Examiners' Report
Principal Examiner Feedback

Summer 2017

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

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.

Some examiners commented on having difficulties in reading some handwriting, particularly when the writing is very small.

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. Students entered for this paper seemed well suited to entry at the Foundation tier.

The paper gave the opportunity for students of all abilities to demonstrate positive achievement. While all questions were accessible to some students, there were few students able to work confidently on all questions. In particular, questions 20 (average speed), 21 (similar triangles), 23 (error interval) and 24 (quadratic equation) proved a real challenge to most students.

Report on individual questions

Question 1

Part (a) of this question requiring students to collect terms involving only one variable was quite well done. Common incorrect answers seen by examiners include $2p$ and $4p$. A less common error was to give an expression involving a term in p^2.

The second part of the question attracted only a small minority of correct answers and was the least well answered part of this question. The most common answer given was m^6. $6m$ was also commonly given as the answer.

Most students scored at least one of the two marks available for responses to part (c) for a correct term in either c or d. Many students gave a fully correct answer though some students lost a mark because they did not fully simplify $+ -4c$. Where answers were not fully correct, this was usually due to carelessness when collecting terms or to a confusion with signs. Occasionally students tried to combine the constant term with the $3c$ and wrote $13c$ or combined terms in c with terms in d, for example by writing $7c + d$ as $7cd$.

Question 2

Few students were successful in this question with 56.8 being a very commonly seen response, that is rounding to one decimal place instead of one significant figure. Some students gave the answer 60.00 which of course is 4 significant figures.

Question 3

A large majority of students scored at least four of the five marks available in this question. Parts (a), (b) and (c) were all answered very well.

The final part of the question was often correctly answered but many students found only the number of students in year 6 and did not double their answer to find the total number of students in years 5 and 6. Students who made errors in their addition but showed their method were able to gain partial credit.

Question 4

The instruction to "start with the smallest fraction" was treated as guidance only and examiners also accepted lists starting with the largest fraction. The question attracted many fully correct answers. Students were usually able to put at least three of the fractions in correct order, the most common method seen being to convert the fractions into decimals. Nearly all the students presented their answers in fraction form but examiners also accepted correct decimal or percentage form.

Question 5

Most students were able to express one thing wrong with the tally chart and one thing wrong with the pictogram with sufficient clarity to score the marks available in this question. In part (a) examiners were looking for responses which suggested that the tally and frequencies for Monday were not consistent. Nearly all students identified this. A small number of students made statements which were too vague, for example, stating that the frequencies are wrong. Other responses which could not be given any credit included comments such as "there is no title", "they have missed off some days" or "there is no total column".

In part (b) most students either identified the inconsistency between the diagram and frequency for at least one of the two days or stated that it is inappropriate to represent a half of a CD on the pictogram. Some students simply stated that "half of 3 is 1.5" without a supporting conclusion. A few students suggested that the pictogram did not show how many CDs a semicircle represented. This is clearly not the case as the key was quite clear. Similarly some students stated that there was no frequency or total column. Examiners could not give these responses any credit.

Question 6

This multi-step question proved to be a good discriminator between students of different abilities taking this paper. A large majority of students made a good start by either finding the number of £1 coins or by finding the total value of the 50 p coins. Many of these students were then able to show a correct process for working out the number of 20 p coins. However, some students added 165 (number of £1 coins) to £62 (the value of the 50 p coins) then subtracted this from 495 in an attempt to find the number of 20 p coins. A number of students used 0.3 or 30% for $\frac{1}{3}$ in their attempt to find the number of £1 coins. This was not accepted by examiners. Students who used 0.33 (or better) or 33% (or better) for $\frac{1}{3}$ were able to score some marks but this did not result in an integer number of £1 coins. Most students scored at least 2 marks overall for their response to this question, with a good proportion of students securing full marks. It was encouraging to see that nearly all students converted between pence and pounds without any trouble. Those students who did use inconsistent units usually obtained a large total sum of money but this did not seem to ring any alarm bells with the students concerned.

Question 7

This question was often correctly answered but there were some students who gave answers such as 9.985 and 99.985, which are not appropriate as probabilities. Examiners were left wondering whether all students had access to a calculator to answer this question.

Question 8

Most students scored at least two of the three marks available in this question and many students scored all three marks. Parts (a) and (b) were answered correctly by a large majority of students. For part (c), it seemed that most students understood what a prime number was but they often included at least one extra inappropriate number, for example 27

Question 9

Students could approach this question by forming and solving an equation in x or by a more informal numerical approach. The more able students often chose the former approach which led to $5x = 270$ and $x = 54$. Weaker students were often able to make a start by subtracting 90° from 360° but fewer students could then identify the need to divide 270 by 5. Instead a significant number of students assigned angles to the $3x°$ and $2x°$ such as

150° and 120° which add to give 270°. These students appeared not to realise that was inconsistent with angles with sizes in the ratio 3:2. These students had more than likely measured the angles. Students are reminded of the rubric stated on the front of the examination paper, that “Diagrams are NOT accurately drawn unless otherwise indicated”.

Question 10

This question discriminated well between students. Many students could find the cost of 150 envelopes at one of the shops, usually Letters2send and scored 2 marks for this. A much smaller proportion of students could take into account the special offer at Stationery World and £31.50 was often seen as the total cost of the 150 envelopes at this shop. This led to an incorrect conclusion. Nearly all students approached the problem by finding the cost of 150 envelopes at each shop. However, a small number of students found the cost of one envelope at each shop and compared these costs (13.96 p and 14 p). Rounding one of these values sometimes led to students giving the incorrect conclusion that both shops gave the same value.

Question 11

Students were usually able to use the graph with accuracy to change 74 cm to inches though some students gave 28 or 20.9 as their response. These could not be awarded the mark available. Part (b) proved to be more of a challenge to students who could often change 6 feet 3 inches to inches but could not clearly show with enough detail a correct strategy to use the graph to convert this to cm. Examiners needed to see the use of an appropriate method, for example 25 inches = 63 cm, so 75 inches = 3 × 63 or 189 cm to award the second method mark as allowed on the mark scheme. Responses outside the range stated on the mark scheme were awarded full marks provided a correct strategy was clearly shown and used without error. For example, though using the conversion of a small number of units can lead to less accuracy, responses such as 5 inches = 12 cm so 75 inches = 15 × 12 = 180 cm were accepted for full marks but only provided a clear method was shown.

Question 12

A majority of students gave a fully correct answer to this question requiring the use of a calculator. Most students wrote down all the figures from their calculator display as advised in the question. A significant number of students who did not score full marks scored one mark for recording a correct value for the denominator or for the numerator of the fraction. However, many students just wrote down an incorrect answer. It appears that many of them had put the whole calculation into their calculator in one go and either had not respected the order of operations or had missed out operations (such as squaring the denominator). Students should be encouraged to work out and write down the value of the numerator and denominator separately.

Question 13

Many students drew an accurate diagram showing the correct position of the quadrilateral in response to part (a) of this question. Of students who did not give a fully correct answer, some were able to draw a shape with the correct orientation but not placed in the correct position in the diagram. A small minority of students carried out the rotation anticlockwise and some students rotated the shape by 180°. Naming the type of transformation used in part (b) was straightforward for many students but only a small proportion of them could describe the detail of the reflection by stating "in the y axis" or "in $x = 0$". Though most students avoided naming more than one transformation (which would have led to the award of no marks) there were many cases where they added details of a transformation other than reflection eg "in (0, 0)". Weaker students often replaced "reflection" with terms such as "flipped over" which, as usual, was not accepted as a correct description of the transformation.

Question 14

Part (a) of this question was not well done and for many students part (b) was more successfully answered. For part (a) it was common to see -5, $5m$ and $5(-2m)$ given as answers. The factorisation of $2a^2b + 6ab^2$ in part (b) was well answered by more able students taking this paper but many students lost marks through not checking by using the reverse process of multiplying out their answers. Doing this would have helped a significant number of students detect errors. There were many attempts to combine the two terms $2a^2b$ and $6ab^2$ in other ways and responses such as $12a^3b^3$, $8ab^2$, $8ab^4$ or $8a^3b^3$ were seen many times by examiners.

Question 15

Only a small proportion of students could write 4.7×10^{-1} as an ordinary number. 47 was a common incorrect answer seen. Most students were able to use their calculator to work out the value of the calculation in part (b) and get 2 280 000 000. These students scored at least one mark, but many of them were not then able to write the number in standard form. Common incorrect answers here were 22.8×10^8 and 228×10^7.

Question 16

The use of the construction of a circle centered on *A* and the perpendicular bisector of *BC* was not often seen and this inevitably reduced the number of students being able to accurately locate at least one of the two possible positions for *T*. More students drew a suitable circle than drew a perpendicular bisector but there were also many answers, some successful in showing the position of *T* accurately, where there was no evidence of either. The mark awarded for drawing at least part of a circle radius 2.5 cm or for showing a point 2.5 cm from point *A* was accessed by a high proportion of students but examiners did not award the mark for *T* being equidistant from point *B* and point *C* as frequently.

Question 17

This question was a good discriminator. The majority of students successfully calculated the probability of the dice landing on 1. A small number of weaker students added the given probabilities but did not subtract their result from 1. It was encouraging to see that a large proportion of students also showed they knew how to find an expected frequency by multiplying a probability by 200. Some students interpreted the instruction to work out an estimate as a need to round either the probabilities or expected frequencies. This often resulted in a final answer of 100. They apparently did not appreciate that working out the outcome of 200 trials by using a theoretical model will inevitability give an estimate. Some students gave an answer in the form $\frac{98}{200}$ and so lost the accuracy mark.

Question 18

Examiners saw a small but significant number of concise, clear and accurate answers to this question. However, for many students, a clear strategy was absent and many responses could attract only one mark for the calculation of 60% of 2600 or for a correct process to find the total number of children (468). The most successful students usually calculated the total number of children and the total number of adults then either compared the total number of people to the number of seats occupied or expressed it as a percentage of 2600. Many students had difficulty dealing with the $\frac{3}{4}$ and it was common to see an attempt to divide 117 by 3

Question 19

Many students were able to score at least 2 of the 4 marks available for drawing accurate elevations. For these students it was usually the case that they gained both marks for a correct front elevation but then scored at most one mark for the side elevation. Sometimes students drew the front elevation only. Side elevations often consisted of rectangles with incorrect dimensions, most commonly a rectangle with height 1 cm. Those students who drew a correct 2 cm by 4 cm rectangle for the side elevation often forgot to draw in a solid line at height of 1 cm. A significant number of students drew at least one correct elevation, usually the front elevation, then added on to their diagram in an attempt to show this as part of a 3 dimensional figure.

Question 20

There were very few fully complete and correct solutions to this question due to most students not appreciating the need to find the total distance between Liverpool and Sheffield and the total time taken. Many students instead tried to find the average of the average speeds for the two stages of the journey. It was unusual to award more than two marks for finding the total distance from Liverpool to Sheffield and/or for a correct process to find the time taken to travel between Liver pool and Manchester. Students' understanding of conversion to change units of time was exposed in this question. For example 0.8 hours = 80 minutes was often seen.

Examiners rarely awarded the mark available in part (b) of this question. When attempts were made to answer this part, they usually consisted of statements suggesting that the distances, speeds or average speeds involved in the two stages of the journey would have to be the same.

Question 21

Students taking this paper seemed unfamiliar with the techniques needed to solve problems such as this involving similar triangles. It was rare to see an attempt involving the use of scale factors or ratios. Instead many students mistakenly thought they could apply Pythagoras's theorem to one of the triangles despite there being no indication they were right angled. A sizeable proportion of students merely subtracted lengths to find *AE*, for example, 8.1 − 2.6 = 5.5. 2.6 was quoted as the length of *AE* by some students and examiners wondered whether they had confused the arrows on sides *EA* and *DB* with the notation used for showing lengths are equal. Students may have found it helpful to redraw the diagram as two separate similar triangles

Question 22

This question on compound interest was one of the better attempted questions towards the end of the paper. Most students were able to score at least one mark by showing a correct process to work out either 2% of 25 000 or 102% of 25 000. Of students who successfully found the interest gained over 3 years most were successful when dealing with Personal Bank with fewer successful attempts for Secure Bank. This was often due to students using 1.09 as the multiplier for an increase of 0.9%. 1.43 was also frequently seen as the multiplier for an increase of 4.3%. A significant number of less able students added the interest rates and increased 25 000 by 6% for the Personal Bank and by 6.1% at Secure Bank. Examiners were unable to give these students any credit. Most students stated in words which bank gave more interest but there were still some students who merely underlined or circled to indicate which interest was most or which bank gave most interest. These students were not awarded the final communication mark.

Question 23

A sizeable number of students made no attempt at this question and it was rare to see a fully correct answer. However, many students were able to state at least one bound (either 4.755 or 4.765) and were rewarded with one mark out of the two marks available. Where inequality signs were used by students, and this was not very common, they were often used incorrectly.

Question 24

The method of solving simple quadratic equations by factorisation, a standard process, is now part of the Foundation level specification and should be accessible to the more able students taking this paper. A fully correct solution was rarely seen and attempts to factorise $x^2 + 5x - 24$ were seldom seen. Instead, much fruitless and incorrect algebra involving the manipulation and often combination of one or more of the three terms of the quadratic expression was common. A trial and improvement approach was common and often led to students obtaining one of the solutions (3) but not the other (−8). Students obtaining only one of the two solutions were not awarded any marks unless they had made a creditable attempt to factorise the expression.

Question 25

Finding an expression for the nth term of an arithmetic sequence is not new to Foundation level students and this question was answered well by a good number of students who scored both marks. Many other students obtained one mark out of two for identifying the common difference and including the term $5n$ in their final expression. For example, $5n + 2$ was commonly seen. Part (b) of this question also often attracted a correct and clear explanation that the value of $3n^2$ was 48 and not 144 together with a correct conclusion. There were inevitably many students who thought Nathan was right because $3n^2 = (3 \times 4)^2$. A small number of students approached the question by trying to solve $3n^2 = 144$ and stating that this leads to a non-integer value which is not possible in this context. This was a valid approach but usually students were unable to see the argument through to its conclusion.

Summary

Based on their performance in this paper, students should:

- Remember that diagrams are not accurately drawn unless otherwise stated
- Learn standard techniques such as writing a number in standard form and solving a quadratic equation by factorisation
- Practise solving problems which require a chain of steps to find their solution
- Carry out a common sense check on the answers to calculations; for example you should expect the number of £1 coins in question 6 to be a whole number
- Use a calculator where possible, for example to add or for checking your addition but only do this after you have written down your method
- Make sure you know the difference between simple interest and compound interest

Grade Boundaries

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