Principal Examiner Feedback

June 2011

GCSE Mathematics (1380)

Foundation Non-Calculator Paper (1F)

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1. PRINCIPAL EXAMINER'S REPORT – FOUNDATION PAPER 1

1.1. GENERAL COMMENTS

1.1.1. A significant number of candidates found this paper difficult, but it was encouraging to see many have a go at even the nominally harder questions, and often with some success.

1.1.2. The vast majority of candidates completed their answers in the spaces provided and many showed the steps in their working.

1.1.3. It was evident that most candidates had the appropriate equipment for the examination. Candidates should be advised that when using a protractor to measure the size of an angle the answer should be given correct to the nearest degree, ie not to the nearest 5 degrees.

1.1.4. Poor skills in arithmetic continue to be an issue for many candidates particular when dealing with fractions and percentages. Candidates should be advised that when using a method of decomposition to work out percentages they should show all the stages in their work *in detail*, eg when working out 10% of 800 they should write down the complete process (ie 800 ÷ 10).

1.1.5. Candidates should be advised to give a complete description of correlation. Positive correlation is acceptable, just positive or just eg good correlation, is not.

1.1.6. When writing a question for a questionnaire, candidates should be encouraged to state the time frame in the question rather than with the response boxes. Candidates should also be advised not to use inequalities when defining intervals for response boxes.

1.2. REPORT ON INDIVIDUAL QUESTIONS

1.2.1. Question 1

This question was done well. Virtually all the candidates were able to extract the required information from the table. In part (b) a small number of candidates wrote 17, and in part (c) a small number of candidates wrote 10.

1.2.2. Question 2

This question was done well. In part (a) virtually all the candidates were able to write the number 1345 in words. A small number of candidates wrote thirteen hundred and forty five which was accepted.

In part (b) the vast majority of candidates were able to write the number in figures. It should be noted that, whilst candidates were not penalised here for the use of poor notation, the use of a comma to separate the thousand and hundreds is an acceptable common practice but the use of a full stop is not. In part (c) most candidates were able to write the number to the nearest hundred. Common incorrect answers here were 4600, 5000 and 4770.

1.2.3. Question 3

In general this question was done well. In part (a) most candidates were able to write down the mathematical name of each quadrilateral. A common incorrect answer in (i) was square, and a common incorrect answer in (ii) was diamond.

In part (b), a significant number of candidates were unable to draw a parallelogram. Common incorrect answers here were trapeziums, octagons and just a single pair of parallel lines. Candidates should be advised to use the lines in the grid (and a ruler) to draw their shapes.

1.2.4. Question 4

Part (a) was done well by the vast majority of candidates. Common correct approaches were 6.20 + 6.20 + 6.20 + 6.20, 12.40 + 12.40 and 6.20×4. A common incorrect answer for those candidates attempting to multiply 6.20 by 4 was 24.84. It was encouraging to see so many candidates use the correct money notation in their answers.

In part (b), many candidates were able to score 1 mark for writing
$15.50 \div 6.20$, but many were unable to deal with this division. Most successful approaches involved either repeated addition,
such as $2 \times 6.20 + 3.10$, or repeated subtraction,
such as $15.50 - 12.40 = 3.10$ = half an hour.
2.5 was a very common correct answer. Candidates should be advised that there is a significant difference between 2.3 or 2.30 as a final answer and 2hrs 30mins. A significant number of candidates having found 2.5 (hours) as an answer in their working then went on to round this to 3 (or 2) on the answer line.

1.2.5. Question 5

Few candidates were able to score full marks in this question. The difference between perimeter, area and volume remains a mystery to many candidates. In part (a) a common incorrect answer was to interchange the values for perimeter and area. Thus 12 was incorrectly written for the perimeter and 20 was incorrectly written for the volume. The most successful approach here was to count the 1 cm lengths for the perimeter and to count the 1 cm squares for the area and show these by numbering in the diagram.

Common incorrect answers in part (c) were 12, 13, 14, and 15, where candidates omitted to count one or more squares in the hidden detail of the prism.

1.2.6. Question 6

This question was done well by virtually all the candidates. In part (a) most candidates were able to interpret the bar chart to complete the table, and, in part (b), most candidates were able to complete the bar chart from the information in the table.

In part (b) some candidates interchanged the positions of the bars or drew the height for pink as 3 or 7. Although not penalised here, candidates should be advised to complete their diagrams using the same format as the question, ie by leaving a space between the bars and by shading the bars.

1.2.7. Question 7

Part (a) was not done well. Few candidates were able to write $\frac{10}{3}$ as a mixed number. Common incorrect answers here were 10.3 and 3.3.

Part (b) was not done well. Few candidates were able change $\frac{3}{5}$ and $\frac{2}{3}$ to a suitable form for comparison. Most candidates chose to use diagrams to compare the given fractions. In virtually all of these answers the diagram method involved sketches of the two fractions which were not accurately drawn (usually circles) and which were therefore unsuitable for direct comparison of the fractions. Candidates who employ this method need to draw two accurate and same size diagrams to allow direct comparison. An alternative diagrammatic approach was to have two rectangles each divided into 15 squares with 9 shaded in one and 10 shaded in the other which, in general, was a much more successful approach. The most successful arithmetic approach was to convert both fractions to the same denominator, usually 15. Percentage or decimal conversions were less popular and also less successful. Many candidates were unable to correctly change $\frac{2}{3}$ to a decimal or a percentage. A small number of candidates chose to use the fraction of a number method to compare the values, eg $\frac{3}{5}$ of 60 is 36 and $\frac{2}{3}$ of 60 is 40, so $\frac{2}{3}$ is bigger, and this approach proved to be successful for most of them. It was disappointing to see such a great number of misconceptions with the operations that are possible with fractions, including subtracting the numerator from the denominator.

There was a very mixed response to part (c). Those candidates who showed in their work that they needed to multiplication both the numerators and both the denominators were able to gain the method mark even though poor arithmetic in later work precluded them from the accuracy mark. A common incorrect answer here was $\frac{12}{32}$ which was often given without working. A significant number of candidates were unable to cancel $\frac{12}{40}$ to $\frac{3}{10}$. Common errors here were in cancelling $\frac{3}{10}$ to $\frac{1}{5}$ or $\frac{2}{5}$. Only a handful of candidates were able to successfully cancel the fractions before multiplying them. It should be noted that a significant number of candidates treated this question as an addition problem.

1.2.8. Question 8

Part (a) was done quite well. Many candidates were able to write down the square root of 6. Common incorrect answers here were 18 and 6^2.

In part (b), only the better candidates were able to write down an acceptable estimate for the square root of 200. Most candidates were unable to write down the squares of 13, 14 or 15, or calculate them correctly. A significant number of candidates thought that because the square root of 100 is 10 then the square root of 200 must be 20.

1.2.9. Question 9

This question was generally answered well. In part (i) most candidates were able to indicate the parallel lines with arrows, but the number of arrows used by some candidates, and the places these were marked, was sometimes surprising. Candidates should be advised to use the correct notation when marking parallel lines.

In part (ii), most candidates were able to mark the angle with the letter O, but the location of the letter was often in a non-standard position, eg on the vertex of the shape.

In part (iii), many candidates were able to measure the size of the acute angle to an appropriate degree of accuracy. Candidates should be advised to write down the angle shown on their protractor rather than a rounded answer. Common incorrect answers here were 45 and 138.

1.2.10. Question 10

Generally this question was answered well. In part (a) most candidates were able to write down the next term of the sequence and give a correct reason for their answer. The most common correct answers here were 'add 5'and 'goes up in 5s', but some based their reason on the repeated pattern in the units of the terms. An unacceptable reason here was a simple statement of the *n*th term of the sequence, $5n + 2$, without further work.

Part (b) was done well. Most candidates were able to work out the tenth term of the sequence, usually by counting, but some by using the formula.

Part (c) was done quite well. This was usually done by explaining why the 4 in 504 could not be part of the repeating pattern of 2s and 7s, but a significant number of candidates thought that because the tenth term was 52 the hundredth term must be 520.

1.2.11. Question 11

Part (a) was generally done well. Most candidates were able to subtract the numbers correctly. A very popular approach here was to add numbers to 547 to make 700. Those candidates attempting to subtract the numbers by 'borrowing' often made an error in either the tens column or the hundreds column. Common incorrect answers here were 253 and 247.

Part (b) was done well by most candidates with many getting a fully correct answer. By far the most popular approaches here were the use of grids and Napier's bones. Relatively few candidates used a traditional long multiplication method. Those trying to break the multiplication down into parts often made errors by missing out some of the combinations. Common errors in the grid approach usually involved simple arithmetic errors such as $20 \times 3000 = 5000$, $20 \times 50 = 100$ and $6 \times 4 = 25$, whilst in the traditional approach the misalignment of numbers in columns resulted in errors in place value, eg 2124 + 708(0) = 2832

1.2.12. Question 12

This question was not done well. Few candidates managed to score all three marks for this question. In part (a), only about half the candidates were able to write down the mathematical name of the 3D shape. Common incorrect answers here were square based prism and triangular prism. Candidates continue to find working with 2D representations of 3D objects a challenge.

A significant number of candidates were unable to count all of the 'hidden' faces in part (b), or all of the 'hidden' edges in part (c).

A common incorrect answer in part (c) was 5, partly resulting in confusion between edges and faces, but also by omitting to include the dotted lines in the diagram.

1.2.13. Question 13

This question was not done well. A significant number of candidates simply put a cross at 0.5 in all three diagrams. In parts (a) and (b), a significant number of candidates did not put their cross exactly at 0 and exactly at 1. Candidates should be advised about the practical interpretation of likelihood, eg that although nothing can be considered to be truly certain, like the sun rising tomorrow, that for all intents and purposes the probability that the sun will rise tomorrow is as close to certainty (ie unity) as makes no difference.

A common incorrect answer in part (c) was to place the cross at 0.25. A significant number of candidates did not place their cross on the probability scale but somewhere above or below the line.

1.2.14. Question 14

This question was done well. Most candidates were able to use the number machine to complete the table. Some candidates were unable to calculate the reverse process correctly. Common incorrect answers for the input were 21 and 16.

1.2.15. Question 15

This question was not done well. In part (a), few candidates could both measure the distance between Church and Castle accurately and use the scale of the map to find the real distance. A very common incorrect answer was 82 000. The conversion between metric units continues to be a problem for many candidates. The statement of a correct conversion factor, such as 1m = 100cm, was comparatively rare, as was a correct answer in the required range. It was not uncommon to see the incorrect calculation $8.2 \times 10000 = 802000$.

In part (b), only the best candidates were able to find the bearing of the castle from the church. Common incorrect answers here were 50, 310 and 230, showing, perhaps, the full range of misconceptions surrounding this topic.

1.2.16. Question 16

This question was answered well. Most candidates were able to use the timetable to answer the various questions, and most candidates presented their answers using an appropriate notation for time.

Parts (a) and (b) were mostly done correctly.

A common incorrect answer in part (c) was 11 03.

1.2.17. Question 17

Generally this question was not done well, but many candidates were able to score a mark for rounding at least two of the three numbers to one significant figure. Common incorrect answers here were 7.19 rounded to 8 and 0.46 rounded to 0 or 1. Candidates should be encouraged to show all the stages in their work, ie rounding the numbers, multiplying the two top numbers together, then dividing the top number by the bottom number. It was particularly noteworthy that whereas many candidates where able to reach the stage 140/0.5, few were then able to correctly evaluate this as 280. By far the most common incorrect answer here was 70.

1.2.18. Question 18

Part (a) was done very well. Most candidates were able to complete the 2-way table correctly.

Part (b)(i) was generally done well. Most candidates were able to use the information in the 2-way table to write down the correct probability in the required format. Few candidates wrote their answer incorrectly as '7 out of 50' or as a ratio. Part (b)(ii) was not done well. A very common incorrect answer here was $\frac{9}{25}$.

1.2.19. Question 19

This question was not done well. Few candidates could work through the problem in an organised way. Calculations were often seen all over the page, some processing the numbers in ways that bore little relation to the demands of the question. Having said this, a large number of candidates were able to score a mark for writing 160×50, even if they were then unable to calculate this correctly. Only a small number of candidates were able to find 35% of their total correctly. This was generally done by a method of composition such as $3\times10\% + 5\%$. Candidates should be advised that when they are using a method of decomposition to work out percentages they should show all the stages in their work in detail, e.g. when working out 10% of 800 they should write down the complete process (i.e. $800\div10$). Having reached the total cost for the computers few candidates attempted to divide this by 400. The most common approach was to build up multiples of 400 to reach the target amount, e.g. $10\times400=4000$, $4000+4000=8000$, $8000+2800=10800$, so 27 computers.

1.2.20. Question 20

This question was not done well. Few candidates knew the correct conversion factor between km and miles, consequently few were able to convert the numbers to the same units for comparison. Where reasons were given, the most common were:

(a) miles are greater than kilometres,
(b) mph is faster than km/h, so 120 mph is faster than 184 km/h,
(c) car A because km/h is bigger than mph,
(d) 10 km = 1 mile, 184 km = 18.4 mph, car B,
(e) 184 – 120 = 64, car A 64 mph bigger,
(f) 184/2 = 92 mph, answer car B 120 mph,
(g) km/h is how far you go and mph is how fast,
(h) roughly 20 km/h for every 10 mph, 120 mph = 240 km,
maximum speed = car B,
(i) car A = 184 km, there are 2 km in a mile. Car B has higher maximum speed.

1.2.21. Question 21

In part (a), many candidates were able to substitute the numbers into the formula, but a significant number of these were then unable to resolve the negative signs to arrive at a correct answer. Common incorrect answers here were $2 \times 5 + 3 \times -1 = 10 + 3$ (=13) and
$10 + -3 = -13$.
Partial substitutions were also popular, eg $2 \times 5 + 3 - 1 = 10 + 2$ (=12). A small but not insignificant number of candidates wrote $25 + 31 = 56$.

In part (b), the requirement to calculate the formula in the correct order escaped all but the best candidates, many of whom were unable to work out –4 squared correctly. Very common incorrect answers here were –48, 144 and –144.

1.2.22. Question 22

This question proved very challenging for most candidates. There were few completely correct answers to this question. When dealing with the numbers as fractions, most candidates were able to get a mark for $40\% = \frac{4}{10}$, but were then unable to add the fractions together. When dealing with the numbers as percentages, few candidates were able to gain any marks. A common error here was to write $\frac{3}{8}$ was 38%. Some of the weaker candidates thought that $\frac{3}{8} = 24\%$ (presumably from 3×8). When dealing with the numbers as decimals, few candidates were able to gain any marks. Some candidates tried to divide the 3 by the 8 but got discouraged by the number of steps they needed to perform. Many of those who worked with fractions and who found the totals for film A and film B often did not go on to subtract this from 1.

1.2.23. Question 23

Part (a) was not done well. Few candidates were able to reflect the shape in the line $x = -1$. The most common incorrect answers here were reflections in the x-axis, the y-axis and in the line $y = -1$. A significant number of candidates rotated the shape about O.

In part (b), few candidates were able to describe the transformation as a translation. Common unacceptable answers here were move and shift. Many were unable to describe how the shape was translated. Some giving unacceptable descriptions such as down 1 and across 6, and others, describing the movement in the wrong direction from Q to P. Few candidates attempted to give the movement purely as a vector, and those that did were usually unsuccessful.

1.2.24. Question 24

This question was done well. In part (a), most candidates were able to describe the relationship between the number of pages and the time taken to read them. Most chose to describe the relationship in words rather state positive correlation, and usually with some success. Candidates should be advised to give a complete description of correlation- positive correlation is acceptable, just positive or just eg good correlation, is not.

Part (b) was done well. Most candidates were able to give an estimate in the required range. A small number of candidates thought that they had to write their estimate as a time.

1.2.25. Question 25

In part (i), most candidates were able to write down the size of the required angle, but in part (ii) only the best were able to give a correct reason for their answer. A popular and currently acceptable alternative to this was F-angle.

Typical incorrect answers here were:
(a) because they are on parallel lines,
(b) parallel angles are equal,
(c) because it is the same as SRB,
(d) it is parallel on SRQP and
(e) opposite angles are equal.

1.2.26. Question 26

In part (a) many candidates had some notion of what it means to expand an algebraic expression, but few were able to do it correctly. Common incorrect answers here were $x^2 + 2$, $2x + 2$, $2x + 2x$ (leading to $4x$ or $2x^2$). A significant number of candidates having reached $x^2 + 2x$ then incorrectly went on to simplify this further, to eg $3x$.

In part (b), few candidates were able to factorise the given expression. Common incorrect answers here were 5 and $3x - 2$ (on their own), and eg $5(3x + 2)$, where only one of the terms in the brackets was correct, or just $5x$ (very common).

In part (c) only the best candidates were able to expand the brackets and simplify the terms correctly. Candidates should be advised that the expansion of two pairs of brackets results in four terms. Common incorrect answers were based on a poor understanding of notation ($x \times x = 2x$) or an inability to resolve directed numbers ($+3x + -4x = 7x$ or $-7x$).

1.2.27. Question 27

This question was not done well. Few candidates were able to use the information in the question to set up the problem in the required ratio 1:3:6. Many simply divided 54 by 3 and went no further. Some candidates were able to select a trial solution in the required ratio, eg 5, 15, 30, but few were successful in producing a completely correct answer. Common incorrect approaches here were to work with the ratios 1:3:2 or 1:2:3.

1.2.28. Question 28

This question was done well. Most candidates were able to design a suitable question for Sophie's questionnaire and include at least three non overlapping response boxes. Common errors include the omission of a suitable time frame, eg each week, in either the question or the response box section, and ill defined response boxes, eg overlapping or non exhaustive intervals. Candidates should be encouraged to state the time frame in the question rather than with the response boxes. It should also be noted that it is unacceptable to use inequalities when defining intervals for response boxes.

1.2.29. Question 29

Only the best candidates were able to make much progress with this question. Some candidates were able to score a mark or two for an attempt to work out the area of the cross section and/or for correctly multiplying their volume by the density. A very common incorrect answer for the cross section was 14 + 14 = 28. A significant number of candidates confused the area of the cross section with the perimeter of the cross section. Few candidates realised that the units given in the diagram (cm) where different to the units given for the length (m) and simply multiplied their area of cross section by 2. A considerable number of candidates did not attempt this question.

1.3 GRADE BOUNDARIES

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