



GCSE EXAMINERS' REPORTS

**SUBJECT
GCSE MATHEMATICS**

SUMMER 2019

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MATHEMATICS

GCSE

Summer 2019

FOUNDATION TIER; COMPONENT ONE

General Comments

To perform well in this examination, candidates need to present their solutions in a logical and methodical way. Candidates should always show full method for any answer that involves more than one step. This is a non-calculator paper and it is expected that candidates show the method for their answer even when they then choose to work out answers mentally, rather than using a written option.

A correct method cannot be assumed from an incorrect value. Candidates who carry out a great deal of mental arithmetic and make a slip in calculation, without showing working, will suffer a loss of marks. Candidates whose work is poorly written often miscopy their own figures, resulting in inaccurate solutions. Work that is compressed into a small space or written in several places can be difficult to follow, again leading to candidates making errors from their working. It would be better if candidates were encouraged to use the continuation page at the back of the examination booklet if this is the case, indicating in the main script that their answer is to be found on the continuation page. Candidates should be encouraged to re-read a question once they have completed their attempt, as often some element of the solution has been omitted. Some candidates are showing that they are identifying key information in the question by highlighting key words and instructions. This seems to be helpful.

Comments on individual questions/sections

Question		Comments
1	(a)(i)&(ii)	Most candidates found this to be an accessible start to the paper as these questions were usually well answered. There were occasional place value slips.
	(b)(i)&(ii)	A good number of correct answers were also given to these parts. The fraction was occasionally given as $\frac{1}{3}$ or $\frac{1}{31}$ or $\frac{31}{10}$. It was unusual to see errors in stating the percentage although place value errors, such as 3.1%, were seen.
	(c)	This part assessed candidates' understanding of place value. Many correct answers were seen. The distractors 4.07 and 4.0615 were sometimes chosen.
	(d)	Method was commonly omitted in this part, but the answer was often correct. Those using $\frac{4}{5} = 80\%$ and then trying 4.5×8 made the question harder than necessary and success with this approach was variable. Some candidates only divided by 5, giving the answer 9. This was an incomplete method so could not be credited.

2	(a)(i)&(ii) (b)	Many correct answers were indicated in both parts. (i) Here, E was sometimes given perhaps indicating that candidates did not understand the plan view. (ii) In this part, 5 was a common wrong answer from weaker candidates (this being the number of cubes perhaps). A good number of candidates chose sphere. Common wrong answers were circle, cylinder and cone.
3	(a) (b)	Most candidates chose to find 12×4.50 . Many successful non-calculator methods were used such as build-up approaches using repeated addition or doubling and partitioning using $4.50 \times 10 + 4.50 \times 2$. These methods were the most successful. Most candidates were able to find £54 accurately. A good number of candidates concluded the argument correctly. As this was a 'Show.....' question, full method needed to be stated to earn all the marks. A few candidates incorrectly concluded 10% of 60 = 54. Finding $12 \times 4.50 = 54$ and then concluding 10% of 60 = 6 without further working was insufficient for the final mark, as the argument was incomplete without linking the 6 to 60 – 54. Similarly, finding $60 - 54 = 6$ without 10% of 60 = 6, was an incomplete argument. A good number of candidates attempted to find $630 \div 30$ and many of these were successful. Some candidates did not know there were 30 days in April and used 31, 28 or 29 days. Some candidates multiplied 630 and 30 instead of dividing. Some found the division challenging and it was not uncommon to see 210 or 201 as the answer. A quick check using multiplication would have possibly corrected this error.
4	(a)(i) (a)(ii) (b)	Some fully correct answers were seen. Many candidates were able to score at least 2 marks for this part. However, commonly the vertical axis was unlabelled. On occasion the scale was not uniform or did not start at 0. Some scales were not well thought out. For example, using 1 square for 5 units was seen several times. Sometimes the bars were of unequal width and some candidates needed to take more care to draw the bars at the correct height. A good number of correct responses were seen. Some candidates chose 19 instead of 2, misinterpreting what they were being asked. Almost all candidates chose South Africa. Very well answered with just occasional slips in arithmetic seen in an otherwise correct method. A few candidates omitted to divide by 2. Most candidates used an efficient method and trials were rarely seen.
5	(a) (b)	Very well answered by the majority of candidates. A reasonable number of candidates earned both marks. A good number earned a mark for a fraction with a denominator of 16. A few earned a mark for a numerator of 5 or for interpreting one condition correctly. Candidates need to understand that, at this level, unless the vocabulary of probability (certain, unlikely and so on) is clearly being tested, when they are asked to find a probability it must be stated as a fraction, decimal or percentage and not as e.g. unlikely or 5 in 16.

6	(a)(i)&(ii)	Both parts were usually correctly answered. It was expected that candidates would mark a cross or dot where the position of C was located, rather than writing a C at the point itself, although this was condoned.
	(b)	Candidates who read the information carefully, plotted the correct point and wrote the correct value. A common wrong answer was to plot D at (3, -2) and give the answer 6. The length of the line given needed to match the position of their point D.
7	(a)(i)	Most candidates were able to find $7a$ but few also had $-4b$. Most commonly answers of $7a + 4b$ or $7a - 2b$ were given. Occasionally, a few candidates went on to combine the terms further, for example $7ab$ was given as a final answer.
	(a)(ii)	Candidates found this part challenging and it was very rare to see a correct answer. Most errors were an incorrect order of operations, treating the expression as $(1 + 4) \times c \times c$, leading to an answer of $5c^2$. Candidates should know that the rules of BODMAS (or BIDMAS) which apply to numerical calculations, also apply when simplifying algebraic expressions.
	(b)(i)	A good number of correct answers were seen to this part. Those who were incorrect usually gave the answer 48.5. Checking the reasonableness of this against the formula given where it was clear that the Japanese size was numerically greater than the UK size may have prevented this error. Some candidates tried to find $29.5 - 19$ but the arithmetic was beyond them.
	(b)(ii)	Some correct answers were seen, with a few in words which was acceptable, but most attempting USA size - 1. Quite a few candidates stated ' $n - 1$ ' or, incorrectly, ' $n + 1$ ', without defining n . This made the solution more complicated than was needed. Many candidates simply wrote ' -1 ' or, incorrectly, ' $+1$ '. This was not accepted as without indicating from what quantity the 1 should be subtracted, the formula was incomplete.
8	(a)	Candidates needed to interpret in the given information and deduce that the quantities in one bottle of the drink were 4 times the quantity in 100 ml. A good number of candidates were able to do this successfully. Some candidates made the correct deduction but were unable to carry out the arithmetic correctly. Most were able to multiply by 4 but division by 4 was more problematic for many with common wrong answers for the salt in 100 ml being 0.2 or 0.0. Some candidates attempted to multiply by 3 or 5.
	(b)	A reasonable number of correct answers were seen, though not always to both parts together. Candidates who had made the correct deduction in part (a) usually gave 1200 ml in this part. Those who multiplied by 5 in part (a) usually stated 1500 ml and the answer 300 ml was also commonly given by candidates who misinterpreted the table. Whilst many candidates attempted 3×0.4 , few were able to find its value correctly. Place value errors were common with 0.12 a very common incorrect answer.
	(c)	Some interpretation was needed to select a pair of correct values from the table. The most successful approach was to use a build-up method e.g. finding $50\% + 10\% + 4 \times 1\%$.

		Some fully correct answers were seen and usually the presentation of work was good, although some candidates should have continued on the continuation page as the compression of their work occasionally resulted in errors being made. A few candidates were writing, for example, 64% of $25 = 16$ without any evidence of method. As this was a 'Show....' question, the method needed to be seen for the marks to be awarded. Candidates who tried to show that 4 was 64% of 6.25 were usually less successful. A few candidates observed that $16 \times 4 = 64$ and $25 \times 4 = 100$ but were unable to connect these pieces of information and so could not be credited. Weaker candidates totalled the values in the 'per bottle' column of the table and tried to work with 153.4. This made no sense as the units were different.
9	(a)(i)	A reasonable number of fully correct answers seen to this part of the question. Candidates initially needed to find a strategy. A few candidates 'boxed' every 2 pencils and the notebook making it clear that the total needed to be divided by 4. This was a useful and efficient approach. Some candidates indicated that they were replacing the notebook with 2 pencils, divided by 8 and then multiplied by 2. This was also very successful but as more steps were involved was a little more prone to error. Some candidates divided by 8 and then stated £2.10 as their final answer. Perhaps these candidates would have improved by rereading the question. Many candidates initially divided by 6, misinterpreting the £16.80 given.
	(a)(ii)	A good number of correct answers were seen. Those who indicated 'no' often tried to find $50 - 16.80$ and did so incorrectly. Candidates who added 34.20 and 16.80 and found it to be 51 were much more successful.
	(b)	A good number of fully correct answers were seen. Some candidates thought the free drink was Americano, choosing the cheapest drink on the menu, whether it had been ordered or not, and misunderstanding the offer. Most candidates were able to make some progress. Weaker candidates often earned the strategy mark for reasonable progress towards the answer. Very few candidates made no real attempt to answer. Some arithmetic slips spoiled otherwise good answers.
10	(a)(i)	This part of the question was well answered.
	(a)(ii)	A good number of candidates found the correct range. A few wrote $2.6 - 0.9$ but gave an incorrect answer. A common incorrect answer was 1.6 from $2.5 - 0.9$.
	(a)(iii)	A reasonable number of correct answers were seen. However many candidates misread the question as 'Find the probability that this runner took 1.5 hours' and $\frac{1}{12}$ was a very common wrong answer.
	(b)(i)	Candidates usually indicated the correct point, although the point (1.7, 0.9) was also selected frequently by those who were wrong. Several candidates circled more than one point which was not condoned unless it was very clear, by indicating values, that the other point circled was used in the solution to part (iii)

	(b)(ii)	Some candidates were careful with the scale and earned 2 marks. Others were slightly inaccurate with at least one plot. A few candidates plotted 4 points, commonly at (1.8, 1.8) (1.9, 1.9) (2.2, 2.2) (2.4, 2.4) or (0, 1.8) (0, 1.9) (2.2, 0) (2.4, 0) or (1, 1.8) (1.9, 1) (2, 2.2) (2.4, 2).
	(b)(iii)	Very few candidates gave the correct answer here. Many candidates could not find either fastest time. A few candidates earned a mark for 0.6 or 0.8. Many wrote 60 and 80 without indicating how they had found those values. Those who were able to identify at least one correct fastest time were usually unable to convert to minutes with the majority multiplying 0.2 by 100 giving an answer of 20 minutes.
11	(a)	This question was assessing a routine method, however it was not well answered. Even though many candidates multiplied values, they struggled to select the correct dimensions from the diagram. There was some confusion between perimeter and area. Some candidates earned the method mark for indicating a correct calculation, but were often unable to carry out the arithmetic required. Other candidates multiplied base by height but omitted to divide by 2. Some candidates made the question much more difficult than it was by attempting to work with 2 triangles and use Pythagoras to find missing lengths.
	(b)	This part was well answered by many candidates. Those who determined that $AB + BC$ had to be ten resulted in a very quick and correct solution. A few candidates were unable to make use of the proportions and attempted many and various trials, without success.
12	(a)	Again, this question assessed a routine part of the syllabus. However, it was very poorly answered. It was rare to see an angle of any size given as the answer. Common wrong answers were 8 cm or 8 km. The instruction 'measure' should have indicated to those who gave answers such as South West that they were unlikely to be correct.
	(b)	Some candidates paid attention to all 3 pieces of information given in the question, drew accurate diagrams, usually with arcs and earned all 3 marks. A good number of candidates were able to earn 2 marks, usually either for being slightly inaccurate with one distance but choosing a point above the line of AB or for being accurate with both lengths but choosing the point below the line of AB . Candidates should understand that, as they needed to indicate a point in space, they should use a cross or dot to mark the point and not simply write C as the position of such is ambiguous.
13	(a)	A good number of candidates formed the correct ratio and simplified correctly or at least earned a mark for $21 : 30$, or similar. Some candidates made an error in simplifying $21 : 30$ and so were unable to make any progress beyond $42 : 60$.
	(b)	Most candidates found this part very challenging. Some candidates assigned a value to each scone (a sensible choice was £1) and then were able to complete the question. Many candidates were unable to connect the information that, as each scone was the same price, the proportions of type made would be the same as the proportions of money made. A common incorrect start was to divide £96 by 7, ignoring the cheese scones.

	(c)	By comparison, this part was well answered with a good number of candidates finding 15% of 54 and adding it on to £54. A good number of candidates showed the method for finding 10% as $54 \div 10$ and for 5% as $5.4 \div 2$, which meant that the method could be rewarded even if the arithmetic was faulty. Some candidates found only £8.10 and others evaluated $£54 - £8.10$, not understanding the context.
14		Very few fully correct answers were seen to this question. Some candidates earned 2 marks or 1 mark for indicating $PTQ = 40^\circ$ and/or TRS or $TSR = 40^\circ$. Some candidates used only the given right angle and the given 50° and found PTQ by working back. These candidates did not use the isosceles triangle in their solution. Candidates should understand that, in such questions, all information given should be used in their solution. Weaker candidates suggested that PTQ was just a bit less than half the right angle, so 50° was about right for x. There were many poor descriptions of angles using 2 letters not the conventional 3 letters. These candidates would have done better if they had labelled the angles they were describing as x or y, for example.
15	(a)	This question was very poorly answered. Many candidates simply stated that Terry was wrong as he had not done the same to both sides. Many were unable to interpret what was written in the correct way. It may have helped them if they had written $30 : 12$ $x : 2$ The neatest solutions demonstrated the correct method and answer and this was sufficient.
	(b)	Some candidates fully justified their decision and a reasonable number of correct answers were seen. It was not sufficient to write values from the question without working, so '275 = 5 hours, 165 = 3 hours' alone, was not enough. However $275/5 = 55$ then 55, 110, 165 was clear and sufficient. Some candidates divided 275 by 2 and estimated the number made in 3 hours from the number made in 2.5. This was not acceptable as it did not justify any decision.
16	(a)	A reasonable number of candidates knew the correct process and were able to earn at least 2 of the 3 marks available. A few candidates seemed to misapply the 'keep, change, flip' process which seems commonly taught for division of fractions. This was not relevant here, although it was commonly quoted. This at least resulted in an improper fraction, from $\frac{3}{7} + \frac{9}{7} = \frac{12}{7}$, which could earn a mark if it was correctly converted to a mixed number. However, this final conversion was not commonly seen. A common incorrect answer was $\frac{10}{16}$ from adding the numerators and adding the denominators.
	(b)	A few candidates were able to identify the correct fraction, commonly given as $\frac{6}{21}$. A few candidates earned a mark for writing $\frac{6}{7} \times \frac{1}{3}$, although many then gave the answer incorrectly, for example as $\frac{18}{21}$.

17	(a) (b)	A few fully correct solutions were seen but these were limited to better candidates. There were many attempts to find 70% of 40 and then subtract from 40 giving a final answer of 12. These candidates usually gave an answer of 30% in part (b) which was not credited as it was significantly easier than the actual solution. Some candidates, usually working with the percentages, calculated that Huw had used 20% + 70% of his weekly wage and therefore had 10% remaining. As they knew that 20% was £40, the answer £20 was commonly seen using this approach, equivalent to omitting to subtract the amount saved from £200 before they found 30%. These candidates earned a special case mark. Some candidates needed to read the question more carefully as they found 70% not 30% of what was left. A few candidates treated the £40 as the weekly wage and were able to earn a special case mark if they worked through the steps correctly using that. These candidates might have realised their error if they had considered the reasonableness of a weekly wage of £40. A few arithmetic errors were seen. Correct answers to this part, or correct answers following through their answer to part (a) which were of equivalent difficulty, were rarely seen. Those candidates who omitted to take note of the connected nature of the bullet points and gave answers such as 10% and 30% did not score in this part.
18	(a) (b) (c)(i) (c)(ii)	Whilst the solving of equations is a routine method, candidates working at this level generally find algebra of any description to be challenging. This question was no exception. Many candidates used arithmetic approaches here and were successful but <i>only</i> because the answer was an integer. Those writing $19 - 8 = 11$ sometimes gave the answer $x = 8$, omitted to connect 8 with $4x$. Many candidates added 19 as first step and then worked out $30 \div 4 = 7.2$ as an incorrect second step. This seemed to be caused by confusion between the decimal part of the value and the remainder when 30 was divided by 4. In this part, arithmetic approaches were of little use as the answer was not an integer. Candidates commonly made order of operations errors and attempted to manipulate the $2x$ or the -3 or attempted to combine them in some incorrect way, prior to dealing with the denominator of 4 on the left hand side. A few candidates attempted to multiply both sides by 4 but commonly the result of this step was $8x - 12 = 4x$. Other candidates correctly wrote $2x - 3 = 3x \times 4$ but in the next step indicated $-3 = x \times 4$, when they subtracted $2x$ from each side of the equation. Candidates who had studied this part of the syllabus were able to find the correct answer. Those candidates who replaced '$>$' with '$=$' often omitted to reverse this at the end of their solution and were not credited. This part was less well answered and it depended on the answer to (i) having been given as an inequality. Some correct attempts were seen, but these were not common.
19	(a)	A good number of candidates were able to make a sensible criticism such as 'green tea and coffee are not shown in the pie chart' or 'it is supposed to represent values but it does not show them'. Some candidates opted for 'the data on a pie chart is difficult to read' or similar but this was not accepted.

	(b)	Some candidates commented that 'it does not show how many of each ice cream were sold', but this was not accepted as this was not indicated in the table either. Some candidates made comments about the seasons and the years, in which case superfluous comments about seasonal trends, rather than yearly trends, were generally ignored. Some candidates were clearly <i>only</i> referencing the seasons and this was not accepted. Only comments which explicitly referenced the yearly trend, or made a clear implication of such, were allowed.
20	(a)	Most candidates made little or no progress with this part. Some found 40 but then tried $120 - 40$. Some misinterpreted 3^k as $3k$. Those who did write $40 \times 3 = 120$ often stated $k = 3^1$.
	(b)	A few correct answers were seen. Some candidates did not think 7 was prime and either did not include it in their product or tried to break it down into a sum. Other candidates thought 21 was a prime number. Many candidates attempted to draw factor trees but the pairs of factors used were not always correct. Some arithmetic errors were seen, such as $6 = 3 \times 3$ or $21 = 6 \times 3$. Some candidates were not writing their answers as a product, these were often given as a list or a sum.
	(c)	Many candidates were able to earn the strategy mark for working with factors and only very few thought they were trying to find the LCM. Some were able to earn the M1 for obtaining a common factor greater than 3, using calculations or lists, but few were able to give the HCF, 24. Common wrong answers were 8 and 12.
21	(a)	Better candidates earned 2 marks for correctly finding $50 \text{ ins} = 127 \text{ cm}$. Some tried this but did not calculate 127 correctly and earned 1 mark only for indicating clearly what they were trying to do. Some candidates stated incorrect values such as $40 \text{ ins} = 100.16 \text{ cm}$ without indicating that they were attempting $50.8 + 50.8$. This was not credited as a correct method cannot be implied from an incorrect value. Very few candidates earned all 3 marks as most did not justify the decision 'might be safe' using the fact that the 127cm was given correct to the nearest cm i.e. the limit of accuracy. Quite a few candidates decided that she was definitely safe, totally ignoring the limit of accuracy.
	(b)	Candidates found this part very challenging. Many assumptions were not actually assumptions but were comments about the information that had been given or that had to be deduced in part (a). Assuming that Jenna's height was exactly 127 cm (incorrect as they had been told it was rounded) or a rounded version of this (they did not need to assume this, they already knew) was not valid as this was something they had to interpret to answer part (a) not <i>assume</i> to answer it. The most sensible comments were along the lines of Jenna not having grown since she was measured. A few candidates did make sensible observations about this. Some candidates suggested that she may have 'shrunk', which was not accepted. Many of the impact comments were not actually impacts at all and again were just observations on the method they had used for their solution e.g. 'I assumed $20 \text{ ins} = 50.8 \text{ cm}$. If it was not, my answer would be wrong.' was not uncommon.

22		This question was not well answered with many candidates making no attempt to answer any part. (a) Most of the candidates working at this level found this part very challenging. Very few candidates earned any marks in this part and miscalculations were common. The best candidates occasionally earned one mark, but rarely 2 marks. These candidates commonly gave -3 as the first y coordinate. (b) Again, candidates found this part of the question very challenging. Some candidates attempted to plot points, if they had found values in part (a). Some tried to draw straight lines, others were insufficiently careful with their plotting, particularly the plotting of the point $(-0.5, -1.25)$. (c) Answers of any real worth were very rare. Occasionally candidates stated 'positive' or 'negative' for example. These comments were usually seen if the points they had plotted were not joined. It seems as if there was some confusion with scatter diagrams. (d) Very poorly answered. Most candidates did not seem to understand what was required.
23		A few candidates had clearly covered this part of the syllabus and were able to provide a fully correct answer. Some candidates were able to find $\frac{1}{2}p$ or one component of the final answer correctly. A few candidates were unable to cope with the double negative in the calculation. Many candidates made no attempt to answer and it is likely they had not covered this part of the syllabus. A few candidates treated the vectors as if they were fractions. This was indicated by those who had included a bar between the components. A few candidates gave a single digit answer, commonly -1.

Summary of key points

- If more than one mark is available for a question, method should always be shown. The more marks there are, the more steps there are likely to be in the method.
- When the answer is given, full method must also be shown as all the marks available will be for the method not the answer.
- Non-calculator methods are expected to be used in this paper. Some candidates are still attempting methods that are more suited to a paper where the use of a calculator is permitted.
- Arithmetic with integers, money values and percentages was reasonably sound. Arithmetic with fractions and decimals was much less so.

MATHEMATICS

GCSE

Summer 2019

FOUNDATION TIER; COMPONENT TWO

General Comments

The paper provided a test for all candidates, starting with readily accessible questions with a graduation in the level of difficulty through the paper, to the questions that are common with Higher tier. Most candidates were able to make a reasonable attempt at the questions at the beginning of the paper, with varying degrees of success in the middle. The candidates found the common questions difficult, apart from the final question. The candidates who attempted this question were often able to score the final two marks.

Comments on individual questions/sections

Question	Comments
1	This question allowed most candidates to get off to a good start, with many scoring all 7 marks. Where there were errors, this was usually in part (a), when they ordered the items rather than the prices, or in part (b), when they did not deal correctly with the notation for money. In part (c), the correct answer of 14 was often seen as an embedded answer.
2	Most candidates were able to answer part (a) correctly. The common error was to include 'zero hundreds'. In (b), the inequality '>' was strictly 'greater than' or equivalent, with no credit for candidates who turned this around, to use the words 'fewer than' or equivalent, even if they switched the numbers. In the remaining parts of the question, candidates were usually able to deal well with place value.
3	Part (a) was a relatively straightforward percentage of quantity. Those who did this best used a calculator method such as ' 0.56×850 '. Those who did not gain the mark(s) in this question usually lost marks from attempting to use a 'build up' method that had errors, or parts omitted. In (b), candidates were able to point out that 7% was equivalent to 0.07, or that the answer should have been 87.5 rather than 875. Candidates should be encouraged not to give long explanation when only one mark is being awarded. Part (c) caused the most issues. Most of the candidates who did not score marks lost them by failing to conduct a correct calculation demonstrating that $9/24$ is over 36%.

4	Part (a), a three part angle fact question, involving angles on a straight line, vertically opposite angles and angles in triangles was well answered. In (b), most knew the diameter of a circle. Part (c), a pizza context for an angles around a point question was well answered. Most who completed this question gained all three marks for showing a clear calculation, leading to the correct identification of the extra slice. It would appear that candidates are taking good notice of the instruction 'you must show all your working'.
5	In this question, whilst many managed to answer most or all of the parts well, there were some candidates who mixed up the meanings of 'perimeter' and 'area'.
6	Not all candidates were able to correctly interpret the distance chart in order to calculate distances.
7	There were varying qualities of answer throughout this algebraic expressions question. Part (a)(i) was often correct, (answer, $b - 5$.) In (a)(ii) most candidates were unable to give an expression three times bigger than (a)(i). Part (b), explaining why x and y do not add to become xy, caused many issues for candidates. Part (c), a negative substitution was less problematic.
8	In (a), candidates needed to recognise that probabilities can never be more than 1. Many did, but not all. Sometimes it was their basic explaining skills that let them down. In (b), candidates needed to find the expected number by multiplying the probability by the number of trials. Many did this, but some left this as a fraction $\frac{4}{24}$, which is not sufficient. 'How many times' was asked for. In (c), explaining needs to be precise, some left it as $\frac{1}{4}$ and $\frac{1}{6}$ which is not enough. They needed to say something along the lines of $\frac{1}{4}$ is greater than $\frac{1}{6}$ or equivalent. In part (d), a pleasing number managed to gain all three marks for calculating the missing probabilities in the table.
9	In part (a), the common incorrect answer was 2.6. This could have come from the two possible answers being 2 or 6. In part (b)(i), the fraction of black counters was relatively easy, although there were various errors in (b)(ii) including writing the ratio of black to white as 7:15 when it should have been 7:8. In (b)(iii) it was relatively rare to see the two correct responses, although some candidates gained a part mark for identifying the correct numbers of black and white counters in the new diagram. Candidates who were well drilled in dividing a quantity in a given ratio performed well with part (c) of the question.
10	Whilst many candidates were able to identify the correct answer of 225, occasionally candidates misunderstood the request and gave either 15 or 152 as their final answer.
11	This value for money comparison gave some students a test, though many were able to get all 5 marks for finding the cost of the two deals and then reaching a decision as to the best value for money. The candidates who attempted percentages by a build-up method were less successful than those with more efficient methods.

12	Candidates were usually able to interpret the frequency tree and get parts (a) and (b) correct. More thinking was required in the 'explain' part (c). The easiest interpretation of the data is that the students have now turned 16, although explanations about students not doing part time work due to exams and revision were acceptable.
13	Candidates are often able to fill in a Venn diagram correctly, although it was very common for them to miss out the letters outside the union (A,U,Z). They then needed to count the number of letters in the intersection and write as a fraction /9 to get part (b) fully correct. Some candidates used this as an opportunity to restart the question and although having not completed the Venn diagram, were able to get full marks in part (b).
14	In (a), parts (i) and (ii) were relatively easy, interpreting a conversion line graph. Part (iii) required some extrapolation to find a value beyond the range of the given graph. Part (b) was the least well answered part, requiring an interpretation of the graph, comparison with the given information and a calculation to find the difference.
15	Part (a), candidates should be encouraged to give the full answer to the calculation before rounding their final answer. This minimises the risk of losing both marks from only giving an incorrect final answer. In (b), it was common to see answers that demonstrated candidates' ability to answer this question. There was, unfortunately confusion as to which answer is in standard form, 4.5×10^{14}, or 450 000 000 000 000. Those who gave both, with no identification as to their correct choice, were given no marks.
16	It was pleasing to see many correct responses to this question.
17	Part (a), caused next to no issues for candidates. In (b), the common error was to interpret 2.25 hours incorrectly as 2h 25min rather than 2h 15 minutes. In (c), candidates often only scored the first mark for dividing 180 by 24, but then nothing else as they could not convert between centimetres and metres correctly.
18	This question was the first of the common questions. Candidates struggled with the concept, either scoring no marks, or gaining the final mark for three correct calculation answers, even though they had been unable to write the most efficient calculator method.
19	This question has been a relatively common feature of these papers, so it was disappointing that many candidates were unable to find an estimate of the mean. Often, the only mark gained was from finding the midpoints of the intervals.
20	This was a no-context basic trigonometry question, where they were asked to calculate an angle. However, many of the foundation candidates found this too difficult. Some assumed, incorrectly, that this was a Pythagoras question.

21	Candidates were often able to gain the first mark for one correct year's depreciation calculated. Some were then able to get the dependent mark for further work. Where candidates continued a method involving year-by-year calculations, early rounding often caused errors that resulted in the final mark being withheld.
22	This question consisted of three parts. The best answered part was the expand and simplify two brackets in (a). Both brackets contained an x and a y term and there were often errors in the final y^2 term. In parts (b) and (c), candidates needed to be able to factorise quadratics, which they found difficult.
23	This two-part journey, average speed question proved to be too difficult for many at this level. There were a handful of correct responses seen and very many attempts that sadly gained no credit.
24	At foundation level, a contextual simultaneous equation question is difficult. Some were able to form two 'equations' to gain the first mark. This was often the only mark gained.
25	This final question was a pleasant ending for the paper for many candidates, as it was a relatively low context density calculation. Candidates were often able to gain both marks, with occasional slips from mixing up the formula.

Summary of key points

- Candidates should work on improving explanation skills – these should be concise and accurate. They can be calculations and/or words.
- Candidates must ensure that even on the calculator paper they include workings to support their answers.
- There have been some key questions that have appeared in similar ways on a number of recent papers. Candidates should work through past papers so that they are familiar with the style of the questions.

MATHEMATICS

GCSE

Summer 2019

HIGHER TIER; COMPONENT ONE

General Comments

To perform well in this examination, candidates need to present their solutions in a logical and methodical way. Candidates should always show full method for any answer that involves more than one step. This is a non-calculator paper and it is expected that candidates show the method for their answer even when they then choose to work out answers mentally, rather than using a written option.

A correct method cannot be assumed from an incorrect value. Candidates who carry out a great deal of mental arithmetic and make a slip in calculation, without showing working, will suffer a loss of marks. Candidates whose work is poorly written often miscopy their own figures, resulting in inaccurate solutions. Work that is compressed into a small space or written in several places can be difficult to follow, again leading to candidates making errors from their working. It would be better if candidates were encouraged to use the continuation page at the back of the examination booklet if this is the case, indicating in the main script that their answer is to be found on the continuation page. Candidates should be encouraged to re-read a question once they have completed their attempt, as often some element of the solution has been omitted. Some candidates are showing that they are identifying key information in the question by highlighting key words and instructions. This seems to be helpful.

Comments on individual questions/sections

Question		Comments
1	(a)	This question proved to be a reasonable start to the paper for many candidates. A good number were able to make a sensible criticism such as 'green tea and coffee are not shown in the pie chart' or 'it is supposed to represent values but it does not show them'. Some candidates opted for 'the data on a pie chart is difficult to read' or similar but this was not accepted. Some candidates commented that 'it does not show how many of each ice cream were sold', but this was not accepted as this was not indicated in the table either.
	(b)	Some candidates made comments about the seasons and the years, in which case superfluous comments about seasonal trends, rather than yearly trends, were generally ignored. Some candidates were clearly <i>only</i> referencing the seasons and this was not accepted. Only comments which explicitly referenced the yearly trend, or made a clear implication of such, were allowed.
2	(a)	A good number of candidates earned both marks. A few candidates made sign slips. Candidates tended to use algebraic processes rather than arithmetic ones.

		Some candidates found one or more common factors but not the HCF. It was rare to see candidates attempt to find the LCM.
5	(a)	Many candidates were able to show that 50 ins = 127cm, usually simply by writing $50.8 + 50.8 + 25.4$ and summing. Very few candidates earned all 3 marks as most did not justify the decision 'might be safe' using the fact that the 127cm was given correct to the nearest cm i.e. the limit of accuracy. Quite a few candidates decided that she was definitely safe, totally ignoring the limit of accuracy. Some candidates tried to find $127 \div 50.8$. These were usually less successful than those using addition or multiplication.
	(b)	Candidates found this part very challenging. Many assumptions were not actually assumptions but were comments about the information that had been given or that had to be deduced in part (a). Assuming that Jenna's height was exactly 127 cm (incorrect as they had been told it was rounded) or a rounded version of this (they did not need to assume this, they already knew) was not valid as this was something they had to interpret to answer part (a) not <i>assume</i> to answer it. The most sensible comments were along the lines of Jenna not having grown since she was measured. A few candidates did make sensible observations about this. Some candidates suggested that she may have 'shrunk', which was not accepted. Many of the impact comments were not actually impacts at all and again were just observations on the method they had used for their solution e.g. 'I assumed 20 ins = 50.8 cm. If it was not, my answer would be wrong.' was not uncommon.
6	(a)	Apart from occasional arithmetic slips, this part of the question was reasonably well answered.
	(b)	Candidates who were sufficiently careful, particularly with the middle point, were able to earn full marks for a reasonable attempt at a smooth curve. A few candidates earned a mark for a reasonable curve through at least 3 correct plots; a few had 5 correct points following through from their table. Some candidates had values which could not be plotted on the given graph paper. This should have made them check their table values.
	(c)	A few candidates gave the correct equation. Others candidates omitted $x =$, so had no equation, or stated the coordinates of the turning point rather than the equation required.
	(d)	Very few candidates understood that they need to read the roots from their graph to answer this part. Some candidates tried to solve the equation algebraically, without success.
7		Many candidates had clearly covered this part of the syllabus and were able to provide a fully correct answer. Some candidates were able to find $\frac{1}{2}p$ or one component of the final answer correctly. A few candidates were unable to cope with the double negative in the calculation.

8		A reasonable number of candidates interpreted the information given and understood this to be an original value problem. Usually these candidates applied a correct method, reversing the 80%. Many did this by dividing 7680 by 4 and then adding it to 7680. A few candidates understood what was needed but, usually having written 7680/0.8, were unable to carry out the arithmetic required. Division by a decimal would have been a useful skill for many candidates both here and in Question 12(a)(i). Weaker candidates did not observe that they needed to apply a reverse percentage technique and found 120% of the given value.
9		This was a high scoring question and candidates often scored more highly in this question than they had in question 2. Many good and accurate solutions were seen. A few candidates made slips with signs in the middle of their solution. A few candidates incorrectly simplified in the last step.
10		Again, this was a question in which candidates often performed well in all 3 parts.
	(a)	This was usually completed correctly and errors were rare. A few candidates completed the probabilities on the second branches as 0.48, 0.12, 0.12 and 0.28, misunderstanding the structure. This issue may have arisen from being encouraged to write the combined probabilities at the end of each branch at some point.
	(b)	This part was often answered correctly. Some candidates attempted to add values instead of multiplying, other candidates made place value errors, giving the answer commonly as 4.8. As this resulted in a value greater than 1, candidates should have known this was not correct.
	(c)	As in part (b), a good number of candidates did multiply and add correctly. A few candidates simply added once again or made place value errors, commonly giving the answer 4. Again, candidates should have known this could not possibly be correct as it was greater than 1. A common incorrect answer came from calculating 0.2×0.7.
11	(a)	The responses to this part were variable. Some candidates, working in standard form for the most part, forgot to check whether 24 was between 1 and 10 so did not make the final adjustment. Others candidates attempted to find, for example, $3^{17} \times 8^9$. Those candidates who tried to write out the values with all the zeros usually miscounted. Some separated out the method as $3 \times 8 = 24$ and $17 + 9 = \dots$ but then did not add the powers correctly or managed to add correctly but wrote down the wrong power when they formed their answer, so this separation was not always successful. Some candidates made a place value error when trying to write the final answer in standard form, giving 2.4×10^{25}. Some candidates multiplied the powers instead of adding them or added the 3 and 8 instead of multiplying them.
	(b)	Many candidates understood the need to divide the given quantities and did so appropriately. Some candidates did not make a statement of this explicitly with the given values and sometimes the method needed to be implied from the partial attempts candidates had made. It would have been preferable for candidates to have written this step down, being the initial step of the method. Many candidates wrote the total energy consumption as an ordinary number and, again, miscounted the zeros. It was not necessary to do this.

		Conversion of the 6000 to standard form and the division of the quantities in standard form was much neater, quicker and simpler. Candidates should understand that, for very large values, working in standard form is more efficient.
12	(a)(i) Many candidates gave a final answer of $\frac{1}{0.8}$ here or attempted to simply this but were unable to do so. Division by a decimal may have assisted these candidates here and also in question 8. Candidates who struggled to work with $\frac{1}{0.8}$ may have had more success if they had initially written 0.8 as $\frac{8}{10}$, but this was not commonly seen. A common incorrect answer from weaker candidates was -0.8. (a)(ii) Those few candidates who interpreted the fractional power correctly as the 4th root generally stated the correct answer. Many candidates, however, attempted to find $625 \div 4$. (a)(iii) Again, those few candidates who interpreted the fractional power correctly as finding the cube root and then squaring, or vice versa, usually stated the correct answer. However, many candidates attempted to find $\frac{2}{3}$ of 64. Some candidates were able to find $64^{\frac{2}{3}} = 16$ but never gave a correct form of the answer, in which this should have been the denominator. Separating the numerator and denominator was not necessary and commonly resulted in a loss of marks. (b) Again candidates tried to work with separate components, which resulted in errors. Many candidates tried to find 27^2 which was not a sensible strategy. As the answer was required as a power of 3, candidates should have recognised 81 and 27 as being powers of 3. Some candidates wrote the correct calculation down but then did not simplify it into a single power of 3, misinterpreting what was being asked. A few candidates thought that 3^0 was 0. (c) A few good answers were seen here. Those who were incorrect commonly did not cube the 5 or the a or they added the powers 4 and 3 giving b^7. Some candidates cancelled terms in a spurious way. On more than one occasion, the power of a in the denominator was used to reduce the power of b in the numerator. This was not condoned and the final answer candidates offered was the answer that was credited.	
13	(a)(i)	Some good explanations along the lines of 'she should have cubed not squared' were seen. Some candidates suggested that she had to do the same thing to both sides not multiply one side by 2 and the other by 3. The ratio 4 : 6 was quite commonly stated as the correct ratio.

	(a)(ii) Not many correct answers were seen to this part. A common answer was 12, from 3×4, or 27, from 3^3. Some candidates wrote $3 \times 3 \times 4$ but were unable to calculate this as 36. (b) Candidates who found the cost of travelling to work from Shabana's old house and then found 15% of this value were the most successful. Another common method was to increase the distance by 15% and find the cost that resulted. Some candidates used very circuitous routes and, as their method involved many more steps, made arithmetic or rounding errors in their solution. Those who labelled each part of their calculation and were careful to write down units were often most successful as they were able to keep track of where they were in their method. Weaker candidates sometimes tried to increase all 3 given values and combine them in some way. Some candidates found the cost of 9 litres of fuel and multiplied this by 945, totally misinterpreting the information given.
14	(a) Candidates seemed well versed in the structure of a box plot and this part was usually well answered. Occasionally, the upper quartile, 64, was stated. (b) Again, this was usually well answered. Occasionally candidates offered the answer 50.8, misinterpreting the scale. (c) Many candidates understood the need to find the upper quartile from the data given and did so correctly, drawing an accurate box plot. Some candidates ranked the given values in order and had the minimum, lower quartile, median, upper quartile and maximum as 20, 26, 42, 46 and 72. Others had a box with no middle line for the median, usually the upper quartile was at 46 in these cases. (d) Candidates found this challenging to explain and very few candidates made any comment of value. They needed to make a comment about both the black and white fish and the red and white fish. They usually only commented on the one they had chosen for their answer. Also, stating that the lower quartile for the black and white fish was 50 was insufficient as they needed to interpret this as meaning that at least $\frac{3}{4}$ of these fish were in excess of 48 cm, as well as pointing out that for the red and white fish, the median was 46 so only half were greater than this length.
15	Good candidates interpreted the information given in the stem and histogram carefully, read the question carefully and used the 1000 they were given, in their solution, deducing the correct percentage. Other candidates did not notice that the total number of visitors had been given and attempted to work it out, often incorrectly. A few candidates divided by the 'class width' instead of multiplying, which was needed here as the frequency density needed to be used to find the frequency and not the other way around. Weaker candidates used the frequency density as if it were frequency and could not be credited.
16	Candidates found this challenging and only the best candidates made any real progress towards an answer. Some were able to state that, or label the diagram with, $\angle BCA = 51^\circ$. Many candidates assumed ABC was isosceles or that PQ was parallel to AC. Neither assumption was correct and these candidates made no progress.

17	(a)	Candidates, again, found this challenging with very few earning all 3 marks. Some candidates were able to simplify the first and last terms but often struggled to simplify the middle term. Even though $\sqrt{3}$ was given as part of the form required for the answer, some candidates did not take note of or make use of this helpful information.
	(b)	Fully correct answers were rarely seen to this part. Some were able to form the correct expression for the area of a trapezium and form an equation with the given area but were unable to deal with the manipulation needed for the next step. Some candidates did not know the area of a trapezium and did not use the 'triangle + rectangle' alternative approach. Other candidates multiplied the given lengths or omitted brackets and did not recover them. A few were able to divide correctly but it was uncommon for candidates to progress to this stage of the solution.
18	(a)	Not much evidence of understanding of the product rule for counting was seen in candidates' attempts at this question. Many candidates had either $7!$ or $5!$, or both, and subtracted them or stated $5 \times 7 = 35$ as their answer. A few candidates tried to list passcodes, which was not a successful strategy. Some candidates ignored the information that each character could be used only once and 7^5 was also offered as an answer by some candidates.
	(b)	Some candidates attempted to use tree diagrams in this part, but these often resulted in $\frac{1}{7} \times \frac{1}{7}$ not $\frac{1}{7} \times \frac{1}{6}$. Few candidates were able to find 60 and use their answer to part (a) to find the required probability. A few candidates earned the last mark for correct use of their 60 and their 2520.
19	(a)	Some candidates were able to compose the correct unsimplified form but few were able to simplify correctly. Many weaker candidates attempted to multiply the functions.
	(b)	Correct statements were rarely seen. On a few occasions, candidates found the inverse function and did state that they were the same. This was more common than using a correct answer to part (a), but was still quite rare. Many candidates usually simply stated 'it is the inverse' or 'they are the same but one would be negative' or 'one was the reciprocal of the other'.
	(c)	Fully correct answers were rare and only the very best candidates made much progress here, although some picked up a mark for finding g inverse. It was common to see $\frac{8}{x} + 5 = 11$ from those who had some, but not full understanding of this topic. There were many attempts from weaker candidates to multiply the functions. A few candidates composed the functions in the wrong order for the second step. Other candidates attempted to substitute $x = 11$.
20		It was not possible to earn marks in this question if appropriate values were not used and few candidates attempted to use the correct values in this question. Very many candidates used 220 and 8 or using an incorrect bound, such as 8.5. A few good candidates were unable to successfully find $225 \div 7.5$. The most successful candidates used build-up approaches, usually counting up in 15's or used $2250 \div 75$.

21	(a) (b) (c)	Many candidates were able to find $p = 5$. Many other candidates made no attempt to answer. Very few candidates were able to earn marks here with most using the given equation and the point (5, 5) and working back to $m = -1$, but then simply stating $y = -x + 10$, thereby making a circular argument. Very few fully correct lengths were found. As the structure of the circle and tangent at (5, 5) was symmetrical about $y = x$, it was possible to work out the required length using the y-intercepts and some candidates did so. A few candidates earned a mark for $OQ = \sqrt{50}$.
22	(a) (b)	This was a very challenging grade 9 question. A small number were able to find $OD = 4a + 2b$ but were unable to take the next step in the proof. Fully correct solutions were rarely seen. Many candidates made no attempt to answer. Regardless of the completion of part (a) candidates were often able to make the correct deduction that E was the midpoint of AC. Some incorrectly stated it was the midpoint of OB or simply said it was the midpoint of the line, which was insufficient.

Summary of key points

- If more than one mark is available for a question, method should always be shown. The more marks there are, the more steps there are likely to be in the method.
- When the answer is given, full method must also be shown as all the marks available will be for the method not the answer.
- When an explanation is required, some interpretation is expected and a restatement of facts is generally insufficient.
- Arithmetic skills were reasonably sound when working with integers, money and percentages. Division by a decimal, arithmetic with decimals and evaluation of numbers written in standard or index form in general were much less so.

MATHEMATICS

GCSE

Summer 2019

HIGHER TIER, COMPONENT TWO

General Comments

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

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 on whether or not each question was answered well.

Comments on individual questions/sections

Question	Comments
1	$17 \times 17 \times 17 = 17^3$ not 3×17 as some candidates thought. The most efficient calculator method, showing calculations for parts (a) and (b) are 1.34×232 and 0.82×4530 .
2	In part (a)(i), the estimate for the mean was sometimes correctly calculated, however common errors were to multiply each of the frequencies by 10, rather than by the mid points of the groups and also to divided by 4 (as four lines in the table) rather than by 100. In part (b) a number of candidates were able to explain that the same total could be achieved in a different way.
3	Many candidates did correctly work with the sine ratio.
4	Although often depreciation was treated correctly, a common error was to find the first year of depreciation, £400, and consider this for each of the years. 325% was commonly worked out accurately, but then not added on to the amount each year. A common error was to consider $\times 3.25^3$ not $\times (1 + 3.25)^3$.

5	A common error in part (a) was to write the final term as $30y$ rather than $30y^2$. However, the sum of the two middle terms allowed a follow through mark to be awarded from this one error. Part (b) was generally well answered. Part (c) was generally well answered, although a few candidates did not use a method of factorising, instead using the quadratic formula to solve this equation. Common incorrect answers to factorising the difference of two squares in part (d) were $(y - 11)^2$ and sometimes $(y + 11)^2$. In part (e) many candidates did find c to be 16 correctly. However, a common error was in substituting $x = -2$ into x^2, although sometimes written as $(-2)^2$ candidates didn't consider this correctly, with -4 often seen.
6	A number of candidates did not have the idea of finding the total distance divided by the total time. Although the total time was often seen, the total distance was not always considered. A common error was to 'average the average speeds'.
7	In part (a) the volume of the sphere was sometimes calculated correctly. The main difficulty for candidates seemed to be with the interpretation of the information given about the cuboid. They did not always realise that the volume of a cuboid is the area of the base multiplied by the height. In part (b) some candidates did calculate the radius or diameter from the circumference, but then did not piece together the two parts of the perimeter required, as the diameter added to half of the circumference.
8	Many candidates did form the required simultaneous equations correctly and also demonstrated a sound method to solve the simultaneous equations.
9	This question was not well answered, in particular part (c). The question told the candidates that the scales are linear, but many candidates did not look at the difference between the values given in the tables and accurately find the other terms. Of all the parts, part (a) was the least demanding part for candidates. Some candidates struggled with reducing by 100 into negative values in part (b). Part (c) was not well answered, although some candidates had a better idea of finding the degrees Celsius than they did for finding degrees Fahrenheit.
10	A number of candidates did not find the formula in part (a), only finding the value of k and working with an implied formula in part (b). However, a number of candidates also made an incorrect start writing the information as if linear.

11	There were many different methods seen for solving this problem. A fundamental error a number of candidates made, was to think that 1kg was 100g not 1000g.
12	The common errors in this question were with expanding the bracket $3(x - 40)$ and also in finding the sum of the angles in a pentagon. Many candidates did know a pentagon has five sides so five interior angles (a hint being the five listed of course), however some candidates considered incorrectly equating the sum of the five angles given to 180° . A number of candidates did calculate x correctly, but did not interpret their answer to answer the question by finding the angles to check if any were greater than 180.
13	Many candidates looked at the second difference and some compared the sequence with 1, 4, 9, 16, 25 ... to find a difference. Many candidates did realise the n th term would be quadratic.
14	Candidates found part (a)(i) the most demanding part of the question. Many candidates did consider that the rate may change in part (b)(ii) or that the container might overflow.
15	Part (a) was more often correct, with candidates deciding on the correct calculation, than part (b). However, in part (b) it was not the decision on whether to multiply or divide that candidates found to be most demanding, it was the conversion of units. Most candidates incorrectly considered 1m^2 as 100cm^2 , rather than $1\text{m}^2 = 10000\text{cm}^2$.
16	Some candidates did not appear to have sufficient knowledge in order to attempt to answer this question. In part (a) a few candidates incorrectly assumed that triangle ACD was an isosceles triangle. In part (b), many candidates did not use the cosine rule to find the length AD.
17	Some candidates have poor knowledge of transformations. Of all the parts, only part (a) was reasonably well answered. In part (b), a number of candidates did show a horizontal transformation but not of the correct order. In part (c) it was clear that enlargement by a negative scale factor caused issues for candidates, many of whom do not work through the centre of enlargement to find the new vertices.
18	Many candidates did not attempt to show $x^2 + 2x - 132.48 = 0$, from the application of Pythagoras' Theorem. A few candidates did however, correctly use the quadratic formula to find x .
19	Many candidates did not know what to consider for the other 22% of the questions to which Waldo did not know the answer. This question was not well answered.

20	Many candidates did not show any method of how to solve $5\sin x = 2$, not working with $\sin^{-1}x$. Part (a) is a standard question, in which a calculator can help by clarifying a few points on the curve. Some candidates demonstrated poor knowledge of the shape of the curve, with straight line sections rather than curves and no symmetry. More care should be taken in sketching graphs.
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Summary of key points

Of the weaknesses in candidate understanding and knowledge, the following stand out from this examination:

- Lack of understanding of how to convert units of areas, such as $1\text{m}^2 = 10\,000\text{cm}^2$.
- Understanding that the volume of a cuboid is length $\times$ width $\times$ height, but not realising this is the same as the area of the base multiplied by the height.
- Failure to understand that the sum of two average speeds over different periods of time, divided by two is not the overall average speed. The average speed of a multi-stage journey can only be calculated from finding the total distance divided by the total time.
- Enlargement of negative scale factors is not well understood, with candidates not seeing the orientation of the enlargement through the centre of enlargement correctly.



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