CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/11
Paper 11 (Core)

Key messages

To succeed in 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 are reminded of the need to read the question carefully, focussing on key words or instructions.

General comments

Showing workings enables candidates to access method marks in case their final answer is wrong. Workings are vital in 2-step problems, in particular with algebra and others with little scaffolding such as **Questions 17** and **19(b)**. 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 get the mark if the answer is inaccurate.

The questions that presented least difficulty were **Questions 7**, **14(a)**, **14(b)** and **19**. Those that proved to be the most challenging were **Question 8(a)** and **(b)** about discrete and continuous data, **Question 15(c)** describing transformations and **Question 18** working with functions. In general, candidates attempted the vast majority of questions. Those that were most likely to be left blank were **Questions 8(b)** and **14(e)**.

Comments on specific questions

Question 1

Candidates did quite well with this opening question where both the answers were to be found in the list of numbers given in the question.

(a) There was only one value that was correct but some gave a common multiple of 9 and 18 rather than a common factor.

(b) Those that gave a common multiple of 9 and 18 in part **(a)** often went on to get this part wrong as they gave a common factor of 6 and 12. Here there are two values that were correct but, as only one was asked for, if candidates give two values both had to be correct to get the mark.

Answers: **(a)** 3 **(b)** 12 or 36

Question 2

Some candidates found this question difficult. This may have been because it was given as a sentence and not written in symbols, as various attempts at turning it into a calculation were seen. Many did not know that ‘of’ in a mathematical sentence means multiply. A common misconception was to divide the 120 by 3 and then maybe use the 10 somewhere. Workings such as these were seen, 20 × 10 + 3 and 20 × 10 × 3. However, some showed no workings at all and gave answers such as 19, 80, 123 and 147 so it cannot be ascertained what calculation was being attempted.

Answer: 36

Question 3

Many candidates found this difficult, perhaps due to a lack of knowledge of the cube root symbol as there were many answers larger than 64, for example, 192 (from 64 × 3). Wrong answers included 6, 8, 16 and 18.

Answer: 4

Question 4

Some candidates ignored the instruction that that they should look between 20 and 30 and gave prime numbers outside this range. Others chose the non-prime odd numbers (21, 25 or 27) within the range. As with **Question 1(b)**, if two answers were given both had to be correct.

Answer: 23 or 29

Question 5

This was done correctly by many candidates. The most common wrong answer had the brackets around the 10 × 3. It is totally acceptable to try different places of the brackets but candidates need to make it clear which is the final answer.

Answer: $5 + 10 \times (3 - 1) = 25$

Question 6

Many thought that a chord across the sector was also a line of symmetry. The answer 3 came up frequently; maybe because the sector was a third of a circle.

Answer: 1

Question 7

This was the question where candidates were the most successful, with virtually all candidates getting three marks. Occasionally another year's total number of candidates was given in part **(b)**.

Answers: **(a)** 63 **(b)** 136 **(c)** Year 3

Question 8

In general, candidates found it difficult to give acceptable types of data. This question was set in context to make it more familiar to candidates but was not a question about Paris as answers were sometimes about numbers of tourists, for example. Adele has to collect data about people so for discrete data she has to ask about the number of something, for example, the number of pets or cars, what is their shoe size, how many people live in a person's flat or how many children they have. Many put answers asking for the person's gender or hair colour. These questions cannot be answered with a number and are examples of qualitative data. Examples of continuous data include asking for weight or height. More candidates got part **(b)** correct than part **(a)** but this was also the part mostly likely to be left unanswered.

Question 9

Most candidates answered with a word connected with circles but vector, symmetry line, intersection and hypotenuse were seen. Often this type of question gives a list of words to pick from but this is the more challenging version as the candidates have to produce the correct word themselves.

Answer: Chord

Question 10

There were frequently one of two incorrect lists of congruent shapes, either B and C or A, D, E, F and G. A few candidates just gave a number as their answer.

Answer: A, E, G

Question 11

The majority of candidates answered this question correctly. As this was a multiple choice question with only three answers to choose, from very few candidates left this blank.

Answer: >

Question 12

The majority of candidates were awarded both marks. There were two sorts of errors here; candidates did not finish simplifying the expression or only one of the terms in the answer was correct.

Answer: $4e - f$

Question 13

Candidates were given the total number of students asked so this question needed the number who supported Liverpool divided by the given total then multiplied by 360 to find the angle for the pie chart. A common wrong answer was 60° (from 360 ÷ 6) or 5 from (30 ÷ 6). A small number went on to draw the pie chart or just this sector of the pie chart which not asked for in the question.

Answer: 72

Question 14

(a) This part was very well done, but there were a few candidates who reversed the co-ordinates.

(b) Those candidates who had reversed the co-ordinates in the previous part often did the same when plotting point *B*, but that was not always the case.

(c) In this part, some candidates joined points *A* and *B* together. Other drew the horizontal line $y = 4$. Some, who had the line in the correct place, only drew a short line. Candidates should have taken notice of the line drawn that uses the whole grid and drawn their line full length to match. This is good practice in case a complete line is needed to answer a future part.

(d) In this part, many candidates gave (–2, 3) as their answer, the 3 being the intercept on the *y*-axis.

(e) This part asked candidates to write down the gradient of the line. The instruction, ‘write down’ should have suggested to candidates that no calculation is necessary and all that they needed to do was to write down the coefficient of the *x*-term.

Answers: **(a)** (5, 3) **(d)** (–2, 0) **(e)** $\frac{3}{2}$

Question 15

(a) This part was well done. The common errors were to reflect the triangle in the *x*-axis or not to do the correct reflection accurately enough. As the *x*-axis is also called $y = 0$ this might have caused confusion to some candidates.

(b) This part was less well done and rotations around the wrong point were often seen.

(c) This was the one of the most challenging part-questions on the paper, and few candidates managed to earn both marks.

Answer: **(c)** Reflection $y = x$

Question 16

The elements required were those that were in both set *A* and not in set *B*. Often all members of set *A* were seen as the answer.

Answer: 4 8 16

Question 17

Many candidates knew that speed is distance over time and time is distance over speed but that was not sufficient to get the method marks – the values must be substituted. Candidates who started by writing 18 ÷ 12 generally went on to get the correct answer. As the units say hours, 1.5 was the correct answer and 1:30 or 1.3 did not get the accuracy mark.

Answer: 1.5

Question 18

As in previous sessions, many candidates found working with functions challenging. Many candidates got as far as $f(36) = 5\sqrt{36}$ but did not go on to multiply the square root of 36 by 5. As this question was worth only 1 mark, candidates had to finish the calculation and get to the final answer of 30 to gain the mark.

Answer: 30

Question 19

This was a well-attempted question, with many candidates getting marks in each part.

(a) Many candidates got as far as 35 ÷ 5 but went on to incorrectly work this out. Many lower scoring candidates did not show any working and just wrote down a single value on the answer line.

(b) Virtually all candidates who showed workings decided to approach this part by multiplying out the bracket rather than dividing by 5. Sometimes when negative 35 was moved to the other side and added to 10 it turned into 35 – 10 = 25 so gave an answer of $x = 5$. Candidates must remember to show one step at a time as combining steps into one can obscure a correct move which cannot then be given a mark.

Answers: **(a)** 7 **(b)** 9

Question 20

This was a more straightforward question on solving simultaneous equations than that in previous sessions. Looking at the coefficients, the efficient way to proceed was to double the second equation then add to eliminate *y*. Some candidates rearranged both equation to equal *y*, for example, and then equated these giving, $10 - 3x = (x - 1) \div 2$. Besides elimination and rearrangement, substitution was also a method used by a few candidates. Some left the answers as rearrangements of the given equations but this did not get any marks.

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

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/12
Paper 12 (Core)

Key messages

To succeed in 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 are reminded of the need to read the questions carefully, focussing on key words or instructions.

General comments

Workings are vital in 2-step problems, in particular with algebra and others with little scaffolding such as **Questions 8**, **9**, **13** and **19**. Showing workings enables candidates to access method marks in case their final answer is incorrect. Often the workings were in disjointed parts, scattered over the available space without much thought to logic. This makes it difficult for the examiners to award method marks. 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 get the mark if the answer is inaccurate. Candidates must take note of instructions in the question about how to proceed, for example **Question 2**, or the form required for the answer, **Question 6(a)**.

The questions that presented least difficulty were **Questions 1**, **6**, both parts of **11** and **12**. Those that proved to be the most challenging were **Question 16** recognising parallel lines, **Question 18** describing transformations and **Question 20**, simplifying an algebraic expression. In general, candidates attempted the vast majority of questions. Those that were occasionally left blank were **Questions 18** and **19.**

Comments on specific questions

Question 1

Candidates did well with this opening question on the order of operations. The most common wrong answer, 10, came from working from left to right rather than doing the multiplication before the addition.

Answer: 14

Question 2

The instruction to round each figure to one significant figure was given in the question but was frequently ignored. Some candidates rounded one figure but not the other. Many worked out the value of 3.17×4.8 by long multiplication and then did some rounding; this did not get any marks. When a particular method or instruction is given in the question then that is what candidates must do.

Answer: 15

Question 3

Some candidates found this question difficult. This may have been because it was given as a sentence and not written in symbols, as various attempts at turning it into a calculation were seen. Many did not know that 'of' in a mathematical sentence means multiply. A few said $\frac{2}{3} = 0.66$ and then multiplied this inaccurate decimal by 21. Some just wrote 13 or 15 on the answer line.

Answer: 14

Question 4

A calculation such as, $200 \div 20 = 10$ was seen on occasions. Some candidates broke this down into 20% of 100 or 10% of 200 then doubled, this method was acceptable as long as no arithmetic slips were made. There were some incorrect expressions, such as $\frac{20}{200} \times 100$, but many gave the correct expression, $\frac{20}{100} \times 200$, then went on to get the correct answer. Candidates must understand the difference between finding a percentage of a number and finding one number as a percentage of another.

Answer: 40

Question 5

Many candidates gave 14 as the square number between 12 and 18. Some gave 4^2 but this was not correct as this needed to be evaluated. Some gave 3 or 6 as their answers – the workings shown suggest that those candidates thought that this was a question about common factors.

Answer: 16

Question 6

For part **(a)**, candidates occasionally gave 8 as the answer but the question asked for the answer in terms of powers of 2. For part **(b)** there were wrong answers of 6 (from 3×2) or 3×3.

Answers: **(a)** 2^3 **(b)** 9

Question 7

Some candidates tried to work out the area by counting squares, but were mostly incorrect. Some gave 16 as if they were finding the area of a square or forgetting to divide by 2. As this was worth only one mark, giving the correct expression $\frac{4 \times 4}{2}$ was not sufficient to get any credit.

Answer: 8

Question 8

As no scaffolding was given, candidates had to decide where to start. Candidates could have taken an algebraic approach and called the width w, so that $2w + 2 \times 9 = 30$ and then solved for w. Or they could have said that the perimeter minus twice the length leaves twice the width or $30 - 9 - 9 = 12$ so the width is 6 cm. A variation on this is half the perimeter is length plus width so $15 = 9 + w$ so again, the width is 6 cm.

Answer: 6

Question 9

Here, the way to start is to work out what 2 kg of pears costs. The calculation is then, $5.95 subtract the cost of the pears, which was found earlier. Some candidates made an arithmetic slip whilst calculating the cost of the pears.

Answer: $2.35

Question 10

To succeed with this type of question on LCM, candidates should break down each number into its prime factors so $12 = 2^2 \times 3$ (or $2 \times 2 \times 3$) and $16 = 2^4$ (or $2 \times 2 \times 2 \times 2$). Then the LCM will be $2^{4\times}3 = 48$. There is another method which can go wrong if candidates make arithmetic slips, that of listing out multiples of each number, i.e. 12, 24, 36, 48 and 15, 32, 48 until the first number that is common to both lists is found. Candidates should remember that for the LCM, the answer will be a multiple, so larger than the given numbers. The most common misunderstanding was to give the HCF, 4.

Answer: 48

Question 11

Candidates did very well with this question but a few candidates did confuse the order of the co-ordinates in one or both parts.

Answer: **(a)** (3, 2)

Question 12

In this question, x and y can be found independently. This is the best way to proceed as if there is an error in finding the first angle then there will be an error in the second. Using corresponding angles, x is 80. Using angles on a straight line sum to 180, gives 30 for the angle above the triangle which is equal to y (alternate angles). Using the calculated value for x with angles in a triangle add to 180 will also give $y = 30$ if x is correctly found as 80 first, otherwise there will be errors in both values.

Answer: $x = 80$, $y = 30$

Question 13

This was challenging to some candidates particularly as there was no diagram but, to mitigate this, all the co-ordinates were in the first quadrant so there were no negatives to consider. Some candidates found the mean of the x and y co-ordinates but forgot these values must be added on to point P (or taken off point Q). Some candidates did not follow the method correctly for both co-ordinates as often one was right while the other was wrong.

Answer: (6, 10)

Question 14

Some candidates did not order the examination marks before picking the middle value so gave 8, 2 or 5 (the middle of 8 and 2). Some who wrote out the marks in order missed out one mark which sometimes affected their median depending on where the error was. Even when the re-ordered list was correct, some gave the two values either side of the median, i.e. 5 and 6. For the mean calculation, some made slips in their adding up or only gave the total of all the marks, 59.

Answers: **(a)** 5.5 **(b)** 5.9

Question 15

The notation n(A) means the number of elements in A so the answer is 6, but some candidates wrote out all the 6 elements of A – if a list of elements is required then there will be set brackets on the answer line such as those seen on part **(b)**. Some gave 4, 6, 7 which is the answer to $A \cap B'$. For part **(b)**, a list of elements was required; this time all elements that appear in A or B. The order of these elements is not important but it is easier to have them in order to help the candidates when they come to check their work.

Answers: **(a)** 6 **(b)** 2, 3, 4, 5, 6, 7, 8

Question 16

The instruction here was to write down the equations of the two parallel lines and no calculation was necessary. Candidates often find questions on the equation of a straight line complex. The knowledge required for this question is that parallel lines have the same gradient. The coefficient of the x-term is the gradient, so the two lines should have the same x-coefficient and the constant terms have no bearing on the gradient.

Answer: $y = 4x - 3$ and $y = 4x + 7$

Question 17

Many candidates drew the reflection in different lines, mainly the y-axis ($x = 0$). Some had one point correct then drew the triangle in a different orientation from that point. There was a mark available for the candidate who reflected the triangle in $x = 1$.

Question 18

Describing transformations is a commonly occurring question that candidates can find difficult. This was one of the more complex as there was no diagram to use. First, candidates had to understand what was happening to f(x). In this case the effect of the –2 in this position means the function moves down by 2 so this is a translation. Many did get the correct type of transformation but some answered reflection. Some tried to explain what the –2 meant but said that the movement was up or to the left. As the question says, describe fully the single transformation, candidates who give more than one transformation did not get any marks.

Answer: Translation, $\begin{pmatrix} 0 \\ -2 \end{pmatrix}$

Question 19

This was the question that was missed out the most often. The first point is that candidates must be able to recall that the domain of a function is the x-values that are being used and the range is the answer values when the function is applied. So, using the domain values in order, the function gives 7, 3, 7 and 12. There is no need to list the 7 twice so the domain is {3, 7, 12}. Some candidates gave only one value as their answer. Others operated on the domain values and gave $3 - (-2) = 5$ without using the function at all.

Answer: 3, 7 and 12

Question 20

This is the question that candidates found the most challenging with many cross-multiplying the two fractions. There are two steps to this question, cancelling an e from the numerator and denominator and multiplying the 3 and the 5 in the denominator and these can be done in either order.

Answer: $\frac{2f}{15}$

Question 21

Most candidates wrote down the integers between –3 and 1 (–2, –1, 0) which is only part of the answer as the ends of the interval have to be considered. The integer 1 must be included in the answer as the sign means x is less than or equal to 1. As the other sign means x is greater than –3, –3 is not included in the answer.

Answer: –2, –1, 0, 1

Question 22

This was a much more straightforward question on solving simultaneous equations than those in previous sessions. As both equations had a coefficient of –1 for y, the simplest method was to take one from the other to eliminate the y. Other methods such as substitution or rearrangement would work but given these particular equations, elimination was the simplest method to use.

Answer: $x = 2$, $y = 3$

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/13
Paper 13 (Core)

Key messages

To succeed in 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 are reminded of the need to read the questions carefully, focussing on key words or instructions.

General comments

Workings are vital in two step problems, in particular with algebra and others with little scaffolding such as **Questions 13**, **14**, **15** and **21**. Showing workings enables candidates to access method marks in case their final answer is incorrect. Often the workings were in disjointed parts, scattered over the available space without much thought to logic. 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 get the mark if the answer is inaccurate. Candidates must take note of the form or units that are required, for example, in **Questions 4**, **18** and **22**.

The questions that presented least difficulty were **Questions 1**, **5(a)**, **7**, **9(b)** and **12**. Those that proved to be the most challenging were **Question 16(b)**, bearings, **Question 18**, a calculation in standard form, **Question 19**, describing transformations and **Question 20**, vectors. In general, candidates attempted the majority of questions rather than leaving many blank. Those that were occasionally left blank were **Questions 16(b)**, **20** and **22**.

Comments on specific questions

Question 1

Candidates did very well with this opening question. Those who were not correct mostly put 3.7 or 370 or answered with the fraction $\frac{37}{100}$.

Answer: 37

Question 2

This was done well with many getting the correct answer. Wrong answers that were seen included 1296 (36^2), 42 (an error for 7^2), 72 (2×36), 6 ($\sqrt{36}$) and 40.

Answer: 49

Question 3

This was answered correctly in the vast majority of cases but some candidates tried to work out the number of days in 5 years. Candidates must check they follow the instructions given in a question.

Answer: 60

Question 4

This was one of the easier types of conversion question in that it wanted linear centimetres converted to metres rather than working in area or volume units. Incorrect answers of 26 showed that some candidates did not know the number of centimetres in a metre.

Answer: 2.6

Question 5

Many candidates read the distance-time graph correctly to find Sammy's distance from Geneva at 11am. Candidates had more difficulties working out the length of time for the return journey from Berne with some giving the time Sammy arrived back in Geneva or including the time he spent in Berne. Part **(b)(ii)**, finding the average speed of the return journey, was the part that candidates found the most challenging so far in the paper. Often candidates did not show any workings to show that they understood how to calculate speed and did not appreciate that they needed their previous answer to help with this part.

Answers: **(a)** 80 **(b)(i)** 2 **(ii)** 80

Question 6

Sometimes candidates shaded one correct and one incorrect square. An error seen a few times was for candidates to shade the third square down on the first column and the fourth on the last column.

Question 7

This was another well answered question. Occasionally heptagon was given as the answer or the answer space was left blank.

Answer: Octagon

Question 8

Again, like the last question, this was generally either the correct answer or left blank.

Answer: Obtuse

Question 9

Some candidates drew their line through $y = 3$, parallel to the given line, L. Other candidates drew a line in the correct place but too short. It is good practice to draw full length lines utilising the whole grid as there could be a follow-on question that needs it. Also, as there is already a line drawn on the grid using the full width, the required line should follow that example. In part **(b)** the intersection of the two lines was asked for which should have indicated that if the line drawn in part **(a)** did not intersect with line L, they must have made an error. Even so, there were some candidates who just wrote that the lines do not intersect without checking that their line was in the correct place.

Answer: **(b)** (3, 2)

Question 10

This question was made more difficult by not providing a diagram. Many candidates did not realise that the two points would be on the same horizontal line on a grid so tried to use Pythagoras' theorem. Some marked the points on the grid in the question above and then realised what they had to do was to find the difference between 5 and –3. Drawing a quick diagram is always useful in this type of question to make sure a situation is understood.

Answer: 8

Question 11

Often in questions of this type the function is given, but this is the more complicated type when the relationship has to be determined. Here, the relationship appears to be 'add 5' which is confirmed by checking the values, so the answer is 14 + 5 = 19. This can also be done by seeing the connection between adjacent values in the domain and range, for example, there is gap of 2 between 1 and 3 in the domain and it is the same for 6 and 8 in the range. The gap between 6 and 11 is 5 and it is the same in the range. The fact that the gaps match across from domain to range means that as the gap between 11 and 14 is 3, the value in the domain should be 16 + 3, again giving an answer of 19. If using this approach, candidates should check all values.

Answer: 19

Question 12

This was the best answered question on the paper. Answers of 40 were occasionally seen as the candidates had added the last two terms together.

Answer: 21

Question 13

Candidates found this question far more challenging than **Question 12** with some giving 19 as their answer – this is the next term. Some gave the term-to-term rule, +3. The common error with the nth term expression is to give $n + 3$, i.e. the coefficients are the wrong way around. Some tried to use $a + (n - 1)\,d$ but then did not know how to substitute the first term and common difference into this expression.

Answer: $3n + 1$

Question 14

The pie chart with the angle of 120° means that $\frac{1}{3}$ of the students are boys, so with a total of 60, 20 of the students are boys. Some candidates gave 6 (from 360 ÷ 60) or 40 (from 360 – 120 = 240, 240 ÷ 60 = 40, the number of girls).

Answer: 20

Question 15

Many candidates got as far as 180 – 148 = 32 and then either did not know what to do next or assumed this was the answer. Others worked out 360 – 148 = 212 as the two base angles. A few measured angle x, which should not be done unless the candidates are told to do so.

Answer: 16

Question 16

Due to an issue with this question, careful consideration was given to its treatment in marking in order to ensure that no candidates were disadvantaged. In direct comparison with the previous question, this angle must be measured. The angle is acute so the candidates that gave an answer over 90 should have realised that they had the wrong answer and should try again. Part **(b)** was the one that many candidates found the most challenging on the paper and it was also omitted most often. All that is required is to put a zero in front of the angle found in part **(a)** to give a three figure bearing. Many gave the length of the line *PQ* or a compass direction. A very small number calculated $360 - 75 = 285$ even though the instruction used was write down.

Answers: **(a)** 75 **(b)** 075

Question 17

To succeed with this type of question on HCF, candidates should break down each number into its prime factors so $54 = 2 \times 3^3$ (or $2 \times 3 \times 3 \times 3$) and $72 = 2^3 \times 3^2$ (or $2 \times 2 \times 2 \times 3 \times 3$). The HCF will then be made from the factors that appear in both numbers, $2 \times 3^2 = 18$. Students should remember that for the HCF, the answer is a factor, so smaller than the given numbers. The most common misunderstanding was to give one of the other common factors, 2, 3 or 9.

Answer: 18

Question 18

This was a challenging question for many candidates. Often the answer was given in full or in incorrect standard form, for example 12×10^{10}. Both of these answers gained a mark; however, answers such as 12^{10} did not get any marks.

Answer: 1.2×10^{11}

Question 19

Describing transformations from a diagram is a question that often comes up. The two trapezia are the same size so this is not an enlargement. This is a rotation of 90° clockwise to go from *A* to *B* and the direction must always be checked. It is sometimes more difficult to determine the centre of rotation but this is about the origin, one of the easiest place to check. Candidates must use the proper mathematical word rotation as turn will not be sufficient. Instead of the origin, (0, 0) is an acceptable alternative.

Answer: Rotation, 90° clockwise, about the origin

Question 20

Like **Question 10**, this is one without a diagram which makes it more difficult. It would be sensible to draw a sketch grid and mark the two points so the vector can be worked out with confidence. Both points are in the first quadrant which makes it simpler. A few tried to use Pythagoras' theorem and some added the co-ordinates. A few used fraction lines between the vectors entries – this is not correct.

Answer: $\begin{pmatrix} -3 \\ -6 \end{pmatrix}$

Question 21

Many candidates found the probability of choosing a green bead correctly by adding the probabilities of choosing the other two colours and taking this from 1, but a few did not perform this last step. From the question the probability of choosing a blue bead is $\frac{5}{8}$ and there are 40 beads in total so candidates had to calculate $\frac{5}{8} \times 40$ in part **(b)**.

Answers: **(a)** $\frac{2}{8}$ **(b)** 25

Question 22

Deriving an expression is an area of algebra that challenges many candidates. Some left their answer as $x = 25$ and $y = 45$ or gave both terms but missed out the addition sign. Others added 25 and 45 so their answer was 70.

Answer: $25x + 45y$

Question 23

This was a fairly straightforward question on solving simultaneous equations. Here, using the elimination method, both equations have to be multiplied in order to equate coefficients. Some candidates rearranged both equations to equal *x*, for example, and then equated these giving $(21 - 2y) \div 3 = (5 - 5y) \div 4$. Besides elimination and rearrangement, substitution was also a method used by a few candidates. Some left the answers as rearrangements of the given equations but this did not get any marks.

Answer: $x = 5$, $y = 3$

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/21
Paper 21 (Extended)

Key messages

Candidates should ensure that they have learnt all areas of the syllabus as it was clear that some of the best candidates had gaps in their knowledge. They should understand that they will not be required to carry out lengthy multiplication or division which would indicate that either they should be cancelling or they have gone wrong. For example, they will never be required to multiply by 3.142 for pi. Candidates should be careful in transferring their working within the question or to the answer line as simple errors involving changing or omitting a sign/power/multiplier can be costly.

General comments

Candidates were generally well prepared for the paper and demonstrated good understanding and knowledge across most of the topics tested. Indeed, a number of candidates scored full marks. Candidates generally attempted all of the questions and were able to complete the paper within the time. Solutions were well set out and the correct processes chosen and used efficiently. However, it was common to see a wide variety of basic arithmetic errors (**Questions 1(a)**, **4**, **9(a)**, and **12(a)**) and sign errors when manipulating algebraic expressions (**Questions 3**, **6(b)**, **10** and **13**) which for some candidates led to a significant loss of marks over the whole paper. In addition, many candidates did not leave their answers in the correct form (for example, **4(a)** needed to be written as a fraction) or had the correct answer and then spoilt it (for example, **6(a)** multiplying out and then re-factorising or **6(b)** factorising and then re-expanding).

Comments on specific questions

Question 1

(a) Most candidates answered this question correctly. However, a common wrong answer was –17, demonstrating a lack of understanding of order of operations.

(b) Whilst most candidates were successful, it was evident that a number of candidates did not recognise the cube root and a variety of wrong answers were seen.

Answers: **(a)** –1 **(b)** 0.1

Question 2

(a) Whilst there were many candidates who measured the angle accurately, some were not within the tolerance and others had measured the obtuse angle.

(b) The majority of candidates answered this correctly.

(c) The candidates who worked out $\frac{360}{18}$ generally scored full marks. However, many candidates tried to use $\frac{(18-2)\times 180}{18}$ or similar. Because they tended to multiply out the numerator first, rather than cancel, arithmetic errors were common. In addition, of those reaching 160°, a significant number then used 360° instead of 180° to arrive, incorrectly, at 200°.

Answers: **(a)** 234° **(b)** 100° **(c)** 20°

Question 3

Most candidates recognised that you could eliminate the *x* immediately and many candidates solved the equations correctly. However, a significant number of candidates made errors that arose from the subtraction $-3y-(-2y)=7-5$, wrongly giving, for example, $y = 2$ or $-5y = 12$. These candidates were frequently awarded an SC1 mark for giving an answer for both *x* and *y* that satisfied one of the given equations.

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

Question 4

(a) Most candidates answered this correctly. The most common error was to give an equivalent fraction not in its lowest terms.

(b) Many candidates answered this correctly. A common error arose from candidates getting as far as $\frac{3}{7}\times\frac{9}{8}$, but then making errors with their multiplication tables. Other candidates made the denominators the same but frequently could not progress beyond $\frac{27}{63}\div\frac{56}{63}$.

Answers: **(a)** $\frac{17}{25}$ **(b)** $\frac{27}{56}$

Question 5

Whilst many candidates could deduce the *n*th term by inspection, many others found the second difference to be 2 and correctly deduced that the *n*th term was a quadratic. These latter candidates often used $an^2 + bn + c$ and attempted to set up simultaneous equations to find *a*, *b* and *c*. Only a few candidates were successful in finding the three coefficients correctly by this approach.

Answer: $(n-2)^2$

Question 6

(a) This question was answered very well with many candidates scoring full marks. The loss of marks arose mainly from errors in combining the $-7pq + 2pq$ incorrectly to give, for example, $-9pq$ or $+5pq$. Some candidates spoilt what would have been a correct answer by re-factorising their expansion.

(b) This question was completed well by many candidates who recognised the type of factorisation and then demonstrated partial factorisation before completely factorising. The most common loss of marks came either from errors with signs or from reaching expressions similar to $2 - t + a(t - 2)$ but being unable to proceed further.

Answers: **(a)** $2p^2 - 5pq - 7q^2$ **(b)** $(1 - a)(2 - t)$

Question 7

A significant number of candidates scored full marks on this question. However, there were many others who clearly had some recollection of the circle theorems but did not apply them correctly. Errors commonly seen included starting with $140 + x = 180$ or $y = 140 \div 2$. However, many of these candidates were awarded an SC1 if *their* x + *their* $y = 180$.

Answer: $x = 70$ $y = 110$

Question 8

Whilst many candidates answered this easily, it was clear that others did not know what 'varies inversely' meant. Others correctly set up an equation such as $y = \frac{k}{x^2}$, but made slips in the arithmetic to accurately find the value of k. A small minority of candidates had the correct answer but then spoilt it by square rooting and giving a final answer of $y = \frac{6}{x}$.

Answer: $\frac{36}{x^2}$

Question 9

(a) Whilst many candidates gave the correct answer, there were a number of candidates who clearly did not know how to deal with a fractional index. Answers including 3, 81, –3 and 18 were seen.

(b) Many candidates struggled to cope with the question given in this form and they possibly would have done better if they had thought of it as $\frac{18h^{18}}{3h^3}$. Whilst a number of candidates did score full marks, others were frequently able to score one mark for having either the numerical or the algebraic part correct.

Answers: **(a)** 9 **(b)** $6h^{15}$

Question 10

Many candidates demonstrated that they were able to rearrange the given formula efficiently with many dividing by the $2a$ as one entity. The most common errors seen were dividing by the $2a$ first but omitting to divided the u^2 term by $2a$, rewriting $u^2 - v^2$ as $(u - v)^2$ and a range of sign errors.

Answer: $\frac{u^2 - v^2}{2a}$

Question 11

There were many correctly shaded regions, with more candidates shading the two set diagram correctly than the three set one. Candidates thus showed that they understood union and complement. The three set diagram caused more problems with the brackets and the union and the intersection to think about.

Question 12

(a) This was answered well by most candidates. Whilst the easiest way to answer this was to square root the 100, other candidates were successful after writing 700 as a product of its prime factors and taking out the pairs. Common errors seen included $7\sqrt{10}$ and $10\sqrt{70}$.

(b) Many candidates recognised that they needed to multiply the given expression by $\frac{7+\sqrt{2}}{7+\sqrt{2}}$ and many went on from here to successfully complete the question. The most common errors made from those not scoring full marks were made in the calculation of the denominator giving $\left(7-\sqrt{2}\right)\left(7+\sqrt{2}\right)=49-4$ or 49 + 2 or 14 – 2. In addition, a not uncommon error was for the numerator to go from $7+\sqrt{2}$ to $7\sqrt{2}$.

Answers: **(a)** $10\sqrt{7}$ **(b)** $\frac{7+\sqrt{2}}{47}$

Question 13

Candidates who were familiar with this type of question were able to factorise both the top and the bottom, then cancel out the common factor, to achieve the correct answer. However, some of these candidates then went on to try to simplify the correct expression further, giving $\frac{t}{3+t}=\frac{1}{3}$. Many candidates could not recognise the denominator as the difference of two squares, although a number scored one mark for factorising the numerator. Many candidates merely crossed out the two t^2 terms, given in the question, leading to $\frac{t}{3}$.

Answer: $\frac{t}{3+t}$

Question 14

(a) Candidates found this part more difficult than part **(b)**. Whilst a number of correct answers were seen, common incorrect answers included 2, –2, 3^2, 9 and 27.

(b) Many candidates demonstrated some understanding of logs and many were awarded at least one mark for some evidence of using a rule of logs correctly. Whilst many gave the correct answer, 44, those giving their answer as log44 were only awarded the method mark. The most common error was to give the answer 15 from 2log2 + log11 = log4 + log11 = log15.

Answers: **(a)** $\frac{1}{2}$ **(b)** 44

Question 15

The most able candidates were able to recognise that both the sector arc and sector area needed to be considered by using two distinct equations or ratios. Frequently these candidates were able to find the sector angle as 30° or as $\frac{1}{12}$ of the whole circle. Others were able to put their equations together to find *k* directly. A common misconception by many of the other candidates was to think that the area could be found by simply multiplying the $\frac{4\pi}{3}$ by $\pi \times 8^2$. The hardest part for many was the manipulation of the fractions and candidates would find the arithmetic less onerous if they cross cancelled. However, a greater proportion of candidates than in previous sessions, were cancelling the π rather than multiplying by 3.142 and then attempting to divide by 3.142 later on.

Answer: $\frac{64}{12}$

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/22
Paper 22 (Extended)

Key message

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 know the correct mathematical description of 2–D shapes.

If a question asks candidates to expand brackets then their final answer cannot be in factorised form.

General comments

The majority of candidates were well prepared for the paper and demonstrated very good algebraic skills. However, a significant number of candidates were not able to correctly convert times in minutes into hours. Many candidates lost marks through careless numerical slips. 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. Many candidates lost marks through incorrect simplification of a correct answer.

Comments on specific questions

Question 1

This question was poorly answered. The most common incorrect answers were parallelogram and rhombus. In addition there was a significant number of candidates that did not attempt the question.

Answer: trapezium

Question 2

In general this question was very well answered.

Answer: 63

Question 3

Again, this question was very well answered.

Answer: 0.3

Question 4

This was very well answered. Nearly all the candidates scored the mark for the correct answer of 61 or 67 and very often both values were given.

Answer: 61 or 67

Question 5

Nearly every candidate obtained the correct answer.

Answer: 4

Question 6

Alternative forms of the correct answer were given and a number of candidates identified 2 and 3 as prime factors, but did not give a correct form for the second mark.

Answer: $2 \times 2 \times 3 \times 3$

Question 7

Most candidates scored both marks. Candidates who did not arrive at a correct final answer scored one mark for correctly moving one term. A common error was changing the sign even though there was division by a positive number.

Answer: $x < -2$

Question 8

Most candidates scored full marks. There was confusion for some candidates who found the gradient of the line *AB.*

Answer: (3, 7)

Question 9

Nearly all candidates were able to obtain the correct answer.

Answer: $\frac{41}{15}$

Question 10

This question was very well answered. Some candidates read from the wrong axes and found 75 – 25 giving an answer of 50.

Answer: 19

Question 11

Most candidates were very successful on both parts. Some candidates gave an answer of the form $a + 4n$ in part **(b)**.

Answers: **(a)** –3 **(b)** $17 - 4n$ oe

Question 12

Many candidates scored full marks. However, a significant number of candidates correctly found the three surds but were unable to simplify to the final answer, with 0 being a popular incorrect answer.

Answer: $6\sqrt{3}$

Question 13

The majority of candidates correctly answered the first part of the question, but the second part was found to be more challenging. Candidates are to be commended for their very clear shading.

Question 14

This was generally well answered by the majority of candidates. Some candidates were unable to substitute a given point with their calculated gradient into the general equation of a line.

Answer: $y = 4x - 5$

Question 15

There were many good attempts by the majority of candidates. The common error was collecting like terms, with $-9xy - 25xy = -36xy$ being seen frequently.

Answer: $15x^2 - 34xy + 15y^2$

Question 16

Many candidates scored two marks realising that they had to cube 0.4. However, a significant number of these candidates struggled with the place value and gave a final answer of 0.64.

There was a significant number of candidates who thought the question was without replacement and tried to calculate $\frac{4}{10} \times \frac{3}{9} \times \frac{2}{8}$.

Answer: 0.064

Question 17

The majority of candidates scored full marks. A common error was the signs inside the brackets. This question was poorly answered on a significant minority of scripts where candidates did not gain any marks.

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

Question 18

Whilst this was a tricky algebraic question, there was a significant number of fully correct answers.

Many candidates scored two marks, one for finding a correct denominator and one for a correct expansion of brackets.

The most common error was to omit the brackets when subtracting $(n - 1)^2$.

Answer: $\frac{4n}{n^2 - 1}$

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/23
Paper 23 (Extended)

Key message

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 and answer the questions carefully.

Candidates must understand the difference between a rational and irrational number.

General comments

The majority of candidates were well prepared for the paper and demonstrated very good algebraic skills. 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. Many candidates lost marks through incorrect simplification of a correct answer. Candidates need to be able to sketch trigonometric graphs ensuring that key points on the graph are in the correct position.

Comments on specific questions

Question 1

Many candidates scored full marks. In part **(a)** there was a significant minority who gave their answer as –3. There were a number of candidates in part **(c)** who had the gradient inverted.

Answers: **(a)** $x = -3$ **(b)** (–3, 2) **(c)** $-\frac{1}{2}$

Question 2

This question was well answered by the majority of candidates. The common mistake was candidates finding the lowest common multiple.

Answer: 12

Question 3

The majority of candidates scored full marks. The common mistake occurred in the expansion of the second bracket.

Answer: $16x + 3y$

Question 4

Nearly all candidates scored this mark.

Answer: 1

Question 5

Again, there were many fully correct answers where the method was clearly visible. Some candidates however were unable to simplify $\frac{300}{20}$ correctly.

Answer: 15

Question 6

This question was found difficult and full marks were rare. In part **(a)** a popular incorrect answer was $\frac{5.5}{7}$. In part **(b)** many candidates gave a rational number.

Question 7

Candidates found this question difficult and full marks were rarely seen. In part **(a)** many candidates added the vector *PQ* to the given point. In part **(b)** candidates found it difficult to square a negative number.

Answers: **(a)** (9, 4) **(b)** $3\sqrt{5}$

Question 8

Candidates realised the demands of the question but found converting one of the given numbers into a suitable form challenging.

Answer: 4.82×10^{-7}

Question 9

Virtually all candidates correctly answered this question. The common mistake was candidates dividing 18 by 5.

Answer: 3, 15

Question 10

Candidates were able to demonstrate their excellent algebraic skills, although some candidates lost one mark through careless arithmetic.

Answer: $x \leqslant -4$

Question 11

Parts **(a)** and **(c)** were well answered. In part **(b)**, candidates did not realise that the sample size was large.

Answers: **(a)** $\frac{50}{300}$ **(b)** large sample **(c)** 200

Question 12

(a) There were many correct answers to this question. Some candidates were able to deal with the shape of the graph correctly but were then unable to label any correct values on the *y*-axis.

(b) This part proved to be too demanding for the majority of candidates.

Answer: 30, 150

Question 13

The majority of candidates knew how to find the height of the bar in part **(a)**. In part **(b)**, candidates who scored both marks in part **(a)** normally were able to find the correct value of 14.

Answer: **(b)** 14

Question 14

This part was a challenge with candidates being confused with *x* occurring twice in the equation. Candidates were able to correctly eliminate the fractions but were then unable to collect like terms.

Answer: $x = \dfrac{cy}{a - by}$

Question 15

In part **(a)**, the majority of candidates knew the basic rules of logs but full marks were lost by many candidates who gave their final answer as $\log\left(\dfrac{8}{25}\right)$. Part **(b)** proved to be a suitable challenge for the final question on the paper.

Answer: **(a)** $\dfrac{8}{25}$ **(b)** 64

INTERNATIONAL MATHEMATICS

Paper 0607/31
Paper 31 (Core)

Key messages

Candidates must remember to write their answers correct to three significant figures unless stated otherwise in the question. Some candidates lost quite a number of marks by writing their answers to 2 significant figures or incorrect to 3 significant figures without showing any working out. Candidates must show all their working out in order to gain method marks if their answer is not correct. Candidates need to have studied the entire content of the Core syllabus.

General comments

Most candidates managed to attempt all the questions in the time allocated. Candidates need to have the correct equipment for the exam: this includes a ruler, sharp pencil, protractor and graphics calculator. It appeared as if quite a number of candidates did not have a graphics calculator or, if they did, then they did not know how to use it. Also, some candidates seemed not to have had a calculator at all as long multiplication and division was seen in a few scripts. Some candidates lost marks because they did not answer to the correct level of accuracy. Many candidates were not able to be given credit as they did not show their working out. If working is shown, method marks can be awarded if the candidate gets the final answer incorrect.

Comments on specific questions

Question 1

(a) (i) Most candidates managed this question, although a few omitted the negative sign.

(ii) Many correct answers were seen. A few candidates missed out the negative sign and some worked out 5.2 – 3 first and then multiplied their answer by 4.1.

(b) (i) Many correct answers were seen here, but some candidates lost the mark by writing 3.76.

(ii) Most candidates found the correct term. Some gained one mark by writing a correct fraction but not in its lowest terms.

(c) Although many candidates did find the correct order, others wrote the terms in descending order instead.

(d) (i) The majority of candidates managed to write 2076 in words.

(ii) A large minority of candidates could not write this number in figures.

Answers: **(a)(i)** –7.4 **(ii)** –7.1 **(b)(i)** 3.77 **(ii)** $\frac{16}{25}$ **(c)** 0.55, 55.5%, $\frac{5}{9}$
(d)(i) two thousand and seventy six **(ii)** 2 550 002

Question 2

(a) At least half of the candidates divided the numbers the wrong way round and wrote 2.5 as their answer.

(b) (i) Many candidates were able to write the number to one decimal place. A few lost the mark by writing 358.2.

(ii) Here too, there were many correct answers.

(b) (iii) Again, many candidates could write the number to the nearest 10. Some candidates lost marks by writing 360 000 which was not correct.

(c) Many candidates managed to find the correct answer. A few lost a mark by writing 205 or 205.3.

(d) Although there were many correct answers here, some candidates just divided 630 by 8 and 13 for their answer. Other answers appear to have been guesses but the numbers did not add up to 630.

Answers: **(a)** 0.4 **(b)(i)** 358.3 **(ii)** 358 **(iii)** 360 **(c)** $205.32 **(d)** 240 : 390

Question 3

(a) There were many correct answers here. Some candidates just added up all the numbers in the table and hence were awarded no marks.

(b) Here too there were many correct or follow-through answers. Some candidates multiplied 255 by 2500.

(c) There were many correct answers to this question. Occasionally the change received was not correct.

Answers: **(a)** 255 **(b)** 10.2 **(c)** 15 bagels, $0.25 change

Question 4

(a) A good number of candidates found the correct LCM. A few wrote 1 as their answer.

(b) Fewer could find the correct HCF. Some candidates wrote 2 or 3, but others wrote an LCM instead.

(c) There were not many correct answers seen for the original investment. Many candidates took $78 as the principal instead of the interest.

(d) There were a few more correct answers to this part. Some candidates managed to score one mark for finding 3.2% of $800.

(e) Many candidates could change 8 km to metres but few divided this answer by 60.

Answers: **(a)** 56 **(b)** 6 **(c)** 650 **(d)** 852.02 **(e)** 133

Question 5

(a) The majority of candidates found the correct number of pages but a few added up incorrectly and others multiplied the numbers to get 651.

(b) Finding the mode proved difficult for a lot of candidates. Many wrote 13 or 16 as their answer.

(c) Fewer candidates could find the median correctly. 10 and 11.5 were common answers.

(d) Here too, there were few correct answers. The most common answer given was $\frac{69}{6} = 11.5$.

(e) Nearly all candidates drew the bar graph correctly.

Answers **(a)** 69 **(b)** 7 **(c)** 8 **(d)** 9.43

Question 6

(a) (i) Many candidates found the correct answer, but 48 and 132 were also often seen.

(ii) Here candidates could gain a follow-through mark for writing the same answer as their part **(a)(i)**. Again, 48 was given quite often as the answer.

(iii) Most candidates gave either the correct answer or a correct follow-through answer and so gained the mark.

(iv) Again, most candidates gave either the correct answer or a correct follow-through answer and so gained the mark.

(v) This was the angle in a semi-circle and the candidates should have known that it was 90. However, not very many managed to get this correct. Once again 48 was a common answer.

(vi) A follow-through mark could be gained here. Quite a few candidates did have the correct answer.

(b) (i) Many candidates could find the circumference although some lost a mark because of accuracy. This was often because they had used 3.14 for pi instead of the calculator value.

(ii) Very few candidates knew what to do here. Many just tried to find the length of the chord *SR* suggesting that the term minor arc was unfamiliar.

(iii) As in part **(i)**, there were many correct answers here. Again, a few lost a mark due to lack of accuracy.

(iv) Very few correct answers were seen here. Some tried to find the area of triangle *SOR* suggesting that the term minor sector was unfamiliar.

Answers: **(a)(i)** 42 **(ii)** 42 **(iii)** 96 **(iv)** 84 **(v)** 90 **(vi)** 48 **(b)(i)** 18.8 **(ii)** 4.40 **(iii)** 28.3 **(iv)** 6.60

Question 7

(a) Many candidates correctly answered right angle and acute angle, but a high proportion wrote obtuse for the reflex angle.

(b) There were many correct answers here. Some candidates managed to pick up a mark by adding up the angles correctly.

Answers: **(a)** right, reflex, acute **(b)** 110

Question 8

(a) (i) The majority of candidates could complete the branches of the tree diagram correctly.

(ii) Here there were few correct answer. Many candidates just wrote 0.18 as their answer. Others added 0.64 and 0.18 instead of multiplying them.

(b) Many candidates found the correct answer. The most common incorrect answer was 21.

Answers: **(a)(i)** branches 0.64 and 0.36, 0.82 and 0.18, 0.15 and 0.85 **(ii)** 0.1152 **(b)** 9

Question 9

(a) Most candidates managed to plot all four points correctly. Others managed to plot two or three correctly.

(b) Many candidates knew that this was ‘negative’ but a few wrote ‘positive’ or ‘descending’ or other similar answers.

(c) (i) Most managed to find the mean height correctly although 2500 was also seen.

(ii) Although many candidates found the mean temperature, many of them lost the mark due to lack of accuracy.

(d) (i) Many candidates found it difficult to plot their mean in approximately the correct place on the graph.

(ii) Many managed to draw a ruled line but it was not always through their mean point. Some candidates lost both marks because they did not draw a ruled line.

(iii) Follow-through marks were awarded in this part for their ruled lines.

Answers: **(b)** negative **(c)(i)** 1930 **(ii)** 2.36 **(iii)** –11.5 to –10.5

Question 10

(a) (i) Candidates found the inequality challenging. Many just tried to substitute numbers for x into the equation. Some managed to gain a mark by writing $2x < 18$.

(ii) This was not well attempted. Some candidates knew to put an empty circle at 9 and then an arrow towards the left. Some had filled in circles and some had the arrow going in the wrong direction.

(b) Many candidates managed to solve the equation correctly. Some candidates managed to gain one mark by making a correct first step.

(c) Many candidates found this part difficult. Some candidates managed to write three terms in the expansion correctly. A common mistake was to write $2x$ or $3x$ instead of $2x^2$.

(d) (i) Most knew to add the indices, although a few multiplied them.

(ii) Here too, many knew to subtract the indices but some divided them.

Answers: **(a)(i)** $x < 9$ **(b)** 8 **(c)** $2x^2 + 5x – 3$ **(d)(i)** r^5 **(ii)** r^6

Question 11

(a) Many of the candidates appeared not to have used the window given in the question, because the maximum point was often far above the 10. Also, the x-axis intercepts were not always approximately in the correct places. Some candidates just omitted this question – perhaps they did not have a graphics calculator.

(b) For those candidates who managed to draw the parabola correctly, this was well attempted with many correct answers.

(c) Those who drew the parabola correctly also managed to find the maximum point.

(d) (i) There were more candidates who managed to draw the line. However, some lost a mark because their line cut the y-axis over half-way down or their gradient was too steep.

(ii) There were very few correct answers for this part. Most of the candidates did not appear to realise that they could use their calculator to find the points of intersection. Most tried to solve the equation algebraically without success.

Answers: **(b)** (1, 0) and (5, 0) **(c)** (3, 8) **(ii)** 0.863 and 4.64

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/32
Paper 32 (Core)

Key messages

To succeed in this paper, it is essential that candidates have completed full syllabus coverage. Sufficient working should be shown, the requirements on accuracy must be observed and full use made of the functions of the calculator.

General comments

The majority of candidates were able to tackle this paper with some confidence and it was clear that there were no problems in completing it in the available time. There was no syllabus area where candidates made no attempt at the question. The questions on number, sequences and probability were answered successfully by most candidates. The questions on trigonometry and exponential change caused the greatest difficulty and there were candidates who struggled to manipulate successfully the change of time from a decimal number of hours to a time in hours and minutes.

Mention should also be made of the necessity to write legibly. The examiner must be able to recognise what the candidate has written, but instances were also seen where the candidate himself or herself misread a badly written digit.

Comments on specific questions

Question 1

Most of this question was answered well by a majority of the candidates.

(a) Nearly all the candidates wrote down correctly the number of days in 6 weeks.

(b) Although most candidates wrote the correct answer, 1527 and 1500 027 were also seen.

(c) (i) Among a large number of correct answers, common errors in this part were 140.0 and 144. A few candidates thought that the position of the decimal point had to change and wrote 14.41.

(ii) While many answers were correct, common errors arose in this part when candidates took a two-step approach, correcting the given number first to 5.535 and then to 5.54. There were also examples of the decimal point being moved to give 553.49.

(iii) Once again there were many correct answers, but a few candidates did not consider the 0 after the 5 to be a significant figure and gave answers of 50 600.

(d) (i) This part was answered well.

(ii) A large majority of candidates, but by no means all of them, answered this correctly.

(e) Nearly all the candidates used their calculators to obtain the correct answer.

Answers: **(a)** 42 **(b)** 15 027 **(c)(i)** 140 **(ii)** 5.53 **(iii)** 51 000 **(d)(i)** $\frac{7}{10}$ **(ii)** 70 **(e)** 0.343

Question 2

(a) Almost all the candidates completed the table correctly. A few gave only a tally and there were some examples of miscounting.

(b) The correct answer was almost always given.

(c) Although many candidates ruled very neat bar charts, there were a few very untidy freehand drawings which were not of an acceptable standard. A bar chart requires gaps between the bars and a few candidates omitted to provide these.

(d) (i) Many candidates wrote the correct fraction $\frac{80}{360}$ and cancelled to give the answer. There were occasional errors in cancelling, some multiplied by 100 to give a percentage, and a number multiplied their fraction by a number of hours. There were a few examples of $\frac{360}{80}$.

(ii) A few candidates tried to find the time spent on one of the other subjects, but the major error in this part was the candidates' inability to convert time in hours into minutes. Instead of converting the total time to 180 minutes before attempting any work, many used 3 hours in their calculation and the resulting answer of 1.25 hours was frequently converted to 1 hour and 25 minutes giving a final wrong answer of 85 minutes.

Answers: **(a)** 8, 4, 7, 5, 1 **(b)** 1 **(d)** $\frac{2}{9}$ **(d)** 75

Question 3

Most candidates found this question to be straightforward.

(a) (i) Nearly all the candidates wrote the co-ordinates correctly although there were a small number who reversed the x and the y co-ordinates.

(ii) This part was similar to part **(a)(i)**, with the actual values nearly always correct but occasionally written in the wrong order.

(b) A vertical ruled solid line was required here and it had to be recognisably in the centre of the trapezium. Some of the attempts were obviously at an angle or too far from the centre to be correct. A few candidates drew diagonals on the figure or a horizontal line.

(c) The question asked candidates to measure the angle marked p and any attempts at trigonometry were therefore not accepted. It was the use of protractors that was being tested here and once again many candidates gave good answers.

Answers: **(a)(i)** (0, 2) **(ii)** (5, –1) **(c)** 54 to 58

Question 4

It was clear from the answers to this question that most candidates were generally familiar with the vocabulary.

(a) There was a choice of correct answers here and while many gave a correct answer, the word trapezium appeared regularly.

(b) Many candidates answered isosceles, although there were a variety of spellings. Scalene and equilateral appeared occasionally.

(c) This was answered well.

(d) Although rhombus was the answer given by many candidates, the non-mathematical word diamond appeared quite often, particularly among candidates who had answered rhombus in part **(a)**.

(e) Many candidates were correct here. Answers of square (or rectangular) prism were also given credit. The word prism alone was not sufficient and the word cube was too specific an example for the definition given.

Answers: **(a)** parallelogram, square, rectangle or rhombus **(b)** isosceles **(c)** hexagon **(d)** rhombus **(e)** cuboid

Question 5

Most parts of this question were answered very well.

(a) (i) Nearly all of the candidates gave the correct answer here. A few did not give the simplest form, with some choosing to use fractions, usually $\frac{5}{9}:\frac{4}{9}$, and some making errors in dividing 40 and 32 by a common factor.

(ii) This was the only part of the question that was not well answered. There were attempts to subtract the ratios 5 : 4 and 1 : 2 in some way, or to divide the original number of oranges by (1 + 2). The simplest method was to realise that since the number of blue counters (32) had not changed, there must now be 16 orange counters, meaning that 24 had been removed.

(b) (i) The only wrong answers here were from candidates who misread or misunderstood the question and gave the **most** likely colour to be chosen.

(ii) This part was answered well by a large majority. Candidates must be aware, however, that answers given in the form of percentages must be correct to 3 significant figures; answers of 54% or 55% with no previous work were not acceptable.

(iii) Nearly all candidates gave this answer correctly, either in the uncancelled form or as $\frac{1}{2}$. The most common error was to ignore the fact that there were now only 10 counters in the box.

(c) This was answered well by most candidates. A few divided 180 by 5 rather than by 6.

Answers: **(a)(i)** 5: 4 **(ii)** 24 **(b)(i)** red **(ii)** $\frac{6}{11}$ **(iii)** $\frac{5}{10}$ **(c)** 150, 30

Question 6

This was another question where many of the candidates struggled to deal correctly with time conversion.

(a) (i) Nearly all the candidates successfully found the time at which John completed the race, although there were some who added 90 minutes to 10 15 with an answer of 11 05.

(ii) A large number of candidates could find the average speed. Where errors occurred, this was frequently because of using a wrong time, or converting the time to minutes. A few candidates worked out the time divided by the distance.

(b) This part successfully discriminated between candidates of differing ability. While most candidates (but not all) gained the first mark for dividing 30 by 16, there was great variety in what followed. Many candidates truncated or rounded the result instead of writing the full answer 1.875. A large number continued by reading the decimal part of their answer as minutes, giving them a final answer of 2 hours and 27.5 minutes. Candidates who knew how to deal with time or who converted the 1.875 to minutes by multiplying by 60 were the most successful in reaching the answer.

Answers: **(a)(i)** 11 45 **(ii)** 20 **(b)** 1 h 52.5 min

Question 7

Many candidates were able to answer nearly all of this question successfully.

(a) (i) This part was done well.

(ii) The great majority of candidates found the correct answers here.

(iii) This part was done well.

(iv) Many candidates were able to find the pattern in this algebraic and numeric sequence, although some did not simplify the first term of $x-(-1)$ to $x+1$.

(b) (i) There were many correct answers here. Some candidates took 0 or 2 for their first value of *n*, while a few found n^2 successfully but then added 1 and not *n* each time to the result.

(ii) Except for a few candidates who simply wrote down the next term of 17, most found the difference between succeeding terms to be 4. Those who knew that this meant an *n*th term of 4*n* were usually able to complete the answer correctly, but many gave an answer of *n* + 4.

Answers: **(a)(i)** 1, 33 **(ii)** 4, 32 **(iii)** 1, – 5 **(iv)** $x+1$, $5x-19$ **(b)** 2, 6, 12 **(c)** $4n-3$

Question 8

This question discriminated demonstrably between candidates.

(a) (i) Many candidates gave the correct answer but $\frac{\pi}{c}$ and πc were also seen.

(ii) Many candidates did not realise the significance of part **(a)(i)** to this part of the question and every possible combination of 2 and π was seen. Candidates appeared reluctant to work with the diameter, preferring to use the standard formula of $2\pi r$ in their working and frequently forgetting to double their answer later. The conversion to centimetres was also frequently forgotten.

(b) For the better candidates, this was a very straightforward calculation. Weaker candidates sometimes found the area of the whole disc or of the hole in the centre but did nothing more. However, a more serious error was seen in solutions where the difference in radii was found and then an area was calculated using $\pi\,(5.2)^2$.

Answers: **(a)(i)** $\frac{c}{\pi}$ **(ii)** 64 **(b)** 111

Question 9

(a) This part was usually well answered, with most candidates factorising fully or at least partially to $2(6x+8)$. A few candidates omitted to include the 4 or the 2 from their final answer. There remains the occasional candidate who writes the expression as an equation equal to 0 and proceeds to "solve" this.

(b) This part was also usually answered well, with the most serious error being $6x$ written instead of $6x^2$.

(c) Nearly all candidates solved this equation correctly, although a few guessed at the solution and verified its accuracy rather than finding it in the normal manner.

Answers: **(a)** $4(3x+4)$ **(b)** $6x^2-10x$ **(c)** 1.5

Question 10

(a) (i) Nearly all the candidates were able to find the required area. Of those who could not, most gained the mark for labelling the height of the triangle as 7.

(ii) Most candidates used the required method, by multiplying their previous answer by 4 and subtracting it from the area of the large square, although a few preferred to calculate the side of the smaller square using Pythagoras' theorem. A few assumed this side to be 7 cm and gave their answer as 49.

(b) Candidates were expected to find the square root of their previous answer and to multiply it by 4 and this gave method marks even to those candidates who had made wrong assumptions in part **(a)(ii).** Many candidates who had the correct answer in part **(a)(ii)** did not gain the accuracy mark here because of a general tendency to approximate values prematurely. Thus $\sqrt{50}$ was written as 7 or 7.0 and the perimeter given as 28 instead of the correct 3 significant figure answer.

Answers: **(a)(i)** 3.5 **(ii)** 50 **(b)** 28.3

Question 11

As well as testing the candidates' knowledge and understanding of statistical terms, this question required them to show their ability to read values from a grid, taking the scale into account.

(a) Candidates were expected to find the median by reading off the height at the point where the cumulative frequency was 100. Those who did this generally obtained an answer in the correct range. A common incorrect method was to find the mean of all the heights labelled on the grid or of the two central heights, 150 and 160.

(b) A number of candidates seemed to be in some doubt as to how to find the inter-quartile range and this led to a variety of wrong answers.

(c) There were many correct answers here but also some evidence of inaccurate reading of the scale on the vertical axis.

Answers: **(a)** 156 to 157 **(b)** 12 to 16 **(c)** 128 to 132

Question 12

(a) Many candidates answered this part correctly, recognising that the information on the diagram required them to use the cosine of the angle. There was no necessity to find the length of the third side of the triangle and those who did often approximated the figures so that their final answer was not the correct one.

(b) The suggestion to include a labelled sketch in their solution was overlooked by many, which made it difficult for them to make a correct trigonometrical statement in order to find the length of the ladder. Those who did sketch the triangle often labelled it incorrectly or included dimensions from the first diagram in part **(a)**. Some of the candidates who avoided these mistakes and reached the stage of writing $\sin 49 = \frac{4}{l}$ went on to obtain the correct answer, but many then stated $l = 4 \times \sin 49$, which led to a wrong answer.

Answers: **(a)** 45.6 **(b)** 5.30

Question 13

Not many candidates recognised the fact that the amount by which the value of the painting increased would itself increase each year. Thus, most found the increase in the first year and multiplied it by 3 to find the total increase. Those who knew the formula for exponential increase usually reached the correct answer, while those who found the new value each succeeding year were liable to make arithmetic errors or make premature approximations during their calculations, leading to inaccurate final answers.

Answer: 2778.3

Question 14

(a) (i) There was no need for any use of a calculator in this part and most candidates gave the correct answer by considering the equation of the curve. Where a calculator was used, this was evident from answers in the region of –6 rather than exactly –6.

(ii) Again, in this part there was no need for calculators and many candidates wrote down the correct answers without showing any working or by factorising the function of *x*. There were a few who reversed the *x* and *y* co-ordinates in their answers here.

(b) This was a question for which most candidates would use their calculator and this was done competently by many, although there was the occasional omission of one or both of the negative signs in the answers. Inexact answers suggested that some candidates had used the trace feature on the calculator rather than choosing to find the minimum value.

(c) Once the minimum value had been found, candidates were expected to recognise that the line of symmetry must be a vertical line through that point and many did so. Others realised the significance of the -0.5 without producing an equation, but many tried to find an equation in the usual form of $y = mx + c$.

Answers: **(a)(i)** (0, –6) **(ii)** (–3, 0) and (2, 0) **(b)** (–0.5, –6.25) **(c)** $x = -0.5$

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/33
Paper 33 (Core)

Key messages

To succeed in this paper, it is essential for candidates to have completed the full syllabus coverage. Sufficient working must be shown and full use made of all the functions of the graphics calculator that are listed in the syllabus.

General comments

Candidates had been well prepared for the examination and, in general, produced work of a good standard. They found the paper accessible and were able to attempt all questions to demonstrate their knowledge of the syllabus content. Candidates had sufficient time to complete the paper.

The presentation of work continues to improve. However, of concern is the number of candidates who do not show enough detail in their working when answering a question. Calculators were used efficiently and accurately; although there were instances where candidates used 'pencil and paper' methods when a calculator method was more appropriate. In longer questions, some candidates were rounding intermediate values and, consequently, arriving at an inaccurate final answer.

Comments on specific questions

Question 1

(a), (b)(i)(ii) and (c) Candidates used their calculators well and invariably attained the correct answer to each of these parts.

(d) (i) Though many rounded correctly, there were those who just moved the decimal point two places to the right.

(ii) There was much confusion between significant figures and decimal places and many answered this part incorrectly.

(iii) This part was more successfully answered. However, some just rounded to the nearest whole number.

(e) (i) Better candidates coped well with this question. Errors were common, for example: giving the value of the investment not just the interest; calculating just one year's interest; confusing simple interest and compound interest.

(ii) This part was less well answered than part **(i)**. Common errors were, for example: giving the value of the investment not just the interest; calculating just one year's interest; confusing simple interest and compound interest. A few did not attempt this question.

Answers: **(a)** 13.8 **(b)(i)** 9 **(ii)** 6561 **(c)** 0.25 **(d)(i)** 56.39 **(ii)** 56.4 **(iii)** 60 **(e)(i)** 36 **(ii)** 36.72

Question 2

(a) (i) There were many correct answers here, candidates giving one or both of the available values as their answer.

(ii) Although this part was often done correctly, a common wrong answer was to give 9 as a prime number.

(b) (i)(ii)(iii) Candidates invariably knew what was required and answered correctly. Some, presumably reading the question too quickly, missed the request for a probability and just gave a number from the list.

Answers: **(a)(i)** 12 or 56 **(ii)** 41 **(b)(i)** $\frac{3}{5}$ **(ii)** $\frac{2}{5}$ **(iii)** $\frac{1}{5}$

Question 3

(a) Many saw the ratio and knew how to proceed. However, there were those who gave circular arguments, for example, finding Bob has $20 from 60 – 18.75 – 21.25 and then using this to work back to Cole's share 60 – 20 – 18.75 = 21.25.

(b) Most candidates got this answer correct.

(c) Most gave a clear method to show that Bob had enough money. Some did not give enough detail in their solution. A few left out one of the three items to be considered.

Answers: **(b)** 4.75

Question 4

(a) Although there were many fully correct answers here, it was clear that a significant number of candidates had little knowledge of stem-and-leaf diagrams.

(b) (i)(ii)(iii)(iv) In general, part **(b)** was not answered well. A few candidates managed to find the range and sometimes the median but the quartile and inter-quartile range were rarely found.

Answers: **(b)(i)** 40 **(ii)** 38 **(iii)** 52 **(iv)** 22

Question 5

(a) (b) Co-ordinates are well understood and these parts were usually answered correctly.

(c) There were a good number of correct answers here. Even when the answer was wrong, candidates showed some knowledge of gradient. Usually, they would give the 4 and 8 required but then either divided the wrong way round or used Pythagoras' theorem.

(d) A number of candidates went on correctly to find the equation of the line. Some confused the value of *m* and the value of *c*. A number did not attempt this part.

Answers: **(a)** (–4, –3) (4, 1) **(b)** (0, –1) **(c)** 0.5 **(d)** $0.5x - 1$

Question 6

(a) (i) Most candidates spotted the right-angled triangle and knew to use Pythagoras' theorem to find the answer.

(ii) Candidates all used the four straight lengths of the perimeter but many did not calculate the length of the semi-circle correctly. Some used the straight length *CD* instead of the curved length *CD*.

(iii) Finding the area of the rectangle and/or the area of the triangle were usually successful. Just a few found the area of the semi-circle as well.

(b) (i) Spotting that one triangle was an enlargement of the other meant that candidates could use a scale factor of 3 to find the missing lengths. A few candidates successfully used the Sine Rule to find the unknown lengths. Some used Pythagoras' theorem, even though there were no right-angled triangles in the diagram.

(ii)(iii) There were many correct answers here, though poor arithmetic was in evidence.

Answers: **(a)(ii)** 66.6 **(iii)** 307 **(b)(i)** $r = 2.1$, $t = 7.2$ **(ii)** 56 **(iii)** 85

Question 7

(a)(b)(i)(ii)(c)(i) All these parts were done accurately and correctly.

(c) (ii) Some candidates just joined the points with straight lines. Others drew a single straight line that did not go through the mean point. Only a few knew exactly what was required.

(iii) Although candidates knew how to use their line to find the answer, many did not round up or down to give an answer appropriate to the context of the question.

Answers: **(b)(i)** 24.5 **(ii)** 4 **(c)(iii)** 7

Question 8

(a) Though many responses were fully correct, a common wrong answer was 2, 5, 4.

(b) (i) Invariably the 3 was placed correctly. However, not all managed to complete the diagram successfully.

(ii) This part was usually answered correctly.

Answers: **(a)** 1, 4, 5 **(b)(ii)** 1

Question 9

(a) Most candidates divided the shaded area into rectangles and found each area correctly. Some made errors when they found overlapping areas, for example 12 × 2 and 38 × 5.

(b) Many correctly identified that they just had to multiply their answer to part **(a)** by 8.

Answers: **(a)** 232 **(b)** 1856

Question 10

(a) This part was well answered, with candidates correctly manipulating the equation.

(b) (i) Few could cope with the inequality sign or the negative x term.

(ii) Very few candidates knew how to represent an inequality on a number line.

(c) Here, candidates usually collected like terms successfully.

(d) Many candidates could multiply out the brackets with three, or all four terms, correct. Multiplying the two x terms often came out as $5x$ instead of $6x^2$. After a correct answer, some incorrectly thought it possible to manipulate the expression further.

(e) There were very few correct answers here. Some only partially factorised the expression.

(f) (i) This part was usually answered correctly, although 4 was a common incorrect answer.

(ii) There was a mixed response to this part. A good number correctly rearranged the formula fully but many others had just one correct step in their working.

Answers: **(a)** –2 **(b)(i)** $x \geqslant 0$ **(c)** $4a - b$ **(d)** $6x^2 + 10x - 4$ **(e)** $x^2y(y^2 - 3)$ **(f)(i)** 8 **(ii)** $\frac{P - 2b^2}{3}$

Question 11

(a) This was done well, although many candidates plotted points to find the shape of their curve rather than using their graphical calculator.

(b) Most correctly found where the curve crosses the *y*-axis.

(c) One, or both, of these values was usually found. Sometimes the answers were given as two co-ordinate points.

(d) Many correctly found the co-ordinates of the local minimum point. Others gave (5, –15) as their answer, this being the whole number co-ordinates closest to the minimum point.

(e) Most candidates struggled with this final part. Some attempted to sketch the new curve on their diagram but then did not know how to find the points of intersection.

Answers: **(b)** (0, 40) **(c)** 2.5, 8 **(d)** (5.25, –15.125) **(e)** 3.24, 8.70

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/41
Paper 41 (Extended)

Key messages

Sufficient working should be shown in order to gain method marks if the final answer is incorrect.

The general instruction is that answers should be given correct to three significant figures unless the answer is exact or the question states otherwise. In the main, this was done well but some candidates lost marks through giving answers too inaccurately.

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 graphically.

Candidates should use the mark value indicated in the question as an indicator of how much work is required for a question.

When a question states ‘show that’, candidates should not start with the answer and try to verify it. They should start with what is given and work towards the answer.

General comments

The paper produced a wide range of marks. Just a few a few parts of questions proved very difficult and gave the very best candidates the chance to really show their ability. Some of the work of the best candidates was very impressive indeed. Although very low marks were rare, there remain a few candidates at the lower end of the scale where an entry at core level would have been a much more rewarding experience.

Whilst most candidates displayed knowledge of the use of a graphics display calculator, some are still 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; on 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.

There were several questions where candidates were asked to show a result. Candidates are then expected to start with what is given and work towards a solution. Many candidates started with what they were trying to show and then tried to verify it. This does not usually gain any credit.

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

Comments on specific questions

Question 1

In part **(a)**, most candidates gained the mark for the names of the transformations but many could not complete the description with the correct vector and equation of the mirror line. The *y*-axis was a common wrong answer in part **(ii)**. Although many were successful with part **(c)**, a significant number had an enlargement but it was in the wrong place. Relatively few drew construction lines from the centre (5, 0). Stretch is, of course, a more demanding transformation. Nevertheless, a large number were successful, although using other invariant lines parallel to the *y*-axis such as $x = 1$ or $x = 4$ was quite common.

Answers: **(a)(i)** Translation $\begin{pmatrix}1\\7\end{pmatrix}$ **(ii)** Reflection in $x = -\frac{1}{2}$

Question 2

Part **(a)** was the first of the show that questions and here some candidates started with $3200. Most, however, clearly showed the correct calculation. Part **(b)** was very well done although a few found the reduction as a percentage of $55 instead of $65. Most candidates knew how to calculate compound and simple interest but many confused interest and final amount so answers of 3000 and 2901.42 were extremely common. The reverse percentage in part **(e)** was usually very well done although weaker candidates often found 95% of $79.80.

Answers: **(b)** 15.4% **(c)** $500 **(d)** $501.42 **(e)** $84

Question 3

Parts **(a)** and **(c)** were extremely well done. In part **(a)**, most candidates showed the substitution of $x = 3$ and reached the result –1, but a few started by substituting $y = -1$ and reached $x = 3$ successfully. A few did not show 2 × 3 and went straight to 6 which was not accepted in a show that question. Part **(b)** was somewhat less well done with some reversal of answers and some not being able to solve $8x + 4 = 0$ in part **(i)**.

Answers: **(b)(i)** $\left(-\frac{1}{2},\ 0\right)$ **(ii)** (0, 4) **(c)** $y = 3x - 1$

Question 4

In part **(a)(i)**, there were clearly some candidates who had not encountered stem and leaf diagrams. This proved true across the range of abilities. Those who knew what to do usually gained full marks.

Many were successful in part **(a)(ii)** even if they had no knowledge of stem and leaf diagrams, preferring to rearrange the complete list. Just a few, after a good stem and leaf diagram, only wrote the units digit here. Part **(a)(iii)** produced a mixed response with many correct answers, but many candidates could not progress further than 4 ÷ 14 or 360 ÷ 14. In part **(b)** most found the median successfully and were able to give a correct answer to part **(iii)**. The inter-quartile range was less well done with some just giving the lower quartile or giving 5 minus the upper quartile. The mean in part **(c)(i)** was well done by better candidates but less well by weaker ones. Common errors were adding the mid-interval values and dividing by 3 and multiplying the mid-interval value by the width of the interval. The histogram, too, was well done by middle and high achieving candidates and almost all gained partial success.

Answers: **(a)(ii)** 21, 19 **(iii)** 102.9° **(b)(i)** 2.4 **(ii)** 0.9 **(iii)** 20 **(c)(i)** 253.125

Question 5

Most candidates were able to use the graphics calculator for the sketch graphs but were less confident for the other parts. The sketches in part **(a)(i)** were usually good with just a few with the wrong amplitude and/or period. Most candidates realised that the range was –1 to 1 but a significant number wrote it as $-1 \leqslant x \leqslant 1$ instead of $-1 \leqslant f(x) \leqslant 1$. Part **(b)(i)** was less well done than part **(a)(i)** but, nevertheless, there were some good sketches. Part **(b)(ii)** was the least well answered on the paper but a few of the very best candidates recognised that logs could not be found for negative numbers.

Part **(b)(iii)** was often correct but answers such as (89.9999, 0) were not uncommon. Candidates are expected to realise that, even if that is what the display really shows, that the correct answer is 90. Although part **(iv)** was well done by many, answers such as $y = 0$ or just listing 0, 180, 360, 540 were fairly common. Part **(c)** proved very demanding for many candidates. Part **(i)** was often correct but only the best candidates were able to use that answer to solve the inequalities in part **(ii)**. Correct answers to part **(iii)** were relatively rare.

Answers: **(a)(ii)** $-1 \leqslant f(x) \leqslant 1$ **(b)(ii)** No logs of negative numbers **(iii)** (90, 0), (450, 0)
(iv) $x = 0$, $x = 180$, $x = 360$, $x = 540$ **(c)(i)** 23.5 **(ii)** $23.5 < x < 156.5$, $383.5 < x < 516.5$
(iii) any integer less than –1.

Question 6

In part **(a)(i)(a)**, a number of candidates started with the radius and then attempted verification. Many others did not realise that, in order to show that a value was correct to 3 decimal places, it was necessary to work to at least 4 decimal places. Hence they only showed the answer 1.910 and did not score full marks. Part **(b)** was well done with only a few using the wrong formula. In part **(ii)**, although many were successful, many continued with the radius as 1.910, instead of calculating the new radius, and hence gained no credit. Part **(b)** proved difficult for all but the best candidates. The combination of unit changes and/or the need to find the linear scale factor led to relatively few correct answers.

Answers: **(a)(i)(b)** 458 cm^3 **(a)(ii)** 1070 cm^3 **(b)** 40

Question 7

In all parts, some candidates treated the events as independent and others tried to add probabilities instead of multiplying. Those who recognised the dependence and knew to multiply did parts **(a)** and **(b)** well, although some forgot to take into account the reverse order of outcomes in part **(b)**. Those doing part **(c)** as 1 – the probability of getting 2 cents were usually successful. Those trying all the outcomes that gave more than 2 cents were rarely correct..

Answers: **(a)** $\frac{6}{30}$ **(b)** $\frac{12}{30}$ **(c)** $\frac{28}{30}$

Question 8

Many good candidates did part **(a)** well. Most recognised that it was a reverse percentage, although some divided by 0.8 instead of 0.9^2. There were many excellent solutions to part **(b)**. Many used trial and improvement successfully although numerical errors did occur. There was some impressive log work from some candidates. Some weaker candidates worked out the depreciation in one year and then assumed that was the amount every year.

Answers: **(a)** $16 000 **(b)** 7 years

Question 9

Those recognising the length that was required in part **(a)** were usually successful. Part **(b)** was well done too although in both parts some long methods were seen, for example Sine Rule and then Pythagoras' theorem in either part. In part **(c)** most candidates recognised the need for the Cosine Rule and calculated angle *DBC* as 20°. In all the first three parts some candidates spoilt their solutions by not working accurately enough. Part **(d)** proved quite challenging for some, but most gained at least part marks for working out one or two of the required areas correctly.

Answers: **(a)** 12.2 cm **(b)** 15.5 cm **(c)** 5.32 cm **(d)** 195 cm^2

Question 10

In this question, there was a high premium on knowing that average speed = total distance divided by total time. Fortunately most did, although it was fairly common to see two speeds added together and divided by 2. Even those who did know this, often found the change of units too difficult to handle. In part **(a)**, as stated, many knew the method but here, even if the units were handled correctly, the accuracy was not good enough to reach the correct final answer. In part **(b)(i)**, most candidates gained some credit for method but the units problem and difficult simplification meant fully correct answers were quite rare. In part **(b)(ii)**, many reached 5.5 but only the better candidates reached the final answer of 5. As with part **(b)(i)**, many candidates gained partial credit in part **(c)(i)** but the units usually prevented a complete proof. Part **(c)(ii)** was the best done part of the question and middle and high ability candidates managed to solve the equation successfully. A number, however, could not clear the fraction correctly.

Answers: **(a)** 7.64 km/h **(b)(i)** $\frac{10x + 60y}{10 + z}$ **(ii)** 5 km **(c)(ii)** 15

Question 11

Almost all candidates were correct with part **(a)**. Although the correct answer to part **(b)** was usually seen, some spoilt their answer by following this with 0.1 to 100 or even 99.9. Part **(c)** was usually correct with the most common error being to follow $2x - 1 = 12$ with $2x = 11$. The remaining parts of the question proved more difficult. Few were able to do part **(d)** by replacing x by $x + 2$ and adding 3. Where the answer was correct, it was usually obtained by recognising that the gradient was 2 and finding the image of one point to use to find the c in $y = 2x + c$. In part **(e)**, many candidates wrote correctly $x = 10^y$ but only the better candidates were able to go on to $y = \log x$. In part **(f)**, those who realised that $\tan^{-1}(1)$ was 45° usually managed to reach 23, but some of them could not reach the second solution.

Answers: **(a)** 5 **(b)** 0.1, 1, 10, 100 **(c)** 6.5 **(d)** $y = 2x - 2$ **(e)** $y = \log x$ **(f)** 23, 113

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/42
Paper 42 (Extended)

Key messages

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

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 three 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 four significant figures to avoid losing accuracy marks.

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. The syllabus contains 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 continues to improve although the potential use of graphics calculators elsewhere is often not realised.

Topics on which questions were well answered include transformations, histograms and scatter diagrams, trigonometry, curve sketching and quadratic equations. Topics which were found difficult included compound functions, combined probability without replacement, scale factor of volume and mensuration. There were mixed responses in other questions as will be explained in the following comments.

Comments on specific questions

Question 1

(a) This was generally well answered, with only a few candidates overlooking the need for accuracy that leads to a correct 3 significant figure answer.

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

(ii) Many candidates were successful here, but 130 was frequently seen.

(c) Almost all candidates were able to do this straightforward percentage question.

(d) Most candidates find ratio questions very accessible and this was no exception. The added challenge here was to find the difference between two parts and a few candidates found this a challenge.

(e) Many candidates appeared to know their number types but many gave a fraction or recurring decimal as an irrational number. Most correct answers were surds, although a few gave π and a few gave the exponential e. 3.142 and $\frac{22}{7}$ were not accepted as irrational.

(f) Many candidates converted both numbers from standard form into decimal numbers, added them and then converted back to standard form. This usually led to a correct answer or at least the correct figures being seen. A few demonstrated the efficient method of converting 7.31×10^{-2} to 0.731×10^{-1} and leaving the other value unchanged.

Answers: **(a)** 0.744 **(b)(i)** 130.5 **(ii)** 100[.00] **(c)** 17.66 **(d)** 1000 **(f)** $2.29[1] \times 10^{-1}$

Question 2

(a) This part scored full marks for almost every candidate. The degree of accuracy varied enormously from some very good sketches with scales and ruled asymptotes to those with large overlaps and/or extremely angular branches.

(b) The main loss of marks in this part was candidates giving 3, –3 and 1 rather than equations of lines. Many could give the vertical asymptotes but not the horizontal one.

(c) This was done well, with most candidates scoring full marks.

Answers: **(b)** $x = 3$, $x = -3$, $y = 1$ **(c)** –2.87, 1.15, 2.72

Question 3

(a) (i) Many candidates were able to apply the correct method to the appropriate type of proportionality. There were misinterpretations of both directly and square root, particularly the use of inverse and squaring. A few candidates did everything correctly but gave their answer in terms of *k* and *x*.

(ii) This one mark answer rewarded a correct answer in part **(a)(i)**.

(iii) This rearrangement of their answer to **(a)(i)** was well done by the majority of candidates.

(b) This inverse variation question was well answered.

Answers: **(a)(i)** $8\sqrt{x}$ **(ii)** 16 **(iii)** $\left(\frac{y}{8}\right)^2$ **(b)** 2

Question 4

(a) (i) This part was answered well by most candidates. However, some of the common errors seen were as follows: adding frequencies then dividing by 5; using lower class or upper class boundaries rather than mid-points; dividing $\Sigma f x$ by 5 not 100; adding the mid-points and then dividing by 100 or 5; arithmetic errors in finding the mid-points.

(ii) Almost all candidates realised the total was 18 oranges less than 140 grams out of 100 oranges. Many weaker candidates just gave $\frac{18}{100}$ as the answer. The most common error was still using $\frac{18}{100}$ rather than $\frac{17}{99}$ for the second orange.

(iii) A number of weaker candidates made errors in calculating the number of oranges in the new sample space and/or the number of oranges less than 250 g (or more than 250 g). For those who found these values correctly, most only found one product and as in part **(a)(ii)** it was common for the second term not to have the denominator reduced by 1. Even for candidates who realised there were two ways of selecting the oranges and had two products added together, the errors of the wrong sample spaces and not reducing the second term were still common, making this a challenging question.

(b) (i) Although most candidates knew that to calculate the frequency densities they had to use the class values and the frequencies, a reasonable number did not know how to do this successfully. The many various errors included: multiplying the class width by the frequency; multiplying the upper class limit by the frequency; multiplying the mid-point by the frequency; dividing the upper class boundary by the frequency; dividing the class width by the frequency; adding class width to frequency. In addition a number of candidates found the cumulative frequency.

(ii) Even with the wrong frequency densities the vast majority of candidates knew how to draw a histogram, although there were a few cumulative frequency curves and frequency polygons. Nearly all had a correct linear scale for their values with the vast majority of these scales making the values easy to plot. The main error was the plotting of the widths of the bars at usually 180 but sometimes 140. The common errors in the plotting of the heights was 0.04 plotted at 0.4 and 0.5 plotted at 0.05.

Answers: **(a)(i)** 198 **(ii)** $\frac{306}{9900}$ **(iii)** $\frac{2850}{6642}$ **(b)(i)** 0.04, 0.35, 0.55, 0.5, 0.5

Question 5

(a) Most candidates succeeded with this straightforward Pythagoras' theorem question.

(b) This right-angled triangle trigonometry question was quite well answered. A few candidates used the Sine Rule or the Cosine Rule, giving themselves a more challenging strategy and more work for only two marks.

(c) The perimeter was usually found correctly by simply applying Pythagoras' theorem again and adding the sides.

(d) The shape whose area was to be calculated was very frequently taken to be a rectangle, with $30 \times 20 = 600$ being the common incorrect answer. Many candidates did use the efficient method of subtracting the areas around the outside of the given quadrilateral from the large rectangle. Some candidates found angles in the shape and then used $\frac{1}{2}ab\sin C$ for the area of *PSR* or *PQR*.

(e) Showing that the two triangles were similar was one of the most challenging parts of this paper. From the information given, the best explanation was to show two sides in the same ratio and the included right-angle equal. Other explanations needed more calculations without using similarity and this proved to be difficult as many candidates listed properties of triangles which would be already similar.

Answers: **(a)** 20 **(b)** 36.9 **(c)** 100 **(d)** 576

Question 6

(a) The majority of candidates gained full marks. The most common error was to translate triangle *A* by 3 units to the left and 7 units down, rather than 7 left and 3 down.

(b) Again, there were many correct answers. It was rare that *A* was not rotated through 90 degrees anti-clockwise but some candidates had not used the correct centre of rotation. A small number carried out a clockwise rotation of 90 degrees.

(c) Most candidates who were successful in parts **(a)** and **(b)** were able to describe the transformation from triangle *C* to *B* successfully. A few, however, saw this incorrectly as a reflection in the line $y = -x - 2$.

(d) This transformation caused difficulty for quite a number of candidates, many of whom used a scale factor of 0.5. A few correctly transformed the vertices (3, 2) and (1, 6) but then positioned the third vertex at (3, –9). Also there were some attempts that resulted in *D* being positioned in the third quadrant as a result of using the origin as the centre of enlargement.

(e) Most candidates recognised that the inverse transformation required was an enlargement. Candidates should be aware that 'shrink' is not an acceptable term. Also, the majority correctly identified the centre of enlargement to be (3, 1) but it was not uncommon for the scale factor to be given incorrectly as 2 when the candidate had used a scale factor of 0.5 in part **(d)**.

Answers: **(c)** rotation, 90° clockwise about (–6, 4) **(e)** enlargement, centre (3, 1), scale factor –0.5

Question 7

This question contained some challenging parts but was generally well answered with almost all candidates scoring well in the early parts.

(a) The correct method of $55 + 7 \times 5$ was usually seen but the common incorrect answer of 95 calculated from $55 + 8 \times 5$, was frequently seen.

(b) This was working backwards and most candidates were able to deduce the number of cups without using any algebra.

(c) The height of a similar shape was usually correctly found.

(d) These parts involved a formula for the volume of a cup and each part proved to be challenging.

(i) This first part involved comparing two diameters and finding half the difference. Many candidates set their working out clearly and gained full marks. Others found it difficult to set up an equation or overlooked that the diameter of one circle was known.

(ii) This part involved substituting three values into a fairly complicated formula. Using the three correct values was found difficult by some candidates.

(iii) This part was to find the volume of a similar shape and all that was required was for candidates to use the cube of the ratio used in part **(c)**. Very few candidates used this but chose to use the formula again, with the same difficulty of finding the three correct values to be substituted.

(iv) This was a straightforward rearrangement of the formula as only two steps were required. Many candidates did answer this correctly and this part met with more success than part **(iii)**. A mark was given to correct answers which were fractions within a fraction as a single fraction could be reasonably expected for full marks.

Answers: **(a)** 90 **(b)** 11 **(c)** 82.5 **(d)(ii)** 56 900 **(iii)** 192 000

Question 8

(a) Candidates needed to state that the angle at the intersection of a radius (or diameter) and a tangent is 90 degrees to be given the mark. Most candidates did not use words tangent and radius (or diameter), giving reference to the lines on the diagram instead.

(b)(i) This was successfully answered by a majority of the candidates. There were a number of mistakes leading to incorrect values. Some candidates may have incorrectly thought that triangle *ODC* was equilateral and hence that angle *DOC* was 60 degrees, leading to the answer 120 degrees for angle *AOD*. Treating *AD* and *BC* as parallel also led to incorrect solutions from mistakenly thinking that angle *ACB* was 36 degrees and using that as a starting point in deducing the angle *AOD*.

(ii) Most candidates who were successful in part **(i)** deduced the correct value for angle *ODC*.

(iii) Candidates needed to know that the angle subtended at the circumference by a diameter (or the 'angle in a semi-circle') is 90 degrees.

(iv)(v) It was difficult for candidates to recover from mistakes in parts **(i)** and **(ii)** to gain marks on these parts. However, the majority of candidates gave correct answers.

Answers: **(b)(i)** 108 **(ii)** 54 **(iii)** 90 **(iv)** 18 **(v)** 48

Question 9

(a) Candidates have become very confident in using the Cosine Rule and this part was very well answered. A number of candidates lost the final mark by not giving an answer more accurate than the one to be shown.

(b) Again, candidates have become very confident in using the Sine Rule and this part was extremely well answered.

(c) The use of $\frac{1}{2}ab\sin C$ was well demonstrated with almost all candidates gaining full marks.

(d) The length of a perpendicular inside a triangle only required right-angled triangle trigonometry but this part proved to be more discriminating. This usually tends to be the case as there is the challenge of knowing where this perpendicular is. The stronger candidates will always draw this line in the diagram and the method then becomes much more obvious.

Answers: **(b)** 78.8 **(c)** 36.6 **(d)** 6.65 or 6.66

Question 10

(a) (i) Nearly all candidates scored full marks or just lost one mark for a mis-plot or omission.

(ii) This was almost always correct with usually just positive although a few candidates added strong or weak. This was not necessary. The only errors seen were 'increase' and 'x increases as y increases'.

(b) (i)(ii) This was nearly always correct. The most common error was giving the answer to 2 significant figures.

(c) (i) The great majority of candidates used their calculator and obtained the correct values. A few tried to use a line of best fit and attempted to find m and c by calculation but were obviously inaccurate. By far the most common error was giving the gradient to only 2 significant figures.

(ii) If there was an equation in part **(c)(i)** then usually 20 was substituted into the equation and the correct answer obtained.

(iii) This was a discriminating question, with only a minority of candidates being awarded the mark. The most common answer was 0.411 or their gradient value. Their equation from part **(c)(i)** was also often given as the answer. Other common wrong answers included cm or ml only.

Answers: **(a)(ii)** Positive **(b)(i)** 17.1 **(ii)** 21.2 **(c)(i)** $y = 0.411x + 14.2$ **(ii)** 22.4 **(iii)** cm/ml

Question 11

(a) (i) Almost all candidates were able to evaluate f(3) correctly, since f(x) was linear.

(ii) Again solving f(x) = 1 was also very well done as it was a simple linear equation.

(b) The inverse of this linear function was more demanding but most candidates were again successful.

(c) (i) The composite function is usually more challenging and this was the case in this part. There were many fully correct answers with the common errors of finding g(f(x)) or f(x) × g(x).

(ii) Solving f(g(x)) = 5 depended on part **(i)** being correct and those candidates usually answered this well. An error seen too often was to have $\sqrt{x} = 6$ followed by $x = \sqrt{6}$. Candidates with an incorrect answer to part **(i)** could still gain the first mark.

(d) (i) This triple composite question was well answered by many candidates. The only common error was the slip of using part **(c)(i)** when this question required h(g(f(x), not h(f(g(x))).

(ii) The condition for this composite function to exist was a final discriminating mark and many candidates realised that $2x - 7$ had to be positive.

Answers: **(a)(i)** –1 **(ii)** 4 **(b)** $\frac{x+7}{2}$ **(c)(i)** $2\sqrt{x} - 7$ **(ii)** 36 **(d)(i)** $\frac{1}{\sqrt{2x-7}}$ **(ii)** $x > 3.5$

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/43
Paper 43 (Extended)

Key messages

Candidates must be familiar with the entire extended syllabus, since all questions on the paper must be attempted.

The rubric on the front cover of the paper indicates that all answers should be exact or to three significant figures and candidates should be well practised to do this. This clearly involves working to more than three significant figures without rounding during the working. The readings of answers from graphics calculators have the same rule about accuracy.

Working should be clearly shown at all times and marks may be lost as a result of only giving answers.

Graphics calculators are to be used in questions in addition to those involving graphs, such as statistics and solving equations graphically.

General comments

There were many excellent scripts showing full methods and accurate working.

A number of candidates found parts of the paper challenging.

Accuracy, particularly when using the graphics calculator, was a problem for some candidates, with two significant figure answers being given.

All candidates were able to complete the paper in the allowed time.

Comments on Specific Questions

Question 1

(a) The range was usually correct. A few candidates gave the answer 10 to 20.

(b) The inter-quartile range proved to be more challenging than expected, with many candidates ignoring the frequencies of the data.

(c) The mode was very well answered.

(d) The median was usually correctly given.

(e) The mean was a little more challenging and as in part **(b)** the frequencies were often overlooked.

(f) Explanations are always quite challenging and this question was no exception. Many candidates only described the mean when the question wanted a reason why the mode was unsuitable.

Answers: **(a)** 10 **(b)** 6 **(c)** 10 **(d)** 15 **(e)** 14.5

Question 2

(a) The selling price was usually correctly found and most candidates realised that they should give the exact answer.

(b) The percentage profit was quite well answered. The common error was to use the selling price as the denominator in the calculation.

(c) This reverse percentage question was well answered with more candidates succeeding with this part than part **(b)**.

(d) This exponential reduction question was much more discriminating, but many candidates answered it well. Many succeeded by using trial and improvement while the stronger candidates used logarithms. The use of a graphical approach with the calculator was never seen. The trial and improvement method was successful because the number of reductions was not too large.

Answers: **(a)** \$30.51 **(b)** 40.9% **(c)** 80 **(d)** 7

Question 3

(a) The translation was almost always drawn correctly.

(b) The stretch was more challenging but there were many correct images. A common error was to have the correct shape translated by one unit parallel to the *y*-axis.

(c) The description of the rotation was generally successfully answered. The correct transformation and angle were usually stated but the centre of rotation was often incorrect or omitted.

Answer: **(c)** Clockwise rotation, 90°, (3, –1)

Question 4

(a) Almost all candidates plotted the six points correctly.

(b) (i) Almost all candidates stated the type of correlation correctly.

(ii) Almost all candidates found the data which fitted the correlation least well.

(c) (i) Finding the equation of the line of regression is always a more challenging topic. Nevertheless, there were many correct answers. A number of candidates gave the coefficients to only two significant figures. Another error was to draw a line of best fit by eye and find its equation. Candidates need to be aware that this topic is for the application from the graphics calculator.

(ii) Most candidates were able to substitute into their equation correctly.

(iii) This explanation was found to be much more accessible than in **Question 1(f)** with candidates demonstrating the concept of data outside the range of given data.

Answers: **(b)(i)** negative **(b)(ii)** D **(c)(i)** $p = 6300 - 967d$ **(c)(ii)** 3980 persons/km^2

Question 5

(a) The sketch of the graph of the function was usually correct.

(b) The co-ordinates of the local maximum were usually found but many answers were to less than three significant figures.

(c) The asymptotes parallel to the *y*-axis were successfully stated, with the one parallel to the *x*-axis being more difficult to recognise. A few candidates gave only numbers instead of equations.

(d) The range of values of k for no solutions to $f(x) = k$ proved to be a discriminating question, especially with part of the inequality coming from the equation of the asymptote parallel to the x-axis.

(e)(i) This part also proved to be challenging, often because of uncertainty about the modulus function.

(e)(ii) This part required the answers to part **(e)(i)** and the equations of the two asymptotes parallel to the y-axis. This is a very challenging situation and only the strongest candidates gained full marks.

Answers: **(b)** (0.0295, –0.833) **(c)** $x = -3$, $x = 2$, $y = 2$ **(d)** $-0.833 < k \leqslant 2$

(e)(i) –5.13, 2.81 **(e)(ii)** $-5.13 < x < -3$, $2 < x < 2.81$

Question 6

This question was slightly unusual as it involved vectors and trigonometry.

(a) This first part was very well answered with most candidates understanding and putting the East and North components into a column vector.

(b) This part also required a column vector as well as more East and North distances and proved to be much more challenging.

(c) (i) This part required candidates to use their answers to part **(b)** and the use of Pythagoras' theorem was expected. It was quite well answered, although this depended on answers to part **(b)**. A number of candidates overlooked the instruction given and decided to use the cosine rule, for which partial credit was given.

(ii) This part also required candidates to use their answers to part **(b)** and the tangent ratio was expected. In addition to the accepted method, candidates also found the topic of bearings difficult.

Partial credit was again given to candidates who used the sine rule. Only the stronger candidates earned full marks.

Answers: **(a)** $\begin{pmatrix} 72.5 \\ 33.8 \end{pmatrix}$ **(b)** $\begin{pmatrix} 187 \\ -46.5 \end{pmatrix}$ **(c)(i)** 193 km **(c)(ii)** 283.9°

Question 7

(a) This volume of a triangular prism proved to be challenging because of the area of the triangular cross-section. A large number of candidates multiplied $\frac{1}{2}$ by 0.8 by 0.6 when the angle between these two sides was not 90°. Candidates should be careful to only use information given in the question.

(b) The total surface area of the prism met with the same success as the volume in part **(a)**. Many candidates earned partial credit for correct use of the cosine rule or for correctly collecting five areas.

(c) This part required the use of scale factors from similar volumes and areas. A number of candidates omitted this part and a large number divided by 1000 or 10 when it should have been 100.

Answers: **(a)** 0.278 m^2 **(b)** 3.48 to 3.49 m^3 **(c)** 0.0348 to 0.0349 m^2

Question 8

(a) The tree diagram was usually completed correctly.

(b) Most candidates understood the combination of events leading to the product of three probabilities.

(c) This was the most discriminating part of this probability question, involving the sum of three products. There were many good answers and it was clear that the tree diagram was very much instrumental towards the rate of success in this part.

Answers: **(b)** 0.504 **(c)** 0.398

Question 9

(a) This part involved the terms of three sequences of patterns in given diagrams. Although the sequences were a little unusual, this part was generally well answered.

(b) (i) This part required candidates to recognise the sequences without having an *n*th term. The patterns were a little complicated giving each number repeated in the sequences. Overall candidates succeeded or partially succeeded.

(ii) The same comments apply to this part.

(c) This part was about finding the *n*th term of one of the sequences and was quite well answered. The expression was a quadratic and the stronger candidates appeared to be well experienced with these and methods varied between immediate recognition and the much longer differences approach.

Answers: **(a)** 25, 25: 16, 36: 25, 41, 61 **(b)(i)** 225, 196 **(ii)** 361, 400 **(iii)** $n^2 + (n-1)^2$

Question 10

(a) The straightforward expression for the time in terms of *x* was well answered.

(b) (i) Obtaining a given equation was much more challenging and only the stronger candidates earned full marks. Others gained partial marks through sign errors in an otherwise correct starting equation. A number of candidates solved the equation, misunderstanding the notion of 'show that'.

(ii) Solving the equation proved to be much more accessible with most candidates using the formula. There was very little evidence of any candidates using the graphics calculator when a simple sketch of the parabola would have sufficed for the method. A few candidates used the completing the square method. Errors in using the formula were often with either the $-b$ term or the numerator not being all over $2a$. Some other candidates overlooked the instruction about answers to one decimal place. In all these cases some marks were awarded.

(iii) This part was found to be more challenging than anticipated. All candidates had to do was to divide 930 by their $(x + 5)$. Many divided by *x* and a few others thought the answer here would be the value of *x*. Many candidates also omitted this part.

Answers: **(a)** $\frac{930}{x}$ **(b)(ii)** –99.0, 94.0 **(b)(iii)** 9h 23min to 9h 24min .

Question 11

(a) (i) This was another explanation question which was found to be difficult for most candidates. Some earned one mark by giving two correct pairs of angles without reasons.

(ii) There was more success with this part where candidates had to multiply out a correct ratio or fraction equation from the similar triangles.

(b) This part proved to be challenging because the length asked for was not one of the sides of the triangles shown to be similar. Also the connection between part **(a)(ii)** was often overlooked.

(c) (i) This part requiring the ratio of the areas of the two triangles was rarely answered correctly when it was simply the square of the ratio of two given lengths. Almost half of the candidates omitted this part.

(ii) This part required the ratio of areas of two other similar triangles and did depend on a correct answer to part **(b)**. A very small number of candidates gave the correct answer but more than half of the candidates did not attempt this part.

Answers: **(b)** 8 cm **(c)(i)** $\frac{49}{36}$ **(c)(ii)** $\frac{64}{25}$

Question 12

(a) This straightforward substitution, using function notation was very well answered.

(b) This inverse function was generally well answered. There were sign errors and a few thought that the reciprocal was the inverse.

(c) The evaluation of a compound function was very well answered. Very few thought that $g(f(x)) = g(x) \times f(x)$.

(d) The algebraic expression from a compound function was well answered. There were a number of careless slips when multiplying out a pair of brackets which was very straightforward.

(e) Solving $h^{-1}(7)$ was rarely carried out by the efficient method. Many candidates found $h^{-1}(x)$ and then substituted 7. The inverse of h involved logarithms and many errors were seen in this process. The allocation of only two marks should have indicated that there must be a shorter method. The very simple equivalence of $y = h^{-1}(x) \Leftrightarrow x = h(y)$ was rarely applied.

(f) The addition of two algebraic fractions with linear denominators was quite well answered. Candidates appeared to be well practised with this type of question as a matter of routine. There were some sign errors when simplifying the numerator and occasionally only the numerator was given as the answer.

Answers: **(a)** –0.75 **(b)** $\frac{4-x}{3}$ **(c)** –17 **(d)** $9x - 8$ **(e)** 3 **(f)** $\frac{5-x}{(2x+1)(4-3x)}$

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/51
Paper 51 (Core)

Key Messages

Looking for patterns and being able to apply them was one of the key elements in this paper. The general pattern varied slightly between odd and even numbers but spotting it not only meant that arithmetical slips would most likely have been noticed, but also the questions towards the end of the paper could be completed much more quickly.

Understanding and knowledge of key words was also most useful. Although these words were explained in the introduction of the paper and examples were given, it would still have been helpful to candidates if they had had prior knowledge of the meanings of these words.

General Comments

Good knowledge of key words like product enabled candidates to give correct answers and not leave them in an unfinished form so that marks were lost; as in giving an answer of 3 × 3 for **Question 1(c)** instead of 9.

There were confusions generally about odd, even, integer, prime, and positive and negative.

Spotting the pattern in sums that were odd, for example, in **Question 2**, meant that no time was wasted in completing the table in part **(c)**. Finding half of the number, then adding and subtracting 1 from the half was very quick and could be checked on a calculator for arithmetical slips. This also led to a very quick and easy way of finding the algebraic expression in part **(d)**.

Comments on Specific Questions

Question 1

(a) Candidates showed that they understood the information given to them at the start of this paper by answering this question well, with only occasional slips. Candidates should be encouraged to check answers that they have calculated mentally by using their calculator. This would, of course, help to avoid any mental mistakes.

Answer:

1	7	8	7
2	6	8	12
3	5	8	15
4	4	8	16

4 × 4

(b) Candidates again answered this question well. By realising that there is a pattern and following it, most candidates managed to avoid the repetition of an answer. There were a few slips in multiplying but with every indication that candidates understood the meaning of a product. Although it was not necessary here, candidates should know the meaning of such words as sum and product.

Answer:

1	9	10	9
2	8	10	16
3	7	10	21
4	6	10	24
5	5	10	25

5×5

(c) This question asked for the largest product and by looking at the pattern in the previous two questions many candidates realised this could be found by squaring half of the sum. There were a few slips in this calculation and some candidates gave the answer as 3×3 without completing the calculation.

Answer: 9

(d) Most candidates used their previous answers to complete this table. Using calculators to check simple arithmetic is still highly recommended.

Answer: 9 16 25 36

(e) (i) There were some different ways of writing this, all of course quite acceptable. Candidates needed to think about what they had just done for part **(d)** and transfer this into algebra, using *S* in their expression. To help them with this, similar tasks should be practised using a variety of letters to avoid the candidates using *x* even though the expression was explicitly asked for in terms of *S*.

Answer: $\left(\frac{S}{2}\right)^2$

(ii) Candidates did not need to use their algebraic expression, if found, in part **(i)**; they could follow the pattern as seen in the previous questions and tables. 31×31 was sometimes given as the final answer and, quite commonly, 30×32 was used for the calculation.

Answer: 961

(f) This question asked the candidates to solve a problem. It used all the words that had, up until this point, been used separately. There was sum, positive, integer, even and product. Candidates were also directed to algebra by the use of *S*. Most candidates found 24 even if they did not follow through to the final answer. Candidates need to learn how to use a mixture of words and not just to know their meanings.

Answer: 48

Question 2

(a) Most candidates took notice of, and applied, the note given and did not repeat a pair of integers in a different order. There were a few slips which should have been checked on a calculator. It would be helpful for candidates to practise writing things like this using an order or pattern to help them to avoid mistakes.

Answer:

1	8	9	8
2	7	9	14
3	6	9	18
4	5	9	20

4×5 or 5×4

(b) Candidates soon spotted that 3×4 gave the largest product. Some, as before, gave this as their answer instead of 12.

Answer: 12

(c) Candidates answered this question well. The intention was to use the knowledge and pattern found in part **(a)**. Some candidates tested many of the numbers that made each sum. There were a few arithmetical mistakes. Candidates should be encouraged to look back at previous questions for a pattern or method that will help them to solve a question more quickly.

Answer: 12 20 42 2550

(d) (i) The key to this answer was that one of the numbers has to be even; so then multiplying by an even number always gives an even answer. Some candidates managed to explain this, in a variety of ways. It would be helpful to practise writing explanations in words. Sometimes there was confusion between terms (e.g. product and sum or positive and negative instead of odd and even. Uneven was used quite often for odd.

Answer: even $\times$ odd = even

(ii) There were several ways of writing this expression depending on how the candidate approached this question, and also if they had found an expression for S as an even number previously. The expectation was that the candidates would follow the pattern used for finding the answers to part **(c)**. This would have been quite quick. Many candidates worked hard algebraically to find an expression. A significant number who found a formula, tested it and found it to be correct.

Answer:

$$\left(\frac{S}{2}-\frac{1}{2}\right)\left(\frac{S}{2}+\frac{1}{2}\right)$$

Question 3

(a) Candidates answered this question well. There were few slips, repeats or incorrect answers and combinations using 0 as one of the digits.

Answer:

1	1	4	6	4
1	2	3	6	6
2	2	2	6	8

$2 \times 2 \times 2$

(b) Candidates continued the pattern to four integers. It would be helpful to practise questions like this where the candidates not only have to find an answer but also show that it is true. Candidates need to write this clearly with no ambiguity.

(c) Again, many candidates followed the pattern and quickly calculated the answers for sums of 15 and 24. Others used trials as they had before. Both methods worked, although the second was obviously more time consuming. Candidates should be encouraged not only to look for patterns but to use them in the questions that follow.

Answer: 8 243 4096

(d) This question was about the application of a method to find the largest product. The best answers were by candidates who set out their working carefully, listing all the factors of 40 first and then methodically testing these. Candidates should practise setting out work so that it is clear and easy to follow, both to help themselves as well as the examiner.

Answer: 1 048 576

Communication

Candidates needed four out of the seven opportunities to gain the communication mark. Most candidates showed their working in all of **Questions 1** and **2** and gained this extra mark. Candidates should be encouraged to continue to show all steps in their working and all methods no matter how simple they appear to be. Frequently it was the lower scoring candidates who achieved this mark because they showed more working than the higher scoring candidates.

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/52
Paper 52 (Core)

Key messages

To do well on this paper, candidates needed to be able to find the *n*th term. They also needed to be able to follow instructions such as using previous answers to work out further questions, and to adapt theory to practical situations.

General comments

Candidates who found the *n*th term correctly were able to use this answer for two more questions and more work later in the paper. Those who followed the instructions correctly were able to achieve follow-through marks when their original answer was wrong. Candidates who understood the practical implications for buying tiles were able to gain marks by working with whole packs of tiles and rounding up their decimals to get whole numbers.

Comments on specific questions

Question 1

(a) The second white border was shown on most diagrams. Some candidates drew more borders than just this one and some separated it into tiles as well. This was answered very well. Candidates should be encouraged to use a ruler and pencil for drawings.

(b) The third grey border was completed correctly by most candidates. A few omitted to shade it so that it could have been mistaken for a white border.

Question 2

(a) There were several methods of working out these answers. Most candidates found one of the ways and completed this table correctly. Candidates would benefit from practice at pattern spotting and sequences.

Answer: 24 40 56

(b) (i) There were very few errors in the answers to this question. Calculators should be used to check for arithmetical errors. Pattern spotting too might have helped a few to see if one of their answers did not follow the pattern.

Answer: 1 4 9 16

(ii) Names for such common sequences of numbers should be known by all candidates. It would be useful to learn these and to be able to identify them when given a few of the numbers in the sequence. The second most common answer to this question was 'quadratic'. Other word answers included 'continuous' and 'cubed'. The next most common answer was n^2. So candidates should also know the difference between the name of a sequence and the *n*th term of a sequence.

Answer: square

(iii) There was quite a variety of alternative expressions given as answers to this question. Most expressions were in terms of *n,* indicating that preparation work on types of sequences had been learnt well.

Answer: $8n^2$

(c) (i) This table was usually completed correctly. The answers could most easily be found by counting the squares using the diagrams in **Question 1** and then continuing the pattern. Candidates are improving their capacity to look back and use information from previous questions to answer other questions. Practice in this should be encouraged.

Answer: 7 11 15

(ii) Most candidates could find a common difference of 4 from part **(i)**. This led to a very common answer of $n + 4$, as well as the correct answer. Candidates need to work on finding the *n*th term, because use of the common difference in the wrong place is often seen.

Answer: $4n – 1$

(iii) This question told the candidates to use their answer to part **(ii)** to write down an expression. Some candidates did so. Many did not. Candidates should know that to follow such an instruction will earn them a mark so it would be prudent to do so. Many candidates, who had the correct answer to part **(ii)** tried to square that answer without just writing down the expression squared, e.g. $(4n – 1)^2$. This cost most of them the mark because they did not expand the expression correctly. Candidates were not asked to simplify their expression. They should be shown how to follow the commands in the wording of such a question and how important this is.

Answer: $(4n – 1)^2$

(d) This question again tells the candidates to use specific answers to help them with this question. Some candidates did do this. Some tried to start with the expression given in this question which did not result in anything useful. Future candidates should be encouraged to follow such instructions as given in this question. A common error was to subtract the answer of part **(c)(iii)** from part **(b)(iii)** instead of the other way round.

Question 3

(a) (i) This question was well answered. Candidates coped well with the different units.

Answer: 19

(ii) Candidates were told to use their answer from **Question 2(c)(ii)**. This worked well for those who had the correct expression. Where they had got this wrong it did not result in 19 as expected. In these situations, candidates should be encouraged to go back to previous questions and answers and to re-work the original question.

Answer: $4 \times 5 – 1 = 19$

(iii) Many candidates went back to the sequences of white and grey tiles rather than using the expressions they had found for the totals of the different coloured tiles. This tactic worked well apart from arithmetical errors. Candidates should be reminded that they should check mental calculations with their calculator. Using the expressions was quicker but relied on the correct expressions to get full marks. In situations where there are two methods candidates should be encouraged to use one method to check their answers obtained by the other method.

Answer: White tiles 200, Grey tiles 161

(iv) To answer this question, candidates needed to divide by 20 and round up to give integer answers for the packs of tiles. Candidates should be aware of the practical issues in such situations and know to round up if their answers to their divisions are not integers.

Answer: Packets of white tiles 10, Packets of grey tiles 9

(b) It would be helpful if candidates could practise questions where an explanation in words is necessary. Often it is a very simple answer that they should be looking for and the explanation is quite straightforward.

Answer: Number of grey tiles in pattern always odd or not a multiple of 20

Communication

Overall the candidates communicated reasonably well on this paper. They showed differences, sequences and working out in most cases.

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/53
Paper 53 (Core)

Key messages

To do well candidates needed to have strengths in working with algebraic expressions and formula and the ability to solve problems. They also needed to be able to follow a method through different stages from numerical to algebraic.

General comments

A good knowledge of Relative Frequency and Probability was important, even though everything was explained throughout the investigation. Candidates who were able to create and use formula did well.

Comments on specific questions

Question 1

(a) (i) A straightforward question to start with, this did not cause any problems to most candidates.

Answer: 800

(ii) To show an answer of *p* to at least three decimal places as given, candidates needed to replace the area of the circle and the area of the rectangle by the values they had calculated. As is often the case it was not acceptable to use the given value of *p* in the equation.

(b) (i) The candidates were asked for the number of grains of rice inside the circle. They should be aware of the difference between the number and the probability. In this case, the number of grains was required and so $\frac{2}{10}$ was incorrect.

Answer: 2

(ii) Here, again, the candidates needed to count the grains of rice in the diagram and put them in the correct numerator and denominator positions. Candidates should be aware that when no simplification is asked for then there is no need to do it.

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

(c) This time the candidates needed to simplify their fraction for the relative frequency. They again needed to count the grains of rice in the diagram and put them in the correct numerator and denominator positions.

Answer: $\frac{3}{20}$

(d) This was where candidates started to have difficulty with the questions. There were two points here that caused concern. First, candidates needed to rearrange the probability formula to find π. Candidates should practice rearrangement of equations and formula so that they are very familiar with these techniques. Secondly, some candidates did not realise that π was the unknown and substituted a value like 3.14 in place of π. Reading the question very carefully might have helped them not to make this error.

Question 2

(a) Most candidates knew the formula for the area of a circle and most knew to use 100 as the number rather than 10^2.

Answer: 100

(b) (i) Candidates needed to add the grains of rice to complete the boxes in the table. They should be encouraged to read questions very carefully to prevent them putting, for example, probability fractions in the places where numbers of rice grains are required.

Answer: 4 6 10

(ii) This question involved further use of the formula to find an estimation for π. Candidates had been given all the values and needed to substitute correctly and in the correct places. It was also necessary to rearrange the formula. This proved quite difficult for many, although at least most made a good attempt to find π.

Answer: 3

Question 3

(a) (i) Candidates should be reminded to consider even the seemingly easiest questions with care. They should check that their answers make sense and fit the criteria given.

Answer: 32

(ii) More work on knowing the difference between area and circumference and using their formula would be very useful. There were also answers for one circle rather than two. Reading the question carefully cannot be emphasised enough.

Answer: 128

(b) Candidates needed to complete the table with the relative frequency this time. They should always be encouraged to look back at previous work to see if it will help them. Here there was a similar table in **Question 2** where the relative frequency was given.

Answer: 79, $\frac{79}{100}$

(c) For this answer to be correct it was dependent on several other parts that had already been worked out. There were follow-through method marks if any of the previous answers were incorrect. Candidates also needed to rearrange the formula to find π. Practice in rearranging equations would be most useful as this was not a strength for many candidates.

Answer: 3.16

(d) Candidates should know that accuracy is improved every time you carry out an experiment. If they did know this, very few were able to put it into words using the practical situation.

Question 4

The whole of **Question 4** called for much thought from the candidates and an ability to solve wordy problems and to follow-through from earlier work.

(a) Introducing algebra (radius *r*) into the method for finding π was a more difficult step for most candidates. It was finding the area of the rectangle to be $2r \times 2r$ which caused more problems than the area of the circle. Candidates also needed to make this into a formula by equating it to the relative frequency of $\frac{785}{1000}$ not $\frac{785}{500}$. Of those candidates who completed this first step successfully many were unable to follow through the algebra correctly, often losing an *r* in the denominator, ($2r \times 2r = 4r$). Then they had to illegally lose an *r* to get a numerical answer for π. Much work would be helpful on questions like this – creating and solving algebraic expressions.

Answer: 3.14

(b) In order to answer this question many candidates preferred to ignore the request for the answer as a single number. Answers including *r* were common.

Answer: 4

(c) Only the best candidates were able to attempt this question. The key was again to calculate the relative frequency as $= \frac{2k}{n}$. Where the candidates had made a valid attempt at estimating π in part **(a)** they had a better chance of doing this.

Communication

Four sets of evidence were needed for the two marks for communication. These were usually seen in the numerical answers in **Questions 1** and **3**. To gain communication marks in other questions candidates need to practice and improve their algebraic skills.

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/61
Paper 61 (Extended)

Key messages

In order to do well in this examination, candidates need to give clear and logical answers to questions, showing sufficient method so that marks, particularly communication marks, can be awarded. Correct mathematical terminology and presentation is also expected where appropriate. Explanations need to be clear and not contradictory. When candidates are asked to 'show that' a result is valid, they should produce clear, mathematical explanations, rather than lengthy descriptions in words.

General comments

Many candidates were well prepared for this examination and gave good, clearly presented and well explained answers. The level of communication was good in ***Part A*** and very good in ***Part B***. Many candidates earned all the communication marks available. A good number of candidates scored well and found both parts accessible. Other candidates engaged well with the first three questions in each part. The later questions in each part proved challenging, particularly in ***Part A***, with many candidates working from first principles. Many candidates presented their work neatly, clearly and with correct mathematical form. In order to improve, other candidates need to understand that their working must be clear and detailed enough to show their understanding. Explanations needed to be concise and comments supported by valid calculations were often awarded full credit. This was highlighted in **Questions 2(b)**, **3(a)** and **3(b)**. Generally, showing clear method is also very important if the instruction in a question includes the words 'Show that…'. This indicates that the answer has been given to the candidates and that the marks will be awarded for showing how that answer has been found. The need for this was highlighted in **Question 5(a)** in this examination. Note that the equation solver facility on the graphics calculator is not on the list of allowable applications for this syllabus, so use of this does not gain credit.

Comments on specific questions

Part A Investigation: Largest Products

Question 1

This question introduced the idea of finding the largest product when two or more positive integers had the given sums 8, 20, 9 and 21. It provided a straightforward introduction into the task for most candidates.

(a) Here candidates considered the calculation that gave the largest product starting with an even number. Candidates rarely made errors, although occasionally arithmetic slips were seen. A few candidates attempted to use Tom's method from **Question 2** to answer this part. As this was later in the task, this was not valid at this stage.

Answers:

(i)

Integers		Sum	Product
1	7	8	7
2	6	8	12
3	5	8	15
4	4	8	16

4×4 **(ii)** 100 10×10

(b) Here candidates considered the calculation that gave the largest product starting with an odd number. Again, candidates demonstrated that they understood what was required and the majority answered both parts correctly. The candidates that had resorted to using Tom's method in part **(a)(ii)** usually repeated the process in part **(b)(ii).**

Answers:

(i)

Integers		Sum	Product
1	8	9	8
2	7	9	14
3	6	9	18
4	5	9	20

4×5 or 5×4 **(ii)** 110 10, 11

Question 2

This question built upon the ideas in **Question 1**. It introduced candidates to Tom's method of carrying out several iterations using the largest product for each of the components of the previous largest product until a final row of 2s and 3s only was found. This resulted in an improved largest product.

(a) Candidates found this straightforward and very few candidates made any error at all.

Answer: Row 2: 10
Row 3: 4 5 5 5

(b) This was the first question that candidates found to be challenging. A reasonable number of candidates were able to make an acceptable comment explaining that the product would be lower if the final row were replaced. Some candidates struggled with the language needed for the explanation. These candidates would perhaps have improved if they had constructed the next row and found the product to be 8. Comments such as 'There are lots of 1s so the largest product is not sensible.' were not acceptable. Many candidates confused the tree diagram for a factor tree and made comments based on 2 and 3 being the smallest prime numbers. This was the most common incorrect explanation.

(c) A high proportion of candidates were able to complete the tree diagram correctly and find the largest product using Tom's method. Some candidates completed the second row with 10 and 12. Whilst this gave the same value for the largest product, it was not using Tom's method and was not given full credit. A few candidates were uncertain as to whether they needed to multiply or add values. These candidates found the correct row of 2s and 3s, wrote down the correct calculation to find the largest product, then wrote it in index form and then calculated $2^2 + 3^6$ instead of $2^2 \times 3^6$. A few other candidates would have benefited from re-reading the ideas used in Tom's method in the previous parts of the question as some stopped with the row of 5s and 6s, rather than progressing to the row of 2s and 3s and consequently gave the answer 900. Almost all candidates successfully communicated the product they used to find their answer.

Answer: 2916

Question 3

(a) Candidates who used calculations such as 2 + 2 + 2 = 3 + 3 to explain why the replacement did not change the value of the sum were the most successful. Those who tried to use words only often gave incomplete arguments or were not clear enough in their explanations to be credited. Simply saying that they both have the same sum was insufficient for the mark as this was little more than restating what they had been given. A small number of candidates offered answers of '2 + 3 = 3 + 2' having misinterpreted the information given.

(b) Again, the many candidates who made statements such as $3 \times 3 > 2 \times 2 \times 2$ were successful, whereas the few candidates who tried to describe this in words and wrote comments along the lines that 'two threes are greater than three twos' were not.

(c) In this part, candidates were first able to demonstrate that they understood the replacement process. Many candidates were able to do this successfully. Some candidates ignored the replacement and gave the answer 864, which had already been given. A few other candidates reversed the replacement and replaced 3^2 by 2^3. Some were again confused as to whether they needed to add or multiply and gave the answer 19, from summing all the 2s and 3s given.

Having found the answer 972 in part **(c)(i)**, candidates were required to write this as a product of powers of 2s and 3s. Candidates who had found 972 correctly were generally also correct here. A small number of candidates gave the answer 10 after stating the correct form as they misinterpreted the question and thought that the powers of 2 and 3 needed to be multiplied.

Answers: **(i)** 972 **(ii)** $3^5 \times 2^2$

Question 4

Candidates found this question to be the most challenging on the paper.

(a) (i) Here candidates needed to connect the sums and products they had been working with and derive a simple formula to find the original sum given the expression found for the largest product using the replacement in Tom's method. Some candidates were able to make this connection and stated a correct formula or expression for *N*. Many candidates found this thinking was beyond them and commonly gave an answer of either $2^x + 3^y$ or $2^x \times 3^y$. A good proportion of candidates were able to communicate that *N* was the subject of their formula.

Answer: $N = 2x + 3y$

(ii) Some candidates gave complete, efficient explanations making it clear that every set of three 2s was replaced by a set of two 3s. Other candidates were unclear in their description or choice of wording and often suggested that, when $x > 2$, all the 2s would be replaced by 3s. This was a common incorrect answer. The remaining candidates made no attempt to answer or offered invalid comments suggesting, for example, that the method would not work otherwise.

(b) (i) Those who had found the correct formula were more successful in this part. Fully correct and clear solutions, using the correct formula, were offered by the better candidates. Some candidates had not fully understood the need for both x and y to be integers and used the correct formula to find their answer with the non-integer value of y that gave the largest value of the expression. These candidates often earned a mark for trying $x = 0$ and $y = 20$. Other candidates tended to draw tree diagrams and tried to work through the method from first principles. Whilst this could have resulted in a correct answer, these candidates almost always omitted to replace the 2s by 3s and thus no credit could be given. Common incorrect answers came from evaluating $2^{12} \times 3^{12}$ or $2^{24} \times 3^{4}$. Some candidates seemed to be trying to use the method of **Question 1** and gave the answer 900 from 30×30. Some candidates communicated their method by drawing tree diagrams. Some of these trees did not have final rows or 2s and 3s and therefore the communication was incomplete. Other candidates were able to state a correct product of 2s and/or 3s and be credited for communication in that way. A very small number of candidates were credited for communication from the substitution of $x = 0$ and $y = 20$ into the correct expression.

Answer: 3486 784 401

(ii) More candidates were successful with this part as many realised that their answer should be twice the answer to part **(b)(i)**. A few candidates added 2 rather than doubling. Those using diagrams and first principles tended to evaluate $2^{28} \times 3^{2}$, again omitting to make the correct replacement. Those candidates who had used the method of **Question 1** in part **(b)(i)** tended to do the same here and gave the answer 961 from 31×31. Candidates also tended to communicate their method in this part in the same way that they did in part **(b)(i)**.

Answer: 6973 568 802

(c) Stronger candidates were able to access this part of the question. A reasonable number of candidates were able to use a correct method to find $x = 2$ and $y = 13$. Most often, this was found using a correct prime factorisation of 6 377 292. A few candidates divided by 4 and then successfully took logs to base 3 to find 13. Candidates finding the correct values for x and y usually found the correct answer. Some candidates incorrectly found $\log_3 6\,377\,292$, multiplied the answer by 3 and then rounded or attempted to take logs of an invalid expression. The method of finding the power of 13, for which communication credit was given, by, for example, the prime factorisation of 6 377 292 by repeated division/factor tree or the taking of logarithms, was shown by a few candidates.

Answer: 43

Part B Modelling: Counting Prime Numbers

Question 5

(a) This was very well answered by the majority of candidates. A few candidates included 1 in their list of primes and consequently omitted one of the four missing primes. A few candidates did not recall or read correctly the definition of a prime as values such as 15 occasionally appeared in the list.

(b) A good number of correct answers were seen to this part. Candidates communicated well in this part, listing the three extra primes, which counted for communication. A common wrong answer was 16 from the inclusion of 49. Some candidates thought that the number of primes in the first 40 integers was directly proportional to the number in the first 50 integers, without any justification. Whilst this gave the answer 15, the working that led to the answer was not valid and credit could not be given. A few candidates incorrectly listed primes in the 50s, having misinterpreted the notation given.

Answer: 15

(c) Fewer correct answers were given to this part, although a good number were still seen. It was common to include 91 or sometimes 91 and 93 and so give the answer 23 or 22. Again, candidates communicated well in this part, stating 97 as the relevant value that is prime and gaining credit for their communication. A few candidates attempted to list all the primes up to 90 rather than using the information given about the number of primes less than 100. This was rarely successful. Candidates who used the unacceptable proportional approach in part **(b)** tended to also use it in this part.

Answer: 24

Question 6

In this question candidates were required to plot points accurately on a scatter diagram. This leads into the linear model for the number of primes less than *x* in **Question 7**. Most candidates were able to plot their points sufficiently accurately to earn the mark.

Question 7

(a) Candidates dealt with this question very well. Most candidates were able to find the correct value of the gradient of the linear model and most of these were also able to find the correct L(x)-intercept. Almost all candidates were credited for communication by showing the substitution needed to find the value of the L(x)-intercept..

Answer: $\mathrm{L}(x) = 0.22x + 3.2$

(b) Most candidates were able to substitute 1000 into their equation of sufficiently accurate form. Method was usually shown and this counted for communication. Very many of these candidates found the correct value for their equation. Some candidates did not appreciate the need for the answer to be an integer and gave an unacceptable decimal answer.

Answer: 223

Question 8

Here, candidates work with a quadratic model for the number of primes less than *x*.

(a) Using given information, candidates needed to find the unknown constant in the model. Many candidates substituted the values in the correct way, found the correct value and rounded to 1 decimal place correctly. Some candidates did not round their answer. A few candidates reversed the substitution whilst others interpreted Q(x) as $\mathrm{Q} \times x$ and had a left-hand side of 34×140. Many candidates showed an intermediate correct step in their method and this counted towards their communication.

Answer: 0.4

(b) Candidates needed to identify the problem with the quadratic model after the point where $x = 200$. Some candidates successfully commented on the shape of the graph and observed that the model decreased after this point. A few candidates stated only that it became negative after this point. This argument was incomplete and so not accepted. Some candidates commented that it would be a straight line after this point, perhaps indicating that they were confusing this model with the linear one in **Question 7**. Other candidates thought they were extrapolating and that was not permitted. Other incorrect reasons were that it did not exist after 200 or that it was inaccurate as *k* has been rounded.

Question 9

(a) Both parts of this question were very well answered by very many candidates. A few candidates gave non-integer answers.

Answers: **(i)** 77 **(ii)** 138

(b) In order to complete the table correctly, candidates needed to understand the cumulative nature of their answers to part **(a)**. Those that did so, were able to complete the table correctly. A few candidates only subtracted 31 from their answer to part **(a)(ii)**. A few candidates gave decimal answers, again not fully thinking through what the values represented. Candidates who did not recognise the cumulative nature of their values tended to write their answers to part **(a)** in the table. Candidates were able to gain credit for communication by writing a correct difference to show how they found one of the missing values in the table.

Answer: 33, 30

(c) (i) This was well answered and a good number of fully correct probabilities were found. A few candidates only calculated that there were 1250 primes less than 10 000 and stopped. A few other candidates misread the 10 000 as 1000 and gave the answer $\frac{1}{6}$. Some candidates used 1000 in the model, finding the number of primes less than 1000 as 167. They then divided this by 1000 and gave a final answer of $\frac{1670}{10000}$. This was not a misread of the figures but a misunderstanding of how to use the model.

Answer: $\frac{1}{8}$

(ii) Many candidates gave a correct unsimplified form for the required probability and this counted towards communication. Only the best candidates were able to successfully manipulate the expression they had into an acceptable simplified form. Weaker candidates tended to offer $\frac{1}{x}$ as their answer.

Answer: $\frac{1}{2\log_{10} x}$

(d) A good number of candidates knew the equation they needed to solve and earned a mark for writing it down. The best candidates gave the correct answer using the graphing function on their calculator. Some were reading the value 1.0117 from their graphics calculator and multiplying it by 100 or similar as they realised it did not have the correct order. These candidates would have done better if they had widened the view window on their calculator display to check to see if there was another point of intersection, which of course there was. A few candidates gave the answer 548. If they had considered this a little more carefully, they should have realised that 548 was not prime as it is even. Some candidates were successful using trials, although some were not sufficiently accurate with these. The most common wrong answer was 25 from the incorrect substitution of 100 into the model. A very small number of candidates were credited for communication in this part, more commonly for sketching a relevant pair of graphs than for carrying out trials

Answer: 547

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/62
Paper 62 (Extended)

Key messages

When candidates sketch graphs with the aid of the graphic display calculator they should show the important features (for example, scale used, intercepts and turning points) to a reasonable level of accuracy.

Candidates should always follow any instruction to use a previous part. Such instructions are intended to aid the candidate. In many cases, ignoring such an instruction will result in no credit being awarded.

In problem-solving tasks candidates should annotate their working as part of good communication, showing how their calculations arise and from where the results came.

General comments

Most candidates made a positive attempt with all questions and had sufficient time to complete the paper. The investigation was answered better than the modelling and most candidates, even weaker ones, were able to attempt the more searching questions of the investigation. Candidates had been very well prepared for handling sequences and they used differences effectively. There was evidence of strong algebraic skills, which were seen in solving simultaneous equations, expanding brackets, deducing formulae from sequences and, to a lesser extent, in solving an exponential equation and dealing with logarithms. To improve further, candidates need to understand the difference between an equation and an expression.

A feel for quantity helps candidates make judgements about their answers. If 30 cm square tiles are laid on a square floor of side 5.7 metres then, without calculation, candidates should sense that the number of tiles cannot be 10 or 5000 as some claimed.

An important skill in modelling is being able to relate the mathematics to the context. So, a model of a continuous quantity (in this paper, speed) will have a continuous graph even if only a few data points are given. Also, appropriate units are necessary. The depth of an object in a river that is 2 metres deep will not be several metres and is unlikely to be less than a millimetre. Correct units are therefore often rewarded under communication.

Comments on specific questions

Part A Investigation: Tile Patterns

Question 1

(a) This question asked candidates to draw the next pattern. Nearly all candidates did this correctly. A few shaded the border grey instead of leaving it white or indicating it.

(b) This question developed the pattern a further step. The question was answered correctly by nearly all candidates.

Question 2

(a) The table showed the numbers of white tiles. All but a small number of candidates completed the table correctly.

Answer: 1st column 24, 56; 2nd column 72

(b) Finding the expression for the number of white tiles was very well done. The popular approach was to use a difference method and candidates showed good understanding of how to use this method to get the answer. Some candidates wrote an equation but should have been aware that casual formulation, such as $n = 8n^2$, does not answer the question.

Answer: $8n^2$

(c) (i) The table for the number of white tiles along a side was completed correctly by nearly all candidates and very few wrote $n + 4$ for the nth expression. Credit for communication was given to those who showed that the differences were common. Many candidates did not show those differences.

Answer: 7, 11, $4n – 1$

(ii) For the total number of tiles, the large majority of candidates correctly squared their answer to part **(i)**. Some went further and expanded the brackets. There were a few who, from the pattern, built up the sequence 9, 49, 121, 225 and used a difference method. This was a much more involved method and demonstrated the disadvantage in not following the instruction to use part **(i)**.

Answer: $(4n – 1)^2$

(d) This question tested the understanding and mathematical formulation of the fact that the number of grey tiles is found by subtracting the number of white tiles, found in part **(b)**, from the total found in part **(c)(ii)**. Candidates, who ignored the instruction to use these parts and used a difference method or assumed a quadratic expression, scored no marks. The large majority of candidates showed the necessary algebraic competence, the most common error being to write $8n^2$ for the square of $4n$.

Question 3

(a) Using the floor size and the tile size, this question asked for the number of white and grey tiles. Candidates largely fell into two groups. A very large number gained full marks for the correct answer. There were also those who correctly worked out that there were 19 tiles along one side (or 361 tiles altogether) but then did not use that information to write $4n – 1 = 19$ and identify that $n = 5$. Credit for communication was given for showing how the 19 was calculated.

The most direct method was to calculate 361 as the total number of tiles and look at the table in **Question 2** to see that the fifth pattern had 200 white tiles.

Further credit for communication was awarded for showing how the second number (usually for grey tiles) was calculated. Some candidates used $n = 19$ which resulted in thousands of tiles. Candidates are urged to think about whether their answer is sensible.

Answer: 200 white tiles, 161 grey tiles

(b) This question required advanced problem-solving skills to find the largest floor that a pack of 500 white and 500 grey tiles would cover. To do this, candidates had to organise their thoughts round the various pieces of information gathered throughout the task. Therefore, annotation of the working was important and given credit towards communication. Further credit for communication was given to those who remembered that units should be given for the length of the largest side.

Many candidates made a sensible start to tackling the problem by writing down a relevant statement from the information they had, such as $8n^2 < 500$. Many were able to go further and implied in their work that n was either 7 or 8. Only a few candidates could give all three correct answers but there were a significant number who calculated correctly that, by taking $n = 7$, there were 108 white tiles remaining.

For the number of grey tiles, 163 was often seen from those who, assuming the final border was white, also used 7 instead of 8 in the formula for grey tiles. This resulted in 27 tiles on a side giving a side length 8.1 m, which was seen quite frequently.

Answer: Length of side 8.7 m, White tiles not used = 108, Grey tiles not used = 51

Part B Modelling: Going with the Flow

Question 4

(a) (i) Candidates had to substitute information into the quadratic model. There were a large number of candidates who did not use the table of information given in the introduction to this part but only substituted the x values, and so were unable to form equations. Some took v as 0 to make equations.

Answer: $a + b + 12 = 21$, $4a + 2b + 12 = 24$

(ii) Only algebraic slips by very few candidates stopped them getting the correct solution to the equations in part **(i)**. Those who used their own values for v, usually 0, in part **(i)** could not score in this part.

Answer: $v = -3x^2 + 12x + 12$

(b) (i) Nearly all candidates plotted the given points accurately although a few omitted the point (1.8, 23.9). Since there was a finite number of data points given, the majority of candidates assumed that the model too would only have the points given in the table. Of those who drew the curve, a few bent it in the wrong direction at the left end, assuming it should pass through the intersection of the axes. A few candidates did not plot any points and instead joined the existing ones.

(ii) This question, about when the model gave a larger answer than the data, proved more difficult. Various inequalities were offered as the answer but many did not cover the full range or left one end open and $x > 1$ was often seen. Many of those who had not shown a continuous graph in part **(i)** wrote $1.2 \leqslant x \leqslant 1.8$ or 1.2, 1.4, 1.6, 1.8.

Answer: $1 < x < 2$

Question 5

(a) The great majority of candidates were successful in finding k in the exponential model by substituting the given information. It was possible to find the value of k because the substitution led to 1^m which equalled 1. Noting this key fact was rewarded under communication. Candidates who wrote $\frac{24}{1^m}$ did not get the mark since this is an expression in m and not a value.

Answer: 24

(b)(i) Although logarithms require higher-level skills a significant number of candidates provided the correct equation after taking logarithms of both sides. The comparison on the answer line with the familiar *y* = *mx* + c may have prompted the correct answer since only a few candidates provided the intermediate step $\log v = \log\left(\frac{x}{2}\right)^m + \log k$, which was rewarded for communication. There were many who incorrectly wrote $\log v = m\log\left(k\frac{x}{2}\right)$ instead.

Answer: $\log v = m\log\left(\frac{x}{2}\right) + \log 24$

(b)(ii) The graph of the line of best fit was given and candidates had to find its gradient *m*. Some did not follow the instruction and instead used the equation and a point from the table. This resulted in a different answer from that when using the graph and so was not credited. While there were many correct answers, a frequent error was to give the intercept, 1.38, as the gradient, thinking that the *v*-axis started at 0.

Answer: $m = 0.2$, $v = 24\left(\frac{x}{2}\right)^{0.2}$

(c) To find the required height, candidates had to equate their exponential function to 12 and then solve the equation. From the information given this answer would be in metres and communication was rewarded for giving the correct unit. Many candidates wrongly substituted 12 for the value of *x*. To solve the equation many candidates preferred algebra though using the graphics calculator might have been more efficient.

Answer: 0.06 m

Question 6

There were some candidates who did not answer this question at all. It is possible that lack of time played a part in that.

(a) Many candidates lost marks here because their explanation was not clear but consisted of disjointed comments. *Show that….* questions require clear and complete reasoning especially since here, the time for lowering the grid was given in the question.

Since $2 - x$ and *u* appeared on the diagram, candidates had to explain where the division came from and why the numerator only was multiplied by 100. Of these two parts many more candidates were convincing in the former, writing time = $\frac{\text{distance}}{\text{speed}}$ for instance. For the latter, $100(2 - x)$ had to be labelled as centimetres. There were many responses where 1 m = 100 cm was stated but not linked to the expression.

(b) Even though time = $\frac{\text{distance}}{\text{speed}}$ was a familiar formula, often seen in the previous part, candidates found the idea behind this question difficult and few correct answers were seen. Of those who understood that $\frac{\text{distance}}{\text{speed}}$ was required only a few changed 20 m to 2000 cm.

Answer: $\dfrac{2000}{24\left(\frac{x}{2}\right)^{0.2}}$

(c) Those who had an incorrect expression in part **(b)** were unable to achieve the given result and so could not score the mark. The question required candidates to show that they knew that the time taken to lower the grid should be less than the time taken for the dirt to travel along the river.

(d) (i) There were a very large number of careful accurate sketches, some with a scale on the u-axis, showing good communication. Although only a sketch was required it was expected that the intercepts and the maximum point would be shown approximately. Too many candidates did not look at their graphic display calculator carefully enough, resulting in an x-intercept not close to 2 and the angle with the u-axis inappropriately large.

(ii) Only a few candidates gave the correct answer here since it required realising that the minimum u in the question occurred for maximum u on the graph. Several gave the value of x instead of u at that maximum. Answers of 0 and 2 were often seen, 0 being the minimum value of u for the graph.

Answer: 1.4 cm/s

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/63
Paper 63 (Extended)

Key messages

To succeed in this paper, candidates need to have covered all of the Extended syllabus content.

They should be able to apply their mathematics to investigate and solve problems and to develop mathematical models to represent real life situations. They must be able to provide full reasons for their solutions and be able to communicate their mathematics clearly and precisely.

General comments

The first half of the paper was an investigation using relative frequency to estimate the value of π; most candidates understood the principle of the process and gained marks from the early questions. To find and explain generalisations proved more difficult for many candidates. The model that was developed in the second half of the paper involved linear programming skills that most, but not all of the candidates were familiar with.

Comments on specific questions

Part A Investigation: Estimating π

Question 1

(a) (i) Most candidates answered this part correctly, showing an appropriate step-by-step approach.

Some candidates who knew what to do did not give enough detail in their method in their response. Many did not appreciate that they needed to give a response to more than three significant figures.

(ii) Nearly all candidates gave the correct response.

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

(iii) Nearly all candidates gave the correct response.

(iv) Most candidates applied the formula correctly and were given credit for communication. There were many correct solutions, but some did not show enough steps in their working.

(b) (i) The correct response was given by most candidates. A few gave an answer of 10^2, which needed to be evaluated.

Answer: 100

(ii) Most candidates gave the correct answers; only a few gave their answers as relative frequencies rather than the whole numbers of grains of rice that were required.

Answer: 4 6 10

(iii) Many candidates found the correct estimate for π and a clear detailed method was often shown. A few candidates were confused and substituted a value of 3.14 for π rather than attempting to find an estimate.

Answer: 3

Question 2

(a) This was a similar question to **Question 1(b)(iii)** and many who answered that successfully went on to gain similar success in this question. The main error was not to use 24^2 for the area of the square.

Answer: 3.12

(b) This question required candidates to generalise the rule for any value of *r* and most did not appreciate this, substituting in particular values.

Answer: 4

Question 3

(a) Many knew how to approach this problem, but only a few candidates could find the area of the hexagon correctly; consequently, there were not many fully correct responses.

Answer: 3.135

(b) This again required candidates to generalise the rule for any value of *x* and most candidates struggled to do this. Those that did go on to make an attempt to find the value of *k*, did not always take heed that the question required an exact value and gave an answer as a rounded decimal.

Answer: $2\sqrt{3}$

Question 4

Many candidates found this explanation beyond them, either not attempting the question at all or giving some numerical calculations. There were a few good responses with candidates showing a clear understanding of the principles involved.

Part B Modelling: Shoe Business

Question 5

(a) (i) Many candidates gave the correct response.

Answer: $0 \leqslant x + y \leqslant 150$

(ii) Although many candidates explained why $x \leqslant 80$ and $y \leqslant 100$, they did not explain that they could not be negative.

(iii) Most candidates gave the incorrect response $4x + 5y \geqslant 180$, as they did not observe that Machine B is used for four hours each day rather than three hours. Many did not show evidence of converting hours to minutes and were not able to obtain credit for communication.

Answer: $4x + 5y \geqslant 240$

(b) Some candidates did not consider the total profit and gave an answer of $100x + 70y$, but there were a reasonable number of correct responses with some gaining credit for communicating how they obtained the profit for each type of shoe.

Answer: $80x + 55y$

Question 6

(a) Few candidates obtained full marks for drawing appropriate lines and shading the correct region. Many obtained part marks for drawing lines for the boundaries of their inequalities. Many did not consider all five inequalities when defining their region.

(b) Only a few candidates were successful here. Many did not realise that they needed to show how to obtain the greatest profit as well as writing down the number of shoes of each style.

Answers: Style $X = 80$, Style $Y = 70$

Question 7

(a) There were a reasonable number of correct responses. Some candidates showed that they needed to consider the line $0.5x + 0.4y = 50$, for which they were credited, but then did not draw this line correctly.

(b) Candidates found this question challenging but there were some correct responses. These candidates generally showed a full method and consequently gained credit for communication as well.

Answer: 2475

Question 8

(a) Many candidates used their graphic calculators to try to sketch the appropriate graph, but often did not use the correct parameters, and consequently only a small section of the graph was shown rather than the required parabola. There were a small number of correct responses.

(b) The majority of candidates found the correct number for the minimum number of bags; of these, many showed the 32.5, and also appreciated that a whole number of bags was required giving the correct response of 33.

Answer: 33

(c) Many candidates substituted 80 into the quadratic formula and most of these obtained the correct profit.

Answer: 3895

Question 9

(a) This question was found to be challenging, with only a few candidates understanding what was required, substituting $x = 40$ into $0.5x + 0.4y = 50$.

Answer: 75

(b) Again, candidates had difficulty understanding what was required to show that the profit each day had increased; a small number did show a full solution, but some having found the correct profit compared it with £10 250 rather than £7775.