting them in the wrong place, often leading to an answer of 65.

Part (b) saw little success with around most students gaining 0 marks. The majority of those that were able to provide a correct first step, e.g. multiplying both sides by 3 to reach $3p = h - 5$, generally went on to score 2 marks. $h = (p + 5) \times 3$ was the most common incorrect answer along with $h = p + 5 \times 3$. Other incorrect solutions included adding 5 first instead of multiplying by 3 and the interchange of h and p e.g. an answer of $h = \frac{p-5}{3}$, was often seen.

Summary

Based on the performance on this paper, students should:

- learn the names of the parts of the circle.
- practise drawing pie charts from a frequency table.
- check their answers, in particular when completing two-way tables.
- practise drawing graphs of linear functions.
- understand the geometrical rules for angles and practise using these to answer longer, multi-step problems.
- practise using their calculators to deal with questions involving substitution.
- use tables and diagrams to extract information from a question to enable them to navigate through a problem.
- understand the difference between simple and compound interest.
- come prepared with the necessary equipment, particularly a calculator of which they are familiar.
- show their workings out especially when calculating percentages rather than just writing 15% of ... or 15% × ...
- understand that the sum of the probabilities of all outcomes for an event is 1 and cannot be greater than 1.
- become more familiar with including appropriate units to answers.
- practise plans and elevations.
- practise articulating their mathematics competently, using the correct mathematical language. A regular practice of mathematical discussions would help in the writing of explanations.
- ensure incorrect working is properly crossed out and it is clear which response they wish the examiner to consider as their final workings/answer.

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