



GCSE EXAMINERS' REPORTS

MATHEMATICS
GCSE

NOVEMBER 2022

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MATHEMATICS

GCSE

November 2022

Foundation tier component 1

General Comments

In order to succeed in this examination, candidates needed to read each question carefully, before using all necessary information to calculate their solution. Candidates who presented their work in a neat and methodical way, clearly indicating their final answers, were generally more successful.

Many candidates were able to access a reasonable proportion of the examination paper and syllabus coverage overall seemed to be reasonable, although algebraic skills were weak with very few reasonable responses to questions 6, 20(b) and 26. Very few candidates had knowledge of how to find the original amount when given a reduced amount and the percentage reduction.

In this examination, candidates were not allowed to use a calculator, so had to use their arithmetical skills, including the four operations. Some candidates lost marks because they were unable to accurately calculate the solutions to questions. This was evident in questions 1(b) and 19, for example. These candidates could improve their grades if their basic arithmetic skills, particularly those involving decimals and division, were more secure.

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

Comments on individual questions/sections

- Q.1
- (a) Generally, this part was well answered. Most candidates used formal multiplication methods, although repeated addition was sometimes seen.
 - (b) This part was not well answered by candidates, with many finding it challenging to add two decimal numbers with differing numbers of decimal places. Those who re-wrote the values, taking care to line up the decimal points, often went on to get the correct answer.
 - (c) Candidates showed a good understanding of the order of operations, with over $\frac{2}{3}$ of candidates answering this part correctly.
 - (d) Most candidates were able to simplify the given fraction, though some candidates simply divided the numerator and denominator by 2, obtaining an equivalent fraction of $\frac{9}{12}$ which was awarded 0 marks.
 - (e) This part was well-answered, with over 85% of candidates giving the correct response of 32%. The most common incorrect answer was 3.2%.
 - (f) This part was well-answered by candidates, with over three-quarters of candidates correctly giving a value less than -10 .

- Q.2 (a) This part required candidates to take two readings from the graph and find the difference between these values. It was evident that some candidates struggled with the scale of the graph, with many incorrectly reading the values from the graph.
- (b) For this part, candidates had to draw a bar to represent 95%. It was evident that some candidates did not have a ruler, with many freehand drawings of bars seen. Some candidates again struggled with the scale of the graph, with bars drawn to 96% or 94% often seen.
- (c) This part was well answered by candidates, with over three-quarters correctly commenting on how mobile phone ownership had change. Some candidates attempted to provide reasons as to why mobile phone ownership had increased, without actually saying it had increased.
- Q.3 This question was very well answered by candidates.
- Q.4 (a) This part was poorly answered by candidates, with few demonstrating knowledge that vertically opposite angles are equal. Many incorrect answers of 25° were seen, obtained by candidates who thought that the sum of the two angles was 90° .
- (b) This part was answered more successfully than (a), with many candidates demonstrating their knowledge that the base angles in an isosceles triangle are equal.
- Q.5 Calculation errors were often an issue in this question, which required candidates to find $\frac{3}{5}$ of 120 and 15% of 120. Candidates were more successful at correctly calculating 15% of 120, with many finding it challenging to divide 120 by 5 when attempting to calculate $\frac{3}{5}$ of 120.
- Q.6 (a) Candidates found this question challenging, with very few fully correct responses of $16x$ seen. Candidates were awarded 1 mark for writing expressions for the price of large oranges ($2x$), the cost of 4 small oranges ($4x$) or the cost of 6 large oranges ($12x$).
- (b) Very few fully correct responses were seen. Most candidates who were awarded marks for this part, were awarded 1 mark for an answer of $\frac{y}{4}$.
- Q.7 (a) (i) In this part, candidates had to show a combination of chicken pieces which would sum to £6.40. Some instead showed the cheapest price combination (£6.20).
- (ii) Less than three-quarters of candidates answered this part correctly, with some candidates who obtained a combination of chicken pieces which added to £6.20 in (a)(i) writing that Jean was not correct for this part.
- (b) This part was well-answered by candidates, but some mistakenly attempted to give the greatest number of trays which would cost less than £83, instead of cost exactly £83.

- Q.8 (a) In order to be awarded both marks, candidates needed to find two whole numbers which satisfied both of the given conditions. Candidates were noticeably more successful at finding two numbers which gave the answer of -9 when one was divided by the other, rather than finding two numbers which had a difference of 20.
- (b) Candidates found this considerably more challenging than (a), with few fully correct responses seen. Some candidates were awarded 1 mark for writing three numbers (one positive and two negative) which multiplied to give 24, but they often found it more challenging to find three numbers which added to a total of -5 .
- Q.9 (a) Candidates answered this part well, with many correct responses of 225 cm seen.
- (b) Few fully correct responses to this part were seen. 1 mark was awarded to candidates who could write 375 mm in cm, but some incorrectly divided by 100 instead of 10.
- (c) Over one quarter of candidates answered this part correctly. Some candidates incorrectly wrote that Mandy was correct, whilst others incorrectly suggested that 450 was the length, as opposed to the number of Alan's wheels.
- Q.10 (a) This part was very well answered by candidates, with over 85% of candidates able to show that Nico earns £700 by multiplying £20 by 35.
- (b) (i) Candidates found this part challenging, with many multiplying all of the hours Nico worked by the overtime rate, rather than just the hours worked as overtime. This gave the candidates an incorrect answer of £1140, which was often seen.
- (ii) This part was well answered, with many able to work out the amount earned through overtime (£360), before dividing by the overtime rate to get the correct answer of 12 hours.
- (c) (i) Candidates who were awarded both marks for this part typically increased £700 by 5%, in order to prove that Nico's pay increase was less than 6%. Some candidates attempted to calculate 6% of £735.
- (ii) Over a quarter of candidates were able to explain why Dana may not be correct. Some candidates incorrectly stated that Dana was indeed correct, whilst others just stated that Nico might work more overtime than Dana.
- Q.11 Most of the candidates who could knew that the relative frequencies of an exhaustive set of outcomes sum to one obtained the correct answer. Some incorrect answers of 0.24 were seen, given by candidates who made an error adding decimals, obtaining 0.76 from adding 0.75 and 0.1.

- Q.12 (a) Most candidates who seemed to understand the concept of substitution were able to substitute both values of x into the equation of the straight-line to find the corresponding values of y . However, some made sign errors after substituting $x = -0.5$ into the equation.
- (b) Two marks were awarded to candidates who correctly drawing the graph of $y = 4x - 1$ between $x = -1$ and $x = 1$. If the graph was incorrectly drawn, one mark was awarded to candidates who correctly plotted 4 or 5 of the points from their table of values.
- Q.13 Candidates found this question very challenging, with few fully correct responses seen. Most candidates struggled to draw and measure bearings, but some struggled to work with the scale given in this question; 1 cm to 20 m.
- Q.14 (a) Candidates who knew that common denominators were required to subtract fractions typically went on to get both marks. The most common incorrect answer was $\frac{7}{7}$, obtained by candidates subtracting numerator from numerator ($9 - 2$) and denominator from denominator ($14 - 7$).
- (b) Candidates found this question more accessible than part (a), but some didn't, or were unable to simplify their answer of $\frac{10}{65}$, and were hence awarded only 1 mark.
- Q.15 In this question, three marks were awarded for correctly calculating the amount which Sarah paid back plus the simple interest. Some candidates were awarded two marks for calculating the simple interest but forgetting to add it to the original amount, whilst others were awarded 1 mark for correctly calculating 2% of £4,200.
- Q.16 This question was poorly answered, with few candidates being able to calculate the size of an interior angle of a decagon. Most marks in this question were awarded to candidates who calculated the size of an exterior angle of a decagon (36°), whilst some were able to calculate the sum of the interior angles of a decagon (1440°).
- Q.17 Candidates found this question very challenging, with few fully correct responses of 6 kg seen. Many candidates simply calculated the mean of the 4 given values and didn't engage with the 5th value at all.
- Q.18 (a) Few candidates were able to reflect triangle A in the line $y = 4$, with many instead reflecting it in the x -axis or the y -axis.
- (b) Candidates were more successful at translating triangle A by the vector $\begin{pmatrix} 6 \\ 0 \end{pmatrix}$, with most candidates understanding the concept of translation but some were unable to interpret the column vector. Some translated triangle A 6 squares up, instead of 6 squares to the right.
- Q.19 Candidates engaged well with this question which required them to convert an amount from pounds to Canadian dollars and from yen to Canadian dollars, before subtracting one amount from the other. Arithmetical errors were common, with many candidates struggling to correctly multiply by 240 by 2.5 and divide 162 000 by 81.

- Q.20 (a) Very few candidates were able to identify the two correct statements in the table. Many candidates indicated that the given identity was an equation, whilst very few knew it was true for all values of x and y .
- (b) In this part, candidates were required to use an algebraic method to find the height of a triangular prism when given its volume. Very few fully correct responses were seen, with most candidates who were awarded marks getting 1 mark for stating the formula to calculate the area of a triangle, or for calculating the area of a triangle by dividing the volume of the prism by 4.
- Q.21 (a) Very few candidates were able to complete the inequality to show the least and greatest possible difference between the times of these two runners, with many simply writing the values given in the question (14 and 15, or 12 and 13).
- (b) In this part, candidates were required to use lengths to give one example to show how Peter may be correct, and one example to show how Peter may not be correct, for both his van and trailer. Many candidates did not consider both his van and his trailer, despite both being emboldened in the question, so were unable to pick up either mark. For the example to show how Peter may not be correct, candidates needed to consider the greatest length of the trailer, which had been written correct to the nearest 10 cm, but they found this very challenging – some who engaged with this aspect, thought that the greatest length of the trailer was 210 cm.
- Q.22 (a) Candidates who attempted this part typically wrote 6×10^5 as 600 000, before dividing 600 000 by 20. Some candidates forgot to write their final answer in standard form, so were awarded only 1 of the 2 marks.
- (b) Candidates found this part more challenging, with over a quarter not attempting it. Most marks in this question were awarded to candidates who attempted to multiply the volume of water by 60, but a few fully correct responses were seen.
- Q.23 (a) Less than a half of candidates were able to find the next term in the given Fibonacci-type sequence, with 45 the most common incorrect answer – obtained by adding 11 (the difference between the previous two terms) to 34.
- (b) Some candidates found the next term in the given sequence, rather than find its n th term. Few candidates gave a fully correct response of $5n - 1$, but some were awarded 1 mark for writing an n th term with 5 as the coefficient of n .
- Q.24 (a) This problem involving ratios was poorly answered by candidates, with those who seemed to have some knowledge of working with ratios simply sharing 9.6kg in the ratio 11:1 and not going any further.
- (b) Just under 60% of candidates attempted to calculate the force exerted by the books. Most of the candidates who attempted this question, incorrectly attempted to calculate the force by dividing the pressure by the area of the table base.
- (c) Less than a quarter of candidates answered this question correctly, with many commenting on how the pressure would change, rather than their answer to (b) which was the force exerted.

- Q.25 Very few candidates demonstrated knowledge of how to calculate an original amount when given the percentage it's been reduced by and the current amount. Most candidates tried to reduce £1008 by 40%.
- Q.26 (a) In this part, candidates were required to expand and simplify a double bracket. Very few correct responses were seen, with many candidates just multiplying the first terms in each bracket and the second terms in each bracket.
- (b) (i) Less than 70% of candidates attempted this part, where they were required to factorise the given expression. Very few fully correct responses were seen, but marks were sometimes awarded for partial factorisations.
- (ii) In this part, candidates had to factorise a difference of two squares expression. Less than 15% of candidates gave a correct response.

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. It is important that candidates show their workings, especially for questions worth 2 or more marks.
- Candidates need to take care reading questions, as marks were often lost by candidates who didn't read questions carefully.
- Higher-grade topics such as measuring and drawing bearings, calculating in standard form, transformations, and forming and solving equations should be revised thoroughly before examinations, as questions assessing these topics are often worth a large number of marks.

MATHEMATICS

GCSE

November 2022

Foundation tier component 2

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. The candidates who used efficient methods and presented their work in a neat and logical way were generally more successful.

Many candidates were able to access a good proportion of the questions. However, a lot of candidates did struggle to attempt 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 question 8 a 'bus stop' division method was seen for calculating one third of the party cost and a partitioning method for finding 15%. These sometimes led to errors in accuracy. A calculator method would have been more appropriate.

There were various questions on this paper which involved simplifying or solving algebraic expressions or equations. There were many errors in simplifying. For example, $8x + 8x + 8x + 8x = 32x^4$ and $8x \times 8x = 8x^2$.

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

Comments on individual questions/sections

- Q.1 (a) Candidates were successful in gaining marks on this question most of the time. Occasionally errors were made in finding the total cost of the buckets and toy ducks, but they were able to calculate the sum of the four amounts correctly. A few candidates did not write the total cost for toy ducks in pounds, leading to answer of 1615 in the answer space, but this was rare.
- (b) The majority of candidates were able to calculate 10% of their total amount correctly. However, a large proportion did not stop at the discount and went on to calculate the discounted price.
- (c) Most candidates successfully answered this question. A variety of methods were seen. Some candidates struggled to interpret the 'buy two get one free' offer and gave an answer of 4 balls with no mention of the two free ones. The cost for 4 balls (£12.80) was seen frequently.

- Q.2 (a) – (d) Part (a) of this question was answered well. But some candidates struggled to interpret the place value of the digits 3 and 4. An answer of thirty-four thousand, two hundred and five was often seen.
- In part (b), six triangles were shaded most of the time.
- In part (c) a common incorrect response was 2000, this was seen as often as the correct answer of $2/10$.
- Generally, part (d) was answered well, a fully correct answer was seen most of the time. Where there was an error, it was usually in ordering 3.6 and 3.45 incorrectly. Some candidates interpret the digits after the decimal point as 6 and 45 instead of 6 tenths and 4 tenths, 5 hundredths.
- (e) Most candidates were successful in part (i), the largest four-digit number was often correct. Part (ii) was not answered as well, with some candidates not giving the smallest even number, just the smallest number. When this was incorrect an answer of 3457 was usually the response.
- Q.3 (a) The correct values 270 and 350 were seen most of the time. A few candidates gave answers of 207 and 305.
- (b) Most candidates were successful in finding the correct mass of the pear. However, the mass of the banana required a two-step method. Quite a few candidates only carried out one of the steps in the process. A common response was 260g from subtracting the mass of the pear from the mass on the second scale. Another was 175g, the candidate not subtracting the mass of the pear before halving the answer.
- Q.4 (a) – (b) The correct two answers were seen most of the time in part (a).
- In part (b) candidates were often successful in placing scenario B correctly on the probability line, but struggled to place A and C. They were sometimes near the correct position, but candidates did not always realise the probability line was split into twelfths.
- Q.5 Candidates found this question challenging. There were a variety of misconceptions on each part of the question. The square and rectangle were often chosen as the shapes with two lines of symmetry. The most successful part of the question was identifying the square as the shape with rotational symmetry of order 4. Similarity and congruence were often mixed up with the correct answers for each part written the wrong way around.

Q.6 (a) This question was either awarded two marks or zero marks. There were very few candidates awarded one mark. They were often able to identify the two times they needed to calculate the time difference between, but in many cases, did not have a correct strategy for doing this. An answer of 1.84 was seen regularly, from subtraction of the times written as decimals. The most successful strategy for calculating the elapsed time was when a build-up method was used e.g. 15 minutes + 1 hour + 29 minutes = 1 hour and 44 minutes.

(b) This correct answer was seen a pleasing number of times. Candidates often offered a statement with their answer without a method. Occasionally the question was misinterpreted and an answer of 09:17 was given. It was assumed Paul got off the train in Petersfield and required 15 minutes to walk to work, and so 09:17 was chosen instead of 09:47.

Q.7 (a) Accuracy was the main error in this question. Most candidates had an understanding of how to read a conversion graph but could not do it accurately. Answers were close to the correct values but not within the acceptable range.

(b)(i) Candidates performed well on this question. €185 was seen most of the time. It was sometimes calculated in two steps, but the correct answer was usually arrived at.

(b)(ii) The correct answer of 12 days was seen a pleasing number of times on this question. It was usually from trials instead of a direct approach. Where a direct calculation was carried out, the answer of 12.8 sometimes led to an incorrect conclusion of 13 days.

Some candidates did not subtract the insurance cost before performing the division which led to an incorrect answer of 24 days.

Q.8 It was pleasing to see a lot of valid attempts at this question. Most candidates who attempted it were often awarded some of the marks.

For the swimming party, the total cost before discount (£356.25) was seen frequently. This sometimes led to a correct evaluation of one third of £356.25. This was often interpreted as the cost of the swimming party instead of the discount and so the correct answer was not arrived at. The most common answer for the cost of the swimming party was £118.75.

When calculating the cost of the adventure centre party, £340 was frequently seen. Candidates were able to calculate the cost before discount was applied. The discount of £51 was sometimes calculated correctly and interpreted as the final cost. Candidates occasionally had difficulty calculating 15% correctly, they chose a partitioning non-calculator method and made errors. A calculator method would have been more appropriate.

Where two party costs were calculated, the correct conclusion was usually seen.

- Q.9 It was clear that most candidates had some understanding of averages, the question was well attempted. The empty boxes were usually utilised to provide five numbers. 23 was often placed in the middle box. However, it was sometimes surrounded by other numbers which meant it was not actually the median if they were put in order of size. A common incorrect response was 21, 29, 23, 29 and 29. This meant that the range and mode conditions were satisfied but not the median. If five numbers were given, candidates usually went on to calculate a total.
- Q.10 (a) In this question a response explaining that 'the number of employees working at each company is not known therefore the statement may not be correct' is what was expected. This was not seen very often. A large proportion of candidates said that the statement was correct as the female proportion for company A was bigger, whilst others did not provide an explanation but instead calculated the missing angles on the pie charts.
- (b) Candidates found this question challenging. Very few fully correct responses were given. Occasionally a correct percentage was calculated for the men in either company A or B. More commonly the difference between the angles of male employees at each company was calculated. This was usually followed by errors in attempting to find the difference as a percentage.
- Q.11 There were a variety of valid attempts to compare the two boxes of cereal. The quality of responses seen were an improvement on those seen in previous papers. Successful candidates compared prices for the same quantity of cereal. The most common comparisons were prices for 100g and 4500g. Other methods included finding the cost of 100g of cereal from the larger box to add onto 900g, finding a total cost for 1000g of cereal. This was then compared to the cost of two boxes of the smaller cereal. Occasionally candidates calculated the number of g per £ for each size cereal box. This sometimes led to an incorrect conclusion, the lowest number was chosen as the best value instead of the greater amount of g per £. Candidates who compared prices for different quantities e.g. 1000g of the small box and 900g of the large box were not awarded marks.
- Q.12 (a) The correct answer of 5a was often seen.
- (b) There were many successful attempts at solving the equation, this sometimes resulted in the correct answer. In some cases, $4x = 7$ was arrived at and followed by an answer of $x = 4/7$. A large proportion of candidates used their calculators to find the value of x, it was often seen embedded in a calculation.
- (c) A common error in this question was multiplying the 7 and g together but not the 7 and 6 leading to an answer of $7g - 6$.
- (d) $6(x + 4)$ was a common incorrect response to this question.

- (e) This question was challenging for candidates. They not only had to provide a statement for the correct area and perimeter of the square but simplify it correctly too. For the perimeter, a common incorrect response was $8x + 8x + 8x + 8x = 32x^4$. For the area, 64, $8x^2$ or $64x^4$ were often given as the answer.
- Q.13 This question was not well answered. Candidates often found it difficult to interpret the question and complete the table accurately, squaring the value on spinner 1 caused the most difficulty. When the table was completed accurately, the candidates were usually able to identify that there were five numbers more than 9. But they did not interpret this as a probability that they could use to find the correct answer. $108 \div 5$ or $\frac{5}{108}$ were common incorrect responses.
- Q.14 (a) A large proportion of candidates chose to change the time into minutes to perform the calculation for speed. $31.5 \div 105 = 0.3$ was commonly seen. This was rarely converted into kilometres per hour. Other responses involved a misinterpretation of the time written in hours. $31.5 \div 1.45 = 21.7\dots$ was also seen frequently.
- (b) Candidates rarely started this part of the question with the correct formula to calculate time. But when they did, an answer of 2.1 hours was often interpreted as 2 hours and 10 minutes. Full marks were not given often.
- Q.15 Candidates found this question challenging. Full marks were not awarded in many cases. A good proportion of candidates thought that 2y and 126 formed a straight line, leading to $2y = 54$ and so $y = 27$. It was left un-attempted several times.
- Q.16 This question was well answered, 25.5 was seen a pleasing number of times. Some candidates were able to use the calculator accurately but did not round their answer, 25.4.... was seen on several occasions. Answers of 16.7 and 31.2 were also common incorrect responses where the calculator had not been used correctly.
- Q.17 In this question candidates needed to know how to find the volume of a cuboid. Where a correct method for finding the volume of a cuboid was used, marks were often awarded. The change in units between litres and cm^3 proved problematic for some candidates. 1 litre = 100cm^3 was sometimes used, leading to an answer of 160. Whilst other candidates did not attempt to use common units and simply divided their volume by 2. A large proportion of candidates did not know how to find the volume of a cuboid and so could not make much progress on this question.
- Q.18 (a) The correct answer was seen a good number of times in part (i). In part (ii) candidates commonly divided the amount by 7 instead of finding $7/12$ of the amount.
- (b) This question was very poorly answered. The most common answer was $\text{£}80 - \text{£}32 = \text{£}48$ profit with no attempt to calculate a percentage profit.

- Q.19 Very few candidates made a valid attempt at estimating the mean. The response seen most often was the sum of the mid-points divided by four or the sum of the frequencies divided by four. Candidates demonstrated knowledge of calculating the mean of a set of values but not from a grouped frequency table. In part (b) explanations usually suggested that 'Deeta should have used the mid-points as it will give a more accurate answer' with no explanation of how using the lower bounds of the group may impact the mean value.
- Q.20 In part (a) the expected response was 'the line doesn't follow the trend of the data' or 'we would expect to see approximately half the plots on each side of the line of best fit'. Incorrect responses often referred to the correlation instead of a criticism of the line of best fit, some candidates thought the line of best fit had to pass through zero.
- In part (b), 'correlation does not imply causation' is what was expected. However, where a candidate explained that 'owning a pet does not necessarily influence how many times someone goes to the doctors, there could be other factors', was also given credit. Most candidates described a negative correlation in this question and agreed with Debbie's statement.
- Q.21 There were not many valid attempts at this question. However, those that made an attempt showed some understanding of how to perform an efficient calculation to find the value of the investment. Marks were sometimes awarded for finding the value of the investment after the first 5 years followed by errors in calculating the final 4 years. Where a candidate attempted a year-by-year approach they were often only successful in correctly calculating the value of the investment after 1 year. Non-calculator partitioning methods should be discouraged in these questions as errors often occur in the early stages of the method.
- Q.22 (a) Candidates were rarely successful in converting between m^3 and cm^3 . 700 was the most common answer where the candidate has multiplied by 100 instead of 100^3 .
- (b) This question is common with the higher tier and foundation candidates found it challenging. However, there were plenty of attempts at the answer. Where marks were awarded, it was usually for correctly calculating the area of the trapezium or circle. Some candidates were then able to go on to calculate the shaded area by subtracting their values. That was usually where their method ended. Very few candidates could calculate the ratio of the white area to the shaded area. Where an attempt at a ratio was seen it occasionally was for the ratio of the circle to the trapezium, leading to an answer of 1:3.
- Q.23 (a) The most common response to this question was from collecting terms, ignoring the fact that it is an equation, leading to an answer of $7x + 10$. Where an attempt at solving was observed candidates sometimes arrived at $3x = 2$ but then did not give the value of x . Or it was given as 0.6 instead of $0.\dot{6}$.

- (b) The most common error in this question was to write it as an equation instead of an inequality, leading to an answer of $x = 5$.
- (c) In this question candidates could use an elimination or substitution method to solve the simultaneous equations. Occasionally an attempt to equate coefficients was seen, this was often followed by numerical errors leading to incorrect values of x and y .

Q.24 This question was challenging for foundation tier candidates. The use of trigonometry was rarely seen. The most common response to this question was an answer of 24cm, candidates assumed the length of each side of the rhombus was 6cm.

Summary of key points

- Candidates should avoid using a partitioning method for calculating a percentage of an amount on a calculator paper in favour of an efficient calculator method.
- When finding elapsed time, candidates should avoid writing the times in decimal form as this often leads to an incorrect answer. A build up method is usually the most successful.
- Candidates should learn to convert between metric units e.g. litres and cm^3 particularly in a problem solving context.
- A better understanding of how to calculate the mean from a frequency table is needed and why the mid-points of the groups are used in the process.

MATHEMATICS

GCSE

November 2022

Higher tier component 1

General Comments

This was a generally accessible paper, but included a number of testing questions, with some of them set in an unfamiliar context. From the work seen, some candidates were entered at the incorrect tier, whereas others did present good work across the whole of the paper.

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) can be found in the foundation tier report.

Comments on individual questions/sections

- Q.1 (a) Although generally well answered, candidates need to consider the difference between every pair of consecutive values, especially if they are unaware of Fibonacci sequences, in order to correctly identify the next term.

An example of an incorrect answer was from only considering the first three differences i.e. 1, 2, 3, and then believing that the differences continued to increase by 1.

- (b) Generally well answered, but the common incorrect answer, as seen in previous series, is ' $n + 5$ '.

- Q.2 (a) Candidates need to be able to recognise 'identities'. Here, candidates should consider all of the statements, and hopefully the better candidates will realise that one of the marks is for knowing whether it is an 'equation', 'identity' or 'inequality', whilst the second mark is for one of the remaining statements referring to the 'values of x and y '.

- (b) The key to answering this question was to be able to calculate the triangular cross-sectional area. If candidates did this correctly, they were invariably able to go on to use either of the methods given in the mark scheme to gain full marks. If they were not able to identify/calculate the cross-sectional area, candidates were still able to access either one or two marks for either identifying the formula for the area of a triangle, or for knowing that the cross-sectional area should be 54 cm^2 .

- Q.3 (a) This was a very poorly answered question. Here, there were two aspects to consider – the difference between the times of the two runners, and the range of times for each runner. Candidates who didn't gain the correct answers tended to concentrate on the least and greatest times for running the 100m, giving answers such as 12 seconds and 15 seconds, or 12.5 seconds and 14.5 seconds.

- (b) Candidates find it difficult to answer questions where they are asked to exemplify or explain. In this question, many candidates failed to realise that they had to engage with the bounds for the two given lengths, and then apply the resulting lower and upper bounds to the conditions, set by the ferry company, to show how Peter may, or may not, be correct.
- Q.4 (a) This question on standard form was generally well answered. The candidates that decided to initially write 6×10^5 as 600000 and then divide by 20 seemed to gain the better marks, but there were some candidates that were able to deal with the standard form directly.
- (b) Although the vast majority were aware that there were 60 minutes in an hour, a number of candidates divided by 60 rather than multiplied. Having correctly multiplied by 60, a significant number of candidates failed to write the final answer in standard form, resulting in gaining 2 out of the 3 marks.
- Q.5 (a) All of the candidates who were able to deal with ratios, dealt with the two ratios separately, and usually gained all 3 marks. However, a lesser number of candidates weren't able to work with ratios.
- (b) As the formula for Pressure was given within the question, this part of the question was very well answered, with every candidate able to rearrange the formula in order to calculate the force exerted on the ground.
- (c) Although part (b) was very well answered, many candidates weren't able to correctly interpret the question asked in part (c). Many referred to the pressure increasing, and not realising that the pressure was a given value, and hence it was asking candidates to comment on how their answer to part (b), which asked for the force exerted on the ground, would change.
- Q.6 This was generally an all or nothing question, with those candidates that knew that the sale price of the ring represented 60% of the original price usually gaining all 3 marks. Unfortunately, a greater number of candidates gained no marks, with many attempting to add 40% to the sale price.
- Q.7 (a) This question was generally well answered with the vast majority gaining 2 or 3 marks – with those gaining 2 marks usually making one slip in their expansion.
- (b) (i) A significant number of candidates attempted to factorise the two terms into two pairs of brackets, and hence gained no marks. Of the candidates who understood to factorise the common factors, most gained either 2 marks for identifying 2 common values or the full 3 marks.
- (ii) The majority of candidates were able to correctly identify and factorise the difference of two squares.
- Q.8 (a) Although only a few candidates gained all 3 marks, it was pleasing to note that the majority attempted to describe a single transformation, and more often were able to gain 2 marks or sometimes 1 mark. Very few candidates attempted to describe the transformation as a two-step transformation.

- (b) Very few candidates understood what was required for this part of the question. This is slightly different to the usual question asked, in that it's the triangle which candidates were required to identify, triangle C, was mapped to the already given triangle A. This is what threw most candidates.
- Q.9 (a) Although most candidates understood that they were required to place the number of people within each part of the Venn diagram, very few completed the whole Venn diagram correctly. Most were able to gain 2 marks, out of a possible 3 marks, for entering 6 values that were given directly from the bullet points (some may have had a fortuitous mark as an empty space was considered acceptable to represent 0). It was the bulleted '10 speak French and Polish' that candidates failed on, as they didn't realise that these 10 people included the 8 people that were able to speak English as well. From this they would have been able to complete the Venn diagram, by ensuring that all regions added up to 50.
- (b) This part of the question was poorly answered. However, some candidates knew what was required, but weren't able to access this mark as their value for speaking 'English and Polish but not French' was either 0, or more often left blank.
- (c) The conditional element to this question threw most candidates. This question was poorly answered with the majority of candidates failing to gain 1 of the marks available. Those that did gain 1 mark, were able to correctly identify the numerator in a fraction over 50, be it from a correct Venn diagram or from following through their Venn diagram.
- Q.10 (a) (i) Although it may have been expected that it is the 2 in the denominator that cause some candidates to fail on this question, it was, in fact, dealing with the indices that proved to be their downfall. However, many correct answers were also seen.
- (ii) This was another all or nothing question. Those candidates that knew their rules of indices were able to deal with the squaring and reciprocal. Unfortunately, the majority of candidates either gained no marks, or didn't attempt the question.
- (b) Nearly half of the candidates were able to gain this mark, by choosing appropriate square values for 'their a and b' and then showing sufficient working to prove the statement is incorrect. Unfortunately, a few candidates didn't attempt this question.
- (c) (i) Again a poorly answered question, with only a few recognising the need to think of the term on the left, $\sqrt[4]{y}$, as a power of y, or equivalent, in order to be able to identify the value of x.
- (c) (ii) Half of the candidates were able to deal with the fractional index, with the majority of these candidates gaining both marks, whereas a few stopped after a partial solution. The other half either weren't able to correctly recall the rules of indices or did not attempt the question.

- Q.11 Very few candidates were able to gain full marks on this question, even for those candidates that knew that the correct first step would be to cube both sides. This was because they consistently forgot to cube the '4'. In order to gain the last two B1s, dealing with the cube root must have been attempted as a first step; otherwise two errors would probably have been made by then.
- Q.12. This was another all or nothing question, with the few candidates that were able to set up a correct equation usually able to solve it to find the answer of 30cm. The final step of identifying $\sqrt[3]{27000}$ as 30 was missed by one candidate. However, the majority of candidates, although they were given the formula for the volume of a sphere, were unable to correctly set up their initial equation.
- Q.13 This question was poorly answered, with many candidates believing, incorrectly, that the average speed can be calculated by finding the mean of the speeds for the three individual parts of the race. Of the very few candidates who did gain some marks on this question, no-one went on to correctly find the distance that Asha ran, let alone writing it as a fraction. This is probably because the candidates failed to realise, or forgot, that Asha ran in two different parts of the race.
- Q.14 (a) This part of the question was an all or nothing question, with those candidates who knew that, in order to estimate the number who drove between 75mph and 80 mph, that they had to find the area of half of the bar representing 70 – 80 mph. If they knew this, then they were able to gain all 3 marks by finding the number and the percentage that drove at greater than 75 mph. Unfortunately, the majority of candidates failed to gain any marks on this part of the question.
- (b) Even though the final cumulative value, for $v \leq 90$ (mph), was given in the table, very few candidates knew how to complete the cumulative frequency table.
- (c) (i) If candidates had failed to complete the frequency table in part (b), they rarely completed the cumulative frequency diagram for the 'Monday drivers'. However, if they had, incorrectly, entered the frequencies into the table in part (b), rather than the cumulative frequencies, some candidates did gain the 2 marks available here, as the actual frequencies were also increasing from left to right.
- (ii) Very few candidates were able to correctly interpret the cumulative frequency diagrams here. The majority of incorrect answers referred to Monday, rather than Tuesday, but even some candidates who indicated Tuesday were unable to justify their choice.
- Q.15 (a) (i) Even though the answer that candidates needed to show, was given, and that the requirement to gain this mark was comparatively straightforward, the vast majority gained no marks, or did not attempt this part, or any other part of this question. This was meant to be an easy lead in to a harder question.
- (ii) Although part (a)(i) was poorly answered, a few more candidates were able to gain this mark, by applying the same idea as that shown in part (i) to correctly set up the second inequality. However, more candidates did not attempt this part of the question.

- (b) No candidates gained any marks in part (b). The vast majority did not attempt to draw any line(s) on the graph provided, and those who did, failed to get any line correct.
- Q.16 Although a number of candidates knew that the angle in a semicircle is 90° , very few candidates were able to go any further with this question. Examples of both alternative methods were seen, with one fully correct, but the other only partially.
- Q.17 (a) The majority of candidates were able to access a generous opening mark for identifying the linear scale factor. However, only a few candidates knew to then square the linear scale factor before multiplying with the area of the smaller shape A to find the area of the larger shape B.
- (b) Less than half of the candidates then knew to cube the linear scale factor in order to calculate the ratio of the volumes. However, not all gained both marks, as they failed to write the ratio in its simplest form.
- Q.18 (a) Very few candidates were able to write the fraction as a recurring decimal. The very few candidates who knew how to convert a fraction to a decimal, by division, did give the answer using the notation used for recurring decimals, although $0.16363\dots$ would have been accepted for this one mark. Some candidates attempted a long division, but made arithmetical errors in their working, but often the question was left unattempted.
- (b) Similarly, few candidates were able to write the recurring decimal as a fraction. Although there are shorter methods available, candidates need to know the complete method of multiplying the given recurring decimal by the appropriate power(s) of 10 and then subtracting.
- (c) This was a testing question, in that candidates had to consider what was being asked, before diving in and attempting to answer it from incorrect thinking. Common errors seen were to write $0.2\dot{5}$ as $5 \times 0.0\dot{5}$ or $(0.0\dot{5})^2$.
- Q.19 (a) Although most candidates gained no marks or didn't attempt this part of the question, some good answers were seen. Of the candidates that gained marks, some gained part marks, but a few gained all 3 marks. One pleasing answer seen was the solution $V = 3^{t-2}$, which is a very succinct answer.
- (b) (i) Of the candidates who gained any marks in part (a), the majority were able to gain the 1 mark available here. The previous answer of $V = 3^{t-2}$ led to an answer 3^{-2} , which would have been accepted, but these candidates did in fact go on to write their answer as $1/9$.
- (ii) The candidates who had any solution in part (a) had the opportunity to gain some marks here. The candidates who had the correct answer in the form $V = 3^{t-2}$ in part (a) found this easiest to solve, as they could equate the 27, written as 3^3 with 3^{t-2} , which led to a simple equation, $t - 2 = 3$. However, there were examples of a few more correct answers seen, some on follow through.

- Q.20 (a) This was a disappointing response to a comparatively easy lead in to this question on combinations. Unfortunately, some candidates attempted to list the combinations, which didn't lead to the correct answer, even though it could have been achieved using this method. Some candidates had the correct idea, but failed to give the correct method
e.g. 5×5 or $5 \times 5 \times 5 \times 5 \times 5$.
- (b) A number of candidates realised that to find the number of combinations that had no repeated digits was found by calculating $5 \times 4 \times 3$, and getting the answer 60, were able to gain 2 marks. Only one candidate realised that the question asked for the probability, and the answer needed to be given as a fraction.
- Q.21 This was a challenging question on surds. Candidates needed to know how to rationalise the denominator in order to access the majority of the marks. However, those who knew something about simplifying surds were able to gain 1 mark for writing $\sqrt{27}$ as $3\sqrt{3}$. A few candidates did know about rationalising the denominator, but only one candidate achieved full marks on the question.
- Q.22 This question was very poorly answered, with only one candidate getting the correct answer, and one other candidate gaining 1 mark for a partial method. Drawing a tree diagram would have assisted the candidates here, as they could then identify the two possible combinations, $P(R, B)$ and $P(B, R)$.
- Q.23 (a) This was a multiple choice question. Candidates need to consider doing some work on the answer lines provided, in order to assist them to identify the correct answer, in these questions. Here, for example, they could have substituted $x = 0, 3$ and 5 into the equation and investigated the three points identified.
- (b) This was a testing question to finish the paper. A few candidates did gain a mark, by identifying that the curve crosses the x-axis when $y = 0$ and setting up the equation $(x - 5)^2 - 16 = 0$. Only the better candidates went on to fully solve this equation and gain the full 4 marks.

Summary of key points

- Candidates find it difficult to answer questions where they are asked to exemplify or explain.
- Candidates need to be aware of how to complete and read Venn diagrams.
- Candidates need to be able to recall all of the circle theorems.
- Candidates need to be able to convert fractions to recurring decimals, and vice versa.

MATHEMATICS

GCSE

November 2022

Higher tier component 2

General Comments

To do well in this examination, candidates need to interpret each question carefully and ensure they use all 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) can be found in the foundation tier report.

Comments on individual questions/sections

- Q.1 (a) Well answered with (ii) often correct even if (i) was incorrect.
- (b) A minority of the candidates were successful with the question. Candidates often find percentages greater than 100 demanding.
- Q.2 (a) Around half of the candidates completed the question successfully.
- (b) Most candidates attempted the question but only half produced explanations that made it clear that they understood.
- Q.3 (a) Well answered, with the majority giving a clear explanation as to why the line of best fit was incorrectly placed.
- (b) A minority of candidates explained that correlation does not imply causation or emphasised that other factors could be relevant.
- Q.4 Well answered with the majority of candidates using powers of the indices rather than step-by-step methods. Some errors were seen when converting the multipliers to decimals.
- Q.5 (a) A minority of candidates gave the correct answer. Candidates do find converting cubic (or square) units very demanding.
- (b) A majority of the candidates gained at least the first two marks for evaluating the requisite areas. Many failed to answer the question completely and gave the ratio of the area of the circle to the whole shape rather than the ratio of the area of the circle to the shaded area as requested.

- Q.6 (a) About half the candidates gave fully correct solutions.
A few candidates obtained $3x = 2$ and then the incorrect solution of $x = 1.5$.
- (b) A few candidates solved the inequality using a correct method then wrote $x = 5$.
- (c) Most candidates seemed familiar with the process required but many solutions contained arithmetic errors.
- Q.7 A few candidates showed no understanding of trigonometry which, at this level, is surprising. Of the correct solutions some resorted to longwinded methods including the use of the sine rule or the use of both right-angled trigonometry and Pythagoras' theorem.
- Q.8 (a&b) Most candidates calculated the coordinates correctly but too many joined their plotted points with straight lines or completed the top of the curve with a horizontal line.
- (c) About half of the candidates failed to relate this part of the question to the table and the curve just drawn.
- Q.9 Only a few were able to complete the question with the majority either unable to start or simply calculating the volume of the box.
- Q.10 A minority of the candidates obtained the correct solution or at least the resultant percentage. A common solution was to consider a total reduction of 26.3% from simply adding the 19.8% to the 6.5%. Compound percentages are a standard concept at this level.
- Q.11 Many candidates were able to complete the box plot, but only a minority gained marks for their explanations. The fact that the question involved speed meaning faster runners took less time seemed to confuse many candidates.
- Q.12 Trial and improvement should be a standard technique for candidates at this level, yet half the candidates gained no marks in this question.
- Q.13 (a) A minority of candidates were able to deal with the bounds here.
- (b) A few candidates gained full marks, with many not engaging with the concepts of bounds at all.
- Q.14 (a) Very disappointing that many candidates did not seem to appreciate that the probabilities on each pair of branches should sum to one.
- (b) A few candidates were able to calculate the probabilities using their tree diagram but were not awarded any marks unless some correct work was evidenced in (a).
- Q.15 (a) Only a few candidates were able to derive the quadratic equation by dividing the given shape appropriately.
- (b) Solving a quadratic equation by factorisation, (or by formula), should be a standard process to candidates at this level. Only a few were able to solve the quadratic equation and these often continued with an incorrect expression for the perimeter of the shape.

- Q.16 Only a few candidates demonstrated any real understanding of vectors.
- Q.17 Quite well answered with over half the candidates gaining some marks, often for the application of Pythagoras' rule in two dimensions.
- Q.18 (a) Most candidates showed no understanding of transformations.
- (b) A few candidates obtained the 17 from $\sqrt{289}$ but were unable to give the relevant coordinate.
- Q.19 About half of the candidates were able to start the question making use of the sine rule given in the additional formulae. Only a minority were able to continue to gain 3 or 4 marks.
- Q.20 More than half of the candidates were able to engage with aspects of the question.
- Q.21 (a) Very few candidates demonstrated any understanding of functions.
- (b) The marks here were for solving the quadratic equation given in (a). Very few candidates seemed to appreciate this.
- Q.22 (a) A few candidates appreciated that the gradient of a tangent was required but none realised that the gradient was negative.
- (b) Calculating the area under a curve using trapezia or the trapezium rule was understood by very few candidates.

Summary of key points

- To be successful with this paper candidates should be familiar with a large proportion of the specification and not just a few concepts.
- 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 should highlight the requirements of each question and then check that they have completely answered the question set.
- Questions worth more than one mark will generally require several steps to be shown in their solution.



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