Oxford Cambridge and RSA

GCSE

Mathematics

General Certificate of Secondary Education **J560**

OCR Report to Centres November 2017

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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General Certificate of Secondary Education

Mathematics (J560)

OCR REPORT TO CENTRES

J560/01 (Foundation Tier) Paper 1

General Comments:

Few candidates scored high marks on this paper, this may be due to the fact that all candidates were retaking this examination. Much of the paper appeared to be accessible and many candidates were able to attempt every question with no evidence that time was a factor in any failure to complete work. However, the later questions proved challenging for some candidates. Given that this was a calculator paper it is a real concern to note how many candidates made arithmetic errors on very simple calculations. Candidates should ensure their working particularly on the longer, more functional, questions is set out clearly in a logical and organised way, they should ensure that they read the questions carefully to determine what they are being asked to do. When plotting points and drawing graphs a sharp pencil should be used to ensure their plots are within the allowed tolerance.

Comments on Individual Questions:

Question No. 1
In part (a) many candidates were able to give the correct answer. A considerable majority of candidates knew that a cube has 6 faces in part (b) to score the second mark.

Question No. 2
Parts (a)(i) and (ii) were generally well answered. The most common responses in part (a)(i) were 26 or 13, only a minority of candidates seemed to attempt finding factors of 13 rather than multiples. In part (ii) 41, 43 and 47 were all seen frequently, with a few candidates listing all three. Part (b) caused more difficulty. A large number of candidates offered attempts that included various factors or prime factors of one or both numbers, but these rarely went on to make any attempt to form a multiple of either number. The most successful strategy was simply to list the multiples of each number; however a surprising number of candidates made arithmetical errors, despite having a calculator available to them.

Question No. 3
Of the two accuracy issues in part (a) rounding to the nearest 100 was the most successful. In (a)(ii) 8 was a common incorrect response. In part (b) several candidates were able to do the calculation but failed to specifically refer to the value of x and left the answer as 3^7. Some gave 10 or 3^{10} from multiplying indices and others failed to read the question properly and fully processed $3^5 \times 3^2 = 243 \times 9$ to arrive at 2187.

Question No. 4
Most candidates recognised that $\frac{1}{4} = 0.25$. In the next two parts, most candidates recognised the need to use an inequality symbol, however some seemed to be under the impressions that they would use one of each symbol, so used one ‘<’ and one ‘>’, rather than two ‘<’ symbols. Part (b) caused difficulty for many candidates with very few able to state that $x > 2$.

Question No. 5
In many cases it was the method of conversion that determined the level of success in this question. Some candidates understood that 2.7 was the largest value and looked to compare $\frac{7}{26}$ and 28%. The most successful method was to convert the fraction to a decimal (0.26, 0.269, 0.27 were all given credit). Many either considered 2.7 to be the smallest value or gave all three values in descending order.

Question No. 6
Part (a) was generally done well, however a small number of candidates did not fully simplify, giving their answer as $7p - 3p$. The most common error was with the negatives in part (a)(ii). There were many correct answers in part (b), with most evaluating both terms correctly. A small number of candidates arrived at 120 + 24, but unfortunately did not go on to find the total, others wrote $120h + 24t$ showing a lack of understanding. Few candidates were able to answer part (c), unfortunately it was often difficult to award any marks at all, because candidates often did not show the steps in their rearrangement.

Question No. 7
Many candidates gained full marks on this question. Failure to secure full marks usually came from arithmetic errors in an otherwise correct method. Other candidates added the values but then did not subtract their total from 1.

Question No. 8
There were some excellent answers, however a significant number of candidates did not appear to have an understanding of frequency trees, consistently failing to identify the relationships between the values on the various branches, with some thinking the top half was practical and the bottom half theory. The most common response to part (a) was to incorrectly suggest that 61 passed both tests. In part (b), many candidates were able to correctly complete the tree. There was also a significant number of candidates who were able to give answers that showed some understanding, for example making an error in finding $\frac{5}{6}$ of 72, but then using their result correctly to find the other values. However, a number of candidates gave answers that did not make sense, such as suggesting the number that passed theory was less than 52. Those who had made a good attempt at part (b) were usually able to produce one or more relevant values from their trees in part (c). The most common problem in part (c) was a lack of clarity, with some candidates attempting verbal explanations that did not include the relevant values from their frequency tree. Those who did give a value sometimes only stated how many passed one of the tests, rather than making it clear how many passed each test.

Question No. 9
The majority of candidates did not appear to be familiar with the term centre of enlargement. Many scored 2 marks for using a correct scale factor. Candidates should ensure they use a ruler.

Question No. 10
There were many correct answers to part (a), however in some cases, candidates' attempts showed no real insight into what they were being asked to do. Attempts to find 62% of 500 were very common, as were non-calculator methods. Those candidates who recognised the need to evaluate $\frac{62}{500}$ usually went on to score full marks. Part (b) was often attempted using a two-step method: finding 9% of 196 and then adding the result to 196. Those who did this using an efficient calculator method were far more successful than those who attempted non- calculator methods. The non-calculator methods seen, usually involved attempts at finding 10%, then 1%. Many had difficulty evaluating 10% and 1% of 196 correctly, those who did manage this step were often unable to combine their results to obtain 9%, some did correctly find 9% but left the answer as £17.64 scoring only 1 of the 3 marks.

Question No. 11
A significant number of candidates gained full marks on this question, with many other candidates gaining two method marks for correctly completing the first two stages. Other correct methods were given equal credit. Errors were often made in processing and marks were lost as a result. Candidates were poor at stating what they had found, with many calling hours students and vice versa. If a candidate got as far as 3 and 2.25 they usually knew they needed to go to a total of 6. There were some candidates who having arrived at 3 students for each, then declared a total of 3.

Question No. 12
This question caused significant difficulty for the majority of candidates. Efficient and clearly laid out solutions were the sole preserve of the highest achieving candidates. A minority used bar models, but those who did were usually successful in establishing that the difference of 750 related to ‘2 shares’; in most cases these candidates were able to go on to establish the correct values for each person. Some candidates appeared to be using trial and improvement in their calculators. These were often able to give a set of values that fitted the criteria of Kush having 750 more than Leo and Mai having an amount equal to the combined total for Kush and Leo, however few seemed clear on how to check whether these values were in the given ratio.

Question No. 13
Part (a) was well answered with a majority realising that the horizontal part of the travel graph was the period when the vehicle was stationary. The most common misinterpretation of this period was 30 minutes. In part (b) many realised that the car travelled 50 miles in 50 minutes and partly processed the figures to give 1 as an answer while the most frequent incorrect response here was 50 mph. Only a minority realised or calculated a speed of 60 mph. In part (c) many candidates scored both marks, however a common error was to arrive too early usually at 1410.

Question No. 14
A large number of candidates gained a mark for calculating the total number of cakes correctly. However, despite the prompt in the question that Katy has x cakes, few attempted to form and solve an algebraic equation. Those who did attempt an algebraic method were often hampered by difficulties in writing a correct expression for each person, the most common error being to assume that Deanna had $2x$ cakes. Having formed expressions for numbers of cakes, many candidates seemed unclear what to equate these to, with many opting for costs and writing their expression equal to 52.70 rather than the value 62.

Question No. 15
Most candidates understood the process of substitution and plotting required in part (a) the most common error was to give –9 as the first value. In part (b) many candidates were able to earn at least 1 mark for plotting points but many failed to complete the curve correctly, with some using ruled lines. Part (c) was generally well answered by the correct line with occasional use of $x = -2$ or simply no response. Two correct answers for x in part (d) were rare although some managed a positive value in the acceptable range. Again, there were many blank responses in this part. Candidates should be reminded that answers given in coordinate form are not acceptable.

Question No. 16
There were many good attempts at part (a), with one or more steps evaluated correctly. Unfortunately, many candidates usually stopped after performing the calculations, rather than going on to offer some sort of conclusion about whether Donald could swim the distance in the given time. Attempts at a conclusion, rather than identifying an assumption, were frequently seen in part (b). Relatively few candidates showed any insight at all into what was considered an assumption in their working in part (a). A common response was for candidates to state that they had assumed that Donald either could, or could not, swim the lengths in the given time. Part (c) was often answered well, with most able to suggest reasons, the most common being that Donald would tire.

Question No. 17
A large number of candidates seemed to understand that points were not necessarily plotted at the intersections of the grid lines and scored 2 marks for four correct plots, some candidates had failed to interpret the scale correctly. Many scored 1 mark in part (b) for "positive" but rarely gained the second mark for describing the strength correctly. It was even less common to award full marks in part (c). A mark could often be awarded for giving the total number of students as 21 but the number whose German outperformed French was less likely to be correct, many candidates appeared not to realise they had to use the data from the graph. Drawing the line $y = x$ would have been helpful but very rarely seen although several produced a line of best fit with no obvious purpose. Coordinates from the scatter graph were often listed and added either in an attempt to work out some form of average or without any obvious purpose at all. A large number of candidates simply failed to respond.

Question No. 18
Many candidates were able to arrive at the conclusion that the original mixture contained 6 litres of white and 9 of red paint, but very few were able to make any further progress.

Question No. 19
In order to answer this question, candidates needed to recognise that Pythagoras and trigonometry should be used and then apply them correctly. Many candidates thought that angles in a triangle played a part in working out the correct answer. A small number of candidates who were able to correctly use Pythagoras to calculate 50, then attempted to use Pythagoras again to obtain a further side length seemingly forgetting that an angle was required. Only a small number of fully correct answers were seen. Of those who did realise the need to use trigonometry many were unable to apply it correctly.

Question No. 20
Part (a) proved to be challenging, with many not attempting this part or just marking random points or lines. The most common way to gain marks was by drawing the arc from C, this was usually the correct radius, but was not always of a sufficient length. Constructing the bisector proved to be more problematic, many drew arcs which were far too small to cross, in a number of cases the arcs were only 3 cm in radius. Those who drew the bisector rarely extended it far enough to find both points of intersection with the arc from C. In part (b), the majority offered horticultural rather than mathematical explanations, referring to the tree needing space to grow. Those who did attempt a mathematical explanation frequently assumed that there was only one place that met both conditions, only a minority realised that the second place that met both conditions was outside the boundary of the garden.

Question No. 21
Many candidates scored the mark in part (a) as they understood that the line should start from, or go through, the origin. In part (b) some candidates had a good understanding of proportion and the need to find a scale factor (k). Those that obtained 3.4 invariably went on to correctly give the final value as 85. Incorrect responses usually involved some manipulation of the three figures given in the question and invariably arrived at 68 – 20 + 25 = 73 as the answer. This question was not attempted by a significant number of candidates.

J560/02 (Foundation Tier) Paper 2

General Comments:

The paper was suited to this level with most candidates attempting a good number of questions. Even the more difficult questions had some evidence of working shown. Many candidates produced written working that was clearly set out in steps that were easy to follow.

Explanation questions caused most problems as often the necessary detail was missing. The ability to use algebra is still very limited. This was evident in question 14 and question 23 where the use of algebra was often ignored and candidates made attempts to show numerically how to arrive at a solution. Question14 and the latter questions were found difficult by many candidates. These covered the areas of speed distance time, difference of two squares, where many candidates demonstrated a lack of understanding. Trigonometry required in question19(b) was not recognised by most, as were tree diagrams and standard form. A number of these areas are new to the Foundation tier syllabus.

Throughout the paper errors with simple arithmetic calculations lost accuracy marks after correct methods were seen and for some the knowledge of multiplication tables would benefit from being more secure. Candidates are generally not considering the reasonableness of their answers. This was particularly evident in question 9 where candidates would state a sub area to be 120 m² even though they had worked out the total area as 80 m².

Comments on Individual Questions:

Question No. 1
A straight forward probability question to start the paper, many candidates performed well in all parts. In (b) some candidates offered more than 1 letter and (c) was least well answered with an answer of C commonly seen. A few candidates didn't answer the question posed, giving the actual probabilities of $\frac{1}{6}$, $\frac{6}{6}$ and $\frac{4}{6}$.

Question No.2
Many candidates struggled with all parts of this question; in (a) many drew only the vertical line of symmetry leading to the answer of 1 which was more common than the correct answer of 3. Candidates were more successful at identifying the order of rotational symmetry in part (b). Some answers of 'clockwise 90°' were seen and incorrect orders such as 1 or 0 were not uncommon. Some thought this part was still about lines of symmetry. In part (c) many candidates gave the correct answer of isosceles, however equilateral was a common error. Other incorrect answers varied between right-angled and scalene. Some struggled with spelling but generally the intention was very clear. A small number named shapes other than triangles. Candidates found the explanation in (d) challenging with few identifying that in general parallelograms have no line symmetry unless they are also squares, rectangles or rhombuses. Some specified that squares had four lines of symmetry for example. Vague comments such as 'not all parallelograms have two lines of symmetry' were more common than precise explanations. Many thought that parallelograms did not have rotation symmetry of order 2. Often answers referred to all parallelograms having more or less lines/order than stated in the question. Some answers appeared to replace parallelogram with quadrilateral and reference to a trapezium was seen numerous times.

Question No.3

Many correct answers were seen with clearly set out working. Most used £1.05 × 4 for comparison and provided a statement choosing the 100 g packet often with a reason why. Finding 25 g of the large packet also worked well but other comparisons proved too difficult to calculate so those attempting pence per g or grams per £ or p often went wrong, or they rounded to too few significant figures. Some candidates made the error of calculating 1.05 × 5 so a comparison of the same amount of tea was not provided.

Question No.4

Many candidates identified that one of the values must be 0 to give the correct mode. Many were also able to order the given numbers to find the median but were then unable to use their list to work out the final value. Only a small number of candidates went on to give the two correct values of 0 and 5. Some thought that as the median was 3.5 they would need a 3 and 4 in the middle of their list to create that situation. This led to common incorrect values of 3 or 4 and sometimes 3.5, alongside the correct value of 0.

Question No.5

This was well answered and many cancelled down the fraction correctly. A common error was to cancel $\frac{26}{100}$ to $\frac{12}{50}$ resulting in an incorrect answer of $\frac{6}{25}$. When full marks were not earned, most scored M1 for showing $\frac{26}{100}$.

Question No.6

In part (a) candidates who were able to expand the brackets correctly in part (i) often reached a final answer with at least one term correct, 13*c* was seen more often than –7*d*. Some gave +7*d* and others added to give 23*d*. Some did not simplify but gained a mark usually for 4*c* + 8*d*. Others attempted to combine the two given brackets and gave answers such as 7(4*c* -3*d*). Errors in multiplying out the brackets arose from incorrectly dealing with the 2nd term in a bracket such as giving 2*d* or 6*d* instead of 8*d*. Part (ii) was usually answered correctly. The most common incorrect answer was 9*ab*, with other errors of 4*a*5*b* and 25*ab* sometimes seen. Many candidates did not understand the term 'factorise' in part (b) and answers such as 14*gh* or 6*g*8*h* in part (i) were common. Some who understood that brackets were required gave answers such as 6(*g* + 8*h*), 6(*g* + 2*h*), (3*g* +3*g*) + (4*h* +4*h*). Again, many candidates did not understand what was required in part (ii) with an error of 25*x* – 15*x* = 10*x* commonly seen. A few that knew the method gained full marks, but correct partial factorisation was more common. Errors in factorisation attempts gave answers of 5*x*(*x* – 3*x*) or *x*(5*x* – 15*x*).

Question No.7

In part (a) many correct answers were seen but a significant number of candidates ignored the priority of operations and worked through the calculations left to right. This resulted in common errors of 2.5 in part (i) and 28 in part (ii). In part ×(b) many demonstrated understanding of powers and square roots but did not always present a scoring final answer. For example, in part (i) some left their answer as 2×2×2×2×2. Those with less understanding gave errors of 64 or 10. In part (ii) answers of 20 × 20 or 20^2 were sometimes seen. Other common errors were 40 or 200. Candidates are often missing that they need to estimate so in part (c) grid multiplication, followed by a difficult division was commonly seen. Some candidates then rounded their attempted answer. Those that estimated the values first, mostly scored 2 marks for rounding to 23, 8 and 4. Very few reached the correct answer of 10.

Question No.8

Many answered (a) correctly with a good amount of clear working. Errors arose from calculating 4 × 30 incorrectly or adding 120 + 20 incorrectly. In (b) most candidates were able to reverse the function machine to reach 75 ÷ 30, but very few were able to work this out correctly. Common incorrect answers resulting from this division were 25 and 2.15.

Question No.9
Many candidates made a lot of dimensional errors in approaching this problem. Examples of this were multiplying the 3 sides of the patio together or working out perimeters or just adding given lengths together. Working out missing lengths was generally handled well but it was not being secure in area formulae that caused problems. A good number attempted the flower bed triangle area but answers of 12 were common due to not dividing by 2. Few were able to calculate the trapezium correctly with many giving the patio area as 5× 8=40. Those who gave an area of 6 for the triangle usually scored 3 marks as they realised the need to subtract their areas from 80.

Question No.10
In part (a) candidates who started with 72 : 48 often attempted to simplify in stages using division by 2 and 3 rather than by 6, 8, 12 or 24. This was prone to an error at some stage and few reached the correct answer. Some gave an answer of 9 : 6 not realising that this was not fully simplified. Reversed ratios were common and some thought that they needed to relate the values to 360. A wide variety of working and answers were seen in part (b). Some candidates worked out that each person was represented by 3° in the pie chart and then divide the given angles by their 3° to reach one or both of the correct values, though division errors were sometimes seen. Some who started with 240° = 80 people couldn't see how to convert this to 72°, others attempted to use 360° instead of using 80 with 240°. A few who identified 3 went on to multiply this by 72 and 48. Some that identified that walk + cycle = 40 people did not know how to find the number for each so guessed two values adding to 40.

Question No.11
Georgia's height in part (a) saw 4 ft changed into 48 inches achieved frequently and some went on to show the next method step of 48 × 2.5 but difficulty was found with this calculation. These candidates ignored the extra 2 inches. Others converted the 2 inches to 5 cm and then added to 48 leading to incorrect answers of 53 or 48.5. Some converted 12 inches to cm first, often by adding a long line of 2.5 cm, but then lost their way in attempting to convert the total height. In part (b), most candidates got to a figure of 84, some forgetting to add on the extra 4 lbs, or 88 but then commonly multiplied by 2.2 or had problems dealing with division by 2.2.

Question No.12
Many candidates identified $\frac{32}{50}$ or 32 out of 50 in part (a) but some were unable to convert this to 64%. Some attempted to find 32% of 50 and others subtracted 32 from 100.Those that started with 10% of 50 = 5 and attempted to build this up to 32 usually made errors in working. In part (b) many correct answers addressed: small sample, only within school, only young people, only one part of England or bias. It was not uncommon for candidates to state that he should have asked the whole of England which was not acceptable. Other incorrect answers referred to those students who said no or do not know or implied that for Jack to be correct it required all surveyed to vote yes.

Question No.13
Not many gave the correct answers, and 15 and 5 were often in reversed places when seen. A good number of candidates worked out 16 as the perimeter of the inner rectangle, but then didn't appreciate that the rectangles were similar. Others worked from the knowledge that the outer rectangle had a perimeter of 40 and therefore they chose 2 sides which added to 20. Some realised that the outer rectangle was an enlargement of the inner one and gave answers in a ratio of 1 : 3. In these cases the scale factor used was usually 2.

Question No.14
Many candidates found all parts of this question difficult to access. In part (a)(i) responses usually referred to '26 km/h is her average speed', 'she did not stop at B' or 'Halina was going uphill'. A few realised that 26x was made up of speed and time but not many went on to state they should be multiplied to give the distance. Others said they were to be multiplied but didn't clarify what they represented. Many candidates omitted this part. Part (ii) proved very difficult. Some candidates identified that the time taken was 5 hours, but almost no correct algebraic expressions were seen. 20x was a very common error. No correct answers were seen in part (iii), $100 - 20x = 80x$ was most frequently seen but many omitted this part completely. Almost no algebraic working was seen in part (b) although some candidates reached the correct answer of 78 using a trial and error approach.

Question No.15
Recall of circle terminology proved difficult for many. In part (a) some correct responses were given, but many varied wrong answers including radius, circumference, straight line and chord were also given. Only a handful of 'segments' were seen in part (b), more put 'sector' with others stating 'chord'. This part was not answered by a number of candidates.

Question No.16
In the first part of (a) answers were split between the correct 13 and 12 from seeing that the last terms were increasing by 1, 2 and 3 so 8 + 4 = 12. Many correct answers were seen in part (ii) but few candidates had the confidence to double 64 mentally as they showed a multiplication or addition calculation. In part (b) most saw 3 as the link between terms but many could not use this to form the correct algebraic expression. Many answers involved 3, 18 and n, but answers such as $3n + 18$, $3n – 18$ and $18n – 3$ were as common as the correct answer of $–3n + 18$. It was also very common to see the difference used in an expression such as $3n – 3$ or $n – 3$.

Question No.17
Not many reached 122 but many scored method marks for squares and/or a final non-prime answer, the list of cubes was less often achieved. Frequently candidates offered an answer with no working. The best approaches were where candidates tackled each of the properties separately and then chose the non-prime number which appeared in all their lists.

Question No.18
Few candidates were able to identify part (a) as the difference of two squares and correctly factorise the expression. Some attempts to introduce brackets to the expression were seen with a few taking x or x^2 outside their bracket. $(x – 43)^2$ and $(x + 2)(x – 21.5)$ were other attempts shown. Part (b) was rarely linked to part (a) so the only valid method commonly seen was squaring and subtracting. Some reached the correct result, although many made errors in one or both multiplications. Others had answers of 14^2 or 28 as they assumed squaring was the same as doubling, $57^2 = 114$ & $43^2 = 96$.

Question No.19
Many candidates identified 1+2+3 = 6 in part (a) but then used 90° or 360° to split into constituent parts rather than 180°. Others didn't make use of the value of 6 they had identified. Very few achieved both marks, as they would often forget to explicitly say that 30 × 3 = 90. Some worked backwards from the right angle given and a few just drew a triangle with a right angle indicated. Extremely few used trigonometry in part (b), some achieved the correct answer with no evidence of trigonometry used. Most that attempted to show working split the lengths in the ratio 1 : 2 : 3, giving 5 cm as the shortest side. Many candidates did not attempt this part.

Question No.20

Few candidates were able to make any progress with this question as they did not start by writing ratios with a common number of women. A small number of candidates reached a ratio such as 8 : 10 : 7, but then very few understood how to use this to reach the correct answer. It was more common to see candidates not linking the ratios together correctly but just adding some or all of the ratio values and attempting to divide 250 by 9, 17 or 26.

Question No.21

Part (a)(i) was usually attempted but with mixed success. Frequent errors were completing the first branch with $\frac{1}{6}$ or getting the first throw correct but then completing the second throw as $\frac{1}{6}$ $\frac{5}{6}$ $\frac{5}{6}$ $\frac{1}{6}$. Sometimes the equivalent fractions of $\frac{2}{12}$ and $\frac{10}{12}$ were seen on second branches. Other incorrect fractions commonly suggested on either branches were $\frac{1}{4}$ and $\frac{1}{2}$, and suggested for the second throw, $\frac{1}{12}$ and $\frac{2}{12}$. The vast majority in part (ii) added $\frac{1}{6}$ and $\frac{1}{6}$ mostly resulting in an answer of $\frac{2}{12}$. Occasionally a method mark was gained for $\frac{1}{6}$ × their $\frac{1}{6}$. A few used words like unlikely for their answer. This part was often not attempted. Part (b) was mostly incorrect or not attempted. Again most fractions were added although rarely a candidate gained a method mark for $\frac{5}{6} \times \frac{5}{6}$.

Question No.22

In part (a) some candidates identified that the answer was not written in standard form while others knew that 12.3 needed to be a number between 1 & 10 but some had difficulty explaining this. It was common for candidates to comment that Beth had multiplied 4.1 and 3 incorrectly, some suggesting it should be 12.1 not 12.3. Others stated that she shouldn't have added the indices or that she had not multiplied the two tens together. A few thought it needed brackets or the error was due to not using BIDMAS correctly. In part (b) candidates who were able to write the two numbers as 450 and 7300 were usually able to show the required result, although some showed confused working when they attempted to introduce a decimal point into 7750. Many made errors when attempting to obtain 450 & 7300 due to having too few or too many zeros on their values. Many omitted this part or reached a different answer to the one given in the question, usually 11.8×10^5.

Question No.23

Explanations in part (a)(i) often referred to 'adding 1 makes the answer odd' but many omitted to explain that $2n$ is always even or just stated 2 is even without referring to n. Some attempted to show their answer numerically with an example such as '2 × 2 = 4 + 1 = 5 which is odd'. Other candidates, in their explanations confused integer with even number. Some correct answers were given in part (ii) but a variety of expressions of the form $an + b$ were more commonly seen. These included $3n + 1$, $3n + 2$, $2n + 2$ and $4n + 1$. Others stated a calculation such as 2 × 2 +1 = 5. Many made no response in part (b) but those who did generally gave lists of pairs of numbers demonstrating it worked. There was little evidence of combining $2n$ +1 with their answer from part (a)(ii) and rare appearances of anything algebraic were usually incorrect.

J560/03 (Foundation Tier) Paper 3

General Comments:

Many candidates showed working that was set out in a logical way, but a significant number of candidates either showed no working or poorly structured working.

The majority of candidates seemed unprepared for this assessment. Many were unable to make a worthwhile attempt at questions 12 and 16 to 20. Few candidates were able to respond correctly to question 1.
Many candidates did not appear to have the use of a pair of compasses or were unaware of what was required to complete a construction question.

Candidates should practise giving coherent reasons, using mathematical justifications. They need to learn how to change between metric units and to use mathematical constructions.

Comments on Individual Questions:

Question No.1
In part (a), the favoured answer was “vertices”, possibly from counting on the diagram. There was a significant number of candidates who did not attempt part (b). Many candidates who did attempt the question marked either angle ACB or all three angles. Some measured the angles and wrote the values in the triangle. In part (c) “an angle” was a common (wrong) answer.

Question No.2
In part (a) many correct answers were seen. However, $\frac{3}{14}$ was a common wrong answer.

Sometimes the variant of the correct answer $\frac{21}{49}$ was seen, which scored the mark.

In part (b) many candidates scored B1 for correctly converting $\frac{1}{4}$ or $\frac{1}{2}$ to sixteenths. Some candidates did not read the question and gave three fractions with the denominator 16 and the numerators 5, 6 and 7.

Question No.3
Many candidates scored 2 marks for part (a). However, a significant number of candidates showed misunderstanding or poor numerical skills. Some obscure wrong methods were seen such as $6^2 + 2^2 + 4^2$, possibly from an attempt to calculate surface area.

In part (b) some candidates went straight to a correct answer showing little working. Others wrote a trial, or a number of trials, attempting to produce 320. Occasionally these lead to the correct result. Many scored M1 for dividing 320 by 5 to reach 64. They were often unsure how to proceed and often gave 32 as an answer.

Question No.4
In part (a)(i) a number of correct answers were seen, 12 and 60 were common incorrect answers.

Part (a)(ii) was often correctly answered. However, 16 × 16 and 4 were common incorrect answers. The correct answer to part (b) was rarely seen. 10, 10.1 and 10.41 were common wrong answers.

Question No.5
Many fully correct answers were seen. Few candidates scored part marks but a number were able to earn the Special Case (SC) mark for getting the correct product of –4 and their 5. Some candidates attempted to add the numbers in the circles or to multiply the number in the circle and the number in the square.

Question No.6
Part (a) was often correctly answered. A few candidates made the error of writing Lucy's share : total. Those who could correctly cancel this to 5 : 7 scored one SC mark. Many who could not cancel a ratio, scored 1 mark for correctly writing 30 : 12.

Part (b) was very poorly answered. Few could write 2.5 m and 70 cm in common units. The candidates who knew how to reduce a fraction to the form 1 : …scored 1 mark for having 28 in their answer.

Part (c) revealed that many candidates could not change units in the metric system. Neither part was done well. A variety of incorrect answers were given for part (i). Common wrong values were 2.5, 50, 100 and 500. Many candidates did not know what to do in part (ii). A common error was to divide their value in part (i) by 2. Many candidates did not use the value from part (i) and started again, often to no benefit.

Question No.7
This question was answered well by many candidates. Part (a) was often correct with occasional slips. A common error was to misinterpret the information about women's choices and to fill all the final cells with 15 or 30, 0 etc.

Part (b) was less well done. Many candidates gave the correct answer for part (i) but struggled to express a valid reason. Few examples of scaling up from a smaller sample were seen. Most simply said there were more men or they might change their mind, missing the point entirely.

Question No.8
Part (a) was well answered. Some candidates chose to give working to explain, which was very acceptable.

Part (b) was poorly done. Many referred to the given calculation and the "0.18..." and made comments about rounding. Some gained a mark for giving a valid reason why 8 people might weigh more than 630 kg but did not support this with an example. Others gave an example but could not give a reason. Some said that there could be 9 women, missing the point that, if the lift could safely carry 9 women it could safely carry 8 women.

Question No.9
In part (a) many candidates scored one mark, often for saying that $\frac{1}{4} = 0.25$. Many did not attempt to follow the logic of the solution and must have changed $\frac{1}{8}$ and $\frac{3}{8}$ on their calculators and written these on line 3 and 4. Few spotted that $\frac{1}{8}$ is $\frac{1}{4} \div 2$ with many writing $\frac{1}{4} \times 2$.

Part (b) revealed generally poor understanding of metric units. Few changed 0.05 litres to 50 ml or 200 ml to litres. Most candidates appear to think that there are 100 ml in 1 litre. There was little evidence of working in consistent units.

Question No.10
This question was often reasonably answered. Many candidates got the correct answer for part (a) although 7^3 was a common wrong answer. In part (b) most candidates gained 1 mark for completing a line correctly. Very few gained both marks. Common errors were to write the value 64 in each row or to write too many "$\times$ 2"s on the second row. Few kept the purpose of the working in mind to end with a power of 2. Part (c) was frequently correct. Many candidates, unnecessarily, converted the standard form into numbers before ranking.

Question No.11
Many candidates gained both marks in part (a) although inaccurate plotting or drawing often led to the loss of one mark. Few candidates had a sharp pencil, although many did have a ruler. In part (b) many gained the mark for estimating the greatest distance travelled. A few gave the answer 150 from reading the last point plotted or gave an incorrect intersection with the horizontal axis. Few were able to state a valid assumption. The simple answer that the trend shown in the graph continues was rarely seen. Part (c)(i) was very rarely answered correctly but many gained the mark for part (ii). Candidates were generally unable to answer parts (d) and (e) and many gave no response. Part (d) was sometimes a calculation and, as an equation was often not seen in part (d), there was no valid work in part (e). The final comment was sometimes an explanation of how a previous calculation was carried out.

Question No.12
This question was not attempted by many candidates, they clearly had no mechanisms to answer this type of question.

Part (a) sometimes gained a mark for coordinates in the form (0, ...). In part (b), an answer was sometimes written down with no working and sometimes an irrelevant calculation using 3, 10 and -2. Very few candidates identified the value of c as -2.

Question No.13
Parts (a) and (b) were often well answered. Some candidates clearly knew how to use their calculators to work with standard form although many converted to ordinary numbers before calculating. Many candidates answered part (a) correctly with some other candidates gained a method mark for showing the correct division. Common errors were to add the two numbers and halve the result or to multiply the numbers. In part (b) many candidates multiplied the two correct numbers. Common errors were to fail to convert to standard form for the final answer or to use 365 days (rather than 288 given), from not reading the question carefully enough. In part (c)(i), few had a fully correct method. Many divided by 152 or 15 but rarely both. In part (c)(ii) there were a few correct assumptions seen, such as "no machine broke down".

Question No.14
Part (a) is a standard process but few gained all marks. Some did use the midpoint of each interval but many struggled with the first range. Better candidates gained 2 marks for finding the midpoints and multiplying by the frequency. Many then divided by 5 rather than 25. Other errors included adding all the numbers in columns (including end points of intervals) and performing some sort of division or using end points of the intervals as representative values.

Very few could adequately express a reason why the mean was not exact. Many comments referred to the process, but few said that the exact data was not known.

Question No.15
This question was reasonably well answered. However, few candidates used efficient methods to calculate percentages and final values. Many found percentages using "non-calculator" methods. Some found 5% of 1500 rather than the 1530 at the end of the first year.

Candidates need to understand how to calculate percentage with a calculator.

Most candidates did not understand that "Show that..." means "Give the calculations that lead to..." and embarked on an explanation which was sometimes well structured. Candidates were allowed to annotate some working to show that the final value was achieved. Many candidates gained 2 or more marks.

Question No.16

In part (a)(i) few candidates knew that 1 : 4 translated to $\frac{1}{5}$. Most gave an answer that ratios and fractions are different and not to be compared. In part (a)(ii), a few candidates gained a mark for showing a value for yellow counters that was three times the value given for red counters in the second row. Some candidates gave fractional or decimal values, not realising that these should be integer numbers of counters. Very few candidates could make any attempt at part (c). Very few considered writing sets of numbers of counters equivalent to 3 : 4 and reducing the numbers of red counters by 3 until a solution was found. Occasionally the correct answer was seen with no working.

Question No.17

This question was very poorly answered and most candidates did not respond. Some tried to work with angles. Some measured lines and attempted to use these linear measurements in some way. Very few, if any, worked with fractions or assigned a length to the square to find areas.

Question No.18

This question also saw very few correct responses. Most did not know what was required for a construction and could not decode the given information. Some drew randomly placed arcs and lines. Often lines were unrelated to arcs (and the description in the question). Only the few candidates who drew a path in part (b)(i) had anything to measure in part (ii).

Question No.19

Most candidates were unable to attempt this question in a sensible way. Very few could give a valid equation. Some did realise that the sum of the angles of a triangle is 180° but were then unable to proceed. The sum of the angles of a quadrilateral was rarely used. Some candidates were able to find the values for *a* and *b* without using equations and scored 2 marks. Some gave values for *a* and *b* that did not have a sum of 110°.

Question No.20

This demanding topic was clearly not accessible to most candidates. Few attempted to use *a* in a meaningful way and few understood what consecutive numbers were. Most did not realise that the middle number was even. A small number of candidates gained a mark for finding the value 83.3... (or 41.6...). A few candidates incorrectly wrote that expressions for the numbers were *a*, 2*a* and 3*a*.

J560/04 (Higher Tier) Paper 4

General Comments:

Many errors in standard algebraic and geometric techniques were seen by examiners, these techniques must be seen as basic knowledge all candidates need to know. In right-angled triangles there is no need to apply the sine rule or the cosine rule as standard trigonometry is sufficient. Many candidates make errors in applying the cosine rule. In algebra few can ‘complete the square’ correctly and most make errors in using the ‘formula’ to solve a quadratic equation. In expanding brackets the use of tables is seen as a useful technique which reduces the likelihood of errors.

Comments on Individual Questions:

Question No. 1
Part (a) can be attempted in many different ways, the most successful method was to find the time for one length, 31 seconds, then for 100 lengths, 3100 seconds and then convert this minutes or to convert 55 minutes to seconds, 3300. Finally we need to see a statement to say that 3100 is less than 3300, or similar. Most did make a start but they failed to get two correct figures that could be compared. In part (b) candidates just need to say that each length was assumed to be at this constant speed and in part (c) they needed to suggest that in real life the swimmer would slow down due to fatigue.

Question No. 2
Part (a) was answered well, the incorrect answers seen were (i) a^3 and (ii) b^8 due to incorrect laws being applied. In part (b) some thought that, as this was a quadratic expression, they applied double brackets to this instead of using a single bracket.

Question No. 3
In part (a) the demand states ‘construct’, so it was necessary to construct the perpendicular bisector of AB which few candidates did do. Most candidates did draw the circle accurately but without the bisector it was difficult to find the two required points.

Question No. 4
The plotting in part (a) was done accurately by most candidates and in part (b) most gave the term ‘positive’ but they did not always understand what was meant by strength. In part (c) it would have helped to draw the diagonal line from (0,0) to (100,100) as many miscounted the numbers and some did not know how to convert their fraction to a percentage.

Question No. 5
In part (a) candidates should use symmetry to avoid errors when negative numbers are substituted into quadratic expressions and when they draw the graph in part (b) they should notice the errors when it is not symmetric. Many curves did not go through the points and missed them by quite a wide margin. In part (c) many knew where to read the figures from the graph. In part (d) they often completed the table correctly but did not know that it was a straight line so they plotted the points and connected them with a curve. In part (e) some did not know that it was the intersection of the line and the curve. As with part (c) there was some incorrect reading of the scales.

Question No. 6
Initially most candidates worked out the 6 and 9 litres correctly. However they did not realise that the 6 litres was the 1 of the next ratio and therefore they did not calculate that either 30 litres of red paint or 36 litres was needed altogether.

Question No. 7
Candidates needed to work out the interior angles of both polygons. Many did in fact do this. However the angle required was half the difference of these angles.

Question No. 8
In part (a) candidates needed to work out 15 options first which many did not do. Too many added so they thought that there were 8 options. However part (b) was answered better as many realised they multiplied the three numbers together.

Question No. 9
The best answers had a method and the most successful were either using a two way table, which did prove to be the easiest in this context, or a Venn diagram. Those who just calculated numbers usually made an error. The question required a decimal or a percentage to be calculated and to be compared to 2 out of 5 or 0.4 or 40%.

Question No. 10
In part (a) unfortunately very few knew how to extract the frequencies from this histogram. It was still possible to answer this question but errors were made in calculating the required figures as the width of each group had to be considered. In part (b) it is always the method to treat frequencies in grouped tables as being uniformly distributed within each group.

Question No. 11
Many candidates did not use x^2 but just x, or even $\sqrt{x}$, so when calculating the value of k the values of 20 or 10 were seen and not 80 as expected. There were also many who used direct proportionality instead of inverse proportionality.

Question No. 12
Both correct boundaries were not often given by candidates. Sometimes all four boundaries were given and not always the correct values were chosen for the calculation. Most responses did use the correct division for the calculation but the numbers chosen were not the most appropriate for the problem.

Question No. 13
In part (a) candidates needed to form a quadratic equation, equal to zero, which many did not do. The expression factorised but many used the 'formula' and errors were quite common. In part (b) it was clear that many candidates did not know how to expand three brackets and multiplying each term by every other term was very common. Those that used a table to expand the brackets did tend to have more success.

Question No. 14
Many candidates did correctly find one of the diagonals, HF or HB, using Pythagoras' theorem. However they did not realise that the triangle was right-angled and a common method was the use of the sine or cosine rules.

Question No. 15
Most candidates who multiplied top and bottom by $\sqrt{5} + 1$, obtained the correct solution. A few candidates were unable to simplify their expression. Most did not know how to start this question.

Question No. 16
Part (a) was a straightforward question and yet many candidates failed to progress. Some did get the square term correct, $(x - 3)^2$ and then they usually put +20 for the 'b' term. Few knew how to calculate the constant term and no-one checked their answer by expanding. Part (b) was testing understanding the use of this technique to find the turning point and very few knew how to do this.

Question No. 17

In part (a) quite a few candidates realised that they needed to use the cosine rule but could not substitute the values correctly whilst others failed to evaluate the correct values on their calculator. A few candidates lost credit by not giving their calculated value to more than 3 significant figures as required for a 'show that' question. In part (b) they needed to find angle ABC first then use the sine rule. This step was found difficult by many candidates.

Question No. 18

The clue is in the question, as the request to write answers to a degree of accuracy is usually a hint to use the 'formula' which many did do. However it is all too common to see the 'formula' used incorrectly and many candidates made errors in the calculation and some made errors in rounding their answers. A few tried to use 'trial and improvement' but this method is no longer tested and will prove extremely difficult to use in this context.

J560/05 (Higher Tier) Paper 5

General Comments:

The entry for this November resit was smaller than the entry for the June 2017 session. A few more able candidates were entered for the exam but the majority of candidates were aiming for either a pass or good pass in the exam.

The majority found some of the earlier questions accessible and showed working where appropriate. The later questions proved very challenging and there were a number of omissions.

The stronger topic areas involved sequences, knowledge of squares and cubes, reflection, median and reasoning from a cumulative frequency graph.

The weakest areas were proof of congruent triangles, recurring decimal to fraction conversion, surds and indices, problems related to speed /time graphs, algebraic proof and simultaneous equations.

Comments on Individual Questions:

Question No.1
Part (a) proved to be an accessible starting question for many. About half were successful with describing the tangent. Part (b) proved challenging and common errors with describing the shaded region included answers of arc, sector and chord. A number omitted part (b).

Question No.2
In part (a), the majority were successful. Some did not recognise the Fibonacci sequence in part (i) and common incorrect answers were 11 or 12. The second sequence caused fewer problems.

Part (b) was also reasonably well answered.

Question No.3
This involved some problem solving with square, cube and prime numbers. Most candidates systematically listed squares and cubes and were given credit for doing this. Many then gave the correct answer 122. A few gave the correct answer without sufficient evidence in working to justify it and others gave an answer of 5 that fitted three of the conditions but was a prime number.

Question No.4
In part (a), many candidates did not recognise this as the difference of two squares and often gave factors like $(x – 43)(x – 43)$ or $x(x – 43)$.

In part (b), only a few used their factors from part (a) to do the calculation. Most tried to evaluate both 57^2 and 43^2 before subtracting, this was usually unsuccessful owing to arithmetic errors in the multiplication.

Question No.5
Part (a) was well answered, a few reflected in the x-axis or the line $x = -1$.
In part (b), some gave the correct term 'enlargement' but fewer gave the additional correct descriptors of scale factor ½ and centre (5, 7). The centre of enlargement was often overlooked entirely and candidates should use the mark allocation for the question as a guide for these description questions and ensure that the correct language is used. Terms like reduction, un-enlargement, shrinking are not acceptable. Some candidates also gave additional transformations such as enlarge then translate when a single transformation was required.
In part (c), candidates often scored 1 mark for the centre but rarely 2 marks for a complete answer.

Question No.6
Some candidates were successful in solving the problem algebraically to obtain the correct answer of 120.

Others were able to set up an initial equation involving all four terms for the perimeter but then made errors in collecting the like terms to simplify the equation. Those that showed full working after that error were able to obtain follow through marks when solving their equation.

The most common error was to confuse area with perimeter at the initial stage and consequently equations involving 46 and the product of the length and width were often seen.

Question No.7
This question on percentage change and reasoning was answered well by only a few candidates. Many misinterpreted the first stage and did a 10% decrease of £252 rather than regarding £252 as 90% of the original wage after a 10% decrease. Follow through marks were available for those that made this (or another) error in the first stage but then increased their initial answer by 10%. Many were able to obtain the follow through marks.

Question No.8
In part (a), some realised that division by (1 + 2 + 3) was required to begin with. Many did not show the second step of multiplying by 30 and simply wrote 90 or 30, 60, 90. On 'show that' questions, where the answer is given, candidates must show every step in the method for the answer to receive full credit.

In part (b), the few candidates who recognised the need for an approach using trigonometry were nearly almost always successful and knew the value of sin 30 or cos 60. Many did not consider using trigonometry perhaps because there was no diagram for this part.

Question No.9
This question involved problem solving with ratios. A number of candidates gave a correct 3-part ratio that represented a combination of the two given ratios and from there obtained the answer. Many candidates did not realise that to combine the two ratios, equivalent ratios should be used to make the women part of both ratios equal.

Question No.10
This question involving a geometric proof was very poorly answered. Most candidates did not realise that this question involved proving congruency. Of those that did, many did not use a concise method or give full reasons for their answers and wrote a paragraph of text rather than clear line by line conditions with reasons.

Question No.11
Many candidates were able to interpret the given formula to provide correct answers to parts (a)(i) and (a)(ii). A few thought that a calculation was required rather than a deduction from the elements in the formula.

Part (a)(iii) was done very well by those that recognised that 75% was $\frac{3}{4}$ and then either did this in two stages or by multiplying 16 000 by $\left(\frac{3}{4}\right)^2$. A number evaluated 16 000 × 0.75^2 by long multiplication of decimals which was fine provided they reached 9000 but there was often an arithmetic error in the processing which prevented full marks being awarded.

In part (b), a number explained that the graph should be a curve or that the formula did not produce a constant decrease.

In part (c), candidates were expected to explain that the car's value was always greater than zero. A few did this but many gave answers that did not include the greater than zero element.

Question No.12
Many were well prepared for part (a) and showed a correct method using division to convert the fraction. Some attempted the division but made arithmetic errors. Candidates should be aware of the correct conventions to record a recurring decimal.

Part (b) was done very poorly by most candidates. Many appeared to be using trials using division.

Question No.13
This question was also poorly answered by most candidates.

In part (a) many attempted a division but often the wrong way round or with a distance in kilometres instead of metres. Those that used the correct values also sometimes made arithmetic errors with the division.

In part (b), those that knew that the area under the graph gave the distance on a speed-time graph were successful. Most candidates, however, were unfamiliar with this concept.

In part (c), candidates could follow through from their *k* value in part (b). A few scored this mark but many overlooked the fact that the gradient was negative.

Very few could describe what the gradient represented in terms of a deceleration in m/s^2.

Question No.14
Candidates' answers to this probability question were mixed.

There were some good solutions to part (a) that highlighted the error and gave a correct method of $\frac{5}{10}\times\frac{4}{9}$. Many earned partial credit for explaining that the two events were dependent and so the probability for the second choice was not the same as the probability for the first choice.

There were some very good answers to part (b) with clear working. Many chose a longer method, listing all pairs of combinations and rather than subtracting the products of the combinations not required from 1. Some candidates had issues combining the probabilities correctly by adding and a number selected only some of the combinations required.

Question No.15
In part (a), the median was well understood but there was a lack of familiarity with the interquartile range.

Part (b) was well answered with most candidates able to reason with at least one of the required values. The most common method involved reading from the graph the numbers of families spending £120 and then calculating the percentage of families that spent more than this before making the decision.

In part (c) candidates were required to use the statistics given to make a general comparison between the spending in the south to the spending in the north. So interpreting the median as average and the interquartile range as spread or variation was required. Many simply gave answers such as the median in the south was less than the median in the north which is insufficient.

Question No.16
In part (a), the work on surds was generally weak and candidates need to learn the conventions for simplifying surd expressions.

In part (b), candidates' knowledge of indices was also weak. A few interpreted the negative index but most thought that $16^{\frac{3}{4}}$ was the same as $\frac{3}{4}$ of 16 and showed 12 as part of the working.

Question No.17
The more able candidates approached this well and found the maximum and minimum values for the inequality by factors. It was surprising to see a number of candidates using the quadratic formula to find the solutions. This often led to errors as candidates struggled to recall the formula accurately and also made errors with substitution. Many candidates were unfamiliar with this new topic area.

Question No.18
Only a few candidates chose to use algebra. Those that started with correct squared algebraic expressions were usually able to complete the proof. Most candidates resorted to numeric examples, which does not constitute a proof.

Question No.19
A few candidates were well prepared for this topic and showed a clear and concise method to obtain the correct solutions. Some candidates combined the two equations to form a quadratic equation in *x* but either factorised incorrectly or more commonly attempted to use the quadratic formula often with errors. Many candidates were unfamiliar with this topic.

J560/06 (Higher Tier) Paper 6

General Comments:

The ability profile of the entry was significantly weaker and narrower than in June 2017. The comments made below are based on the candidates who took the paper and may not be applicable to a broader entry profile.

The paper represented a significant challenge to many of the candidates, some of whom may have been more appropriately entered at Foundation tier. These candidates scored few marks beyond those available on the questions that were common with Paper 3. It was not unusual for these candidates to make little or no attempt at the questions in the second half of the paper and so they were often unable to demonstrate their mathematical knowledge to the full.

Many candidates would gain more marks if they made better use of their calculators. For example, questions 1a, 8, 11b and 12a are all relatively straightforward to answer on a calculator, but candidates made errors trying to do the evaluations by hand. Care is also needed to give a final answer to the degree of accuracy stated in the question.

Comments on Individual Questions:

Question 1
The evaluation of the formula in part (a) should have provided a straightforward introduction to the paper, but only about half of the candidates could do so accurately. Evaluating $\frac{1}{2}at^2$ as $(\frac{1}{2}at)^2$ or $\frac{1}{2}(at)^2$ was common, whilst treating *ut* as *u* + *t* was also seen. It was not surprising, therefore, that even fewer candidates made any progress in the rearrangement for part (b).

Question 2
Most candidates found the correct next date although their working was often unclear or incomplete. Almost all candidates used calendar dates rather than finding the lowest common multiple of 3 and 7. They usually listed dates from 9^{th} to 30^{th} November and indicated “runs” every three days. “Swims” was often omitted from their calendar, making it difficult to award method marks in the event of an incorrect answer. A few candidates misinterpreted “runs every 3 days” as “runs for 3 consecutive days”.

Question 3
This question was common with Paper 3. Finding the mean of grouped data has been a frequent question on the practice papers and previous specifications and is a topic that higher candidates should be successful on. However, the standard of the responses was very disappointing with many candidates failing to use using midpoints, some using class widths or cumulative frequencies, and others dividing a total by the number of class intervals rather than the number of customers. Although some explanations of why it was not possible to calculate an exact value for the mean lacked clarity, most were able to convey that the exact times were not known.

Question 4
Most candidates were able to state or demonstrate that the occurrence of 12 out of 28 was equivalent to $\frac{12}{28}$ and, therefore, $\frac{3}{7}$. However, these fractions were sometimes inverted, ignoring the probability context. Although most candidates chose the correct operation, $10\,000 \div \frac{3}{7}$, to find the number of seeds to be planted, lack of attention to the context was evident with a decimal answer being common. Multiplying by $\frac{3}{7}$ was the most common error where again, with a little reflection, candidates may have realised that 10 000 plants cannot grow from less than 10 000 seeds. Comments on using the experimental probability usually described the possible growing conditions on the farm without explicitly stating that these could be different to those in the garden. The alternative answer of referencing the small scale of the experiment was rarely seen.

Question 5
This question was common with Paper 3 and was answered well. Most candidates divided the number of sweets by the number of packets to obtain the mean number of sweets per packet. There were few errors in this calculation despite the values being given in standard form. A few candidates found the mean of the two values. Most candidates found the number of sweets made each year correctly and the majority also gave their answer in standard form. Most incorrect answers were as a consequence of using the number of packets rather than the number of sweets. The process required to find the number of sweets made per hour by one machine was understood by many but some stopped part way with an answer that represented the number of sweets per machine in 15 hours or the number of sweets made by all machines in one hour. A considerable number of candidates failed to give their final answer to the nearest 10. The most commonly stated valid assumptions made referenced no breakdowns or that all the machines worked at the same rate.

Question 6
This question was common with Paper 3. Candidates who converted the ratio into a fraction or vice-versa invariably scored the first mark, whilst those who wrote about the number of parts or number of red counters often failed to give a sufficiently clear and correct explanation. Most were able to give the ratio red : yellow for one of the bags but many solutions did not produce the same number of counters in each. The problem solving element of part (b) was found challenging and few candidates made progress.

Question 7
About half of the candidates scored zero on this simple interest question. Of those making progress, most were able to calculate the interest gained over six years and then that for one year. Many stopped at this point. Those that did continue usually found the annual interest rate correctly. A few candidates used trial and improvement to solve a compound interest task.

Question 8
There were few fully correct responses and many candidates made little progress on this unstructured task. The formula used for the circumference of a circle was often incorrect, with πr and πr^2 being particularly prevalent. The use of $r = 3.5$ rather than $(6 – 3.5)$ was also common. Whilst some candidates scored marks for relevant calculations based on a full circle, few were able to accurately adapt these to sectors. It was evident that some candidates had difficulty in proceeding despite writing down $\frac{45}{360}$. About half of the candidates who did reach a perimeter of 13.67… then failed to give the answer correct to 3 significant figures.

Question 9
Almost all candidates scored zero on this equation question set in the context of bearings. The idea of reverse bearings was clearly not well known. A diagram was presented to aid the candidates. In future, if candidates transfer the written information to the diagram, it may help them clarify what is required. Only a minority attempted to set up an equation and this was invariably given as $6b + b = 180$ rather than $6b – b = 180$. The diagram also suggested the correct bearing lay between 180° and 270°, but almost all answers given were outside that range.

Question 10
Most candidates identified the world populations in 1951 and 2015 but did not know how to proceed. Those attempting a gradient calculation were usually successful and able to state their answer in figures or words. Few mentioned “people” when giving the units for their answer.

Question 11
This was a fairly standard question but a sizeable number of candidates still scored zero. The remainder usually completed the tree diagram correctly. Whilst some failed to identify the required branches for part (b), others made arithmetic errors despite writing down the correct calculation. Use of the fraction buttons on a calculator may have helped candidates to obtain the correct answer.

Question 12
Although the sequence notation was beyond many, the evaluation of u_2 using $u_{n+1} = \sqrt{2u_n + 15}$ with $u_1 = 5$ was only correctly answered by a small minority of the candidates. Only a few candidates realised they were being given information to set up simultaneous equations in part (b), but about half of these candidates did solve these equations correctly.

Question 13
Less than half of the candidates were able to use a scale to find the real length from that of the model. Many could not convert between mm and m correctly, whilst others divided instead of multiplying. Consequently, it was no surprise that only a very few candidates scored anything on the volume factor part.

Question 14
In part (a), many candidates thought “product” meant “sum”, whilst others did not provide sufficient working for a “show” question. Only about half of the candidates scored both marks. It was expected that candidates would use algebra in part (b), but almost all attempts at the proof merely consisted of further numerical examples. Those using algebra often omitted brackets in the products but usually gained some credit for correct relative terms, such as $n – 1$ and $n + 1$.

Question 15
It was quite common for candidates to correctly evaluate either the curved surface area of the cone or the area of the circular base but only about half of these candidates actually attempted both. Nevertheless, this was one of the higher scoring questions in the second half of the paper.

Question 16
Many candidates appeared unfamiliar with vector notation and the question was frequently omitted by the weaker candidates. Most of those making an attempt ignored the instruction for answers to be in terms of **a** and **b**, leaving their responses rather meaningless and of no use in the subsequent parts. Unsurprisingly as a consequence, only a very small number of candidates were able to prove that $\overrightarrow{EF}$ and $\overrightarrow{AG}$ were parallel.

Question 17
Only a few candidates were able to write down the equation of the circle. Many candidates merely plotted (8, –6) on the diagram when asked to show the point lay on the circle whereas a calculation such as Pythagoras was required. It was rather alarming that some of these plots showed the point marked in the wrong quadrant and also not on the circle. Only a small number of candidates attempted to find the equation of the tangent but did so with some success.

Question 18
Only a minority of candidates were able to correctly use inequality notation to define a region. A was sometimes correctly defined as $y \leq 2$ but B was rarely given as an equivalent of $y \geq 18 - 2x$. Some candidates did not draw the boundary line when asked to shade the region $y \geq 6$, thus not distinguishing it from $y > 6$. It was very rare for there to be any worthwhile progress in part (c).

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