



GCSE EXAMINERS' REPORTS

**MATHEMATICS
GCSE**

SUMMER 2022

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MATHEMATICS

GCSE

Summer 2022

Foundation tier component one

General Comments

In order to succeed in this examination, candidates needed to read each question carefully. They also needed to make sure that they used all necessary information that was given in their solution. Candidates who presented their work in a neat and methodical way, indicating what the values they had found represented, were generally more successful. In questions 3(b), 12(b) and 24, 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 were weak with very few reasonable responses to questions 9, 15 and 25.

In this examination, candidates were not allowed to use 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 8 and 21(a), for example. These candidates could improve 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 This should have been an accessible start to the paper, although it was rare for candidates to earn all 7 marks available.

- (a) Generally part (i) was well answered. Part (ii) was more variable with some candidates trying to use 'bus-stop' approaches and these were often for finding $1000 \div 600$. A few place value errors were also made. Whilst trailing zeros are acceptable, extra leading zeros are not, as this is not a standard way of writing a decimal value. Part (iii) tested correct order of operations and a few candidates gave the correct answer. A common wrong answer was 42. Part (iv) assessed arithmetic with negative values. Again, a few correct answers were seen. Common incorrect answers were 42, -13 and -1.
- (b) In part (i), candidates who first wrote the given fraction as $\frac{44}{100}$ were more successful. A variety of incorrect answers were given and some candidates made no attempt at this part. In part (ii), performance was better with a good number writing the correct decimal. Common among those incorrect was 8.7. Again, extra leading zeros were not accepted.

- (c) A few correct responses. The answer 7 had to be clearly indicated and an embedded answer in a calculation such as $7 \times 7 = 49$ was not accepted. Weaker responses suggested the answer was 24.5.

Q.2 (a) Was generally well answered.

(b) Was more variable.

In part (i), candidates needed to understand that a number greater than 13 was impossible, which many did as they wrote this down. They then needed to translate that into a probability of 0 on the scale, which a good proportion did, but some did not. A few candidates drew an arrow that was not sufficiently close to 0 or indicated some other tick mark. In part (ii), candidates needed to observe that 2 out of the 6 options were even and interpret the probability scale to reflect that. A reasonable proportion of candidates were able to do this, but many chose the half-way point or chose the point on the scale that represented 4 out of 6. A few candidates used circles or vertical dashes instead of arrows. This is not recommended as it is harder to judge the candidate's intention. Also, weaker responses typically had horizontal lines spanning a section of the probability scale.

Q.3 (a) Was fairly well answered. A few candidates listed the values in order, but did not select a value from their list or the original list. A list of values in order was not credited as this did not answer the question.

(b) Fully correct solutions were not as common as expected. The simplest way to find 25% of 48 was to calculate $48 \div 4$. Those candidates who took a moment to reflect on what they were doing and did this, earned a very simple mark. Most candidates opted to find 10%, 10% and 5% of 48 and then sum the values. This was sometimes executed correctly, but was much more prone to error. A few candidates attempted to find 20%, or some other percentage value, not reading the question carefully enough. This was not considered a misread but an incomplete or incorrect method. A good number of candidates were able to find $\frac{2}{5}$ of 45 correctly, in steps, dividing by 5 and then doubling being the most common, successful, approach. Candidates could earn the final mark if they had attempted to find the values needed using correct approaches with arithmetic errors and some candidates did earn the final mark in this way.

Q.4 (a) Candidates either earned a simple 2 marks or produced mismatched columns with girls appearing in the column for boys and so on. Very few responses earned one mark, usually for listing 4 or 5 correct options.

(b) Success in this part usually depended on what the candidate had produced in the previous part, although a correct answer without evidence in part (a) was accepted. Some candidates only stated answers that were ratios or 1 in 8 or similar. These are not acceptable forms for probabilities and so were not accepted. Weaker responses generally gave probability words, such as unlikely, as their only answer.

- Q.5** (a) Was generally well answered with only a few candidates reversing the coordinates.
- (b) Some good solutions were seen, with a single correct point plotted and the correct length measured. A few candidates misinterpreted the information given or miscounted squares or mis-measured the distance BD . Some of these were able to measure the length of CD sufficiently accurately to earn a mark, following their mis-plot. A common incorrect mis-plot in weaker responses was to mark D at (4, 5), making a parallelogram.
- Q.6** (a) Some good responses were seen to this part of the question. Most were able to multiply 2.5 by 10 correctly. A few miscalculated the final answer as 31 after writing $25 + 16$. Some candidates misinterpreted the information in the question and attempted to use the 20 kebabs, the maximum number of kebabs that could be cooked on the grill, in some way. This was not accepted.
- (b) Responses to this part were more varied. Candidates needed to apply a correct order of operations to find the number of kebabs. Good responses were neat and short and simple, with $26 - 16 = 10$ and $10 \div 2.5$ clearly stated. Weaker responses were often poorly presented and generally attempted to find $26 \div 2.5$ first.
- Q.7** (a) In this part of the question, some candidates were able to find 1% of £300 as £3 and correctly multiplied it by 8 or 10% as £30 and 2% as £6 and subtracted. A few of these went on to subtract the £24 found from £300 and so lost the accuracy mark. Some arithmetic errors were made in finding the 8%. Candidates should understand that unless they make their method clear, they cannot be credited. A correct method can rarely be determined from incorrect values.
- (b) Answers to this part were much more varied and misinterpretations of the question were common. Candidates were credited for finding £5 from $15 \div 3$ as a first step in the main method in the mark scheme. Some candidates attempted to find 30% of 15 instead of $\frac{1}{3}$ and this was not accepted as a correct method for the initial mark or for the final, follow through, mark. The next successful step was to find 60% of 8. A good number of candidates were successful with this, often finding 10% and then multiplying by 6 or by finding 50% and 10% and summing the values found. Finally, the £5 and £4.80 found should have been summed. Commonly candidates summed to find £9.80 and then subtracted this from £23 giving a final answer of £13.20 which was penalised. The alternative solution in the mark scheme was similarly marked.
- Q.8** (a) Many candidates were able to deduce that the calculation needed was 9×6.5 and, very sensibly, wrote this down before attempting to calculate it. A few candidates correctly stated $9 \times 6 = 54$ and $9 \div 2 = 4.50$ and summed the values found. Candidates who gave little or no method and made errors usually could not be credited.

- (b) Good responses had an initial step of subtracting £160 from £314 and then dividing the answer by 14. Often, in these cases, this was done accurately, although occasional slips, more commonly in the subtraction, were seen. Weaker responses either had an initial step of $£314 \div 14$ or an initial step of $£314 + £160$.

Q.9 This question was not well attempted in either part. A few candidates earned a mark in **part (a)** and it was rare to see anything of any value in **part (b)**. A large proportion of candidates made no attempt to answer and some responses were numerical calculations.

Q.10 A small number of fully correct solutions were seen. Some candidates were able to earn 2 of the 3 marks available, often for knowing that $6^2 = 36$ and then simplifying the fraction that resulted to lowest terms. Common incorrect responses for the first 2 marks were:

$\frac{6}{36}, \frac{8}{12}, \frac{6}{12}$. Weaker responses were only credited for simplifying an incorrect fraction to lowest terms, although candidates also made arithmetic slips in carrying out this process.

Q.11 (a) This simple problem involved knowledge of statistical quantities. A small number of candidates gave fully correct solutions. A good number of candidates were able to offer a solution that was at least partially correct, with either the mode or the range interpreted correctly. A few responses included ages that were less than 12, even though this was clearly stated as the age of the youngest child in the question.

A few candidates omitted to read the question carefully enough and had three children with age 14 rather than two. Again, this was clearly stated in the question.

(b) It was expected that candidates would discard the costs of the two cheapest burgers and then round the remaining values to the nearest pound and sum them. A few candidates did this and earned a simple 3 marks. Some candidates misinterpreted the special offer as being the two cheapest meals free and were partially credited for this. It was more common, however, for candidates to sum some or all of the exact values given and then round the final answer that they obtained. Some credit was given for this approach, providing that the values were summed accurately before they were rounded, as the accuracy of the arithmetic was then considered. Generally, candidates are not credited for such an approach when the demand word in the question is clearly **estimate**, so candidates should be made aware that adding accurate values and then rounding the final answer is usually **not** an acceptable method.

- Q.12 (a)** Most candidates earned a method mark, although far fewer earned the accuracy mark as the division was not commonly well executed. Build-up approaches commonly contained errors and those using traditional short division were usually more successful, although some errors were seen in this method also. A few candidates found £36 correctly but then continued their method and, for example, divided by 12 again or subtracted £36 from £432. This continuation of method resulted in the method mark being withheld as the method was clearly stated in the question and very little interpretation was needed in this case.
- (b)** Some candidates offered fully correct solutions, although these were not common. Weaker responses contained a lot of arithmetic errors and there were quite a few errors in sorting out the method needed to arrive at the correct solution. Most candidates attempted to find 14×500 , or similar. Place value errors were common in the answer to this calculation. Some candidates attempted 30×20 , or similar, though often this was omitted and 20p added to £70. Candidates who took careful note of the units they were working in were more successful than those whose units stated were incorrect or omitted. A few candidates attempted to sum values in £ with values in pence, incorrectly. Other candidates found 5% of the cost of the electricity only, and did not include the standing charge. Candidates could improve if they took care with the units and presented their work more logically. Some solutions to this part were very poorly presented and working difficult to follow. Those candidates who did present clear and logical solutions often earned most credit as they made fewer slips in working.
- Q.13** This question was not well answered. Many candidates earned a mark for an initial correct unit conversion but then simply went on to say something like 'the bottle is only 50p more and you get more in it so it is better value' without considering any unit costs. It was rare for a correct pair of calculations for a comparable unit cost to be stated and even more rare for those calculations to be evaluated correctly.
- Q.14 (a)**
- (i)** A good number of correct solutions were seen. Some candidates earned a mark for a correct ratio which had been simplified but not to lowest terms, with 45 : 35 being most common.
 - (ii)** Candidates found this part to be more challenging and only a handful of fully correct solutions were seen. There was little evidence of use of a correct ratio or proportion to find the values needed for a correct solution. Some candidates found the £27000 and stated that as their answer. These candidates may have improved if they had reread the question after they had completed their solution.
- (b)** Candidates were a little more successful in this part. In order to be credited, they needed to demonstrate calculations for a full and correct method. A few candidates drew block diagrams which contained errors and these could not be credited for method at this level. It is expected that candidates will demonstrate that they know they are dividing 35000 by 10 and then multiplying the result by 3 using calculations. A few candidates spoiled an otherwise correct method, by subtracting £10500 from £35000 before adding £21000.

- Q.15** This was not well answered and solutions that gained any credit at all were rarely seen. Commonly candidates simply rewrote the given formula with n and t interchanged. Another common incorrect first step was $3n = 5 - t$. Some candidates gave poorly expressed final answers such as $n = t - 5 \div 3$ which was not acceptable.
- Q.16** Candidates found both parts of this question to be extremely challenging and fully correct solutions were very rarely seen. In fact it was unusual for a candidate to earn any credit at all here. The majority of responses to **part (a)** were of no value and comments such as 'it is the same as P ', or similar, were common. A few candidates were on the right track with their thinking but did not express themselves well, stating, for example, 'corresponding angles' or 'alternative angles' which were incorrect. In **part (b)**, even though the diagram is clearly labelled as not being drawn to scale, very many candidates measured the bearing and stated that that was what they had done, as they listed their process as part of their 'Give a reason for each step of your answer.' These candidates may improve if they understand that the diagram should not have been measured and that calculations were expected. Also, when reasons are asked for, correct geometric reasons are expected and not general descriptions of a process.
- Q.17** (a) Some excellent solutions were seen to this part of the question with a few candidates offering fully correct responses. Occasionally candidates found $\frac{11}{14}$ and stated this as their final answer and were partially credited. Weaker responses typically summed the two given fractions incorrectly as $\frac{8}{21}$.
- (b) Candidates found this part to be more of a challenge although a reasonable number of fully correct solutions were seen. It was simpler to find the time in minutes and then convert to hours. Many candidates did this, commonly by dividing by 3, doubling and adding to 324 before converting the 540 minutes found to hours. Candidates who attempted the unit conversion as a first step made obtaining an accurate answer more of a challenge and full credit was not as commonly awarded to those taking this approach. Weaker responses generally showed conversion of 324 minutes to 5 hours 24 minutes, which was not credited at this level, or found $\frac{3}{5}$ of 324.
- Q.18** (a) Candidates needed to observe that, as the data was continuous, the bars should not have any gaps in between them. Some candidates did manage to make a comment that was along these lines. However, a few candidates destroyed a reasonable answer by then commenting further. For example, a comment such as 'Some of the times are repeated.' was acceptable whereas a comment such as 'Some of the times, such as 12.4 are repeated, the next bar should start 12.5' was not acceptable. Weaker responses commonly indicated that the vertical axis should go up to 20 not 8.

- (b) This was not well attempted. Many candidates were able to earn a mark for listing the correct frequencies, although that was not always the case. Few candidates showed any working. Those who did often earned 4 or 5 marks. Occasionally candidates worked in percentages rather than degrees, which was acceptable although degrees were expected. Without working the pie chart was not credited as working was clearly requested in the question and so was necessary. Some candidates had 4 angles that did not sum to 360° . Some pie charts were unlabelled or inappropriately labelled and others had sectors that were not drawn with a ruler.
- Q.19** A few correct solutions were seen to this exchange rate problem. Most candidates who were successful found that each of the given values were equal to £100 and £99 and then made the correct choice of answer. Those who earned both method marks almost always went on to complete the solution correctly. A reasonable number of candidates were able to earn a method mark for a correct calculation or value. There was some confusion about currency symbols in this question, with many values being mislabelled. This was condoned as the units could be implied from the calculations if seen, although generally it is expected that the units used are correctly stated. Some candidates made no progress or no attempt to answer.
- Q.20** This multiple choice question assessed candidates' understanding of congruency. Some candidates indicated the correct pair of statements and a few candidates earned a mark for one statement correct out of two or two statements correct out of three. Common incorrect choices were statements 1 and 6, although clearly some candidates were guessing.
- Q.21** (a) A small number of candidates were successful in this part of the question. The formula required was given and so needed to be correct. The simplest way to earn the first mark was to substitute the correct values into the correct formula. Some candidates were unable to square 15 correctly but were still able to earn the final mark, following their value. Candidates who did not show the correct use of the formula could still be credited if the method they used, even in steps, was equivalent to this. However, on many occasions, the method used was faulty at some point and so candidates could not be credited. Those many candidates who multiplied 15 by 30 and gave the answer 450 or 450π may improve if they are more aware of the formulae given.
- (b) This was not well answered. Very few candidates were able to use the scale correctly to find the correct dimensions for the cone they needed to draw. Candidates were still able to earn marks for the plan and elevation of a cone similar to the given cone and some were able to do this. It was necessary for the plan and elevation to be drawn accurately and freehand drawings were not given full credit. Some candidates were drawing ellipses, or similar, for the plan and half cones were common for the elevation. Many candidates made no attempt to answer.
- Q.22** (a) A small number of candidates produced graphs that were sufficiently accurate to be credited. Candidates needed to use a uniform scale that started at 0 and ended at 225 or more. The line drawn needed to start at (0, 225) and have a negative gradient, ending at (45, 0). A good number of candidates, although not all, earned the mark for the uniform scale, but fewer earned anything else, as the most common line drawn started at (0, 0) and had a positive gradient. A few candidates drew a series of lines or a curve.

- (b) This part of the question could be answered without reference to the graph and some candidates were able to calculate the correct answer. A few candidates were able to earn at least 1 mark for a correct calculation or for the value 90 or 135 seen.
- Q.23** Candidates found this question challenging. Some were able to complete the tree diagram correctly but the vast majority earned no marks beyond that. Commonly answers of $0.6 + 0.3 = 0.9$ for **part (b)** and $0.4 + 0.1 = 0.5$ for **part (c)** were given.
- Q.24** Again, candidates found this question a challenge. There were some fully correct responses. Those using three quantity working were most successful, providing that they were careful. Candidates who earned both the method marks usually went on to earn all 3 marks. A few candidates earned a mark, commonly for a correct first step using three quantities or for finding $1000 \div 8 = 125$. The most common incorrect first step was to state that 1 machine made 500 erasers in 20 minutes.
- Q.25** It was clear that some candidates had not studied algebra at this level and many candidates made no real attempt to answer any part of this question. A few correct responses were seen, though not to all parts. Commonly in **part (a)** the square was omitted from the first term or the answer $6x + 4$ was offered. Candidates who worked in a grid need to understand that marks are not awarded until they extract the expression they have generated from the grid and that marks are also not awarded for a list of terms.
- (b) In this part, candidates struggled to write any sensible factors and, as part (ii) required factors in part (i), those who wrote correct solutions in (ii) with no factors seen in (i) could not be credited.
- Q.26** (a) This question assessed inference. A few candidates were able to provide a sufficient amount of evidence to earn 2 marks. A few earned a mark for stating a relevant fraction or proportion. Weaker responses suggested that $30 + 9$ was about 40 or $30 + 12$ was about 40.
- (b) It was expected that candidates would make a comment about the size of either the population or the sample in this part. A few candidates made comments about the experiment needing to be repeated and this was accepted. Some candidates made contradictory statements which were not credited. Other candidates decided that Vikram's estimate was reliable or that it was not reliable but without any, or sufficient, mathematical justification.

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 or multiplication, it was better if they stated the division or multiplication calculation first, so that it was clear exactly what they were trying to find in their build-up approach.
- 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.
- When an accurate drawing is required, use of compasses and a ruler is expected and freehand drawings are penalised. In the case of a pie chart, a protractor and ruler are expected to be used.
- When a diagram is not drawn to scale, such as in question 16, candidates should be aware that this means they should not measure bearings and lengths and that any values needed should be calculated.

MATHEMATICS

GCSE

Summer 2022

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 necessary 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 the questions that are common with the higher tier paper.

Candidates were able to use a calculator for this paper but sometimes used non-calculator methods. For example, on question 4(b) some candidates used a partitioning method to find 18% of 160 instead of an efficient calculator method. Similar methods were observed on question 11(c) and question 20. When this approach was used, there were often numerical errors.

There were various questions on this paper which involved calculations with money. Some candidates struggled to interpret their answers correctly. For example, on question 13 some candidates who arrived at the correct answer of 0.7 then incorrectly interpreted this as 7 pence or 0.7 pence instead of 70 pence or £0.70.

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 on this question with the correct answer of £14.64 seen most of the time. Occasionally the answer of £69.09 was given, where a candidate had not used consistent units to add the cost of the items together.
- (b) Nearly all candidates attempted this question and very often the correct answer of £7.55 was seen. Some candidates made errors when attempting to add five lots of £2.49 together without the use of the calculator. These candidates were still able to gain a method mark if they showed the subtraction of their answer from £20.
- (c) The majority of candidates stated the correct two items on this question. It was rare to award one mark for the correct method or sight of £3.10, the candidates either gained both marks or zero marks.

- Q.2** (a) Candidates were usually successful in calculating one or more of the angles in this question. Correct values for a and b were usually the ones that were correct, using angle properties on a straight line and vertically opposite angles. Some candidates thought the sum of the angles in a triangle were 360° and so calculated the value of angle c incorrectly.
- (b) The correct answer isosceles was seen around half of the time.
- (c) The majority of candidates could not use a protractor to accurately measure the angle, the correct answer of 300° was rarely seen. Some measured the acute angle accurately and gave 60° as their answer.
- Q.3** (a) Most candidates were able to attempt this question and the correct answer of 8.25 was sometimes seen. A common incorrect answer was 8.2.
- (b) It was not common to see the correct two values circled.
- Q.4** (a) This question was answered well with a large proportion of candidates selecting the correct symbol to use.
- (b) In this question candidates were required to show two fully correct methods that arrived at the correct answer of 28.8. The candidates that chose efficient methods such as 0.18×160 and $\frac{2}{3} \times 43.2$ were usually awarded all three marks. However, a large proportion of candidates chose a partitioning method to calculate 18% of 160 which was not fully complete, or had inaccuracies, and so did not gain all the marks. Many candidates calculated $\frac{2}{3}$ of 43.2 in stages but showed the full method so were awarded the method mark for this.
- Q.5** (a) (i)–(iii) There were a variety of responses for these three parts of question 5, but full marks on every part was rare. In part (i) most candidates that attempted it, chose the correct operator to calculate the sum of the two numbers. At least one of the numbers was usually a prime number. In part (ii) candidates had more success in selecting the two square numbers than the correct operator for a product. A common incorrect answer was $9 + 36 = 45$. In part (iii) the correct answer of 24 could sometimes be seen embedded in two calculations such as $72 \div 24 = 3$ and $8 \times 3 = 24$.
- (b) The candidates who were successful in this question stated that “the probability should be $\frac{1}{9}$ because there is only one cube number”. This response was seen occasionally. Some candidates simply stated that “27 is the only cube number” without reference to the probability.
- Q.6** (a) This part of the question was well answered with over half of the candidates arriving at an answer of 7.5 or 750. Unfortunately, some were not able to interpret this correctly in the context of the question and used incorrect units in their stated answer. A common incorrect response was 120 cm which came from misinterpreting the scale and multiplying 30 by 4 instead of dividing by 4.

- (b) Where a candidate arrived at the correct answer of 8cm they often did not show their method.
- Q.7** (a) This question was well answered. The correct answer was common. Occasionally candidates gave the number of lines and circles for pattern 4 instead of pattern 5.
- (b) Most candidates illustrated that it was impossible to have a pattern with 36 lines and 24 circles by showing the number sequence for lines and circles. They often stated, "it should be 23 circles".
- Q.8** (a) This question was not well answered. Many candidates started incorrectly by calculating the perimeter of the rectangle instead of the area. Some multiplied all four sides of the rectangle together before multiplying their answer by the cost. There were occasions where a candidate would correctly calculate the area of the rectangle but not engage with the cost. However, when a correct area was calculated it would usually result in the correct overall cost.
- (b) Most candidates opted for trials in this part of the question instead of dividing the total area by the area per roll. A correct trial for 6 or 7 rolls was seen frequently and this usually resulted in the correct answer of 7 rolls. When trials are used, candidates should show the consecutive trials that result in an answer too small and too big. Candidates that used $67.2 \div 10.5 = 6.4$ sometimes came to the incorrect conclusion of 6 rolls.
- Q.9** (a) This was well answered, a good number of candidates stated they needed to multiply the values in the recipe by six and got all four ingredients correct. Awarding one mark was rare, candidates mostly got all values correct or none correct.
- (b) Very few candidates were awarded all three marks for this question. It was left blank by several candidates. If a mark was awarded, it was usually for correctly converting 1.75 kg to grams. When a correct answer of 14 batches was seen, it was usually embedded in a calculation such as $125 \times 14 = 1750$ instead of a direct calculation, $1750 \div 125 = 14$.
- (c) There were very few correct responses to this question. Candidates often calculated 25% of each ingredient without further explanation to show the statement was correct.
- Q.10** (a) Most candidates were able to collect the 'f' terms but found collecting the 'g' terms more of a challenge. A common incorrect response was $8f + 15g$. When terms were collected correctly the answer was not always written in the correct form e.g., $8f + - 3g$, $8f - - 3g$ or they incorrectly simplified their answer to $5fg$.
- (b) Several candidates answered this correctly.
- (c) Marks were often awarded for this question for working out the value of $6x$ or $3y$ but they were not always added together to get the final answer correct. A common error was adding the values instead of multiplying them e.g. $(6 + 5.2) + (3 + 0.4)$. Some candidates left an x and y on their answer after the substitution e.g., $31.2x + 1.2y$.

- (d) Candidates who answered this correctly often arrived at the answer by embedding the value for e in the equation instead of solving it. Where solving was attempted, there were usually errors in either the first or second step. A common incorrect response was $\frac{e}{2} = 10$ leading to $e = 5$. Another was multiplying through by two incorrectly e.g. $\frac{e}{2} - 4 = 6 \times 2$ leading to $e = 16$.
- (e) It was very rare to award marks in this question. A large proportion of candidates did not even attempt it. However, candidates who started by labelling the sides of the shape with x 's and y 's sometimes gained marks for recognising that $y = 2x$ or for correctly stating the perimeter in terms of x and y . A common error was to include the internal lengths when creating an expression for the perimeter.
- Q.11** (a) This was well answered. A good proportion of candidates either stated that the probabilities should add up to one or they showed this through an addition sum. A common incorrect response was "she is incorrect because there are not any other colours listed in the table".
- (b) An answer of 0.56 was often seen (or 0.56/1). However, there were several candidates that added the one incorrectly to the hundredths column and got an answer of 0.47.
- (c) Many candidates did not engage with the probability part of the question and did not calculate the expected number of winners. It was rare to see a fully correct response. Marks were usually awarded for calculating the income from playing the game once. Some candidates assumed that 12 players won because the probability of winning was 0.12. They went on to calculate the profit using this.
- Q.12** (a) Candidates who used a 'build-up' method to calculate the time difference were more successful than those that attempted subtraction. For example, 09:27 + 33 minutes is 10:00, 10:00 + 3 hours is 13:00, 13:00 + 13 minutes leading to 33 minutes + 3 hours + 13 minutes is 3 hours 46 minutes. Some candidates listed times such as 09:27, 10:27, 11:27, 12:27, 13:27 minus 14 minutes. This often led to an incorrect answer of 4 hours 46 minutes.
- (b) A good proportion of candidates were successful on this question. The most common method was to list times starting at 8 a.m. for each bus and stopping at 10 a.m. Some candidates made an error when adding 24 minutes to 08:48 and so were unable to find a common time for each bus.

- Q.13** This question was well attempted with candidates gaining some or all of the marks. It was common to see the total cost for 3.5 kg of potatoes calculated. However, some candidates chose to do this in stages by calculating the cost for 3 kg and 0.5 kg separately, this sometimes resulted in numerical errors. Often the method stopped after calculating the cost for 2.3 kg of parsnips. If a candidate did then go on to divide by 2.3 they usually arrived at the correct answer of 0.7. This was not always interpreted correctly in the context of the question. The final mark was sometimes lost when 0.7 was followed by an answer of 7p or 0.7p.
- Q.14** (a) A good proportion of candidates used their calculator correctly and were awarded one mark for 9.2625 or two marks for 9.3. Some candidates did not know what rounding to one decimal place meant and moved the decimal point one place to give an answer of 92.625. An answer of 2.6 was seen on occasion where the correct order of operations was not applied but the answer had been correctly rounded to one decimal place.
- (b) Common incorrect responses were 68.000 and 68 320.
- (c) 63×10^5 was commonly seen but often there was no standard form notation attempted.
- Q. 15** (a) Most candidates were able to place some of the numbers correctly in the Venn diagram, but it was not common for all the numbers to be placed correctly. Occasionally the circles were completed correctly but 32, 34, 38 and 40 were omitted.
- (b) An answer of 3/10 was seen on times even though the Venn diagram was incorrect. These candidates used the number list to calculate the correct probability. When a Venn diagram was incorrect in part (a) candidates were often able to gain marks for a correct numerator or denominator in their probability.
- Q.16** (a) It was very rare to see the correct enlargement in the correct place. However, candidates often gained two marks for a correct enlargement in an incorrect position.
- (b) It was clear that many candidates correctly identified the shape they were trying to complete, but often the fourth vertex was placed one square out of place.
- Q.17** Not many fully correct responses were seen in this question. But if the candidate started with the correct area of a circle formula, they often gained marks. Some candidates calculated the area of each circle but did not engage with the sectors. When the areas of the sectors were calculated the correct person was usually selected.

- Q.18** This question was not answered as well as expected. Not many candidates knew the full method for estimating the mean from a frequency table, but some could make a start. When marks were given, it was either for finding correct mid-points or for multiplying their mid-points by the frequencies and attempting to add them. Following this, candidates often divided their answer by five (the number of groups) instead of the total number of carrots. Another incorrect response that was seen on several occasions was the sum of the mid-points divided by five.
- Q.19** (a) The correct answer of 2 : 6 : 3 was not seen often, but many candidates were able to give a correct ratio that was not fully simplified. The most common response being 1 : 3 : 1.5.
- (b) The correct answer was rare but occasionally a candidate had a correct response based on their incorrect ratio.
- Q.20** Most candidates that attempted this question successfully calculated the number of years the digger had been used for. Very few candidates knew how to use an efficient method to calculate eight percentage reductions. Those that engaged with this question attempted to calculate one reduction at a time, this often led to numerical errors resulting in an incorrect answer. Partitioning methods for calculating 18% of 35950 were seen frequently, this sometimes resulted in the correct answer for one reduction but very rarely led to a correct answer for further reductions. Of those candidates that calculated the correct value of the digger after eight years, some did not fully answer the question and did not state what the decrease in value was.
- Q.21** (a) This question was not well attempted, but when it was, occasionally marks were awarded for $\frac{42}{60}$ or 0.7 or for calculating the total amount of degrees the wheel had turned in 42 complete turns. Most candidates did not know how to use these correct first steps to get to the final answer.
- (b) In this part of the question a response such as “the wheel spins at a constant speed” with the impact being “if it was ever spinning faster, it will have turned through more degrees in one second” is what was expected. Many candidates just restated facts from the questions, for example, “the wheel turns 252° each second”.
- (i)(ii)
- Q.22** (a) Some candidates attempted to collect x terms on one side of the equation with numbers on the other side, however this was rare. It was common to see an answer of $x = 2$ from $5x - 2x = 11 - 5$, avoiding the use of negative numbers.
- (b) Candidates struggled to expand the bracket in this question, it was often interpreted as $8x(3x + 1) = 2$ instead of $8x - (3x + 1) = 2$. $24x^2 + 8x = 2$ was a common incorrect start to this question. Candidates should be reminded that $-(3x + 1)$ means $-1(3x + 1)$.
- (c) A few candidates were able to explain that -1 should not be included in Tansi’s solution but it was not seen often.

- (d) Very few candidates understood how to represent an inequality on a line. This was not well answered.
- Q.23**
- (a) It was common to see the correct answer of 17 seconds.
- (b) In this question we were looking for a response that commented on why the line of best fit was likely or unlikely to give reliable predictions. Occasionally a response such as “we don’t know what happens after 50 seconds” was seen. This was not sufficient as it makes no reference to the line of best fit. Those candidates that quoted values using the line of best fit were more successful, for example, “the temperature is 50 degrees at 50 seconds so it would be a lot more than 50 degrees at 70 seconds”.
- (c) Candidates rarely attempted this question.
- (d) In this question candidates were expected to give an explanation that considered both the steepness of the line and the variables. A response such as “the increase in temperature per one second” is what was expected. Most candidates either stated what a positive correlation is or explained that the gradient is the steepness of the line.
- Q.24** This question was challenging for foundation tier candidates. They often struggled to pick the correct trigonometric ratio. A large proportion of candidates did not even consider the use of trigonometry. Some attempted to use the formula to calculate the area of a triangle but the values they used for the base of the triangle did not come from a valid method.

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.
- More understanding of rounding to decimal places and significant figures is needed.
- Candidates should learn how to interpret decimal answers where the question involves money, in pounds and pence.
- A better understanding of how to calculate the mean from a frequency table is needed.
- Candidates should use an efficient method for compound appreciation or depreciation using decimal multipliers.

MATHEMATICS

GCSE

Summer 2022

Higher tier component one

General Comments

To succeed in this examination, candidates needed to read each question carefully and make sure they used all necessary information that was given in their solution. Good arithmetic skills are required across all forms of number. Presentation is important as candidates who present their work in a neat and logical way are generally more successful, being less likely to make simple errors such as miscopying their own 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.

Comments on individual questions/sections

- Q.1** A good number of correct solutions were seen to this exchange rate problem. Most candidates who were successful found that each of the given values were equal to £100 and £99 and then made the correct choice of answer. Those who earned both method marks almost always went on to complete the solution correctly. Many candidates were able to earn a method mark for a correct calculation or value. There was some confusion about currency symbols in this question, with many values being mislabelled. This was condoned as the units could be implied from the calculations if seen, although generally it is expected that the units used are correctly stated.
- Q.2** This multiple choice question assessed candidates' understanding of congruency. A good proportion of candidates indicated the correct pair of statements and a few candidates earned a mark for one statement correct out of two or two statements correct out of three. Common incorrect choices were statements 1 and 6.
- Q.3** (a) A reasonable number of candidates were successful in this part of the question. The formula required was given and so needed to be correct. The simplest way to earn the first mark was to substitute the correct values into the correct formula. Some candidates were unable to square 15 correctly but were still able to earn the final mark, following their value. Candidates who did not show the correct use of the formula could still be credited if the method they used, even in steps, was equivalent to this. However, on many occasions, the method used was faulty at some point and so candidates could not be credited. Those candidates who multiplied 15 by 30 and gave the answer 450 or 450π may improve if they are more aware of the formulae given at the start of the examination.

- (b) This was reasonably well answered. Some candidates were able to use the scale correctly to find the correct dimensions for the cone they needed to draw. Candidates were still able to earn marks for the plan and elevation of a cone similar to the given cone, even if they ignored the scale or did not have correct values from the use of it, and some were able to do this. It was necessary for the plan and elevation to be drawn accurately and freehand drawings were not given full credit. Some candidates were drawing ellipses, or similar, for the plan and half cones were common for the elevation.
- Q.4** (a) A reasonable number of candidates produced graphs that were accurate enough to be credited. Candidates needed to use a uniform scale that started at 0 and ended at 225 or more. The line drawn needed to start at (0, 225) and have a negative gradient, ending at (45, 0). A good number of candidates, although not all, earned the mark for the uniform scale. Some candidates also had a line that started at the correct point but had incorrect gradient and often ended at (50, 0). Some candidates drew a line starting at (0, 0) and that had a positive gradient. A few candidates drew a series of lines or a curve. Most lines were ruled, although some freehand lines were attempted.
- (b) This part of the question could be answered without reference to the graph and some candidates were able to calculate the correct answer. A good number were able to earn at least 1 mark for a correct calculation or for the value 90 or 135 seen.
- Q.5** This question was standard for this level and a good number of candidates offered solutions that were correct or mostly correct. Some slips in arithmetic were made, more commonly in **part (c)** where the answer was often given as 0.4 following a correct product. Weaker responses offered answers of $0.6 + 0.3 = 0.9$ for **part (b)** and $0.4 + 0.1 = 0.5$ for **part (c)**.
- Q.6** Candidates found this question a challenge. There were some fully correct responses. Those using three quantity working were most successful, providing that they were careful. Candidates who earned both the method marks usually went on to earn all 3 marks. A few candidates earned one mark, commonly for a correct first step using three quantities or for finding $1000 \div 8 = 125$. The most common incorrect first step was to state that 1 machine made 500 erasers in 20 minutes. Responses were often poorly presented and difficult to follow.
- Q.7** This was a standard question at this level assessing expansion and factorising and many candidates answered all parts correctly or simply made sign or arithmetic, rather than process, errors.
- (a) In part (a), candidates who worked in a grid need to understand that marks are not awarded until they extract the expression they have generated from the grid and that marks are also not awarded for a list of terms.
- (b) In **part (b)**, candidates who wrote incorrect factors in (i) could only be credited if the solutions stated in (ii) followed the factors they had stated in (i).
- Q.8** (a) This question assessed inference. A reasonable number of candidates were able to provide a sufficient amount of evidence to earn 2 marks. A few earned a mark for stating a relevant fraction or proportion. Weaker responses suggested that $30 + 9$ was about 40 or $30 + 12$ was about 40.

- (b) It was expected that candidates would make a comment about the size of either the population or the sample in this part. A few candidates made comments about the experiment needing to be repeated and this was accepted. Some candidates made contradictory statements which were not credited. Other candidates decided that Vikram's estimate was reliable or that it was not reliable but without any, or sufficient, mathematical justification.
- Q9** Candidates needed to solve a simple reverse percentage problem. A reasonable number of fully correct solutions were seen and a few candidates earned 2 marks, being penalised for inaccurate arithmetic. A few candidates earned a strategy mark for a strategy that was correct but poorly executed. The most common incorrect answer was to find 90% of £8690 as £7821.
- Q.10** (a) This part of the question was a simple lead into the proof in part (b). Here candidates needed to write 378 as a product of primes in index form. A standard question that was well answered with most errors being arithmetic slips rather than process errors. Occasionally, candidates miscounted the number of 3's or omitted to include the 7, following a correct factor tree.
- (b) A reasonable proportion of candidates earned at least one mark here for a partially correct solution, often showing or stating that the prime factors of 275 were 5, 5 and 11. Many candidates made no concluding comment. A comment was required for full credit as this question was assessing proof. A few candidates made comments that were not sufficiently correct. For example, a few suggested that '1 is the only prime factor', which was not accepted.
- Q.11** (a) Responses to this part of the question were varied. A few candidates worked out a correct answer from a correct difference or sum of vectors in each part, ignoring the grid. Other candidates used the grid successfully to arrive at their answers. Few candidates showed sufficient strategy to earn a mark if their answer was incorrect. Lines drawn on the diagram with no direction were not credited unless direction of movement could also be deduced from the working. It was expected that candidates would plot points correctly from the position vectors given, but often, coordinates were reversed. Also, a few candidates plotted O at a point other than the origin, which only confused them.
- (b) Candidates had the opportunity to critically evaluate a given way of presenting information in this question. A good proportion stated that the directions had been omitted and a few observed, in some way, that the directions of **2a** and **b** were mismatched. A few candidates determined that the answer should have been a single line. This was not accepted as a valid criticism as the drawing of two, joined directed lines is perfectly valid.
- Q.12** (a) This part of the question was generally well attempted. A good number of candidates either found and used that 1 part of the ratio equated to 8 or scaled up the 3 quantities to find 104 : 56 : 16 and earned 3 marks instantly. A few arithmetic slips were seen, but mostly correct processes were applied. Weaker solutions commonly attempted to multiply all 3 parts of the ratio by 22 or made no real progress beyond writing down the question.

- (b) This was not well answered, with few fully correct responses in any form, offered. Commonly, candidates divided by x and multiplied by f , or vice versa, or formed an equation of some sort.
- Q.13** Some excellent responses were seen to this simple problem involving values in standard form. A good number of candidates understood the process needed and a good number of these executed it accurately. Mostly candidates converted the value from standard form into an ordinary number and then divided. A few place value errors were made, but these were not common. Occasional slips in arithmetic were also seen. Candidates who made no progress generally chose the wrong operation initially, or tried to combine incorrect values.
- Q.14** This was a fairly standard transformation of formula question at this level. A good number of candidates offered correct responses and detailed their working, methodically and neatly. The most common errors were to forget to multiply all terms by 7 when clearing the fraction or to multiply by b rather than divide or to take the cube root of the numerator only in the final step. A few candidates combined steps and made errors in the process. This is not recommended.
- Q.15** This circle geometry question required candidates to Show that... a particular value of x was correct from information given and a diagram. Candidates who worked back from the answer to show that the given information was correct were not given full credit. However, this was not common and candidates generally did try to work in the correct way. A reasonable number of fully correct or partially correct answers were seen. Candidates needed to use properties of a cyclic quadrilateral and the tangent being perpendicular to the corresponding radius to be completely successful. Some were able to do this. Some candidates truncated their working by not stating $\widehat{PSR} = 60^\circ$ but simply wrote $\widehat{OSR} = 35^\circ$. This was only credited if there was evidence that they had used the cyclic quadrilateral property. In the final step, candidates often used angles on a straight line, making the arithmetic a little more complicated than necessary and introducing more opportunity to make an error. Weaker responses often only earned a mark for finding $\widehat{PSO} = 25^\circ$. Presentation of answers was often poor with many unlabelled unidentifiable calculations scribbled on the page. Often, these could often not be credited.
- Q.16** (a) In part (i), a reasonable number of candidates seemed to have an understanding of frequency density but not as many were able to carry out the arithmetic needed to find the correct values. Sometimes division was carried out in reverse or all values were simply divided by 10. Most candidates opted to try to find decimal values for the table, where fractions would have been acceptable and were less of an issue. Candidates who had demonstrated reasonable knowledge of frequency density were then able to be credited for a correct histogram in part (ii), following their values. Most histograms that were attempted had no gaps between the bars, as expected. A good number of candidates were able to generate the correct probability in part (iii). A few omitted to take note that the 43 was given in the question and did not need to be calculated. A few candidates earned a mark for finding the correct total frequency of 17 trees. Some candidates made no attempt to answer part (a).

- (b) Some fully correct solutions were seen. A few candidates made an arithmetic error but were still able to earn a method mark. Some candidates gave values very close to the correct answer but showed no method. These could not be credited as a correct method cannot be implied from an incorrect value.
- (c) The comment made needed to be sensible, choose Brian and have some supporting evidence. It was required that candidates had earned at least a method mark in part (b) for any credit to be given here, so that the comment at least had a firm basis for being made. Candidates also needed to justify their choice by mentioning something numerical, such as a group of heights they were comparing, frequencies they were using or a statistic they were using, such as the modal group. General comments without mathematical justification were not accepted.

Q17 Good responses used Pythagoras' theorem or trigonometry. A reasonable number of candidates chose a correct strategy and a few of these candidates executed it fully and earned all the marks. A few candidates stopped with a correct, but not fully simplified expression for h . Some candidates made bracketing errors and were penalised for that. Some candidates did not deduce that half the base of the triangle was x and used an alternative variable in their solution. Weaker candidates often made no attempt to answer or tried to apply an area formula.

- Q.18**
- (a) Was reasonably well answered. The most common incorrect answer was 5^{-1} .
 - (b) Was fairly well answered with a decent number of candidates understanding the need to take the 4th root and then cube the answer. Many demonstrated this neatly, in steps. A few place value errors were made when attempting to find interim values.
 - (c) Was the most challenging part of the question and few correct solutions were seen. Some candidates stated correct answers but then spoiled them by then writing 70^n which was not accepted for full credit. To be partially credited candidates needed to convert the square root to the power $\frac{1}{2}$ for the 10^{2n} part of the product, as this was required in order to simplify the expression, and also to rewrite the expression as the product of two terms. Again this was not commonly seen. $7\sqrt{10^{2n}}$ was a commonly stated answer that earned no credit at this level.

- Q.19**
- (a) Was not well answered. Only a handful of correct recurring decimals were stated. Candidates commonly incorrectly stated $0.\dot{2}7$ or omitted to place a dot over the repeated 0.
 - (b) Candidates made better progress in this part of the question. A good number adopted a correct strategy to find the fractional form needed and some of these continued to provide a fully correct solution. Various methods were seen, most are detailed in the mark scheme. Those candidates who were not successful often attempted to use an invalid combination such as attempting to use $1243\cdot4\dot{3} - 1\cdot2\dot{4}3$. Some candidates found the correct fraction but were then unable to form common denominators and complete the solution. Weaker responses typically attempted to work all in decimal values, ignoring the instruction in the question.

- Q.20** (a) Candidates needed to show that they understood how to form a composite function correctly in this part. Some candidates were able to do this and their arithmetic skills were good enough to earn both marks. Other candidates struggled to divide $\frac{1}{3}$ by 2 and cube the answer. Weaker responses typically stated the product $\frac{x}{2} \times x^3 \times \frac{1}{3}$ and simplified it.
- (b) Candidates needed to show that they understood how to form an inverse function or how to use the relationship between a function and its inverse to solve the equation. Again, some candidates were able to do this, although a few stated $\sqrt[3]{x} = -2$ and then stated $x = \sqrt[3]{-2}$ or similar. Weaker responses typically stated or used the inverse function as if it were the reciprocal of $h(x)$ and could not be credited.
- Q.21** (a) A few fully correct graphs were seen in part (i). Some candidates had a graph of the correct shape but omitted to mark one or both of the 1 and -1 on the vertical axis, so were penalised. A few others drew graphs which had ruled sections. Many graphs were for sine curves or were inverted. Some candidates made no attempt to answer. In part (ii), very few fully correct solutions were seen. Some candidates stated 30° or gave an embedded answer which was only accepted if clear. Many candidates made no attempt to answer part (ii).
- (b) Few fully correct sketches were seen for either part. Graphs were commonly translated in the wrong direction. Some appear to have been reflected in some way, also. Some coordinates had sign errors for the quadrants under consideration. This was a careless way to lose a mark at this level.
- Q.22** (a) Was not well answered. Candidates needed to form a product of correct probabilities, taking into account the dependency. Some candidates omitted to take into account that the balls could be chosen in either order and stated $\frac{1}{5} \times \frac{1}{4}$. Few candidates used a correct strategy and some seemingly correct values were obtained from spurious working, which was not accepted.
- (b) Again this was not well answered. Correct solutions were rarely seen. Candidates again needed to form a correct product, using their answer to part (a), providing that answer was not $\frac{2}{5}$ or $\frac{1}{5}$. Most candidates did not adopt a correct strategy. Some candidates tried to find the probability of losing without using their answer to the previous part. This was mostly unsuccessful. Many candidates tried to sum incorrect probabilities or made no attempt to answer.
- Q.23** (a) Some candidates, who were careful and logical, made short work of this question and earned a simple 3 marks. Candidates who were more slap-dash and disorganised with their setting out often lost marks they would likely otherwise have earned if they had been more careful. Not all candidates were able to access the work at this level, but many attempted to answer. Common errors made were to write $3\sqrt{3}$ as $9\sqrt{3}$ or 35×3 as $35\sqrt{3}$ for example. Other, various, arithmetic errors were also seen.

- (b) Candidates found this part of the question to be challenging. A few fully correct and well-presented solutions were seen. The simplest correct strategy was to form the total area by summing the vertical rectangle and shorter horizontal rectangle, indicated by the dashed line. Some candidates ignored this hint and attempted to separate the shape into other components. That approach was more prone to error. Candidates then needed to form a correct equation and take some steps towards solving it. An error was allowed but some candidates made several errors in this step. Some candidates omitted brackets and made order of operations errors when collecting terms. A few candidates formed a correct expression for x and then cancelled the irrational denominator with the numerator incorrectly. The error $\frac{35\sqrt{2}-30}{5\sqrt{2}} = 7\sqrt{2}-6$ was seen several times. Again, those candidates for whom this level of work was accessible, often lost credit because their work was very slap-dash and poorly presented and they misread their own figures.

- Q.24** (a) Was fairly well answered by those who were capable of working at this level. Candidates needed to interpret the equation of the circle correctly. The answer was an integer and so answers that were not integers were not accepted.
- (b) Was fairly well answered by those who generally made progress with part (a). A few candidates drew a circle but stated the point $(-12, -16)$. These were credited for one correct coordinate. Those who drew a circle, centre the origin with A correctly marked could earn a special case mark for interpreting the circle equation correctly and some candidates did earn a mark in this way. A diagram is a very sensible strategy in solving problems such as this and should be encouraged.

- Q.25** This question assessed average rate of change. It was not well answered, although a few correct answers were seen using one or other of the methods detailed in the mark scheme. Common incorrect responses involved direct proportion along the lines
- $$5 \rightarrow 6 \text{ so}$$
- $$15 \rightarrow 18$$
- or some sort of use of distance $\div$ speed, without any reference at all to the acceleration given in the question, which was totally overlooked. Candidates should make sure they use all given information in their solution. Candidates tended to earn 3 marks for a fully correct solution or zero, with the latter being far more common.

Summary of key points

- Recognition of problems requiring a strategy for reversing a percentage would help some candidates apply an appropriate method of solution.
- In questions assessing circle geometry, it is essential that angles found are identified clearly and reasons stated.
- Conversion from a fraction to a recurring decimal, a simple process, remains very poor.

MATHEMATICS

GCSE

Summer 2022

Higher tier component two

General Comments

Weaker candidates did find the questions towards the end of the paper more demanding as expected.

The paper differentiated well, with different styles of questions and a graduation in the level of difficulty.

As item level data is available to all centres, by centre and for individual candidates with comparison of all candidates sitting these examinations, this report will focus on common errors and misconceptions to aid the interpretation of the data available rather than focus whether each question was well answered or not.

Comments on individual questions/sections

- Q.1** Candidates should be encouraged to make it clear which values they are using for their mid-points. Several candidates did calculate the correct total and then divided by 5. Candidates should be encouraged to consider the reasonableness of their answer e.g., are answers such as $8280/5 = 165.6$ or $525/90 = 5.83$ reasonable?
- Q.2**
- (a) Candidates should appreciate that ratios in their simplest form always involve whole numbers. A common error was to give the ratio as 1 : 3 : 1.5.
 - (b) Fractions should always have whole numbers for both the numerator and the denominator.
- Q.3** The question expected the use of compound depreciation. Those candidates that choose to work year-by-year have to work with complete accuracy at each stage. Too many candidates failed to calculate the decrease in the value and left their answer as the value after 8 years.
- Q.4**
- (a) Many candidates were able to calculate that the wheel completed 0.7 turns in a second but failed to progress further.
 - (b) Candidates cannot use as an assumption the information that they were given in the question or an assumption that contradicts it.
- Q.5**
- (b) Candidates would be advised to write the -1 outside the bracket since they are generally able to expand brackets but make errors when there is no apparent number there.

- Q.5** (c) Too many candidates explained why Tansy was incorrect but then indicted that Ali was incorrect.
- (d) Candidates must ensure that an open circle is clearly shown. The inequality should then be represented by an arrow, to indicate that all values in that direction are to be included.
- Q.6** (b) Candidates must read the question carefully and not rely upon standard responses such as 70 is outside the range of the graph.
- (c) Many candidates were able to calculate the gradient and then failed to appreciate that they had been given the value of c.
- (d) Candidates were expected to explain that the gradient for this graph represents the rate of change of temperature with time, rather than simply give a standard response that the gradient is a measure of steepness.
- Q.7** Too many candidates decided not to use the obvious right-angled triangle work and area as $\frac{1}{2} \times \text{base} \times \text{height}$ and consequently made the question more demanding than was necessary.
- Q.8** Candidates were given the formulae for both the area of a circle and the volume of a prism on the additional formulae sheet but too many failed to correctly calculate the volume of the cylinder with a number using $\frac{1}{3} \times \text{base area} \times \text{height}$ or the formula for the volume of a sphere.
- Q.9** Average speed needs to be calculated from the total distance divided by total time. The crux of the question was to calculate the distance travelled whilst cycling.
- Q.10** Many candidates drew arcs from S and R and found a single point that was equidistant from S and R when the perpendicular bisector was required. Too many did not know how to construct a perpendicular to the path at Y with a number constructing a perpendicular bisector of the path, which did not then pass-through Y.
- Q.11** (a) Too many candidates failed to notice that an example of the format of the statement needed to describe the answer to (a) was given in (b).
- (b) Several candidates simply drew a reflection of triangle ABC in the y-axis.
- Q.12** (a) Too many answers here were spoiled by incorrect arithmetic, even though a calculator was allowed.
- (b) Many candidates correctly looked for a common second difference and then failed to realise that this difference of 4 implied that the sequence was based upon $2n^2$.
- Q.13** Too many candidates correctly calculated the density of the copper but failed to progress further.
- Q.14** The expansion of $(5x^2y)^5$ caused problems for too many candidates with $10x^7y^5$ being a common result. Dealing with y^5/y^6 caused issues for quite a few candidates. However, many candidates did manage to gain part marks, with the $5^5 = 3125$ being the least likely element to be correctly evaluated.

- Q.15** (a) Many candidates struggled with the maximum bound being 825. Some candidates calculated 825 then gave the maximum value as 824.9.
- (b) Far too many candidates failed to appreciate that $\min - \max - \max$ was required and simply subtracted from 370. Candidates would be best advised to write upper and lower bounds for each of the values and then consider which to use to obtain the required outcome.
- Q.16** (a) Discussion of the placement of the median as the 23rd term was required in (ii). Use of the 22.5th term as the median was allowed.
- (b) (i) With the example box-plot drawn for them, correctly calculating the maximum mark was all that should have been required for the marks available here.
- (ii) In (ii) many candidates failed to read the question and gave the standard responses without any reference to either the median or an appropriate measure of spread.
- Q.17** Candidates should be advised to label their lines as unlabelled extra horizontal or vertical lines meant it was unclear as to whether the correct two lines had been drawn. A pleasing number of candidates were able to follow the requirement in the use of solid and dotted lines.
- Q.18** (a) Candidates should appreciate that fractional answers are exact whilst decimal and percentage answers involve rounding. Here it was obvious which values had been used to obtain a decimal answer. This was not the case in (b).
- (b) Too many candidates did not appreciate that the 6 guests who failed to tick a statement were excluded from this part of the question.
- Q.19** (a) As the answer was required in the form, $y = mx + c$, candidates would have benefitted from starting with $y = -4x + 5$.
- Too many candidates tried to substitute (1, -1) into an equation that included the 5.
- (b) Many candidates were aware of the rules for perpendicular lines but were unable to identify the gradient of the given line. For those who identified the gradient of the given line, a common error was to write $y = 5/x + c$, rather than $y = 5x + c$.
- Q.20** Many candidates were unable to start the question as they simply equated R to the given expression.
- Q.21** (a) A pleasing number of candidates were able to answer the question correctly, but common incorrect answers were 64 or 8^8 .
- (b) Several candidates identified the straightforward way to answer this part without involving the product rule for counting.
- Q.22** Candidates need to appreciate that interval bisection was required in this question and that standard use of trial and improvement is not appropriate.

- Q.23** (a) This part was generally well answered by those that attempted it.
- (b) Candidates failed to read the question and simply solved the quadratic equation here. In order to show the given equation, candidates needed to start by setting up an equation using the fact that the difference in the cost per kg of the butter and flour, which could be identified from the table, was £5.
- (c) Candidates that chose to use the quadratic formula often failed to deal correctly with the $(-4)^2$.
- Q.24** Right-angled triangles and rules for parallel lines were seen here far too often. The requirement to show that angle ABC was 50° correct to the nearest degree was missed by many candidates. Many candidates were able to demonstrate correct usage of the sine and/or cosine rules.

Summary of key points

- Candidates must read the questions carefully. Too many answers indicated that candidates were answering the question that they expected to be there rather than the actual question asked.
- All stages must be shown in questions requiring a 'show that' response.
- Candidates must make effective use of the formulae provided.
- The meaning of notation used for composite and inverse functions is still seemingly very unclear for some candidates, who treat them as products and reciprocals.



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