CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/12
Paper 12 (Core)

Key messages

To succeed with this paper, candidates need to have completed the full Core syllabus, be able to apply formulae, clearly show all necessary working and check their answers for suitability. As calculators are not permitted, it is vital that candidates carry out their calculations accurately. Candidates should be reminded of the need to read questions carefully, focusing on key words or instructions.

General comments

Workings are vital in 2-step problems, such as **Questions 14**, **17**, **21**, and **22**, as showing workings enables candidates to access method marks if the final answer is inaccurate. Candidates must make sure that they do not make arithmetic errors especially in questions that are only worth one mark when any good method will not get credit if the answer is wrong, for example **Questions 4**, **7**, and **8**. Candidates should note the form their answer should take, for example, **Question 1** as a fraction and **Question 3** in metres.

The questions that presented least difficulty were **Questions 1**, **2**, **6**, **7(a)**, **12** and **18(a)**. Those that proved to be the most challenging were **Question 9** write down numbers from a number line, **Question 10** name the quadrilateral, **Question 16** find the equation of a line and **Question 17** calculate a bearing.

In the majority of cases, it could be seen that candidates attempted virtually all questions as there were very few questions left blank.

Comments on specific questions

Question 1

Candidates did very well with this opening question, correctly giving $\frac{25}{100}$ or another equivalent fraction.

Question 2

Many answers given were correct. A few candidates seemed not to understand the square root symbol so divided 81 by 2 instead.

Question 3

Length conversion is the simplest conversion compared to area, volume or capacity. Occasionally, answers such as 0.305 or 30 500 were given. If candidates cannot remember whether they need to multiply or divide by a power of 10, then they should try to estimate by saying 300 cm is 3 metres to help them give the accurate answer of 3.05.

Question 4

A few candidates made arithmetic slips adding the four lengths and, as this question was only worth 1 mark, any errors made meant that no marks were awarded.

Question 5

Some answered with A which is the letter that is most likely to be chosen not the least as asked for. This was a question showing that it is vital to read the question carefully.

Question 6

Virtually all candidates were correct here. This was one of the easier questions asking for brackets to be inserted, as it could be seen that the 7 needed to be multiplied by 2 to give 14.

Question 7

(a) A large majority were correct with the value for x. The most common error was to give 5 for y.

(b) Candidates needed to state that 58 was not odd, as all the terms in the sequence were odd. This could be expressed in a variety of ways.

Question 8

Here there were two common errors. The most common was the sign of the answer, the other was with knowing how many 3s there were in 45.

Question 9

Some candidates gave the interval, $7 < x \leqslant 11$, rather than writing the integers shown on the number line. Of those who gave integers as their answer, a few included the 7 as well as the correct integers.

Question 10

Here, some candidates gave names which were not quadrilaterals, such as polygon or hexagon. Of those that gave names of quadrilaterals, many incorrectly gave parallelogram, rectangle or kite. Candidates should be advised to draw quadrilaterals to see which one fits the description. This working was only seen in a very small number of cases and, generally, these candidates gave the correct answer.

Question 11

There were many good answers with the correct number of lines accurately drawn. There were other responses where only two of the lines were drawn, the vertical and the horizontal.

Question 12

Virtually all candidates were correct here.

Question 13

The large majority gave the correct angles. Only a few gave the correct reason with many saying that the lines are parallel, but this was not sufficient.

Question 14

Candidates had to use the information for pet cats to deduce each student is drawn as 6°. They could then use this information to complete the table. Checks could have been done to ensure the number of students added to 60 as given in the question and that their angles added to 360°. Alternatively, candidates could have started by finding the missing angle as 66° and it may have been easier to see that each student is equal to 6° by comparing 66 and 11. Most candidates showed little working and a few made one or more arithmetic errors.

Question 15

(a) This question required that the mean point was plotted and then the line of best fit drawn through it. Some candidates needed to be more careful in how they plotted the line of best fit as their line should follow the trend of the points and have approximately the same number of points on either side, as well as going through the mean point. The lines that were in tolerance that went through the mean point, but no cross was seen, were given both marks but candidates should be advised that it is good practice to show the plot of the mean point clearly. A few candidates joined the points with line segments which was not acceptable.

(b) Most were correct giving an acceptable score for Asrah following their reasonable line of best fit. A line of best fit made up of line segments is not reasonable.

(c) Many candidates circled the correct point, that at (30, 45), as it was the furthest from the line of best fit (in a perpendicular direction). There were some candidates who circled more than one point. These candidates did not get the mark as it must be clear which single point is their answer.

Question 16

Many candidates find this area of the syllabus complex. There were some candidates who were awarded a single mark for showing partial understanding of what was required. Not many were awarded both marks. The simplest mark to obtain was for the realisation that, in the $y = mx + c$ form of the line, the value of c is the y-coordinate when $x = 0$, given by the point (0, –3) in the question.

Question 17

Here there was a diagram for candidates to work from, so it was a simpler question than one without a diagram. The first step was to draw a north arrow at *Q* and to work out which bearing was being asked for. A minority got this correct and those candidates generally showed working both on the diagram and as calculations. Many others gave an incorrect answer with no indication to how the answer was found.

Question 18

(a) Most candidates gave the correct answer. Those who were not correct missed out 4, the member that is in both sets.

(b) Similarly, for this part, occasionally 4 was included in the set B', or all the members of set B were given.

(c) Many gave the correct answer of 3 elements showing understanding of set notation. Some gave the elements of set B or 15, the sum of the members.

(d) Candidates were more successful here with many giving the correct members showing that they understood the union symbol as well as the not symbol even if they got **part (b)** wrong. Some gave the members in the union without the 4 or just the 4 alone.

Question 19

Many candidates gave the correct image. Some reflected A in the x-axis or in the line $y = x$. There were a very small number who plotted point A correctly and then went no further.

Question 20

Again, many answers were correct. Some candidates measured the angles *OAB* or *BOA*. This is not how to approach circle theorem questions as the question paper clearly says that the diagram is not to scale. Candidates were expected to realise that Angle *BAO* is 90° as the tangent *AB* is at right angles to the radius, *AO*.

Question 21

Virtually all the correct answers had clear workings to support the answer. Occasionally, the wrong answer of 18 was seen, most likely without working. This comes from the totally wrong method of noting that 6 is 2 less than 8 so x must be 2 less than 20. Similar triangles are enlargements of each other so one way to gain a mark is to find the scale factor between the two or to show the full method.

Question 22

Candidates did well here with many being awarded all 4 marks and others gaining some of the marks. The solving of simultaneous equations should have been familiar to candidates. Here, there are no common coefficients of either variable so one equation does need to be multiplied so that one variable can be eliminated – either the first by 4 or the second by 3. There are various other methods for solving simultaneous equations, for example, substitution of the rearrangement of one equation into the second or to equate rearrangements of both equations. Any correct method may be used. Candidates need to be careful not to make arithmetic slips.

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/22
Paper 22 (Extended)

Key messages

Candidates should remember that they need to give answers in their simplest form.

Some candidates were unable to give a clear solution to the complex geometry question and gave a collection of numbers without a coherent explanation. Clearly presented solutions to such questions is essential.

General comments

Candidates were well prepared for the paper and demonstrated excellent algebraic skills. The presentation of solutions from nearly all candidates was very good, with necessary working shown in sufficient detail before the final answer. Some candidates lost marks through careless numerical slips.

Comments on specific questions

Question 1

Nearly all candidates answered this question correctly showing a good understanding of fractions.

Question 2

The majority of candidates answered this correctly.

Question 3

(a) The majority of candidates answered this part correctly.

(b) This part proved to be more challenging with a significant number of candidates unable to find a pattern that gave the correct rotational symmetry.

Question 4

Nearly all candidates answered this question correctly, showing a good understanding of indices.

Question 5

(a) There were no problems with understanding the question but careless arithmetic was seen by some candidates.

(b) Nearly all candidates scored both marks.

Question 6

This question proved to be a good discriminator. Candidates were expected to find the interior angle of the hexagon and the square, enabling them to find the interior angle of *B*. From this calculation, candidates could then find the correct number of sides, 12, of shape *B.* The majority of students were able to earn some of the marks even if their final solution was incorrect.

Question 7

This question tested the candidates understanding of relative frequencies.

(a) Nearly all candidates scored this mark.

(b) The majority of candidates scored full marks. There were some careless numerical errors when dividing by 200.

Question 8

This question was very well answered with candidates able to demonstrate excellent algebraic skills. Some candidates, who were unable to eliminate one of the variables correctly, were still able to score one mark if their answers satisfied one equation.

Question 9

(a) Nearly all candidates scored this mark, giving the correct answer of 24.

(b) The majority of candidates scored both marks. There were some careless numerical errors when finding multiples of 54.

Question 10

The majority of students scored this mark.

Question 11

This unstructured question proved to be more demanding. Many candidates set out their working clearly and logically leading to correct answers. The majority of candidates found the correct answer of $\sqrt{61}$, but some were only able to apply Pythagoras' Theorem once to a section of the diagram.

Question 12

There were many correct answers for this question showing the excellent algebraic skills of the candidates. Some candidates lost the final mark by leaving their answer as a combination of decimals and fractions.

Question 13

(a) This part proved to be challenging with a significant number of candidates unable to correctly simplify $\left(2\sqrt{3}\right)^2$.

(b) The majority of candidates scored both marks. Candidates were easily able to rationalise the fraction and then make a correct simplification.

Question 14

This question tested candidates' understanding of proportionality. There were many perfect solutions and candidates are to be commended in the presentation of their answers to this question.

Question 15

Many candidates scored full marks and all candidates were able to score some marks, by using one of the rules of logs correctly. The part of this question that was found difficult by candidates was writing 2 as log 100.

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/32
Paper 32 (Core)

Key messages

Candidates should ensure that they know how to carry out all the functions on a graphic display calculator that are listed in the syllabus.

The candidates should be encouraged to show all their working out. Many marks were lost because working out was not written down and the answer given to only one or two significant figures.

Teachers should ensure that the candidates are familiar with command words.

Candidates should bring the correct mathematical instruments to the exam.

General comments

Candidates attempted all the questions, so it appeared that they had sufficient time to complete the paper.

This session all candidates appeared to have a graphical calculator and knew how to use them to draw graphs and find the minimum and intersection points accurately. Not all candidates had mathematical instruments with them. A ruler is needed to draw straight lines or measure the length of lines and a protractor for measuring angles.

Candidates should be careful when writing their answers. If no specific accuracy is asked for in the question, then all answers should be given exactly or correct to 3 significant figures. Many marks were lost because working out was not written down and the answer given to only one or two significant figures. Giving answers to fewer significant figures will result in a loss of marks and, if no working out is seen, then no marks will be awarded. When working out is shown and is correct then partial marks can be awarded.

The candidates should be aware that if the question states 'Write down' then they do not have to work anything out. Candidates should be familiar with correct mathematical terminology.

Comments on specific questions

Question 1

(a) (i) Most candidates wrote the number correctly to the nearest 10. Some incorrectly wrote 50 or 505.

(ii) Many candidates did write 5000 correctly but a few appeared to be confused by the 2 significant figures and wrote 5050 or 5100 for their answer.

(b) (i) Nearly all candidates could find a multiple of 7.

(ii) Here too, most candidates knew which number was the cube number.

(iii) There were many correct answers for a prime number.

(c) (i) Nearly all candidates knew how to find the cube root.

(ii) Here too, most gave the correct answer of 5.

(iii) The percentage was also well answered.

Question 2

(a) (i) All candidates wrote the correct coordinates.

(ii) Here too, the correct coordinates were given by a large majority of candidates.

(iii) A minority of candidates could not find the mid-point.

(b) Not all candidates found the correct size for the angle. Perhaps they did not have a protractor with them or thought that the angle asked for was the right angle.

(c) Most found the correct length for *CA* and then the perimeter. Some candidates used Pythagoras' Theorem to find *CA* rather than measuring it.

(d) The calculation of the area was well attempted, but a few candidates gave the wrong units.

(e) Many candidates drew the correct reflection, but some drew the reflection in the line $x = 1.5$.

Question 3

(a) (i) Candidates were able to complete the bar chart correctly.

(ii) All candidates were able to interpret the bar chart and found the correct number of bottles.

(iii) Here too, all candidates found the correct number of bottles.

(iv) Most candidates wrote the correct day that an equal number of bottles were sold.

(v) Most candidates found the correct day.

(vi) A few candidates added up the number of bottles incorrectly. However, they could be awarded a method mark if they wrote down all the numbers correctly.

(b) The majority of the candidates found the correct probability.

(c) Not all candidates remembered that their answer needed to be a whole number. A method mark was awarded if they wrote 6.06…

Question 4

(a) Although this part was done well by the majority of candidates, some found it difficult. Those who did not gain full marks were generally able to be awarded 1 mark for correctly calculating the cost for Company B. For Company A, some candidates added the \$1.35 to \$24.50 before multiplying by 140.

(b) Many candidates were able to answer this part correctly but, again, this part was also found challenging by some candidates. A few candidates did not write their answers for Company A and Company B as whole numbers. Some candidates rounded their answers up to the nearest whole number which did not give the correct answer.

(c) Most candidates managed to rearrange the formula correctly.

Question 5

(a) Although the majority of candidates were able to answer this part correctly, not all candidates managed to simplify the expression correctly. Some tried to combine the *x* and *y* terms.

(b) (i) Most candidates found the correct answer to the equation.

(ii) Here too the majority of candidates answered this part correctly.

(c) Most candidates who knew how to factorise did so correctly.

(d) Many candidates multiplied the brackets out correctly but found it more difficult to carry out the simplification.

Question 6

(a) The majority of candidates answered this question well. Some candidates added the 110 and 80 together before finding the percentages and some found 35% of 190.

(b) (i) Most candidates managed to find the correct mean.

(ii) Although most candidates answered this part well, not all candidates chose the highest and lowest numbers in order to find the range.

(iii) Many candidates knew to write the numbers in order in order to find the median.

(c) There were few fully correct answers seen for the area of the lenses. Most candidates were able to gain some method marks. The majority of the candidates only found $2 \times \pi \times 2.5^2$.

Question 7

(a) A majority of candidates were able to calculate the value of *x* correctly. However, many incorrectly just subtracted 52 from 180 here rather than finding one of the other angles in the triangle first.

(b) About half the candidates were able to give the correct answer for the size of an interior angle of a 9-sided polygon. Some candidates gained 1 or 2 marks for dividing 360 by 9 correctly.

(c) Only about half the candidates used the correct trigonometric ratio the correct way around.

Question 8

(a) Only about half of the candidates managed to simplify the numbers correctly. Others were awarded 1 mark if they showed some correct partial cancelling.

(b) Those candidates who managed **part (a)** usually also had the correct answers for this part. Some candidates just divided the amount by 3 and wrote the same answer for all 3 people.

Question 9

(a) Only a minority of candidates found the correct mean age. The majority only added up 12, 13, 14, 15 and 16 and divided that sum by 5.

(b) This part was done better, with many candidates finding the correct expected number.

(c) (i) A small majority of candidates completed the tree diagram correctly. Others earned one mark for a partially correct diagram.

(ii) Very few candidates found the correct probability. Some gained 1 mark for writing $\frac{1}{10} \times \frac{9}{10}$.

Question 10

(a) Nearly all candidates were able to sketch the parabola correctly.

(b) Most candidates found the correct coordinates of the minimum point.

(c) Again, the majority of candidates were able to draw a correct sketch.

(d) Only a minority of candidates were able to answer this part correctly. A few candidates thought that they had to solve the equation algebraically.

Question 11

(a) Although about half of the candidates answered this part correctly, not all candidates knew what prime factors were. Some candidates were awarded 1 mark for writing down some correct product of factors of 180.

(b)(i) Again, about half of the candidates were able to answer this part correctly. Many candidates gained 1 mark for finding 5832000, but not all of them could change this number correctly to standard form.

(ii) There were very few correct answers for this part.

Question 12

(a) Nearly half of the candidates were able to find the volume correctly. Of those that had problems finding the volume, many gained 1 mark for finding the correct volume of the cuboid but made errors finding the volume of the pyramid. Candidates should be reminded to use the formulas given at the beginning of the question paper, which gave them the formula for the volume of a pyramid.

(b) Few candidates realised that they had to use Pythagoras' Theorem to find the length of the diagonal. The majority just added 3 lots of 85 and 2 or 3 lots of 110. As a result, only a minority of candidates could obtain a final correct answer.

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/42
Paper 42 (Extended)

Key messages

Candidates should show sufficient working in order to gain method marks if the final answer is incorrect.

The general instruction is that answers should be given correct to three significant figures unless the answer is exact or the questions states otherwise. A few candidates lost marks through giving answers too inaccurately.

When asked for the equation of a straight line, give the exact values of constants not rounded decimals.

General comments

The paper proved accessible to almost all the candidates with few scoring very low marks and omission rates were extremely low. There were scores across the entire range, but very low scores were comparatively rare.

Comments on specific questions

Question 1

(a) Most candidates drew acceptable curves. A few had the maximum point at or even above $y = 1.5$.

(b) Very few candidates gave both correct answers. In particular the amplitude was rarely correct.

(c) (i) Most candidates drew a satisfactory straight line cutting the curve four times.

(ii) Most candidates gave all four correct answers with just a few making rounding errors. A few also gave the y-coordinates.

(iii) Most candidates, who gave satisfactory answers in **part (ii)**, also gave correct inequalities. A few gave only one inequality, such as $-154 < x < 121$.

Question 2

(a) The majority of candidates used the reversed percentage correctly with just a minority who subtracted 8%.

(b) There were many correct answers but almost as many gave 209.78 from omitting to multiply the daily rate per basket by 5.

(c) (i) Only the better candidates were able to give a correct answer.

(ii) There were many good solutions, but also many solutions where no real attempt was made and a few where the answer was obtained from spurious working. Some solved the equation here.

(iii) Most candidates were able to solve the equation, but some candidates lost a mark by unacceptable rounding, and some candidates showed no working at all followed by poor rounding. Both the methods, factorisation and formula, were seen but very few used sketches from their GDC.

(iv) There were many correct answers even from those candidates who had found the previous parts difficult.

Question 3

(a) Most candidates gave the correct translation. The most common mistake was to make a sign error in the vector.

(b) A large number of candidates gave all three components correctly. The most common error was to omit the negative sign for the scale factor or to give –2. There were very few candidates who gave more than one transformation.

(c) (i) The majority of candidates gave a correct diagram although a number rotated about the wrong centre.

(ii) This question was marked on a follow-through basis and so most candidates were successful even if they made an error with the previous part.

(iii) The great majority of candidates recognised that the transformation was a reflection but the line of reflection proved more difficult. Nevertheless, there were many correct answers.

Question 4

(a) Almost all candidates plotted the points correctly. Just a few made errors with the scale or did not plot any points at all.

(b) This was almost always correct although one or two candidates decided the correlation was positive.

(c) A large number of candidates omitted to give both parts of the regression equation to the required 3 significant figure accuracy. The most common error was to give the gradient as –0.32 or –0.324.

(d) Most candidates were able to substitute 10.8 into their equation to find the answer.

(e) There were many good answers but also some which, though lengthy, showed little understanding.

Question 5

(a) There were many correct answers to this part. Almost all candidates made some progress in finding angle *ACD* = 47 but many could go no further than that. A few candidates incorrectly thought that it was necessary use trigonometry for this part.

(b) There were many good answers, although a few transcribed the Cosine Rule incorrectly. Most candidates recognised that it was necessary to give the angle correct to at least 4 significant figures in order to show that the answer was 81.9 correct to 3 significant figures, although a few candidates only gave the answer 81.9. There are still some candidates who do not give enough working in a 'show that' question.

(c) This was very well done with the majority of candidates gaining all the marks. The most common reason for a loss of a mark was because of premature rounding of intermediate answers.

Question 6

(a) (i) Most candidates were able to complete the Venn diagram successfully. The most common errors were to misplace the 1 or to omit all or some of the elements outside the two sets.

(ii) Almost all candidates gave the correct answer from their diagrams.

(iii) Most candidates gave the correct answer from their diagrams, although a substantial number listed the elements rather than finding the number of elements.

(b) (i) Almost all candidates answered this correctly.

(ii) The majority of candidates treated this as a question involving probability with replacement. Most of those recognising that it was without replacement, were successful.

(iii) This was done better than the previous part. Less able candidates, however, did not recognise that it was necessary to use the probability of choosing the appropriate bag, that is, $\frac{1}{2}$.

Question 7

(a) (i) Most candidates gave the correct answer and, of those who did not, many gained partial success for showing the 50 or the 30 and 20 in the correct place on the diagram.

(ii) The majority of candidates gave the correct answer.

(iii) This too was very well done.

(b) (i) This question was not answered well. Many candidates did state the correct equal angles but with no, or incorrect reasons. Others made one correct statement with the valid geometrical reason. A few gave correct statements and reasons but did not give a conclusion. For full marks it was necessary to give two correct statements about equal angles with correct solutions and to make the correct conclusion.

(ii) Many candidates gave the correct answer but the answer of 2.5 was also frequently seen. Some candidates wrote down an equation with incorrect corresponding sides.

Question 8

(a) A surprisingly large number of candidates plotted the heights at the class mid-point rather than the upper end of the class.

(b) (i) This was marked on a follow-through basis and so most candidates gained the mark even if they had plotted at the mid-point.

(ii) This too was usually correct.

(c) This was fairly well done with many correct answers The most common error was to misread the scales.

Question 9

(a) The great majority of candidates gave the correct answer.

(b) Most candidates gave the correct answer. Of those who did not, most gained partial credit for the correct method but often made a mistake in working out the fractions. Exact constants were required here and so rounded decimal values of m and c were not accepted.

(c) A large number of candidates were able to show how to get the correct equation correctly. The most common reason for marks to be lost was the omission of the derivation of the gradient for the perpendicular bisector.

(d) Most candidates did enough to gain the mark.

(e) There were many correct answers and it was good to see so many candidates who were able to work accurately and confidently with surds. A common error was to assume angle *ACB* was a right angle. There were also some candidates who obtained an answer of 10 because they were working with half of the base and with the smaller triangles. Some candidates who did not work with surds lost an accuracy mark because of premature rounding, particularly those who found angle *ACB*.

Question 10

(a) (i) Almost all candidates gave the correct answer

(ii) The great majority of candidates gave the correct answer, the most common errors were sign errors. A few expanded $(5 + 2x)(5 – 2x)$ rather than $(5 – 2x)^2$.

(iii) The majority of candidates were able to reach the correct inverse. Here too, some made sign errors.

(b) (i) Most sketches were good, particularly those who drew in the asymptotes first. The most common reason for the loss of a mark was excessive overlaps of the branches. There were also some candidates who gave too wide a gap between the two branches.

(ii) Many candidates gave the correct answer but many also gave no answer at all. Common wrong answers were stating 2.5, rather than giving an equation, and $y = 2.5$.

(iii) Most candidates gave at least one of the answers. The answer of 3.31 was often given as 3.3. It was good to see that most were able to use their GDC, with very few candidates deciding to use an algebraic approach. Few candidates drew the second function on their sketch.

Question 11

(a) Most candidates were confused by the combination of a negative sign and an inequality sign and therefore obtained 2.5 but with an incorrect inequality sign for their final answer.

(b) Many candidates gave a full factorisation but some only gave partial factorisation.

(c) (i) There were many correct answers but also many which were not simplified enough. Many candidates did not recognise that the simplest common denominator was $30x$ and used, for example $30x^2$ or $90x^3$. These candidates rarely made the simplification after obtaining a single fraction.

(ii) It was pleasing to see a high number of candidates who gave the correct answer with good working shown. Of those who did not reach the final answer, the most common error was in not being able to factorise the denominator correctly, if at all.

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/52
Paper 52 (Core)

Key messages

Many communication marks were lost through candidates not showing how they worked out the results for magic squares.

Candidates need to ensure that they read the questions carefully.

General comments

A very large number of candidates showed skill in following instructions and were able to construct various 3 by 3 magic squares and a 5 by 5 magic square correctly.

Nearly all candidates showed good geometric understanding when reflecting 3 by 3 magic squares vertically and horizontally.

Candidates are advised to use the terms in the question when giving explanations. 'It' and lack of the subject in sentences is open to ambiguity and so examiners cannot award marks.

Comments on specific questions

Question 1

(a) Nearly all candidates found the line total. A significant number could have improved their mark by communicating how this total was calculated.

(b) The majority of candidates were able to complete the magic square.

Question 2

(a) The majority of candidates correctly reflected the given magic square in the horizontal line that they had drawn. Several candidates who drew the correct horizontal line did not use it, as required in the question, and gave a different reflection.

(b) Reflecting in the diagonals was more difficult for candidates. There were many who did not understand that the reflection has to be perpendicular to the line. Those candidates who were successful in the first reflection usually did the second reflection correctly too.

Question 3

(a) (i) Nearly all candidates added the numbers 1 to 9 correctly.

(ii) In completing the explanation to calculate the line total, several candidates interpreted *the total in all three rows* as meaning *the total in each row* or *the total number of integers*, which gave 15 or 9 instead of 45.

(b) (i) Only a small minority of candidates did not write the numbers 1 to 9.

(ii) Any connection between the middle integer, 5, of the integers 1 to 9 and the magic square gained the mark. There were many possibilities, the simplest being to say that the middle integer was the same as the integer in the middle square. A large number of candidates did not gain the mark for this question since their answer lacked precision, usually through a lack of reference to the middle square as in, for example, *It remains the same*.

(iii) To find the line total most candidates realised that you multiply the middle integer from 1 to 9 by 3, the number of rows or columns. A direct connection between middle integer and line total was required and credit was not given to several candidates who explained how to construct the magic square.

Question 4

(a) (i) Nearly all candidates gave the correct answer for the middle integer of the even integers from 2 to 18.

Many could have improved their mark by reading the question carefully and noticing the word *even* when writing out the integers for the communication mark. Writing all the integers from 2 to 18 was often seen.

(ii) Most candidates found the correct line total of 30, usually by calculating 10 × 3. Other values seen were 5, 20, 40 and 60.

(iii) Candidates who, in the previous two parts, had found a middle number of 10 and a line total of 30, usually completed the magic square correctly.

(b) Most candidates could reflect their answer to **part (a)(iii)** to get another magic square. A few candidates did not reflect the whole magic square and either swapped over just two squares or swapped adjacent columns.

Question 5

(a) (i) Constructing this more advanced magic square was very well done with candidates able to follow the method successfully. There was a communication mark for showing the method and many more candidates could have gained a communication mark for doing so.

(ii) Nearly all candidates worked out the line total correctly.

(b) (i) The majority of candidates were largely successful in constructing the 5 by 5 magic square from the integers 1 to 25. As in **part (a)(i)** candidates showed good skill in following the method.

While many candidates gained a communication mark for showing this method, identifying all the diagonals should also have been indicated, especially as two of the five were already done in the question.

(ii) Nearly all candidates could write down the calculation to find the line total for the 5 by 5 square.

Question 6

Candidates had to make a magic square with numbers from a sequence whose *n*th term was given.

A significant number of candidates did not read the first three lines carefully enough. Some candidates only considered the first line and took 9 terms to mean the integers 1 to 9. Other candidates only considered the first two lines and took a sequence with first term 2 as meaning 2, 3, 4, …, 10 or 2, 4, 6, …,18.

Many candidates would have gained another mark (for communication) if they had written out the sequence correctly before starting to construct the magic squares. Most candidates were able to gain some marks in this question by correctly reflecting their squares even though the results were not magic squares.

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/62
Paper 62 (Extended)

Key messages

In the Investigation on this paper there were many places where answers and working could be checked which could have avoided some unnecessary errors. In the Modelling section, candidates needed to be strong in their use of algebraic fractions, especially working with fractions in the denominator of a fraction. It is also key that candidates know how to use a graph on a graphical calculator to solve questions, not just the question that instructs them to 'Sketch' a graph. When a sketch of a model is asked for this should be interpreted as sketching, with key points labelled, not as plotting and joining points on the paper.

General comments

In the Magic Squares investigation candidates, having found a row total, could then check that the same value was the total of other rows, columns, or the diagonals. This was not only true for the numeric examples but also for the algebraic answers in **Question 7** and even for the explanation answers in **Questions 2** and **4**.

There were two main methods used for the manipulation of algebraic fractions. Strong candidates showed this in **Questions 8(d)(ii)**, **9(b)** and **10**. Setting this out as correct working was equally necessary for 'Show that' questions as working out was required for method marks. Using a graph to solve a problem is key and should be shown by candidates either sketching a new graph on axes given in a previous question, for example in **9(c)** sketching a new graph onto the axes in **8(f)**, or by sketching the relevant graphs in the answer space.

Comments on specific questions

Section A Investigation Magic Squares

Question 1

Three out of the four blanks were completed correctly by most candidates. 'The total of the integers in all three rows' was misunderstood by many who gave an answer of 15 as being the total for any one row.

Question 2

(a) This question was well answered with only the occasional repeat of a number. Candidates should be encouraged to always check answers even at this simple early stage.

(b) (i) More practice on explaining questions would always be useful. For example, in this part the word 'it' was used very often, mostly, but not always, to stand for the 'integer in the middle square'. An explanation is much clearer if the terms given in the question are used.

(ii) In this part the use of the words 'multiply' and 'divide' were often implied but not used. 'Into' was also used in the context of multiplication, and division was often described the wrong way round. So even practice in correctly describing multiplication and division would be useful.

Question 3

(a) This question was very well answered with the numbers on the horizontal reflection line already in place.

(b) Candidates also answered this question well with a few more mistakes on the right diagonal reflection, presumably because only the middle number was given. In both these parts checks could have been made using row, column and diagonal totals.

Question 4

(a) Most candidates followed the instructions carefully and made the correct magic square. In the cases of only 1 mark being achieved it was usually for 19 in the middle square.

(b) (i) Again, this magic square was consistently answered correctly with 13 almost always in the middle square. There were a few slips which might have been noticed had candidates checked their row and column totals. This would have been easy and quick to do and checking should always be encouraged.

(ii) Presumably most candidates added the integers in a row or column to find the answer to this question. Most answers were correct even following an incorrect magic square in **part (i)**. Checking by adding more than one row or column could have helped candidates to go back and correct their square if necessary.

(iii) Some candidates again found this explanation difficult. They should be encouraged to use a numerical example, when possible, to support their explanation in words.

(c) This was well answered. Most candidates understood the connections as outlined in their answer to **part (b)(iii)**. Some candidates drew out the complete 7 by 7 magic square to support their answer. They should know that the amount of space for an answer often denotes the amount of communication that might be necessary. The 7 by 7 magic square had to be drawn on the blank page or in an extra booklet because there was not room for this in the question space. Alternatively, of course, those candidates who drew out this square because they had not seen the connections did well to use this method to find their answers.

Question 5

The correct communication and correct answer were usually given. With more careful reading of the question some candidates might have avoided the loss of 2 marks because they used 81 for n instead of 9.

Question 6

The sequence numbers were invariably placed correctly in the first square and the following four correct reflections were completed. Communication was often not awarded for this question. Many candidates did not write out the sequence and even more did not draw lines of reflection on any of their diagrams. Some candidates used the numbers 2 to 10. Of these some correct reflections were then seen whilst others then used the numbers 2 to 11, then 4 to 12 and so on. There were three extra magic squares and candidates should be encouraged to redraw when they have made a mistake rather than trying to change numbers which then become difficult to read.

Question 7

(a) Good answers often simply followed the pattern in the stem of this question by replacing 1 by k. Others used the method and their sequence of k to $k + 15$. When extra grids or similar are provided for working, candidates should be encouraged to label their final answer or to cross out their working grid. Some candidates gave only integers, not expressions, in their answers.

(b) (i) Some candidates double checked their answer to find the line total for more than one row, column or diagonal. Communication was good with only a few writing only their answer.

(ii) This was invariably well answered although some candidates did not take note of the phrase ‘in the third row’ and gave the value of the largest integer instead.

Section B Modelling Deliveries by Scooter

Question 8

(a) A common approach was to write $\frac{12}{0.25}$ straight away or to get there by changing $\frac{15}{60}$ to a quarter. The speed was asked for in km/h so candidates need to know that the best approach is to change the minutes to hours rather than convert all to m/s and then back to km/h.

(b) Following **part (a)** this was a straightforward calculation, correctly answered by most. Candidates should know to use international units, that is, km/h and not kph nor km/hr.

(c) Good understanding was shown here of how to calculate average speed for the whole journey. One error was to use 12 km instead of 24 km caused perhaps by rushing and not thinking about the context of the question. The incorrect answer of $\frac{48+24}{2}$ was also seen in several cases.

(d) (i) By using $S = \frac{D}{T}$ many candidates showed how to reach the numerator and the two parts of the denominator. For this type of answer, candidates should know not to miss any detail. Some missed identifying the numerator as the total distance or that the speed on the quiet roads was $\frac{4}{48}$ which simplifies to $\frac{1}{12}$.

(ii) Two marks should have indicated to candidates that it was necessary to show at least two steps. The first could have been to show that both the numerator and denominator should be multiplied by 24 and then the second step would be to do the multiplication. Candidates should be aware that multiplying by a single 24 only multiplies the numerator and is not the same as multiplying by $\frac{24}{24}$. Alternatively, the first step could have been to convert the fractions in the denominator to have a common denominator and then to multiply the numerator by this common denominator. Identifying the LCM as 24 could have saved some candidates much work involving larger numbers, such as 288, and simplifying.

(e) Many candidates did remember to subtract the 4 km from 10 km using the information given in the second line of the stem and most showed substitution of either 10 or 6 into the model.

(f) Most sketches fitted the criteria for shape with very few either not reaching the S-axis or being drawn too low. Candidates should be reminded that there are often communication marks for showing scale on the axes where this is not given in the question.

(g) The simplest, quickest method was to input S as 27 km/h and read 14 for x from the graph. Communication for this method is simply to draw and label the line at $S = 27$ in approximately the correct position. The algebraic solution of putting the model in **part (d)(ii)** equal to 27 was much preferred. Some candidates used x as 14 so that $96 + 24 \times 14$ gave 432 km. Candidates should think about the reality of their answer of going 432 km at 27km/h to make one delivery; taking 16 hours is not an appropriate answer. Many candidates forgot to add the 4 km for the total distance.

Question 9

(a) A large majority of candidates wrote down the correct answer showing that they understood the context of the modelling questions as well as the speed, distance, time connections. Candidates should also know that 'Do not simplify your model' means exactly that and so they should not have converted $\frac{3}{24}$ to $\frac{1}{8}$.

(b) The same correct and incorrect algebra was seen here as for **Question 8(d)(ii)**. The simplest method was to multiply by $\frac{48}{48}$ but when shown as × 48 was incorrect. Alternatively making the denominator into $\frac{6+d}{48}$ and then multiplying the numerator by 48 was also correct and more widely used.

(c) Candidates should think of drawing curves on their calculator and communicating this by sketching, as the primary method for answering questions like this. Some did show a sketch of the two curves in this answer space, but candidates did not go back to the axes in **Question 8(f)** and add the new graph. This method would have been easier, less prone to error and would have avoided the rounding errors that often occurred when $\sqrt{12}$ was algebraically calculated and substituted into one of the models.

Question 10

(a) This was quite well answered showing evidence of a good understanding of the mathematics involved.

(b) Many candidates realised they had to add in a further 15 minutes to the time taken. This was often, although not always, converted to hours, i.e., $\frac{15}{60}$ or $\frac{1}{4}$ of an hour. A common error was to work with x and not $3x$ even if they had given the correct answer in **part (a)**. Similar issues were seen involving algebraic manipulation as in **Questions 8(d)(ii)** and **9(b)**. The layout of working in both this part and **part (c)** often made it difficult to follow.

(c) A common starting statement was $\frac{24(4+3x)}{8+3x} = 24$ which, of course, led to 4 = 8. Candidates who did introduce the extra time often used it as t, which gave them an answer of 2 which they often did not realise was $\frac{2}{24}$ of an hour. A few successfully used $\frac{t}{60}$ although some of these used many complicated algebraic steps to get there.