GCSE

Mathematics B (Linear)

General Certificate of Secondary Education **J567**

OCR Report to Centres November 2015

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This report on the examination provides information on the performance of candidates, which it is hoped will be useful to teachers in their preparation of candidates for future examinations. It is intended to be constructive and informative and to promote better understanding of the specification content, of the operation of the scheme of assessment and of the application of assessment criteria.

Reports should be read in conjunction with the published question papers and mark schemes for the examination.

OCR will not enter into any discussion or correspondence in connection with this report.

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OCR REPORT TO CENTRES

J567/01 Paper 1 (Foundation tier)

General Comments

Candidates are obviously being advised to attempt all questions as the number of parts with no response has reduced significantly over the past few years. Methods of approach are more evident and students are more willing to show working. As always it is vital that candidates read the question carefully, and check their answers. Centres are advised to concentrate on ensuring that work is presented in a more logical manner. Calculations are often difficult to follow when they are scattered around the answer space available with no obvious connection.

The question that required candidates to show good quality written communication (Q15) caused problems for some candidates due to the use of fractions. Additionally, many answers were incomplete due to a lack of explanation regarding the reason why there was an error in the table.

Time did not generally appear to be a factor and there was no evidence that questions were missed as a result of failure to finish in the time allowed.

Comments on Individual Questions

1 This question was generally answered well, and errors were mainly arithmetic slips. In part (b) many did show a method to find 40% of 840 and often one mark was gained by candidates who did not manage to obtain the correct final answer.

2 This was again answered well. When drawing candidates must ensure their bar is drawn accurately; almost all candidates had drawn a complete bar with top and sides.

3 In part (a) the common error was to give (1, -3). Some candidates are not sure of coordinates and in (b) the common error was to plot (-3, -4). In (c) several gave the correct answer with various other incorrect answers seen of which Isosceles was by far the most common.

4 Part (a) was not answered well. There were more wrong answers than correct ones and the most common ones were 4.5, 0.45, and 0.75.

5 Parts (a) and (b) were generally correct with some interesting spellings of the word obtuse in part (b). In part (c) the angles and reasons were generally correct. A common error in part (ii) was to refer to corresponding angles and parallel lines.

6 This question was generally answered correctly.

7 This question was generally answered correctly.

8 Most candidates scored both marks. A common error was to repeat the given row. Candidates should be encouraged to list in a logical way in order to reduce errors.

9 Part (a)(i) was generally correct. Part (a)(ii) was also answered well, with 7 and 8 being the most common incorrect answers. In part (b) many candidates were able to give the correct answer; common incorrect answers were $8r + 3s$ and $8r \pm 17s$, along with $8r + -3$. It was also quite common to see $8r \pm 3$. A very small number failed to get $8r$.

10 Most of this question was answered well. In (a)(i) most answers were correct. Errors seen were most commonly 24 and 33. Some answered 09.33, the time the bus gets to Rose Way. In (a)(ii) a variety of different notations were used. Most used thew 24 hour clock as

given in the table so are using the preceding 0. Time was written correctly more often than in previous exams with very few putting am or pm. A common error was 09.49 and another incorrect time seen was 09.36. Part (b)(i) was almost always correct.

(b)(ii) If full marks were not scored here then one mark was often earned for either correct hour or minutes. Common errors were 3 or 5 for the hours and 20 for the minutes. The odd nonsensical answer was given,,5hrs 80mins for example, but most were in the correct format.

11 The whole of this question was answered well, particularly in part (a) where a large majority scored both marks. Division by 8 proved to be more demanding than multiplying by 5 but it was quite rare for no marks to be awarded. A common error was either the loss or gain of zeros leading to answers of 15 or, for example, 1500. The weakest candidates seemed to understand what was required of them but lacked the skills to perform the calculation. However, most attempted the work and there were few scripts with no response. Part (b) proved to be more difficult but, again, a majority scored well. There was good understanding that 48 and 18 were required but some lost marks by leaving *a* and *b* in place while others added these values rather than subtracting. There were a few examples where candidates added (4+12 and 6+3) before attempting to process further.

12 This question provided good differentiation with some impressive work at this level although those that scored full marks were probably in the minority. Most commonly 2 marks could be awarded for doubling the individual costs to reach 1800 and 1920. The 10% discount on OCR was mostly correct but finding 5% of 960 proved to be more problematic. Most chose to break down the parts getting 96 as 10% but frequently failed to halve this amount to obtain an accurate final figure. There was plenty of scope for arithmetic errors and these were frequently evident. Common conceptual errors included adding the discount and parking (180 + 80 = 260) and applying the parking charge to the cost for one person before doubling resulting in the charge being applied twice. The special case mark for only considering one person was awarded with some regularity. It was very rare to find a script where no attempt was made which is very pleasing. Candidates should be encouraged to set their work out neatly and in a logical manner.

13 Part (a) was answered very well with many correct answers, often without any working. Part (b) was less well-answered. Many candidates divided 36 by 4, rather than finding the square root. Some candidates made arithmetic errors on the simplest of calculations.

14 In part (a) there was often only one correctly drawn sector. Some sectors drawn had values just outside of tolerance but usually had no supporting working to show where these values have come from. Several candidates added the three fruits to give 65 but did not go on to do further work. In (b) 90 and 25 were common incorrect answers.

15 Fractions and probability often cause problems and answers to this question were no exception. Better candidates converted the fractions and added correctly to get 13/12 but only a very small number compared their result with 1 (12/12) and went on to mention its significance. Some simply added the numerators to get 8 counters and stated that 8 was less than 12. Those who analysed the fractions often failed to understand the relevance of the parts and added the denominators to get a total of 31 counters. A significant number realised the importance of having equivalent fractions but failed to give 12(n) as a common denominator. There were others who compared the sum of the top with the sum of the bottom or simply felt that having different denominators was enough to justify an

error. Candidates who mentioned 12 counters were guaranteed one mark and often scored at least three for adding the totals to get 13. There was no evidence of a successful response coming from an attempt to convert the fractions to decimals.

16 Part (a) was poorly answered, candidates appeared to be writing ‘diameter’ or ‘radius’ randomly throughout this question. This is an area that requires development. Some candidates lost marks for poor spelling when the word was not clear enough. (b) There was a variety of wrong answers here. Many candidates did not appear to be familiar with the requirement to leave their answer in terms of π and despite showing 4 x 4 x π in working went on to use 3.14... More of a concern is the number of candidates who thought 4 squared was 8.

17 Part (a) was generally answered well with the most common error being $20x + 15$, $20x + 50 = 70x$. In (b) an equation was required, which several candidates provided but a large number of candidates did not know how to attempt this question. The value of x needs to be written on the answer line; the value should not be left embedded in the equation.

18 Many candidates were able to answer part (a) correctly. In (b) the common error was to use the origin as the centre of rotation. Of those not scoring 2 marks many scored 1. The main error in (c) was candidates failing to give a single transformation. Candidates need to understand clearly the moves that are associated with each type of transformation. Some candidates gave rotation by vector, whilst others stated ‘rotate 90º and then move…’.

19 Part (a) was answered well with the most common incorrect answer being 0940. In (b) however, there were few correct answers. Some did pick up M1 for some evidence of dividing 85 or 55 by a time interval but there was often muddled working. Examiners often found it difficult to decide what some candidates were attempting to calculate. The numbers 85, 55 and 30 were seen frequently, but not always linked correctly.

20 Candidates are now realising what is required for this type of question and it was pleasing to see very few errors in part (a). When describing a sequence both quantity and direction need to be stated - it is not enough to say there is a difference of 6. More candidates appeared to score in (b) than in the past. Many were able to give $7n$ for 1 mark. The most common incorrect answer was $5n + 7$.

21 Failure to score here was very rare and a large majority of candidates gained either full marks or 3 for one correct row (usually 5 and 10 for Norway). If there were errors in this row they often occurred as a result of failure to divide by 3 having correctly worked out that silver and bronze totalled 15. For Italy a small number used 8 as the total number but divided them equally to get 4 and 4.

22 Although some candidates did score full marks, many, even the more able, appeared to be finding surface area instead of volume with 104 the most common answer. Of those who were multiplying three quantities, many gave the wrong value for at least one of the dimensions, usually the ‘2’; or they thought one side was length 14. Even those who did the correct calculation frequently gave the units as cm2. Others gave the correct units, sometimes without a calculation.

23 In (a)(i) the marks awarded were very much split between the ideas that in this form there is too much information to sort out and the question is too personal. Non-scoring answers often referred to not asking gender or didn’t state if it is years or years and months. (aii) was very well answered, most recognising the overlaps and some offered how to correct the error. In (b) candidates are beginning to realise what is required in this type of question. Many gave a correct question and response boxes covering all options up to 20 without overlap. Common errors were no or an inappropriate question; sometimes the

question failed to mention ‘week’. Quite a number missed out the option of 0 pints. Most that did not score full marks are scored B1.

24 Only a very small number of the more able candidates managed to score full marks here and the most successful had obviously remembered that 0 and 1 figure regularly in number problems involving factors and reciprocals. There seemed to be some guess-work when deciding where to apply this principle. The first question relating to squares seemed to be the most accessible followed closely by numbers with an even number of factors. The huge variety of responses makes it impossible to select common misconceptions but there seemed to be some evidence that many candidates did not fully understand what they were being asked to do. Quite a large number of candidates made no response at all and it seemed that many simply played around with figures while waiting.

J567/02 Paper 2 (Foundation tier)

General Comments:

Candidates were generally well-prepared for this paper and were able to attempt most of the questions; few appeared not to finish due to lack of time. There were few really low marks and few really high marks suggesting that candidates had generally been entered at an appropriate level of entry.

It is expected that candidates will use a calculator on this paper. There is still evidence that some are using techniques that are more suitable to non-calculator papers, particularly on questions involving percentages.

Four questions or part questions had 4 or 5 marks assigned to them. Most candidates are aware that they need to show their method and working on such questions and attempted to give a detailed solution. Unfortunately this was often presented as a series of random calculations rather than a coherent structure that led to the solution of the problem posed in the question. For such responses a small number of part marks could be awarded, but to score well on such questions a clear structured solution was needed.

Sometimes it is difficult to make out what has been written if a value has been amended. Candidates should be encouraged to cross out wrong answers and replace them, rather than trying to amend a value by going over it again.

Comments on Individual Questions:

Question No.

1(a) Only about half the candidates recognised that 27 was the cube number.

1(b) Most candidates recognised that the only number with 3 and 5 as factors was 75.

1(c). Only about half the candidates could identify 7 as the only number that was both prime and a factor of 42. Some confused multiple with factor.

1(d) Nearly all candidates identified 36 as the only number that was square and a multiple of 6.

2(a) Only about half the candidates recognised that this shape was a pentagon. Common mistakes were trapezium and parallelogram.

2(b) Many candidates did not have a strategy for finding the area of the shape. Some tried to use some sort of formula rather than simply counting the squares.

2(c) Most candidates were able to draw a correct line of symmetry.

2(d) Most candidates were able to draw a correct enlargement.

2(e) Nearly all candidates were able to draw the correct reflection.

3 Only a small number of candidates were able to gain all three marks, with many just using one or two pieces of the properties and consequently obtaining 1 or 2 marks.

4 This question required several steps to be made, but most candidates found the question accessible and a significant number gained full marks with many of these showing a full and clear solution. Only a small number failed to score any marks.

5(a) Most candidates had some idea of appropriate measures in everyday settings, obtaining 2 or 3 marks.

5(b)(i) The majority of candidates attempted this question in a sensible manner. Some did not read the question carefully and gave an answer of £1.30. A small number used 0.3 for one third, which was not accurate enough to obtain any marks.

5(b)(ii) Again the majority made an attempt at this question that would lead to a correct answer if used appropriately. Some used a non-calculator method, which led to inaccuracies; others failed to read the question carefully and gave the new price rather than the reduction; and others did not round to the nearest penny successfully. Consequently only a minority obtained full marks.

There were some candidates who used a totally incorrect method such as dividing by 0.12.

5(c) Few candidates appreciated that to make a comparison between the two types of milk they needed to find two rates with the same units.
Many candidates started sensibly by converting 2 litres to 3.52 pints, but then tried to compare 3.52 pints costing £1.18 with 4 pints costing £1.40 without using rates at all and consequently only obtained 1 mark.

6(a)(i) Nearly all candidates gave South as the correct compass direction.

6(a)(ii) Nearly all candidates were able to convert the distance on the map to the correct distance travelled.

6(b) Many candidates gave the correct compass direction of North West; some candidates became confused and gave answers such as South West or South East.

7(a) Nearly all candidates successfully converted 4 gallons into litres using the graph.

7(b) Most candidates successfully converted 38 litres into gallons using the graph.

7(c) Many candidates had some idea as to how to use the graph to convert 80 litres into gallons. Most of these obtained both marks, but some lacked accuracy and their method was not always clear enough to award a mark.

8(a) Most candidates were able to find the next term in the sequence in both parts of this question.

8(b)(i) Candidates generally had a good understanding of how to use this term to term rule and many found the third term in the sequence correctly.

8(b)(ii) A few candidates found the seventh term in the sequence, but most realised that you had to reverse the flow diagram. Some became confused with the order of the flow chart, others with the use of their calculator with the order of operations required, but many obtained both marks.

8(b)(iii) Many candidates found that the next term in the sequence was 1 but then failed to realise the significance of this and did not explain, in some way, that the sequence would continue with 1 as every term.

9(a) Only about half of the candidates were able to use the range to find the missing number. A common error was to use the first number in the list, 4, as the lowest number and then give an answer of 11.

9(b) Few candidates scored both marks on this question. Many scored a method mark, from realising that the data needed to be ordered, but then could not go on and solve the problem. Some confused the mean and the median.

9(c) Few candidates realised that a mean of 4.5 for the six test results would give a total of 27 marks and use this this to find the missing number. Many used some sort of trial and improvement with varying degrees of success.
Again some candidates confused the mean and the median.

10(a) The majority of candidates knew that 35% was equivalent to 35 hundredths.
Many were able to simplify this successfully, but some either did not attempt the simplification or were confused as to how to proceed.

10(b) Most candidates knew the equivalent percentage.

10(c) The majority of candidates converted the fraction to a percentage successfully.
A few gave an answer of 0.12, for which they obtained a method mark.

11(a) This question was generally answered well. A few candidates were not aware of the significance of the order of operations and gave an answer of 24. Another incorrect answer, seen occasionally, was -9

11(b).Nearly all candidates found the correct solution.

11(b)(i) Nearly all candidates gave the correct solution.

11(b)(ii) Most candidates gave the correct solution. $2^5 = 10$ was seen occasionally.

12(a) Most candidates gave the correct year.

12(b) Few candidates realised what was required here.
A common incorrect response was to give a year such as 2007.

12(c) Only a small number of candidates were able to read from the graph, using the scale.

12(d) Difficulties using the scale and working in time rather than decimals, led to there being few correct responses to this problem.

13(a) Most candidates completed the table correctly.

13(b) Nearly all candidates plotted their values from the table on the grid correctly.
The majority of these then went on to draw a straight line, with a ruler, and were awarded both marks. A significant number did not realise that they needed to draw a straight line through their points.

14 Few candidates gave an answer that was an algebraic expression that could represent a perimeter. Answers such as $4x4y$ in part(a) or $6x4y$ in part(b)were quite common.
Some candidates appeared to be confused as to the difference between perimeter and area.

15(a) The larger numbers and the arrangement of the equation did not put candidates off and there were many correct solutions. Few used a totally algebraic method; those who used a reverse flow chart were usually successful and some who adopted some sort of trial and improvement approach often found the correct answer.

15(b) This part of the question was completed less successfully.
Many candidates failed to realise that multiplying by 4 would be needed at some point in their solution.
A few candidates gained a method mark for showing evidence of some understanding of part of the process.

16(a) Many candidates had little idea as to how to find an estimate of the mean from a grouped frequency table. Often they just found the total frequency and divided this by the total number of classes. Some did go on to make a good attempt at finding an estimate of the total waiting time but then, again, divided by the number of classes rather than the total frequency.

16(b) Most candidates attempted to draw a frequency table and gained some marks. Only a small number achieved a correct solution. Beyond silly mistakes, the most common error was not to plot the frequencies at the mid point of the interval or failing to join up the points that they had plotted with straight lines.

16(c) Only a minority of candidates identified the correct modal class.
The most common error was to give a figure, such as 15, rather than an interval.

16(d) Many candidates tried to answer this question without using calculations as evidence for their conclusion.
A few candidates obtained method marks from finding the appropriate figures, but there were only a few fully correct explanations.

17(a)(i) Only a few candidates gave the correct reason of alternate angles. ‘z’ angles was accepted as a reason, but examiners are looking for candidates to use more mathematical terminology.
Common incorrect reasons were corresponding angles or responses such as ‘angles on a straight line add up to 180’.

17(a)(ii) A significant number of candidates managed to work out the correct angle, usually showing a detailed method as to how they achieved this, which was pleasing.
About half of the candidates failed to score on this question; the most common error was treating triangle BFC as an isosceles triangle.

18 This question was answered poorly.
Common errors were to multiply the base of the parallelogram by the slant height rather than the height or just to multiply the three given lengths together.
Candidates need to know the formula for the area of a parallelogram and how to apply it.

19(a) Those candidates who understood how the table worked were usually able to complete it successfully. Some candidates just used the Black cards and gave an answer of 0.72, for which they were awarded a mark.

19(b) Many candidates found 0.36 for the probability of taking a square, but a few did not feel that this was an appropriate answer and went on to do further work to this and lost the mark.

20 This was the Quality of Written Communication (QWC) question. Many candidates did not know how to approach this question and either did not attempt a response or made a very limited effort to find a solution.

For those who did attempt the question, some clearly recognised that on a QWC question there were marks available for evidence of some understanding of what was required and put down a series of statements and calculations, for which they may have scored some part marks. Very few candidates had any idea as to how to find the volume of a cylinder or as to how to apply using rates to come to a conclusion.

J567/03 Paper 3 (Higher tier)

General Comments:

The candidature fell into two main groups; those attempting to gain a grade C and those attempting to gain a grade A or A*. Therefore there was a wide range in the quality of responses. Common to both groups was poor layout and presentation and a lack of a methodical approach. This resulted in marks being lost in a lot of questions. This was particularly evident in questions 16 and 21 where the layout and method was not always easy to follow. The use of algebraic manipulation continues to improve whilst the ability to reason in geometrical applications has not improved. In this paper there were questions which tested candidates' ability to use mathematics from a number of areas in the specification within one question and this they found to be difficult as well.

Comments on Individual Questions:

Question No. 1

In part (a) the common error was to start counting at 1 without moving the triangle so some responses were one square short in both directions. In part (b) many used the origin as the centre and not the point requested. In part (c) the angle was often given as clockwise.

Question No. 2

Some found the difference but did not know what to do with the +8. A few answers confused the 8 and 3 so they gave $3n + 8$ as their answer.

Question No. 3

This question exposed the uncertainties that grade C students have with ratio. The question needs to be carefully read. In (a) some divided 600 by 2 rather than 3. In (b) many divided 200 by 9 rather than 5. It was a surprise that those who chose this route did not have 'second thoughts' when confronted with 200 ÷ 9.

Question No. 4

This question was answered well by most candidates. In (a) a few multiplied 4 with 5 and 4 with -10 first and then they squared the result. In (b) some did not multiply out the 10 and 5 and a few added rather than multiplied. In (c) most answered this correctly. In (d) the signs were not reversed when the terms were 'moved from one side to the other side'. Hence candidates would reduce the equation to $8x = 9$. Some found $2x = 23$ difficult to reduce to $x = 11\frac{1}{2}$. Examiners did allow correct equivalents of this fraction. In (e) the main problem was the square root which many incorrectly reversed as the first or second step. The square root must cover the entire expression for which it is applied to. It is particularly important that it covers the denominator of the fraction in this question.

Question No. 5

Part (a) was answered well. In (b) there were few correct answers, with both the distance and the time causing problems. This was set with the intention that division by 30 (minutes) would be unnecessary. However most did attempt division by 30 or by ½. In many attempts the answer was incorrect. It was assumed that to convert from 30 minutes to one hour all they had to do was double their distance. Only a few realised this and candidates should always look for simple solutions. Part (c) was answered well and (d) was also correctly read from the point of intersection.

Question No. 6

This was a different type of question, which tested their use of algebra within a statistics problem. Most were able to write $a + b + c = 15$. However they did not realise that the subject was $(b + c) \div 2$. Few were able to write the mean of b and c as an expression.

Question No. 7

This question was quite well answered especially as it was asked in a slightly different way. A few realised that 1 would satisfy all the 'false' statements and examiners did allow any type of real number including those which were outside the range suggested. This question did demonstrate that candidates are able to apply themselves to unusual questions.

Question No. 8

In part (a) the intention was to test candidates' knowledge of correct mathematical terms. However many did not know the correct name even though they must all have been asked to do the construction. In (b) most did gain credit though some added their own further constructions that were unnecessary. They were expected to link each statement with one of the constructed arcs or lines.

Question No. 9

It was surprising that many struggled with this question, they were often unable to find the three distinct dimensions and it was common to see a single dimension repeated. A few tried to find the surface area which was actually more demanding.

Question No. 10

Many gave the correct answers in part (a), those who decided that (i) did not have any options, were allowed that response though it should have been that the question is indelicate. In (b) many gave overlapping options despite the hint given in (a)(ii).

Question No. 11

In (a) the question did ask the plural 'regions' but many gave just one response and it was usually B. In (b) few correctly found the equation of the line $x + y = 1$. Those who gave $y = 2x - 1$ usually wrote the inequality the wrong way round even though they had said in (a) that their version described the region B.

Question No. 12

Candidates were asked to show the evidence used in their conclusions but few did show any quantitative values. It was expected that median, range and inter-quartile range would be shown but few actually found those. Indeed few actually made comments on 'average' and 'spread. We did allow descriptive comments but to gain 5 marks some numerical evidence had to be used.

Question No. 13

There were many correct attempts. The usual incorrect method involved adding or subtracting rather than multiplying or dividing. There were a few attempts at Pythagoras' Theorem but none of the angles are given as right-angles.

Question No. 14

Part (a) was answered well by the higher scoring candidates, the most common alternative was $(x – 10)^2$. In (b) few wrote down the possible pairs of factors of 100 and quick elimination of 1 and 100 also 2 and 50 would have led to the correct pair. Many left their answer in factorised form and did not actually solve the equation. In (c) few gave the correct denominator as $(x – 3)(x + 5)$ and they must resist the temptation to multiply the brackets out.

Question No. 15

In (a) many gained at least one mark; the most common error was to repeat the top part of the second branch in the bottom part. In (b) they needed to read 'at least' because many did not include both pictures. In calculating the probability many added the individual probabilities rather than multiplying them.

Question No. 16

The intention was to write two simultaneous equations in a familiar context and solve them. However, few candidates realised that this was the required method. Trialling was allowed although the success rate was low. Those who did write equations were more successful than those who did not.

Question No. 17

Histograms are still poorly understood and few could calculate correctly the frequencies from the diagram. In (a) bars were drawn to either 0.4 or 0.8 indicating that the area of the bar had not been considered. In (b) few even gave the correct figures and many worked with their frequencies as decimals.

Question No. 18

Many had forgotten the rules of calculating with standard form so examiners saw these numbers converted to normal form and then the division and multiplication attempted. This made the calculation more difficult. Part (a) was found to be more difficult than part (b) and figures 136 were common. In (b) 12×10^9 was a common answer with the number not in the correct standard form.

Question No. 19

In (a) many thought the negative power meant a negative number. The best responses used the rules of indices to reduce this to three single actions, reciprocal, cube and square root. It is always advisable to find the square root first which many failed to do, preferring to cube 16.

Question No. 20

This was a standard question but many did not read it carefully. It is <u>inversely</u> proportional to x^2. We saw expressions that were about direct proportion and often to the square root of x. The step in writing the algebraic equation, either $x^2y = k$ or $y = k/x^2$, is crucial. Some, who then found k to be 250, did not substitute this value into the equation.

Question No. 21

This question was aimed at the grade A and A* students and it was pleasing to see that other candidates, not in the target group, managed to gain credit. It was essential to find AC and then necessary to realise that the side of the square was a third of the length of AC. We did not demand a rigorous proof that it was one third of the length except that the angles at A or C were 45°. It was expected that work in surds was necessary and there was really no other way it could be achieved. Candidates did try to work backwards from the answer but this was actually more difficult. Few candidates achieved the result $\sqrt{72} = 6\sqrt{2}$. In (b) this was $(2\sqrt{2})^2$ and again few could simplify this and incorrect answers such as $8\sqrt{2}$ and 16 were seen.

J567/04 Paper 4 (Higher tier)

General Comments:

Most candidates attempted a large proportion of the question paper and solutions were generally well-presented. Graphs were usually neatly drawn and rulers used where appropriate.

In general, candidates performed well on the questions at the beginning of the paper, which were testing the more straightforward topics such as angles in polygons and basic algebra. Candidates had more difficulty with questions testing trigonometry, bounds of quantities and more complex algebra, with some candidates omitting many of the questions towards the end of the paper.

Many candidates had difficulty dealing with the conversion of units and the combination of processes required in the quality of written communication question. In contrast to much of the rest of the paper, solutions here were frequently laid out in a haphazard manner.

Candidates are expected to be able to use their calculator appropriately on this paper. A significant number of candidates used inappropriate non-calculator methods in work on percentages. Some candidates also broke calculations down into several steps with unnecessary intermediate rounding, which led to inaccurate final answers. These calculations could have been carried out in a single step on a calculator leading to an accurate answer. This was particularly evident in the calculation of the volume of a cone in question 15a.

Comments on Individual Questions:

Question No. 1

In part (a)(i) many candidates identified that the reason required was alternate angles. Some gave an answer of Z-angles, which was condoned in this case, but alternative was not acceptable in place of alternate. Incorrect reasons such as corresponding angles, opposite angles and angles in a triangle were also seen by examiners.

Most candidates could work out correctly angle y in part (ii). Those that did not reach the correct answer usually correctly showed either angle EFB or angle FBC as 60°.

In part (b) confusion between exterior and interior angles of a polygon was evident. Many candidates did the correct calculation of 360 ÷ 18 but often followed this with subtraction of 20 from 180 leading to the common incorrect answer of 160. Subtraction from 360 was also seen in some cases.

Most candidates correctly identified the lower bound in part (c).

Question No. 2

Many correct calculations of the mean using the correct midpoints were seen in part (a). Some candidates then went on to give a final answer of the group, $10 < t \leq 15$, in which case they lost the final mark. Having found the sum of the products, some candidates divided by the number of groups rather than the total number of patients. Candidates should be aware that the midpoints of the intervals may be decimal values; some were seen to use 3, 7, 13 for example, rather than 2.5, 7.5, and so on which are the correct values. Other candidates used either the endpoints of the intervals or the class width in their calculations. On some occasions cumulative frequencies or frequency densities were used.

Most candidates selected and labelled an appropriate linear scale in part (b). Some candidates used a scale starting from 1, rather than 0, which was not acceptable. Most candidates showed the correct heights, but points were seldom drawn at the midpoints of the intervals. Candidates who knew what a frequency polygon was usually joined their points with straight lines rather than curves. It was common to see bar charts rather than frequency polygons drawn.

Most candidates identified the correct modal class in part (c).

Many good comparisons were seen in part (d) with appropriate calculations clearly shown. Candidates either identified that 25% of the patients was 15 and that 17 patients had waited longer than 15 minutes or worked out that 28.3% of the patients had waited longer than 15 minutes.

Question No. 3

Few candidates knew the formula for the area of a parallelogram and correct answers were rare. Those candidates who multiplied just two of the dimensions more commonly selected the two side lengths rather than the base and the perpendicular height. Other candidates added or subtracted the area of a triangle from their parallelogram area, often having used Pythagoras's theorem to calculate another length.

Question No. 4

In part (a) most candidates performed the calculation correctly although it was evident that many did not know the difference between three significant figures and three decimal places. Answers of 2.378 and 2.379 were common.

In part (b)(i) candidates who began the calculation by evaluating 2^3 and 4^4 often reached the correct answer. Some candidates gave the answer 2^5 rather than 5, the value of *m*, which was required. The most common incorrect answer was $m = 1$, which resulted from candidates attempting to use index laws incorrectly in the division $4^4 \div 2^3$ and reaching an answer of 2^1.

Candidates usually solved part (ii) using the trial and error approach of substituting different values of *p* and *q* into the equation. Some reached the correct answer although it was common to see pairs of values of *p* and *q* with a product of 6 but ignoring the requirement that $p > q$. Few candidates rearranged the given equation to reach $pq = 6$ and then select an appropriate pair of values that met the conditions.

Question No. 5

Most candidates answered part (a)(i) correctly. Some candidates gave an answer of 0.72 which resulted from assuming that the sum of the top row was 1. A small number of candidates gave an answer of 0.12 which resulted from finding the sum of the white row as 0.4 and assuming that the sum of the black row would also be 0.4.

Many correct answers were also seen in (a)(ii) with some candidates giving answers as either fractions or decimals, both of which were acceptable.

In part (b) it was common to see candidates adding the given fractions and reaching the correct total of $\frac{7}{8}$ or $\frac{35}{40}$. Only a minority of candidates knew how they could use this result to work out how many balls were in the bag and many gave the numerator of their fraction as the answer.

Some candidates wrote the three given fractions with a common denominator of 40 but did not realise that this common denominator was the correct answer to the problem. Some candidates added the given denominators leading to the common incorrect answer of 23.

Question No. 6

Many candidates factorised the expression in part (a) correctly. Some correct partial factorisations were seen by examiners, usually with x as the factor. Only a small number of candidates thought that the expression should be factorised into two brackets.

In part (b) many correct answers were seen with clear, correct algebraic steps shown. Those candidates who did not reach the correct answer had usually expanded the bracket incorrectly to $3x + 7$. This was usually followed by correct rearrangement so partial credit could be awarded.

In part (c) most candidates solved the inequality correctly. Some candidates did not give their final answer as an inequality, simply stating 6 on the answer line, which only gained 1 mark. Some used an incorrect inequality symbol which was also penalised.

Question No. 7

Responses to this question assessing both problem solving and quality of written communication were generally disappointing. Calculations were often poorly laid out and it was unclear what the candidate was doing, as there was both a lack of units with answers and a lack of annotation to state what was being calculated. In a question of this type, candidates would benefit from first breaking down the problem into a series of steps to be carried out, and then doing these one by one with a brief note next to each to say what they are doing.

Only a small proportion of candidates showed a correct solution with clearly laid out steps in their working and a correct conclusion. Candidates demonstrated a lack of fluency in dealing with the different units used in the question and incorrect conversions between cm^3, m^3 and litres were common as well as a failure to realise that any conversion might be required.

Perhaps because there was no diagram to guide candidates, many used an incorrect formula for the volume of a cylinder, such as $2\pi r^2h$, πd^2h, πdh or even simply dh. Having calculated a volume, candidates did not always then go on to work out the time taken to fill the tank with this volume of water, and those that did attempt this often used inconsistent units in their division.

Question No. 8

Most candidates completed the table correctly in part (a)

In parts (b) and (c) many correct, neatly ruled lines covering the required domain were seen by examiners. Little evidence of working out was seen for the line in part (c), suggesting that candidates realised that they could substitute $x = 0$ and $y = 0$ into the given equation to give them the two points they needed to draw a straight line.

Many candidates gave the correct solutions in part (d) with some giving solutions that correctly followed through from their incorrect lines. A minority of candidates confused the x- and y-coordinates and gave reversed answers.

Question No. 9

Most candidates performed the percentage reduction correctly in part (a)(i) although many did not use the efficient multiplier method of calculating 36 × 0.88. It was equally common to see 36 – 36 × 0.12, often done in two steps. In this case, 12% was often found using the non-calculator method of 10% + 1% + 1%, which is inappropriate for this calculator paper. Few candidates gave the price reduction rather than the reduced price as their answer.

Candidates are still failing to identify where reverse percentage calculations are required, as in part (a)(ii). Here it was far more common to see an answer of £27.10, resulting from increasing £24.20 by 12%. Those candidates who understood that £24.20 was 88% of the original price usually reached the correct answer.

Candidates were more successful with the repeated percentage change in part (c) with many correct answers seen. Many candidates performed the calculation in two stages, increasing first by 8% and then by 5% rather than using the more efficient single calculation of 65 × 1.05 × 1.08. The most common errors were for candidates to think that an increase of 8% followed by 5% was equivalent to an increase of 13% or to follow the increase of 8% by an increase of 13%.

Question No. 10

Many candidates gave the correct coordinates for the centre of enlargement. However, few identified correctly the scale factor as 0.5, with the answer of 2 seen most frequently. Those candidates who realised that the scale factor was not 2 demonstrated confusion between fractional and negative scale factors and an answer of –2 was common. Again many candidates were not familiar with area factors, and answers of 2 : 1 were more common in part (c) than the correct answer of 4 : 1. Some candidates reached the correct answer in part (c) by calculating the areas of the two triangles rather than by squaring the scale factor.

Question No. 11

Many candidates drew a correct graph in part (a). Incorrect graphs were generally linear graphs through the origin with a positive gradient. Fewer correct responses were seen in part (b), with very few candidates knowing the shape of a cubic graph and those cubic graphs drawn seldom satisfied the conditions given in the question. Some graphs appeared to satisfy the conditions, but when extended they would have crossed the *x*-axis again so these only gained partial credit.

Question No. 12

Many candidates appeared not to have met moving averages and correct answers in part (a)(i) were rare. It was more common to see candidates attempting to use the two given moving averages as the first two terms in a sequence.

In parts (a)(ii) and (a)(iii) it was clear that candidates did not understand the difference between the weekly changes and the overall trend. It was common to see the same answer, explained in a slightly different way in these two parts. Many candidates identified the fluctuating changes in the weekly amounts but fewer identified the overall decreasing trend.

Candidates interpreted the graph in part (b) well with correct answers in both parts common. In part (i) some read off the total height of the bar at the top of the housing, fuel and power section rather than finding the height of this section of the bar. In part (ii) some candidates described how one particular section had changed rather than the total amount spent.

Question No. 13

Candidates who identified that they needed to use tangent to answer this question usually reached the correct answer. Some candidates used an incorrect trigonometric ratio or attempted a long method using cosine followed by Pythagoras's theorem.

Question No. 14

Many candidates correctly worked out the angle at the centre as 70° and then often went on to work out that angle OBC was 55°. Marks were often lost for missing, incomplete or incorrect reasons. It was common to see reasons such as 'the angle at O is twice the angle at A' or 'the angle in the middle is twice the angle at the edge'; however a complete reason involving 'angle at the centre is twice the angle at the circumference' was required. Similarly candidates often referred to equal radii in their the second reason; it was less common to see reference to the isosceles triangle, although a calculation involving 180° was usually present.

Question No. 15

Many candidates used the formula for the volume of a cone given on the formula sheet and reached the correct answer in part (a).

In part (b) many candidates showed a correct calculation to work out the total mass of the box of candles; however, it was rare that they selected the correct upper bound for both the mass of a candle and the mass of the box. It was more common for candidates to use 185 g as the upper bound for the mass of a candle than it was for them to identify that the upper bound of the mass of the box was 52.5 g. Many candidates assumed that the accuracy used for the mass of the candle and the box was the same.

Question No. 16

Candidates who understood the concept of exponential growth usually stated a correct expression in part (a) and went on to use it to calculate the correct population in part (b). In a few cases, candidates used 1.2 rather than 1.02 for the 2% rise. An answer of 94192 was common in part (b) when the original population had been increased by 12%.

Question No. 17

In part (a) many candidates correctly factorised the denominator of the fraction and cancelled the common factor of $(x + 4)$. However, following this, it was far more common to see the answer $(x - 2)$ than the correct answer of $\frac{1}{x-2}$.

In part (b) it was common to see attempts to expand $(x + 3)^2$, with either the correct result or the answer $x^2 + 9$. Candidates did not always then know how to use this expansion to work out the missing numbers in the given identity.

Question No. 18

Few correct answers to this question were seen by examiners. Candidates who used the sine rule correctly often gave an answer of 24.6°, the angle BLC, rather than using this angle to find the bearing required. It was also common to see attempts at using the cosine rule or for candidates to assume that there was a right angle at B and use Pythagoras's theorem to find the length CL, which was then used in a further trigonometric calculation.

Question No. 19

Candidates who attempted this question often started by equating the given equations and reaching the correct quadratic equation. They could not always solve this equation and an incorrect factorisation of $(x + 6)(x - 2)$ was often seen. Some candidates used their incorrect solutions for x correctly in the equation $y = 8 - 3x$ to find solutions for y.
A common incorrect method involved finding the solutions to $x^2 + 5x - 4 = 0$ and then using the second equation to find the associated values of y. Other methods involved trying to equate coefficients of x in the two equations and then subtract to eliminate, but in these cases the y terms were usually ignored.

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