CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/11
Paper 11 (Core)

Key messages

To succeed with this paper, candidates need to have completed the full Core syllabus, be able to apply formulae, show clearly all necessary working and check their answers for sense and accuracy. Candidates should be reminded of the need to read questions carefully, focussing on key words or instructions.

General comments

Workings are vital in two-step problems, such as **Questions 10**, **13, 16** and **17** as showing workings enables candidates to access method marks. Candidates must make sure that they do not make arithmetic errors especially in questions that are only worth one mark when any good work will not get credit if the answer is wrong; this was noticeable in **Questions 4** and **19(a)**.

The questions that presented least difficulty were **Questions 1**, **2**, **7**, **12** and **15**. Those that proved to be the most challenging were **Question 3(b)**, triangular numbers, **Question 9**, rotational symmetry, **Question 17**, time and distance and **Question 18**, number of sides of a polygon. In general, candidates attempted the vast majority of questions as there were not many questions left blank this session. The exception was **Question 9** (a question that has already been mentioned as challenging) which was often left blank by candidates.

Comments on specific questions

Question 1

Candidates did very well with this opening question. In a few cases, the zero to show no hundreds was missing.

Answer: 10 011

Question 2

As with the previous question, the vast majority of candidates gave a correct response. Occasionally, the answer was spoilt by the addition of a percent symbol.

Answer: 20

Question 3

As this is a multiple choice question there is no reason for answer lines to be left blank. Candidates were more successful at picking out the cube number than the triangle number. In questions of this sort, sometimes an answer can be used twice or there is more than one correct answer to choose from; here, there was only one cube but two triangle numbers to pick from. If candidates gave two answers to part **(b)** then both answers had to be correct to get the mark.

Answers: **(a)** 8 **(b)** 6 or 10

Question 4

Many candidates got this order of operations calculation correct. In this case, the order of operations was the order in which they were given as multiplication has to be done first, but it was the negative signs that caused problems for some. The answer of 10 was seen a few times, from the incorrect, $-5 \times -(4-2)$. Other wrong answers were –13 from $-5-4-2$, ignoring the multiplication symbol or 22 from $-5 \times -4+2$. A few candidates misinterpreted the question as an equation to solve, i.e. $5x = -4-2$ giving an answer such as $\frac{-6}{5}$.

Answer: 18

Question 5

Generally, candidates gave obtuse as their answer. Also seen were acute, right angle, open angle and triangle.

Answer: Obtuse

Question 6

This was done well by candidates who nearly always used a pencil and ruler to draw an accurate diameter. The most common wrong answer was a radius drawn in the circle.

Question 7

The vast majority of candidates got this correct. Those that did not, generally made arithmetic errors when they were calculating $180 - 40$.

Answer: 140

Question 8

Many candidates were correct with their conversions from kilograms to grams. Others had a wrong conversion factor as answers such as 300 or 0.3 were seen.

Answer: 3000

Question 9

This was the question that was often left blank. Candidates gave a variety of answers, the most often appearing was an order of 1 or of 4. Others gave the angle, 180°, that the shape would turn though but still look the same, as their answer.

Answer: 2

Question 10

Many candidates did well getting full marks or one mark for getting as far as showing the 42 divided into 7 parts or for finding one of the two answer values. This was the first question without scaffolding to guide the candidate through the various stages to solve the problem. The first stage is to realise that 42 must be divided by $2 + 5$, (so, $42 \div 7$) then the resulting answer must be multiplied by 2 for one answer (12) and then 5 for the other (30), the two resulting answers should then add to 42 as a check of working. Candidates could vary this method by working out one of the values (say the 12) and take that away from 42 for the other value, then the check would be to multiply 6 by 5 to check their second value. It is important that candidates know that for some types of questions there are different methods to check working besides just repeating the calculation when the same error could be repeated.

Answer: 12, 30

Question 11

Again, there were some very accurate diagrams, drawn with pencil and ruler. The common misunderstanding was for some candidates to reflect the shape in the *x*-axis instead of the *y*-axis.

Question 12

This was one of the two best answered questions on the paper with the overwhelming majority giving the correct answer. There were a few candidates who gave the wrong letter or even two letters. Candidates must make sure that their answer to questions like this are not ambiguous as there were a small number where the answer had to be enlarged to make sure candidates were writing C and not G.

Answer: C

Question 13

This was another multistage problem like **Question 10**. There was one mark for the candidates who found the amount of the discount ($100). Sometimes a question like this asks for the discount amount only so it is very important that candidates know what they are asked for as some who could have done the discount calculation correctly, might not have read question carefully enough. To gain the final mark, the discount had to be correctly subtracted from $400.

Answer: 300

Question 14

Many candidates gained a method mark, if not two marks, for this question. Some multiplied 10 by 12 giving 120 as their answer. This got one mark as 120 is a common multiple of 10 and 12 but it is not the lowest. The most common wrong answer was 2 which is the highest common factor of the two numbers. Candidates need to be confident about the definitions of LCM and HCF – the most important words are denoted by the M and the F not the L and H – in general, the lowest common multiple is going to be bigger than the given numbers (the exception is, for example, if the numbers in question are 6 and 18, the LCM is the 18) and the HCF is going to be smaller (the exception is, using the same example, 6 and 18, that the HCF is the other number, 6).

Answer: 60

Question 15

This question is essentially pattern spotting and then applying it and was the one along with **Question 12** where virtually all candidates gave the correct answer. Some recognised that the function was divide by 3. Many showed workings that explained how they got to the answer. Others who did not see the connection between the domain and range, counted the gaps between elements. In the range, the gap was one third that in the domain so as the gap between 42 and 60 is 18, so 6 needed to be added on to 20. This method is perfectly fine to use but it does have a lot of places where candidates can make arithmetic slips and as this is only worth one mark, all good work does not get credit. It is best to work out the function, if possible by checking with pairs of values, in order to cut down the possibility of arithmetic slips.

Answer: 20

Question 16

Again, most candidates did well here. This was a straightforward substitution question but candidates had to remember to square the radius but not the height. Answers such as 30 showed no squaring at all had been done. Some wrote out the formula as $5 \times 6 \times 6$ (or equivalent) so got one mark but then went on to make errors.

Answer: 180

Question 17

This question was a calculation of distance given time and speed with the complication that time was in minutes so the first step was to turn this into hours. The formula, $\text{Speed} = \frac{\text{Distance}}{\text{Time}}$ had to be re-arranged to give $D = S \times T$. Often candidates stated the formula correctly and then re-arranged incorrectly to give $D = \frac{\text{Speed}}{\text{Time}}$ or $\frac{\text{Time}}{\text{Speed}}$.

Answer: 1.5

Question 18

This question was made more complex as there was no diagram to help candidates picture the situation and consequently was not well done. Very few candidates drew a diagram to help them. Some just wrote down integers with no working, often very small integers, such as 4 to 10. Some used half remembered formulae when the correct formula is 360 ÷ exterior angle = number of sides of the polygon. 9 was often seen (from 180 ÷ 20) and so was 5 (from confusion of polygon with pentagon).

Answer: 18

Question 19

In general, candidates did well with parts of this question with many finding part **(c)** the most challenging. For part **(a)**, candidates had to find the maximum and minimum times and subtract them correctly as there was only one mark for this part so any inaccuracy in picking the right times or doing the subtraction meant no marks. Some gave both times but did not subtract or only gave one of the values. A small number gave 11 as their answer; this was the first time minus the last time. A few calculated the mean. Part **(b)** was less well done than part **(a)** with some candidates working out the mean. Others were successful in reorganising the 12 times into the correct order and then picked out the times in 6th and 7th places (20, 21) rather than give the midpoint of these two values. For part **(c)**, candidates had to return to their ordered list in part **(b)** to find the midpoint between the minimum and the median. The minimum, 6, was the most frequently occurring wrong answer.

Answers: **(a)** 23 **(b)** 20.5 **(c)** 11

Question 20

This was done well with a large majority getting both marks. Most knew where to put the number of students who liked only one drink. There were candidates who put the eight students who did not like tea or coffee in the intersection (which is the section for the students who like both drinks) without realising that those students had already been placed in the diagram. Those students did not take the first piece of information, that there were 40 students in this group, into account at all. Other incorrect answers to the number who like both tea and coffee were 16 or 26 (errors over adding up the number of students), 14 (40 –10 –16, ignoring the other eight students)

Question 21

This was a more complex question than most involving vectors. Here, there was no diagram drawn showing the start and finishing points so drawing a labelled diagram should have been the first step. Some candidates did understand some of what was required. Their answers were often spoilt as they either had the components upside down, made arithmetic errors or had the signs reversed, this latter answer did get a special case mark but it is vital that the *x*-component is at the top with the *y* underneath. There were various incorrect solutions: $\begin{pmatrix}10\\12\end{pmatrix}$, from adding the co-ordinates of each point, $\begin{pmatrix}9\\13\end{pmatrix}$, from adding the two *x* co-ordinates then the two *y* co-ordinates, $\begin{pmatrix}18\\36\end{pmatrix}$ from multiplying the co-ordinates, a matrix $\begin{pmatrix}6 & 4\\3 & 9\end{pmatrix}$ made up from the points or the length of the line joining *A* and *B* ($\sqrt{34}$). There were also various answers that had a horizontal line between the two components. Candidates need to be aware that this is not acceptable.

Answer: $\begin{pmatrix} -3 \\ 5 \end{pmatrix}$

Question 22

As with other questions this one did not have a diagram which might have helped. A few candidates drew a correct diagram but then did not go on to interpret it correctly. Some candidates had difficulties with meaning of the symbols so answers that included –2 were the most common. Others said, 4, meaning that there are 4 integers. If candidates gave three correct integers and no incorrect integers they gained a mark so the most common answer to get this mark was –1, 0, 1. Candidates should be encouraged to know what these signs mean as ignoring them in a future exam might not get them a mark as it did here.

Answer: –1, 0, 1, 2

Question 23

There were some totally correct answers or answers where only one factor was taken outside the bracket. The only way to get marks with a factorisation question is to give an answer that when it is multiplied out gives the expression in the question. Others had $2x$ outside the bracket and made mistakes inside. Sometimes candidates combined the terms to give answers such as $22x$, $14x$ or $10x^3$.

Answer: $2x(2x + 3)$

Question 24

Candidates need to check for the most efficient way to tackle simultaneous equations so that they have as little opportunity as possible to make numerical slips. Here, the simplest method to eliminate one variable, is to multiply the first equation by 2 and then subtract the two equations. Many other methods, including substitution, will work but often have more opportunities for errors to be made. Candidates should check that their answers will fit both equations.

Answer: $x = 1$, $y = 3$

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/12
Paper 12 (Core)

Key messages

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General comments

Showing workings enables candidates to access method marks in case their final answer is incorrect. Workings are vital in two-step problems, in particular with algebra and problem solving such as **Questions 5**, **11** and **22**. Candidates must make sure that they do not make numerical errors especially in questions that are only worth one mark when any good work will not be rewarded if the answer is inaccurate.

The questions that presented least difficulty were **Questions 1**, **2**, **3**, **5**, **8** and **16**. Those that proved to be the most challenging were **Questions 9(a)** (relative frequency), **10** (quadrilaterals), **12** (bearings) and **20** (describing transformations). In general, candidates attempted the vast majority of questions. Those that were sometimes left blank were **Questions 19** (equations of asymptotes) and **20** (transformations).

Comments on specific questions

Question 1

The vast majority of candidates got this opening question correct. Some ignored the effect of the zero. A few included the words zero hundreds in their answer – this is not correct.

Answer: Fifty one thousand and twenty five

Question 2

This was an extremely well answered question where candidates could give any two of the six factors of 12. Candidates need to read questions like this carefully, so that they answer the question that is asked, i.e. only giving one factor is not enough for the mark. Giving an incorrect and a correct factor will not get marks either.

Answer: Any 2 from 1, 2, 3, 4, 6 or 12

Question 3

This was done very well. Some candidates were unclear about the order of operations. Here, the division is done first using the values either side of the division sign so that the calculation becomes $7 + 2 - 3 = 6$, rather than treating it as though there were brackets present, for example $(7 + 14) \div 7 - 3 = 0$ or $(7 + 14) \div (7 - 3)$.

Answer: 6

Question 4

Again, candidates did well here. Some put a percent sign after the answer 5 – this did not get the mark. Some gave 0.05 as their answer; this is the decimal equivalent to 5% and does not get any credit.

Answer: 5

Question 5

Many candidates were very successful here, getting full marks or one mark for getting as far as showing the 35 divided into 7 parts. There were some very clear methods seen enabling those candidates who made arithmetic errors in the final stage to pick up a method mark. This was the first question without scaffolding to guide the candidate through the various stages to solve the problem. The first stage is to realise that 35 must be divided by 4 + 3, (so, 35 ÷ 7 = 5) then the resulting answer must be multiplied by the larger of 4 and 3 to get the number of sweets that Paulo keeps.

Answer: 20

Question 6

The vast majority of candidates got at least one mark here. Those that were only awarded the method mark made numerical errors in their calculations. Some candidates did not understand the significance of the symbol on the sloping sides that meant that those two sides are the same length so this meant that the two angles at the bottom were the same. As a result, some assumed that angle x was also 44°. Other candidates got as far as 180 – 44 without then dividing by 2. A few also got to 136 but then subtracted another 44.

Answer: 68

Question 7

This is a multiple choice question where the same choice cannot be correct twice. The many wrong choices for part **(a)** were equally split between continuous or commutative with only a very small number choosing random. The answer is discrete as there can only be an integer answer to how many apples are on a tree. For part **(b)**, the weight of an apple is continuous as it is measured on a continuous scale like height, distance and time.

Answers: **(a)** discrete **(b)** continuous

Question 8

This question was done very well. In part **(a)** nearly all candidates were correct picking out the mode with occasionally a candidate giving 19 as their answer. To work out the range in part **(b)**, candidates had to do every step correctly as there was no method mark. Wrong answers included 13 (the lowest test score) and this was often the same candidates who gave 19 for part **(a)**. There was a method mark for part **(c)** for those who got as far as the total of all five test scores or showed the full method but made numerical errors. Sometimes, an incorrect 14 was given as the answer, maybe because this is the median.

Answers: **(a)** 13 **(b)** 6 **(c)** 15

Question 9

In comparison to the last question, candidates found part **(a)** the most challenging on the paper. This might be due to not understanding the term, relative frequency as many just gave the frequency of having a 2 on the top face. As the question does not mention the form the answer should take, any equivalent probability such as 0.13 was worth the mark. Part **(b)** was much better handled by the candidates and as quite a few candidates used $\frac{84}{200}$, the relative frequency of rolling a 4, this implies that it was the misunderstanding of the term used in part **(a)**. A very small number did not notice that part **(b)** was about rolling the number 4, not the 2 as used before, so worked out an estimate of the number of 2s rolled in 1000 repetitions; this did not get any marks. A final point, when a question asks for candidates 'to work out an estimate', then a guess or answer like ‘about 400’ is not correct as this instruction means ‘use probabilities to work out’.

Answers: **(a)** $\frac{26}{200}$ **(b)** 420

Question 10

There were some good diagrams drawn by candidates to help them work out what the shape was. The most common wrong answer was parallelogram but that has two pairs of parallel sides; also seen were rectangle, rhombus and, less frequently, square. Some answered with words that were not the names of quadrilaterals – equilateral (with and without) triangle, hexagon, cuboid (three dimensional, maybe because this was used in the next question) or single.

Answer: trapezium

Question 11

Candidates had to recollect the formula for the volume of a cuboid or apply the formula for a prism and then rearrange as the volume is given but not the height. If candidates showed the correct rearrangement with the data substituted, this got a mark; it was not sufficient just to substitute the values into the formula without rearranging it.

Answer: 20

Question 12

Candidates found both parts challenging as is often the case with questions on bearings. Having a diagram was a great help to candidates. Many wrote 090° or 90° for part **(a)**. This is the bearing of *C* from *B* not *B* from *C* as asked for. Candidates should think about this almost in reverse, as, stand at the place where it says **from** (*C*), facing north then turn clockwise until you see the **first** place (*B*) mentioned. Similarly in part **(b)**, stand at *B*, looking north, turn to look at *A*. There are two methods to find this bearing; first draw in a line going south from *B* then there will be an alternate angle to the 30° which is then added to 180 to get the correct bearing, The other method uses co-interior angles, 180° – 30° = 150°, then 360° – 150° = 210°. Some candidates gave 330 (320 – 30) or 60 (90 – 30) as their answer.

Answers: **(a)** 270 **(b)** 210

Question 13

The most common wrong answers were 60, the lowest common multiple, the smallest common factor, 2, or one or more prime factors of either number. Candidates need to be confident about the definitions of LCM and HCF – the most important words are denoted by the M and the F, the last words, not the first, L and H – in general, the lowest common multiple is going to be bigger than the given numbers and the HCF is going to be smaller.

Answer: 6

Question 14

Although there were many correct answers it could be seen that some candidates did not understand the required form of the answer. Those that did recognise that their answer should include $\times 10$ to a power had had the wrong number of digits in front of the decimal point, the power of 10 was wrong or missed out the ‘$\times 10$’ completely, examples of these errors include, 0.001346×10^{-5}, 13.46×10^{-3}, 1.346×100^{3} and 134.6^{3}. A few rounded the number to 135 or wrote it as a fraction, $134\frac{3}{5}$. A small number rounded or got the power of 10 incorrect or both, for example, 1.3×10^{-2}.

Answer: 1.346×10^{2}

Question 15

Many candidates were successful at finding the first three terms of the sequence or at least two of them. A few candidates did not know that they had to substitute 1, 2 and finally 3 for n, as answers such as $n^2 – 2$, $n^2 – 1$, n^2 or $n^2 – 1$, $n^2 – 2$, $n^2 – 3$ treated the expression for the nth term as if it was the first term of a sequence. Occasionally 1, 2, 3 was seen. Others chose any number for the first term then took away 3 twice.

Answer: –2, 1, 6

Question 16

A majority of candidates were correct here. There was no method mark so the answer had to be completely correct to get the single mark. Some candidates tried to solve the expression as if it was an equation, $x^2 = 5x$, others combined the two terms to give $5x^3$ or $–3x$.

Answer: $x(x – 5)$

Question 17

Often, working with the equation of a line is syllabus content that candidates find challenging, but this time the question was more to do with algebraic manipulation. Candidates did not need to know which term relates to the gradient and which gives the place where the line crosses the y-axis. Even after being told what form their answer should take, many responses differed greatly and some were just numbers, most often the gradient. A method mark was available for those who had part of equation correct, either $–1.5x$ (the gradient times x) or the constant, 3. Common wrong answers included $y = 1.5x + 3$ (the sign is not dealt with correctly but this got one mark for the constant term being correct) or $y = –3x + 6$ (no division by 2 and no marks gained).

Answer: $y = –1.5x + 3$

Question 18

Many candidates did not realise that part **(a)** asked for a list of the integers (there are four) that make up the Universal set as many repeated the inequality or gave the number of elements instead. Those that understood that a list was needed often included 5. Sometimes the list was only {1, 3, 5} which might be influenced by the fact that set A' (on the next line) was {2, 4} and they did not notice the set name was different. Part **(b)** was followed through and more candidates were correct here even if they got the previous part incorrect.

Answers: **(a)** 1, 2, 3, 4 **(b)** 1, 3

Question 19

A few candidates drew in the asymptotes but then did not write the equations correctly. Some got the equations reversed $x = 0$, $y = 3$; this repeated error gained the candidate a special case mark. A small number tried to work out the co-ordinates where the curve disappeared off the grid. This was the question along with the following question that the most candidates did not attempt.

Answer: $y = 0$, $x = 3$

Question 20

As mentioned before, this was one of the two questions that candidates were likely not to attempt. It was found to be the most challenging question on the paper. Translations and the affect they have on functions have to be learnt – application of the translation $\begin{pmatrix} 2 \\ 0 \end{pmatrix}$ means the x value has been increased by 2 so the new function must use an x value decreased by 2.

Answer: $g(x – 2)$

Question 21

This type of question is not that common on this paper but many candidates understood what was required of them and very few left no responses. Some got as far as the correct fractions and then used long division to give a decimal; as the question says to write down rather than calculate or work out the value, and there is only one mark for each part, no calculation is needed. Some understood the question but got the wrong trigonometric ratio or gave the inversion of the correct answer. A few tried to measure angles *x* and *y*.

Answers: **(a)** $\frac{12}{13}$ **(b)** $\frac{5}{12}$

Question 22

All candidates tried this question and many got at least one out of the three marks. The diagram showed that there was a right-angled triangle but that they needed to use a half of 16 as the triangle's base. Then candidates had to recognise that they needed to rearrange Pythagoras' Theorem into $x^2 = 10^2 - 8^2$. If candidates got to 36 this was worth one mark and $\sqrt{36}$ got them two marks. Some did not realise that they should know $\sqrt{36}$ is 6. Those who got to 6 by saying $16 - 10 = 6$ did not get any marks as the method must be correct. Also, those who used Pythagoras' Theorem with 16 and 10 did not get any marks.

Answer: 6

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/13
Paper 13 (Core)

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Answers: **(a)** $\frac{26}{200}$ **(b)** 420

Question 10

There were some good diagrams drawn by candidates to help them work out what the shape was. The most common wrong answer was parallelogram but that has two pairs of parallel sides; also seen were rectangle, rhombus and, less frequently, square. Some answered with words that were not the names of quadrilaterals – equilateral (with and without) triangle, hexagon, cuboid (three dimensional, maybe because this was used in the next question) or single.

Answer: trapezium

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Answer: 6

Question 14

Although there were many correct answers it could be seen that some candidates did not understand the required form of the answer. Those that did recognise that their answer should include × 10 to a power had had the wrong number of digits in front of the decimal point, the power of 10 was wrong or missed out the '× 10' completely, examples of these errors include, 0.001346×10^{-5}, 13.46×10^{-3}, 1.346×100^3 and 134.6^3. A few rounded the number to 135 or wrote it as a fraction, $134\frac{3}{5}$. A small number rounded or got the power of 10 incorrect or both, for example, 1.3×10^{-2}.

Answer: 1.346×10^2

Question 15

Many candidates were successful at finding the first three terms of the sequence or at least two of them. A few candidates did not know that they had to substitute 1, 2 and finally 3 for n, as answers such as $n^2 – 2$, $n^2 – 1$, n^2 or $n^2 – 1$, $n^2 – 2$, $n^2 – 3$ treated the expression for the nth term as if it was the first term of a sequence. Occasionally 1, 2, 3 was seen. Others chose any number for the first term then took away 3 twice.

Answer: –2, 1, 6

Question 16

A majority of candidates were correct here. There was no method mark so the answer had to be completely correct to get the single mark. Some candidates tried to solve the expression as if it was an equation, $x^2 = 5x$, others combined the two terms to give $5x^3$ or $–3x$.

Answer: $x(x – 5)$

Question 17

Often, working with the equation of a line is syllabus content that candidates find challenging, but this time the question was more to do with algebraic manipulation. Candidates did not need to know which term relates to the gradient and which gives the place where the line crosses the y-axis. Even after being told what form their answer should take, many responses differed greatly and some were just numbers, most often the gradient. A method mark was available for those who had part of equation correct, either $–1.5x$ (the gradient times x) or the constant, 3. Common wrong answers included $y = 1.5x + 3$ (the sign is not dealt with correctly but this got one mark for the constant term being correct) or $y = –3x + 6$ (no division by 2 and no marks gained).

Answer: $y = –1.5x + 3$

Question 18

Many candidates did not realise that part **(a)** asked for a list of the integers (there are four) that make up the Universal set as many repeated the inequality or gave the number of elements instead. Those that understood that a list was needed often included 5. Sometimes the list was only {1, 3, 5} which might be influenced by the fact that set A' (on the next line) was {2, 4} and they did not notice the set name was different. Part **(b)** was followed through and more candidates were correct here even if they got the previous part incorrect.

Answers: **(a)** 1, 2, 3, 4 **(b)** 1, 3

Question 19

A few candidates drew in the asymptotes but then did not write the equations correctly. Some got the equations reversed $x = 0$, $y = 3$; this repeated error gained the candidate a special case mark. A small number tried to work out the co-ordinates where the curve disappeared off the grid. This was the question along with the following question that the most candidates did not attempt.

Answer: $y = 0$, $x = 3$

Question 20

As mentioned before, this was one of the two questions that candidates were likely not to attempt. It was found to be the most challenging question on the paper. Translations and the affect they have on functions have to be learnt – application of the translation $\begin{pmatrix} 2 \\ 0 \end{pmatrix}$ means the x value has been increased by 2 so the new function must use an x value decreased by 2.

Answer: $g(x – 2)$

Question 21

This type of question is not that common on this paper but many candidates understood what was required of them and very few left no responses. Some got as far as the correct fractions and then used long division to give a decimal; as the question says to write down rather than calculate or work out the value, and there is only one mark for each part, no calculation is needed. Some understood the question but got the wrong trigonometric ratio or gave the inversion of the correct answer. A few tried to measure angles *x* and *y*.

Answers: **(a)** $\frac{12}{13}$ **(b)** $\frac{5}{12}$

Question 22

All candidates tried this question and many got at least one out of the three marks. The diagram showed that there was a right-angled triangle but that they needed to use a half of 16 as the triangle's base. Then candidates had to recognise that they needed to rearrange Pythagoras' Theorem into $x^2 = 10^2 - 8^2$. If candidates got to 36 this was worth one mark and $\sqrt{36}$ got them two marks. Some did not realise that they should know $\sqrt{36}$ is 6. Those who got to 6 by saying $16 - 10 = 6$ did not get any marks as the method must be correct. Also, those who used Pythagoras' Theorem with 16 and 10 did not get any marks.

Answer: 6

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/21
Paper 21 (Extended)

Key messages

In order to be successful in this paper, candidates need to have covered the entire extended syllabus.

Candidates need to show all of their working. Incorrect answers without working cannot be given credit, whereas partial credit can be awarded if a correct method is shown.

Candidates need to read questions carefully to ensure that they have a clear understanding of the demands of the questions.

General comments

Candidates were well prepared for the paper and demonstrated excellent algebraic skills. Some candidates lost marks through careless numerical slips, particularly with negative numbers and simple arithmetic operations, especially in **Questions 2** and **7**. Candidates should make all of their working clear and not merely write a collection of numbers scattered over the page. Candidates should always leave their answers in their simplest form. Candidates should choose the most suitable method to solve simultaneous equations and look carefully at the coefficients of the variables used.

Comments on specific questions

Question 1

Nearly all candidates answered this question correctly, showing a good understanding of basic negative numbers. Some candidates misinterpreted this as an equation and tried to find 'x'.

Answer: 35

Question 2

Most candidates answered this correctly but there were small arithmetic slips subtracting from 360.

Answer: 72°

Question 3

Virtually all candidates answered this correctly but some omitted to simplify their answer.

Answer: $\frac{1}{5}$

Question 4

Many candidates were successful but some did not evaluate 3^2.

Answer: $\frac{1}{9}$

Question 5

Almost all candidates answered this question correctly.

Answer: 4

Question 6

This question showed a lack of understanding of multiples and factors. Many listed the factors of both numbers and 3 was the common incorrect answer.

Answer: 60

Question 7

The most successful candidates used the fact that the exterior angles of a polygon sum to 360°. When candidates tried to find the interior angle they were generally successful obtaining 135° but then incorrectly subtracted their answer from 360 rather than 180.

Answer: 45°

Question 8

Most candidates answered this correctly when they understood that they had to find the **length** of *AB*. However many candidates confused this question with finding the gradient of *AB*, the mid-point of *AB* and even the equation of the line *AB*.

Answer: 5

Question 9

There were many correct answers but the most common mistake was candidates forgetting to square the 5.

Answer: $25x^8y^6$

Question 10

The majority of candidates scored at least one mark but zero was a common omission.

Answer: –2, –1, 0, 1, 2

Question 11

This question was demanding for many candidates.

There was little understanding shown of simplifying surds in general. However, some candidates were able to simplify $\sqrt{50}$ correctly and were awarded one mark. Many candidates made the mistake of finding $32-72+50$ and gave the answer incorrectly as $\sqrt{10}$.

Answer: $3\sqrt{2}$

Question 12

This question was difficult for many candidates and many did not get more than one mark for finding the next term. Although most candidates looked at the differences between terms, and the differences of differences, they did not seem to be familiar with a quadratic sequence.

Answer: 61, $2n^2 - 11$

Question 13

This question showed a lack of understanding of bearings. It was rare to see a correct answer even from strong candidates. The most common error was to subtract 234 from 360. The best attempts were accompanied by a sketch.

Answer: 054°

Question 14

Candidates were most successful when they used the elimination method, although some struggled adding and subtracting negative terms. Unfortunately, those who tried the substitution method rarely managed to cope with the fractions that emerged.

Answer: $x = 2$, $y = -1$

Question 15

Many candidates were successful although a significant number of candidates tried to solve the expression.

Answer: $(4x + 1)(x - 2)$

Question 16

Candidates who started the question by drawing a tree diagram were in general successful. This approach is to be encouraged when answering similar questions.

Many candidates obtained a denominator of 81, as they did not notice that the question stated **without** replacement and were unable to earn any marks.

Answer: $\frac{40}{72}$

Question 17

Most candidates attempted to multiply both numerator and denominator by $5 + \sqrt{3}$.

The attempts were varied but even strong candidates did not simplify fully as requested in the question.

Answer: $\frac{(5+\sqrt{3})^2}{22}$ or $\frac{14+5\sqrt{3}}{11}$

Question 18

This was a challenging question for all candidates. Many simply rewrote the formula for the curved surface area of a cone as πrh and were not able to gain any marks. Those who tried to use $l^2 = h^2 + r^2$ were usually successful in gaining full marks.

Answer: $h = r\sqrt{15}$

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/22
Paper 22 (Extended)

Key messages

Candidates need to show all of their working. Incorrect answers without working cannot be given credit, whereas partial credit can be awarded if a correct method is shown.

Candidates need to have the correct mathematical equipment to ensure that lines are drawn accurately.

General comments

Candidates were reasonably well prepared for the paper and demonstrated very good algebraic skills. However, many candidates did not know some basic facts, for example, the cube root of 27.

Candidates needed to take more care with their working as some lost marks through careless numerical slips. Candidates should make all of their working clear. This makes it easier for partial credit to be awarded if the final answer is incorrect.

Candidates should be reminded always to leave their answers in their simplest form, as stated on the front of the question paper. Answers not in their simplest form may not gain full credit.

Comments on specific questions

Question 1

(a) The majority of candidates answered this part correctly. The common incorrect answer was 49 060 00.

(b) This part was well answered. Candidates who answered part **(a)** incorrectly could still be awarded this mark by correctly writing their answer in standard form.

Answers: **(a)** 49 100 000 **(b)** 4.91×10^7

Question 2

This question proved to be a good discriminator. However, many candidates who started the question correctly did not know the cube root of 27.

Answer: $\frac{3}{2}$

Question 3

This question was correctly answered by the majority of candidates.

Question 4

(a) Nearly all candidates gave the correct answer.

(b) A significant number of candidates found the 'length' of **3p**. Candidates who started the question frequently lost marks through careless arithmetic.

Answers: **(a)** $\begin{pmatrix} -9 \\ 15 \end{pmatrix}$ **(b)** $\sqrt{34}$

Question 5

(a) The majority of candidates were able to answer this part correctly although there were a significant number who thought that as the question related to the modulus function the answer was –3.

(b) This question proved to be too demanding for all but the best of candidates. This is an area of the syllabus which invariably proves challenging to students.

Answers: **(a)** 3 **(b)** $f(x) \geqslant 0$

Question 6

The majority of candidates were able to draw the correct two lines onto the given diagram. However, many candidates were then unable to identify the correct region.

Question 7

Answers to this question showed the excellent algebraic skills that many of the candidates have acquired.

(a) Although there were many correct answers to this part, there were a substantial number of candidates who did not realise that the question related to the difference of two squares.

(b) The majority of candidates were able to answer this part correctly. The common error was the signs in the brackets.

Answers: **(a)** $(8x + 1)(8x - 1)$ **(b)** $(2y + 3)(y - 2)$

Question 8

(a) This part was answered correctly by many candidates.

(b) This part proved to be more challenging with candidates giving their answer as a surd.

Answers: **(a)** –4 **(b)** 2.5

Question 9

The majority of candidates gave fully correct answers.

Question 10

Answers to this question again showed excellent algebraic skills. The common error was the inequality sign in the final answer.

Answer: $x \geqslant 6$

Question 11

This question proved to be an excellent discriminator with the full range of marks seen and only the very best candidates scoring full marks.

Answer: H B C G

Question 12

(a) This part was well answered with the majority of candidates realising that there was an isosceles triangle and then using the angle at centre theorem.

(b) Again, this part was well answered.

(c) This part proved to be far more challenging. Candidates who used the angles in *ACOD* were in general successful.

Answers: **(a)** 70° **(b)** 120° **(c)** 60°

Question 13

Candidates started to expand the brackets correctly, but there were many careless slips especially dealing with $\left(2\sqrt{3}\right)^2$.

Answer: $37+20\sqrt{3}$

Question 14

(a) There were many correct answers. Many candidates showed a good understanding of the rules of logs.

(b) This part proved to be difficult for the majority of candidates with a variety of wrong answers given, even 3.14 = π.

Answers: **(a)** 7.5 **(b)** 1.4

Question 15

(a) This part was correctly answered by the majority of candidates.

(b) Although candidates realised that the question related to the symmetries of a sine graph very few were able to give a correct answer.

Answers: **(a)** 3 **(b)** For example, 195 or 255

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/23
Paper 23 (Extended)

Key messages

Candidates need to show all of their working. Incorrect answers without working cannot be given credit, whereas partial credit can be awarded if a correct method is shown.

Candidates should know how to change from one set of standard units to another.

Candidates need to be familiar with trigonometric ratios in all four quadrants.

General comments

Candidates were reasonably well prepared for the paper and many demonstrated very good algebraic skills.

Many candidates lost marks through careless numerical slips, particularly with negative numbers and simple arithmetic operations.

Candidates should make all of their working clear and not merely write a collection of numbers scattered over the page. It is then easier for partial credit to be awarded if the final answer is incorrect. This is particularly true when solving geometric problems.

Comments on specific questions

Question 1

(a) Although many candidates scored full marks, there was a significant minority who lost the final mark by careless numerical work.

(b) Again, the majority of candidates scored both marks. However, marks were lost through careless algebraic manipulation.

Answers: **(a)** 3 **(b)** $\frac{y-c}{x}$

Question 2

Nearly all candidates scored full marks.

Answer: 9

Question 3

There were many correct answers to this question. The common mistake was to make a slip in their use of inequalities.

Answer: $-3 < x \leqslant 2$

Question 4

(a) Virtually all candidates gave the correct answer.

(b) This question was poorly answered. Candidates could not change metres into kilometres, nor seconds into hours. Answers of less than 1 km/h were regularly seen for the speed of the train.

Answers: **(a)** 40 **(b)** 144

Question 5

This question was well answered. A minority of candidates found a common denominator of 6 and 16.

Answer: $\frac{8}{9}$

Question 6

(a) Candidates were able to split 98 correctly but then a significant number gave their final answer as $2\sqrt{7}$.

(b) The majority of candidates scored full marks.

Answers: **(a)** $7\sqrt{2}$ **(b)** $\frac{3+\sqrt{5}}{4}$

Question 7

This question was answered correctly by many of the candidates. Errors occurred due to careless manipulation of negative values.

Answer: $t = -1$ $u = 2$

Question 8

(a) This part was answered correctly by nearly all of the candidates.

(b) This part proved to be challenging with very few correct answers seen. A number of candidates scored one mark with an answer of $100x^{150}$.

Answers: **(a)** $36v^{15}$ **(b)** $1000x^{150}$

Question 9

(a) This part was well answered.

(b) Again, this part was well answered. There were some answers of 180°.

Answers: **(a)** 0 **(b)** 2

Question 10

This question was a good discriminator. Many candidates scored one mark by setting up a correct equation, but they were then unable to solve their equation.

Answer: 3

Question 11

There were many excellent answers to this question. Candidates were able to demonstrate an excellent understanding of circle theorem.

Answer: **(a)** $x = 48$, $y = 42$ **(b)** $p = 44$, $q = 51$

Question 12

This question was poorly answered. Candidates did not appear to be familiar with trigonometric ratios in the four quadrants.

Answer: 225, 315

Question 13

This question was a good discriminator. Many candidates thought that the gradient of the perpendicular was –2. A significant number of candidates were unable to substitute (2, 5) correctly to find c.

Answer: $-\frac{1}{2}x + 6$

Question 14

This question proved to be too challenging for all but the best candidates. The popular incorrect answer given was 40.

Answer: 10

Question 15

There were some excellent answers. Common mistakes occurred when simplifying a correct numerator.

Answer: $\frac{9x + 26}{(x-1)(2x+3)}$

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/31
Paper 31 (Core)

Key messages

Full coverage of all the topics in the Core syllabus is required. Candidates need to know how to use their graphical calculator correctly. Candidates should remember to write their answers correct to 3 significant figures unless stated otherwise in the question. Writing answers to 2 significant figures will often result in a loss of marks. Candidates must show all their working in order to gain method marks if their answer is not correct.

General comments

Many candidates are still working out answers by hand in situations where using their graphical calculator would be much quicker. Most candidates appeared to have had a ruler this session and bar charts were neatly drawn. Most candidates managed to attempt all the questions in the time allocated. Some candidates lost marks because they did not answer to the correct level of accuracy. If answers are given to only 2 significant figures then the mark is often not awarded. This accuracy is particularly important where a candidate has not shown any working out as then all marks are lost. It is important to show all working out; if this is correct, then partial marks can be awarded.

Comments on specific questions

Question 1

(a) (i) Nearly all candidates answered this part correctly.

(ii) Most answered this correctly with a few giving $\frac{1}{3}$ as the answer.

(iii) Almost all candidates managed to shade 60% of the diagram.

(b) (i) This was also well answered with only a few writing 18.

(ii) This part was not quite as well answered and some candidates did not give their answer to 1 decimal place as requested.

(iii) Some candidates did not use their calculator correctly in this part and worked out 489 divided by 21.2 and then added 8.8.

(c) This was very well answered with only a small minority of candidates giving an incorrect factor.

Answers: **(a)(i)** 0.88 **(ii)** $\frac{3}{10}$ **(b)(i)** 216 **(ii)** 2.5 **(iii)** 16.3 **(c)** 2, 3, 4, 6

Question 2

(a) (i) This was reasonably well answered. A few candidates appeared not to have understood the question and gave 10 minutes 7 seconds as their answer. Others just subtracted the two times incorrectly.

(ii) Some candidates had problems adding the times, but the majority answered it correctly.

(b) There were many incorrect answers to this part. Many candidates wrote $\frac{7}{8}$ as 0.88 instead of 0.875 and so lost the marks. Others did not change their answer to metres.

(c) Most candidates knew how to calculate this, but many of them found the total number of steps instead of how many **more** steps she took.

(d) Many candidates could cancel the ratio fully. Some others managed to earn 1 mark by correct, but not complete, cancellation.

Answers: **(a)(i)** Pat by 4 minutes 42 seconds **(ii)** 8 h 8 m 52 s **(b)** Pat by 95 m **(c)** 177 **(d)** 31:35

Question 3

(a) Many correct answers were seen here. A few candidates mixed up the perimeter and area. Some put 13 down as the perimeter.

(b) About half of the candidates knew how to find the length of one side of the square. Others just divided 36 by 4 and 9 was a common wrong answer.

(c) Quite a number of candidates managed to find two correct values here with 8 and 9 being the most common answer. Some others wrote down values for the area of a rectangle and not a triangle.

Answers: **(a)** P = 26, A = 36 **(b)** 6

Question 4

(a) (i) All but a few candidates found the next two terms in the sequence correctly.

(ii) Many knew the rule for finding the next term. Some candidates unfortunately gave an expression for the *n*th term instead.

(b) This part was less well attempted with many candidates writing answers such as 0, –10, –20, –40 or similar.

(c)(i) Only the better candidates could find the expression for the *n*th term. $n + 2$ was a common wrong answer.

(ii) Very few candidates wrote the correct answer here. Most did not mention multiplying two terms but only gave an answer that all the terms were odd or the difference was 2 every time.

Answers: **(a)(i)** 13, 16 **(ii)** +3 **(b)** 5, 2.5, 1.25, 0.625 **(c)(i)** $2n - 1$ **(ii)** odd $\times$ odd = odd

Question 5

(a) Most candidates found the co-ordinates correctly with only very few writing them the wrong way round.

(b) (i) The majority of candidates plotted *D* in the correct position.

(ii) Most wrote down the co-ordinates of *D* correctly or gained a follow through mark.

(c) Here too, the line of symmetry was generally correctly drawn. A few candidates drew two lines of symmetry and therefore lost the mark.

(d) (i) Only about half of the candidates could rearrange the equation correctly.

(ii) Few candidates knew to answer this part using their equation in part **(i)**. Most used two points from the diagram and then used the gradient formula, not always successfully.

(e) Many candidates could find the equation. A common incorrect answer was $y = x - 2$.

Answers: **(a)(i)** (2, 4) **(ii)** (–1, 1) **(b)(ii)** (2, –2) **(d)(i)** $y = -0.5x + 5$ **(ii)** –0.5 **(e)** $y = x - 4$

Question 6

(a) (i) This part was generally correctly answered.

(ii) Some candidates were unsure of how to factorise and just added 9 to 12. Many did manage to factorise correctly.

(b) (i) The majority found the correct answer here with a few writing 4 instead.

(ii) Here too there were many correct answers.

(c) The majority of candidates could multiply out the brackets correctly and then made errors adding up the terms.

(d) Most knew that this was 1 but a few wrote 0 for their answer.

(e) (i) The majority managed to get this part correct.

(ii) A few candidates incorrectly thought that it was 4 to the power 2 and a few just added the powers. However, most managed to find the correct answer.

(iii) There were fewer correct answers for this part. Some managed to pick up a mark for having the number correct or the *y* to the correct power.

Answers: **(a)(i)** 57 **(ii)** $3(3y + 4)$ **(b)(i)** 16 **(ii)** 4 **(c)** $x^2 + 5x + 6$ **(d)** 1 **(e)(i)** t^8 **(ii)** p^8 **(iii)** $3y^6$

Question 7

(a) Nearly all of the candidates plotted the points correctly.

(b) Many candidates knew that the correlation was negative but some wrote decreasing or positive.

(c) (i) Many candidates lost a mark for the mean age because they wrote 3 or 3.4 for their answer. Most managed to find the mean value correctly though.

(ii) Few candidates scored full marks for this part. Most managed to draw a line in tolerance but not through their mean point. Some others only joined up the points and so lost all the marks. It is important that the line of best fit is a ruled lined passing through the mean point.

(d) Many candidates gained a follow through mark here, but only if their line was ruled.

Answers: **(b)** negative **(c)(i)** 3.375 or 3.38, 4500

Question 8

(a) (i) There were many correct answers for finding *x*.

(ii) Few candidates could find this angle, although some managed to pick up a mark if they had marked 70 in the correct place on the diagram.

(b) This part was well attempted with many finding the correct answer.

(c) There were few correct answers for the bearing. The most common wrong answers were 70, 110 and 290.

Answers: **(a)(i)** 45 **(ii)** 55 **(b)** 42.5 **(c)** 250

Question 9

(a) Approximately half of the candidates knew how to find the relative frequencies but some of those lost a mark because they rounded their answers to one or two significant figures.

(b) More candidates found the correct probability because they used the original information and wrote the answer as a fraction.

(c) There were a good number of correct answers to this part. However, some divided by 24 instead of multiplying. Others gave an answer that was more than 24.

Answers: **(a)** 0.326, 0.256, 0.418 **(b)** 0.582 oe **(c)** 10

Question 10

(a) (i) Candidates found this standard form question difficult. A common wrong answer was 12.6×10^{-5}.

(ii) Many candidates were unsure of what 'an ordinary number' meant and there were many different answers for this part. Some managed to gain a follow through mark from their answer to part **(i)**.

(b) (i) This part was better attempted with quite a majority of candidates arriving at the correct answer.

(ii) There were only a few correct answers to this part. A few lost a mark by not giving their answer to 2 significant figures. Others picked up one mark by substituting the correct numbers in the formula for the surface area of a sphere. Many candidates incorrectly used the formula for the area of a circle.

Answers: **(a)(i)** 1.26×10^{-4} **(ii)** 0.000126 **(b)(i)** 6.96×10^{5} **(ii)** 6.1×10^{12}

Question 11

(a) The majority knew that the modal class was $40 < d \leqslant 50$. Some wrote $30 < d \leqslant 80$ and a few $50 < d \leqslant 60$.

(b) There were hardly any correct answers for the estimate of the mean. Most candidates just added the mid-points of the groups and divided by 5. So, 55 was the most common answer given. The candidates should practice finding the mean from a grouped frequency table on their graphing calculator. Many candidates tried to find the mean by hand.

(c) The bar chart was generally well drawn. A few had problems with the odd numbers and quite a few did not have bars of the full width.

Answers: **(a)** $40 < d \leqslant 50$ **(b)** 51.4

Question 12

(a) Although many candidates earned both marks here, many did not know to use ratios here. The most common answer was 44 from 51 – 7.

(b) (i) This part was better attempted with many candidates knowing that they had to use Pythagoras' Theorem.

(ii) Not as many knew to use trigonometry in this part and the most common answer was 45.

Answers: **(a)** 40.5 **(b)(i)** 43.4 **(ii)** 38.5

Question 13

(a) (i) Only a minority of candidates knew how to draw the asymptotes, and many left this part blank.

(ii) Even fewer candidates could write down the correct equations for their asymptotes.

(b) Most of the candidates tried to solve this without using their calculator and, as a result, there were very few correct answers. More practice using the calculator for work with graphs, such as points of intersection, is needed.

(c) This part was also poorly answered with only a handful of candidates getting the correct answer.

Answers: **(a)(ii)** $x = -3$, $y = 1$ **(b)** –2.5 **(c)** translation, $\begin{pmatrix} 0 \\ -1 \end{pmatrix}$

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/32
Paper 32 (Core)

Key messages

Full coverage of all the topics in the Core syllabus is required. Candidates need to know how to use their graphical calculator correctly. Candidates should remember to write their answers correct to 3 significant figures unless stated otherwise in the question. Writing answers to 2 significant figures will often result in a loss of marks. Candidates must show all their working in order to gain method marks if their answer is not correct.

General comments

Many candidates are still working out answers by hand in situations where using their graphical calculator would be much quicker. Most candidates appeared to have had a ruler this session and bar charts were neatly drawn. Most candidates managed to attempt all the questions in the time allocated. Some candidates lost marks because they did not answer to the correct level of accuracy. If answers are given to only 2 significant figures then the mark is often not awarded. This accuracy is particularly important where a candidate has not shown any working out as then all marks are lost. It is important to show all working out; if this is correct, then partial marks can be awarded.

Comments on specific questions

Question 1

(a) (i) Nearly all candidates could write down an odd number from the list. Some wrote both and a few wrote down an even number instead.

(ii) All candidates could write down a multiple of 7.

(iii) Not all knew what a square number was. Some candidates wrote down 8.

(b) Nearly all candidates wrote the next two terms of the sequence correctly.

(c) Most candidates could write the number correct to the nearest 100. A few wrote it correct to the nearest thousand instead and a few rounded the number incorrectly.

(d) (i) There is still some confusion between decimal places and significant figures. Many candidates did manage to write the number correct to 2 decimal places. Some rounded incorrectly and some added a 0 at the end.

(ii) There were fewer correct answers to this part than the previous part.

(e) The majority of the candidates managed to work out the correct answer for this part.

(f) Although the majority knew that there were 1000 metres in a kilometre, some only multiplied by 100 and some divided by 100 or 1000.

Answers: **(a)(i)** 17 or 25 **(ii)** 14 **(iii)** 25 **(b)** 20, 23 **(c)** 3700 **(d)(i)** 68.44 **(ii)** 68.4 **(e)** 14.4 **(f)** 2300

Question 2

(a) Most candidates found the correct price for the 3 pencils and 1 sharpener. A few candidates went on and changed their answer into dollars.

(b) Many candidates could increase the price by 20%. Some only wrote down the increase and forgot to add it to the original price.

(c) Fewer candidates could work out the percentage reduction. Most tried to work with 19 instead of with 6.

Answers: **(a)** 61 **(b)** 36 **(c)** 24

Question 3

(a) Nearly all candidates found the correct number of students.

(b) The majority found the correct probability but some only wrote down 11 instead of a probability. Candidates should be aware that probabilities cannot be greater than 1 and so an answer of 11 is impossible.

(c) All candidates managed to draw the bar chart correctly and most of them used a ruler.

Answers: **(a)** 18 **(b)** $\frac{5}{18}$

Question 4

(a) Most candidates found the correct number of blue cars.

(b) This part was also well answered.

(c) Some candidates struggled with this part but a good number managed to work out the correct sector angle.

Answers: **(a)** 15 **(b)** $\frac{11}{36}$ **(c)** 100

Question 5

(a) (i) Most candidates managed to score one mark here. Some missed out letters and others added wrong letters.

(ii) This part caused more problems that the previous part. Some candidates only wrote down one letter while others wrote down one or two correct letters and also some incorrect ones.

(iii) There were a variety of answers for this part but the majority of them were correct.

(iv) Many of the candidates could write down the letter that had no symmetry.

(b) (i) Some confused the area with the perimeter and a few wrote down 13. However, the majority found the correct answer.

(ii) Again, some candidates confused the area with the perimeter. However, the majority found the correct answer.

Answers: **(a)(i)** V I E D **(ii)** I N **(iii)** I **(iv)** R **(b)(i)** 26 **(ii)** 22

Question 6

(a) This part was not well attempted. A good number of candidates managed to put the correct fractions on the branch for the first marshmallow but few managed the correct fractions on the branches for the second one.

(b) There were few correct answers seen for this part. Some candidates attempted to add their fractions instead of multiplying them.

Answers: **(a)** $\frac{8}{15}$ and $\frac{7}{15}$, $\frac{7}{14}$ and $\frac{7}{14}$, $\frac{8}{14}$ and $\frac{6}{14}$ **(b)** $\frac{56}{210}$

Question 7

(a) Most candidates knew that this was a reflection but a few put $x = 0$ instead of the x-axis or $y = 0$.

(b) Many knew that this was a translation and quite a few candidates also wrote down the correct vector.

(c) There were not very many correct answers for the rotation. Some drew a reflection followed by a translation and many rotated the triangle about the point (3, 2) instead of the origin.

(d) Following on from part **(c)** there were very few fully correct descriptions for the single transformation.

Answers: **(a)** Reflection x-axis **(b)** Translation $\begin{pmatrix} -6 \\ -2 \end{pmatrix}$

(c) Triangle with vertices at (–3, –2), (–4, –5) and (–1, –5)
(d) Rotation about (–3 , –1) through 180°

Question 8

(a) Many candidates managed to find the correct perimeter and show that it was 757 metres. Only a few tried to make up answers here.

(b) Quite a few of the candidates could find the time correctly.

(c) Fewer candidates could find the speed correctly although many picked up 1 mark for some correct working out.

(d) Many candidates managed to work out the total area correctly. However, a few added on a complete circle instead of a semi-circle.

(e) Most candidates gained the mark here either for a correct answer or for follow through. A few incorrectly divided by 0.29.

Answers: **(b)** 3.44 **(c)** 4.54 **(d)** 28 900 **(e)** 8380 to 8390

Question 9

(a) Nearly all candidates plotted the points correctly.

(b) (i) Nearly all found the correct length.

(ii) Most found the area correctly. Only a few wrote down 36.

(iii) Finding the gradient proved challenging for some candidates.

(c) Most managed to find the midpoint correctly.

(d) Not many candidates managed to find the correct equation. A few wrote down $y = 8$ instead of $x = 8$.

Answers: **(b)(i)** 6 **(ii)** 18 **(iii)** 1 **(c)** (5, 5) **(d)** $x = 8$

Question 10

(a) (i) A good number of candidates found the correct angle but 80 was a common wrong answer.

(ii) This part was also well attempted on the whole with only a few candidates writing 90 for their answer.

(iii) Many candidates also managed to find this angle correctly.

(iv) This angle proved more difficult with 15 being a common wrong answer.

(b) Only about half of the candidates could find the value for x. Some picked up a mark for knowing that the total of the angles was 540 or they added up the angles given correctly to get $5x + 70$.

Answers: **(a)(i)** 90 **(ii)** 80 **(iii)** 160 **(iv)** 25 **(b)** 94

Question 11

(a) Most candidates put the correct number on the line provided.

(b) (i) Many found the correct probability but some only wrote down 7 and so lost the mark.

(ii) Many found the correct probability here too, but some only wrote down 8 and so lost the mark.

(c) Quite a few managed to find the correct answer but 8 was a common wrong answer here. Not all candidates knew what n(T) stood for.

(d) About half of the candidates could shade the correct area.

Answers: **(a)** 2 **(b)(i)** $\frac{7}{20}$ **(ii)** $\frac{8}{20}$ **(c)** 15

Question 12

(a) The vast majority of candidates found the correct value for x.

(b) (i) The simplification caused problems for some candidates. Most managed to find $5a$ but $-5b$ was a common wrong answer.

(ii) There were surprisingly few correct answers to this part. The majority wrote $2x$ for their answer.

(c) (i) Nearly all managed this part correctly.

(ii) This part was also well attempted.

(d) Many candidates managed to expand one or both brackets correctly but not all could simplify the terms correctly.

(e) Only just under half of the candidates could write down the correct inequality here.

(f) Many candidates managed to solve the simultaneous equations correctly. Those who created extra work by multiplying by 3 and 2 to make the coefficients of the x the same usually ended up with an incorrect answer.

Answers: **(a)** 11 **(b)(i)** $5a - 7b$ **(ii)** 2 **(c)(i)** 10 **(ii)** 7 **(d)** $8x + 10$ **(e)** $x < 3$
(f) $x = 5$, $y = 1$

Question 13

(a) More candidates than in previous sessions could find the zeros correctly. This may have been because the question told them to use their calculator.

(b) The co-ordinates of the local maximum were also found correctly in many cases.

(c) The line of symmetry proved a problem for most of the candidates with few correct answers being seen.

Answers: **(a)** –0.886 and 3.39 **(b)** (1.25, 9.125) **(c)** $x = 1.25$

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/33
Paper 33 (Core)

Key messages

Full coverage of all the topics in the Core syllabus is required. Candidates need to know how to use their graphical calculator correctly. Candidates should remember to write their answers correct to 3 significant figures unless stated otherwise in the question. Writing answers to 2 significant figures will often result in a loss of marks. Candidates must show all their working in order to gain method marks if their answer is not correct.

General comments

Many candidates are still working out answers by hand in situations where using their graphical calculator would be much quicker. Most candidates appeared to have had a ruler this session and bar charts were neatly drawn. Most candidates managed to attempt all the questions in the time allocated. Some candidates lost marks because they did not answer to the correct level of accuracy. If answers are given to only 2 significant figures then the mark is often not awarded. This accuracy is particularly important where a candidate has not shown any working out as then all marks are lost. It is important to show all working out; if this is correct, then partial marks can be awarded.

Comments on specific questions

Question 1

(a) (i) Nearly all candidates could write down an odd number from the list. Some wrote both and a few wrote down an even number instead.

(ii) All candidates could write down a multiple of 7.

(iii) Not all knew what a square number was. Some candidates wrote down 8.

(b) Nearly all candidates wrote the next two terms of the sequence correctly.

(c) Most candidates could write the number correct to the nearest 100. A few wrote it correct to the nearest thousand instead and a few rounded the number incorrectly.

(d) (i) There is still some confusion between decimal places and significant figures. Many candidates did manage to write the number correct to 2 decimal places. Some rounded incorrectly and some added a 0 at the end.

(ii) There were fewer correct answers to this part than the previous part.

(e) The majority of the candidates managed to work out the correct answer for this part.

(f) Although the majority knew that there were 1000 metres in a kilometre, some only multiplied by 100 and some divided by 100 or 1000.

Answers: **(a)(i)** 17 or 25 **(ii)** 14 **(iii)** 25 **(b)** 20, 23 **(c)** 3700 **(d)(i)** 68.44 **(ii)** 68.4 **(e)** 14.4 **(f)** 2300

Question 2

(a) Most candidates found the correct price for the 3 pencils and 1 sharpener. A few candidates went on and changed their answer into dollars.

(b) Many candidates could increase the price by 20%. Some only wrote down the increase and forgot to add it to the original price.

(c) Fewer candidates could work out the percentage reduction. Most tried to work with 19 instead of with 6.

Answers: **(a)** 61 **(b)** 36 **(c)** 24

Question 3

(a) Nearly all candidates found the correct number of students.

(b) The majority found the correct probability but some only wrote down 11 instead of a probability. Candidates should be aware that probabilities cannot be greater than 1 and so an answer of 11 is impossible.

(c) All candidates managed to draw the bar chart correctly and most of them used a ruler.

Answers: **(a)** 18 **(b)** $\frac{5}{18}$

Question 4

(a) Most candidates found the correct number of blue cars.

(b) This part was also well answered.

(c) Some candidates struggled with this part but a good number managed to work out the correct sector angle.

Answers: **(a)** 15 **(b)** $\frac{11}{36}$ **(c)** 100

Question 5

(a) (i) Most candidates managed to score one mark here. Some missed out letters and others added wrong letters.

(ii) This part caused more problems that the previous part. Some candidates only wrote down one letter while others wrote down one or two correct letters and also some incorrect ones.

(iii) There were a variety of answers for this part but the majority of them were correct.

(iv) Many of the candidates could write down the letter that had no symmetry.

(b) (i) Some confused the area with the perimeter and a few wrote down 13. However, the majority found the correct answer.

(ii) Again, some candidates confused the area with the perimeter. However, the majority found the correct answer.

Answers: **(a)(i)** V I E D **(ii)** I N **(iii)** I **(iv)** R **(b)(i)** 26 **(ii)** 22

Question 6

(a) This part was not well attempted. A good number of candidates managed to put the correct fractions on the branch for the first marshmallow but few managed the correct fractions on the branches for the second one.

(b) There were few correct answers seen for this part. Some candidates attempted to add their fractions instead of multiplying them.

Answers: **(a)** $\frac{8}{15}$ and $\frac{7}{15}$, $\frac{7}{14}$ and $\frac{7}{14}$, $\frac{8}{14}$ and $\frac{6}{14}$ **(b)** $\frac{56}{210}$

Question 7

(a) Most candidates knew that this was a reflection but a few put $x = 0$ instead of the x-axis or $y = 0$.

(b) Many knew that this was a translation and quite a few candidates also wrote down the correct vector.

(c) There were not very many correct answers for the rotation. Some drew a reflection followed by a translation and many rotated the triangle about the point (3, 2) instead of the origin.

(d) Following on from part **(c)** there were very few fully correct descriptions for the single transformation.

Answers: **(a)** Reflection x-axis **(b)** Translation $\begin{pmatrix} -6 \\ -2 \end{pmatrix}$

(c) Triangle with vertices at (–3, –2), (–4, –5) and (–1, –5)
(d) Rotation about (–3 , –1) through 180°

Question 8

(a) Many candidates managed to find the correct perimeter and show that it was 757 metres. Only a few tried to make up answers here.

(b) Quite a few of the candidates could find the time correctly.

(c) Fewer candidates could find the speed correctly although many picked up 1 mark for some correct working out.

(d) Many candidates managed to work out the total area correctly. However, a few added on a complete circle instead of a semi-circle.

(e) Most candidates gained the mark here either for a correct answer or for follow through. A few incorrectly divided by 0.29.

Answers: **(b)** 3.44 **(c)** 4.54 **(d)** 28 900 **(e)** 8380 to 8390

Question 9

(a) Nearly all candidates plotted the points correctly.

(b) (i) Nearly all found the correct length.

(ii) Most found the area correctly. Only a few wrote down 36.

(iii) Finding the gradient proved challenging for some candidates.

(c) Most managed to find the midpoint correctly.

(d) Not many candidates managed to find the correct equation. A few wrote down $y = 8$ instead of $x = 8$.

Answers: **(b)(i)** 6 **(ii)** 18 **(iii)** 1 **(c)** (5, 5) **(d)** $x = 8$

Question 10

(a) (i) A good number of candidates found the correct angle but 80 was a common wrong answer.

(ii) This part was also well attempted on the whole with only a few candidates writing 90 for their answer.

(iii) Many candidates also managed to find this angle correctly.

(iv) This angle proved more difficult with 15 being a common wrong answer.

(b) Only about half of the candidates could find the value for x. Some picked up a mark for knowing that the total of the angles was 540 or they added up the angles given correctly to get $5x + 70$.

Answers: **(a)(i)** 90 **(ii)** 80 **(iii)** 160 **(iv)** 25 **(b)** 94

Question 11

(a) Most candidates put the correct number on the line provided.

(b) (i) Many found the correct probability but some only wrote down 7 and so lost the mark.

(ii) Many found the correct probability here too, but some only wrote down 8 and so lost the mark.

(c) Quite a few managed to find the correct answer but 8 was a common wrong answer here. Not all candidates knew what n(T) stood for.

(d) About half of the candidates could shade the correct area.

Answers: **(a)** 2 **(b)(i)** $\frac{7}{20}$ **(ii)** $\frac{8}{20}$ **(c)** 15

Question 12

(a) The vast majority of candidates found the correct value for x.

(b) (i) The simplification caused problems for some candidates. Most managed to find $5a$ but $-5b$ was a common wrong answer.

(ii) There were surprisingly few correct answers to this part. The majority wrote $2x$ for their answer.

(c) (i) Nearly all managed this part correctly.

(ii) This part was also well attempted.

(d) Many candidates managed to expand one or both brackets correctly but not all could simplify the terms correctly.

(e) Only just under half of the candidates could write down the correct inequality here.

(f) Many candidates managed to solve the simultaneous equations correctly. Those who created extra work by multiplying by 3 and 2 to make the coefficients of the x the same usually ended up with an incorrect answer.

Answers: **(a)** 11 **(b)(i)** $5a - 7b$ **(ii)** 2 **(c)(i)** 10 **(ii)** 7 **(d)** $8x + 10$ **(e)** $x < 3$
(f) $x = 5$, $y = 1$

Question 13

(a) More candidates than in previous sessions could find the zeros correctly. This may have been because the question told them to use their calculator.

(b) The co-ordinates of the local maximum were also found correctly in many cases.

(c) The line of symmetry proved a problem for most of the candidates with few correct answers being seen.

Answers: **(a)** –0.886 and 3.39 **(b)** (1.25, 9.125) **(c)** $x = 1.25$

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/41
Paper 41 (Extended)

Key messages

It is important that candidates have covered the extended syllabus fully. There were a number of candidates omitting whole questions suggesting that topics had not covered.

Candidates should be reminded that three figure accuracy is required unless otherwise indicated or when answers are exact. This rule applies to reading values from the graphics calculator.

Candidates should also be aware of the uses of the graphics calculator listed in the syllabus. There were cases where some complicated algebra could have been replaced by using the calculator and sketching to show the working.

General comments

Candidates were usually able to demonstrate their knowledge and ability. Most candidates showed necessary working and earned marks when answers were incorrect. The curve sketching continues to improve and many candidates gained full marks in this area. Most candidates attempted all or most of the questions and all candidates were able to finish in the allotted time.

A few candidates found the paper difficult and would probably have enjoyed a more positive experience by taking the core examinations. Topics found to be very accessible were equations, statistics of discrete variables, curve sketching, transformations and trigonometry. Topics found to be more challenging included probability, co-ordinate geometry, exponential reduction and vectors. Questions involving more than one topic tended to be found quite challenging for a number of candidates and this was particularly the case in **Question 10**.

Comments on specific questions

Question 1

(a) (i) Almost all candidates answered this linear equation correctly.

(ii) Almost all candidates also answered this question correctly, although there were a few sign errors when moving terms across the equal sign.

(iii) This equation was a little more challenging as it included an algebraic denominator, albeit a simple one. There were many correct answers and the common error was to only multiply the right hand side by x and overlooking a term on the left hand side.

(b) (i) The solving of the quadratic equation was usually successful, with most candidates either using the formula or factorising. The use of the graphics calculator with a sketch of the curve was rarely seen. Some candidates who chose to factorise found the $6x^2$ term to be a challenge and had the 2 and 3 as the constant part of the brackets instead of coefficients of x. The answer of $\frac{1}{3}$ was often given as 0.33 or even 0.3 with these candidates unnecessarily losing a mark, unless $\frac{1}{3}$ was also seen.

(ii) This proved to be a very challenging question and correct answers were not frequently seen. The instruction about using answers from part **(i)** was frequently misunderstood with candidates substituting their answers into this trigonometric equation instead of using the factors to generate two trigonometrical equations.

Answers: **(a)(i)** 8 **(ii)** 4 **(iii)** 3 **(b)(i)** $\frac{1}{2}, \frac{1}{3}$ **(ii)** 30, 19.5

Question 2

There seemed to be many candidates who did not use the statistics facility of their graphics calculator as a considerable amount of working was seen. This comment particularly applies to parts **(c)**, **(d)** and **(e)**.

(a) The mode from this discrete frequency table was almost always correctly answered. A few candidates gave the frequency instead of the mark.

(b) The range was also usually correctly stated. The common error was to give an answer 0 to 8 instead of simply 8.

(c) The median was usually correctly given.

(d) The inter-quartile range was found to be a little more challenging with a number of candidates subtracting two frequencies or even overlooking the frequencies.

(e) The mean was usually successfully answered.

(f) The interpretation of the mean being an estimate was generally well answered.

(g) This was the discriminating part of this question with several challenges. The first challenge was the understanding of the demand with many candidates thinking the question was asking for marks of 2 or less when the highest mark had to be 2. The other challenges were in giving the correct denominator, realising that products of probabilities were needed and also giving the full list of products to be added. Only the strongest candidates were successful with this part.

Answers: **(a)** 1 **(b)** 8 **(c)** 2 **(d)** 3 **(e)** 2.93 **(g)** 0.182 or $\frac{168}{925}$

Question 3

(a) This required a sketch of a graph which would not be familiar to candidates and yet was very well done. Many candidates showed a fully correct curve and many more only lost one mark as a result of incorrect intercepts on the x-axis. A few candidates had a sine graph but with a much smaller period and a small number of candidates did not attempt this question. The remaining parts of the question clearly depended on a correct graph in the calculator.

(b) The x-intercepts were usually correctly stated.

(c) The co-ordinates of the local maximum point were also usually correctly given.

(d) The x co-ordinates of the three points of intersection were usually correct. A few candidates did not give all their answers to 3 significant figures and a few appeared to trace along the curve and should know that this approach will not give an accurate answer.

Answers: **(b)** (20, 0), (80 0) **(c)** (–40, 3) **(d)** –80.2, 28.9, 56.7

Question 4

(a) (i) Most candidates gave a correct intersection with the y-axis. A few did not divide by 3 to reduce the coefficient of y to 1 and gave an answer (0, 24).

(ii) Most candidates gave a correct intersection with the *x*-axis with fewer errors than in part **(i)**.

(iii) The midpoint was usually correctly given and candidates who had made the errors in parts **(i)** and **(ii)** were still able to gain full marks here.

(b) The rearrangement of the equation was usually correctly done and a number of candidates who appeared to find co-ordinate geometry difficult were able to earn full marks through good algebra skills.

(c) The equation of this line was more challenging and a number of candidates were unable to either realise that this line was perpendicular to the line in part **(b)** or know how to find the gradient of a perpendicular line. There was also the challenge of substituting the co-ordinates of *B* into their $y = mx + c$. The stronger candidates succeeded comfortably with this part.

(d) Both parts involved finding an appropriate strategy and the most efficient was to use vectors or simply look at the displacements.

(i) This part was reasonably straightforward as it simply required the *y*-intercept of the line in part **(c)**. Many candidates with incorrect answers to part **(c)** were still able to earn this mark.

(ii) This part was more demanding, requiring candidates to realise that the displacement from *A* to *D* was the same as from *B* to *C*. This proved to be another good discriminating question and responses were mixed.

Answers: **(a)(i)** (0, 8) **(ii)** (6, 0) **(iii)** (3, 4) **(b)** $y = -\frac{4}{3}x + 8$ **(c)** $y = \frac{3}{4}x - \frac{9}{2}$ **(d)(i)** (0, –4.5) **(ii)** (–6, 3.5)

Question 5

This question was one of the most challenging questions on the paper and many candidates found the fact that it was exponential reduction made it difficult. Many candidates started successfully but then later treated dividing by 0.96 to be the same as multiplying by 1.04.

(a) (i) This part was generally well answered as a straightforward percentage change.

(ii) This part was also answered well with candidates correctly multiplying by the correct power of 0.96. A few candidates earned partial credit by multiplying by a power of 0.96.

(iii) This reverse percentage question was quite well answered with candidates continuing to use 0.96. However at this stage of the question some candidates changed their strategy and multiplied by 1.04.

(b) This part was more challenging as candidates needed to find the number of times to divide by 0.96 to reach the value of 50 000. Some candidates multiplied by 0.96, thus obtaining a negative number of years but correctly dealt with this and marks were allowed for the correct answer. Some of the stronger candidates started with 50 000 and multiplied by 0.96 to reach 30 000, almost always with full success. The very frequent error was to use 1.04 as indicated earlier and this clearly gained no marks.

(c) (i) This part was very well answered, with candidates simply finding the product of the three values given. Some candidates did not read the question thoroughly and did not multiply by 50 for the year's amount. A small number of candidates divided by 3.50, perhaps anticipating a less straightforward question.

(ii) There were mixed responses to this percentage profit question and the most frequent problem was the mixing up between a week's value and a year's value. The well organised candidates showed clear working and kept to either a year or a week. The new given value of this part should have been the denominator for this calculation and a number of candidates used values from part **(i)** for their denominators.

(d) This was a much more discriminating question involving changes in cost and selling prices with the challenge to find the number of kilograms required to be sold to give the same percentage profit as in part **(i)**. The stronger candidates succeeded whilst many found it very difficult to set up a correct calculation. Many candidates gained two marks by finding the new cost price and the new selling price.

Answers: **(a)(i)** 28 800 **(ii)** 19 100 **(iii)** 31 250 **(b)** 2005 **(c)(i)** 140 000 **(ii)** 25 **(iii)** 960

Question 6

(a) Almost all candidates reflected the object triangle correctly. A few reflected in a different line parallel to the *x*-axis and a small number reflected in the line $y = -2$. These candidates did earn one mark.

(b) The 180° rotation was generally well done. The centre of rotation was quite challenging so some candidates gained one mark by rotating through 180° but with an incorrect centre.

(c) The description of a reflection was almost always correct.

(d) The enlargement of a factor of 2 was generally well answered. A few candidates drew an image correctly orientated but in an incorrect position, thus earning one mark. A few drew a triangle with a scale factor either $\frac{1}{2}$ or – 2. These only gained credit if the centre was correct.

Answers: **(a)** Image at (–5, 3), (–8, 3), (–8, 5) **(b)** Image at (–5, –5), (–8, –5), (–8, –7) **(c)** reflection, $y = -1$
(d) Image at (1, 4), (7, 4), (7, 8)

Question 7

(a) (i) The *n*th term of this linear sequence was usually correctly answered. A few candidates gave the rule for finding the next term.

(ii) This exponential sequence was much more challenging with many candidates giving answers as polynomials and many others stating the rule for finding the next term. Candidates giving an incorrect power of 2 or $\frac{1}{2}$ earned one mark.

(b) This part was found to be much easier as it asked for the first four terms of a sequence where the *n*th term was a given quadratic.

(c) This part also asked for the first four terms of a sequence with the *n*th term given. This *n*th term involved the absolute value of $n - 3$ and many candidates appeared to be unfamiliar either with the topic or with the notation.

(d) (i) This part was to find the first three terms from a given *n*th term which was again a quadratic. As in part **(b)** candidates were almost always correct.

(ii) This part required an explanation that the 41st term was not a prime number. The 41st term was $41^2 + 41 + 41$ and yet most candidates carried out the calculation to 1763. Many of these candidates finished at this stage without any indication of this not being prime. Many went on to write 41×43 and earned the mark. A few of the stronger candidates were more efficient by writing 41(41 + 1 + 1) without the need for any more working.

Answers: **(a)(i)** $-3n + 83$ **(ii)** $128\left(\frac{1}{2}\right)^{n-1}$ **(b)** 0, 3, 8, 15 **(c)** 2, 1, 0, 1 **(d)(i)** 43, 47, 53 **(ii)** 41(41 + 1 + 1)

Question 8

(a) Most candidates gave the value of 90° correctly and many gave a correct reason with both tangent and radius seen. This was the only accepted reason as it is a circle property candidates are expected to know.

(b) This part was much more challenging, requiring the use of trigonometry in the right-angled triangle in the diagram. Only a few candidates reached the sine or cosine of an angle correctly. Many candidates assumed that the question was entirely about properties of circles. Some of these candidates rather fortunately gave the correct answer. This part was also often omitted.

Answers: **(a)** 90, angle between tangent and radius **(b)** 60

Question 9

(a) The sketch of the cubic function was generally well done. Almost all candidates had the correct shape. A number of candidates had incorrect intersections with the x-axis.

(b) The co-ordinates of the local minimum were usually correctly stated. A few candidates gave one or both values to only 2 significant figures and a few omitted the negative sign from the y co-ordinate.

(c) This part required the range of values of k when $f(x) = k$ had only one solution. This was a more challenging question as candidates needed to find the y co-ordinate of the maximum point and insert correct inequality signs. Only the stronger candidates gained full marks.

(d) This part was also a good discriminator requiring candidates to add a sketch of a quadratic function, $g(x)$, find the intersections and insert correct inequality signs when $f(x) > g(x)$. This proved to be very challenging for most candidates.

Answers: **(b)** (2.53, –12.1) **(c)** $k < -12.1$, $k > 2.13$ **(d)** $-0.726 < x < 1.26$

Question 10

(a) (i) This straightforward vector subtraction was usually correctly answered. There were some candidates who appeared to have little knowledge or experience of vectors and if this part was incorrect, usually the whole of **Question 10** was incorrect.

(ii) This part was also straightforward with most candidates using a correct fraction from the given ratios.

(iii) This part was more searching as the geometry of the vectors was more involved. There were difficulties with obtaining a correct route, usually as a result of directions of vectors. The better candidates organised their work well and either gained full marks or earned a method mark.

(b) This part required candidates to explain why two vectors were parallel. This required some indication about both vectors being multiples of a single vector **a**. There were some good answers. Other answers simply described parallel lines, demonstrating a misunderstanding of the demand.

(c) This was another explanation question with candidates needing to explain why two triangles were similar. The only reasonable and short explanation was to use the parallel lines to show two pairs of alternate angles as well as using vertically opposite angles. Many candidates chose to use sides in the same ratio and this approach usually made too many assumptions. Also in part **(c)**, some candidates described some properties of similar triangles rather than give necessary reasons. It was hoped that more candidates would have seen the connection with part **(b)**.

(d) (i) This part proved to be more accessible and many candidates gave a correct vector, in the same way as in part **(a)**.

(ii) This part was much more challenging and involved quite difficult vector geometry. Only the stronger candidates gained full marks for this question.

(e) This final part was also very testing, requiring the ratio of the areas of the two similar triangles. Many candidates did not find the correct ratio of the sides and only a few candidates squared this ratio. It appeared that to change from vectors to similar triangles and then to similar areas was a step too far for many candidates.

Answers: **(a)(i)** $-6\mathbf{a}+6\mathbf{c}$ **(ii)** $\frac{2}{3}(-6\mathbf{a}+6\mathbf{c})$ **(iii)** $-4\mathbf{a}$ **(d)(i)** $-6\mathbf{a}+2\mathbf{c}$ **(ii)** $\frac{1}{5}(-12\mathbf{a}+4\mathbf{c})$ **(e)** 9 : 4

Question 11

(a) This part required candidates to use the trigonometrical formula for area in reverse to find the angle included between two given sides. This was well answered.

(b) Candidates were asked to use the cosine rule to find the opposite side in the triangle. This was also very well answered.

(c) Candidates were asked to use the sine rule in this part and they needed to choose which angle to calculate. This was also generally well answered. Some candidates carried out two calculations before deciding on the final answer. The better candidates realised that they had to calculate the angle opposite to the longest side.

Answers: **(a)** 35.99... **(b)** 5.57 **(c)** 78.9

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/42
Paper 42 (Extended)

Key messages

Candidates should include sufficient working to gain method marks if their 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. In the main, this was done well but some candidates lost marks through giving answers too inaccurately. Candidates should recognise that in order to give a final answer correct to 3 significant figures, it is necessary to work to greater accuracy. Premature approximations in intermediate answers can lead to much greater inaccuracies in final answers,

Most candidates were familiar with the use of the graphics calculator for curve sketching questions, but many did not use them for statistical questions and/or for solving equations.

When a question states 'show that', candidates should not start with the answer and try to verify it. Start with what is given and work towards the answer. In such questions, it is also necessary to show all the stages in the calculation or proof. If the question asks to show that the answer is a given value correct to a given accuracy, it is necessary to show that value to at least one more place of accuracy.

General comments

The paper proved accessible to almost all the candidates with very few candidates scoring very low marks and omission rates were also very low. Nevertheless, there remained a few for whom entry at Core level would have been a more rewarding experience. As always, there were some parts of questions which proved more demanding and gave the very best candidates the chance to show their ability. Some of the work of the best candidates was very impressive indeed.

Whilst most candidates displayed knowledge of the use of a graphics calculator, some still are plotting points when a sketch graph is required.

Answers without working were fairly rare but there were a number who produced answers without justification. The penalties for this are twofold. For certain questions, working is required to get full marks; in others, whilst full marks are available without working, they depend on an accurate correct answer and no method marks are available if the answer is not correct.

Time did not appear to be a problem for candidates as almost all finished the paper.

Comments on specific questions

Question 1

All parts of this question were extremely well done. Part **(a)** was almost always correct and whilst a few used simple interest in part **(b)**, it was extremely rare. In part **(b)(ii)**, a significant number used trial and improvement but there were many impressive solutions using logs.

Answers: **(a)** 5% **(b)(i)** $7407.76 **(ii)** 12 years

Question 2

All parts of this question except part **(a)(v)** were done extremely well. In part **(a)(i)** a few candidates gave the answer as 6 to 21 rather than 15. In part **(a)(v)** many chose to do this by reordering the data and often made errors in deciding on the quartiles. It was expected that candidates would enter the data in the graphics calculator and read off the answer. Those that appeared to have done this were almost always successful.

Answers: **(a)(i)** 15 **(ii)** 6 **(iii)** 11.5 **(iv)** 11.6 **(v)** 7.5 **(b)** $\frac{2}{12}$

Question 3

The translation in part **(a)** was well done with just a few making errors in the direction of either the *x* movement or the *y* movement. In part **(b)** most recognised the transformations as an enlargement. Some gave the wrong centre and rather more gave an incorrect scale factor with $\frac{1}{2}$ and –2 being the most common wrong answers. Many candidates ignored the instruction to give a single transformation and gave a combination of two, usually an enlargement and a rotation. These gained no marks.

Part **(c)** was less well done. The main problem for candidates was the fact that they chose inappropriate shapes as their object shape, for example, squares or isosceles triangles. That made it difficult to identify the resulting image as a rotation.

Answers: **(a)** Triangle at (–5, 3), (–1, 3), (–1, 5) **(b)** Enlargement, scale factor $-\frac{1}{2}$, centre (6, 4)
(c) Rotation, 90° clockwise, centre (0, 0)

Question 4

Parts **(a)(i)** and **(ii)** were extremely well done. A few candidates started off with the wrong variation, usually proportional to (x + 2). In part **(a)(ii)** most candidates understood what to do and made progress in solving the equation but frequently missed the possibility of a negative square root. Some expanded the brackets and solved the equation that way.

As expected, part **(b)** proved more demanding. It was hoped that better candidates would recognise that dividing *A* by 9 meant *z* would be multiplied by 3 but that rarely happened. Most used the standard method of finding an equation connecting the variables and substitution. Whilst this was sometimes successful, more often candidates struggled with the algebra.

Answers: **(a)(i)** $y = 4(x + 2)^2$ **(ii)** 1600 **(iii)** $\frac{1}{2}, -\frac{9}{2}$ **(b)** 54

Question 5

Most candidates were able to use their graphics calculator to produce good sketches although some were careless with the *x* intercepts. There remain a few candidates who try to plot the graphs. Part **(b)** was well done by most candidates but a number gave answers that were too inaccurate and some gave co-ordinates rather than just the *x* values.

Both parts of **(c)** were extremely well done, although just a few reversed the answers.

Part **(d)** proved more difficult. Many recognised that there was rotational symmetry but omitted the centre or the order or both. A considerable number thought there was a line of symmetry and some thought there was no symmetry at all. Some used the language of transformations giving 180° instead of order 2. This was not accepted.

Answers: **(b)** 0.511, 3.18 **(c)(i)** (–2, 22) **(ii)** (2, –10) **(d)** Rotational symmetry, order 2 about (0, 6).

Question 6

Solutions to part **(a)** were given by various mixtures of trigonometrical and Pythagoras methods. Simple right angle trigonometry would have sufficed. Too often the final accuracy was omitted and sometimes steps in the working too. Some candidates did not realise that it was necessary to find an angle first.

High and middle ability candidates did both parts of **(b)** and **(c)** well. A few omitted to add the length 10 cm in part **(i)** and there were some long methods for the area of the triangle in part **(ii)**. Less able candidates found these parts difficult and often used wrong formulae.

Answers: **(a)** Correct method leading to 8.506 to 8.507 cm **(b)(i)** 20.7 cm **(ii)** 11.1 cm^2

Question 7

Almost all candidates were able to find the time taken for the journey in hours but converting that to hours and minutes and hence to a time of arrival, proved more difficult. 06 03 and 18 02 were common wrong answers. Nevertheless there were many correct answers.

In part **(b)(i)**, most were able to obtain the correct answer but a considerable number divided by 60 instead of 3600 or multiplied by 3600. The latter produced such an improbable answer that it should have concerned the candidates. In part **(b)(ii)** many did add the length of the train to the length of the bridge and hence reached the correct answer. However many simply used the length of the bridge and a few just the length of the train or added twice the length of the train.

Answers: **(a)** 18 03 **(b)** 70 m/s **(c)** 102 s

Question 8

Almost all candidates found the correct answer in part **(a)**.

Better candidates did both parts of part **(b)** well. However, a considerable number did not appreciate the need to amend the probability after the first selection and hence simply squared the initial probability. Also in part **(b)(ii)**, a number did not reach the correct total, 71, for the number of members in the set.

Part **(c)** was less well done as many started with the fraction $\frac{42}{150}$ instead of $\frac{42}{63}$.

Answers: **(a)** 16 **(b)(i)** $\frac{7}{745}$ **(ii)** $\frac{497}{2235}$ **(c)** $\frac{1640}{5673}$

Question 9

A large majority of the candidates produced excellent cumulative frequency curves. Almost all were plotted at the end of the interval. Just a few miscalculated their cumulative frequencies. The fact that the final cumulative frequency was not 120 should have alerted them. Just a few drew frequency diagrams and thus the next three answers were inaccessible to them. The majority, however, were successful with part **(b)** too, with just a few errors in the inter-quartile range. Part **(c)** proved slightly more demanding but, here too, there were many correct curves. The omission rate in part **(c)**, however, was fairly high.

Answers: **(b)(i)** 63 to 66 **(ii)** 17 to 23 **(iii)** 4 to 8

Question 10

Those who drew good diagrams usually coped very well with this question. Most showed good use of the sine rule in part **(a)** and the cosine rule in part **(b)**. The problem more often was a poor understanding of bearings by some candidates. This often led to incorrect angles in triangle *ABC* and an incorrect final answer in part **(b)**.

Answers: **(a)** 60.2 m **(b)** 228.2°

Question 11

There were many correct answers to part **(a)**. The main problems that arose were use of incorrect formulae, using a whole cylinder rather than half a cylinder and a hemisphere instead of a quarter sphere.

Part **(b)** proved somewhat more difficult as many candidates omitted one surface or, more often, used extra surfaces, for example the base of the structure. Here too, full cylinders and hemispheres were seen as were incorrect formulae.

Answers: **(a)** $46.8\,\text{m}^3$ **(b)** $60.5\,\text{m}^2$

Question 12

Most candidates were able to produce good sketches from their graphics calculator although just a few were spoilt by overlapping at the asymptotes or by curves which departed too far from the asymptotes. Just occasionally the right hand branch crossed the axes on the wrong side of the origin. The best curves were from candidates who drew the asymptotes first.

Better candidates were successful with the equation of the asymptotes in part **(b)**. Some just gave the answers –2 and 2 rather than the equations.

In part **(c)(i)**, those using their graphics calculator were usually successful. Those using an algebraic approach were much less successful as errors were usually made in rearranging the equation. The amount of space available and the fact that only 2 marks were available should have led candidates to use the calculator approach. A few candidates lost marks due to giving inaccurate solutions.

In part **(c)(ii)**, almost all candidates were able to obtain the correct initial composite function. However problems often arose in simplifying the expression. The most common error was to multiply both the denominator and numerator by 2 instead of just the numerator. Even those who did this correctly, often made sign errors when finding the common denominator.

Answers: **(b)** $x = -2$, $y = 2$ **(c)(i)** –2.81, 2.31 **(ii)** $\dfrac{x+16}{x+2}$

Question 13

Part **(a)(i)** was well done by most candidates. Part **(ii)** was less well done but still produced many correct answers. Those who knew what to do often made sign errors or did not simplify the vector correctly. Similar errors occurred in part **(b)(i)** particularly with **b** often being used instead of –**b**.

The mark for part **(b)(ii)** was only available if the answer to part **(i)** was a multiple of **a** and so was inaccessible to many and the part was omitted by a number of candidates. Even those who were successful with part **(i)** found difficulty with the explanation. What was required was that $\overrightarrow{BQ}$ was a multiple of $\overrightarrow{OA}$.

Answers: **(a)(ii)** $\mathbf{b} - \mathbf{a}$ **(ii)** $\frac{2}{5}\mathbf{a} + \frac{3}{5}\mathbf{b}$ **(b)(i)** $\frac{2}{3}\mathbf{a}$

Question 14

Almost all candidates were successful with parts **(a)** and **(b)**. Just a few gave the gradient in part **(a)** or used $(10 + 7)^2 + (9 + 1)^2$.

The pleasing thing about part **(c)** was that most candidates realised that the equation required was the perpendicular bisector of *AB*. Most candidates found the gradient of *AB* successfully but some could not use that to find the gradient of the perpendicular. Another common mistake was using (1, 9) or (7, 1), instead of the co-ordinates of the midpoint, to find the value of *c*.

Answers: **(a)** 10 **(b)** (4, 5) **(c)** $y = \frac{3}{4}x + 2$

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/43
Paper 43 (Extended)

Key messages

Candidates are expected to answer all questions on the paper so full coverage of the syllabus is essential.

Communication and suitable accuracy are also important aspects of this examination and candidates should be encouraged to show clear methods, full working and to give answers to 3 significant figures or to the required degree of accuracy specified in the question. Candidates are strongly advised not to round off during their working but to work at a minimum of 4 significant figures to avoid losing accuracy marks. Candidates who consistently give inaccurate answers lose a significant number of marks on the whole paper.

The graphics calculator is an important aid and candidates are expected to be fully experienced in the appropriate use of such a useful device. It is anticipated that the calculator has been used as a teaching and learning aid throughout the course. In the syllabus there is a list of functions of the calculator that are expected to be used and candidates should be aware that the more advanced functions will usually remove the opportunity to show working. There are often questions where a graphical approach can replace the need for some complicated algebra and candidates need to be aware of such opportunities.

General comments

The candidates were very well prepared for this paper and there were many excellent scripts, showing all necessary working and a suitable level of accuracy. Candidates were able to attempt all the questions and to complete the paper in the allotted time.

A few candidates needed more awareness of the need to show working, either when answers alone may not earn full marks or when a small error could lose a number of marks in the absence of any method seen.

The sketching of graphs does continue to improve although the potential use of graphics calculators elsewhere is often not realised.

Topics on which questions were well answered include reverse percentages, transformations, vectors, probability, trigonometry, curve sketching and quadratic equations.

Difficult topics were compound functions, compound interest, trigonometry in 3D shapes, absolute values and mensuration.

There were mixed responses in other questions as will be explained in the following comments.

Comments on specific questions

Question 1

(a) (i) This question was generally well done with only a few candidates overlooking the need for the simplification of final answer.

(ii) Almost all candidates answered this correctly although again a few forgot to give the answer in its simplest form. A small number gained SC1 for the values the wrong way round.

(b) This was nearly always correct with only a small number gaining M1 for a final answer of 18:15.

(c) (i) Almost all candidates were able to do this straightforward percentage question although some truncated answers of 45.4 were seen.

(ii) This was nearly always correct, with most candidates simply dividing by 5 to get the correct answer.

(d) Generally very well answered with candidates either scoring 0 or 3 in this part. Common wrong methods seen were multiplying by 0.96 or 1.04 instead of use of a reverse percentage method.

Answers: **(a)(i)** $\frac{38}{83}$ **(ii)** 45 : 38 **(b)** 18 **(c)(i)** 45.5 **(ii)** 3 **(d)** 375

Question 2

(a) Most candidates gained at least 1 mark here although several spoilt answers were seen with responses having more than one transformation. Very few candidates gave their answer as 270° anti-clockwise or –90°. Those who gained B2 generally omitted the centre of rotation or gave it incorrectly.

(b) Nearly always correct.

(c) The majority of candidates gained full marks with both shifts being positive although a few gained B1 for only one correct directional move.

(d) This part was found more difficult with many candidates only stretching the point at (4, 3) and leaving the base the same. Very few tried to stretch with the *y*-axis invariant as this led to the image going off the grid. Many candidates scored B1 for a stretch factor 3 displaced vertically but none for a different stretch factor.

Answers: **(a)** rotation, 90° clockwise, (5, 1)

Question 3

(a) (i) Nearly always correct.

(ii) Nearly always correct.

(iii) This was a reasonably well answered part, but many candidates did not understand the meaning of the absolute sign and attempted to find the determinant. Several lost the marks for not correctly squaring –2 and ending up with a final answer of $\sqrt{12}$. Several gave their final answer in surd form.

(b) (i) Most scored full marks here.

(ii) A well answered part with most candidates gaining full marks.

Answers: **(a)(i)** $\begin{pmatrix} 1 \\ 3 \end{pmatrix}$ **(ii)** $\begin{pmatrix} 4 \\ -2 \end{pmatrix}$ **(iii)** 4.47 **(b)(i)** $\begin{pmatrix} 2 \\ 5 \end{pmatrix}$ **(ii)** (6, 17)

Question 4

Most parts of this question required readings from a graphics calculator and candidates need to know that this does not change the rules about 3 significant figure accuracy. Candidates also need to know that there are specific functions on the calculator to answer these questions and not to simply move the cursor around the screen as this will not lead to accurate answers. A small number of candidates omitted this question, suggesting a lack of experience with a graphics calculator.

(a) (i) Most candidates scored full marks here with only a few scoring 0 due to incorrect scaled axes. B2 was awarded on a few occasions to those graphs which reached the horizontal boundaries of the grid and a few candidates earned only B1 for just 1 correct branch.

(ii) Many candidates lost the first B1 for incorrect accuracy as detailed above, usually giving the 2 significant figures answer of 0.71. A few candidates gave acceptable surd form final answers.

(iii) Only the most able candidates gained this mark. Wrong answers included using x instead of f(x) or y, or use of their 0.707.

(iv) Only the more able candidates gained both marks here. Most thought that the asymptotes were the axes and gave $x = 0$ and $y = 0$.

(b) (i)(a) This was mostly all correct but some lost one of the marks for only sketching the curve above the x-axis.

(b) Again, this was usually correct, but those who had lost a mark in the previous part for the reason given could then only score a maximum of one mark as their curves only intersected once.

(ii) Many candidates scored both marks but several only gained the B1 because their inequality signs were reversed. Often the first value was again given to a 2 significant figures accuracy of 0.56.

Answers: **(a)(ii)** (0.707, 1.41) **(iii)** $f(x) \geqslant 1.41$ **(iv)** $x = 0$, $y = x$ **(b)(ii)** $0.556 < x < 2.40$

Question 5

(a) Most candidates successfully found the correct values. However, some used the scores for mathematics students. A small number gave the median as 7 or 8, not understanding that they had to average out these values. The upper quartile was easier to find as there were 3 values of 9 scored by the students in the tests.

(b) This was usually correct but there were a couple of linear or negative answers seen. The majority of candidates added a comment on the strength of the correlation.

(c) Many candidates only scored B1 here for the correct c value of 1.98; a large number lost the mark for the m value of 0.681 being given to 2 significant figures.

Answers: **(a)** 7.5, 9 **(b)** positive **(c)** $y = 0.681x + 1.98$

Question 6

(a) A well answered part, with most candidates correctly using the given formula to find the area of the triangle.

(b) Good explicit use of the cosine rule was often seen to calculate the length of the unknown side.

Answers: **(a)** 96.9 **(b)** 18.0

Question 7

This question contained some challenging parts and was probably the most discriminating question on the paper. Many candidates did not read the question carefully and lost marks because of this. In part **(b)**, incorrect methods led to the correct answer due to the small percentage values used in the question.

(a) Some excellent answers were seen here but the final mark was often lost due to candidates not giving their final answer correct to the nearest 100. Many candidates who used the wrong method here did however often gain an SC mark for correctly rounding their final answer. Common misconceptions here were either to use 10% as their percentage decrease or use $n = 20$ for the number of years.

(b) (i) A reasonably well answered part by many candidates. However, common misconceptions here were either to multiple by 0.98^2 or to divide by 1.04 leading to almost correct final answers.

(ii) A very discriminating part with only the more able candidates using a fully correct method to gain full marks. Several responses correctly used a trial and improvement method to get to the same result. The vast majority of unsuccessful candidates used the multiplier of 0.98^{14} which led to the correct number of years but gained no credit. Several candidates did however pick up an M1 for correctly forming an equation.

Answers: **(a)** 23 500 **(b)(i)** 25 000 **(b)(ii)** 14

Question 8

This was similar to **Question 4** in that most parts of this question required readings from a graphics calculator. The general comments in that question also apply here.

(a) A very well answered part with the vast majority of candidates scoring full marks. A few only gained B1 as their parabola passed through (or to the right of) the origin.

(b) This was nearly always correct but some omitted the x = and thus did not form an equation. Some stated $y = 2$.

(c) (i) The usual loss of marks occurred in this part with many losing both marks for 2 significant figure answers given. A small number of able candidates gave their answers in acceptable surd form. Only a few incorrectly gave the y co-ordinates as well.

(ii) This was a discriminating part, with very few recognising the link to the previous answer and thus gaining no credit. A small number did pick up the FT mark here.

(d) Similar responses and penalties to part **(c)** were seen with a few again giving surd answers.

(e) A well answered part with most recognising the need to sketch a straight line with a negative gradient passing through (5, 0). Those that only scored B1 generally missed (5, 0) or passed through (0, 6).

(f) A potentially tricky part with most candidates scoring well, dependent on their correct sketches in previous parts. A few missed out on this mark for not continuing their region below the x-axis.

Answers: **(b)** $x = 2$ **(c)(i)** –0.236, 4.24 **(ii)** $-0.236 < x < 4.24$ **(d)** –0.449, 4.45

Question 9

(a) This part was not particularly well answered as many candidates found the sum of the given two fractions but then did not subtract this from 1 to find the required probability. Very few answers were given as decimals or percentages.

(b) (i) This was nearly always correct, including the FT answer from part **(a)**, although some neglected to write an answer for the first branch.

(ii) As many candidates did not find the correct answer in part **(a)** this had a knock-on effect here with only the most able candidates gaining full marks. However, most did score some credit for correctly multiplying their fractions together to find a combined probability. Several M2s were given for a full correct method using their fractions.

(iii) Candidates usually got this correct using their answer from the previous part multiplied by 90.

Answers: **(a)** $\frac{11}{20}$ **(b)(ii)** $\frac{8}{15}$ **(iii)** 48

Question 10

This discriminating question required candidates to be able to correctly visualise right-angled triangles from within a 3D shape and to then apply Pythagoras' Theorem or trigonometry methods. The less able students lost a lot of marks here for identification of the wrong triangles although they did pick up method marks on FT. A common misconception was that this was a square-based pyramid.

(a) Only the more able candidates scored full marks here for the use of trigonometry in the correct triangle. Most, but not all, used tan although some found the length from *P* to the midpoint of *BC* (*M*) first and then used sin or cos. This length (*PM*) was useful in solving subsequent parts of the question.

(b) There were fewer correct responses seen here with many candidates unable to successfully calculate the length of the diagonal *BD* before applying trigonometry to triangle *POB* (*O* directly below *P*) using half the length of *BD*. Some candidates had the same answer to parts **(a)** and **(b)** whilst a few reversed their answers to both parts.

(c) A tricky part with candidates having to calculate the length *PM* before finding *PC* by using Pythagoras twice. The more able candidates were able to do this and some gave their final answer in surd form. Some candidates gave 6 as their answer from assuming triangle *PBC* was equilateral.

(d) A small number of correct responses were seen here with the constant difficulty in identification of the required angle. Those that had found *PM* in earlier parts generally used trigonometry to evaluate angle *PCB* but a few used the cosine rule.

(e) Most candidates recognised the need to use the sine rule but very few gained full marks here. Many scored M1 or M2 for use of their angle found in part **(d)** in an implicit or explicit form.

Answers: **(a)** 60.3° **(b)** 54.5° **(c)** 8.60 **(d)** 69.6° **(e)** 6.49

Question 11

(a) An excellent, well-answered part, with most candidates scoring full marks.

(b) A well answered part with most candidates using their statistics function on their calculators to gain both marks.

Answers: **(a)** 70, 80, 30 **(b)** 156.25

Question 12

(a) This was a fairly straightforward part, with the majority scoring all 3 marks. However, several candidates forgot to double the sum of the sides when setting up their equation and scored 0. A few lost the final mark for giving their final answer as an improper fraction, $\frac{19}{4}$.

(b) Many correct answers were seen with many using a trial and improvement method rather than setting up and solving an equation. Others generally scored at least M1 for showing the two sides multiplied together to equate to the area of the rectangle. Both methods of factorisation or use of the quadratic formula were seen in equal measure.

(c) Most candidates scored 2 or 3 marks here as they were readily able to set up the 2 simultaneous equations before generally solving them correctly. Again, some used a successful trial and improvement method.

(d) This was the most discriminating part of the paper with only a very few correct solutions seen. Very few candidates managed to set up a correct initial equation leading to the quadratic equation although several picked up a M1 for finding either of the unknown sides of the rectangles.

Answers: **(a)** 4.75 **(b)** 17 **(c)** 2.5 **(d)** 1.69

Question 13

(a) A fairly straightforward part which caused problems for a lot of candidates with –4 and ± 4 seen regularly; also some expressed 0^2 as 1.

(b) (i) Most candidates managed to gain M1 for 3(1 – x) – 2 but many were then unable to correctly expand and collect the terms together to find the simplest form.

(ii) The more able candidates scored full marks here, but many others were awarded B2 for the correct expansion of the brackets whilst others were awarded M1 for writing down the correct expression. Several responses had all three functions multiplied together.

(c) Only the most competent candidates recognised that the inverse function was the same as the given function. Several went to great lengths algebraically to get to the correct final answer for just 1 mark.

(d) (i) Many correct responses were seen, but several candidates misunderstood the question and simply found g(2). Several spoilt methods were seen with correct answers of $\frac{4}{3}$ leading to e.g. 1.3.

(ii) A very discriminating part to conclude the paper with only a small number scoring full marks for finding all four answers. Many did not understand the concept of absolute value and only solved $x^2 - 4 = 3$ to gain the SC mark and many omitted to find both square roots of a positive number.

Answers: **(a)** 4 **(b)(i)** 1 – 3x **(ii)** 5x **(c)** 1 – x **(d)(i)** $\frac{4}{3}$ **(ii)** ± 1, $\pm\sqrt{7}$

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/51
Paper 51 (Core)

Key messages

A clearer understanding of the words *expression* and *formula* is desirable as there was evidence that many candidates confused the two. In **Questions 2(a)**, **3(c)(i)** and **4(a)**, the formula required a subject, in this case $d =$.

When trying to see a relationship it is helpful to construct a table and look at common differences. Generally, showing differences counts towards communication.

As a general rule, anywhere that a calculator is used requires the candidate to show the calculation that was typed in. This is important for communication marks.

General comments

Many candidates preferred to draw rectangles to answer questions, missing out on the opportunity to use the patterns. Some showed good organisation in drawing systematic sets of rectangles.

With accurate drawing and using the time to persevere several were able to answer the more difficult questions, even if the pattern had not been spotted.

Comments on specific questions

Question 1

(a) (i) This introduction to the task presented no difficulty for the candidates.

Answer: 0 1 2 3

(ii) The large majority of candidates noticed that the number of dots inside the rectangles was found by subtracting 1 from the width given in the table. Many candidates unnecessarily wrote a formula rather than an expression.

Answer: $w - 1$

(b) Nearly all candidates gained the marks for completing the tables for different heights. Most deduced the correct formula although some were not clear about using brackets in their answer and $3(w - 3)$ was seen often. Most candidates gained credit for communication by drawing relevant accurate rectangles.

Answer: 0 2 4 6 0 3 6 9 $3(w - 1)$

(c) (i) The generalisation of the expressions $w - 1$, $2(w - 1)$, $3(w - 1)$ for heights 2, 3 and 4 required skill in algebra. A significant number seemed to find the formula but wrote their answer with incorrect use of brackets and $h - 1(w - 1)$ was seen several times.

Some candidates looked ahead to part **(ii)**, where $h = 6$ and $w = 7$ gave 30 dots, and wrote an invalid result, such as $hw - 12$ or $h(w - 2)$, based on that.

Answer: $(h-1)(w-1)$

(ii) Those who found the correct formula in part **(i)** invariably gained the mark here for showing the formula was correct for $h=7$ and $w=6$.

(iii) With 33 dots in the rectangle candidates had to find possible values for h and w. The presence of two variables in the formula in part **(i)** made this question less straightforward. Communication was credited to those candidates who stated that, for instance, $33=3\times11$. Some candidates showed perseverance and found the solution by drawing rectangles of different dimensions.

Answer: 4 and 12 or 2 and 34

Question 2

(a) Candidates were required to change their formula for the rectangle into that for a square by replacing h and w by s. In working with these three variables most candidates got confused and often attempted to answer the question from first principles. Diagrams of squares were frequently seen. Several formulae were seen with h, w and s on both sides of the equals sign.

Answer: $d=(s-1)^2$

(b) The best answers were seen from those candidates who substituted 10 into their formula in part **(a)** or, failing that, in **Question 1(c)(i)**. A few were successful in drawing the relevant square and using a counting method. Communication was credited to those who showed the substitution of 10 into their formula.

Answer: 81

Question 3

(a) Candidates usually answered this by drawing appropriate diagrams. Most candidates showed the relevant rectangles, which were then used to find the numbers in the table. Some candidates realised that, when the height increased by 1, the number of dots increased by the same amount each time. Those candidates made fewer counting errors, seen particularly when the height was 4.

Answer: 4, 5 8 11, 3 8 13 18

(b) This question was well done since most candidates saw a pattern in the formula for number of dots in a diagonal rectangle when given the width. Some candidates emphasised this pattern by writing $1w-0$, instead of simply w, for the first cell. Few candidates showed differences of 5 in part **(a)** as communication in finding $5w-2$.

Answer: w, [$3w-1$,] $5w-2$, $7w-3$, [$9w-5$]

(c) (i) Only a few candidates could generalise the pattern seen in part **(b)**. Some candidates showed understanding by being able to continue the table and credit for communication was given if this was done. A table of coefficients and consideration of the differences would have been useful.

Answer: $d=(2h-1)w-(h-1)$

(ii) Many candidates found the number of dots in a 10 by 3 rectangle through counting in an accurate drawing. This was a preferred method since substitution in their formula in part **(c)(i)** often produced unrealistic answers. Since the question directed candidates towards substitution, credit was given for an answer from their formula, even if the formula was incorrect. Several candidates gained further credit for showing that substitution clearly. Some candidates extended the table correctly and found that the relevant expression was $19w-9$. Of those, few went further and showed the subsequent substitution of $w=3$ that was necessary to get the answer.

Answer: 48

Question 4

(a) The comment in **Question 2(a)** applies here. The relationship between the variables *d*, *h*, *w* and *s* was often not understood. A formula for *d* in terms of *s* should start *d* = and have only *s* and numbers on the right side.

Answer: $d = (2s - 1)s - (s - 1)$

(b) To find the dimensions of the square with 181 dots it was necessary to replace *d* by 181 in the formula in part **(a)**. Some candidates were able to get a method mark for this step. A few candidates could solve the question by looking at the squares they had drawn or by testing integer values. For good communication, candidates needed to show several results from these tests and should be encouraged, when trying out solutions, to show also those trials that do not work.

Answer: 10

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/52
Paper 52 (Core)

Key messages

Make sure that all the vocabulary in the syllabus is known.

Candidates should always follow instructions to use previous parts of a question: either it is essential for earning the marks or it is a hint as to the easiest way to tackle a question.

When generalising, candidates should be encouraged to write out several results, preferably as a table, and look for a pattern.

Candidates need to understand that communication is an important component in this paper. There were many who appeared to hide their working.

General comments

Good mathematical work was seen from many candidates. Especially the continuation of sequences and the clear and accurate substitution in formulae were well done.

There was evidence of candidates not reading the question slowly enough since several jumped to conclusions about what was required.

Comments on specific questions

Question 1

(a) Nearly all candidates completed the spiral correctly showing they understood the context for the investigation.

(b) Candidates who had drawn a correct spiral found its length correctly. A few candidates gained credit for communication by showing the relevant addition.

Answer: 30

(c) The large majority of candidates were successful at completing the table, which showed the additions needed to calculate the length of the spiral for the first 10 corners. The occasional arithmetic slip was seen.

Answer:

1 + 1 + 2 + 2	
1 + 1 + 2 + 2 + 3	9
	20
1 + 1 + 2 + 2 + 3 + 3 + 4 + 4 + 5	25

Question 2

(a) All candidates were able to continue the sequence 1, 3, 6, 10, 15, …. Some candidates gained credit for communication by showing the differences increasing by 1 each time.

Answer: 21, 28

(b) A range of names was seen and very few candidates knew the name for the numbers in the sequence in part **(a)**.

Answer: Triangle numbers

(c) Most candidates successfully substituted $n = 5$ into the given formula and showed it gave the fifth triangular number.

Answer: $\frac{5(5+1)}{2} = 15$

Question 3

(a) Continuing the table for even-numbered corners was done correctly by most candidates. Communication was credited for showing a method used to do this. Several methods were possible, using differences being the most popular. Occasionally an arithmetic slip was seen.

Answer:

8	10	12	14	16
20	30	42	[56]	72

(b) (i) From previous information candidates completed a table of four columns. From this they had to find the formula for n in terms of k. Some candidates appeared confused by the extra columns in the table and it might have been useful for them to highlight those labelled n and k.

Answer: $n = \frac{k}{2}$

(ii) This question also required extracting information from the relevant two columns in the table. This was more successfully done and most had no difficulty expressing in words the connection between L and the term of the sequence.

Answer: L is twice the term of the sequence

(iii) The formula for L when k is even is found by using the answers to part **(i)** and part **(ii)** in the given formula in **Question 2(c)**. Candidates were accordingly directed towards doing so but very few followed that instruction. Instead, many substituted a numerical value into the given result and checked it worked for that particular value. Candidates should learn that a single numerical check does not justify making a general result.

(iv) A large number used the formula correctly. The most common error was to take $k = 12$ instead of $k = 6$. This was seen from candidates who thought $n = 6$ was the label for the corner.

(v) Most candidates correctly substituted an odd value of k into the formula. Full marks were only gained by those candidates who went further and explained why the result from the formula could not be correct. Several reasons are possible, such as saying that the answer must be a whole number, or that the answer must be the same as seen before in the table. Candidates are advised to give full explanations for a question that says *Show that*.

Question 4

(a) (i) Many candidates were able to write down the lengths required by looking at the original spiral.

The most common wrong answer was 12, which was the length of the whole spiral. Candidates are advised to take care when reading a question.

Answer: 3

(ii) The same comment applies here as in part **(a)(i)**, the most common incorrect answer being 14.

Answer: 4

(b) (i) Candidates had to generalise the result seen in part **(a)(i)**. Generalisation is usually the most difficult skill required in an investigation. The result in part **(a)(i)** was insufficient on its own in spotting a pattern. Successful candidates wrote out the results for several values of *k* until they saw the pattern. Communication was credited for this approach. Some candidates did not use even values of *k*, having confused whether corners were even- or odd-numbered.

Answer: $\frac{k}{2}$

(ii) The same comment applies here as in **(b)(i)**.

Answer: $\frac{k}{2}+1$

Question 5

(a) The given formula only applied to an even value of *k*, so in order to check the length of the spiral to Corner 7, use had to be made of the results in **Question 4**. Candidates found it very difficult to distinguish between *k* being even and the corner number being odd. Hence there were few attempts at using the results from **Question 4**, as asked for in the question. Some candidates thought they had checked the result by substituting $k = 7$ into the formula for *k* even. Of those, a few noted that, in general, subsequently adding $\frac{1}{4}$ did give the correct result and this was considered a valid approach. Some candidates added the lengths of the sides of the spiral and so did not check any formulae, as required, and therefore could not be given the marks.

(b) The few candidates, who realised that rounding off the result from the formula actually gave the correct answer, were able to gain marks here for the correct numerical answer. One or two candidates used the method suggested in the task (in **Question 3(b)(iii)** and **Question 4**) and evaluated $\frac{92}{2}\left(\frac{92}{2}+1\right)-\frac{92}{2}$ or $\frac{90}{2}\left(\frac{90}{2}+1\right)+\frac{90}{2}+1$.

Answer: 2116

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/53
Paper 53 (Core)

Key messages

Make sure that all the vocabulary in the syllabus is known.

Candidates should always follow instructions to use previous parts of a question: either it is essential for earning the marks or it is a hint as to the easiest way to tackle a question.

When generalising, candidates should be encouraged to write out several results, preferably as a table, and look for a pattern.

Candidates need to understand that communication is an important component in this paper. There were many who appeared to hide their working.

General comments

Good mathematical work was seen from many candidates. Especially the continuation of sequences and the clear and accurate substitution in formulae were well done.

There was evidence of candidates not reading the question slowly enough since several jumped to conclusions about what was required.

Comments on specific questions

Question 1

(a) Nearly all candidates completed the spiral correctly showing they understood the context for the investigation.

(b) Candidates who had drawn a correct spiral found its length correctly. A few candidates gained credit for communication by showing the relevant addition.

Answer: 30

(c) The large majority of candidates were successful at completing the table, which showed the additions needed to calculate the length of the spiral for the first 10 corners. The occasional arithmetic slip was seen.

Answer:

1 + 1 + 2 + 2	
1 + 1 + 2 + 2 + 3	9
	20
1 + 1 + 2 + 2 + 3 + 3 + 4 + 4 + 5	25

Question 2

(a) All candidates were able to continue the sequence 1, 3, 6, 10, 15, …. Some candidates gained credit for communication by showing the differences increasing by 1 each time.

Answer: 21, 28

(b) A range of names was seen and very few candidates knew the name for the numbers in the sequence in part **(a)**.

Answer: Triangle numbers

(c) Most candidates successfully substituted $n = 5$ into the given formula and showed it gave the fifth triangular number.

Answer: $\frac{5(5+1)}{2} = 15$

Question 3

(a) Continuing the table for even-numbered corners was done correctly by most candidates. Communication was credited for showing a method used to do this. Several methods were possible, using differences being the most popular. Occasionally an arithmetic slip was seen.

Answer:

8	10	12	14	16
20	30	42	[56]	72

(b)(i) From previous information candidates completed a table of four columns. From this they had to find the formula for n in terms of k. Some candidates appeared confused by the extra columns in the table and it might have been useful for them to highlight those labelled n and k.

Answer: $n = \frac{k}{2}$

(ii) This question also required extracting information from the relevant two columns in the table. This was more successfully done and most had no difficulty expressing in words the connection between L and the term of the sequence.

Answer: L is twice the term of the sequence

(iii) The formula for L when k is even is found by using the answers to part **(i)** and part **(ii)** in the given formula in **Question 2(c)**. Candidates were accordingly directed towards doing so but very few followed that instruction. Instead, many substituted a numerical value into the given result and checked it worked for that particular value. Candidates should learn that a single numerical check does not justify making a general result.

(iv) A large number used the formula correctly. The most common error was to take $k = 12$ instead of $k = 6$. This was seen from candidates who thought $n = 6$ was the label for the corner.

(v) Most candidates correctly substituted an odd value of k into the formula. Full marks were only gained by those candidates who went further and explained why the result from the formula could not be correct. Several reasons are possible, such as saying that the answer must be a whole number, or that the answer must be the same as seen before in the table. Candidates are advised to give full explanations for a question that says *Show that*.

Question 4

(a) (i) Many candidates were able to write down the lengths required by looking at the original spiral.

The most common wrong answer was 12, which was the length of the whole spiral. Candidates are advised to take care when reading a question.

Answer: 3

(ii) The same comment applies here as in part **(a)(i)**, the most common incorrect answer being 14.

Answer: 4

(b) (i) Candidates had to generalise the result seen in part **(a)(i)**. Generalisation is usually the most difficult skill required in an investigation. The result in part **(a)(i)** was insufficient on its own in spotting a pattern. Successful candidates wrote out the results for several values of *k* until they saw the pattern. Communication was credited for this approach. Some candidates did not use even values of *k*, having confused whether corners were even- or odd-numbered.

Answer: $\frac{k}{2}$

(ii) The same comment applies here as in **(b)(i)**.

Answer: $\frac{k}{2}+1$

Question 5

(a) The given formula only applied to an even value of *k*, so in order to check the length of the spiral to Corner 7, use had to be made of the results in **Question 4**. Candidates found it very difficult to distinguish between *k* being even and the corner number being odd. Hence there were few attempts at using the results from **Question 4**, as asked for in the question. Some candidates thought they had checked the result by substituting $k = 7$ into the formula for *k* even. Of those, a few noted that, in general, subsequently adding $\frac{1}{4}$ did give the correct result and this was considered a valid approach. Some candidates added the lengths of the sides of the spiral and so did not check any formulae, as required, and therefore could not be given the marks.

(b) The few candidates, who realised that rounding off the result from the formula actually gave the correct answer, were able to gain marks here for the correct numerical answer. One or two candidates used the method suggested in the task (in **Question 3(b)(iii)** and **Question 4**) and evaluated $\frac{92}{2}\left(\frac{92}{2}+1\right)-\frac{92}{2}$ or $\frac{90}{2}\left(\frac{90}{2}+1\right)+\frac{90}{2}+1$.

Answer: 2116

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/61
Paper 61 (Extended)

Key Messages

To do well in **Section A** of this paper, candidates needed to know how to find a formula from a sequence of expressions by looking at patterns between the coefficients and the constants. A good knowledge of how to manipulate expressions in algebra, particularly using squared brackets and square roots was a necessary strength to succeed in **Section B**.

General Comments

The pattern of the questions in the investigation was firstly to find numbers that made sequences, and then to use these sequences to find formula. Using a differences method was one way of finding each of the parts of the formulae. There were patterns in both the coefficients and the 'constants'. In the modelling sections **Questions 5(a)**, **7(a)** and **7(b)** were the main questions where algebraic manipulation at a high level was necessary.

Comments on Specific Questions

Section A Investigation: Dots In Rectangles

Question 1

(a) The candidates were very good at counting the dots and continuing the sequences of numbers. Most of these tables were completed accurately with exceptionally few arithmetical mistakes. Many candidates supported their answers with some drawings on the square dotty paper. A few who did not do this tried to follow the pattern of the first table in the second and third tables.

Answer: 3, 4, 5
5, 8, 11, 14
8, 13, 18, 23

(b) The candidates were very good at looking for patterns in these expressions. Some width 1 answers of $1L - 0$ showed their thinking, and both this and 1L were acceptable answers for L. Very few candidates showed working using differences in the tables. This practice to find the expressions should be encouraged, with the patterns between the expressions used as a check.

Answer: L, $5L - 2$, $7L - 3$

(c) There were some good solutions to simple simultaneous equations following on from sensible choices made for substitution. The key to answering this question easily was to choose values for W as 1 and 2. One of $W = 1$ or $W = 2$ gives $c = -1$ straight away, and use of these two values gives two very simple linear equations for the coefficient of L. Some candidates chose larger values of W successfully whilst others made arithmetical mistakes or became confused with the algebra. There were also some good solutions use Trial and Improvement. Testing answers in different expressions to those used to find these answers should be encouraged.

Answer: $a = 2$, $b = -1$, $c = -1$

Question 2

(a) Like **Question 1(a)** the candidates answered this question well. Many used a pattern in the numbers rather than counting the dots in diagrams. They indicated this by writing the difference of 4 twice on the first table and once on the second table. Patterns should not be assumed by finding one difference or two equal differences; patterns should be based on a minimum of three differences. Candidates, who used extended drawings to help them, sometimes missed the dot or dots on the joining line. Checking should be encouraged by using the alternative method to the one used to find the answer – either patterns or drawings.

Answer: 16, 20
26, 35, 44
26, 54, 68

(b) Again, candidates looked for these expressions by either looking for the patterns between the coefficients and between the constants in the expressions, or by drawing the rectangles and counting the dots.

Answer: $4L$, $9L - 1$, $14L - 2$

(c) The candidates who had used or spotted the patterns in part **(b)** were able to use these to write down this formula. Others used a mixture of Trial and Improvement and substitution with simultaneous equations. Several of these successfully produced the correct expanded version of the formula: $d = 5WL - L - W + 1$.

Answer: $d = (5W - 1)L - (W - 1)$

Question 3

(a) This question asked for the expressions straight away. Some candidates made use of the dotty squared paper provided. Many looked at the possible answers that fitted the pattern with the second and fifth rows as given. This was the quickest way of achieving the correct answers and these candidates quickly spotted a mistake if made and changed their answer accordingly.

Answer: $9L$, $29L - 2$, $39L - 3$

(b) Those candidates who had successfully found the formula in **Question 2(c)** were able to achieve this mark too. The simplified version was not as commonly seen as the one in **Question 2**.

Answer: $d = (10W - 1)L - (W - 1)$

Question 4

(a) Good candidates were able to follow the patterns through to achieve the correct answer for a gradient of $\frac{1}{5}$. Some of the candidates who had some incorrect answers to one or more of the first three expressions were still able to sort out the correct expression needed for the last row. They did not usually go back to correct their previous answers. Candidates should be encouraged to go back over their previous work in the light of further answers which may help them to check and might well offer them the chance to rectify an error.

Answer: $d = (26W - 1)L - (W - 1)$

(b) Most candidates who found this solution worked by using first and second differences between the expressions in the table in part **(a)**. An alternative, efficient method, used by some, was to start with the sequence of squared numbers.

Answer: $d = ((n^2 + 1)W - 1)L - (W - 1)$

(c) With or without the formula in part **(b)** candidates made very good attempts to find this gradient. Candidates should practice expansion of brackets, especially with a bracket within a bracket. This is where some candidates, having done so well, made mistakes and were unable to find the correct value of *n*.

Answer: $\frac{1}{10}$

Section B Modelling: Ladders

Question 5

(a) Candidates understood that this was based on Pythagoras' Theorem and most started with $x^2 = y^2 + 1.5^2$. They should be aware that to start this with the square root already in place was not detailed enough to gain the mark.

(b) (i) The sketch of this graph relied heavily on the candidate's use of the ranges as given for *x* and *y*. Lack of attention to these values produced straight line graphs and graphs that did not touch the *x*-axis. Some candidates did plot enough points successfully to get a good shape and symmetry.

(ii) The idea that length and measurements cannot be negative was appreciated by many candidates. The practical situation behind all models should always be considered to avoid such assumptions as the ladder could not be buried in the ground.

Answer: Length cannot be negative

Question 6

(a) Candidates recognised that they now needed to use trigonometry and most found the cosine of angle 76. In questions where a value needs to be shown it is important to recognise that this value has probably been rounded and that the unrounded figure needs to be shown.

(b) Having been given a similar model in part **(a)** candidates were able to find this second inequality in the same way, this time using cos 82°.

Answer: $z > 0.139x$

(c) How to plot inequality boundaries needs to be studied by most candidates. Many of the answers did feature straight lines with many starting from the origin. Candidates also need to practice reading scales, especially where the *x*-axis scale is different to the *y*-axis scale or the scale is unusual, as in this case on the z-axis.

(d) The values of *a* and *b* could be found by reading from the graph in part **(c)**, as the question asked. They could also be calculated from the inequalities in part **(a)** and part **(b)**. Some candidates realised the connection and were able to correctly find at least *b* if not *a* as well.

Answer: $0.417 < z < 0.726$

Question 7

(a) A first line using Pythagoras' Theorem was found by most candidates. It was necessary to rearrange and square root to find the formula for *y*. Candidates need to work on simplifying and multiplying out squared brackets, e.g. the fact that $(x + 0.9x)^2$ is equal to $(1.9x)^2$ was missed by many candidates or written as $1.9x^2$. Of those who multiplied out $(x + 0.9x)^2$, many got an answer of $x^2 + 0.81x^2$ or $x^2 + 0.81x$, missing the middle term.

Answer: $y = \sqrt{(1.9x)^2 - 1.5^2}$

(b) (i) As this is a 'show that' question it is prudent not to start with the given answer but to work towards it. The best approach was to use Pythagoras' Theorem on two triangles, one using the original length of the ladder and one with the ladder extended. This would show explanations for both 3.61 and 2.25.

(ii) Candidates made good use of their graphical calculators to give a correct sketch of this model.

(c)(i)(ii) Both these answers could be written down by reading from the graph modelled and sketched in part **(b).** Students need to learn not only how to draw a graph on their calculators but also how to find out information using this graph.

Answers: **(i)** 2.06 **(ii)** 1.695

(iii) Using the facts that the ladder was 1.5 m away from the wall and its original length was found in part **(ii)** candidates needed to use Pythagoras to find out how far up the wall the ladder touches. By including the increase in height from part **(i)** trigonometry could then be used to find the angle that the extended ladder is inclined to the wall. When this angle (approximately 62°) did not lie between 76° and 82° the candidates could determine that the extended ladder was not safe.

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/62
Paper 62 (Extended)

Key Messages

Candidates needed to find and adapt formula throughout this paper. They also needed a good understanding of trigonometry and to be able to sketch a graph on a graphical calculator and then use the sketch to answer questions.

General Comments

In the Investigation candidates had to find a connection between *n* and *k*. In the modelling section candidates needed to use trigonometry in several questions and to make and change a model. The sketch on the graphical calculator was used to find the heights for a given volume and the validity of the model.

Comments on Specific Questions

Section A Investigation: Right Spirals

Question 1

(a) Candidates needed to continue the spiral up to the point (3, 3). This was very well answered.

(b) Candidates needed to count the length of this spiral. Again this was very well answered.

Answer: 30

(c) Candidates had to complete the table. They could use the diagram to help them. Very few errors were made.

Answer:

1 + 1 + 2 + 2	
1 + 1 + 2 + 2 + 3	9
1 + 1 + 2 + 2 + 3 + 3 + 4 + 4	
1 + 1 + 2 + 2 + 3 + 3 + 4 + 4 + 5	25

Question 2

(a) This question asked for a connection between *n* and *k* which could be found numerically in the table.

Answer: $n = \frac{k}{2}$

(b) Candidates needed to substitute their formula from part **(a)** into the $n(n + 1)$ from the table. Many did this with no problem. Candidates should be reminded that if they are answering a show that type question then they should not start with the final result, but rather find another starting point and work towards the given formula. Candidates should also show every step of their working to show they know how to reach the formula.

(c) It was necessary to show the length of the spiral in two different ways. Most candidates substituted the value of 14 for k into the formula in part **(b)**. Some then substituted $n = 7$ into $n(n + 1)$. This was where the formula came from so these two methods were actually the same. A different method was to go back to the original diagram and to add up the lengths of the spirals.

Answer: 56

Question 3

(a)(i)(ii) To find the lengths of the spirals between odd and even numbered corners candidates needed to find values from the original diagram and to look for patterns between them. Candidates should be advised to formalise their findings, for instance, in a table so that it is easier to see the pattern.

Answers: **(i)** $\frac{k}{2}$ **(ii)** $\frac{k}{2}+1$

(b) (i) Since the formula in **Question 2(b)** was for the length of the spiral from (0, 0) to corner k, it was necessary to add to this the length for k to corner $k + 1$, as found in part **(a)(ii)**. Most candidates continued to expand and simplify their original statement although this was not necessary.

Answer: $\frac{k}{2}\left(\frac{k}{2}+1\right)+\left(\frac{k}{2}+1\right)$

(ii) Candidates needed to realise that for corner 7 they needed to substitute the value of $k = 6$ into the formula in part **(b)(i)**.

Question 4

(a) The last row of the table needed to be completed by looking at the patterns made by the previous rows. Most candidates could see the sequence here.

Answer: 1 + 2 + 3 + 4 +5 + 6 + 7 + 8 + 9, 45

(b) Many candidates found this formula without much working out – probably by trial and improvement. Using differences was quite straightforward. Some candidates started with square numbers and some were successful.

Answer: $H = 2x^2 - x$

(c) Having found the formula for the total horizontal length it was expected that candidates would be able to write down the formula in terms of y for the vertical length. Most candidates saw the symmetry which enabled them to follow through from part **(b)** with the correct answer.

Answer: $V = 2y^2 - y$

(d) (i) The first part of this answer was to say that $y = x$. This was necessary to gain the first mark and could be said in several ways, e.g. $H = V$. Some candidates lost this mark but they did achieve the second mark by equating the vertical and horizontal lengths, both in terms of x and simplifying them to obtain the given formula.

(ii) The final answer in this investigation could be found by equating the formula given in part **(d)(i)** to 1560 and solving it. Many candidates solved it on their calculators, whilst others factorised it or used the quadratic formula.

Answer: 20

Section B Modelling: Open Boxes

Question 5

(a) Candidates found the first mark quite easy to obtain. They used trigonometry in a variety of ways and mostly got to $\frac{15}{\cos 30^\circ}$ quite quickly. Candidates need to remember that because the answer was corrected to 4 significant figures they need to give at least 5 figures to complete the 'show that'.

(b) (i) This was well answered. Use of the Sine Rule added an extra step but did not lose the candidates any marks.

(ii) Most candidates knew how to use the Sine Rule and some used other longer methods to get to the same answer. Most candidates also knew to use 17.32 – 4 for the hypotenuse.

Answer: 76.8

(iii) Candidates saw that they needed three of the triangles for the base of the box, multiplied by the height of the box, 2 cm, which they were given in part **(b)**. They should remember that because this value for the volume was approximate they should work to at least one more figure before reaching 461 cm^3.

Question 6

(a) (i) This was very well answered. Most candidates understood the difference between the required '*r*, in terms of *x*' and '*x,* in terms of *r*'.

Answer: 2*x*

(ii) This answer involved further use of the sine rule which had been given on the facing page. There were several acceptable ways of writing the answer depending on how much the candidate simplified the expression.

Answer: $\frac{1}{2}\sin 120^\circ\left(17.32 - \frac{x}{\sin 30^\circ}\right)^2$

(iii) The only things that were different in this model to the expression in part **(ii)** were the *x* (height) and '× by 3'. Since volume is area × height the only thing that needed explaining was the × by 3. Some candidates managed to explain this as part of a fuller explanation.

Answer: 3 triangles

(iv) Candidates should know that to get a good sketch they need to pay attention to the scales given. This curve started from the origin and touched the *x* axis just before $x = 9$. It also peaked at $v = 500$.

(b) Candidates should have found these values by reading from the graph on their graphical calculator.

Answer: $0 < \times < 8.66$

(c) By reading across the graph on their graphical calculator, candidates should have been able to find the points with a *v* value of 400.

Answer: 1.5 and 4.54 to 4.55

Question 7

(a) Since the side of 30 is now E the only difference between the model in **Question 6(a)(iii)** and this model was that 15 in the first model has been replaced by $\frac{E}{2}$ in this model. Few candidates saw this difference.

Answer: 15 becomes $\frac{E}{2}$

(b) From the graph the maximum point is at (5.774, 4000). Candidates should appreciate that they can use the graph of a model to find answers very quickly. Some candidates gave these co-ordinates for their answer, not distinguishing between the height and the volume.

Answer: 5.77

Question 8

(a) Each part of the model needed to be looked at to compare the equilateral triangle base to the square base. There were three changes to be made. Some candidates found at least one of these changes. Others went back to basics and made a sketch of the new piece of metal and developed the model from this.

Answer: $V = 2x\sin 90°\left(\frac{E}{2\cos 45°} - \frac{x}{\sin 45°}\right)^2$

(b) When candidates test values, which is a worthwhile approach to a question like this, they should be organised and set them up in a table with results. Some candidates might have seen where their trialled values were leading if their work had been more organised.

Answer: $x = \frac{E}{6}$

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/63
Paper 63 (Extended)

Key Messages

In the Investigation candidates needed to be able to find an expression for the *n*th term and to identify patterns in expressions to produce formula. For the modelling section candidates needed very good algebraic skills in rearrangement as well as a good knowledge of linear equations and graphs.

General Comments

Several expressions in **Question 3** led to a general formula and the last question required a series of expressions to be found so that their patterns would lead to a final expression. In **Question 5** the mean and one other point were used to find the equation of the line of best fit. In **Question 6** substitution and rearrangement were needed to show how formulae could be derived.

Comments on Specific Questions

Section A Investigation: Nearest Neighbours

Question 1

(a) Most candidates could work out the numbers of pairs of nearest neighbours and by looking at the pattern they were able to complete the *n*th term.

Answer: 2, 4, 5, $n - 1$

(b) This question was well answered too. Some candidates made use of the square dotty paper to support/check their answers. Methods of checking should always be encouraged.

Answer: 3, 10

(c)(i) There were several ways of writing this answer depending on the view of looking at this from doubling or halving. Multiplying by 2 and dividing by 2 were perfectly acceptable phrases to use as long as they were correctly explaining the connection. Most candidates were able to explain this.

Answer: The answer is double the total.

(ii) If candidates recognised the sequence as triangle numbers they may have been able to write down this expression. Alternatively, they could find the pattern from the table in part **(b)**. Various forms of the correct answer were acceptable.

Answer: $\frac{n(n-1)}{2}$

Question 2

(a) This table was well completed numerically and most found the expressions in *n* as well. Not so much evidence was seen on the square dotty paper. Candidates worked mostly from the patterns in the numbers.

Answer: 1, 2, 3, 4, $n - 2$
1, 2, 3, $n - 3$

(b) This answer followed on from the expressions for the *n* in part **(a)**. Candidates should be encouraged to read the questions very carefully to help them to see the connections between questions.

Answer: $n - k$

(c)(i) This question was well answered. Candidates should be encouraged to show the working that they have used. If they make a slip in the answer their working out might gain them some marks.

Answer: 55

(ii) Candidates needed to use their expression found in **Question 1(c)(ii)**. Any correct expression with the correct substitution of 11 gained marks.

Answer: $\frac{11 \times 10}{2}$

Question 3

(a) Reading the question carefully meant that many candidates found a way of finding the correct expression. Most candidates simplified their working correctly.

Answer: $3w - 2$

(b)(i)(ii) These two expressions were found by many candidates with very little working shown.

Answers: **(i)** w **(ii)** $2(w - 1)$

(c)(i) Candidates needed to look both for a connection between *h* and *T* as well as a pattern in the coefficients of the expressions in the table.

Answer: $T = (h - 1)w$

(ii) Candidates realised that they needed to substitute into the formula that they had found in part **(i)**. They substituted correctly and mostly managed to find the value of *w*. An incorrect formula that did not lead to the correct value was awarded the mark if the substitution and evaluation were correct.

Answer: 10

(d) The final question in this investigation required the candidates to find expressions as they had done already and then to find another final expression using *h* and *w*. Some candidates managed to find the formula for *T* using a trial approach and very few separate expressions were seen. There were several acceptable ways of writing the expression.

Answer: $w(2h - 1) - h$

Section B Modelling: Long Jump

Question 4

Candidates answered this question well. They showed the substitution of 3.5 and the rearrangement that led to the answer. Candidates should know not to round their answers to less than 3 significant figures.

Answer: 0.613

Question 5

(a)(i) Most candidates knew that they should plot the mean and then the line of best fit should go through the mean. They should also know that lines of best fit do not necessarily go through the bottom left corner of the graph – in this case (6.5, 6.5). Working out how the scale on the axes work is also very important; e.g. d = 7.9 was not one small square but two small squares below 8.

(ii) To find the equation of the line it was necessary to take two points to calculate the gradient and then the value of the d intercept. Candidates need to set their method out clearly so that they can earn marks for working out.

(iii) To answer this comparison question candidates needed to calculate the value of d given by their equation found in part **(a)(ii)**. They should know that writing down the working out and the answer in such questions is necessary if the marks are to be awarded. Without this value a comparison is not valid.

(b)(i) Similar to the last question candidates needed to calculate the value of d in the quadratic model again using a speed of 6.6 m/s. This calculation and value needed to be seen to support the candidate's decision.

(ii) Through this sketch the candidates needed to show that they had observed that this n-shaped curve met the r-axis just after r = 5 and that it did not meet the r-axis again given that the sketch finished at r = 12. Candidates need to make sure they are using the values on the axes as given (such as on the r-axis here) and that they know how to change the range on the d-axis so that they can get a good sketch. It is also appropriate to put a value on the d-axis to indicate the scale.

(iii) Candidates should find these values from the graph on the graphical calculator.

Answer: $5.19 < r < 9.46$

Question 6

(a) Candidates should be familiar with the sine and cosine curves. Most of the sketches had a good shape and many candidates marked an appropriate value on the y-axis.

(b) Candidates needed to take the model from the stem of this question and use the maximum value of the $y = \sin a \cos a$ graph that they had just drawn. The replacement of $\sin a \cos a$ by 0.5 gave the required formula. Candidates should be reminded that they should not start with what they are trying to show; this should be what they are working towards and so they need to look for something else to start with.

(c) For this comparison candidates needed to calculate the long jump distance given by the model in this question. This value forms part of the comparison and needs to be written down.

(d) (i) The reading of the question is very important. On seeing the words ‘Use trigonometry’ many candidates wrote down the equations for sin*a* and cos*a*. After this many made the substitution correctly and some managed to complete the working to find the formula.

(ii) This question asked the candidates to put together the information they needed. First they needed the original formula given in **Question 4** to find the vertical speed of 5 m/s. Pythagoras’ Theorem was used to find the horizontal speed and use of sine to find the angle. The answers were dependent on finding the value of *v* and those who found it were often able to go further.

Answer: $h = 8.66$, $a = 30°$