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

Workings are vital in 2-step problems, in particular with algebra and others with little scaffolding such as **Questions 11**, **12** and **16**. Showing workings enables candidates to access method marks in case their final answer is wrong. As in previous years, the workings were often 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.

The questions that presented least difficulty were **Questions 3**, **6**, **7**, **10** and **13(b)**. Those that proved to be the most challenging were **Question 8,** finding the gradient of a given line equation, **Question 13(a)**, drawing a segment in a circle and **Question 14,** describing transformations. There were few un-attempted questions as, in general, candidates attempted the vast majority of questions. Those that were most likely to be left blank were **Questions 8** and **9(b).**

Comments on specific questions

Question 1

Candidates did reasonably well with this opening question. The most common error was to give 430 as the answer. Some gave answers such as 400.3 or 40 300 implying that they did not understand that multiplying by a power of 10 is what is required. For the change from hours to days, the common wrong answers were 3 days and 2 days and 12 hours. This second answer is wrong as it is not in days, 2.5 or $2\frac{1}{2}$ are the answers that are required.

Answers: **(a)** 4300 **(b)** 2.5

Question 2

In general, this was done well but some gave 5^2 or a square number outside the range 20 to 30. Some gave more than one answer, which did not get the mark even if 25 was in their list. These extra answers were often not square numbers.

Answer: 25

Question 3

On the whole, candidates understood this question but sometimes inserted an extra pair of brackets. It is a good idea to try out positions for the brackets to check what effect they have on the order of operations. This could be thought of as a multiple choice type question as there is only a limited number of places where brackets could be placed so candidates should try to give an answer rather than leave it blank.

Answer: $(24 – 12) \div 3 = 4$

Question 4

There are two approaches to finding the lowest common multiple. The easiest is to list multiples of each number until the first time a number appears in both lists – this method relies on correct addition. The second is to find the factors of each number then put together a multiplication sum so that the factors of each number are included once, for example, $6 = 2 \times 3$ and $15 = 3 \times 5$ so the LCM is $2 \times 3 \times 5 = 30$ and there is no need for to multiply by another 3. Some candidates tried to find the highest common factor so answers were often 1, 2, 3 or 5 or even a few of these.

Answer: 30

Question 5

Candidates should read the instructions carefully in a question as errors here included drawing the angle at the left end of the line or the midpoint rather than at *A*. Sometimes an angle at *A* was not accurate enough. These inaccurate angles were split between those that were only a few degrees out to angles that were either far greater than 90° or only about 30°. Most angles were drawn using a pencil, protractor and straight edge, but some were freehand. For questions like these, freehand lines are not acceptable.

Question 6

Many did very well with this question with nearly all candidates getting **part (a**) correct. **Part (b)** was less well done with wrong answers of 10 to 11 years rather than 10.5.

Answers: **(a)** 20 **(b)** 10.5

Question 7

Again, this was done well with most candidates gaining at least one mark. Candidates got the probability correct of choosing a yellow cake but some gave $\frac{1}{5}$ as the probabilty of choosing a pink cake. Occasionally candidates gave $\frac{0}{0}$ as the probability of choosing a blue cake. A few gave $\frac{1}{4}$ as the probability for all 3 answers, maybe as there were 4 lines to the table, without taking in account the different numbers of each cake colour.

Answer: Pink $\frac{5}{12}$, Yellow $\frac{1}{12}$, Blue 0

Question 8

This question was the one most likely to be missed out by candidates and the one that presented the most difficulties. The understanding of the equation of a straight line is one area that candidates often find complex and this equation is not in the expected form of $y = mx + c$. This tested understanding that the gradient is the coefficient of x rather than the first number after the equal sign as many candidates gave 7 as their answer.

Answer: –1

Question 9

Many candidates were aware that their three angles must add to 180° but did not always give the correct angles and two out of the three angles had to be correct to get one mark. The answers varied a great deal so it was not always possible to see what method a candidate was using. The pie charts were generally drawn well with accurate angles or following through their angles from **part (a)** provided they added to 180°. A few who got the angles in **part (a)** incorrect, went on to draw a perfectly correct pie chart. Like with **Question 5**, candidates are expected to use pencils and straight edges for pie charts. The three sectors had to be labelled in the same way as the given sector for $t > 50$ to gain full marks.

Answers: **(a)** 40, 60 and 80

Question 10

This was a well answered question. Candidates had to get both the x and y co-ordinates correct in order to gain the mark in each part. Occasionally, the co-ordinates in **part (a)** were reversed so gained no marks. **Part (b)** was less well done as it was more involved. Most candidates could plot point C correctly but then the positioning of point B so that C was the mid-point of the line AB was less well done as, in a few cases, B was given as the mid-point of AC.

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

Question 11

This was a question with no scaffolding to lead candidates to the solution so was more demanding. In questions like these it is important to recognise the key words and to give what is actually asked for. Some candidates only worked out the 25% profit but did not add that on to the cost of the carpet to calculate the selling price asked for in the question. The fact that this question was worth three marks was an indication that there are various steps to be undertaken towards the solution. Some worked out 25% of 640 but then subtracted giving £480. A few divided 640 by 25 instead of multiplying and some knew the method but made numerical errors.

Answer: 800

Question 12

This question was one where candidates had to devise their own strategy for dividing up the diagram to work out the area in parts as, again, no scaffolding was given. There were basically two methods, one, to draw a vertical line to create a rectangle 2 cm by 8 cm and a triangle of height 4 cm and base 6 cm (from 8 – 2) and the other to draw a horizontal line making a smaller rectangle, 2 cm by 4 cm, and a trapezium below. In both cases, once the areas had been calculated these needed to be added. It is also possible to make a large 8 cm square and subtract either a trapezium or rectangle 6 cm by 4 cm and a triangle of height 4 cm and base 6 cm. However some continued the triangle's hypotenuse (to the left), correctly giving the base as 8 cm but they could not know the height. Then they were left with a trapezium one of whose lengths they did not know. Some gave the answer 22 from simply adding all the given lengths.

Answer: 28

Question 13

In **part (a)** many confused segment with sector. Some drew a chord without shading on one of the sides so did not get the mark. Other incorrect answers included a radius or diameter drawn. This was the second most challenging question on the paper. Conversely, **part (b)** was almost the best answered one. Many started **part (c)** well by adding right angles at either tangent to the radius or the vertically opposite angle of 50°. This is where many stopped. Some went on the halve the quadrilateral to create a triangle, AOP (or BOP) so found half of the required angle as 65° but omitted to double this to get AOB. Another approach uses the fact that the angles of a quadrilateral add to 360° so subtracting the two right angles and the 50° at P leaves 130°.

Answer: **(c)** 130°

Question 14

With transformation questions, if the image is a different size to the original then it is a an enlargement and it is irrelevant whether the image is larger or smaller than the original. As there are three marks for this, besides giving ‘enlargement’, the scale factor and centre of enlargement are also worth a mark each. As the question says, describe fully the single transformation, candidates who give more than one transformation will not get any marks. This was the case for some candidates.

Answer: Enlargement, scale factor $\frac{1}{2}$, centre (1, –1)

Question 15

Although this topic has not been on this paper for a while, a reasonable number of candidates gained at least one mark here, with the intersection the most likely to be correct. A few candidates added unnecessary lines to make more regions or only partially shading in an area.

Question 16

A relatively small number of candidates got both marks here and many others lost marks for using the wrong sign. Quite a few candidates started well showing $3x \geqslant 12$.

Answer: $x \geqslant 4$

Question 17

This was a fairly straightforward question on solving simultaneous equations. Looking at the coefficients, the efficient way to proceed was to multiply the second by 4 then add to eliminate y or to double the second equation then subtract to eliminate x. Some candidates rearranged both equation to equal y, for example, and then equated these giving, $3x - 11 = (34 - 6x) \div 4$. Besides elimination and rearrangement, substitution was also a method used by a few candidates. Full working must be shown for full marks to be awarded. Those candidates who just give the answers without algebraic working will only get one mark. Some left the answers as rearrangements of the given equations but this did not get any marks.

Answer: $x = 5$, $y = 1$

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 question 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 9**, **11** and **13**. Showing workings enables candidates to access method marks in case their final answer is wrong. 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 of answers or whether units are required, for example, in **Question 9**.

The questions that presented least difficulty were **Questions 1**, **3**, **4**, **7(b)** and **12**. Those that proved to be the most challenging were **Question 8**, examples of discrete data, **Question 15**, finding the gradient of a given line equation **Question 17**, writing the range of a function and **Question 18**, describing a transformation. There were few un-attempted questions as, in general, candidates attempted the vast majority of questions. Those that were occasionally left blank were **Questions 8**, **15** and **17.**

Comments on specific questions

Question 1

Candidates did very well with this opening question. A few gave answers that were not from the list. Some gave more than one number from the list but as each part asked for the number that satisfied a condition this means that there is only one answer. **Parts (a)** and **(b)** were the best answered and were in fact the best done on the whole paper. Candidates should not leave this almost multiple choice type of question blank as there is a limited choice of what answers could be. This time, very rarely was any part left blank. Here none of the answers were repeats but candidates should remember that is not always the case.

Answers: **(a)** 33 **(b)** 29 **(c)** 25 **(d)** 20

Question 2

There were many incorrect decimals given but the common ones were 0.25 and 1.25 as well as 0.3, 1.05 and also percentages.

Answer: 0.8

Question 3

Many did well here, getting at least one out of the two marks but often the given fractions were not fully simplified.

Answer: $\frac{3}{10}$

Question 4

Many gave answers that did not add to \$150, such as \$75 and \$50 (from dividing \$150 by 2 and then 3) or \$300 and \$450 (150 × 2 and 150 × 3). Others did give two amounts that totalled \$150, but they were not in the right proportion.

Answer: 60 and 90

Question 5

Pentagon, hexagon and polygon were seen often but also other shapes such as parallelogram or pyramid.

Answer: Octagon

Question 6

Many candidates were accurate with their measuring but some angles were far from 42°, for example 90°, 130° or 190°.

Answer: 42

Question 7

In **part (a)** many candidates gave 85° as the angle although some gave 95°. Candidates were less successful giving the reason why. Some tried to give equations but reasons must be in words as shown below. Errors in **part (b)** include using the wrong number of degrees in a quadrilateral and making numerical errors in adding the three given angles or the subtraction from 360°.

Answers: **(a)** 85**,** vertically opposite angles **(b)** 80

Question 8

This question was the one that was left blank most often. Candidates gave answers which were nothing to do with data. Some gave examples that were of continuous data, for example, to do with height, mass or time. Others gave categorical data such as eye colour. Examples of correct answers include the number of candidates in a class or shoes sizes in other words, data that take discrete numerical values.

Question 9

This question was one where candidates had to devise their own strategy for dividing up the diagram to work out the area in parts as no scaffolding was given. There were two main methods, one was to take the area of the two small triangles from the area of the enclosing rectangle and the other was to split up the shaded area in to rectangles and trapeziums or triangles. This type of problem needs working for each step but many of the incorrect solutions had little working or no working. Also, candidates were asked for the correct units, some did not give units or gave cm or cm^3.

Answer: 28 cm^2

Question 10

Many candidates did not appear to know that standard form involves a value in the range $1 \leqslant n < 10$ multiplied by a power of 10. For those that did give an answer in the correct form, errors included counting the zeros incorrectly or giving the power as positive instead of negative. Occasionally a fraction was given as the answer.

Answer: 3×10^{-8}

Question 11

This was another question with no scaffolding to lead candidates to the solution so was more demanding. In questions like these it is important to recognise the key words (3%, 4 years, simple interest and total value) and to give what is actually asked for. Some candidates only worked out the interest but did not add that onto the initial investment of $200 to calculate the total value asked for in the question. The fact that this question was worth three marks was an indication that there are various steps to be undertaken towards the solution. Some only worked out one year's interest. A few worked out the total interest as $2400 as they omitted divide by 100 and some knew the method but made numerical errors.

Answer: $224

Question 12

This was generally done well but candidates were more successful with **part (b)**. For **part (a)** answers such as $2.5\ (x + 4)$ and $4(x + 2) + 2$ are not acceptable. Some tried to combine the terms giving $14x$ or $40x$ showing that they had no understanding of what factorise means and that only like terms can be combined. **Part (b)** was handled very well and the only errors were when candidates combined terms after they had correctly expanded the expression, giving $24ab$ or $48ab$ as their final answer which gained no marks, or made numerical slips in the initial multiplication. Those that tried to combine terns in **part (a)** often did the same in **part (b).**

Answer: **(a)** $2\ (2x + 5)$ **(b)** $36a – 12b$

Question 13

This was challenging to many candidates as large numbers of them gave answers that did not involve x^2 although they simplified the numbers to $\frac{3}{5}$. Many candidates gave $\frac{18x}{30}$ which contained two errors and did not gain any marks.

Answer: $\frac{3x^2}{5}$

Question 14

Some candidates had difficulty knowing that the top value in the vector went with the x co-ordinate and the lower one with the y co-ordinate. Another difficulty was that the operation, addition, was not explicitly stated as often the answer seen was (2, 5) or (–2, 5) from some kind of subtraction. If candidates made a single numerical error with one co-ordinate they still got a mark for the other.

Answer: (8, –1)

Question 15

This question was the one that presented the most difficulties and was the second most often missed out. The understanding of the equation of a straight line is one area that candidates often find complex and as this equation is not in the expected form of $y = mx + c$, it had to be re-arranged to $y = \frac{3}{4}x - \frac{7}{4}$. This tested understanding that the gradient is the coefficient of x in the '$y =$' form of the equation rather than the first number after the equal sign as many candidates gave 3 as their answer.

Answer: $\frac{3}{4}$

Question 16

Some candidates drew a diagram to show the points but because the diagrams were not to scale, the wrong mid-point was chosen. A diagram is a good idea to see roughly where the mid-point will be, but should not be used instead of working with the individual co-ordinates. This is a more simple question than where there are negative co-ordinates as well as positive ones but not the simplest as one value was not an integer. Some worked out the x co-ordinate correctly then rounded it to 4 in the answer which did not get the mark. As with **Question 14**, if one co-ordinate was wrong, they could still get the mark for the other.

Answer: (3.5, 4)

Question 17

Many candidates are not confident dealing with functions or the difference between domain and range. Here, the question did not explicitly state that the domain was $-3 \leqslant x \leqslant 6$ so some answers were list of integers from – 3 to 6. Other knew that they were dealing with square numbers, f(x), so some candidates' answers were lists starting with 1, 4, and it was rare for candidates to realise that zero is the lowest square integer. It was also rare for candidates to use the correct notation, but those that did often gave $9 \leqslant f(x) \leqslant 36$, not realising that the lower value should be zero as was common with the candidates who listed values of x^2.

Answer: $0 \leqslant f(x) \leqslant 36$

Question 18

Describing transformations is a commonly occurring question but this form was more demanding than most as there was no diagram to follow. As there are only two marks for this question it will not be an enlargement or a rotation as three pieces of information are needed to describe these. Many did get the correct type of transformation, translation, but some answered reflection. Some tried to explain what the '+3' meant but said that the movement was to the right instead of left. As the question says, describe fully the single transformation, candidates who give more than one transformation will not get any marks. This was one of the question likely to be left blank.

Answer: Translation, $\begin{pmatrix} -3 \\ 0 \end{pmatrix}$

Question 19

Many candidates drew a reflection of P in the x-axis or in $x = -2$ or drew a rotation of 180° around the origin. Those who drew the line $y = x$ first were more likely to gain both marks. Occasionally, the image of P had only two of the three points correct with (5, 2) being replaced with (5, –2).

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 question 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 15** to **18**. Showing workings enables candidates to access method marks in case their final answer is wrong. 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 2** and **8**.

The questions that presented least difficulty were **Questions 1**, **6a**, **7**, **10,** and **15**. Those that proved to be the most challenging were **Question 4(b)**, parts of a circle, **Question 6(b)**, the mathematical name for a particular quadrilateral and **Question 21**, describing transformations without a diagram. There were few un-attempted questions as, in general, candidates attempted the vast majority of questions rather than leaving many blank. Those that were occasionally left blank were **Questions 6(b)**, **19(b)** and **21**.

Comments on specific questions

Question 1

Candidates did very well with this opening question. A few gave answers that were not from the list. Some gave more than one number from the list which was acceptable in **parts (a)** and **(d)** as but **parts (b)** and **(c)** asked for the number that satisfied a condition this means that there is only one answer. **Part (b)** was the best answered, maybe as π did not look like the other numbers. Candidates should not leave this almost multiple choice type of question blank as there is a limited choice of what the answers could be. This time, very rarely was any part left blank. Here 36 or 9 could be used more than once so candidates should not think that just because they have used a number once it cannot be the answer to another part.

Answers: **(a)** 36 or 9 **(b)** π **(c)** 3 **(d)** 36 or 9

Question 2

This was an unusual problem solving question but many candidates gained at least one mark. Candidates found it fairly simple to find one fraction but struggled to find a different second one and often gave two equivalent fractions. Some gave fractions where the denominator was a decimal which did not get a mark. $\frac{1}{3}$ and $\frac{2}{5}$ were the most popular correct answers with $\frac{1}{5}$ and $\frac{2}{3}$ common wrong answers. One way to tackle this question was to think in eighths and sixteenths and what is wanted is the number of each between a quarter and half way so $\frac{3}{8}$ and $\frac{5}{16}$, $\frac{6}{16}$ and $\frac{7}{16}$ will fit the criteria, but $\frac{3}{8}$ and $\frac{6}{16}$ are equivalent so only one of these should be given. Another approach is to turn the fractions into decimals, 0.25 to 0.5 and then find a decimal that be easily turned back into a fraction, for example, 0.3 or 0.4 are $\frac{3}{10}$ and $\frac{2}{5}$.

Question 3

Candidates did not do very well with this question, maybe that was because they were not asked to draw the lines of symmetry. Answers ranged from 9 to 12 or even 16 lines of symmetry. Those that gave large numbers may have been treating the diagram as separate pieces instead of one whole. The two lines of symmetry are horizontally and vertically through the mid-point of the diagram.

Answer: 2

Question 4

The line *AB* caused some confusion with candidates not realising that this means the straight line so answers such as arc and circumference were incorrect. Some gave segment as their answer which is the area defined by the line *AB* and the arc of the circle. Others choose diameter or even radius. **Part (b)** was challenging for many candidates with many giving sector or arc. Those that choose segment in **part (a)** had a problem as segment cannot be both answers so this was an opportunity for candidates to revisit **part (a)** and change their answer. Very rarely was either part left blank.

Answers: **(a)** Chord **(b)** Segment

Question 5

Candidates should read the instructions carefully in a question as errors here included drawing the angle at the right hand end of the line or the midpoint rather than at *A*. Sometimes the angle at *A* was not accurate enough. These inaccurate angles were split between those that were just out of tolerance, for example, other obtuse angles that were far less accurate and acute angles, most likely around 16°, the supplementary angle to 164°. Most angles were drawn using a pencil, protractor and straight edge, but some were freehand. For questions like these, freehand lines are not acceptable.

Question 6

Candidates did well with **part (a)** but wrong answers including equilateral, right angle or just triangle were seen. **Part (b)** was a different matter with this being the most challenging question on the paper and very many candidates gave no answer. Rectangle, parallelogram and quadrilateral being the most frequent wrong answers that were at least to do with 4-sided shapes.

Answers: **(a)** Isosceles **(b)** Trapezium

Question 7

This was the best answered question on the paper. The only errors in **part (a)** were when candidates put an x and y in the co-ordinate brackets or reversed the co-ordinates. With **part (b)** those candidates who reversed the co-ordinates made the same error here.

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

Question 8

Candidates are getting more familiar with leaving their answer in terms of π but some still go on to do the multiplication. This did not get any marks.

Answer: 36π

Question 9

Some candidates added the given lengths or gave the perimeter. A small number tried to multiply all the lengths. Some gave the area of the removed square.

Answer: 60

Question 10

This angle is the sum of the opposite angles in the triangle or, for those candidates who do not know that angle property, they should have used angles in a triangle to find the third angle in the triangle then subtracted that result from 180 to give x.

Answer: 155

Question 11

The most common misconception of this standard form number was that 10^4 meant 42 followed by four zeros. Some candidates treated the standard form number as if the power was negative giving answers such as 0.00042.

Answer: 42 000

Question 12

To succeed with this type of question, candidates should break down each number into its prime factors. So, $32 = 2^5$ and $48 = 2^4 \times 3$. This means the highest common factor is 2^4 which should be evaluated to 16. Two, four and eight are also factors and were seen as answers but 16 is the HCF. The candidates that gave 96 had found the lowest common multiple of 32 and 48. For the HCF, the answer is a factor so smaller than the given numbers, for the LCM, the answer will be a multiple so larger than the given numbers.

Answer: 16

Question 13

Many candidates did not remember the conversion factor of grams to kilograms to tonnes.

Answer: 3.8

Question 14

This is, in effect, a multiple choice question as there is a limited number of combinations that can be picked. Many correctly choose A but there was not a mark for just choosing one of the correct lines. To gain the method mark, candidates had to rewrite at least one of the equations *B* to D in the $y = mx + c$ form in order to compare them. The understanding of the equation of a straight line is one area that candidates often find complex. This tested understanding that the gradient is the coefficient of x in the '$y =$' form of the equation as many candidates gave *A* and *D* as their answer as *D* also appears to have a '3x' term.

Answer: *A* and *C*

Question 15

Many candidates gained at least one mark for correctly expanding one or other of the brackets. There was another way candidates could gain a single mark if either of the two terms in the answer were correct. The most common error was not to take into account the minus sign with the 2 in front of the second bracket when multiplying by +3. More serious than arithmetic errors that many made were the misconceptions about algebra. An error in misunderstanding was for candidates to expand the two brackets then treat these as further brackets to multiply together giving a quadratic expression. Candidates also got the expansion correct then went on to erroneously combine $10x – 9$ into something such as $–90x$ or just x. This shows a misunderstanding of one of the basic algebraic rules that only like terms can be combined. A few candidates decided that they needed to go on to solve an equation ($10x – 9 = 0$) which is totally incorrect as the answer to this question is an expression not an equation.

Answer: $10x – 9$

Question 16

Only a few candidates did very well here but many got one mark for getting as far as $3x^2 = 48$. Some candidates misunderstood the question and instead substituted $x = 49$ in f(x) getting $3 \times 49^2 – 1$ as a calculation to work out. Some got as far as $16 = x^2$ and then only gave the positive value, 4, without considering –4. Then, there was often no working to support whatever second value they choose.

Answer: 4, –4

Question 17

This was a question with no scaffolding to lead candidates towards the solution so was more demanding. In questions like these it is important to recognise the key words and values (3%, 4 years, total simple interest) and to check the answer is sensible for the situation. Some only worked out one year's interest. A few said the total interest was $2000 (from 500 × 4) which is too vast a sum of money to be generated by 3% interest, some divided $500 by 4 getting $150. Some knew the method but made numerical errors.

Answer: 60

Question 18

This ratio and proportion type of question frequently occurs. The most frequent error was to think the sides of the larger triangle can be found by addition, so 11 (from 10 – 4 + 5) was the common answer. The scale factor for sides of the smaller to larger triangle was 2.5 (from 10 ÷ 4) or to go from the sloping side to base was 1.25 (from 5 ÷ 4).

Answer: 12.5

Question 19

Part (a) was another multiple choice style question with only 3 options this time so all candidates should give an answer, but not all candidates did. Candidates found **part (b)** challenging with many not attempting the question. The main difficulty seemed to be that candidates were unsure how to express their answer so answers such as $–1 < 4$ were common. Other candidates gave answers of the correct form but with one sign incorrect. Many were unsure of the significance of the empty and filled in circles.

Answers: **(a)** $<$ **(b)** $–1 < x \leqslant 4$

Question 20

Describing transformations from a diagram is a question that often comes up. This is one of the more straightforward transformation question as there is a diagram. Rotations and enlargements need three pieces of information but translations or reflections only need two. The two triangles are the same size so this is not an enlargement, they do not face the same way so this is not a translation and finally one is not the reflection of the other. This is a rotation of 90° anticlockwise to go from A to B and the direction must always be checked. It is sometimes more difficult to determine the centre of rotation. There is a quite complex method of finding the centre involving drawing the perpendicular bisector of lines that join the same points on original and image and seeing where they cross. It is sometimes easier to try points with a piece of tracing paper with a right angle marked to see if they are likely, starting with the origin. Candidates must use the proper mathematical word, turn, will not be sufficient. Instead of 90° anticlockwise, +90° is acceptable and (0, 0) is acceptable instead of the origin.

Answer: Rotation, 90° anticlockwise about the origin

Question 21

This form of describing transformations was more demanding than **Question 20** as there was no diagram to follow and the question used function notation. As there are only two marks for this question it will not be an enlargement or a rotation. Many did get the correct type of transformation, translation, but some answered reflection. Some tried to explain what the addition of the '+3' meant but said that the movement was to the right instead of left. As this question and **Question 20** use the phrase single transformation, candidates who give more than one transformation will not get any marks. This was one of the questions likely to be left blank.

Answer: Translation, $\begin{pmatrix} -3 \\ 0 \end{pmatrix}$

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/21
Paper 21 (Extended)

Key messages

Candidates should read each question carefully to ensure they answer the question asked.

Candidates should ensure that they are able to complete simple numerical processes accurately and efficiently. This includes practising cancelling down fractions with denominators greater than 2.

Candidates should check that their answers are given in the form required.

General comments

Candidates were generally well prepared for the paper and demonstrated good understanding and knowledge across the range of 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. Unfortunately, it was common to see basic arithmetic slips and indeed misconceptions (**Questions 2(a)**, **6**, **8**, **9**, **10**, **11**, **13**, **14** and **16**) 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, or had the correct answer and then spoilt it. For example, in questions which ask for the brackets to be expanded (**Questions 4** and **15**) full marks are not awarded if candidates reinsert brackets back into their final answer.

Comments on specific questions

Question 1

Most candidates chose to work in decimals and could complete this question accurately. Common wrong answers were 3.6 and 0.036. A minority converted to $\frac{6}{10} \times \frac{6}{10}$ and these candidates were invariably successful.

Answers: 0.36 oe

Question 2

(a) Apart from a few arithmetic errors in the cancelling, this question was answered correctly.

(b) Apart from a few candidates who misread the fractions or made a slip, this was answered correctly.

Answers: **(a)** $\frac{4}{15}$ **(b)** $\frac{9}{11}$

Question 3

Most candidates expanded the brackets successfully. However marks were lost either because the answer was left as $x \times x^3 - x \times 4x$ or the correct answer was seen and then spoilt by either re-factorising or incorrectly trying to collect together the two terms. Other errors came from misreading the question, for example the power or the negative sign, or indeed misreading their own writing.

Answer: $x^4 - 4x^2$

Question 4

Almost all candidates knew that the conversion required dividing 430 by a power of 10. Common errors included 4.30 and 0.43. A few candidates made the error of multiplying by a power of 10 which demonstrated a lack of understanding that there will be less of the larger unit.

Answer: 0.043

Question 5

Most candidates answered this successfully. The common wrong answers were 16 and 0 and a few candidates misread the question as 16 degrees.

Answer: 1

Question 6

Whilst a number of candidates were successful in answering this question correctly, this question was not answered well with many candidates not understanding what the term *lowest common multiple* was asking. As a result, a very commonly seen wrong answer was 2. Of those who attempted to find the lowest common multiple, correct methods included factor trees or multiples of both 20 and 24 written out. Unfortunately there were a variety of arithmetic errors sometimes seen in both of these methods. Candidates who gave an answer which was a larger multiple of 120, such as 480, or who gave their answer in index form were awarded one mark.

Answer: 120

Question 7

Whilst many candidates answered this correctly, there were a number of very common errors seen. These errors included rearranging incorrectly and trying to solve $x^3 = 25 - 2$, evaluating $\sqrt[3]{27}$ as 9 or as ± 3 or trying to evaluate $25^3 - 2$. Candidates should realise that they would not be expected to work out 25^3 on this non-calculator paper.

Answer: 3

Question 8

Whilst most candidates recognised that this was Pythagoras' theorem, and many were successful, again this was a question in which poor arithmetic let many candidates down. A surprisingly commonly seen error was that $26^2 = 20^2 + 6^2 = 436$ and similarly $24^2 = 416$. Other arithmetic errors were seen as well as errors such as using $26^2 + 24^2$. The best candidates recognised that the triangle was similar to the 5, 12, 13 triangle and deduced x with ease, others used the difference of two squares to show $(26 + 24)(26 - 24) = 100$, which was a neat solution.

Answer: 10

Question 9

This was done well by many candidates and the majority used the elimination method. The errors which were seen arose mainly from arithmetic slips or from not multiplying all three terms in the given equations. Most candidates who did not score full marks were usually able to gain a method mark or a mark for finding a pair of values that satisfied one of the given equations.

Answer: $x = 1.5,\ y = -2$

Question 10

Whilst a number of candidates scored full marks on this question, many did not understand the notation of either the vector bracket or the modulus sign. Errors seen included $6^2 - 3^2$, $\sqrt{45} = 3\sqrt{15}$ and $\dfrac{6!}{3!3!}$.

Answer: $3\sqrt{5}$

Question 11

Whilst many candidates answered this question correctly, there were, in addition, a number of errors seen. These included writing correctly, but evaluating incorrectly, $\dfrac{11-3}{3-7}$, , or $\dfrac{x_1 - x_2}{y_1 - y_2}$ or calculating and/or using the midpoint $\dfrac{y_1 + y_2}{x_1 + x_2}$. Other errors included incorrect calculation of k after reaching $y = -2x + k$.

Answer: $y = -2x + 17$

Question 12

Many candidates used factorisation to solve the expression and a good proportion of these went on to score full marks. Common errors from this method included being unable to deal correctly with the $2x^2$ or giving the solution from $(2x - 7)$ as 7. Other candidates chose to use the quadratic formula, and whilst some were successful, there were a number of sign errors, particularly with the ‘ -5 ’ or arithmetic errors with the $4 \times 2 \times (-7)$.

Answer: $x = 3.5,\ -1$

Question 13

It was pleasing to see that most candidates knew they needed to multiply the given expression by $\dfrac{\sqrt{6}+2}{\sqrt{6}+2}$ and many went on from here to successfully complete the question. The most common errors made from those not scoring full marks were $\left(\sqrt{6}-2\right)\left(\sqrt{6}+2\right) = 6 - 2$ and a surprising number of candidates reached $\dfrac{12\sqrt{6}+24}{2}$ but divided by 2 incorrectly giving final wrong answers such as $6\sqrt{3} + 12$ or $12\sqrt{6} + 12$ or $6\sqrt{6} + 24$.

Answer: $6\sqrt{6} + 12$

Question 14

This question was answered well by a number of candidates who demonstrated clear solutions to the problem. Many were able to select and evaluate the correct two products and then add them together to reach $\frac{48}{90}$. However, this did not mean that full marks would be scored because it was not uncommon for candidates to be unable to correctly or completely cancel $\frac{48}{90}$ to $\frac{8}{15}$. Unfortunately, a significant number of candidates either did not read the question carefully and were not awarded any marks because they used replacement of the balls or they were confused as to when to add or multiply the fractions.

Answer: $\frac{8}{15}$

Question 15

On the whole, candidates were very successful with this question. The loss of marks arose from basic arithmetic slips, loss of the powers, sign errors or re-factorising what would have been a correct answer.

Answer: $8x^2 - 26xy + 15y^2$

Question 16

It was clear that most candidates have a basic understanding of logs and many were awarded at least one mark for some evidence of using logs correctly. Unfortunately, many candidates then made basic errors with the powers or they had the numerator and denominator the wrong way round. However, a good number of candidates used more than one rule of logs and were able to reach $\log\left(\frac{3^2}{2^3}\times\left(\frac{2}{3}\right)^2\right)$. The last mark from here should have been straightforward, but too many candidates made arithmetic slips with the fractions or did not include the word ‘log’ in their answer.

Answer: $\log\frac{1}{2}$

Question 17

Those candidates who had learnt the values of the trigonometrical functions for 60° were able to complete this question with ease. Other candidates spent time writing out the values of all the trigonometrical functions for 0°, 30°, 45°, 60° and 90° and were equally successful. A few candidates drew an equilateral triangle and worked out the values. Other candidates had no idea of the relative order and appeared to have guessed the order. Marks were not awarded to candidates who did not write their answer in terms of the original list.

Answer: cos60°, sin60°, $\sqrt{2}$, tan60°

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/22
Paper 22 (Extended)

Key messages

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

Candidates need to read and answer the questions carefully. If a question asks candidates to 'expand brackets' then their final answer cannot be in factorised form.

Similar triangles are not understood to an appropriate standard.

General comments

The majority of candidates were well prepared for the paper and demonstrated very good algebraic skills. However, only a small proportion of candidates were able to notice the 'difference of 2 squares' question which led to a lot of tricky and unnecessary work.

Some 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

(a) This part was generally very well answered.

(b) This part was more challenging with many candidates giving an answer correct to 3 decimal places.

Answers: **(a)** 5.310 **(b)** 0.00365

Question 2

(a) The majority of candidates scored full marks. There were occasional sightings of an unordered diagram and some candidates were unsure of the demands of the 'Key'.

(b) Although this part was generally well answered there was a popular incorrect answer of 41.

Answers: **(a)**

1	7
2	6 6 8
3	0 3 4 7 7
4	1 5 6 6 8 8 9
5	2 3 3 4

Key 5 | 3 = 53

(b) 43

Question 3

This question was well answered by the majority of candidates. Candidates who did not score full marks left their answer in a partially factorised form e.g. $x(6x - 2)$.

Answer: $2x(3x - 1)$

Question 4

The majority of candidates scored the mark for identifying the correct rotational symmetry as 2 but many did not know the number of lines of symmetry of a parallelogram.

Answer: 0, 2

Question 5

This question was well answered. There were some answers given as $5x - 2$.

Answer: $5x + 2$

Question 6

This question was very well answered by the majority of candidates. Some candidates spoiled an otherwise correct answer by trying to simplify $27 + 9\pi$ and giving a final answer as 36π.

Answer: $27 + 9\pi$

Question 7

(a) Although there were many correct answers to this part, a significant number of candidates were unable to deal with the negatives and the inequalities.

(b) Candidates who did not score full marks in **part (a)** were able to still score this mark as a strict follow through was applied.

Answer: **(a)** $x \leqslant 4$

Question 8

(a) This part was poorly answered and displayed a lack of understanding of similar triangles. The popular incorrect answer was *DCB*.

(b) Although there were a significant number of correct answer, a final answer of ‘10’ was frequently seen.

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

Question 9

(a) This part was well answered with the majority of candidates scoring both marks.

(b) Again, well answered although some candidates were confused between union and intersection.

Answer: **(b)** $A \cap B \cap C'$

Question 10

Whilst this question was well answered and there were many candidates who were able to find three correct terms, the common error was the omission of the 'squared' on the *y* term.

Answer: $6x^2 - 17xy + 12y^2$

Question 11

This question was well answered by the majority of candidates. Candidates who did not score full marks were able to draw a modulus graph but didn't have the graph symmetrical.

Question 12

The question was well answered.

(a) Most candidates scored this mark.

(b) Although the majority of candidates gave the correct answer, a significant number of candidates who gave a correct answer in **part (a)** were able to gain the second mark by realising that the two answers must add up to 165.

Answers: **(a)** 35 **(b)** 130

Question 13

Full marks were rarely seen for this question.

There was much evidence of very disorganised working, only the strong candidates were able to realise that the question was designed to use the difference of two squares.

Candidates who decided to expand both sets of brackets found difficulty in dealing with the '–' sign before the second bracket.

Answer: $40\sqrt{3}$

Question 14

The majority of candidates were able to apply and solve this logarithm question. The understanding of logarithms has improved significantly over recent years.

Answer: 4

Question 15

There were some impressive solutions that enabled candidates to score full marks on this question.

Candidates who started the question by realising that the zeros of the graph led towards two factors gained some marks.

Answer: $a = 2$ $b = -2$ $c = -12$

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/23
Paper 23 (Extended)

Key messages

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

Candidates need to read and answer the questions carefully. 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.

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 'transformed' graphs ensuring that key points on the graph are in the correct position.

Comments on specific questions

Question 1

Many candidates scored full marks. However, there was a significant minority who found the square root of 2 and the square root of a quarter.

Answer: 1.5

Question 2

This question was well answered by virtually all candidates.

Answer: 28

Question 3

A number of candidates gave an incorrect answer which showed a lack of understanding of the modulus function.

Answer: – 5 and 5

Question 4

Nearly all candidates scored the first mark, but the second part proved to be more of a challenge with many unable to find the *n*th term.

Answers: **(a)** –1 **(b)** $-4n + 19$

Question 5

Again, there were many fully correct answers where the method was clearly visible. Some candidates however spoiled a correct answer by re-factorising their work.

Answer: $x^5 + 3x^3$

Question 6

This question was poorly answered and full marks were rare. Many candidates were able to start the question correctly but were then unable to convert their correct numerical answer into standard form.

Answer: 5×10^{-16}

Question 7

Virtually all candidates scored both marks in this question.

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

Question 8

Nearly all candidates scored some marks in this question, but full marks were rare.

In **part (a)** the popular incorrect answer was $4y^4$, and in **part (b)** it was $10w^{10}$.

Answer: **(a)** $4y^6$ **(b)** $32w^{10}$

Question 9

Virtually all candidates correctly found the value of *p*, but *q* proved to be more challenging. Candidates did not realise that *ABCE* was a cyclic quadrilateral.

Answer: $p = 75$, $q = 105$

Question 10

Candidates were able to demonstrate their excellent algebraic skills, although some candidates lost 1 mark through careless arithmetic.

Answer: 0.5

Question 11

Both parts proved to be too demanding for the majority of candidates. Candidates must realise the effect of basic transformations to graphs.

Question 12

There were many correct answers to this question. Some candidates were able to deal with the index correctly but were then unable to find the correct numerical answer.

Answer: *8*

Question 13

(a) The majority of candidates knew how to expand the brackets correctly. The common mistake was $\left(-\sqrt{3}\right)\left(\sqrt{3}\right) = -9$.

(b) Virtually all candidates were able to rationalise the denominator correctly.

Answer: **(a)** 13 **(b)** $\frac{5\sqrt{7}}{7}$

Question 14

(a) The majority of candidates were able to factorise this part correctly. Candidates who did not score full marks normally had the correct numerical values with incorrect signs.

(b) This part was a greater challenge with candidates being confused with the sign of the common factor.

Answers: **(a)** $(p-6)(p+5)$ **(b)** $(u-v)(x+y)$

Question 15

The majority of candidates knew the basic idea of variation but full marks were rarely seen. Candidates were able to find '*k*' but made carless numerical slips in trying to find the value of *y*.

Answer: $\frac{16}{1000}$

Question 16

The majority of candidates were able to write down the amplitude but were unsure as to how to find the period. A significant number of candidates worked in radians and these candidates normally scored full marks.

Answer: amplitude = 6, period = 60

Question 17

Candidates were not expecting the cosine rule on a non-calculator paper, but the better candidates applied the rule and then used their knowledge that cos 60 = 0.5, leading to a correct solution.

Answer: *7*

Question 18

This question showed a lack of understanding by the majority of candidates in knowing the relationship between the log function and its inverse.

Answer: log *x*

INTERNATIONAL MATHEMATICS

Paper 0607/31
Paper 31 (Core)

Key messages

In order to do well in this paper, candidates need to have covered the entire Core syllabus. They also need to be confident in the use of a graphics calculator. This is necessary in order to answer some questions accurately. Candidates should remember to write their answers correct to three significant figures unless stated otherwise in the question. Candidates need to show all their working out in order to gain method marks if their answer is not correct.

General Comments

Most candidates managed to attempt all the questions in the time allocated. Candidates need to be careful about the accuracy of their answers. If no specific accuracy is asked for in the question, then all answers should be given exactly or to 3 significant figures, except for angles in degrees, which should be given to one decimal place. Candidates should also show all their working out. When working out is shown and is correct, but the candidate's final answer is incorrect, then method marks can be awarded.

Some candidates did not appear to have a graphics calculator; this is a requirement of the syllabus, and is essential for graph drawing questions.

Comments on specific questions

Question 1

(a) Most candidates managed to gain at least 1 mark here and many earned both marks.

(b) (i) Most candidates could write down a multiple of 7. A few candidates wrote 1, presumably confusing the words multiple and factor.

(ii) Nearly all candidates found the correct answer. A few wrote $\frac{7}{10}$ or 0.07.

(iii) Most candidates found the correct answer here. Some wrote 7^6.

(c) (i) This was answered correctly by most candidates.

(ii) This was also reasonably well answered. However, quite a few candidates rounded incorrectly and lost the marks. Others wrote their answer to 3 decimal places instead of 3 significant figures.

(iii) Few candidates could put this answer into standard form. The most common answer was 823543. Another answer that was seen was 7×7×7×7×7×7×7.

Answers: **(a)** any two of the following: whole, prime, odd, integer, real, natural, rational, positive
(b)(i) any multiple of 7 **(ii)** $\frac{7}{100}$ **(iii)** 399 **(c)(i)** 0.14 **(ii)** 2.65 **(iii)** 8.24×10^5

Question 2

(a) Most candidates found the correct answer.

(b) Most candidates found the correct answer but a few wrote 45.

(c) Many candidates managed to give the fraction in its simplest form – others wrote $\frac{45}{100}$ and a few 0.45.

(d) Most candidates completed the bars correctly.

Answers: **(a)** 100 **(b)** 27 **(c)** $\frac{9}{20}$

Question 3

(a) (i) Most candidates answered this correctly.

(ii) The main error here was not making the 7th game free and writing 105 as the answer.

(iii) Many candidates either had the correct answer or a correct follow through answer.

(b) Although most candidates answered this well, some rounded up to 15 and a few others gave an answer for the Valley club instead.

Answers: **(a)(i)** \$94.50 **(ii)** \$90 **(iii)** The Valley by \$4.50 **(b)** 14

Question 4

(a) The majority of the candidates found the correct angle.

(b) (i) There were many different answers given for this part. A good number of candidates did write the correct answer, but common incorrect answers were isosceles and right-angled.

(ii) Many candidates did find the correct answer but some must have measured it and wrote 62. Candidates should be reminded that ‘Not to scale’ on a diagram means that answers need to be calculated.

(iii) The most common answers here were the correct answer and 1.

(c) Many candidates managed to find the correct answer here.

Answers: **(a)** 29 **(b)(i)** Equilateral **(ii)** 60 **(iii)** 3 **(c)** 78

Question 5

(a) Some candidates multiplied the indices instead of adding them.

(b) Some candidates divided the indices instead of subtracting them.

(c) Some added the indices and some used 6^3.

Answers: **(a)** x^{11} **(b)** x^8 **(c)** x^{18}

Question 6

(a) (i) Nearly all the candidates could draw pattern 4.

(ii) This part was very well answered with only a few candidates writing 10 crosses.

(b) There were many correct and many incorrect answers here. Some candidates had quite unique sequences. Others knew the sequences but could not put them into words to make the rules.

Answers: **(a)(ii)** 12 **(b)** Two correct sequences and corresponding rules

Question 7

(a) Many candidates managed to find both volumes and subtracted them correctly. Others found the surface areas instead. Some others just added the side lengths up.

(b) Quite a few candidates managed to gain full marks for this part. Others found that 80% of 1165 was 932 and so managed to gain 2 marks.

Answers: **(a)** 14

Question 8

(a) There were many correct answers seen.

(b) In general, this part was found difficult by candidates. Some candidates just tried to add the terms, others divided through by 3 or *x* and so did not have the complete answer. More work on factorisation would benefit candidates.

(c) (i) Again, many correct answers were seen.

(ii) Some candidates who did not find the correct answer managed to earn 1 mark for multiplying out the bracket correctly.

(d) Candidates found it difficult to rearrange the formula correctly. $\frac{B-F}{2}$ was often seen.

Answers: **(a)** 7 **(b)** $3x(x-3)$ **(c)(i)** 2 **(ii)** 9 **(d)** $\frac{F-B}{2}$

Question 9

(a) Few candidates gained full marks for this part. Some missed out the origin and so were only awarded 2 marks. Others spoiled their answer completely by using more than one transformation in their description.

(b) Some correct translations were seen. Other candidates gained 1 mark by translating 4 across but not 1 up.

(c) There were fewer correct answers seen for the reflection. Many candidates gained 1 mark for reflection in another vertical line.

Answers: **(a)** rotation, 90 (anti-clockwise), about the origin **(b)** correct translation **(c)** correct reflection.

Question 10

(a) Most candidates plotted the four points correctly. Occasionally one or two points were missed out.

(b) The majority of candidates answered this part correctly. A few candidates wrote positive and some wrote an answer describing the situation.

(c) In both **part (i)** and **part (ii)**, the majority of candidates found the correct answer. Some forgot to divide by 10.

(d) Few candidates gained full marks here. Some did not have their line passing through the mean point, others were not in tolerance and some just joined up the points.

(e) Many correct or follow through answers were seen. Some candidates wrote their answer as a fraction. Candidate should always think about the context when answering questions of this type.

(f) (i) Although many candidates found the correct modal class, others wrote 41 to 60 or 0 to 100.

(ii) There were few correct answers seen for these ranges. A few candidates gained a mark by writing 100 for the largest range.

Answers: **(b)** negative **(c)(i)** 6 **(ii)** 5.5 **(e)** 9 **(f)(i)** 21 to 40 **(ii)** largest 100, smallest 61

Question 11

(a) About half of the candidates gained full marks here and many others gained a method mark for writing $\frac{7}{30}$.

(b) This part was well answered although a few wrote 4 and forgot to subtract it from 50.

(c) The majority of candidates managed to answer this part correctly. Some still tried to divide by 11 and others appeared to have guessed.

Answers: **(a)** 14 **(b)** 46 **(c)** 176

Question 12

(a) There were few fully correct answers seen. Many candidates gained some method marks by finding 139 for *AB*. However, quite a few put 110 for *AB* and lost the final accuracy mark for their answer.

(b) There were more correct answers seen in this part. However, a lot of candidates did not use trigonometry.

Answers: **(a)** 38.3 **(b)** 32.4

Question 13

Those candidates who did not have a graphics calculator were unable to access this question, resulting in a loss of 6 marks.

(a) Many of the candidates who had a graphics calculator could draw this sketch.

(b) Many of the candidates who had a graphics calculator could draw this sketch.

(c) There were few correct answers for finding the intersection point. Some candidates forgot that they had to answer to 3 significant figures and so marks were lost for inaccuracy here.

Answers: **(c)** 1.83 and –0.442

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 must 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 sequences and algebra were answered successfully by most candidates and a large number used their calculators effectively. The questions on sets and mensuration caused the greatest difficulty as did the vocabulary for sets of numbers.

Comments on specific questions

Question 1

This question was answered well by a majority of the candidates.

(a) Most candidates were able to write the number 70 302 in words with very few mistakes in spelling.

(b) Nearly all candidates used their calculators correctly to evaluate the cube of 13.68. It was apparent that some calculators were set to give a 6-digit display only and it would be worthwhile for candidates to investigate how to change such settings to increase the number of digits in the display.

(c) While most candidates correctly wrote the number to the required accuracy in the three parts here, there were some who moved the position of the decimal point, or who truncated or rounded incorrectly.

(d) The values of x and y were correctly substituted by almost all the candidates and the value of the expression was then calculated without error.

(e) The most common error in this part was to forget about the change in sign when a term is moved from one side of the equation to the other, and a number of candidates gave the answer 8 from adding 10 to 54 instead of subtracting.

Answers: **(a)** Seventy thousand three hundred and two **(b)** 2560.108032 **(c)(i)** 623.89 **(ii)** 624 **(iii)** 600 **(d)** 11 **(e)** 5.5

Question 2

A large majority of candidates performed well in this question.

(a) (i) A few candidates gave an answer of 420, assuming that the chickens laid 5 eggs every day of the week but, except for these, nearly all gave the correct answer of 60.

(ii) There were many correct answers in this part, any errors arising from not taking into account the fact that the cost of $2.10 was for 10 eggs.

(iii) This part was done very well.

(b) (i) Although many candidates answered this part correctly, answers of 5 or 16 were seen in some cases.

(ii) Nearly all candidates knew that they should subtract their answer to **part (b)(i)** from their answer to **part (a)(ii)** even if, in some cases, this left them with a negative profit.

Answers: **(a)(i)** 60 **(ii)** $12.60 **(iii) $**2.90 **(b)(i)** $4 **(ii)** $8.60

Question 3

(a) Nearly all the candidates placed the elements of the given universal set in the correct regions of the Venn diagram. The main error was to forget about *h* altogether.

(b) Although the question asked for "an element" of set *P*, a large number of candidates listed them all. This was acceptable provided no extra elements were included. The placing of the elements inside curly brackets was treated as an error.

(c) Curly brackets were provided in the answer space here as a set was required. Any of the elements of *Q* were accepted, this time with the condition that not all four elements of *Q* were given since a proper subset was asked for. This was a common error among the candidates.

(d) This part was not answered at all well. Many candidates ignored the word "complement" and listed either all the elements of *P* or of the intersection of *P* and *Q*.

(e) There were two sources of error in this part. The question required the number of elements in the set that was the complement of the union of *P* and *Q*. Many candidates ignored the letter n and simply stated *h*, while equally as many listed the elements, usually of $P \cup Q$ or $P \cap Q$, forgetting about the complement.

(f) This was another part where many candidates did not know the correct notation. All kinds of symbols were inserted, including the euro symbol and, frequently, the = sign.

(g) Only about half the candidates were able to shade correctly the region that was required.

Answers: **(b)** any of a, c, e, f or g **(c)** no more than 3 of b, d, f or g **(d)** b, d, h **(e)** 1 **(f)** $\in$

Question 4

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

(a) (i) Nearly all candidates correctly indicated the position of an acute angle in the diagram.

(ii) Nearly all candidates correctly indicated the position of a right angle in the diagram.

(iii) Nearly all candidates correctly indicated the position of an obtuse angle in the diagram.

(b) (i) Most candidates were able to name a pair of parallel lines, although there were a number who gave a single letter for their answers. A straight line needs two letters to define it, or sometimes, as in the case of *APB*, three letters may be used.

(ii) This part was the least well done in this question. A large number of candidates named *MP* and *PN* as perpendicular lines. Since no information was available about the size of the angles in the diagram, this assumption was not justified.

(iii) This part was again well answered by many candidates, with many naming the two triangles, but some choosing to name the trapeziums or the rectangles.

Question 5

Although most of this question was well answered, it was clear that many candidates were less confident in their ability to explain their reasoning in the final part.

(a) The value of *x* was correctly stated by almost all candidates.

(b) The fifth term of the sequence was usually correctly stated, although the answer 30 appeared a number of times.

(c) Many candidates correctly stated the *n*th term of the sequence, with $n - 7$ a common error.

(d) The best responses to this part put –187 equal to the expression in the previous answer and solved the equation. Since the solution was an integer, the candidates were able to conclude that –187 was a term in the sequence. Less efficient and more time consuming a method was to list the subsequent terms of the sequence by subtracting 7 each time. However, a number of candidates simply stated that their answer was "Yes" (or sometimes "No") without very much supporting evidence.

Answers: **(a)** 9 **(b)** –5 **(c)** $30 - 7n$

Question 6

(a) (i) The method by which candidates found the length of time had a considerable impact on their success in this part. Some immediately wrote 3 hours and 10 minutes and then successfully converted this to a number of minutes. A few subtracted the two times and gave 310 as their answer. A considerable number tried to work out the difference between the two times in minutes, with variable success.

(ii) This part was answered well with nearly all candidates correctly dividing their previous answer by 10, and rounding down to an integer number if necessary.

(iii) A number of candidates lost both marks here by showing no working and giving an answer of 63, as such, an inaccurate answer cannot imply the method used. There was also some confusion among candidates who subtracted 12 from 19 before finding this value as a percentage of 19.

(b) (i) A large majority of the candidates found the range correctly. There are, however, still some candidates who forget that in this context the range is a specific value and who write 3 – 18. There were also those who gave an answer of 8 from subtracting the end values in the table instead of putting the number of appointments in order.

(ii) It became apparent in this and the next part that some candidates were regarding the table as a frequency table and this led to many wrong answers, including the identification of the teacher F. Candidates must look at the context of the question to ensure that they know what is required of them. However, many candidates did find the mode of the given numbers.

(iii) There were a few more errors in this part, with a few candidates finding the mean instead of the median.

(c) (i) Many candidates were able to find the probabilities required in these two parts. Many weaker candidates wrote $\frac{12}{13}$ and other errors included answers of 2 with no denominator. Candidates are also reminded that a ratio is not a probability and that decimal answers must be given to three significant figures if they are not exact.

(ii) As in **part (c)(i),** wrong answers here included $\frac{9}{13}$, 7 and occasionally the letters identifying the teachers instead of a probability.

Answers: **(a)(i)** 190 **(ii)** 19 **(iii)** 63.2 **(b)(i)** 15 **(ii)** 8 **(iii)** 11 **(c)(i)** $\frac{2}{13}$ **(ii)** $\frac{7}{13}$

Question 7

It was apparent in the answers seen here that candidates were not sufficiently familiar with the vocabulary and notation for this topic.

(a) (i) A surprising number of candidates omitted the number –3 from their list of integers, perhaps forgetting that integers can be negative as well as positive.

(ii) The fraction or the decimal number were frequently included in the list of irrational numbers.

(b) There were many blank answers in this part, indicating that candidates had forgotten that the set $\mathbb{Q}$ is the set of rational numbers.

(c) Candidates did very much better in this part with a large majority writing the correct answer.

Answers: **(a)(i)** 2, –3 **(ii)** $\sqrt{2}$ or π **(b)** $2,\ -3, 0.55,\ -1\frac{1}{7}$ **(c)** $\frac{11}{20}$

Question 8

Although parts of this question were well answered, this syllabus area continues to be one where some candidates lose marks.

(a) Most candidates were able to plot the points correctly.

(b) With only a few exceptions, candidates were able to identify the correlation as positive. There was no necessity for any further embellishments.

(c) (i) In calculating the mean of the ages, a number of candidates included the age 11. Many candidates also corrected their answer to 10 without showing the accurate value of 9.9.

(ii) There were a variety of incorrect answers, from a small number of candidates, but the majority gave the correct answer here.

(d) A large number of candidates plotted their mean point correctly.

(e) Many candidates continue to make their line of best fit pass through the origin, regardless of the position of the plotted points. Often, those who draw a sensible line omit to make it pass through their plotted mean point. The line of best fit should, of course, be ruled.

(f) In this part, the context was again important. Candidates who gave as an answer the decimal value read off from their line of best fit at age 11, or who rounded this value up, could only gain part marks since they were not giving the number of complete lengths the student could swim.

Answers: **(b)** positive **(c)(i)** 9.9 **(ii)** 10.1 **(f)** 12

Question 9

(a) This part was very well answered, with most candidates able to interpret the scale of the bar chart and obtain the correct answer.

(b) Nearly every candidate gave the correct answer here.

(c) (i) Although this part was more demanding there were a number of good answers demonstrating that the sector angle for Monday was 88°.

(ii) There were a large number of accurate pie charts drawn and the labelling of the sectors was excellent. Weaker candidates were less effective when using their protractors, sometimes not measuring the angle from the centre of the circle, and not always ruling their lines.

Answers: **(a)** 90 **(b)** Friday **(c)(i)** $\frac{22}{90}\times 360$

Question 10

(a) Many candidates correctly used Pythagoras' theorem to calculate the third side of the triangle although there were those who added the squares of 100 and 80.

(b) Most candidates successfully added 180 to their answer to **part (a)**.

(c) While many candidates found the angle correctly, using one of the trigonometrical ratios, there were frequent examples of these ratios being used incorrectly. There were also a number of guesses and this part was often left blank.

(d) (i) The conversion from km/h to metres/minute was successfully accomplished by many. Errors from other candidates included just multiplying 9 by 1000, by 100 or sometimes even by 60.

(ii) This part was left unanswered by a number of candidates and there were also a number of incomplete solutions. Some candidates just multiplied the length of the track by 5, others found the time taken for one circuit of the track. Stronger candidates realised that both these steps must be combined to reach the correct answer.

Answers: **(a)** 60 **(b)** 240 **(c)** 36.9 **(d)(i)** 150 **(ii)** 8

Question 11

Only about half of the candidates were able to answer this question fully.

(a) Many candidates found only the volume of the cone or of the cylinder.

(b) (i) This part again involved the use of Pythagoras' theorem, with the hypotenuse to be found, and many correct solutions were spoiled by truncation to 20.8. There seemed to be some doubt as to what the slant height was and many weaker candidates simply added the heights of the cone and the cylinder.

(ii) Many answers here were incorrect because the height, and not the slant height of the cone was used. Candidates who had left **part (b)(i)** unanswered wrote down the correct formula but were unable to proceed.

Answers: **(a)** 880 **(b)(i)** 20.9 **(ii)** 394

Question 12

(a) Many candidates produced a suitable sketch here, although the shapes seen would suggest that not all had set suitable ranges on their calculators. The quality of the sketches was variable and there were some candidates who produced straight lines or who made no attempt at this part.

(b) This part was answered well by many candidates, who gave the exact answers required. Inexact answers suggested that some candidates had used the trace feature on the calculator rather than opt for finding the intersection with the *x*-axis.

(c) Many candidates gave the correct answer here, but as this was a simple question requiring the candidate only to consider the equation of the graph, there should have been many more giving the answer 2.

(d) Some answers with a y co-ordinate of 7 suggested that the candidate had looked for the point with the maximum value of y on the sketch. Those correctly finding the local maximum point frequently gave their answers with insufficient accuracy. These two values were not exact and should therefore have been given correct to 3 significant figures.

Answers: **(b)** –1, 0.5, 2 **(c)** 2 **(d)** (–0.366, 2.60)

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 this paper. They had a sound understanding of the syllabus content and clearly demonstrated that they were capable of applying that knowledge. Candidates had sufficient time to complete the paper. Most candidates attempted every question.

Diagrams were drawn carefully. 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) (i)(ii) Candidates invariably had both of these answers correct after some simple multiplication and subtraction.

(iii) Many realised that Chris only had to pay for 10 bars and that 5 extra bars would be free. Some thought that however many bars you bought, only 1 bar was free while another common misunderstanding was that when you bought 2 bars, one of those bars was free.

(iv) Although there were many who answered this part correctly, a significant number thought that Chris himself had the 15 bars meaning that his brother would have 10.

(b) Some candidates correctly used a simultaneous equations approach. Others used a trial and improvement method, often successfully. It was common to see candidates showing their working as requested in the question.

Answers: **(a)(i)** 4 **(ii)** 1 **(iii)** 8 **(iv)** 6 **(b)** pizza $0.50, salad $0.60

Question 2

(a) (i) There were many correct answers here although an equal number did not have the correct number of zeros in their number.

(ii) A successful use of BIDMAS led to many correct answers. Even after obtaining the correct answer in their working, some ignored the minus sign and gave an answer of 2. Others performed 10 – 2 first and incorrectly gave 48 as the answer.

(iii) Correct calculator use meant that there were many correct answers here.

(b) Another successfully answered question. The majority of candidates had the correct factor list.

(c)(i) Once again, there were many correct answers although some candidates omitted to write down their full calculator display.

(ii) Although most knew how to round their answer to 2 decimal places, there were those who just truncated after 2 decimal places.

(iii) Rounding to 2 significant figures was less successful. Once again, some truncated after 2 figures and others confused significant figures with decimal places.

Answers: **(a)(i)** 3 002 001 **(ii)** –2 **(iii)** 11.2 **(b)** 1, 2, 4, 5, 10, 20 **(c)(i)** 70.516 **(ii)** 70.52 **(iii)** 71

Question 3

(a) Nearly all candidates scored full marks here.

(b)(i) Candidates showed a good understanding of what was required and showed the steps of their work clearly.

(ii) Some good algebra was seen in answer to this question. Correct substitution, and then rearrangement of the equation, was seen often. Some preferred to rearrange the formula first, before substitution.

(c) Once again, there was some good work seen, with candidates confidently solving the equation. However, a number faltered after reaching $-3x = 15$ or $3x = -15$ and finished with an answer of 5, losing the negative sign during the division.

(d) There were many correct answers, with a few extracting just one common factor. It was apparent that a small number of candidates did not understand what to do and did not attempt the question.

(e) This was another successfully answered question, with just a few candidates making errors in combining the three different elements.

Answers: **(a)** $3a + 11b$ **(b)(i)** –8 **(ii)** 3 **(c)** –5 **(d)** $3a(a - 4b)$ **(e)** $8x^5y^3$

Question 4

(a) Some candidates had difficulty in coping with the scales on the two axes and consequently mis-plotted their points.

(b) Most found the two mean values correctly but those who did the calculations ‘by hand’ sometimes miscalculated totals, leading to wrong answers.

(c)(i) Once again the scale confused some and the point was incorrectly placed. A number, even after correctly finding the mean values, plotted a point at (150, 50) which is the middle point of the grid.

(ii) There were many unsuccessful attempts at drawing a line of best fit. Those who drew a straight line often did not have it going through the mean point or did not have it lying in the direction of the plotted points. A large number just joined the plotted points either with straight lines or a curve. This part of the syllabus is not well known.

(iii) Nearly all candidates identified an appropriate score for someone revising for 200 minutes.

Answers: **(b)(i)** 169.375 **(ii)** 67.5 **(c)(iii)** 66 to 76

Question 5

(a) All candidates could neatly and accurately complete the bar chart.

(b) Probability is well known and candidates rarely made an error in answering all sections of **part (b)**. Many candidates, unecessarily, converted their fractions to percentages, usually correctly.

(c) Completing the pie chart caused problems for many. Better answers were from those showing clear working to establish the size of the angles required followed by accurate measuring of angles and drawing and labelling of the sectors. A large number showed no support for the angles they used and many sectors drawn were of an incorrect size.

Answers: **(b)(i)** $\frac{8}{30}$ **(ii)** $\frac{6}{30}$ **(iii)** 0

Question 6

(a) When converting from minutes to hours, many rounded their value. This led to an inaccurate answer for the speed.

(b) Too often a calculated value of the time as 1.25 hours often led to an answer of 1 hour 25 minutes, although some did realise that a conversion of .25 hours to 15 minutes was needed. A number misunderstood the question, thinking it was asking for the answer in hours and its equivalent in minutes and wrote ‘1.25 hours 75 minutes’ on the answer line.

Answers: **(a)** 180 **(b)** 1 hour 15 minutes

Question 7

(a) It was clear that a significant number of candidates had not come across a stem and leaf diagram in their studies. Most who answered the question knew to order the leaves although a few did not include repeated values in their lists. A small number did not keep a close eye on their entries and omitted one or more values. Some others did not complete the key or did so incorrectly.

(b) (i) Most candidates knew that the mode was the most popular value and correctly gave 23 as their answer.

(ii) It was clear that candidates knew to look for the middle value but their attempts to do this were often unsuccessful. Miscounting, not using the ordered list, finding the middle value of the leaves only and using a list which did not use all of the given values were just some of the incorrect approaches.

(iii) Inter-quartile range is not well known. Most candidates either found the range or did not attempt the question. Some had knowledge of quartiles but did not know how to find them accurately.

(iv) The mean was correctly calculated by the majority of candidates. Some were incorrect through not being able to find a correct total of the values given.

Answers: **(b)(i)** 23 **(ii)** 26 **(iii)** 23 **(iv)** 29.1

Question 8

(a) All candidates knew how to find the equivalent decimal.

(b) This question was answered well. A few ordered the values the wrong way round, from largest to smallest, but the most common error was to ignore the whole number part of $1\frac{1}{4}$.

(c) 26 was almost invariably correctly given as the answer here. A few candidates halved the 13 rather than doubling.

(d) This was generally very well answered with only a small number making errors in their calculation.

(e) Many did not use their calculator facility to answer these questions on fractions. Consequently, arithmetic slips occurred.

Answers: **(a)** 0.215 **(b)** $\frac{43}{200}, \frac{13}{50}, \frac{11}{40}, 1\frac{1}{4}$ **(c)** 26 **(d)** 27.5 **(e)(i)** $\frac{19}{40}$ **(ii)** $\frac{55}{52}$ **(iii)** $\frac{43}{160}$

Question 9

(a) Most candidates spotted that they needed to add 17 to continue the sequence and were able find the next two values.

(b) Finding the *n*th term proved more of a challenge. Many wrote $n + 17$. Some knew the formula contained $17n$ but either included an incorrect constant or had no constant at all.

Answers: **(a)** 132, 149 **(b)** $47 + 17n$

Question 10

(a) Although there were a good number of correct answers, many candidates just entered three numbers which satisfied the F and C values but, when taken all together, exceeded the given total of 30.

(b) Even after an incorrect answer to **part (a)**, candidates could interpret their diagram correctly for their answer here.

(c) Very few candidates found the correct shaded area.

(d) As in **part (b)**, many candidates found a ‘correct’ answer based on their diagram.

Answers: **(b)** 13 **(d)** $\frac{9}{30}$

Question 11

(a) There were many correct answers to this part. A few reflected in the wrong vertical line or the x-axis.

(b) There were fewer completely correct answers here. The most common error was to rotate the shape about the wrong centre.

(c) It was clear that the majority of candidates knew to ‘slide’ the shape to the left and down. However, the final position of the image was sometimes incorrect. The most common error was to translate the shape so that the corner (1, 1) moved to (–6, –5). A small number had the horizontal and vertical moves mixed up.

Question 12

(a) Here, candidates often correctly found the curved surface area of the coin but omitted to include the circular top and bottom in their total.

(b) (i) The majority of candidates correctly found the volume of one coin. Some just gave this as their answer but many went on to multiply by 15. Unfortunately, rounding their value for the volume of one coin often led to an inaccurate final answer.

(ii) Better candidates found the radius but did not always give this correct to 1 decimal place as requested. Others knew what they had to do but could not deal with the manipulation of their equation.

Answers: **(a)** 18.8 **(b)(i)** 53.0 **(ii)** 2.4

Question 13

A number of candidates did not attempt this question.

(a) Many candidates used their calculators successfully and drew a correct sketch of the curve. However, some of these were not always quite accurate enough. Some candidates resorted to plotting points, often without success.

(b) Generally, if the graph was correct, this answer was correct also.

(c) Of those who answered this part, most had two or three values correct. Where a value was not correct it was often due to a lack of accuracy, for example 1.9 instead of 2 was a common wrong answer.

(d) This proved too demanding for the majority of candidates. Even when the correct point was identified, the accuracy of the answer was often insufficient. Many gave answers to whole number accuracy or, at best, 1 decimal place.

(e) Only the very best candidates scored here and even these struggled with **part (ii)**. It was common to see the demand misunderstood and, instead of transformations of the original curve, many transformed $y = x$ or $y = 0$. Very few candidates knew that **part (ii)** referred to a horizontal translation of one unit to the right.

Answers: **(b)** (0, 0) **(c)** (–3, 0), (0, 0), (2, 0) **(d)** (1.12, –4.06)

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/41
Paper 41 (Extended)

Key Messages

Sufficient working should be shown so that method marks can be awarded if a candidate's final answer is incorrect.

The general instruction is that answers should be given correct to three significant figures unless the answer is exact or the questions states otherwise. In the main, this was done well but some candidates lost mark through not giving answers to a sufficient degree of accuracy.

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.

Candidates should use the mark value indicated in the question as a guide to how much work is required for a question.

General Comments

The paper proved accessible to most of the candidates with omission rates very low. There were sufficient straightforward questions that proved accessible to lower and middle ability candidates. Just a few parts of questions proved very difficult for all but the very best candidates and these did have higher omission rates. Marks across a substantial range were seen and the work from 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 calculator, some still are plotting points when a sketch graph is required.

Answers without working were fairly rare, but there were a number of candidates 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.

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

Comments on Individual Questions

Question 1

Most candidates were able to find the next term in the sequences in **part (a)**. Middle and high ability candidates did well on the *n*th terms also. Some weaker candidates gave term to term rules in the first two parts rather than the *n*th term. Most attempted **part (b)** by the difference method and some of the work in solving the necessary simultaneous equations was very impressive. Some, however, got no further than the common differences. Very few spotted that the answer could be obtained by adding the four *n*th terms from **part (a).**

Answers: **(a)(i)** 24, $4n$ **(ii)** –11, $–2n + 1$ **(iii)** 108, $3n^2$ **(iv)** 216, n^3 **(b)** 337, $n^3 + 3n^2 + 2n + 1$

Question 2

Part (a) proved the most demanding with many candidates just finding the mean of the frequencies. It was expected that this part would be done using the statistical functions on the graphics calculator but many used long methods. These sometimes led to arithmetic errors.

Those candidates who understood cumulative frequency did **parts (b)** and **(c)** well. Most correctly calculated the cumulative frequencies and were able to plot them. Just a few plotted them at the middle of the interval. Those with correct graphs usually got the median correct. Some did not understand interquartile range although many were successful. Most were able to make a good attempt at the final part.

Answers: **(a)** 31.1 **(b)(i)** (7), 20, 40, 72, 100 **(c)(i)** 32.5 to 34.5 **(ii)** 16.5 to 20 **(iii)** 3 to 4

Question 3

There was some impressive work on trigonometry here and most were able to get at least part marks. Many however chose long methods involving more than one step or cosine and sine rules when right angle trigonometry techniques were adequate. There was some confusion between **part (a)** and **part (b).** Those using sine rule and $\frac{1}{2}bc\sin A$ in **parts (c)** and **(d)** sometimes used the wrong angle. This was one of the questions where some candidates lost marks through premature approximation.

Answers: **(a)** 49.8 **(b)** 39.8 **(c)** 21.7 **(d)** 325

Question 4

Many candidates did this very well indeed and full marks were common. **Part (a)** was usually correct although some translated –4 units in the x direction. **Part (b)** too was usually correct although some used the wrong centre. Those who got **part (b)** right were usually successful in **part (c)** although a few omitted part of the description. **Part (c)** proved more difficult with a significant number reflecting in one of the axes even if they drew the $y = -x$ line.

Answers: **(c)** Rotation 90°clockwise about (0, 0) **(e)** Reflection in x-axis

Question 5

Many omitted 'radius' from their explanation in **part (a)**. More able candidates did **part (b)** well. There was some confusion over the circle theorems and 92 was a common answer to **part (i)** although marks could be earned later on a 'follow through' basis. Some considered *AOCD* to be a cyclic quadrilateral in **part (iv)**. **Part (c)** was much less well done and was sometimes omitted. Many treated *ACB* as an isosceles triangle.

Answers: **(a)** Angle between tangent and radius = 90° **(b)(i)** 134° **(ii)** 23° **(iii)** 67° **(iv)** 113° **(b)** 44°

Question 6

Candidates, who knew the basic algorithm for dealing with variation often did this very well. Some did use direct variation rather than inverse or 'square' root instead of 'square' and therefore made no progress. A number of able students obtained the correct formula in **part (a)** but then omitted to substitute in $x = 4$.Those that were successful with **part (a)** were nearly always successful in **parts (b)** and **(c)** although, in the latter, some reverted to an equation with k still in.

Answers: **(a)** 8 **(b)** $\pm\frac{1}{2}$ **(c)** $x = \pm\sqrt{\frac{128}{y}}$

Question 7

In **part (a)**, more able candidates produced a correct or nearly correct sketch graph. A number, however, had the wrong curvature for the outside branches. Less able candidates did not recognise the modulus sign and simply sketched $y = 9 - x^2$. Those trying to plot points were rarely successful. Most candidates realised what was necessary in **part (b)** but most only gave one or two solutions instead of the required four. Only the very best candidate were successful with **part (c).** A very common error was to give the answer $0 \leqslant k \leqslant 9$.

Answers: **(b)** ±1.41, ±4 **(c)** $k = 0$ and $k > 9$

Question 8

There were very few partially correct answers to **part (a)**. Usually the solution was completely correct or completely incorrect due to inserting the total number in the set instead of the number in the subset, for example 25 instead of 7. **Part (b)(i)** proved very difficult indeed with only the very best candidates being successful. More gained the correct answer for **part (ii)** but it also proved difficult. Most candidates were correct with **part (c)** albeit often on a follow through basis from their Venn diagram. In **parts (d)** to **(f)** many struggled with conditional probability often having the second fraction, in **parts (d)** and **(f),** the same as the first and maintaining the denominator of 56 in **parts (e)** and **(f)**.

Answers: **(b)(i)** 17 **(ii)** 11 **(c)** $\frac{4}{56}$ **(d)** $\frac{17}{44}$ **(e)** $\frac{6}{25}$ **(f)** $\frac{2}{145}$

Question 9

Many candidates answered this question completely correctly. In **part (b)** a number started the with the 'wrong' version of the cosine rule and a significant number concatenated 64 + 36 – 96 cos$B$ to 4cos$B$. Fewer errors were made with **part (b).**

Answers: **(a)** 117.3° **(b)** 26.4°

Question 10

There were some excellent sketches for both **part (a)** and **part (b).** A number of candidates in **part (a)** drew a graph passing through the origin and/or (180, 0) and (360, 0). In **part (b)** a number of candidates drew a graph of the correct shape but totally above the x-axis. Those who attempted to do this by plotting points were often unsuccessful with insufficient points to sketch the whole shape. Candidates who knew how to use the 'Solve' function on their graphics calculator, usually gave the correct answers although sometimes not to the required accuracy. Many candidates tried to use algebraic techniques which, of course, were totally inappropriate.

Answers: **(c)** 6.18, 159, 320

Question 11

The first four parts of this question were done very well. Just a few omitted to read the mileage chart correctly and some could not convert a time in hours to hours and minutes in **part (b)**. In **part (c)**, some multiplied by 12.5 instead of dividing. **Part (d)** proved much more demanding. There was some impressive algebra from some of the better candidates in **part (d)(i)** but many started with the wrong equation or could not rearrange it successfully to the required three term quadratic equation. Often 1.5 was added to the wrong fraction or multiplied by one of the fractions. A significant number simply solved the equation in **part (d)(i)**. More able candidates were able to solve the quadratic equation in **part (ii)**, usually using the formula rather than the graphical calculator. Most, however, left the solutions as their answers, not realising that there was still work to be done in reaching the required answers.

Answers: **(a)(i)** 275 **(ii)** 2.5 **(b)** 09 00 **(c)** 24.6 **(d)(ii)** 125, 130

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/42
Paper 42 (Extended)

Key message

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

It is also important to point out that the graphics calculator is an essential aid and candidates are expected to be fully experienced in the appropriate use of such a useful device. It is hoped that this type of calculator is seen as a teaching and learning tool throughout the course. There is a list of functions of the calculator that are expected to be used and candidates should be aware that more advanced functions will usually remove the opportunity to show working. There are often questions where a graphical approach can often replace the need for some complicated algebra and candidates need to be aware of such opportunities. In such cases sketches are necessary to show working.

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 accuracy asked for in a particular question. Candidates are strongly advised not to round off during their working to avoid final answers being out of range.

If candidates replace work, it should be clearly erased or crossed out. Work done in pencil and then overwritten in black or blue can often make the script very difficult to read.

General comments

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

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

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

Topics on which questions were well answered include transformations, two variable statistics, column vectors, curve sketching and continuous variable statistics.
Difficult topics were exponential change, showing equations from given information, bearings, inequality from a sketch of graphs, co-ordinate geometry and transformations of graphs of functions.
There were mixed responses in other questions as will be explained in the following comments.

Comments on specific questions

Question 1

(a) This salary and tax problem was generally well answered. Errors appeared from overlooking 'monthly' which was emboldened in the question.

(b) (i) This reverse percentage question was very well answered. It is a topic which has improved during recent years.

(ii) This exponential type problem was more challenging. Most candidates set up a reasonable equation and often found the correct number of years. This number was not an exact integer and this caused problems in determining the actual year. A number of candidates gave the number of years as their final answer. The most successful method was from using logarithms. Very few sketches of graphs were seen.

Answers: **(a)** \$1598 **(b)(i)** \$23 500 **(ii)** 2024

Question 2

(a) These three single transformations were usually described fully and correctly.

(b) (i) The rotation was usually correctly drawn. A few candidates drew the rotation by 90° clockwise.

(ii) The drawing of the stretch was, as anticipated, more difficult but there were many fully correct answers. A common error was to move the origin to the point (2, 0) even though the *y*-axis was invariant.

Answers: **(a)(i)** reflection, $y = x$ **(ii)** enlargement, (2, 1), $\frac{1}{4}$ **(iii)** translation, $\begin{pmatrix} 3 \\ -5 \end{pmatrix}$

(b)(i) image at (0 0), (0, 2), (–2, 3) **(ii)** image at (0, 0), (4, 0), (6, 2)

Question 3

(a) Almost all candidates completed the scatter diagram completely.

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

(c) (i) Most candidates gave the correct line of regression, using the graphics calculator efficiently. A few rounded the coefficients to 2 significant figures and are reminded that usual 3 figure rule applies when using the calculator.

(ii) Most candidates used the line of regression correctly.

Answers: **(b)** positive **(c)(i)** $y = 0.787x + 0.356$ **(ii)** 5.4

Question 4

(a) (i) Most candidates calculated this column vector correctly.

(ii) Most candidates calculated this column vector correctly.

(iii) The magnitude of a vector was more challenging and tested both method and recognition of notation and surds. There were many correct answers. Problems seen included decimal answers, incorrect use of Pythagoras and a misunderstanding of the magnitude notation.

(b) This was a very straightforward addition of two column vectors followed by drawing an image point. This was extremely well answered.

Answers: **(a)(i)** $\begin{pmatrix} -1.5 \\ 1 \end{pmatrix}$ **(ii)** $\begin{pmatrix} 10 \\ -1 \end{pmatrix}$ **(iii)** $\sqrt{13}$

Question 5

(a) This change of currency question was almost always correctly answered.

(b) (i) The calculation of an arrival time when crossing time zones is usually found to be less straightforward than to be expected. This question proved to be no different. The candidates who set down their times carefully usually succeeded. Often working was unclear and one common answer was 1 hour earlier than the correct answer. Another error was to subtract the time difference which should have been added.

(ii) The speed of the aircraft was usually answered correctly.

(iii) The time of flight was also usually answered correctly. A few candidates gave 5.53 hours equal to 5 h 53 min.

Answers: **(a)** 2500 **(b)(i)** 06 10 **(ii)** 722 km/h **(iii)** 5 h 32 min

Question 6

(a) (i) Most candidates gave a correct expression in terms of *c* and *v.*

(ii) Most candidates gave a correct expression in terms of *k* and v^2.

(iii) Most candidates correctly added their answers to **parts (i)** and **(ii).**

(b) (i) This part required candidates to show an equation using data in a table. The stronger candidates had no difficulty in setting the correct equation while many others tried to use the equation that was to be shown.

(ii) The same problem occurred here although this was not a "show that" situation. There was a considerable number of omissions to this part. In both **parts (i)** and **(ii)** many candidates appeared to overlook the instruction about using the answer to **part (a)(iii).** This comment is endorsed by the fact that many candidates put correct equations in the next part.

(c) Most candidates demonstrated good ability in solving simultaneous equations.

(d) This part required candidates to substitute into an earlier equation and, unlike **part (b)(ii),** no direction was given. Most candidates did understand the necessary steps and gave a correct or a correct follow through answer.

Answers: **(a)(i)** $x = cv$ **(ii)** $y = kv^2$ **(iii)** $d = cv + kv^2$ **(b)(i)** $750 = 12c + 12^2k$ **(ii)** $2050 = 20c + 20^2k$
(c) $c = 2.5$, $k = 5$ **(d)** 8100

Question 7

(a) A good drawing of bearings and distances was needed here, not only for the 3 marks in this part but also in the rest of the question. Most candidates gave a reasonable sketch, enough to earn full marks. A few showed misunderstanding of bearings.

(b) The angle was usually correctly stated but tended to be only from good diagrams in **part (a)**.

(c) Almost all candidates recognised the need to use the cosine rule and those with the correct angle in **part (b)** usually earned 2 or 3 marks here. The subtlety of finding a more accurate answer to show a 3 figure answer was a difficulty for many candidates and those who simply wrote down the values in the cosine rule and only then wrote down 91.8 scored only 1 mark.

(d) This was a challenging question to find a bearing which was not straightforward and proved to be a good discriminator. There were good answers from using either the sine formula or the cosine formula. Many candidates correctly found an angle in the triangle but were unable to go on to find the correct bearing.

Answers: **(b)** 120° **(c)** 91.78 to 91.79 km **(d)** 288°

Question 8

(a) Most candidates gave a fully correct sketch.

(b) Most candidates gave the correct x co-ordinates of the maximum points. A few candidates appeared to use the trace facility on their calculator and gave answers close to the exact values but these were not accepted.

(c) This part required candidates to find two x co-ordinates which were beyond the sketch. This was more challenging but was very well answered.

(d) This question was set as a more challenging one, going straight into an inequality without any structured part first. Candidates were not instructed to add a straight line to their sketch and very few sketches showed this line. This was not absolutely necessary as a number of candidates gave correct answers or found the three values of x without showing the line but must have used it on their calculator. Only the stronger candidates gave fully correct inequalities with many having incorrect inequality signs and many others only writing down the x values. This part was also omitted by a number of candidates.

Answers: **(b)** –270, 90, 450 **(c**) 750, 870 **(d)** $x < 54.7$, $164 < x < 267$

Question 9

(a) (i) The finding of an expression for the area of a triangle in terms of x, using the trigonometric area formula was understood by most candidates with a correct first statement often seen. However, many candidates omitted important brackets and gave incorrect answers after making a good start.

(ii) The impact of expressions without brackets was evident here as correct equations appeared from incorrect cancelling. The number of candidates showing fully correct steps to arrive at the given equation was quite small.

(b) (i) Most candidates recovered in this part and correctly solved the given quadratic equation. The formula, completing the square and sketches were seen, almost always leading to success.

(ii) This shortest distance between a line and a point is never found to be easy, largely because of its recognition rather than the calculation. The 2 marks for the question should have indicated that the method should be quite short. A few candidates used area, which did work in some cases, and this involved a large amount of working.

Answers: **(a)(i)** $\frac{\sqrt{3}}{4}x(x+2)$ **(b)(i)** –9.54, 7.54 **(ii)** 6.53 or 6.54 cm

Question 10

(a) (i) This part involved finding a gradient and then the constant in the equation $y = mx + c$. Most candidates answered this successfully.

(ii) The equation of a perpendicular was a little more searching but was still quite well answered. The perpendicular gradient was well understood but the constant in the equation was found to be more challenging and quite a number of candidates substituted co-ordinates of points that were not on the required line.

(b) There were several approaches seen in this "show that" question. The most common was to simply substitute the co-ordinates into the equations and show that the equations were satisfied. Another approach was to solve simultaneous equations. These methods generally met with full success. Another method was to use gradient but explanations were not always complete.

(c) The co-ordinates of a particular point proved to be quite challenging and more difficult than anticipated. It was not too obvious that (10, 6) was the mid-point of *BD*. Good additions to the diagram were very helpful and even more helpful in **part (d).** There was only a limited number of correct answers.

(d) This was probably the most difficult question on the whole paper. Without the *y* co-ordinate of the answer to **part (c)** being 8, this question was going to be almost impossible for scoring full marks. Some candidates found appropriate lengths or correct areas within the quadrilateral but only a few reached a final correct answer.

Answers: **(i)** $y = \frac{1}{2}x + 1$ **(ii)** $y = -2x + 26$ **(c)** (9, 8) **(d)** 30

Question 11

(a) The mean was usually correctly given, although often following much working and use of $\frac{\Sigma fx}{\Sigma f}$ when the graphics calculator would give the answer much more quickly. If in doubt about working, the mid-interval values would have scored M1 in the event of an incorrect final answer.

(b) This histogram was more challenging than usual as a suitable scale had to be chosen. The obvious one was 2 cm to 10 on the frequency density axis and many candidates did choose this and went on to a fully accurate drawing. Less user-friendly scales were seen and these often led to inaccurate columns. A few candidates used frequencies, not frequency densities.

(c) (i) This probability of a selection of two without replacement was generally well answered.

(ii) This was also the probability of two events without replacement but this could occur in two ways. There were many fully correct answers and, as perhaps anticipated, a common error was to only give one product.

Answers: **(a)** 12.9 cm **(c)(i)** $\frac{198}{2873}$ **(ii)** $\frac{100}{2873}$

Question 12

(a) This evaluation of a function was usually correctly answered.

(b) This evaluation of a composite function was a little more challenging but generally well answered. A few candidates took the composition as a product of the two functions.

(c) Finding *x* for a given value of f(*x*) proved to be very straightforward.

(d) The range of one of the functions proved to be more discriminating with both the concept and the notation being quite difficult. There were however many correct answers.

(e) This inverse of a function question was very well answered.

(f) The description of the single transformation of the graph of a function was well answered by many candidates, especially those who knew the property *k*f(*x*). A number of candidates considered the drawing of the two straight lines which seemed to make the stretch less obvious. Reflections and rotations were often seen but the equation of the reflection line and the angle of the rotation were extremely difficult.

(g) In this part the transformation was given and candidates had to know about replacing *x* by (*x* – 2). There were longer methods seen using translated points and these only occasionally led to a fully correct answer. The common error was to replace *x* by (*x* + 2). The question was also omitted by a number of candidates.

Answers: **(a)** 11 **(b)** 6 **(c)** –3 **(d)** $h(x) \geqslant -3$ **(e)** $\frac{x-2}{4}$ **(f)** stretch, *x*-axis invariant, factor 2
(g) $y = x^2 - 4x + 1$

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/43
Paper 43 (Extended)

Key message

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

It is also important to point out that the graphics calculator is an essential aid and candidates are expected to be fully experienced in the appropriate use of such a useful device. It is hoped that this type of calculator is seen as a teaching and learning tool throughout the course. There is a list of functions of the calculator that are expected to be used and candidates should be aware that more advanced functions will usually remove the opportunity to show working. There are often questions where a graphical approach can often replace the need for some complicated algebra and candidates need to be aware of such opportunities. In such cases sketches are necessary to show working.

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 accuracy asked for in a particular question. Candidates are strongly advised not to round off during their working to avoid final answers being out of range.

If candidates replace work, it should be clearly erased or crossed out. Work done in pencil and then overwritten in black or blue can often make the script very difficult to read.

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 small number of candidates demonstrated a lack of relevant working and ran the risk of losing several marks whenever an answer was incorrect or out of range.

The sketching of graphs continues to improve although the potential use of graphics calculators elsewhere is often not realised. An example of this is the calculation of the mean where candidates should use the graphics calculator and the only necessary working is showing the mid-interval values, as has been indicated in mark schemes in recent years.

Topics on which questions were well answered include transformations, geometry, continuous variable statistics, percentages, curve sketching, trigonometry and functions.
Difficulties were noted in discrete variable statistics, a cross-section of a cone problem, inequalities and ranges from graphs, an algebraic "show that" and vectors.
There were mixed responses in other questions as will be explained in the following comments.

Comments on specific questions

Question 1

(a) The translation was usually correctly drawn. Good freehand is accepted but candidates are encouraged to use a straight edge.

(b) (i) The reflection was almost always correctly drawn.

(ii) The reflection was almost always correctly drawn.

(iii) Most candidates correctly gave a rotation by 180˚. The centre of this rotation proved to be a little more challenging.

(c) The description of a stretch is always a more searching question. However, candidates often answered this correctly or partly correctly. It should be noted that the invariant line must be clearly stated and "from the *x*-axis" or "parallel to the *y*-axis" are not accepted.

Answers **(a)** Image at (0, 5), (3, 5), (3, 3) **(b)(i)** Image at (2, 2), (5, 2), (5, 4) **(ii)** Image at (–4, –2), (–7, –2), (–7, –4) **(iii)** Rotation, 180˚, (–1, 0) **(c)** Stretch, factor 2, *x*-axis invariant

Question 2

(a) (i) This was a straightforward isosceles triangle and parallel line question which was usually well answered. The candidates who put the values of various angles in the diagram were almost always successful.

(ii) Most candidates recognised the triangle as isosceles, although a few thought it was scalene.

(b) The calculation of the interior angle of a polygon was extremely well answered.

(c) (i) The reason needed for the two angles being equal was some reference to the angle sum of a triangle. Candidates who gave similar triangles as the reason did not earn this mark and the next question should have prompted them into something else.

(ii)(a) Almost all candidates correctly gave the triangles as similar.

(b) Almost all candidates went on to use the correct ratio of sides of these similar triangles and gave the length of one of the sides.

Answers **(a)(i)** 44° **(ii)** isosceles **(b)** 162° **(c)(ii)(a)** similar **(ii)(b)** 5.4 cm

Question 3

Part (a) was about a list of values of a discrete variable and candidates appeared to be less familiar with this than with a continuous variable. The graphics calculator can be used for the median and quartiles or a simple ordered list would have helped.

(a)(i) The median was often correctly found whilst a few candidates gave a student as the answer and others appeared to think that the answer must be one of the items of data.

(ii) The same comment applies to the lower quartile.

(iii) The amount of data below the lower quartile did depend on **part (ii)** being correct and this mark turned out to be a reward for those candidates who knew how to locate median and quartiles from the graphics calculator.

Part (b) tested two variable statistics and, although this is a higher level, candidates were much stronger in this part than in **part (a)**. This was probably due to being more experienced in using the graphics calculator for this type of problem.

(b) (i) Most candidates gave the correct answer to the type of correlation.

(ii) The range of one of the variables was well answered.

(iii) The mean of one of the variables was also well answered.

(iv) The equation of the line of regression was usually correctly given. A few candidates gave coefficients to less than three significant figures.

(v) Almost all candidates sketched a straight line with a positive gradient. Some candidates lost a mark because their line either had or would have had, if extended, a positive *y*-intercept.

Answers **(a)(i)** 6.5 **(ii)** 4.5 **(iii)** 3 **(b)(i)** positive **(ii)** 13 **(iii)** 15.5 **(iv)** $7.32t - 55.3$

Question 4

(a) (i) The simplification of the ratio was usually correctly answered.

(ii) This percentage of a given amount was also usually correctly answered.

(iii) Candidates have become very familiar with reverse percentages and this question was very well answered.

(iv) This simple interest question was quite well answered. A few candidates only gave the interest as their answer and a few others treated the question as compound interest.

(v) This part was a compound interest question and was well answered.

(b) This question was also compound interest, requiring candidates to find the number of complete years needed for the investment to reach a certain value. Candidates have gradually improved with this topic and logarithms are being seen more frequently and with success. Trial and improvement is still evident and is acceptable if clear and there have been enough relevant trials. A small number of sketches were seen.

Answers **(a)(i)** 5 : 4 **(ii)** \$41.68 **(iii)** \$12.50 **(iv)** \$300 **(v)** \$311.72 **(b)** 17

Question 5

(a) This question required candidates to find the difference between the volume of a cone and the volume of a sphere. This was generally well done with candidates using the appropriate formulae on page 2. Some candidates rounded the two volumes before subtracting, risking a final answer to be out of accuracy range.

(b) Candidates were required to realise that they must first use Pythagoras to find the sloping height of the cone in order to calculate the curved surface area. The stronger candidates had no difficulty with this. A number of candidates used the vertical height and a few candidates added the area of the base to the curved surface.

(c) This part was one of the most discriminating questions in the whole paper. There were several approaches and they were all seen. Similar triangles was probably the most popular, especially if the sloping height was used, although the pairing of the sides was often incorrect. Trigonometry was perhaps less popular but more successful, with the main problem here being answers out of range due to an angle being used to only 3 significant figures within the calculation. The question was occasionally omitted.

Answers **(a)** $804\,\text{cm}^3$ **(b)** $450\,\text{cm}^2$ **(c)** $8.94\,\text{cm}$

Question 6

(a) Almost all candidates gave a correct sketch of the graph.

(b) The co-ordinates of the minimum point were usually correct.

(c) The range over a given domain was found, as often is the case, to be more challenging. Many candidates gave the values of the function from the values from the domain, overlooking the minimum point between within this domain. The stronger candidates did see the link with **part (b)**.

(d) Most candidates were able to solve an $f(x) = k$ type of equation using their graphics calculator. Candidates are again advised that three figure accuracy is required.

(e) Giving the inequality using answers from **part (d)** was not found to be so straightforward. Inequality signs were frequently incorrect and the link with **part (d)** was often overlooked.

(f) (i) This part was to find values of the function for very small values of *x* and, although this was a slightly unusual question, candidates generally answered it well.

(ii) Many candidates realised what **part (i)** was leading to and correctly gave “asymptote” for the answer. Several candidates appeared to be less familiar with vocabulary and omitted this part or gave “parallel” as their answer.

Answers **(b)** (2.17, 0.488) **(c)** $0.488 \leqslant f(x) \leqslant 1.51$ **(d)** 0.502, 5.83 **(e)** $0.502 < x < 5.83$ **(f)(i)** 15, 25, 35
(ii) asymptote

Question 7

(a) This very straightforward trigonometry calculation was correctly answered by almost all candidates. Several used the sine rule instead of right-angled triangle trigonometry but were equally successful.

(b) This part required the use of the cosine rule to calculate an angle and this too was generally well answered.

Answers **(a)** 9.77 cm **(b)** 60.6°

Question 8

(a) This evaluation of a function was usually correctly answered.

(b) This evaluation of a composite function was a little more challenging but generally well answered. A few candidates took the composition as a product of the two functions.

(c) This was a more challenging algebra question involving a composite function and collecting like terms. There were errors in the squaring of the linear function as well as a repetition of the error in **part (b)** in treating $f(g(x))$ as $f(x)g(x)$.

(d) The inverse function was quite well answered, although this particular inverse involved more steps than usual. The candidates who went from $y = \frac{1}{x+1}$ to $x + 1 = \frac{1}{y}$ were the most successful. Other routes tended to create more difficulties with signs.

(e) (i) Solving g(x) = 1 was found to be very straightforward with almost all candidates gaining full marks.

(ii) This part, solving $g^{-1}(x) = 1$, was often correctly answered but almost all candidates worked out $g^{-1}(x)$ in terms of x. The simple matter of changing the question to x = g(1) was rarely seen and thus demonstrated the need for candidates to have a basic understanding of what an inverse function means as opposed to only knowing the mechanical and manipulative work on inverses. A lot of work was done for 1 mark.

Answers **(a)** 10 **(b)** 4 **(c)** $5x^2 + 12x + 11$ **(d)** $\frac{1}{x} - 1$ **(e)(i)** –1 **(ii)** 5

Question 9

(a) Almost all candidates completed the Venn diagram correctly.

(b) (i) Almost all candidates recognised that this part was asking for the number in the intersection of the two sets.

(ii) This part required more understanding with “or” and “not” involved. There were correct answers but a common incorrect answer was the one that did not include the intersection.

(c) Although this part involved set notation, it was a more familiar subset and was usually correctly answered.

(d) The probability of choosing two from the same set was well answered.

(e) (i) This was a probability of choosing an element from a subset and was very well answered.

(ii) This was the probability of two events which could occur in two ways. There were many correct answers as well as the common error of only giving one product.

(f) This probability question was designed for candidates to set up an equation to find the number of new elements. Most candidates did set up a correct equation leading to the correct answer. Some candidates used trial and improvement and were successful if they realised that the answer must be an integer. A few candidates struggled to find a suitable strategy, often with rather untidy guesswork.

(g) The shading of the Venn diagram was well done. A few candidates only shaded the region outside the union of the two sets.

Answers **(a)** 15, 7, 12 correctly placed **(b)(i)** 7 **(ii)** 28 **(c)** 15 **(d)** $\frac{462}{1560}$ **(e)(i)** $\frac{7}{19}$ **(ii)** $\frac{168}{342}$ **(f)** 8

Question 10

(a) (i) The calculation of a mean was well answered, although many candidates went through a full method of finding $\frac{\Sigma fx}{\Sigma f}$ instead of using the graphics calculator. A hint that little working was required was the allocation of only 2 marks.

(ii) The histogram was found to be very straightforward with most candidates giving the 3 correct columns.

(b) (i) This part required the setting up of an algebraic equation containing two fractions and, as anticipated, it turned out to be a good discriminating question allowing stronger candidates to demonstrate their manipulative skills. A large number of candidates found the clearing of the fractions difficult and another error seen was to have the fractions in an incorrect order.

(ii) Most candidates were able to solve the quadratic equation which gave them 2 of the 4 marks. The application of the positive root was more challenging as candidates had to return to the context of the question and divide the distance by the positive root. An error seen here was to add 10 to the speed and then divide it into the distance, believing that this smallest time would give the time of the slower journey.

Answers **(a)(i)** 3.0875 **(b)(ii)** 2h 45 min

Question 11

(a) (i) This straightforward vector addition was well answered.

(ii) Most candidates correctly found $\frac{1}{4}$ of their answer to **part (i).**

(iii) This part required a vector to be added to the answer to **part (ii)** and most candidates again succeeded. A few candidates did not give their answer in its simplest form.

(b) This was quite an unusual question requiring the substitution of column vectors into the expression in **part (iii)**. A number of candidates were unable to decide on how to do this substitution but many demonstrated a sound understanding and gave a fully correct answer.

Answers **(a)(i)** $-\mathbf{a} + \mathbf{b}$ **(ii)** $-\frac{1}{4}\mathbf{a} + \frac{1}{4}\mathbf{b}$ **(iii)** $\frac{3}{4}\mathbf{a} + \frac{1}{4}\mathbf{b}$ **(b)** (6.5, 1.5)

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/51
Core

Key Messages

There were links between most of the questions. Candidates should look for connections between questions and parts of questions to help them to make the most progress.

Communication is not just for extra marks. Writing everything down is an exceptionally good way of spotting mistakes and of seeing what to do next. Candidates should be instructed to write down all their thoughts and everything that they put into their calculator.

General Comments

The candidates who took this paper answered most parts very well. Working towards a formula in terms of *n* is standard practice in an investigation. Candidates showed themselves to be familiar with the methods for deriving formulae from sequences but many appeared unaware of the necessity or methods for testing their findings.

Comments on Specific Questions

Question 1

Several different skills and areas of knowledge were tested in this question. This led to varying levels of success for the different parts.

(a) Most candidates were successful and very few mistakes were seen.

(b) This part was also answered correctly by most. Some candidates who made a mistake in **part (a)** still managed to complete the table correctly, but they did not go back and check/correct their first answer.

Answers: 7
9

(c) The answer to this part was not well known. Many candidates misinterpreted the question, giving their answer in the context, such as 'infected' or 'dead'. Many others chose 'uneven' as the name for odd numbers: Other names that were popular with candidates were 'prime' and 'integer'. Names of sets of numbers are expected to be known by candidates.

Answer: Odd

(d) This part was well answered. Most candidates were able to continue the sequence up to Day 9 and most wrote this down thereby helping themselves to score in communication.

Answer: 17

(e) Most candidates found this formula although many omitted the 't = ' so giving their answer as an expression rather than a formula. This did not lose marks on this occasion. Candidates should be made aware of the differences between expressions, equations and formulae etc. Many candidates wrote their answer without simplifying it or in 'bad' form, such as, $n2 - 1$, $n + n - 1$ or $(n-1)\times 2+1$. Candidates should know how to write formulae correctly. $2n + 1$ was also a common answer.

Answer: $t = 2n - 1$

(f) Quite often this was correctly answered even if the formula in **part (e)** was incorrect. It was quite common to see the original table extended up to 97 plants quite independent of the previous answer. Many of the candidates who used their formula from **part (e)** used it incorrectly to obtain answers of 48.5 and 49.5 and many of these gave the final answer as 48. It was also quite common to see $n = 97$ substituted into their formula found in **part (e)**. Candidates should be directed to constantly check the definitions of the variables they are using. They should not expect that they will always be substituting into the object of the formula and should know how to work with a substitution into its subject.

Answer: 49

Question 2

Even candidates who had struggled with some parts of question 1 managed to do well in question 2.

(a) Most candidates drew this correctly.

(b) This part was also well answered but with a significant number of candidates who wrote 11, 13.

Answers: 13
17

(c) Yet again many candidates gave their answer as an expression rather than a formula. A majority found the '$4n$' although often with an incorrect constant. A popular way of writing the correct answer was '$(n - 1)4 + 1$'. Although simplified answers were not asked for it is expected that candidates do try to write their answers as neatly as possible.

Answer: $t = 4n - 3$

Question 3

(a) Many candidates completed this drawing successfully although a significant number replaced Ds by Zs in the second and second to last rows or simply made a different symmetrical pattern.

(b) This was quite well answered with a surprising number of candidates who completed these cells with the same answers as for **part (d)**. Many candidates made use of the grid to draw out the pattern first. This helped them to obtain the correct answers and further assisted them in gaining a communication mark.

Answers: 12
16

(c) More expressions than formulas were given as answers here. Again $4n$ commonly scored one mark but this time it was more often seen by itself, i.e. with a constant of 0. It is likely that the initial difference of 3 made this formula more difficult for the candidates to work out. It is not unusual for this to happen so candidates should be prepared for sequences like this.

Answer: $p = 4n - 4$

(d) Considering the difficulty of this sequence many candidates managed to complete the two cells correctly. Those who had drawn a correct pattern on the grid in **part (b)** were able to use counting to achieve the first number and subsequently the second one. Some possibly saw the connection between this table and the one in **part (b)**. Very little evidence of the use of differences was seen.

Answers: 25
41

(e) Very few candidates were able to use simultaneous equations to find the two unknown values. Many tried but were unsuccessful. Others recognised the first and second differences but were unable to proceed further with this. Of those who were successful many achieved the correct answers through Trial and Improvement. It is recommended that candidates should check their answers by trialling them in the formula that they have worked out to see if other, already given results, work.

Answers: $b = -2$
$c = 1$

(f) Without the correct answers to **part (e)** candidates were not able to show the formula working by substitution. Very few candidates made any attempt to do this. Most attempted, very often successfully, to draw the diagram. Very few realised that they could have extrapolated the answer from the table in **part (d)**; in fact it was only the next term.

Communication

Quite a significant number of candidates failed to achieve two marks for communication despite the many opportunities. There were three instances where differences could be used so only one set of differences was allowed to count for a communication opportunity. There were, however, few candidates who showed use of differences to obtain any of the formulae in **Questions 1(e), 2(c)** or **3(c)**. Continuing the sequence was very often seen in **Question 1(d)** and use of $2n - 1 = 97$ was commonly seen in **Question 1(f)**, as was the correct diagram in **Question 1(b)**.

Communication seen in three of **Questions 1(d), 1(f), 3(b), 3(e), 1(e), 2(c)** and **3(c)**, with a maximum of one from the last three.

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/52
Paper 52 (Core)

Key messages

Work on sequences and number patterns are common in investigations, as is finding the *n*th term and generalising information and patterns. The best prepared candidates knew what to look for and how to check their answers as well as how to link their findings algebraically.
Questions are often linked to previous questions throughout the paper; so it would be appropriate to study links between different sequences as well.

General comments

Candidates were able to answer the majority of the questions quite well. They still need to make sure that they read the questions carefully and again when they think they have the answer. They should also write down as much as possible, not only because it is good to communicate in this way but because often by writing something they may 'see' a solution or pattern that was not clear to them before this.

Comments on specific questions

Question 1

(a) This question tested whether the candidates had understood the explanation about Number Stems and whether they could now calculate number stems. The question was very well answered with very few errors being made. Some candidates, who made changes to their answers, probably spotted the patterns and if they noticed that their answer did not fit a pattern they changed it to fit. This is a good example of using alternative methods to check answers.

Answers:

Multiple of 3				6		
Multiple of 12			3	6	3	6
Multiple of 21	6	9	3	6		
Multiple of 30	6	9	3	6		

(b) (i) Many candidates knew the correct names for these numbers and many more knew what they were, calling them e.g. 'Multiplications', Multiplication Numbers', etc. There are still many candidates who confuse Factors with Multiples and this probably needs further clarification.

Answer: multiple[s]

(c) This question tested whether the candidates could work out division with remainders because the decimal answer was not required. The question was well answered, with most candidates showing that they could divide by 9 and give whole number remainders. There were again patterns that could be followed for checking if their answers were correct.

Answers: 21 ÷ **9** = 2 remainder **3**
30 ÷ 9 = 3 remainder 3
39 ÷ 9 = **4** remainder **3**

(d) Despite their correct completion of the table in **part (c)** many candidates did not realise the connection with the remainders in the division. A common answer here was 'multiple' despite the fact that this did not correctly fit the wording of the sentence. Although this was true for the multiples of 3 shown in the table it is not true for all multiples of 3 as could be seen from the first table in **Question 1(a)**. There were many non-numerical answers to the second missing gap in the statement.

Answers: remainder 3

(e) (i) This question simply asked the candidates to state the rule for finding each next number in this sequence. Many candidates confused this with finding the *n*th term and, even if they did not give the *n*th term as the answer, they still gave an answer that included an *n*. Candidates need to know the difference between a 'rule' and the '*n*th term'.

Answer: Add 9

(ii) The *n*th term was very well answered in terms of candidates calculating the '9*n*'. They were not so consistently good at calculating the number to go with it. Checking their answer for the *n*th term would be a good way to avoid so many incorrect solutions and should be encouraged as part of the answering process.

Answer: $9n + 3$

(iii) The correct value was often given although not always by the substitution of 87 into the *n*th term as found in **part (ii)**. Some answers given did not have a number stem of 3 which could have been checked very easily.

Answer: 786

Question 2

(a) There were very few slips in the Number Stem answers in these tables but many candidates could not correctly complete the three cells with the multiples of 11. It is an important skill that candidates should know how to calculate multiplication tables for any number.

Answers: Multiple of 2

Number Stem	1	3	5	7	9			
Multiple of 11						110	121	132
Number Stem	1	3	5	7	9			

(b) (i) The next two numbers in this sequence were usually written down correctly. There was occasionally a misunderstanding as to which were the next two so allowance was made for this in the mark scheme.

Answer: 38, 47

(ii) Again many candidates found the common difference of 9 and many could follow this through to find the *n*th term. Answers using the 9 as a constant were often seen.

Answer: $9n + 2$

(iii) The easiest way to answer this question was to substitute 150 into the *n*th term which led to an answer of 1352. This was not the most obvious way for many candidates. More commonly they divided 1352 by 9 which gave 150 with a remainder of 2, or, subtracted 2 from 1352 and then divided 1350 by 9. Both methods were acceptable in this instance for the mark. It should be noted that candidates should know the correct way to solve linear equations.

Answer: $9 \times 150 + 2$ [= 1352]

Question 3

(a) Candidates needed to read this question carefully if they were to gain both of the marks. The question stated in bold '**greater than 8**' but many candidates ignored this and started their list with 8. This meant they only had three correct values and lost one mark. Very few other errors were made.

Answer: 17, 26, 35, 44

(b) This was the third time that candidates needed to find an *n*th term. The result depended on the correct answer to **part (a)** but a follow through of $9n - 1$ was also allowed from a previous answer of 8, 17, 26, 35. Candidates tended to make the same mistakes throughout the three questions, **1(e)(ii)**, **2(b)(ii)** and this one. All answers should have been easily checked by a couple of straightforward substitutions. This should be part of the procedure of teaching sequences.

Answer: $9n + 8$

(c) This was not a particularly well answered question despite the hint 'Using your answer to **part (b)**'. The expected method of equating $9n + 8$ to 10 000 was not seen very often. Candidates used trial or substitution for *n* and although they found a large number with a number stem of 8, it was not necessarily the closest to 10 000.

Answer: 9998

Question 4

(a) This question, bringing together the findings of the investigation in an algebraic form, proved too difficult for many candidates. Of course, those who had already found *n*th terms correctly had only to look at the connection of their answers with the wording of each question and then follow this pattern in terms of *k*. Candidates still need encouragement to look back at previous work to help them to answer current questions.

Answer: $k + 9$, $k + 18$, $k + 27$, $k + 36$

(b) The final *n*th term was the answer to the final question. It was necessary to have correct either at least two of the *n*th terms previously asked for or **part (a)**. Good candidates were able to look back at their results and write down this answer.

Answer: $9n + k$

Communication

This could have been better with very little effort. Substitution in **Question 1(e)(iii)** was shown by many candidates but others did not use this method to answer this question. Again the methods chosen to answer **Question 3(c)** were not written out or checked explicitly. Many candidates obviously worked out number stems in their heads or on their calculators and did not write down how they did this or what they found. Candidates using differences to work out the *n*th terms often did not write down the differences.

Communication seen in two of **Questions 1(e)(iii)**, **2(b)(ii)**, **3(b)** and **3(c)**

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/53
Paper 53 (Core)

Key messages

The ability to look for patterns was quite crucial in this paper. Most of the answers could have been found in other ways but using patterns would have shortened the time taken to answer several questions as well as helping the candidates to find answers to other questions. Pattern spotting, when used as an alternative method, is also very useful to check answers.

General comments

Candidates were able to read carefully and follow instructions to answer many of these questions correctly. They found it much more difficult to answer questions where they had to find extra information other than that which was given. An important part of investigating is to look for connections and facts that might not be obvious to begin with. Candidates also need to be able to explain using words.

Comments on specific questions

Question 1

(a) The introduction explained how to make regular stars and this first question asked the candidates to follow the instructions to draw two regular stars. This question was well answered although many candidates did not use a ruler and some did not extend the sides using continuous straight lines.

(b) This question was answered correctly by almost all the candidates.

(c) (i) Candidates now had picture examples of regular stars made from polygons with 5, 6, 7 and 8 sides, so by carefully counting the sides of the stars that they had drawn they could complete the table for the 6, 7 and 8 sided starting polygons. The 5-sided polygon was shown in the first example and the number of sides of the star made from a 9-sided polygon could easily be worked out from the pattern.

Answer: 12, 14, 16, 18

(ii) Most candidates could write the correct connection between S and P. Although the formula was asked for as S in terms of P, the reverse (P in terms of S) was allowed for the mark. Most candidates also wrote a formula and not an expression.

Answer: $S = 2P$

(d) (i) The concept of a point angle was introduced in this question. There are several ways to calculate the sum of a star's point angles but it was only necessary here to notice the common difference of 180° between the sums of the angles, as the number of points increased by one. Some candidates used other, more complicated methods but only a few got this wrong.

Answer: 900°

(ii) There was more than one way to approach this problem and it was often explained quite well. The most common method was to divide 1450 by 360 and to show that the answer was not a whole number. Many found this concept quite difficult to explain even though they understood why the answer was 'No'. It might be beneficial to all candidates to do more work on questions like this.

(e) (i) Many candidates appeared not to know about the sum of the interior angles. Most realised that the triangles were isosceles and knew what this meant in terms of angles. The main difficulty for many candidates was to use the information that they knew and not to make incorrect assumptions. Values of 36 and 72 occurred quite often but not usually in the correct places. There was also a recurrent use of 90° which had nothing to do with this question.

Answer: 540 ÷ 5 or 108 or 72 seen 36

(ii) Very few candidates were able to answer this question. It was a generalisation of the concepts in the previous question, which were not often understood. The most common wrong assumption was that $a + b = 90°$. There were some reasonable attempts but even the best could not simplify their equations correctly.

Answer: $2b - a = 180$

Question 2

(a) The good answers to this question showed that the candidates read and understood the information and were able to rotate the polygons around their common centres. Candidates could have used pattern spotting to check their calculated answers. Checking using a different method should be encouraged wherever it is possible to do this.

Answer:

Number of points of the star	Number of sides (S) of the star
6	**12**
8	**16**
10	20
12	**24**

(b) Most candidates wrote an equation, not an expression. Knowing this difference is something that candidates often do not appear to understand, so this is a worthwhile improvement in candidates' knowledge. This question was answered well with the most common answer being $S = 4P$.

Answer: $P = \dfrac{S}{4}$

Question 3

(a) By drawing the stars as requested, candidates could find the answers to the next four spaces in the table by counting. This meant that very few errors were seen in these cells but the answers in the last two cells did not always follow on correctly. There was little evidence on any of the papers that candidates had tried to draw the last two stars implying that they had looked for a pattern in the table to find the last two answers. The usual pattern to look for is differences and although there is an add and subtract pattern between the number of points on the star it was more likely that candidates would see the connection between the odd and even numbers of equally spaced points with the number of points of the star. Candidates are improving in their knowledge of how and where to look for patterns.

Answer: 7, 4, 9, 5, 11, 6

(b) Candidates who correctly completed the last two cells in **part (a)** did not necessarily manage to answer this part correctly. Candidates needed to find the even/odd pattern for the number of equally spaced dots in **part (a)** and then to relate this to **part (b)**. When they did this the question was easy to calculate but not many candidates made the connection.

Answer: 185

Question 4

(a) (i) Coding was now introduced and most candidates showed that they understood how it worked by drawing a correct diagram. Those candidates who drew a triangle for this part were unsuccessful in most of the rest of this question.

(ii) Many candidates reversed the given code which was probably the most obvious choice. Many others, however, chose a new starting point. Some omitted to repeat the first number at the end of the code but otherwise this question was well answered.

(b) (i) Many candidates did not find a connection. Others found the connection and some of these were able to explain it.

Answer: Number of points in the code – 1 = number of points of the star

(ii) Most candidates were unable to answer this question. Practice on explanations in words would definitely be useful to help candidates to answer these kinds of questions.

Answer: Number of dots round the circle is a multiple of the number of numbers in the code – 1

(c) Although many answers were triangles very few candidates took into account that since 4 and 7 represented every third dot there needed to be two dots between 7 and 1: This meant that the circle needed 9 dots not 7 or even 8.

(d) Some candidates managed to find one code, a few two and very few found three. Most candidates did not think beyond circles with 10 dots. It was those who did who found the second and third answers.

Communication

Only one example of communication was needed but this mark was not always earned.

Communication seen in one of **Questions 1(d)(i)**, **1(e)(i)** and **3(b)**.

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/61
Paper 61 (Extended)

Key messages

Candidates should remember that good mathematical communication is being assessed in this paper and that answers alone are generally insufficient. Clear and logical answers to questions, showing sufficient method need to be given, so that marks can be awarded or communication credited. Correct mathematical terminology and presentation, including the correct use of brackets in algebraic expressions, for example, is also expected where appropriate. In 'show that' questions, candidates should produce clear, mathematical explanations, rather than lengthy, worded descriptions. Any diagrams used to communicate method should be clear and follow the structure and pattern of those given elsewhere in the paper. When many unit changes are required, it is helpful if candidates state the units they are using as this helps them to present clear and logical arguments.

General comments

Candidates seemed to be well prepared for this examination and often gave clearly presented and well explained answers. The level of communication was good in both parts of the paper. A good number of candidates found both parts accessible. Other candidates engaged well with the initial questions in both parts. The later questions in each part proved challenging, with many candidates trying to make connections between parts of questions that were not valid. Better candidates usually presented their work neatly, clearly and with correct mathematical form. In **Part A**, for example, candidates were asked to derive several formulae. It was important that the subject of each formula be given correctly. Some candidates needed to take more care with this. In order to improve, other candidates need to understand that their working must be well-presented and detailed enough to show their understanding clearly. 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 **Part A**, **Questions 2(f)** and **3(a)** and in **Part B**, **Questions 2(a)**, **3(a)**, **4(a)** and **4(b)** in this examination. In **Part A**, some candidates needed to take more care with whether the formula being derived was for the number of dead plants or the total number of dead and infected plants. Also some candidates were using the regression functions on their graphics calculators. Stating 'Using GDC' is not valid communication and candidates should be reminded that using quadratic or cubic regression functions on their graphics calculator is not listed as a requirement of the syllabus and should not be used as it will gain no credit. In **Part B**, candidates needed to keep track of many unit changes. Those who stated their units clearly and consistently tended to do better than those who did not.

Comments on specific questions

Part A Investigation: Virus

Question 1

(a) This question was intended to provide a straightforward introduction into the task. Candidates made few errors. Occasionally arithmetic slips were seen. Also, it was clear that some candidates had assumed that the maximum number of plants was 8, as they were given a diagram with 8 dots as their example. It was clear that these dots did not represent all the plants in the field. Reading the question a little more carefully may have helped these candidates to understand this.

Answer: 7, 9

(b) Again, this question was generally well answered, with a high proportion of candidates finding a correct expression for the formula. Many candidates successfully communicated a correct method of differences.

Answer: $2n - 1$

(c) Candidates usually communicated and applied a correct method to answer this question. Occasionally an answer of 48 was given following the subtraction of 1 from 97. Weaker candidates substituted $n = 97$ and the answer 193 was seen on occasion.

Answer: 49

Question 2

(a) Candidates needed to draw the next diagram in the sequence. Those who took care and used a pencil most often produced excellent and clear diagrams. Other candidates using pen and making an error often made slips and either included extra D elements or omitted elements of the pattern. Those who used one dot to represent one plant usually produced a dimensionally correct diagram. Some diagrams consisted entirely of ringed dots rather than the correct pattern of dead and infected plants. Candidates who did this needed to understand that this was an incorrect representation of the information asked for, as the dead and infected plants were not clear.

(b) Very well answered – almost universally correct. Candidates often communicated well in this question, drawing an accurate diagram to support their answer. Some candidates did not use the structure of the established pattern. This was required for communication in this question.

Answer: 12, 16

(c) Most candidates found the correct expression. Some candidates stated t as the subject of their formula. This was not the case and not accepted in this part of the question. A small number of candidates misread the question and stated the values for the total number of dead or infected plants in this part.

Answer: $p = 4n - 4$

(d) Again a very well answered part of the task with very many correct answers seen.

Answer: 25, 41

(e) Some excellent answers were seen for this question. Many candidates used the method of differences. These almost always interpreted the second row of differences correctly without the need for a high level of algebra. These solutions were generally the most efficient offered for this part and were good communication.

Answer: $t = 2n^2 - 2n + 1$

(f) In this part, candidates needed to draw the correct diagram to demonstrate that it contained 61 elements and support this evidence with a relevant calculation. Many candidates only drew the diagram and a few candidates only showed that substitution of 6 into their formula gave $t = 61$.

(g) Many candidates gave the correct answer to this part. Those who did not have the correct formula usually attempted to continue the sequence. Occasional slips were seen in factorising or in applying the quadratic formula. It is good practice to check solutions to equations by substituting the values found into the original equation to check that they do satisfy it. Some candidates might have corrected sign errors if they had done this.

Answer: 11

Question 3

This question was the least well answered in this part.

(a) In this part, candidates needed to show that the expression given was valid for at least day 2, 3 and 4. To do this, candidates needed to give diagrammatic evidence indicating 11, 15 and 19 along with algebraic evidence indicating the same three values. Most candidates gave insufficient evidence to show that the given expression was correct. Many simply demonstrated that the expression was correct for day 2. Some candidates showed that it was also correct for day 3. Rarely did candidates show that it was also correct for day 4. Diagrams, which were required as part of their evidence, were often difficult to interpret. Some candidates miscounted as a consequence of this.

(b) Good candidates used the method of differences with 19, 34, 53 and 76 to derive the correct expression. These candidates almost always had a quadratic expression with $2n^2$ as the first term. Many of these found the correct expression. Some candidates did not include the 8 dead plants from day 1 and attempted to use the sequence 11, 26, 45 and 68. These candidates had misinterpreted the information '$n \geqslant 2$'. Other candidates gave linear expressions, often without any method.

Answer: $2n^2 + 5n + 1$

Part B Modelling: Scout's Pace

Question 1

Most candidates stated a correct relationship between metres and kilometres and minutes and hours and earned the mark for this question. Some candidates incorrectly stated seconds rather than minutes. Other candidates tried to justify the division by 60 and often spoiled their answer because of this. The simplest answers were usually the best answers.

Question 2

(a) This question was very well answered by almost all candidates.

(b) Again, this was well answered with candidates communicating their method very clearly. Occasionally candidates made rounding errors which resulted in an answer outside acceptable limits.

Answer: 20.8

(c) Again, a very well answered part of the task with clear communication of method seen**.** Once again, rounding errors were seen on occasion. This was particularly the case when $166\frac{2}{3}$ was rounded to 166.

Answer: 33.3

Question 3

(a) Many successful methods were used in this part of the question. The most common was to work out $\frac{1}{4}$ of 60 and $\frac{1}{5}$ of 60 and sum the results. Some candidates formed proportions using the numbers of metres they had found in **Question 2(b)** and **(c)**, multiplied those by 60 and summed the results. This led to slight inaccuracies because of rounding errors. This was condoned provided candidates were working to a reasonable accuracy. In general, working with rounded values to prove a given result is not acceptable. A common wrong answer was $\frac{20.8+33.3}{2} = 27$.

(b) A good number of candidates used $\frac{\text{total distance}}{\text{total time}}$ and gave an answer of acceptable accuracy. Many candidates misinterpreted the average speed as the average of the speeds and simply calculated $\frac{5+10}{2}$ km/h and converted that to m/s or calculated $\left(\frac{83.3+166.6}{60}\right) \div 2$.

Answer: 2.01 m/s

(c) Again, a good number of candidates applied a correct sequence of unit conversions or multiplied by a correct conversion factor. Some candidates incorrectly used the conversion factor they were given in **Question 1** here. Other candidates divided by $\frac{3600}{1000}$ when the correct process was to multiply. Those candidates who changed their values in steps were almost always successful when they stated their units.

Answer: 7.22 km/h

Question 4

(a) Many candidates combined the correct unit conversion and proportion to arrive at the given expression. The most efficient arguments were generally that 120 paces for $\frac{1000}{60}x$ metres was equivalent to 30 paces for $\frac{1}{4} \times \frac{1000}{60}x$ and the result followed. Some candidates verified that the result worked for $x = 5$, for example. This was not sufficient to prove the result and did not score.

(b) This was the most challenging question for candidates with only the best candidates being awarded full marks. Those who earlier had assumed the average speed was the average of the speeds made the same error in this part of the question. Many candidates seemed to simply be attempting to create the numbers in the formula somehow without really addressing the point of the question. Some candidates spotted patterns. Whilst this was not credited in this part, these candidates were able to gain credit for their observations in **Question 5**.

(c) In this part, candidates simply needed to use the relationship $y = 2x$ in the model given in **part (b)**. Many candidates did this successfully. Other candidates misinterpreted what they were being asked. Among the common misinterpretations were an answer of $1.5x$ km/h from averaging $x + 2x$ and an answer of $\frac{15}{9}x$ from using $y = 2(5x)$. Also commonly seen was $\frac{5x+8y}{9}$.

Answer: $\frac{13}{9}x$

(d) A reasonable number of candidates equated the model from **part (b)** to $1.5x$ and correctly rearranged to make y the subject. Some candidates needed to read the question a little more carefully as misreading $1.5x$ as 1.5 was fairly common. Some candidates attempted to use the information from **part (c)** in this part of the question. As y was replaced by $2x$ in **part (c)** and in this part candidates were asked to find an expression for y it should have been clear that this was not the case. Candidates who gave the answer $1.5x$ in **part (c)** usually gave the answer $y = 2x$ in this part.

Answer: $\frac{17}{8}x$

(e) Some good answers were seen and many candidates communicated their units in this part. Many other candidates gave the answer as 4 km/h following the calculation $\frac{10+x}{2}=7$. These were often the candidates who had averaged *x* + 2*x* in **part (c)**.

Answer: 4.6 km/h

Question 5

Many candidates did not attempt to answer this question. Some candidates earned a mark for giving a correct pair of times. A few of the best candidates showed full and complete method for the derivation of the new model. A small number of candidates applied the pattern they had observed in **Question 4(b)** successfully to this part of the question.

Answer: $\frac{6x+5y}{11}$

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/62
Paper 62 (Extended)

Key messages

The length of the answer line is a guide as to the length of the necessary response.

The command *Write down* means that the answer can found directly with little mental calculation if any.

The instruction to use another part of a question must be followed.

Testing particular numbers is not a valid method of showing a result is generally true.

Candidates are advised to take sufficient care with their presentation, in particular the writing of digits and symbols. This applies especially when figures are written over with an alternative number or symbol.

General comments

All candidates could access the paper and provide complete answers to nearly all questions.

Numerical and algebraic calculations were nearly always accurate.

Candidates across the ability range showed excellent ability in finding the *n*th term of a linear sequence. Many candidates used their graphics calculator to confirm graphs and the work on trigonometric graphs generally showed good understanding.

Most candidates took time to communicate well, though there were some of the more able candidates who seemed reluctant to show much working.

Comments on specific questions

Part A Investigation: Number Stems

Question 1

(a) The large majority of candidates could work out the number stems correctly. The few errors seen were from those candidates who did not repeat the addition of the digits to reach a single-digit answer.

(b) (i) The next term in the sequence was given correctly by almost all candidates. There were a few answers of 48, obtained by a further increase of 9.

Answer: 39

(ii) This question was especially well done. The very few wrong answers were of a wide variety.

Answer: $9n + 3$

(iii) This was another question with a very high rate of success. Most candidates also gained credit for communication by showing a substitution of 87 into their formula.

Answer: 786

(c) (i) The table that related the remainder on division by 9 with the number stem was correctly filled in by most. With a choice for the number in the last row, many candidates took 43, perhaps seeing a pattern in the tens digit in the table.

(ii) Most candidates correctly wrote that the number stem and remainder were equal. The most common error was trying to relate the number stem to the decimal after a division on the calculator. Only one line was given for this very short answer, yet several wrote beyond that without any benefit.

(iii) The large majority of candidates gave the correct answer for the remainder on division by 9 by adding the digits in 104 020 000. Some checked this by a division, either on the calculator or by hand. As the question specifically required use of **part (ii)**, those who showed only a division calculation did not receive credit.

Answer: 8

Question 2

(a) Extending the sequence here was similar to **Question 1(b)(i)** and was answered correctly by almost all candidates. Several entered the next term into the line of the question and then gave the subsequent two terms. No penalty was given for that.

Answer: 38, 47

(b) Finding the *n*th term of the sequence was a similar question to **Question 1(b)(ii)**. It established a pattern for subsequent questions and was answered successfully by nearly all candidates. Communication was credited to the many candidates who showed the differences of 9 in the pattern.

Answer: $9n + 2$

(c) Successful candidates, of which there were many, often solved the inequality $9n + 2 < 10\,000$, with communication being credited for such a statement. Many went straight to the answer without communication. A few found the value of n but did not proceed further to get the final answer, perhaps assuming that n was what was required.

Answer: 9992

Question 3

(a) Following the pattern from previous questions most candidates gave the correct sequence. A few overlooked the instruction **greater than k** even though this had been emboldened.

Answer: $k + 9$, $k + 18$, $k + 27$, $k + 36$

(b) With more than one variable in this question some candidates lost sight of the pattern from their previous work.

Answer: $9n + k$

Question 4

(a) This question looked at remainders when dividing by 12 rather than 9.

There were many candidates who used the result that division by 9 gave a remainder equal to the number and wrote, for instance, that $23 \div 12$ had a remainder of 5. Another frequent error was to use the calculator, read that $23 \div 12 = 1.916\ldots$ and so had a remainder of 9.

(b) The majority of candidates did not manage to link this question correctly with **part (a)**. A common misconception was to find the *n*th term for the numbers 7, 15 and 23 (seen in the table) and so $8n - 1$ was often featured in the many different answers given. Several answers were written in the form of equations as a way of forcing *f* into the answer.

Answer: $12n + f$

(c) Candidates who were unsuccessful in **part (b)** usually made little of this question, which required equating $12n + f$ and $f + 10$ and deducing that *n* was not a positive integer. While some did not give a response to this question, many chose values of *f* to test. Such numerical testing cannot be used to find a general result unless, in this case, every remainder *f* is tested.

A different but correct method was to observe that $f + 10$ was always less than any term in the sequence defined by $12n + f$, which is $f + 12$, $f + 24$, $f + 36$, … .

Part B Modelling: Elevators

Parts of this task looked at a primitive form of the Monte Carlo method that uses random numbers to model a physical situation, in this case the masses of passengers in a lift. Other parts of the task used trigonometry to model the motion of the lift.

Question 1

(a) (i) Filling in the table with the masses generated by the random numbers required careful work on ordering quantities. Most candidates managed this successfully.

(ii) Some candidates were not clear about the term relative frequency and either found total frequencies or the single frequency 2. The large majority gave the correct answer.

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

(b) (i) Nearly all candidates answered correctly with only a few having the lift stop at the floor at which it had started.

Answer: Floor 3

(ii) Most candidates had no difficulty answering this question. The common error was to read the time axis rather than the *number of the floor* axis. Some candidates answered as if the lift was descending rather than ascending. Since relating to the context is an important aspect of modelling this was not given credit.

Answer: Between floors 0, 1 and 2

(iii) It was quite common to see candidates averaging out the times taken between successive floors. While this method is valid here it was more prone to error than taking the total time of 20 seconds and dividing by 4. Sometimes those averaging the times did not read the graph correctly. Communication was credited for candidates who showed either method. Amongst those giving incorrect answers there were a few candidates who divided by 5 because there are 5 floors from floor –1 to floor 3 inclusive and a few who gave an answer of 0.2 floors/second.

Answer: 5 seconds

Question 2

(a) (i) Filling in the table produced from random numbers was answered correctly by the majority. Some had difficulty in dealing with the process and the necessary relationship between the cells. A proportion of $\frac{0}{8}$ was seen quite often.

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

1	2
	6, 7

(ii) This question was similar **Question 1(a)(i)** and was almost as well done. A few candidates muddled up cells and some discarded too many masses.

(b) (i) One can find the average time between floors by reading directly from the graph and the large majority of candidates were successful here. Many indicated they had used $\frac{20}{2}$ to find the answer and, as in **Question 1(b)(iii)**, there were those who divided by 3 (the number of the floors). Credit for communication was given to those who gave the unit *seconds* in their answer.

Answer: 10 seconds

(ii) Although this was a skill at a higher level there were many correct answers. These were often based on calculating $\frac{360}{40}$ or in observing that $\frac{360}{9}$ gave the required period. A popular method was to note that $\cos 90° = 0$ and that this corresponded to $\cos 10k$. Communication was rewarded for showing such methods. Several candidates took 10 as the answer, perhaps from the previous question.

Answer: 9

Question 3

(a) The word *and* between the bullet points was crucial. Many candidates did not realise that both conditions were necessary for a well-designed elevator. Answers suggesting well-designed for speed but not well-designed for masses were common. Some candidates only looked at a condition that was satisfied.

Of those who had the right idea, a frequent error was to say that the probability of x being less than the maximum was the 0.2 seen in **Question (a)(ii)**. It was important for candidates to state clearly that this probability, which was smaller than 0.95, was in fact 0.8.

(b) Although similar to **part (a)**, candidates were more successful here, identifying that the elevator was not well-defined because it took 10 seconds per floor on average.

Some only mentioned probability, not realising the need to look at both statements.

A few appeared to confuse *EasyUp-3* with *EasyUp-5*.

Question 4

Few fully correct answers were seen. Candidates were asked to improve Model 1 (which was the Monte Carlo method). Most candidates wanted to improve the elevator itself, place conditions on the passengers or adjust proportions to what they considered more realistic values.

Answer: Increase the number of trials.
Increase the number of masses.

Question 5

(a) (i) This table was a more general table than that in **Question 2(a)(i)** and the variable *m* caused difficulty for the candidates. Answers in the first cell of $\frac{0}{m}$ were common as well as complex algebraic expressions. Even if candidates did not arrive at the correct table they could gain credit for communication by showing knowledge that the proportions had to add up to 1 or that there had to be *m* numbers. Several candidates tried to bring the total mass 80*n* into their argument.

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

1 2 $m - 3$

(ii) Many candidates did not see the essential statement that $m = 3$ gives 0 and an impossible proportion. Some tried to argue from totals and some only accounted for $m < 3$.

(b) (i) There were a good number of correct answers but also a good number of errors. Frequently *2* was placed before the cosine instead of inside it. Another common error was to forget to include the variable *t*. Some candidates only wrote the right side of the equation and others left *k* in their answer.

Answer: $y = -\cos 18t$

(ii) Many candidates showed good understanding in drawing the correct graph here by transforming the graph in **Question 2(b)(i)**. Others followed through their equation in **part (i)** by using their graphics calculator correctly to gain the mark. Care was evident in the sketching of many of the graphs. Several candidates were unable to proceed since they neither knew how to transform the graph nor made use of their graphics calculator.

(c) This question asked candidates specifically to use the information given as well as their graph. Several candidates only considered one item. In this paper communication is important and unquantified comments about probability or speed did not get credit. Candidates are advised always to back up such an explanation with the relevant figures.

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/63
Paper 63 (Extended)

Key messages

The graphics calculator is especially valuable when modelling. Sketches of graphs taken from the calculator should indicate a scale on the axes. It is advisable to set the calculator window in accordance with any information given in the question. Using the equation solver on the calculator to circumvent mathematical understanding and provide the immediate answer is to be discouraged. According to the *Graphics calculator requirements,* printed in the syllabus, using the equation solver will not gain credit.

Candidates should always follow the instruction to use particular information.

When trying to find a general result, making a table can help in seeing a pattern.

General comments

Communication skills remain high with most candidates now taking time to show their working or write differences to extend a sequence.

The work on converting random numbers into masses was done with care and accuracy and this process was understood well.

Comments on specific questions

Part A Investigation: Regular Stars

Question 1

(a) The majority of candidates extended the lines to create the required stars. Some did not follow this method and added incorrect isosceles triangles to the polygons.

(b) (i) Almost all candidates correctly continued the column in the table.

Answer: 12, 14, 16, 18

(ii) The correct formula was seen in most scripts. Candidates were expected to know the difference between an expression and a formula, but some candidates only wrote 2P.

Answer: $S = 2P$

(c) (i) Almost all candidates understood how to continue the sequence for the total point angles of a star. Credit for communication was awarded to those who showed that the sequence was continued by adding 180°. Only a few candidates did so.

Answer: 900°

(ii) The majority of candidates correctly stated that 1450 was not a multiple of 180, so such a star was not possible. Others showed that the sequence from the previous part contained 1440° which was the closest one could get.

(d) (i) Most candidates found the correct answer. The question instructed candidates to use the fact that the angle sum of a pentagon was 540°. Some candidates did not do so and therefore could not receive any credit if they deduced the answer from the table of stars in **part (c)(i)**. For full marks candidates were expected to communicate how they found the answer such as showing two or three calculations.

Answer: 36°

(ii) The challenge in this question was that candidates had to work algebraically. Some candidates showed fine algebraic skills while others found dealing with the two variables quite demanding and many inaccurate or incomplete equations were seen. Several candidates found a correct relationship but neglected to simplify it.

Answer: $2b = a + 180$ or equivalent

Question 2

(a) It was extremely rare to find a candidate who did not correctly determine the number of points on the stars.

Answer: 7, 4, 9, 5, 11

(b) Nearly all the candidates who had the correct numbers in **part (a)** were able to note that an odd number of dots round the circle gave an equal number of points on the star while an even number of dots produced half the number of points on the star. While most candidates used “odd” and “even” in their descriptions, a few used words which did not always have the same meaning.

Question 3

(a) Most candidates were successful in using the code to draw a regular hexagon in the circle.

(b) A good number of correct codes, with the corresponding value for n, were seen. Some candidates did not use the description at the top of the question and so interpreted joining every third dot as meaning join dot 1 to dot 3. A few codes did not end at 1 as required. Some candidates wrongly used $n = 5$, and some $n > 6$ though the question stated $n \leqslant 6$.

Answer: $n = 4 \quad 1 \to 5 \to 9 \to 1$
$n = 6 \quad 1 \to 7 \to 1$

(c) (i) This question was answered less well. Candidates were expected to notice that n should be a factor of d. A frequent mistake was to say that n was a multiple of d. Some candidates thought that n should be a factor of $\frac{n}{2}$. Further credit was awarded to the very few candidates who noted that, while n was a factor of d, n should not be 1 or d.

(ii) Very few correct answers were seen to this challenging question and many candidates were unsure how to proceed. A suitable table of results (e.g. for $d = 3, 5, 7$) might have helped many in formulating an answer.

Answer: $\frac{d-1}{2}$

(d) (i) A good number of candidates were successful in finding the number of dots round the circle. The most common incorrect answers were 122 and 120. Credit for communication was awarded to those who showed that the next point after 114 could be labelled 114 + 8 = 122.

Answer: 121

(ii) A frequent error in understanding the situation was to take the 121 dots round the circle and divide by 8 giving 15 to the nearest whole number as the points on the star. However, many correct answers were seen and showed that candidates had understood how such a star was constructed.

No one gained credit for communication by noting that this result happened because 8 and 121 had no common factor.

Answer: 121

Part B Modelling: Reliability

Question 1

(a) Although a few misread the height of the relevant bar, most candidates answered correctly.

Answer: 80

(b) While many answered correctly there were a good number who omitted the type of USB stick. Some candidates read from a different bar or did not subtract from 85 from 100.

Answer: USB3 15

(c) Most candidates realised that the result would be a negative percentage when this model was used beyond seven weeks. Some thought that a zero result would invalidate the model but that is not the case.

(d) (i) The graph of the quadratic function was in the main well sketched. A small number of candidates did not transfer the information from their graphics calculator properly. The graph starts at (0, 100) and has a minimum of (3.5, 87.75). A sketch should indicate the intercept clearly and give a reasonable position for a turning point. A few candidates seemed to use a vertical window from 0 to 100 rather than 80 to 100. This syllabus requires the use of a graphics calculator yet some candidates did not use it in this question. Occasionally a bar chart was seen.

(ii) Full marks were awarded to those who stated that the model was not suitable because the graph increased, suggesting that the USB sticks start working again. Though not assessed this time, it is worth noting that a model is never perfect and so a small temporary increase would not invalidate it. Here however the graph permanently increases after three and half weeks. There were again candidates who appear not use a graphics calculator.

(e) The successful candidates substituted values taken from the bar chart and solved the resulting equation to find the correct answer. The most popular substitution was $t = 1$ and $W = 90$ but many used $t = 2$ and $W = 80$, sometimes as a second equation. Many candidates were not sure how to tackle this question.

Answer: $k = -10$

Question 2

(a) (i) The sketch of the exponential decay was well done by many candidates. Indicating 100 and 30 at the ends of the axes would have shown good communication too but many candidates did not gain that credit. The most common error was lack of clarity regarding intercepts. The graph starts at (0, 100) and goes close to, but does not touch, the horizontal axis after 30 weeks. Several candidates showed a vertical as well as the horizontal asymptote. As in the previous sketch a few bar charts were seen and there was evidence that a graphics calculator was not available.

(ii) While several candidates found the correct answer for when half the sticks still worked, there was little communication as to how this was found. Allowance was made for those candidates who felt that the question implied that a whole number of weeks was required.

Answer: 6.3

(b) To find the percentage it is necessary to calculate the mean time between failures (MTBF). Credit for communication was given for showing how this was done. The majority of candidates, who found 20 for the MTBF, were able to substitute it correctly into the given formula.

Answer: 5.75

(c) This question required interpretation of the formula for MTBF. Some candidates realised that *t* and *m* would be the same in this case and were given credit for communication if a power of –1 was seen to be used. These candidates were usually successful in finding the correct percentage. Some candidates omitted the percentage sign, thus not giving a probability. Several candidates were not sure which numbers would help them in this question.

Answer: $\frac{1}{3}$

(d) This question required the solution to the equation $99 = 100 \times 3^{\frac{-52}{m}}$, which can be found by drawing $y = 100 \times 3^{\frac{-52}{m}}$ and finding its intersection with $y = 99$. Alternatively, one can convert the equation to logarithmic form and evaluate $m = \frac{-52\log 3}{\log 0.99}$. Either of these methods gained credit for communication. No credit for communication was given to those who used an equation solver.

Answer: 5680 weeks or 109 years

Question 3

(a) Some candidates gained credit for noting that "times 100" was necessary to convert the fraction to a percentage. In general, few candidates enjoyed success here with practically no-one mentioning that the power of *t* came from repeated multiplication of probabilities. Most candidates described the operations but not why they were necessary. Some noticed that it was like compound interest without giving enough details. A frequent error was to say that $\left(1-\frac{x}{100}\right)$ gave the number, rather than the probability or proportion, of sticks still working.

(b)(i) A large number of candidates substituted 1 correctly into the formula to find the correct answer but many did not know how to begin. An error that was seen a few times was evaluating $\left(1-\frac{5}{100}\right)^5$ instead of $\left(1-\frac{1}{100}\right)^5$.

Answer: 95.1%

(ii) In comparing models, candidates should be prepared to mention similarities and general trends. Some candidates focused exclusively on one or two particular values for *t* and so did not have enough information for purposes of comparison. A good way to compare the models is to graph each, as that illustrates both the similarities and where the differences lie.