GCSE EXAMINERS' REPORTS

MATHEMATICS
GCSE

NOVEMBER 2021

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MATHEMATICS

GCSE

November 2021

Foundation tier: component one

General Comments

In order to succeed in this examination, candidates needed to read each question carefully and make sure that they used all given information in their solution. For example, in question 24(a), many candidates did not use the relative frequency. Candidates who presented their work in a neat and clear way, indicating what the values they had found represented, were generally more successful. In questions 5 and 13(b), for example, the presentation of work was sometimes poor, with many unidentifiable, incorrect calculations that generally could not be credited.

Many candidates were able to access a reasonable proportion of the examination paper and syllabus coverage overall seemed to be reasonable, although algebraic skills remain weak. This examination did not allow the use of a calculator. A good number of candidates were able to determine the method needed to solve many of the problems set but were unable to work accurately. This was evident in questions 4, 15 and 23, for example. These candidates could improve if their basic arithmetic skills, particularly those involving division, were to be strengthened.

Most candidates seemed to have sufficient time to answer those questions that were within their capability, although some candidates omitted the final question, possibly because of its algebraic content.

Comments on individual questions/sections

Q.1 Most candidates seemed to find this question accessible.

(a) **(i)/(ii)** Answers varied for the square number, with 2 being fairly common, although 16 was also stated. The smallest prime number was commonly stated as 3, although some correct answers were also seen.

(b) **(i)/(ii)** Part (i) was well-answered. In part (ii), it was common for the decimal point to be incorrectly placed and 45 was a common incorrect answer.

(c) This was reasonably well answered. Common wrong answers were $\frac{1}{17}$ or 0.17.

(d) Candidates needed to write the values in descending order. A few candidates did this correctly. Some candidates started 0, 0.03, and others wrote the values in ascending order. Another common issue was to write 0.03, 0 and then -5, -2.

(e) A good number of candidates earned both marks. Some candidates were able to get as far as $240 \div 12$ but were not able to evaluate it correctly. Only a few candidates were not able to find 240.

Q.2 **(a)** This part of the question was generally well answered with a good proportion finding the correct difference.

(b) **(i)** A good number of correct answers were seen. A few would have improved if they had written down the probability they were trying to mark on the scale, so that credit could be given if the scale was incorrectly marked. Some candidates were clearly guessing, as random arrows appeared on the probability scale without any supporting work. A few candidates incorrectly interpreted the probability scale as a number line.

(ii) When a simplified answer is required, candidates should be encouraged to write the un-simplified fraction down first and then simplify it, so that credit can be given when errors occur. A reasonable number of candidates earned one mark but fewer were able to earn both marks. Those who read the question carefully and used 120 as the denominator of their fraction were more successful. A few candidates were able to deduce from the pictogram patterns that World cup represented $\frac{1}{3}$ without ever indicating $\frac{40}{120}$. Some candidates earned a mark for their fraction, with either denominator or numerator correct, cancelled down to lowest terms. A few cancelled down $\frac{40}{120}$ but stopped at $\frac{5}{15}$ or $\frac{2}{6}$.

Q.3 A reasonable number of candidates indicated correct answers in both parts. A few candidates earned one of the two marks available; many more candidates did not score.

(a) The most common wrong answer was $5x + 7$.

(b) The most common wrong answer was $n \times n \times n \times n$.

Q.4 A reasonably good number of candidates offered fully correct solutions to this problem. Other candidates commonly stated correct method steps but were unable to cope with the arithmetic needed for one or other of the calculations. Most candidates understood the need to multiply 30 by 12 and 13. Multiplying 30 by 12 was far easier than by 24 and then halving, but not all candidates observed this. Some candidates made the final mark harder as the difference in their values was much greater than the actual answer and some could not cope with the subtraction that resulted. There were a few candidates making an order of operations error when calculating the cost for Supadeal, with 25 being added before the cost was halved. A common error seen in weaker responses was not to halve at all and have £745 for Supadeal. Other poor responses suggested that she should choose Rugs to Go because the prices were always low and delivery was free or added the values given instead of multiplying or treated the 24 and 13 as quantities of metres.

Q.5 This question required candidates to apply a handful of simple geometric skills. Unfortunately, most candidates were unable to deduce what was needed and generally responses were very weak. Few candidates were able to recall and use that each angle inside an equilateral triangle is 60°. Not many, therefore, were able to make progress with finding either angle *a* or angle *b*. Some candidates were credited for a correct follow through value of *c*. Arithmetic errors were seen, but more common were errors in their geometric reasoning. Candidates could find angle *c* in various ways and, perhaps, the best method was to use quadrilateral *PRTS*, which only relied on knowing that the angles in the triangle were 60°. However, this was seldom seen. Some candidates did not deduce that angles *UPS* and *PST* were 90° and other candidates treated *RT* and *QS* as being parallel and suggested that $b + 85° = 180°$. A small number of candidates appeared to be measuring angles from the diagram, even though it is clearly labelled as not being drawn to scale. Candidates should be aware that random jottings on the page, with many incorrect angles calculated and not linked to the diagram in any way are seldom likely to produce creditworthy solutions.

Q.6 **(a)** This part of the question was mostly correct, with weaker responses reversing the coordinates.

(b) **(i)** A reasonable number of candidates earned both the available marks, but the majority earned one mark, either for the correct right angle or a point plotted at (4, 7). A few candidates chose a point *C* that was collinear with *A* and *B*. Even though this occasionally satisfied *BC* being twice *AB*, it was not credited as the three points did not make a triangle.

(ii) This part of the question was a strict follow through of the candidate's answer to part (b)(i). Some good answers were seen although, clearly, some candidates were unable to recall the meaning of congruent as there were many incorrect plots.

Q.7 **(a)** A good number of fully correct responses were seen. Some candidates made arithmetic slips and there were a few who clearly did not understand the strategy needed.

(b) A few fully correct answers were stated. Some candidates earned a mark for stating a probability with the correct denominator, but many either stated $\frac{9}{16}$ (the probability of winning) or $\frac{6}{16}$ (perhaps forgetting to count the 11). A few candidates were penalised for writing their answer in an incorrect form such as 7 : 16.

Q.8 **(a)** **(i)/(ii)** A reasonable proportion of candidates understood the correct order of operations and earned both marks. Common errors seen in either or both parts were to bracket 1×2 and/or $36 \div 2$.

(b) Most candidates decided Callum was incorrect. A few candidates offered the simplest solution '$40 - 30 = 10$ and $10^2 = 100$'. Some candidates chose other successful approximations such as $41 - 30$ and then squared 11 or $41 - 29$ and squared 12. A few candidates attempted to find the actual value, which was allowed, but the arithmetic was significantly more difficult and errors were common. A few candidates indicated they intended to square and then double, so were penalised. A few simply doubled without any indication of squaring, this was not accepted as the operations needed to be correct for partial credit to be given. A small number of candidates calculated $1600 - 900 = 700$ and determined that Callum was correct.

Q.9 **(a)** **(i)** Most candidates stated the correct answer.

(ii) A small number of correct answers were seen, but many candidates spoiled their answer by continuing and stating a final answer of $17x$. Some wrote $17x$ without showing a complete expression, such as $2x \times 7 + 3$ or $14x + 3$ and were not credited.

(b) Many candidates stated an acceptable form of the correct answer. Weaker responses showed that candidates had disregarded, or omitted to notice, the instruction to use multiplication or division and these usually subtracted.

Q.10 **(a)** There were a good number of fully correct answers to this part. A few candidates stopped having found 24 or were unable to halve 24 successfully and these benefitted from the special case. It was rare for a candidate not to attempt this part of the question or make little progress.

(b) Fewer correct answers were seen to this part of the question, although there were a reasonable number. A few candidates earned a mark for indicating they were trying to find $26 \div 4$. More candidates may have been credited if they had written this down as, when using build-up approaches, many did not take into account that 2 was half of 4. Weaker candidates tried $31 \div 9$ or $31 \div 4$.

Q.11 **(a)** This part was often answered correctly. Common wrong answers included 4 and 9.

(b) A few candidates did offer fully correct solutions, commonly by finding £800 per year and then stating 1% of £20 000 = £200 and building-up to £800. Many candidates earned one mark, generally for finding that the interest was £800 per year or that £4000 was 20% of £20 000. Two marks were rarely awarded. Common wrong final answers were 20% or 5% (from $20\,000 \div 4000 = 5$) or 25% (from $20\,000 \div 800$).

Q.12 **(a)** Whilst a fairly good number of candidates were able to calculate the cost of the Family room successfully, far fewer engaged with the calculation needed for the Double plus rooms. Most commonly, the cost of this was given as $160 \times 2 =$ £320. A small number of candidates misinterpreted the question and found costs for 2 adults and 2 children. A few other candidates miscalculated their values resulting in the cost of the Double plus rooms being less than the Family room. This was not accepted for the final mark, which otherwise followed their values as long as a method mark had been awarded.

(b) **(i)** Some good solutions were seen to this part of the question, with many gaining full credit. Common wrong answers often involved dealing with the extra 5 minutes, after adding the initial 5 mins, or the 10 minutes if that was dealt with at the end. Many earned one mark for a build-up approach with a slip. The summation of time had to be attempted, it was not sufficient just to write it down. Very few candidates subtracted instead of adding.

(ii) In this part, method marks were awarded for a correct complete strategy. Candidates who worked out the difference in the take-off and landing times, as they were given, as 4 h 15 mins and then added 5 h 30 mins usually had the simplest and neatest solutions. Candidates who attempted to deal with the 5 h 30 mins first often miscalculated and were then unable to earn the accuracy mark, although commonly earned 2 method marks. A few candidates did not deal with the change in time correctly and added 5 h 30 mins to 11 05. Some solutions were insufficiently clear to be credited. It is important that candidates indicate what they are trying to find before they attempt to find it.

(iii) Correct answers were general statements about the flight time being shorter. Candidates who determined exact values for the duration of the flight were not credited as this could not be justified.

Q.13 Many candidates made no attempt to answer either part of part (a).

(a) **(i)** This was very poorly answered, and marks were rarely awarded.

(ii) Candidates who had at least marked a point for *D* were able to earn credit here, although the accuracy of measurements was variable, and a few candidates forgot to use the scale.

(b) A fairly good proportion of fully correct answers were seen. Those that were not fully correct commonly either forgot to take account of the hour for lunch or worked as if there was only 1 trip every 2 hours. Some candidates were unable to cope with the arithmetic. Other candidates would have improved if they had communicated better what their values represented. It had to be clear, for example, that 48 passengers represented 48 passengers in 2 hours and not in any other time frame or that 6 represented the number of working hours. This could not always be determined.

Q.14 **(a)** A good proportion of candidates correctly chose *Q* and offered a sensible reason based on the speed or rate of travel. Those that chose *P* seemed to have reversed the meaning of the axes.

(b) **(i)** A reasonable number offered a fully correct graph for the bus journey. A few candidates began the journey at 1530. Some candidates had no section to represent the part of the journey in the traffic jam. Other candidates used a single line for the whole bus journey, perhaps mimicking the journey of Nicky and of Alf. Those candidates who did have three sections, commonly made an error, representing the last part of the journey as taking 20 mins rather than the whole of the bus journey. Several candidates made no attempt to answer.

(ii) Most candidates were attempting $2 \div 0.5$ or 2×0.5. Those who wrote '2 km in 60 mins' or '1 km in 30 mins' were much more successful. This was a much better non-calculator approach.

(iii) Answers to this part were variable. Many candidates omitted it altogether and others did not stop the line they drew at 2 km.

Q.15 **(a)** Many candidates correctly found that Paige worked for 6 hours. A few candidates wrote that they were finding $51 \div 8.50$ and earned the method mark even though they could not evaluate this. Some candidates used efficient build-up methods and counted in 17s. Candidates who added several amounts of £8.50 often made an arithmetic error which resulted in them not reaching 51 exactly.

(b) **(i)** A good number of correct answers were seen. Some could not manage the arithmetic, although their method was otherwise sound. Some candidates omitted to add the values for the day-time and night-time, thereby not engaging with the context of the question. These earned partial credit.

(ii) Candidates found this part more challenging as there was a problem-solving element. Many were able to deduce the correct first step was to divide 360 by 5. Few were able to find 72 correctly. Many who did stopped at that point. Those who realised that the 72 represented £ and not hours usually went on to complete the question correctly. A common misinterpretation, from those who did not offer a correct first step, was to think that £360 was the pay for the night-time and to divide by 4.

Q.16 It was very rare to see a correct answer to this question. Only a handful of candidates added $\frac{1}{3}$ and $\frac{2}{5}$ correctly and then made the correct connection between the fraction $\frac{11}{15}$ and 33. Some candidates were able to add the fractions but made no progress beyond that. Other candidates added incorrectly to get $\frac{3}{8}$. Some of these concluded 88 members and so earned a method mark for a correct process. Most responses indicated that 11 people painted and so 22 must sew, or similar. Some answers of 45 were incorrectly derived and these were not credited. Many candidates made no attempt to answer.

Q.17 This question was common with Higher tier.

(a) A fair number of candidates drew a sufficiently accurate line of best fit, following the trend of the data and being of reasonable length. A small number of these used the information given about the mean point correctly, plotted it and drew the line through it. The line drawn needed to be ruled and a handful were not. Some were far too flat or steep and so did not follow the trend. A few candidates tried 'dot to dot', which was completely incorrect. Some candidates made no attempt to answer.

(**b**) **(i)** A good number of candidates stated an acceptable value. Weaker answers offered a letter rather than a letter size as the answer, or stated 6, not reading the question carefully enough.

(ii) Candidates needed to observe that Jared's age was outside the data set and so the graph should not be used. Many candidates did this successfully.

Q.18 This question was common with Higher tier.

Candidates needed to address the two issues with the survey question given. Firstly, the use of the word 'politics' was too vague and needed to be embellished with 'recent' or 'national' or preferably both. Also, the response boxes offered were too limited, as they offered no opportunity to say 'none of these' or 'I use another option'. A few candidates successfully dealt with both points, but many observed and corrected only one of the two issues. A few candidates gave questions that had wording that was not an improvement on the original and response boxes that, although increased in number, still did not offer all possible options. A few candidates thought that ticking multiple boxes improved the question. Others gave two questions rather than one, with varying results.

Q.19 This question was common with Higher tier.

Many candidates made no attempt to answer any part of this question.

(a) A few candidates gave the correct answer. Some candidates spoiled this by then attempting to square the surd. Those who attempted to answer often wrote $8\sqrt{14}$, $8\sqrt{49}$ or other values of no merit.

(b) Candidates found this part of the question very challenging and, for the vast majority of them, cube-rooting 8000 was beyond their capabilities. Common wrong answers included 2006 and 24 006 (from $6 + 3 \times 8000$).

(c) Candidates were more successful in this part with a handful of correct answers seen and many others earning a mark for a final answer of 3^2. A few candidates destroyed an otherwise-correct answer by going on to write 1^{38} or 9^{38}.

Q.20 This question was common with Higher tier.

Candidates were asked to use the table when answering this question and, whilst it was not necessary to complete all the cells, it was important that the table was completed as far as necessary so that marks could be awarded. A few candidates offered fully correct solutions. Some candidates completed the table correctly and then extracted an incorrect probability from it ($\frac{49}{125}$ and $\frac{21}{49}$ were not uncommon). A few candidates would have done better if they had taken more care in writing down the values they had been given and also more care with their arithmetic. Candidates who, when completing the table found it impossible to complete a cell, may have improved if they had checked these.

Q.21 This question was common with Higher tier.

(a) **(i)/(ii)** Very few candidates used the appropriate mathematical word 'similar'. Common answers were congruent, the same or equal. Proportional was not accepted as this was indicated in the question. In the second part of the question, few completed with a number. Those that did usually wrote 2 or 5 or 7 or 3. Other candidates simply repeated the ratio.

(b) A few candidates earned a method mark for 7.5 ÷ 'their 2.5' from part (a). The few candidates who used the ratio afresh and ignored their answer to part (a) often fared better and earned both marks.

Q.22 Many candidates made no attempt to answer some or all parts of this question.

(a) A handful of correct answers were seen. A few more candidates earned a mark for a term $9n$. The most common wrong answer was $n + 9$.

(b) **(i)** The answer to this part was rarely correct. Some candidates got as far as $3(100 + 1)$ or wrote $3 \times 100 + 1$, then gave the answer 301. There were many algebraic answers rather than numerical ones.

(ii) The simplest explanation, that 601 is not in the 3 times table, was not commonly stated. A few candidates thought about tables, but commonly opted for the 9 times table, possibly confusing themselves with the n^2.

Q.23 This question was common with Higher tier.

A reasonable number of candidates gave neat and accurate solutions to this problem. Some made a correct start but were unable to deal with the proportions successfully. Finding 20% of 5 was a challenge for some, similarly others made hard work of 25% of 20, whereas 10% of 15 was usually correctly found. Others forgot to sum the numbers of trays. A few candidates made no real progress beyond finding 40 ÷ 8 = 5 or 5, 15, 20. Weaker responses suggested that 20% + 10% + 25% = 55% of the trays were uneaten and often attempted to work out 55% of 40. Some candidates made no attempt to answer.

Q.24 This question was common with Higher tier.

Many candidates made no attempt to answer either part.

(a) Coverage of this part of the syllabus seemed to vary and fully correct answers were rare. Many candidates did not seem to understand relative frequency as an estimate of probability and many tried to sum and use values from the graph in this part, which was not a valid method. Other candidates tried to include the minimum spend of £25 as part of their calculation of the value of the sample boxes or did not use the relative frequency at all and $3 \times 400 = 1200$ was a common incorrect answer.

(b) In this part, commonly candidates said 'no' because there were two values of 0.31 or because 0.38 was not the highest value or said 'yes' and then gave the reason that all the values were between 0.3 and 0.4 and 0.38 fitted that, or similar. It was very rare to see a suggestion that 1000 was the largest number of customers shown in the graph.

Q.25 This question was common with Higher tier.

(a) **(i)** This part of the question was poorly answered. Some tried, without success, to solve the equation algebraically. This was not accepted as the question clearly stated that they should use the graph. It was rare to see the correct decimal. Commonly the y-coordinate was stated or both coordinates were stated or 4 was stated (y-intercept of one of the graphs) or no attempt was made to answer.

(a)(ii)/(b) Responses varied. A few were fully correct. Common wrong choices were $3y = x - 1$ and $7 = xy$ or $x + y = 1$.

Summary of key points

- Generally, candidates had a reasonable understanding of the methods that needed to be used to solve problems. However, their arithmetic skills were not always good enough for accurate answers to be given.
- Mental arithmetic leading to an incorrect answer, cannot be credited if no working is seen. Also, when candidates used a build-up method in lieu of division, it was better if they stated the division calculation first, so that it was clear exactly what they were trying to find in their build-up approach.
- Calculations with lengths of time were an issue for some candidates. Again, a few may have improved if they had stated what they were attempting to do before carrying out their build-up approach. The result would have been a clear method that could then, potentially, have been credited.
- Candidates needed to be aware that a ratio was not an acceptable form for a probability. Fractions were commonly the simplest presentation, with decimals and percentages also being accepted, unless the question required a particular form.

MATHEMATICS

GCSE

November 2021

Foundation tier: component two

General Comments

To do well in this examination, candidates needed to interpret each question carefully and make sure they used all the given information, particularly key words, and phrases, in their solution. They should have shown all their methods. Those candidates who presented their work in a neat and logical way were generally more successful.

Many candidates were able to access a good proportion of the earlier questions. However, a lot of candidates did struggle to attempt some of the middle questions and those that are common with the higher tier paper.

Candidates were able to use a calculator for this paper but sometimes chose to use non-calculator methods. For example, on 10(a) some candidates chose to find multiples of 10%, 5% and 1% to find 69% of 118p. Similar methods were observed on question 18. When this approach was used, there were often numerical errors.

A large proportion of candidates chose to use trials on questions where a direct algebraic approach was required. On question 20, candidates were required to form and solve simultaneous equations. Although some candidates were able to form the two equations, very few attempted to solve them using an algebraic method. Question 17(b) was also solved without the use of algebra in most cases.

All candidates seemed to have sufficient time to answer those questions that were within their capability.

Comments on individual questions/sections

Q.1 Candidates made a good start with this question, with many gaining some of the marks. Candidates selected words from the given list, it was rarely un-attempted. In part (b), a good proportion of candidates chose the incorrect answer 'an even chance', where they considered to chance of it raining to only have two options with equal probabilities.

Q.2 **(a)** A good number of candidates were successful in this question and were able to change between pounds and pence accurately. Most of the errors seen in this question were numerical slips.

(b) Although this part of the question was generally answered well, there were a few candidates that were unable to select a method to find 0.25kg of cheese. Even though they were successful in finding the cost for 0.5kg of cheese in part (a).

Q.3 The majority of candidates were able to answer both parts of this question accurately. If errors were made it was usually in the sum of the angles in a full turn or in a triangle. Some candidates incorrectly chose a sum of 180° for angles in a full turn and 360° for angles in a triangle

Q.4 **(a) (i)(ii)** Candidates engaged well with this question. Most got at least one of the parts correct. The correct rectangles were frequently seen and were often accompanied by the correct perimeter. Some candidates chose to multiply two or four of the sides of their rectangle to calculate its perimeter.

(b) Although this part of the question was well attempted, two marks was not often awarded. In most cases either the angle was measured correctly within tolerances, or the line was. A minority of candidates chose to re-draw the original line of 8cm and not use the one given, when this was done it was usually drawn the correct length (within a tolerance of $\pm$2mm) and so subsequent marks could be awarded.

Q.5 **(a)** This part was well answered. However, some candidates misinterpreted the question and attempted to find the total savings for the week instead of for one day.

(b) Most candidates answered this question well. Common errors that were seen included using the unlimited day ticket cost instead of the return ticket cost, and calculating costs based on a seven-day week instead of a five-day week.

(c) Many candidates arrived at the correct cost for the cheapest way to travel for 3 days, however, some forgot to state their selection, 'day ticket', to complete the question.

Q.6 This question proved challenging for most candidates. Full marks were not often awarded. Very few candidates structured their methods. Most often, random lists of numbers were observed. Where an answer was given, it often only met one part of the criteria for the problem and so only one mark was awarded. 4 and 8 was a common incorrect response.

Q.7 **(a)(i)** Candidates were generally successful in this part. The most common incorrect response of 2w was seen.

(a)(ii) This part of the question was well attempted. Most candidates were able to correctly collect the x's or the numbers. Please note that an answer of 8x +-1 is not awarded full marks as the candidate has not decided which sign to attach to the 1. $7x^2$ -1 and 8x – 7 were common incorrect responses.

(b)(i) When this part was attempted, the correct answer of 2.25 was usually seen.

(b)(ii) The correct answer of 312 was seen frequently on this question either as a result of rearranging the formula and calculating 12 x 16 or as an embedded answer in a fraction $12 = \frac{312}{26}$.

Q.8 **(a) (i)(ii)** Many candidates understood how to use the ratio given in part (i) and arrived at the correct answer of 50.4cm. Some candidates chose an incorrect method and shared the length 2.8cm in the ratio 1:18. Whereas others read 1:18 as a decimal 1.18 and added it onto 2.8cm.

In part (ii) candidates were expected to explain what was incorrect about Tomas's method. Successful candidates gave comments such as 'he did not convert to cm correctly', 'there are 100cm in a m' or 'the correct answer should be 8.5cm'. An explanation which highlighted that the units had been changed incorrectly from centimetres to metres was required here.

(b) (i)(ii) A correct ratio was seen some of the time but not always in its simplest form 2:1. A common error was the ratio written the wrong way around. When this was the case, it was sometimes followed by an answer of 38 hours, from correct use of the ratio 1:2. 114÷ 2 = 57 was a common incorrect response to this question.

Q.9 Very few candidates gained marks on all parts of this question. If marks were gained, they were usually from correctly completing the values in the table. Candidates were usually able to plot some or all their values correctly but did not always join them up to make a straight line, even when all were plotted correctly. Very few candidates could draw the line x = 2, although some were able to find the intersection point in part (e) without it.

Q.10 (a) Candidates that chose a calculator method in this question were usually successful at arriving at the correct answer. However, some did not interpret 81.42p as an exact amount and chose to give a final answer of 81p.

A number of candidates chose to use a non-calculator method to find 69% with most using a partitioning method. For example, finding multiples of 10%, 5% and 1%. Where this method was used there were often numerical errors leading to an incorrect answer.

(b) This part of the question was answered well. Many candidates arrived at the correct answer and showed their steps logically. Where candidates did not gain full marks, they were usually able to start the question off by calculating the total cost of 51 litres of diesel. Some then went on to subtract this from the total cost of £130.29. Common errors at this stage were multiplying the cost difference by the cost per litre of petrol. Some simply stopped working at this stage.

Q.11 Candidates were able to attempt this question with more success than in previous papers. A common approach was looking for the cost per 100ml of each bottle. But pence per ml and ml per pound for all three bottles were also seen regularly. Candidates that used one of these methods were usually successful in gaining all three marks.

A common incorrect method was looking at the cost difference between each bottle. For example, 'the 700ml bottle is only £1.27 more than the 400ml bottle for an extra 300ml'. This does not provide a comparison of price per millilitre or equivalent volumes with their associated costs and so marks could not be awarded.

Q.12 (a) (i)(ii) A good number of candidates were able to find the total number of baskets of blackcurrants sold in (i) by listing the heights of each bar to arrive at the correct answer. Whilst some simply counted the number of bars, or the numbers labelled on the horizontal axis. The answers 4 and 6 were seen a number of times as a result.

In (ii), 57 was often seen in the workings but not always with a correct denominator. Or, sometimes not in a fraction at all. 57/269 was a common incorrect answer, where the candidate had used the 269 from the stem of the question instead of the total number of baskets. 2/4 and 3/6 were also common incorrect responses where the candidate had either counted the bars as the total number of baskets or the labels along the vertical axis.

(b) (i)-(iv) It was clear that most candidates had some understanding of how to calculate the mean, median, mode and range for a set of values. But, most struggled with doing this from a frequency table.

An incorrect range of 30 was seen many times in part (i), the difference between the highest and lowest frequencies instead of number of raspberries.

A median of 47.5 was seen most often, where the candidate had listed the six possible number of raspberries and found the median of the six numbers. The frequency of these occurring was not considered.
Similarly, with calculating the mean. 45 + 46 + 47 + 48 + 49 + 50 = 285,
285 ÷ 6 = 47.5 was the most common response seen. Again here, the frequencies were not considered, only the possible number of raspberries.
Those who correctly multiplied by the frequencies gained M1 for this, or sight of 6172. However, they often divided by 6 instead of 130, as the table had 6 rows. There was little understanding that this answer of 1028.6 was impossible, as the table only went up to 50. Candidates clearly did not relate back to the table.

Q.13 The most successful part of this question was (a)(i), candidates were able to correctly complete the percentage part of the table and a good proportion knew the remaining two angles should sum to 209°. However, these were not always calculated correctly. Marks could be awarded for the completion of the pie chart even if the candidates' angles were not correct, but only if two sectors were drawn.

Q.14 (a) Candidates found this question a challenge. Many did not use the fact that only 1/8 of the grapefruit juice was needed for each glass and started by adding 68ml and 232ml to get 300ml. As this meant no lemonade was actually needed, they could not progress any further. Others made it as far as finding 1/8 of 232 but no further.

Where a candidate was able to find the amount of lemonade needed per glass, 203ml, they often went on the gain the subsequent marks. Generally, candidates that made it this far through the question were able to change between millilitres and litres easily. Candidates did not always show the conversion between millilitres and litres, but, following the correct answer of 14616ml of lemonade for 72 glasses were able to arrive at the correct answer of 8 bottles.

(b) In this part of the question, candidates were required to calculate the cost of fruit for one glass of Omar's drink. Very few candidates arrived at the correct answer of 40p, with most simply adding the £1.08 and the 56p together to calculate the total cost of the fruit stated in the question, not what was required per glass. However, they were able to progress with the question by increasing their value by 60%. There were many non-calculator methods observed here (similarly to question 10). This often meant the final answer was not accurate.

Some candidates used information from part (a) and attempted to calculate the total cost of fruit for the 72 glasses. Where this method was adopted, the candidate often forgot to divide their answer by 72 at the end.

Q.15 Very few correct solutions were seen on this question. Candidates struggled to calculate the area of the trapezium. Where an area was attempted, it was usually an attempt at the area of the rectangle and triangle. The area of a trapezium formula was rarely seen. Some candidates were able to find the base of the triangle but then used it with the length of the hypotenuse instead of the vertical height to calculate its area.

A good proportion of candidates knew they had to multiply 'their area' by £1.35 to find the total cost to treat the vegetable patch. However, the 'area' value they used was not always an 'area'. Many candidates added all of the sides together and then multiplied that by £1.35. An answer of 13.4 x £1.35 = £18.09 was the most common incorrect response.

Q.16 In this question candidates had a lot of information to digest. It was important to read the question carefully and pick out the appropriate values to use. When the question had been attempted, a conversion from 50knots to km/h was usually what was seen. This being the easier conversion to make as they were given 1knot = 1.852 km/h. It was sometimes accompanied by a conversion from 65mph to km/h as well. This one was not seen as frequently. Candidates commonly multiplied 65 by 0.625 instead of dividing by 0.625.

Very few candidates were able to select the faster vehicle and correctly evaluate the distance travelled. Answers were often multiplied by 15 minutes, rather than converting this into hours.

Q.17 When a correct answer was observed in part (a) of the question it was usually from a candidate who used a balancing method. The '-x' and '+1' were clearly visible underneath the equation. Where a candidate attempted to swap the x and -1, they often forgot to change one, or both, of the signs e.g., $7x = 4$ leading to $x = 4/7$.

Some candidates did not have a method for solving an equation with variables on both sides and attempted to use trials to find the value of x. As x was not a whole number this was rarely successful.

A correct answer for (b) was seen quite often but an algebraic approach was not used, and so full marks could not be awarded.

Q.18 The most efficient method in this question, 130×1.06^{10} was not seen very often. Some candidates chose to calculate ten separate 6% increases and lost accuracy marks for incorrectly rounding part way through. A common incorrect answer of £208 was often seen, where the candidate used a simple interest approach. Non-calculator methods for finding 6% were seen more frequently than calculator methods.

Q.19 Very few candidates were awarded full marks on this question. A good proportion did not know the formula for the circumference or area of a circle. A common incorrect response was dividing the circumference given by 2 to calculate either the diameter or radius. This was sometimes substituted into the formula for area of a circle.

Q.20 In this question candidates were expected to form simultaneous equations and solve them algebraically. Although some candidates were able to form the two equations from the statements given in the question. Not many went on to solve the equations using an algebraic approach. Most opted for trials. It should be noted that marks were not awarded for this approach, an algebraic method is what was required.

Q.21 **(a)** It was clear not many candidates were familiar with trigonometry and so a correct method was rarely seen.

(b) To get started on this part of the question candidates needed to recognise that Pythagoras' Theorem was required. This approach was not selected by the majority of the candidates. It was common to see the three dimensions multiplied together in an attempt to find the volume of the shape.

Q.22 There were very few responses at this late stage in the paper. A correct translation was rare in part (ii) with some candidates choosing to rotate or reflect the shape given. In part (b) candidates used language such as 'the shape has been flipped around' to describe the transformation instead of the correct mathematical description.

Q.23 **(a)** An attempt at expanding the double brackets was seen frequently but often with errors. Some candidates stated incorrectly that $7x \times x = 7x$, some selected the incorrect sign for each term. It should be noted that if a two-by-two table is used to multiply the four terms they must be written as an expression to be awarded marks.

A common incorrect response was $8x - 1$ where the candidate collected the terms and ignored the brackets.

In part (b) Very few candidates were able to factorise the expression and just tried to simplify it instead.

Summary of key points

Candidates should learn efficient calculator methods for finding a percentage of an amount.

- Candidates should choose methods that are efficient for a non-calculator paper.
- The use of trials should be avoided where there is a more efficient method to find the answer, or, if an algebraic approach is required.
- More understanding of how to calculate the mean, median, mode and range from a frequency table is needed.

MATHEMATICS

GCSE

November 2021

Higher tier: component one

General Comments

To succeed in this examination, candidates needed to show sufficient method so that marks could be awarded even when the final answer was not correct. It was important that method was shown for any solution that that required more than one step. Candidates needed to make sure that they read each question carefully and paid careful attention to key words and phrases. Candidates who presented their work neatly were less likely to make errors such as miscopying figures.

Candidates' basic Number skills were reasonably good, whilst Algebra and Geometry skills were more variable.

All candidates seemed to have sufficient time to answer those questions that were within their capability.

The entry for this paper was low. Comments about the common questions, Questions 1 to 8, are indicated in the Foundation tier report, though it should be noted that the Higher tier candidates generally made more progress with these questions.

Comments on individual questions/sections

Q.9 In part (a) a few candidates were able to form the correct inequality and a few others were credited for a correct pair of values. Some candidates chose incorrect inequality signs or thought 1.44 was the upper bound.

In part (b), a few candidates would have benefitted from using methods more suitable for an examination where the use of the calculator was not permitted. For example, it was far easier to build-up in steps such as

25 mins for 15 miles
÷5 ÷5
5 mins for 3 miles
×12 ×12
60 mins for 36 miles

than it was to evaluate $\frac{15}{25/60}$.

Q.10 This question involved using known constructions to solve a loci problem. This was very poorly answered with very few candidates offering anything of any merit.

Q.11 Very few candidates understood how to interpret the identity in part (a). A reasonable number made some progress when solving the linear inequality in part (b), although some made the final step harder as they needed to divide by a negative quantity. The quadratic inequality in part (c)(i) was rarely correctly solved. Candidates could have had more success in part (c)(ii), which could have been completed without answering part (c)(i). However, most candidates did not spot the numerical logic needed to complete the answer.

Q.12 This question involved a multiplicity of skills, including working with multiples of π and standard form. Reponses to part (a) sometimes involved fractions of an area rather than fractions of a circumference. It was rare to see a fully correct answer to this part, although some were able to earn partial credit, often the special case mark. In part (b), some candidates showed that 312 was a multiple of 13 but did not conclude their argument to show that this resulted in 312π being a multiple of 13π. The standard form in part (c) was better attempted with a reasonable proportion of candidates able to make some progress.

Q.13 The change of subject was often started correctly, although only the better candidates offered a fully correct solution, with many candidates not seeing the need to factorise in order to extract *y*.

Q.14 In part (a), a small number of candidates spotted that 33 was close to 32, and that this was 2^5. These candidates were usually successful in this part. Weaker responses often showed division of 33 by 5. In part (b), candidates who, as an initial step, wrote $\left(\frac{4}{5}\right)^2$ were more successful than those who started by writing 1.25^{-2}. Some candidates confused the power of -2 with a power of $\frac{1}{2}$ and square rooted. In part (c), a greater proportion of candidates than in previous sessions, understood the meaning of the fractional index, although many were not able to cube 7 correctly.

Candidates who showed working in part (d), for the writing of the recurring decimal as a fraction, were more successful than those who simply wrote a value down.

Q.12 A few good attempts were made at answering this question. However, in parts (a) and (b), many candidates simply rewrote the frequencies, rather than the cumulative frequencies, in the table and then plotted these. This was not accepted. A reasonable number were able to write a sensible comment to explain part (c)(ii). Many candidates chose the incorrect month in part (d).

Q.16 Some candidates may have improved if they had clearly identified the values they were working with. Presentation in this question was commonly poor and it was difficult to award marks for working.

Q.17 A handful of good solutions were seen to this question, although it was rare for the completion of the argument to be done correctly.

Q.18 Confusion between direct and inverse variation was very common.

Q.19 Candidates did not seem to understand that the area enclosed by the velocity-time graph and the axis represented the distance. Commonly, candidates attempted 2400 ÷ 6.5.

Q.20 In part (a), weaker responses offered the product of functions, rather than a composition of functions. Fully correct responses to this part were rare. Some candidates stated sin30, but were unable to evaluate this. Part (b) was very poorly answered with many candidates simply continuing the curve or reflecting it in the *y*-axis. A handful of correct responses were seen to part (c). Some candidates thought that the notation for the inverse function meant that they needed to find the reciprocal of $k(x)$.

Q.21 A fairly good number of candidates were able to multiply out the cube of the binomial expression correctly, although fewer candidates saw the need to factorise in order to simplify

Q.22 A reasonable number of correct or partially correct solutions were offered to part (a). The vast majority of candidates found part (b) to be beyond their capabilities.

Summary of key points

- Candidates should choose methods that are efficient for a non-calculator paper.
- The meaning of notation used for composite and inverse functions is still seemingly very unclear for most candidates.
- In questions assessing circle geometry, it is essential that angles found are identified clearly and reasons stated.

MATHEMATICS

GCSE

November 2021

Higher tier: component two

General Comments

To do well in this examination, candidates need to interpret each question carefully and make sure they use all of the given information in their solution. Sometimes solutions are offered that are incomplete or that do not answer the question. This may be avoided if candidates are encouraged to read the question again once they believe they have completed their solution. Those candidates who present their work in a neat and logical way are generally more successful as they are less likely to make simple errors such as miscopying their own figures.

All candidates seemed to have sufficient time to answer those questions that were within their capability.

The November series is a resit opportunity only, so as expected, the number of entries was low. Additional comments on the common questions (1 to 7(a)) can be found in the foundation tier report.

Comments on individual questions/sections

Q.1 **(a)** There were many correct solutions but too many candidates are made errors with signs or divided incorrectly with $5x = 6$ leading to $x = {}^{5}/_{6}$.

(b) Candidates need to appreciate that if they are requested to use an algebraic method then non-algebraic methods are not acceptable.

Q.2 This was well answered by many with only a few resorting to longwinded methods. Some candidates were unable to calculate 6% of £130 and even start the question.

Q.3 Some candidates were able to demonstrate a good understanding of both basic circle formulae. A few candidates used radius = circumference divided by 2 and others simply calculated $40.841 \times \pi$.

Q.4 **(a)** This was well answered by most of the candidates.

(b) Very few candidates appreciated that Pythagoras' theorem was required to start the solution. Of those that did, there were problems calculating the volume of a prism.

Some candidates calculated the angle of the ramp and the angle of slope that needed removing. Candidates should appreciate that the same concept is unlikely to be assessed in consecutive questions.

Q.5 **(a)** Many correct approaches were seen but some candidates were penalised for incorrect notation, despite the notation being given in the question.

(b) Drawing the image of *C* should be the first step in this question. There were very few correct solutions with many candidates using more than one transformation.

Q.6 This was well answered by the majority of candidates. The inclusion of the instruction 'use an algebraic method', should point candidates away from calculator solutions to the equations.

Q.7 **(a)** Many correct solutions were seen.

(b) Many candidates knew the process but failed to check their solutions and included the incorrect signs.

Q.8 A few candidates calculated the mean correctly with many others using the correct process with at least one incorrect mid-point.

Q.9 **(a) and (b)** This was reasonably well answered but there were too many graphs consisting of a set of chords.

(c) This should have been very straightforward but caused problems for many candidates. Some simply wrote down the coordinates of the intersections with the x-axis.

(d) A few candidates followed the instructions and used the graph, a number of others attempted algebraic solutions, often containing errors.

Q.10 **(a)** **(i)** Many candidates calculated the differences but failed to notice that the difference was always the previous term.

(ii) This part was well answered.

(b) In this case the second differences of 2 were often found but too many failed to appreciate that this implied a quadratic sequence.

(c) Candidates generally do find proof demanding. Very few candidates were able to state that the next even number greater than 2n is 2n + 2. Those that managed to obtain 6n + 6 were unable to complete the proof.

Q.11 Very few candidates were able to deal with reverse percentages. The most common answer was £10 421.21 from £6510 × 1.16 × 1.38.

Q.12 Many candidates were unable to start the question with the obvious calculations of $3^3 + 3$ and $4^3 + 4$. Those completing the question often failed to complete the final step to confirm that $x = 3.3$.

Q.13 **(a)** Very few candidates were able to complete tree diagram correctly. Candidates must appreciate that the use of rounded decimals means that accuracy is lost and will be penalised.

(b) Those candidates that attempted this part generally calculated the probability of one white button and failed to include the third pair of branches for both buttons being white.

(c) This was poorly answered.

Q.14 **(a)** Many candidates were unable to start, but those that did were generally correct.

(b) Many of those that attempted the question were able to obtain the correct values for the ends of 2024 and 2025 but then failed to calculate the increase requested.

(c) It was often shown that the formula failed by the end of 2027 but there was insufficient work to show that was the first year the formula could not be used.

Q.15 A number of candidates gained marks simply for calculating the volume of large pyramid. Too many failed to make use of similar figures to calculate the height of the removed pyramid and a number incorrectly calculated the mass using mass = volume divided by density.

Candidates need to appreciate that an assumption is not something they were told in the question. The correct assumptions usually related to the density of the wick.

Q.16 Many candidates only gained the mark for converting miles to kilometres. Most did not appreciate to find the smallest, smallest ÷ largest is required and those that did, failed to use the correct bounds.

Q.17 Candidates seem very unfamiliar with this topic.

Q.18 **(a)** Many did not appreciate graph was horizontal at age 17.

(b) The gradient of the chord was often attempted by the repeated addition of the change in height each year, often with errors

Q.19 Most candidates made no progress with this question.

Q.20 Most candidates seem unfamiliar with the rules for non-right-angled triangles and consequently made no progress with this question.

Q.21 The majority of candidates were unable to start. Many that did confused $A \cup B$ and $A \cap B$.

Summary of key points

- Candidates must learn the basic formulae that are not provided for them.
- When an algebraic method is requested then full working is expected and not solutions resulting from the use of a calculator function or the use of trial and improvement.
- Candidates need to highlight the requirements of each question and need to check that they have answered the question set.
- Questions worth more than one mark will need a number of steps in the solution. These should be shown.

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