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 8** and **11**. 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 **Question 12**.

The questions that presented least difficulty were **Questions 1**, **3**, **4**, **6, 9** and parts of **10**. Those that proved to be the most challenging were **Question 5,** using a mapping diagram, **Question 10(b)**, the Mathematical name for types of numbers and **Question 13,** describing transformations. 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 10(b)**, **13** and **15.**

Comments on specific questions

Question 1

Candidates did well with this opening question and a large majority shaded 10 rectangles. Most shaded the first two columns but some went across the diagram leaving parts of the last two rows blank. The rectangles did not have to be all adjacent. Some had no idea that 10 rectangles was the number required.

Question 2

Many candidates were correct with the sector but not so many with the chord. Some drew a smaller circle inside the first circle. Some drew a diameter in both circles. This was given credit in the second circle but not the first as a diameter is a chord but in the first circle it did not necessarily show that candidates understood that a sector is an area of a circle. A few drew an arc instead of a chord. Candidates must be encouraged to use a pencil and ruler when a straight line within a diagram is required.

Question 3

The most frequent error seen here was for candidates to miss out 21. Occasionally, multiples of 21 were seen.

Answer: 1, 3, 7, 21

Question 4

This question was all about the order of operations but, unfortunately, some candidates who got the order correct went on to make numerical errors and so did not get any marks. The frequent wrong answers were 96 followed by 2. Candidates did not always get both right or wrong.

Answers: **(a)** 48 **(b)** 14

Question 5

This question had a few routes to find the missing value. Candidates could find the mapping, $y = 2x - 3$ and use $x = 16$ to find the missing value. Alternatively, candidates could work out the relationship between the adjacent values in the domain and the corresponding relationship in the range, so whatever the addition is in the domain to get the next value, the addition is doubled in the range, i.e. from 9 to 11, 2 is added so 4 will be added to 15 to get 19. This means as 5 is added to 11 to get 16, then 10 must be added to 19 to get the correct answer of 29. Some candidates just added 8 to 16 in the same way as 8 is added to 11 giving the wrong answer 24. Often the working was non-existent or scattered around with no logic. Many appeared to start and then did not know how to complete the question.

Answer: 29

Question 6

Many candidates did very well with this question with the vast majority dividing $40 by 4 then giving $30 and $10 as their answers. However, some gave $20 to each son. Also seen were, $39 and $1 or $24 and $16 or $13 and $1 (40 ÷ 3 = 13). A few solutions added up to more than $40.

Answer: 30 and 10

Question 7

Candidates did well with this multiple choice question and all candidates attempted it. Workings were often seen with candidates drawing axes of symmetry, although not always correctly. Not many candidates assumed there would be only one answer that fitted the criteria and many gave 3 answers with parallelogram often being the third one along with the correct two shapes.

Answer: Rectangle and Rhombus

Question 8

This question had no scaffolding and many candidates treated this as a volume and gave the answer 100. Many gave clear logical working to support the correct answer. However, many did this question by filling the working space with many calculations such as the 3 different areas, doubling each and finally adding various ones together. This gave ample opportunity to miss something out or make numerical errors.

Answer: 160

Question 9

This question was done well, but some candidates only looked at the connection between the last two terms, 12 and 6, so decided that the rule was ‘dividing by 2’ giving 3 and 1.5, or that it was ‘subtract 6’ resulting in 0 and –6. Candidates should look at the differences starting from the beginning of a sequence and here the differences were 0, –2, –4, –6 and –8 so to continue, 10 should be subtracted then 12. Some got the –2 and then made errors getting to their next value.

Answer: –2, –12

Question 10

This question had both the most successful part questions on the papers as well as the part that was seen as the most challenging on the paper and which was most likely to be left blank. Parts **(a)(i)** and **(iii)** were done well and as part **(a)(ii)** was not so well done, maybe showed a lack of understanding of the notation used in that part. In part **(b),** answers ranged from integers, natural, even, odd, prime, factors, vector, Venn, Set, U, four, elements and union. The most common responses were for this to be left blank or prime or integer to be given. Part **(c)** was another multiple choice type question and candidates on the whole did quite well, with many picking up at least 1 mark.

Answers: **(a)(i)** {1, 4, 9} **(ii)** {2, 4, 6, 8} **(iii)** {1, 9} **(b)** square numbers **(c)** $7 \notin A$ and $A \cap B'$ = {4}

Question 11

This was another question with no scaffolding to lead candidates to the solution so was more demanding. Candidates needed to realise this was a five-sided shape so that the angle sum was given by (5 – 2) × 180, then that they needed to add the given angles including the right angle, and subtract this from the angle sum. Candidates could do this in stages and if the whole method was seen, but numerical errors were made, this could still get 2 out of the 3 marks. A significant number of candidates decided that the angle sum was 360° and then subtracted all the angles except for the right angle so their answer was 30°. Candidates should realise that if an angle looks obtuse on the diagram, such a small answer as 30° is unlikely to be correct. There were no marks if candidates simply added all the given angles; candidates needed to show some knowledge of angle properties of shapes.

Answer: 120

Question 12

This was not done well. To find the answer, candidates needed to know that speed is distance divided by time but, not only that, had to be able to convert the units of metres and seconds to kilometres and hours. Speed in metres per second or successful change of units gained a mark.

Answer: 45

Question 13

Describing transformations is a commonly occurring question but this form was more demanding than most as there was no diagram to follow. Many did get the correct type of transformation – translation – but some answered enlargement. Some tried to explain what the addition of the '+3' meant but said that the movement was to the right instead of up. As in previous session candidates seem to find function notation challenging. This was the second mostly likely question to be left blank.

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

Question 14

This question asking candidates to find the expected number of times an archer will hit a target out of a total of 50 shots caused some problems as the most common incorrect answer was the probability, $\frac{35}{50}$.

Answer: 35

Question 15

Although this was left blank by some candidates, many gained at least one mark because of the 2 marks available. Many realised that the answer was a list of integers. Those that got a mark either listed all integers from –3 to 2 inclusive or from –2 to 1 inclusive. Some lists appeared to be almost random.

Answer: –3, –2, –1, 0, 1

Question 16

Most candidates gained some marks in this question. Sometimes part **(a)(i)** was given as $x + 2$ or $9x$ and part **(ii)** as $p^3 + q$ or p + q. Candidates treated part **(b)** as if $3 - x$ was in a bracket giving answers such as, $2x^2 - 13x + 21$. Those who did not get their expansion exactly right but dealt with signs correctly were able to gain a mark.

Answers: **(a) (i)** $3(x + 2)$ **(ii)** $p(p + q)$ **(b)** $21 - 5x$

Question 17

This looks like standard bookwork solving of simultaneous equations but one of the values was zero which appeared to caused some consternation. If candidates found x first they were more successful. Those that got as far as $1y = 0$, often went on to say $y = 1$. Looking at the coefficients, the efficient way to proceed was to double the first equation to eliminate y. Some rearranged both equation to equal, y, say and then equated these giving, $8 - 2x = (12 - 3x) \div 2$. Besides elimination and rearrangement, substitution was also a method used by candidates. Some left the answers as rearrangements of the given equations as, for example, $x = (8 - y) \div 2$, $y = (12 - 3x) \div 2$ but this did not get any marks.

Answer: $x = 4$, $y = 0$

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 two-step problems, in particular with algebra and others with little scaffolding. Showing workings enables candidates to access method marks in the case where 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 that is required for answers, for example, in **Questions 1**, **5** and **8**.

The questions that presented least difficulty were **Questions 2**, **4(a)**, **5**, **6**, and **9**. Those that proved to be the most challenging were **Question 8(c)**, explaining their answer, **Question 14**, equations of asymptotes and **15(b)** the interquartile range. As in previous sessions, there were few un-attempted question. Those that were occasionally left blank were **Questions 4(b)**, **8(c)** and **12**.

Comments on specific questions

Question 1

Candidates did fairly well with this opening question. Often the first question is only worth 1 mark to ease candidates into the paper so, as this was worth 2 marks, candidates had more work to do. As mentioned above, the question gave the units needed for the answer as the time had to be written as a fraction of an hour, but many left their answer as 45 minutes, which was worth 1 of the 2 marks.

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

Question 2

This question testing lines of symmetry produced a large majority of correct responses even if some were only good freehand lines. Candidates must be encouraged to use a pencil and straight edge when the answer is a diagram.

Answer: One line only, horizontally through centre of shape

Question 3

Candidates were most likely to name the parallelogram correctly. The triangle caused more problem with candidates not noticing that the diagram indicated that all sides were equal so equilateral triangle was what was needed for the mark. Sometimes the trapezium was named as hexagon, polygon or isosceles.

Answer: [Rectangle] Trapezium
Parallelogram Equilateral triangle

Question 4

Candidates were more likely to get **part (a)** correct but answer such as 40.5, 4.5, 27 and 8 were seen. For **part (b)** answers such as 512, 24 or 128 were seen along with candidates not giving an answer at all.

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

Question 5

This was done well by candidates. The percentage was given as 0.9 or 9 with others making numerical errors. The most frequent error with **part (c)** was for candidates to try to calculate 340 ÷ 15, so many gave 22.6 or 22.7 as their answer.

Answers: **(a)** $\frac{30}{100}$ **(b)** 90 **(c)** 51

Question 6

Part (a) was very well done indeed by candidates. Some candidates did not understand which pair of angles were equal in **part (b)** so gave *y* as 40; others did not finish the calculation leaving it as 140 instead of going on to divide by 2.

Answers: **(a)** 55 **(b)** 70

Question 7

This fraction multiplication was done well except that some tried to multiply the 3 by the 7 and also the 2 by the 5. There was no preparation to be done such as conversion of mixed numbers which can raise the difficulty level of fraction questions.

Answer: $\frac{6}{35}$

Question 8

Generally, candidates started well writing 2.96 correct to 1 significant figure. This was a lead-in to the next part, to encourage candidates to write all the figures in the calculation to 1 significant figure to work out an approximation. Many candidates did not use this approach and tried to work out the answer exactly then maybe round it at the end. **Part (c)** was the most challenging on the paper with a few candidates being nearly correct but omitting to give the full answer that referred to numerators being rounded down and denominators rounded up.

Answers: **(a)** 3 **(b)** 8 **(c)** Lower, and correct reason

Question 9

Candidates did well here with only the occasional wrong answer of $\frac{2}{6}$ or $\frac{2}{21}$ for **part (a)**. If the candidates's answer to **part (b)** followed through from their answer to **part (a)** the mark was available.

Answers: **(a)** $\frac{1}{6}$ **(b)** $\frac{5}{6}$

Question 10

The algebra in this question caused some problems. Many candidates combined the terms in **part (a)** giving answers such as $4x^2$, $10x$, $5x^3$, $x = 5$. Those that did attempt to take out the common factors were confused to what was to start the bracket, so answers such as $x(–5x)$ were very common. In **part (b)**, often the negative in the denominator was left there or ignored, rather than positioned as shown in the answer below.

Answers: **(a)** $x(1 – 5x)$ **(b)** $-\frac{4}{5}$

Question 11

This was one of the simplest kind of simultaneous equations to solve in that there was no need to multiply one equation to equate coefficients. All that was necessary was to subtract the second equation from the first to give $8y = 8$, so $y = 1$ and substitute back to give $x = 5$. If candidates wanted to approach this pair of equation differently this was acceptable but, in this instance, there was no method mark available.

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

Question 12

This was one of the questions most often not attempted by candidates. There was a mark available for simplifying the inequality to $1 \leqslant n < 5$. Many candidates realised that a list of integers was required, but this meant answers such as, 3, 5 or 1, 3, 5, 12, 15 or all the integers 1 to 15 were seen. It is acceptable to try out values to see if they satisfy the inequality if that helps candidates understand as long as a more formal answer is given. For example, a few candidates saw that $3 \leqslant 3 \times \mathbf{4} < 15$ and $3 \leqslant 3 \times \mathbf{3} < 15$ but then did not go on give the list of four integers.

Answer: 1, 2, 3, 4

Question 13

This was expected to be a straightforward question. Points *A* and *B* were plotted on a grid with simple scales but the most common errors were to mix up the directions, positive and negative or *x* and *y*. These errors also explain why some candidates plotted point *C* incorrectly.

Answers: **(a)** $\begin{pmatrix} 4 \\ -3 \end{pmatrix}$ **(b)** Plot at (4, 3)

Question 14

This question was also challenging, as befitting its place in the paper. It was not done well by candidates and had one of the highest omission rates. The question did demand a lot from candidates as they had to understand the function drawn, understand the word asymptotes, find where they were and finally write these as equations. A mark was available for those candidates that indicated where the asymptotes would be on the graph. Many candidates used $x = 1$ or (1, 0) (where the line cuts the axis) in their answers but had more variety in their answers to do with the other part of the curve.

Answer: $x = 0$, $y = –1$

Question 15

This was a similar question to ones set in the recent past but was not very well handled. Some gave 40 as the median as it is half way along the *x*-axis, or 140 as that is the frequency corresponding to 40. To find the median from a cumulative frequency curve, candidates must look to half-way up the frequency axis, go across to the curve and read the value from the horizontal axis. The interquartile range is more complex with readings taken from the curve half-way from the origin to the median and median to the maximum thus dividing the cumulative frequency into quarters before subtraction.

Answers: **(a)** 30 **(b)** 24

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

The questions that presented least difficulty were **Questions 1**, **8**, **9(a)** and **15(a)**. Those that proved to be the most challenging were **Question 4**, naming quadrilaterals, **Question 10**, estimation, **Question 12**, calculation of the perimeter of a semi-circle and **Question 14**, functions and transformations. In general, candidates attempted the majority of questions but there were more un-attempted questions than in previous years. Those that were the most often left blank were **Questions 4**, **5**, **12** and **14**.

Workings are vital in two-step problems, in particular with algebra and others with little scaffolding such as **Questions 9(b)**, **10** and **12**. Showing workings enables candidates to access method marks in the case where their final answer is wrong. 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 that is required for answers, for example, in **Questions 11** and **12**.

Comments on specific questions

Question 1

This was a good start for many candidates. Often, the first question is only worth 1 mark to ease candidates into the paper but as this had two parts worth 5 marks in total, candidates had more work to do. Candidates had to complete the frequency table with no errors and a large number did this. The total of cars was given in the question so candidates should have used this to check their work. Occasionally, the tallies were not in groups of 5 or were missing altogether. The bar chart in **part (b)** was handled well with candidates completing the frequency axis as well as the bars. Occasionally, the scale did not start at zero.

Answers: **(a)** 8, 2, 6, 4 **(b)** Complete correct bar chart including scale

Question 2

Candidates did reasonably well here with many getting at least 1 mark for having two values in the same form.

Answer: $\frac{2}{5}$ 42% 0.49

Question 3

The square that was least likely to be shaded was the one in the centre of the grid. Often the resulting grid would have line symmetry rather than rotational symmetry of order 4.

Question 4

The rhombus was often named as a parallelogram. The kite was named as a diamond which is not a mathematical name. Some candidates misunderstood the question and said the top shape was regular and the lower, irregular.

Answer: Rhombus, Kite

Question 5

Most candidates got this correct or left the answer space blank.

Answer: 6

Question 6

Candidates often confuse highest common factor with lowest common multiple and that was the case here with 2 being the most frequent answer. One approach is to list the multiples of each number until the lowest common one is reached, this relies on accurate calculations. Another approach is to find each number as a product of primes and then to use these to formulate the product that will give the LCM. Candidates should remember that multiples are larger than the starting numbers so the LCM will be larger than the given numbers.

Answer: 24

Question 7

Pie charts are drawn to scale so candidates needed to start by measuring the angle of the Geography sector. As the question asks for the fraction of students then a percentage is not acceptable. For **part (b)**, using the right angles marked on the pie chart, or measuring again, it can be seen that 9 students are represented by 135° and if candidates stated this, they gained a method mark.

Answers: **(a)** $\frac{45}{360}$ **(b)** 24

Question 8

Candidates found this question the second most straightforward on the paper. If candidates did not get both marks, there was a method mark for substituting into the individual terms. Occasionally, candidates did the subtraction the wrong way around giving an answer of 1 instead of –1.

Answer: –1

Question 9

In this question, **part (a)** was more accessible than **part (b)**. In **part (a)**, candidates had to subtract the given angles from 180° correctly as no method marks were available. To start **part (b)**, candidates had to realise that, as the two lines were tangents, angles *OTP* and *OSP* were 90 degrees. Many candidates gave 60 as their answer which was probably angle *TPS* instead of the one that was asked for, angle *TPO*.

Answers: **(a)** 48 **(b)** 30

Question 10

Candidates found this question challenging and tried to do it accurately rather than estimating as asked. The amount of space should indicate that long calculations were not required. This was a more difficult question than some as other questions in past sessions have said, 'estimate by rounding each number to one significant figure'. As mentioned in the general comments, this lack of scaffolding makes questions more challenging. However, there were a number of candidates who produced neat, logical solutions.

Answer: 25

Question 11

This question asked candidates to use cents rather than dollars for the total cost of the drinks. Many answered in dollars but the algebra was correct. Some gave answer of 175 cents from adding the two costs without using the other information in the question. Others left words in their answer.

Answer: $90p + 85q$

Question 12

This was another question without scaffolding. Candidates had to realise that there were two steps to this problem and that the answer was not a single number. The arc length of the semi-circle had to be found and then the base or diameter added. Candidates were not confident about leaving their answer in terms of π and wanted to multiply the arc length out in order to add 18.

Answer: $9\pi + 18$

Question 13

This ratio and proportion type of question frequently occurs. The common error is to think the sides of the larger triangle can be found by addition, so 11 (from 9 – 6 + 8) was the common answer. This session, some candidates invented a third, 'unit' triangle with sides 4cm and 3cm so that the question's first triangle had this 'unit' triangle scaled up by 2 and the other triangle, by 3. This meant that *RP* was found by 3×4 cm. This neatly got round having to deal with the fractions, $\frac{2}{3}$ or $\frac{3}{2}$.

Answer: 12

Question 14

This question was challenging, as befitting its place in the paper. **Part (b)** was the part most likely to be left blank in the whole paper with **part (a)** the second. Very few correct responses were seen for either part. For **part (a),** some gave the answer, –1, f(–1), f(0) or f(x). Candidates often confuse domain and range and did not appear to know where to start. The first step should have been to realise that the function was a straight line so f(2) and f(9) (the values at either end of the domain put into the function), will give either end of the range.

Answers: **(a)** $f(x) - 1$ **(b)** $-15 \leqslant f(x) \leqslant 6$

Question 15

This last question was more accessible than many of the last few questions and in particular, **part (a)** where virtually all candidates were correct. For **part (b)**, many got the correct answer but 54 was occasionally seen (perhaps from an addition error) rather than recognising the square numbers. Others who gave 36 may have been calculating the number of grey squares instead of white. Nobody omitted this part. For **part (c)**, some candidates described the term to term rule or gave n^2, the rule for white squares. From working it could be seen that some candidates had the right idea but had difficulty expressing it correctly.

Answers: **(a)** $\begin{matrix} 9 & 16 \\ 16 & 20 \end{matrix}$ **(b)** 64 **(c)** $4n + 4$

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/21
Paper 21 (Extended)

Key messages

Candidates should read the question carefully to avoid spending time on unnecessary arithmetic.

Candidates should ensure they answer all parts of the question.

Candidates should check their answers to check they have answered the question asked.

General comments

Candidates were generally well prepared for the paper and demonstrated a clear knowledge of the wide range of topics tested. Candidates attempted all of the questions, despite many candidates spending considerable time working out large multiplication sums (**Question 3** and **Question 4**) where it was not required. In these questions many candidates did not round the numbers to one significant figure (**Question 3**) or they did not leave their answer in index form (**Question 4**). It would be most unusual for candidates to be asked to complete arithmetic of this order in a non-calculator paper and they should be expecting to demonstrate their arithmetic skills more at the level of that required in **Question 1** and **Question 5(b)(i)**. Again, candidates should read the question carefully, for example when asked to shade only two more squares and triangles (**Question 2**) and ensure that they answer all parts of the question as many candidates did not complete the Venn diagram (**Question 7(a)**) despite completing the rest of the question. Good algebraic skills were demonstrated across a range of questions (**Question 6**, **Question 8** and **Question 10**), although frequently candidates were not sure when to stop, for example trying to factorise $3x(4x-9y)$ further using the difference of two squares (**Question 10**). The circle theorem question proved challenging (**Question 9**) as did the vector question (**Question 12**). However, it was pleasing that the last two questions (**Question 13** and **Question 14**) were attempted by most candidates and a large number of excellent solutions were completed for these.

Comments on specific questions

Question 1

(a) Most candidates were able to answer this correctly. Those who were successful had often worked out the equivalent sum $\frac{800}{4}$, or similar. Common wrong answers included 20 and 0.02. Candidates should think about the size of answer they are expecting to avoid slips such as these.

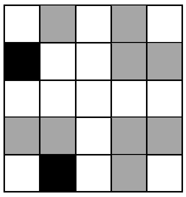
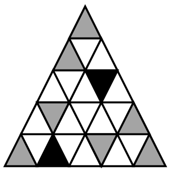
(b) This part caused few problems with most candidates earning both marks. Most candidates worked in fractions and showed $\frac{16}{20}-\frac{5}{20}$ although it was not uncommon to see errors in subtraction leading to the wrong answer $\frac{9}{20}$ or occasionally adding to give $\frac{21}{20}$.

Answers: **(a)** 200 **(b)** $\frac{11}{20}$

Question 2

(a) Many candidates were able to draw the two squares in the correct positions. Others found this visually difficult and it was not uncommon to see more than 2 squares added.

(b) Again, many candidates successfully added two correct triangles to the diagram. However this part proved harder than part **(a)** and often candidates wrongly added more than the two triangles required.

Answers: **(a)**  **(b)** 

Question 3

Those candidates who read the question carefully and rounded each of the numbers correctly to 1 significant figure were generally able to complete this question with ease. However, many candidates attempted to calculate the exact value of the calculation and spent considerable time and effort performing a long multiplication followed by a difficult long division. This approach was not required and scored no marks. In addition a few candidates changed the denominator to 50×100 rather than $50 + 100$.

Answer: $\dfrac{10 \times 300}{50 + 100} = 20$

Question 4

Many candidates did not read the stem of the question requiring them to 'leave your answer as a product of prime factors'. This meant that they spent considerable time performing large calculations which were not required.

(a) Most candidates realised that they needed to find $(2^3 \times 3^4 \times 5)^2$. Often this was simplified correctly but a common error was to add 2 to each of the powers giving the wrong answer of $2^5 \times 3^6 \times 5^3$.

(b) This was answered well by many. However, a common error was for the candidate to try to find the lowest common multiple and multiply *a* and *b* together.

(c) Most candidates attempted to find a multiple of *a* and *b,* but it was not always the lowest multiple. The most common wrong answer being $2^8 \times 3^6 \times 5 \times 7^3$.

Answer: **(a)** $2^6 \times 3^8 \times 5^2$ **(b)** $2^3 \times 3^2$ **(c)** $2^5 \times 3^4 \times 5 \times 7^3$

Question 5

(a) Most candidates understood the need to divide each of the four numbers by 200 and they scored full marks for this part. Errors came from dividing the numbers into 200 or by showing no working and writing down incorrect answers such as 1.3 or 1.3% or 0.26 for example.

(b) Most candidates recognised that they had to work out 64×25 and they competed this successfully.

(c) Many candidates recognised that a good estimate comes from completing a large or sufficient number of trials and were awarded the mark. Other candidates explained how they calculated 1600 from the 64 green beads and the 200 repeats but this did not explain why this was a good estimate. Or they referred to the relative frequency staying the same rather than 200 being a large number of trials.

Answer: **(a)** 0.13, 0.36, 0.32, 0.19 **(b)(i)** 1600 **(ii)** Sufficient trials

Question 6

Many candidates answered this well and the majority were able to recognise the need for a common denominator of 6 for the two fractions. However, a number of candidates made errors in combining these fractions, the most common errors being either $\frac{x-2x\pm1}{6}$ or $\frac{x-2x+2}{6}$ where the main problem was multiplying a bracket with a negative sign in front.

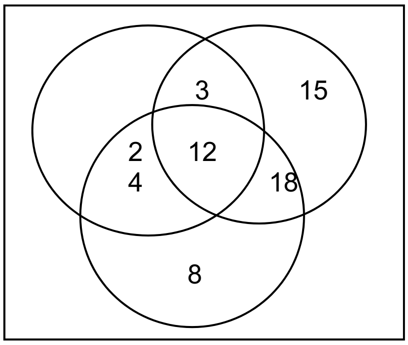
Answer: $x = 14$

Question 7

(a) Many candidates filled in the required numbers correctly, although some marks were lost because candidates either omitted numbers or placed the same number in more than one subset. Unfortunately, some candidates omitted this part of the question and left the Venn diagram blank. These candidates were able to gain marks in part **(b)** from their diagram.

(b) In parts **(i)** and **(ii)** many candidates understood which regions these subsets included and were able to list the correct members.

Answer: **(a)**



(b)(i) 5, 7, 11, 13, 17 **(ii)** 8, 10, 14, 16

Question 8

Many candidates answered this question using good algebraic skills and were able to arrive at a correct answer with no errors seen. There was clear evidence that candidates understood the process of first multiplying out the brackets, then collecting like terms and finally rearranging their expression to find x. Some candidates arrived at $-4x > -5$, which was a harder route but many of these understood the need to change the direction of the sign when dividing by a negative The most common errors arose from incorrectly multiplying out the bracket or incorrect signs when collecting terms.

Answers: $x < 1.25$

Question 9

This circle theorem question proved challenging as many candidates were unable to recognise which circle theorems could be used, as they were not presented in the most usual positions.

(a) Whilst some candidates correctly recognised this as 'the angle at the centre is twice the angle at the circumference', many candidates either could not start this question or gave a wrong answer, the most common wrong answer being 50°.

(b) This part was completed more successfully than part **(a)**. Candidates had the choice of using 230° at the centre and the same theorem as in part **(a)** or they could use their answer to part **(a)** and opposite angles in a cyclic quadrilateral add to 180.

Answers: **(a)** 65° **(b)** 115°

Question 10

(a) Many candidates factorised this completely and scored full marks. Other candidates either partially factorised the expression or spoilt their expression by further work. A common example of further work was to write $3x(4x-9y)=3x(2\sqrt{x}-3\sqrt{y})(2\sqrt{x}+3\sqrt{y})$. There were also a number of arithmetic errors seen, such as $3x(4x-7y)$.

(b) This question proved quite tricky and not all candidates knew how to approach it as they did not recognise the form. Whilst many candidates did approach this question correctly, many candidates then made small slips, often with the negative sign outside of a bracket, which they would have found if they had checked their answers by multiplying out their brackets.

Answers: **(a)** $3x(4x-9y)$ **(b)** $(a+2b)(4a-c)$

Question 11

This question was answered very well with many correct answers seen. Common errors included a negative final answer of $-\frac{\sqrt{7}}{7}$.

Answer: $\frac{\sqrt{7}}{7}$.

Question 12

Many candidates were not sure how to approach this question with a number of candidates counting squares or producing column vectors with either numbers or letters in them. Other candidates clearly found this question very straightforward and were able to find correct expressions for **p**, **q** and **r** with ease.

Answer: **p** = **a** + **b**, **q** = 2**a** + **b**, **r** = −2**a** + **b**

Question 13

This question required understanding of two of the more difficult concepts on the syllabus, namely the sine graph and transformations. Some candidates were able to use this knowledge to state the two correct values of a and b with ease. Less knowledgeable candidates were sometimes able to write down the correct value for a but were less successful in obtaining the correct value for b. Very occasionally some candidates did not spot the degrees sign in the function and on the axis and gave the answer to b in radian form.

Answer: $a = 2$ $b = 30°$

Question 14

This question could be solved by a variety of approaches and this was evidenced in the wide range of responses seen. The two most common approaches were to either substitute the co-ordinates P and Q into the equation of the curve to form two simultaneous equations and then solve them, or to recognise that $y = kx(x-4)$ and to substitute (8, 96) into it. Many candidates realised that $b = -4a$ and gained credit for that. Also, many candidates knew that $a = 3$ but could not proceed from there. A significant number of candidates wrongly attempted to apply the gradient formula to a curve. It was possible to use the symmetry property of the curve and thus the equation $y = a\left((x-2)^2-4\right)$ but this was not seen very often.

Answers: $a = 3$ $b = -12$

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/22
Paper 22 (Extended)

Key message

Candidates need to show all of their working. Incorrect answers without working cannot be given credit, whereas partial credit can be awarded if a correct method is shown. Candidates need to use correct mathematical terminology to ensure that transformations are described accurately.

General comments

The majority of candidates were well prepared for the paper and demonstrated very good algebraic skills. However, a significant number of students were not able to correctly convert times in minutes into hours. Many candidates found working with numbers written in standard form too difficult. Many candidates lost marks through careless numerical slips. Candidates should make all of their working clear and not merely write a collection of numbers scattered over the page. Candidates should always leave their answers in their simplest form, as specified in the rubric on the front cover. However, many candidates lost marks through incorrect simplification of a correct answer.

Comments on specific questions

Question 1

This question was answered with most candidates scoring full marks. Some students used decimals and gave their answer as 4.83.

Answer: $4\frac{5}{6}$

Question 2

In general this question was very well answered. Many students converted the time into minutes, found an answer of 99 minutes and then gave the correct answer. Candidates who converted the time into hours and then found '1.65' were less successful in converting this into the correct answer, with an answer of 2 hours 5 minutes being popular.

Answer: 1 h 39 min

Question 3

Again, this was a very well answered question, with many students scoring full marks. The common mistake was taking a base angle of the triangle to be 42°, which led to an incorrect answer of 96°.

Answer: 69°

Question 4

Candidates showed excellent algebraic skills leading to the correct answer. Some stronger candidates having found a correct answer, rationalised the denominator.

Answer: $[\pm]\,\dfrac{1}{\sqrt{t}}$

Question 5

(a) This part was well answered and in most cases was correct. A number of candidates incorrectly cancelled a correct answer. The 'popular' incorrect answer was 0.5.

(b) Candidates who did not score the mark in part **(a)**, were not penalised here, as this mark followed through from their previous answer.

Answers: **(a)** $\dfrac{42}{60}$ **(b)** 840

Question 6

This question proved to be more straightforward than in previous years and the correct answers were seen in most cases.

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

Question 7

This question caused more problems than in previous years. Candidates were not confident in subtracting negative indices and this led to a popular incorrect answer of 1.6×10^{-19}.

Answer: 1.6×10^{19}

Question 8

This question was well answered with many fully correct solutions seen. The common error was dealing with the change of sign when dividing by –7.

Answer: $x < 1$ or $1 > x$

Question 9

The first two parts were well answered. Full marks in the final part were in the minority. Many students started this part correctly but then could not divide one by a half.

Answers: **(a)** –2 **(b)(i)** 8 **(ii)** 2

Question 10

This question was the one of the most demanding on the paper. There were many excellent solutions. The better candidates drew a sketch as this gave them a visual understanding of the problem. Some students were able to correctly find the intercepts but then did not manage to find the midpoint.

Answer: $\begin{pmatrix}9\\6\end{pmatrix}$

Question 11

This question was well answered by the majority of candidates. Candidates who did not score full marks usually did not include the '1' in the bracket with '*x*'.

Answer: $(2p-q)(1+x)$

Question 12

The question was well answered. There were two common errors: multiplying by $\sqrt{2}+1$, and omitting the '5' in the numerator.

Answer: $5(\sqrt{2}-1)$ or $5\sqrt{2}-5$

Question 13

Full marks were rarely seen for this question. There was much evidence of very disorganised working, and only the strong candidates were able to cope with the lack of structure. Many candidates were able to correctly find the radius, but were unable to proceed effectively with many forgetting to add the diameter.

Answer: $8\pi+16$

Question 14

This was generally well answered by the majority of candidates. Some candidates simply considered the diagram as a bar chart. Other candidates lost a mark through misreading the height of second bar.

Answer: 32, 13

Question 15

Many candidates scored full marks. The most common error occurred when candidates squared 4, rather than finding the square root.

Answer: $\frac{6}{\sqrt{x}}$

Question 16

The majority of candidates demonstrated an excellent knowledge and understanding of the rules of logs with many fully correct solutions.

Answer: 12

Question 17

There was much variation in the terminology used in this question. Candidates need to be familiar with the correct mathematical terms if full marks are to be earned. The mark for 'stretch' was awarded far more frequently than the mark for '*x*-axis invariant, factor three'. The use of connectives such as from/on/in/along/over/against need to be carefully contextualised in order to ensure that the meaning conveyed was mathematically correct. A minority of students stated enlargement rather than stretch.

Answer: Stretch, *x*-axis invariant, factor 3

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/23
Paper 23 (Extended)

Key message

Candidates need to show all of their working. Incorrect answers without working cannot be given credit, whereas partial credit can be awarded if a correct method is shown. Candidates must read the question carefully and not simply look for key words and then assume the demands of the question.

General comments

Candidates were reasonably well prepared for the paper and demonstrated very good algebraic skills. However, many candidates did not know that the square root of 0.7 was greater than 0.7. Many candidates lost marks through careless numerical slips. Candidates should make all of their working clear and not merely write a collection of numbers scattered over the page. Candidates should always leave their answers in their simplest form. Many candidates lost marks through incorrect simplification of a correct answer. Candidates must be able to apply their knowledge not simply be able to answer routine questions. E.g. work on surds. 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 having found the correct time of the journey as 0.8 hours, were unable to convert this into 48 minutes.

Answer: 08 33

Question 2

Although there were many correct answers, a number of candidates did not read the question carefully and proceeded to divide $36 by 8.

Answer: 60

Question 3

Nearly all candidates scored full marks on this question.

Answer: 11.5

Question 4

Candidates found this question to be challenging, with a significant number of candidates unable to start the question. There appears to be a lack of understanding of the difference between interior and exterior angles of a polygon. A number of candidates thought that both parts of the question referred to the same polygon.

Answers: **(a)** 1800 **(b)** 24

Question 5

Again, there were many fully correct answers where the method was clearly visible. Some candidates however had a collection of numbers scattered over the exam paper making it very difficult for an Examiner to check the method. Some candidates tried to solve the question by trial and error with varying degrees of success.

Answer: 3

Question 6

(a) This was correctly answered by virtually all candidates.

(b) Again, correctly answered by virtually all candidates. The common error was the omission of the negative sign.

(c) This part proved to be more challenging and 0 was seen as frequently as the correct answer.

Answers: **(a)** 51 **(b)** –96 **(c)** 0.5

Question 7

(a) This part was poorly answered. An answer of 11.5 was frequently seen. A number of candidates who obtained the figures of 7.54 were unable to give the correct power of 10.

(b) Virtually all candidates scored on this part, but the majority only scored 1 mark, leaving their answer as 30×10^{-10}.

Answers: **(a)** 7.54×10^{-4} **(b)** 3×10^{-9}

Question 8

Nearly all candidates scored full marks.

Answer: $x^5 - 7x^2$

Question 9

Candidates started the question correctly by trying to convert each number into a similar format. The main difficulty was the inability of candidates to understand the magnitude of the square and square root of a decimal.

Answer: 0.069 0.6^2 65% $\frac{2}{3}$ $\sqrt{0.7}$

Question 10

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

Answer: 1

Question 11

(a) This part proved to be demanding for the majority of candidates. Although they were able to expand the brackets correctly, many were unable to simplify $\sqrt{3}\sqrt{12}$.

(b) The majority of candidates gave excellent fully correct solutions. Candidates had clearly been expertly drilled on answering this type of question.

Answers: **(a)** 3 **(b)** $3 + \sqrt{2}$

Question 12

There were many excellent solutions. Where errors occurred, they tended to be in careless algebraic manipulation.

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

Question 13

(a) The majority of candidates knew the basic shape of a cubic graph, but some candidates translated the graph in the *x*-direction.

(b) This part proved to be more challenging, with many unable to draw a sketch with the correct period.

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/31
Paper 31 (Core)

Key messages

It is important to make sure that all the topics in the syllabus are covered. Candidates should write down all their working in order to maximise their chance of success. Candidates should also be aware that all answers should be given to 3 significant figures unless stated otherwise in the question. The candidates must have a graphics calculator and know how to use it.

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. Candidates must also show all their working. When working is shown and is correct then partial marks can be awarded if their final answer is incorrect. Candidates should bring the correct equipment to the examination. Many appeared not to have a ruler with them to draw a straight line. It also appeared as if some candidates did not have a graphics calculator.

Comments on specific questions

Question 1

(a) (i) Most candidates could answer correctly to 1 decimal place.

(ii) Many candidates had difficulty with significant figures. More attention should be given to teaching this topic.

(iii) Many candidates could give the answer correct to the nearest 100.

(iv) This is another topic that needs more attention. Very few candidates could put the number into standard form.

(b) (i) There were very many correct answers seen. However, some candidates did not write down all the figures shown on their calculator, as requested.

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

(b) There appeared to be some confusion here as some candidates put their answer over 300 instead of their answer to part **(b)(i)**.

***Answers*: (a)(i)** 356.3 **(ii)** 360 **(iii)** 400 **(iv)** 3.56×10^2 **(b)(i)** 279.14 **(ii)(a)** 20.86 **(ii)(b)** 7.47

Question 2

(a) (i) Many candidates gave the correct answer. 4^5 was also seen.

(ii) It appeared as if many candidates did not know what an integer was. Many just repeated their answer for part **(a)(i)**.

(b) (i) Many candidates worked this out correctly but some appeared to be under the impression that all the answers in this question should be written as powers of 4.

(ii) Again there were many correct answers seen.

(c) This part was also well attempted, although 4^5 was also seen.

***Answers*: (a)(i)** 4^6 **(ii)** 4096 **(b)(i)** 272 **(ii)** 255 **(c)** 4^8

Question 3

(a) Most candidates managed to multiply 13.50 by 2 correctly.

(b) This part proved difficult for many candidates. Candidates should remember to check that their answers are realistic.

(c) (i) Here too there were many correct answers seen.

(ii) Many candidates realised that they had to subtract their answer for part **(a)**.

(d) Many candidates could not reduce the fraction to its simplest form. Others gave the answer as a percentage instead of a fraction.

***Answers*: (a)** 27 **(b)** 10 **(c)(i)** 50 **(ii)** 23 **(d)** $\frac{1}{20}$

Question 4

(a) The majority of the candidates managed to complete the table correctly.

(b) (i) Many knew how to find the range. Some candidates found the range of the frequencies rather than the range of the number of strawberries.

(ii) There were a lot of correct answers seen for the mode.

(iii) There were fewer correct answers seen for the median.

(iv) Many candidates were unable to find the mean correctly.

(c) (i) The majority of candidates were able to answer this part correctly.

(ii) Again, the majority of candidates were able to answer this part correctly.

***Answers*: (a)** 5 4 1 1 2 4 **(b)(i)** 8 **(ii)** 28 **(iii)** 29 **(iv)** 30 **(c)(i)** $\frac{4}{20}$ **(ii)** $\frac{11}{20}$

Question 5

(a) (i) Many of the candidates managed to substitute the numbers correctly into the formula and gained a method mark even if their final answer was not correct.

(ii) The candidates found rearranging the formula a challenge. Most of them managed to pick up one method mark though.

(b) This part was reasonably well done with a few candidates missing the double negative and giving an answer of –29.

(c) In this part too, rearranging the formula proved a challenge for many of the candidates.

(d) It appeared as if a sizeable minority of candidates did not know how to solve simultaneous equations. It was very important in this part for the candidate to show all their working out.

***Answers*: (a)(i)** 1 **(ii)** 3.2 **(b)** –13 **(c)** $\frac{2y+9}{3}$ **(d)** kiwi = 90, pomegranate = 300

Question 6

(a) Many candidates could find the angle correctly.

(b) Drawing the pie chart was fairly well attempted. It appeared as if some candidates did not have a protractor with them as the angles were not always accurate or this part was left blank.

***Answers*: (a)** 144

Question 7

(a) (i) Most candidates found the angle correctly. A few candidates wrote 105.

(ii) There were even more correct answers for this part.

(b) Again many fully correct answers for the angles were seen. Very few candidates scored no marks because they could pick up follow through marks for some of the answers.

***Answers*: (a)(i)** 75 **(ii)** 105 **(b)** $p = 70$, $q = 20$, $r = 20$, $s = 140$

Question 8

(a) (i) The majority of candidates found this question difficult and more practice in right-angled trigonometry would be beneficial.

(ii) Some candidates managed to gain follow through marks here by adding 2.5 to their answer for part **(a)(i)**.

(b) This part was also found difficult.

(c) Very few correct answers were seen for this part. Some candidates found the total distance rather than the extra distance that Abimela had to cycle to school.

***Answers*: (a)(i)** 1.61 **(ii)** 4.11 **(b)** 1.92 **(c)** 1.02

Question 9

(a) The majority of the candidates plotted the 2 points correctly. A few plotted (3, 2) and (7, 5) instead.

(b) Many candidates managed to find the correct co-ordinates for the midpoint of *AB* but (3, 5) was a common wrong answer.

(c) Fewer candidates managed to find the gradient of *AB* correctly. Some wrote the answer as co-ordinates, others as a vector and $\frac{3}{4}$ was also seen.

(d) This part of the question appeared to be out of reach of the majority of the candidates. Only the very best managed to find the correct equation of the line.

***Answers*: (b)** (3.5, 5) **(c)** $\frac{4}{3}$ **(d)** $y = \frac{4}{3}x + 4$

Question 10

(a) (i) A large minority of candidates did not manage to find the volume of the cylinder even though the formula is given to them. Candidates should be reminded that many formulae are provided on the paper.

(ii) Many candidates managed to pick up follow through marks for this part by multiplying their answer to part **(a)(i)** by 12.

(b) There were a lot of correct answers seen. Some candidates, however, found the surface area of the box instead of the volume.

(c) Once again there were many candidates who picked up a follow through mark in this part.

(d) This was very challenging for the candidates, with only a handful managing to find the correct answer.

***Answers*: (a)(i)** 47.1 **(ii)** 565 to 566 **(b)** 720 **(c)** 154 to 155 **(d)** 21.39 to 21.53

Question 11

(a) Many candidates could reflect *P* in the *y*-axis. A few, however, reflected it in the *x*-axis.

(b) Fewer candidates managed to translate *P* correctly. This is a topic that needs more work.

(c) The enlargement caused even more problems than the translation and few correct answers were seen. Some candidates managed to gain one mark for having the correct size of the figure but not in the correct place. This too is a topic that needs more work.

(d) Quite a few candidates managed to find the correct ratio although some also put 1 : 3.

(e) It was difficult to know if the students just guessed the answer here or not. There were 3 choices and all 3 were seen in the answers with similar and congruent being the most popular choices.

***Answers*: (d)** 3 : 1 **(e)** similar

Question 12

(a) Many candidates did not understand what was meant by the modal group. A common answer was $200 < x < 1000$.

(b) (i) There were some very creative answers to show that 250 was the midpoint of the first group. Many candidates left this part of the question blank.

(ii) Many candidates took the word “estimate” to mean that they had to guess the mean mass of the meerkats and proceeded to do just that. A few of the stronger candidates did, however, calculate an estimate of the mean mass correctly.

(c) Although quite a good number of candidates managed to complete the cumulative frequency table correctly, there were others who either put in the original frequencies, guessed numbers or left the table empty.

(d) Not all of those candidates who managed to complete the table correctly managed to plot the points correctly. Not all the curves drawn were increasing curves.

(e) (i) Very few candidates managed to correctly find the median from their graph.

(ii) There were even fewer correct answers for the inter-quartile range. Some candidates managed to gain one mark by writing down either the lower or upper quartile correctly from their graph.

(iii) This part was slightly better answered than the previous two parts. Also, some candidates managed to be awarded one mark for writing down the number of meerkats that were 850g but who forgot to subtract this number from 200.

***Answers*:** **(a)** $700 < x \leqslant 800$ **(b)(i)** $\frac{200+300}{2} = 250$ **(ii)** 638.5 **(c)** 15, 41, 75, 115, 177 **(e)(i)** 662 **(ii)** 230 **(iii)** 12

Question 13

(a) There were some very good sketches seen. It appeared as if not all the candidates had graphics calculators though, as often this question was not attempted. Some candidates only drew a straight line for their answer.

(b) It appeared as if very few candidates knew what an asymptote was. Only the very best candidates managed to get a correct answer here. This part was often left blank.

(c) More candidates managed to find the co-ordinates of the minimum point. Some candidates gave negative co-ordinates even though their minimum point was in the first quadrant.

(d) Once again, the candidates did not understand what the question was asking here and some tried to find the actual intersection points instead of saying how many solutions there would be. Very few correct answers were seen.

***Answers*:** **(b)** $x = 0$ **(c)** (1, 3) **(d)** 3

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/32
Paper 32 (Core)

Key messages

To succeed in this paper, it is essential for candidates to have completed 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

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. The questions on number, algebra, co-ordinate geometry and sequences were answered better by most, while the question on average speed caused some problems because of the context.

Comments on specific questions

Question 1

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

(a) (i) Nearly all candidates were able to write the number 9427 in words with few mistakes in spelling.

(ii) Most candidates correctly wrote the number correct to the nearest 10.

(b) (i) While most answers were correct, a few candidates used the same number twice (e.g. 2 + 2 = 4) or chose two numbers whose sum was not a square (e.g. 2 + 4 = 6).

(ii) Nearly all candidates wrote down one of the two correct alternatives.

(iii) Most candidates wrote down one of the three correct alternatives, although there were a few who considered 9 to be a prime number.

Answers: **(a)(i)** Nine thousand four hundred and twenty seven **(ii)** 9430 **(b)(i)** 7 + 2 = 9 or 7 + 9 = 16 **(ii)** 4 + 2 = 6 or 7 + 9 = 16 **(iii)** 9 + 2 = 11 or 9 + 4 = 13 or 4 + 7 = 11

Question 2

(a) (i) A majority of the candidates correctly answered 24 but answers of 6, 15 and 37 were seen, all clearly arising from a misunderstanding of what was being asked.

(ii) The bar chart was completed correctly with many candidates using a ruler to present the work neatly.

(b) (i) Most candidates gave the correct answer but there were a few who thought that 1 was the most common number of children in a house.

(ii) A number of candidates thought that the symbol > means “less than” while some thought that it means “ 2 or more”.

(iii) Although a correct angle was given in many cases, the number and variety of wrong answers indicates that there are many candidates who lack proficiency in the use of a protractor.

(iv) A significant number of candidates used the angle of each segment to calculate the number of houses that segment represented, while the easier and more accurate method was simply to multiply 15 by 4 since the segment representing 15 houses was a quarter of the circle.

Answers: **(a)(i)** 24 **(b)(i)** 2 **(ii)** more than 2 **(iii)** 54 **(iv)** 60

Question 3

(a) Most candidates correctly found the perimeter, while just a few confused area and perimeter.

(b) The majority of candidates found the area correctly. Stating the units proved more of a challenge with cm, cm^2 and m^3 all making an appearance.

(c) Efficient candidates formed a simple equation with the product of 8, 10 and the unknown height equating to 12. With all units here being metres, the resulting height had only to be multiplied by 100 to convert it to centimetres. Those who tried to use the area from **part (b)** frequently divided 80 by 12 instead of the other way round.

(d) Nearly all candidates found 16 as one of the answers for the other side of Ben's garden, but not many realised that the other answer was 25.

Answers: **(a)** 36 **(b)** 80 m^2 **(c)** 15 **(d)** 16 and 25

Question 4

(a) Nearly all candidates correctly wrote down the calculation $450 + 15 \times 62$, but many then performed the operations in the wrong order, multiplying 465 by 62.

(b) A significant number of candidates considered only the Disco room and stopped after finding 36. However, many successfully considered both rooms for the party, although trial and improvement rather than calculation was the preferred method for finding the possible number of people.

Answers: **(a)** 1380 **(b)** 38

Question 5

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

(a)(b) The co-ordinates of *A* and *B* were found correctly by nearly all candidates.

(c) The point *C* was nearly always correctly plotted.

(d) The midpoint of *AB* was usually correct.

(e) Nearly all candidates were able to reflect the line *AB,* although there were some who mistakenly reflected it in the *x*-axis instead of the *y*-axis.

(f) Many candidates neglected to use the correct term "translation" for this transformation but most were able to write the vector $\begin{pmatrix} 3 \\ -1 \end{pmatrix}$ or to describe its effect.

Answers: **(a)** (3, 1) **(b)** (0, 4) **(d)** (1.5, 2.5) **(f)** Translation $\begin{pmatrix} 3 \\ -1 \end{pmatrix}$

Question 6

The first three parts of this question were straightforward and were well answered, but many candidates had considerable difficulty in finding the *n*th term of the second sequence.

(a) (i) Nearly all the candidates drew the fourth pattern of crosses correctly.

(ii) Almost all the candidates stated the correct number of crosses in pattern 15.

(b) (i) A large majority of the candidates were able to write down the next two terms of this sequence.

(ii) Most candidates realised that the number 4 must feature in their expression, but were unsure as to how. Some candidates tried to use the formula for the *n*th term of an arithmetic series, with varying degrees of success.

Answers: **(a)(ii)** 30 **(b)(i)** 1, –3 **(ii)** $-4n + 25$

Question 7

(a) A number of candidates could not identify angle *BCD* as an obtuse angle.

(b) (i) Although many candidates found the correct answer using the sum of angles on a straight line, some made the assumption that the triangle was isosceles with angles *BAC* and *BCA* equal and gave an answer of 55°.

(ii) There were a number of correct solutions to this part but many candidates did not realise that they must find the size of angle *ABC* in order to proceed. Having stated that this angle was 55°, it was a simple step to identify the triangle as isosceles, with *AB* as its base, and to state the length of *BC.* Many weaker candidates tried to use trigonometry in triangle *ABC*, even though it was clearly not a right-angled triangle.

Answers: **(a)** Obtuse **(b)(i)** 70 **(ii)** 10, isosceles triangle

Question 8

A large majority of the candidates performed well in this algebra question.

(a) A number of candidates chose to answer this simple part by factorising, but some did not complete the process and left their answer as $a(4 + 3 - 1)$.

(b) Most candidates were able to multiply out the brackets correctly but a number then tried to combine the two terms in some way.

(c) The equation was solved correctly by nearly all the candidates.

(d) (i) Nearly all the candidates simplified correctly, with only a few multiplying the indices instead of adding them. Students must take care when writing indices: a few solutions looked like *t7* instead of t^7.

(ii) There was significantly less success in this part, with many candidates dealing correctly with either the numerical or the algebraic part of this simplification, but not both.

Answers: **(a)** $6a$ **(b)** $3x^2 - 5x$ **(c)** 9 **(d)(i)** t^7 **(ii)** $5t^3$

Question 9

(a) There were a large variety of incorrect or incomplete answers to this part. A few candidates, misunderstanding what they were asked to do, added the two times together. Many realised that they must convert the two times into the same units but chose to go into seconds instead of minutes. Those who converted the 1 hour into minutes, simplified the numbers but stopped at 15 : 6, not recognising that these numbers have a common factor of 3.

(b) Candidates were a little more successful with this part, with many starting correctly by adding 5 and 7, although fewer continued to find the correct answer.

(c) (i) Although there were some accurate answers, a number of candidates did not identify the largest and smallest value in the list correctly, and some evaluated $8 - 1.5$ as 7.5. There were also some who gave the median as the answer instead of the range.

(ii) In general, candidates were more successful at finding the mean, but addition errors were made occasionally.

Answers: **(a)** 5 : 2 **(b)** 2.5 **(c)(i)** $6\frac{1}{2}$ **(ii)** $5\frac{1}{2}$

Question 10

(a) Many candidates plotted the remaining points correctly with only a few errors in using the scale, particularly on the vertical axis. A few omitted this part completely.

(b) Most candidates recognised the positive correlation, with many embellishing the answer unnecessarily.

(c) There were some good lines of best fit drawn and these were mostly ruled. A few candidates joined up the individual plots, indicating clearly that they did not understand what was asked of them. There were some who drew the line from the point (40, 0) indicating a lack of regard for the context of the question – a baby of length 40 cm is unlikely to have a mass of 0 kg!

(d) Many candidates successfully read off the correct value using their line.

Answers: **(b)** positive **(d)** 3.4 to 4

Question 11

(a) Many candidates did not appreciate that in order to show that the circumference of the wheel was 198 cm, correct to the nearest centimetre, they had first to find a more accurate value. Thus those who wrote $63 \times \pi = 198$ could only score the method mark. A number of candidates misread the 63 as being the radius.

(b) This part was only answered correctly by the better candidates. A frequent answer involved dividing 172 by 12, with candidates not appreciating that this was not the distance travelled.

Answers: **(b)** 28.4

Question 12

(a) Many candidates gave the correct answer here, although some found 5% of $5850 and not of the sales figure.

(b) This part involved a simple comparison of the sales figure in the two months concerned, but a large number of candidates made it unnecessarily more complicated by finding 5% of the new month's sales figure, although some did eventually reach the correct answer. Some included Ravi's basic salary in their calculation which naturally made the answer they obtained incorrect.

Answers: **(a)** 13500 **(b)** 12.4

Question 13

Many candidates did not appreciate the fact that the universal set was defined as students who could speak English and this affected their solutions in **part (c)**. In this part, some candidates chose to give their probability answers not as fractions but as decimals or percentages, and they must be reminded that in such cases, numbers that are not exact must be given correct to 3 significant figures.

(a) This was an easy part requiring the addition of all the numbers in the Venn diagram but many candidates omitted to include the 12 students who were not in the sets *S* and *F.*

(b) (i) The candidates' responses indicated that there is often confusion between the symbols for the union and the intersection of sets. Those who correctly looked for the number of students in the union of *S* and *F* often gave their answer as 8, 3, 6 instead of adding the figures together.

(ii) There were many different wrong answers to this part, showing that the candidates do not all fully understand set notation.

(c) (i) A numerator of 8 was common, with candidates neglecting to include the students who also spoke Spanish.

(ii) A variety of incorrect answers were offered, although there were a number of candidates who answered correctly.

(iii) 3 was a common numerator here with many candidates forgetting that all the students spoke English and that what was wanted was the number who spoke Spanish or French but not both.

Answers: **(a)** 29 **(b)(i)** 17 **(ii)** 26 **(c)(i)** $\frac{11}{29}$ **(ii)** $\frac{3}{29}$ **(iii)** $\frac{14}{29}$

Question 14

This relatively simple trigonometry question was answered well by the abler candidates but weaker ones made many errors, in particular omitting to distinguish between lengths and angles. Once again, answers were not always given correct to 3 significant figures.

(a) Candidates were expected to use Pythagoras' theorem, but many used it incorrectly with $90^2 + 70^2$ appearing quite frequently. Answers of 57 did not earn full marks.

(b) Given the lengths 70 and 90, candidates were expected to use sin *x* and many did. However those who chose a trigonometrical ratio involving the length they had found in **part (a)** often used its approximate value of 57, thus losing out on the accuracy mark.

Answers: **(a)** 56.6 **(b)** 51.1

Question 15

(a) The sketching of the parabola was of a pleasing standard.

(b) Many candidates correctly found the co-ordinates of the minimum point, although some presumably used the trace facility on the calculator and reached an approximate value, for instance (1.9, 3.2) instead of the exact answer.

(c) A freehand sketch is expected in a question of this type. However, candidates should have been aware that what they were drawing in this part was a straight line, and there were a few solutions where the candidates drew a distinctly curved line.

(d) Correct use of the graphics calculator was essential in this part and the solutions offered indicated that not all candidates were sufficiently confident in this. Answers given were often in the vicinity of the correct values rather than correct to 3 significant figures. Two values of *x* were to be found, but many candidates used the second answer space to give the *y* co-ordinate corresponding to the *x* co-ordinate in their first answer space.

Answers: **(b)** (2, 3) **(d)** 5.24, 0.764

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/33
Paper 33 (Core)

Key messages

To succeed in this paper, it is essential for candidates to have completed 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

In general, candidates had been well prepared for this paper. They had a sound understanding of the syllabus content and could apply that knowledge. The presentation of work is a cause for concern and candidates must clearly show their step by step approach to the solution. Diagrams were often drawn carefully and calculators were used efficiently and accurately by many candidates. There is room for improvement in algebra although number work is good. Probability and statistics is well understood and approached with confidence. Spatial awareness is sometimes a little weak. Candidates had sufficient time to complete the paper; nearly all candidates attempted every question.

Comments on specific questions

Question 1

(a) The majority of candidates identified the point correctly.

(b) Although not always spelt correctly, most candidates were able to give an appropriate term to describe the triangle. A common wrong answer was 'rectangle triangle'.

(c) Although often measured, as requested, some candidates resorted to the angle sum of an isosceles triangle to arrive at their answer.

(d) Invariably, candidates accurately drew the line of symmetry of the triangle.

Answers: **(a)** (7, 2) **(b)** Right-angled or isosceles **(c)** 45 **(d)** Straight line from (3, 2) to (5, 4)

Question 2

(a) Candidates found this question quite challenging. Many worked the total area out in m^2 but then did not convert their answer to cm^2. Answers often lacked structure, leading to some confused work. Some candidates misinterpreted the request and found the perimeter of the shape.

(b) (i) Many candidates found the number of tiles that could fit along the length and width of the shape and used this to find the total number of tiles. Others used the 'false area' method and divided the total area of the shape by the area of one tile. Candidates should be made aware that this last method often leads to incorrect conclusions.

(ii) There were fewer correct answers here. Some divided their total number of tiles by 4, instead of by 5, as part of their calculation. Others pursued a counting method, listing numerous 4s and 1s whilst keeping a running total, trying to match their total number of tiles.

(c) Many candidates did not to identify the length, width and height of the cuboid correctly and a few did not know the formula for finding the volume. These incorrectly used perimeters or areas as part of their calculation.

Answers: **(a)** 171 000 **(b)(i)** 190 **(ii)** 16 boxes plain, 4 boxes pattern **(c)** 9.45

Question 3

(a) All sections of part **(a)** were answered well with few incorrect answers seen. It was noted that, this session, very few candidates used incorrect notation to describe a probability.

(b) Although there were many correct answers to this part, a number of candidates misunderstood the information in the question. These thought that the **number** of yellow counters had to stay the same rather than the probability of choosing a yellow counter staying the same.

Answers: **(a)(i)** Green **(ii)** Yellow **(iii)** $\frac{2}{12}$ **(iv)** 0 **(b)** e.g. Green 1, Red 2, Orange 2, Yellow 5

Question 4

(a) Both sections of part **(a)** were answered well. Some candidates did use trial and error to answer part **(ii)** although many could work the formula backwards.

(b) It was common to see distance divided by time used to find the average speed of the journey. Many, however, overlooked the need to change the minutes to hours or used an incorrect scaling factor to do so.

Answers: **(a)(i)** 290 **(i)** 7 **(b)** 24

Question 5

(a) (i) Stem and leaf diagrams are well understood and candidates correctly ordered the leaves. Some had problems when writing the key and so did not score the mark for this.

(ii) The range was invariably found correctly, either through taking values from the diagram or the original list.

(iii) A few candidates did not find the middle value in the ordered list either through miscounting or through not including all the values.

(b) It was rare to see any correct attempt to change months into years. 14.7 was the common wrong answer.

Answers: **(a)(ii)** 3.3 **(iii)** 15.1 **(b)** 14.6

Question 6

(a) There were many correct answers to all sections of part **(a)**. Part **(v)** was found the most difficult, where 1 was often seen as a prime number.

(b) Candidates had little trouble in completing the Venn diagram. Some included one or more of the numbers in more than one section of the diagram.

Answers: **(a)(i)** 1 or 4 or 6 **(ii)** 9 **(iii)** 15 **(iv)** 8 **(v)** 7

Question 7

(a) The reflection was usually drawn accurately and correctly.

(b) There were many correct rotations although some were drawn using the wrong centre of rotation.

(c) Translation proved more of a problem with more incorrect answers. Some candidates misunderstood the vector notation, and ended up drawing a translation using vector $\begin{pmatrix} -3 \\ 2 \end{pmatrix}$ or $\begin{pmatrix} 2 \\ 3 \end{pmatrix}$.

(d) Although candidates identified that the transformation was an enlargement of scale factor 2, they often coupled it with another transformation. This contravened the instruction to identify a 'single' transformation. Clearly, the centre of the enlargement could not be found as it lay somewhere off the grid.

Answers: **(d)** Enlargement, scale factor 2

Question 8

(a) (i), (ii) The straightforward equations in the first two sections of part **(a)** were, in general, answered correctly, either by inspection or by simple manipulation.

(iii) Candidates knew to multiply out the brackets and collect terms, although this was not always done successfully. The second term inside the brackets was often overlooked. In general, candidates set out their work in a clear and logical way.

(b) Very few candidates followed a simultaneous equations approach. Solutions were usually found through trial and error. A number did not attempt this part.

Answers: **(a)(i)** 8 **(ii)** –4 **(iii)** $1\frac{1}{2}$ **(b)** $x = -2$, $y = 5$

Question 9

Both parts of the question were answered well with many clear, concise answers. A few candidates found the increase in part **(b)** but then forgot to add it to the original amount to find the new mark. Unusually, some found the increase but then did not work out 21 + 60 correctly.

Answers: **(a)** Maths **(b)** 81

Question 10

(a) Candidates employed many different ways to answer this part. Some made a table of values, others drew a graph but most substituted the value of *x* and worked out the value of *y*.

(b) Many did not know how to find the gradient of the line from its equation. A small number gave $2x$ as the gradient.

(c) This part was found difficult, with only the better candidates knowing how to proceed.

(d) Although candidates knew what a rearrangement required, performing the steps correctly and in the correct order proved a challenge. Some wrote their answer as a string, $y + 3 \div 2$, omitting the required brackets. A common wrong answer was $\frac{-3 - y}{2}$.

Answers: **(b)** 2 **(c)** $y = 2x + 1$ **(d)** $\frac{y+3}{2}$

Question 11

(a) There were many correct tree diagrams completed. A few thought that the probabilities would change on the second set of branches.

(b) Again, a good number of correct answers were seen. Some thought that the probabilities needed to be added and others tried to multiply but did so unsuccessfully giving, for example, $0.3 \times 0.3 = 0.9$.

Answers: **(b)** 0.09

Question 12

(a) Better candidates only partially cancelled the algebraic fraction. Some misinterpreted $18x^2$ as $(18x)^2$. Others correctly cancelled the numbers but then incorrectly added the powers to get their answer.

(b) Many candidates could not factorise at all although some managed to extract one common factor. This is an area where more work would be beneficial.

(c) The inequality symbols are not well known, although the notation required to describe them is. Answers ranged from a correct diagram to one with a correct arrow but an open circle at 3. Others drew diagrams for $x > –3$, $x < 3$ and $x = 3$.

(d) Here, candidates were able to identify some of the required values but usually not all of them.

(e) It was common for candidates to know how to multiply out the brackets and that they should get four terms. These were not always collected correctly to a three term answer. In fact, it was common to see only two or three of the four terms correct from the multiplication.

Answers: **(a)** $9x$ **(b)** $3x(x + 2)$ **(d)** 5, 6, 7 **(e)** $x^2 + x – 6$

Question 13

(a) Most candidates knew that Pythagoras' Theorem was needed here to solve the problem and a high number could perform the calculation correctly. A few forgot that the formula required the squaring of the lengths in the calculation and just added the two known sides to get 19.

(b) Many identified that tan should be used and divided the two lengths correctly. Unfortunately, some of these then rounded their decimal before using inverse tan and consequently had an inaccurate answer. This premature rounding of intermediate values should be avoided.

Answers: **(a)** 13.8 **(b)** 37.8

Question 14

(a) It is clear that many candidates do not sit this exam with a graphics calculator to hand. Centres should remember that a graphics calculator is a requirement for this syllabus. Many candidates were plotting points whilst others were just guessing what the curve looked like. Graphs occasionally strayed outside the vertical range and many did not pass through the origin.

(b) Again, candidates did not use their calculators properly, using the trace function rather than the built in max/min function. This led to inaccurate values being found. Some misunderstood what was required and just substituted the largest and smallest x values into the formula.

(c) Once again, inaccurate answers were commonplace due to candidates' lack of understanding of their calculator functions. Most attempted the question with (0, 0), usually being given correctly.

Answers: **(b)** Maximum (–2, 20) Minimum (1, –7) **(c)** (–3.31, 0) (0, 0) (1.81, 0)

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/41
Paper 41 (Extended)

Key messages

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

The general instruction is that answers should be given correct to three significant figures unless the answer is exact or the question states otherwise. Money answers should be to the nearest cent, again unless the question says otherwise. This means that candidates may lose marks if answers are given to fewer significant figures.

Candidates should be familiar with the expected uses of a graphics calculator. This is both for graphical questions and statistical questions. When using the calculator to solve equations, candidates are expected to show the sketches of the functions on the paper.

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

General comments

The paper proved accessible to most of the candidates with omission rates very low. Just a few parts of some questions proved very difficult for all but the very best candidates. 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 candidates are still plotting points when a sketch graph is required. Familiarity with other uses such as statistical functions was not so apparent.

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

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

Comments on specific questions

Question 1

All parts of this question were done well by most candidates. In part **(a)(i)**, however, many candidates added 15% to 13 600 rather than the correct reverse percentage technique of dividing by 0.85. Part **(a)(ii)** was rarely incorrect. The most common errors were to increase by 11% or to use simple interest. In part **(b)** the methods of using logs and trial and improvement proved equally popular and successful. Weaker candidates often found this difficult and even stronger candidates occasionally rounded to 8 years instead of 9.

Answers: **(a)(i)** $16 000 **(ii)** $9590 **(b)** 9 years

Question 2

Candidates who knew the basic algorithm for dealing with variation did this very well. Some did use direct variation rather than inverse and therefore made no progress. Some did leave 299.84 in their answer but this did not prevent them scoring in the later parts. Those that were successful with part **(a)** were nearly always successful in parts **(b)** and **(c)**.

Answers: **(a)** $f = \frac{300}{L}$ **(b)** 107 **(c)** 857

Question 3

Better candidates did part **(a)(i)** very well. The most common error was to do the rotation clockwise. Some candidates appeared to have done the reflection but erased it. There was a part mark for this and hence this was lost if the final shape was incorrect. Most recognised the translation as a reflection and the better candidates also were correct with the equation of the mirror line.

As was to be expected, part **(b)** was less well done, however there were many correct answers. The most common error was to use $x = 1$ as the invariant line. In part **(ii)** most who had done a stretch in part **(ii)** gave the correct name and invariant line but many gave –3 as the stretch factor.

Answers: **(a)(ii)** Reflection in $y = -x$ **(b)(ii)** stretch, factor $\frac{1}{3}$ invariant line the y-axis

Question 4

Part **(a)** was extremely well done by almost all candidates. The only relatively common error was to use 15^2 rather than 15^3 in the sphere formula. Although part **(b)(i)** was well done by most candidates, a significant number used the radius of the sphere rather than the diameter.

Part **(b)(ii)** was not well done. Only the best candidates were able to use the correct scale factor for volumes, $(\frac{1}{5})^3$.

Answers: **(a)** 66 000 cm^3 **(b)(i)** 16.4 cm **(ii)** 120 g

Question 5

Parts **(a)**, **(b)** and **(c)** of this question were done extremely well by most candidates. In part **(d)(i)**, those who were familiar with the statistics functions on the graphics calculator were usually successful and gave the constants to the required level of accuracy. Other candidates often drew a line of best fit on the diagram by eye and found the equation of that. In part **(ii)**, most could substitute 85 into their equation but many did not round to the nearest whole number.

Answers: **(b)** Positive **(c)(i)** 75 **(ii)** 16.6 **(d)(i)** $n = 0.168t + 3.96$ **(ii)** 18

Question 6

Parts **(a)** and **(b)** were done very well. In part **(a)** a few weaker candidates gave the answer $n + 3$ and there were occasional computation errors in part **(b)**. In part **(c)** there was some impressive work on algebraic fractions from some stronger candidates but many others could not simplify the fraction. There were many confused explanations in part **(d)**. The most successful candidates usually solved $5n - 1 = 501$ and pointed out that this gave a non-integer solution.

Answers: **(a)** $3n + 2$ **(b)** –3, 4, 15, 30 **(c)** $2n - 3$ **(d)** correct explanation

Question 7

There was some excellent Pythagoras work seen in part **(a)** with most candidates successful. However a number assumed angle *BDA* was 68° as well as angle *BCA*. In part **(b)** too, there was a good understanding of the Sine Rule. A few gave the correct sine rule but could not transform it into an explicit expression for *AC*. The most common source of a lost mark was not to realise that, in order to show that $AC = 12.1$, correct to three significant figures, it was necessary to show the answer to at least four significant figures. Most candidates struggled to make meaningful progress with part **(c)**. The problems were twofold. Firstly bearings is a topic which many candidates find difficult. Secondly candidates did not appreciate the three-dimensional aspect of the diagram. This latter problem led to most candidates using angle *BDA* rather than angle *ADC*.

Answers: **(a)** 19.9 m **(c)** 301° or 239°

Question 8

Almost all candidates gave an acceptable sketch in both parts **(a)(i)** and **(b)(ii)**. Part **(a)(ii)** was less well done with the answer –2 being most often wrong. Better candidates usually gave the correct answer to part **(a)(iii)** but a number thought the asymptote was horizontal. In part **(b)(ii)** most candidates were able to pick out one common feature in the two sketches. Part **(b)(iii)** was not well done. It was expected that candidates would recognise that $\log 2(1 + x) = \log (1 + 2x + x^2)$ but that the fact there is no log of a negative number meant that the function $\log 2(1 + x)$ did not exist for values of $x < -1$. Hardly any of the candidates recognised this and gave a description of the difference rather than explaining it.

Answers: **(a)(ii)** –2, 0 **(iii)** $x = -1$

Question 9

In part **(a)**, most candidates knew to divide 65 by 48.75 but inaccurate answers led to an inaccurate conversion to hours and minutes. The answer should have been exactly 1 h 20 minutes but many gave inaccurate answers and also some gave 1 h 33 minutes. Part **(b)** proved very difficult for many candidates. There were many solutions which found average speeds by adding two speeds and dividing by 2. Many also did not initially add the 632 to the 65. That said, there was some impressive work from some candidates. In part **(c)** almost all candidates knew that they needed to divide a distance by the speed. However that distance was often 800 or 130 or 1060 rather than 930. The conversion of units so that the answer was in seconds also presented many problems.

Answers: **(a)** 1 hour 20 minutes **(b)** 140 km/h **(c)** 27.9 s

Question 10

Part **(a)** was the best done part of the question. However, the difficulties in this part for some candidates were twofold. Firstly, many made sign errors in working out the components of $\overrightarrow{AB}$; secondly, many did not understand the modulus sign so that they just gave the components. There were also many correct answers.

Part **(b)** proved difficult due to the problem solving nature of the question. Most candidates did not appreciate that the equation of the perpendicular bisector was required. Most candidates simply found the midpoint of *AB* and checked that it was on the line $2x + y = 5$. That said, there was some impressive work from those that did attempt the equation of the perpendicular bisector. Part **(c)** was rarely correct as candidates did not appreciate that it was necessary to substitute $y = x$ into $2x + y = 5$.

Answers: **(a)** 8.94 **(c)** $\left(\frac{5}{3}, \frac{5}{3}\right)$

Question 11

Most candidates were able to substitute into the correct Cosine Rule equation in part **(a)** although work was often spoilt by lack of brackets round algebraic expressions. This led sometimes to incorrect equations. Even if the correct equation was retrieved, it was felt that in a 'Show that' question brackets should not be omitted. A number of candidates used the wrong version of the Cosine Rule involving cos *A*. Since they did not know angle *A* they made little progress. Part **(b)(i)** was much more successfully done with the quadratic formula being the chosen method for most. There were, however, some good sketches following use of the graphics calculator. Most candidates were able to substitute their answers to part **(i)** to find the sides in part **(ii)**. Part **(c)** was less well done. Better candidates had no trouble substituting into $\text{area} = \frac{1}{2}ac\sin B$ but many candidates thought the height of the triangle was 9 cm.

Answers: **(b)(i)** 3.68, –3.11 **(ii)** *AB* = 7.36 cm, *BC* = 10.0 cm **(c)** 32.0 cm^2

Question 12

Part **(a)** was accurately done by those candidates who knew the method. Many, however, added the mid-interval values and divided by 7. In parts **(b)** and **(c)**, those candidates who understood cumulative frequency did very well, often gaining full marks. There were occasional errors in interpretation of the scale and in the interquartile range but most of the work was very good. There were, however, a significant number who plotted a frequency curve and therefore made no progress. Better candidates did part **(d)(i)** well. Common errors were to use the whole of the bottom two intervals rather than reading off the graph at 53 and giving the answer $\frac{53}{200}$. As was to be expected part **(d)(ii)** proved more difficult. The required information was in the table but many read off from the graph. Only the best candidates recognised the dependence of the probabilities.

Answers: **(a)** 63.6 **(c)(i)** 63 to 64 g **(ii)** 8.5 g to 10.5 g **(d)(i)** $\frac{12 \text{ to } 16}{200}$ **(ii)** $\frac{72}{39800}$

Question 13

There was some very good work shown on functions. Even the weaker candidates often did well here. Although some made mistakes in solving the equation in part **(a)(i)**, the majority were successful. Most candidates wrote 5 – 2(5 – 2*x*) in part **(ii)** but a number made sign errors in simplifying. $(5 - 2x)^2$ was also quite common. Better candidates did part **(iii)** well although here too, sign errors were common. A few thought $f^{-1}(x) = \frac{1}{f(x)}$. Some candidates clearly understood straight away that the answer to part **(b)** was 3. Others were puzzled by the fact that they were not told the function. A few used f(*x*), sometimes successfully. $\frac{1}{3}$ and –3 were relatively common wrong answers.

Answers: **(a)(i)** 2.25 **(ii)** 4x – 5 **(iii)** $\frac{5-x}{2}$ **(b)** 3

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 vital.

Communication and suitable accuracy are also important aspects of this examination and candidates should be encouraged to show clear methods, full working and to give answers to three significant figures or to the accuracy asked for in a particular question. Candidates are strongly advised not to round off during their working.

The graphics calculator is an important aid and candidates are expected to be fully experienced in the appropriate use of such a useful device. It is hoped that the calculator has been used as a teaching and learning aid 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.

Erased and replaced work or work written in pencil and then overwritten in black or blue can often make the script very difficult to read and so this should be avoided.

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, percentages, cumulative frequency, similar triangles, curve sketching, sine rule and cosine rule and area formula. Difficult topics were exponential change, showing similarity, range of a function and a reverse mensuration problem. 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 almost always correctly drawn.

(b) This reflection was also well answered, although a little more challenging. A number of candidates had the image partially correct but drew the rotation by 180° of the original object. A few also reflected in other lines such as the *y*-axis or the line $y = x$.

(c) This 90° rotation was more challenging as the centre was not the origin. There were many correct answers as well as many candidates gaining partial credit for the correct angle of rotation but an incorrect centre.

(d) (i) The description of the enlargement was almost always correct. Occasionally a detail was omitted, usually the centre of the enlargement.

(ii) The stretch was also well described. Candidates need to be aware of the need to indicate that a line is invariant and phrases such as "parallel to…" or "from the …" are not accepted.

Answers: **(d)(i)** enlargement, scale factor 3, centre (2, 4) **(ii)** stretch, *y*-axis invariant, factor 2

Question 2

(a) This "show that" question using ratios was generally well answered. A few candidates used the two given values in a reverse approach but did not use the given total amount. A few others omitted to show the second value.

(b) (i) This reverse percentage question was well answered, showing an improvement on recent papers. Most candidates realised that the given amount was not 100%.

(ii) This percentage loss question was well answered. A few candidates found the sale price as a percentage of the cost price.

(iii) This straightforward calculation of a sum of money was well answered. Candidates should realise that if a money answer is exact, as this one was, then the exact answer should be given, rather than rounding it.

(iv) This compound interest question was very well answered. A few candidates overlooked the instruction about rounding to the nearest dollar.

(c) This compound interest problem was much more challenging and proved to be a good discriminating question. The unit of time was months, which in itself was a challenge. The other aspect of the demands of this question was to find the number of months required for a total to be reached. The stronger candidates answered the question successfully. As well as the usual problem of this nature, other difficulties were dealing with months and dealing with a small percentage rate. There were attempts to change the monthly rate to a yearly rate, there was occasionally confusion over whether a value was in months or years, and the multiplier, which should have been 1.0015, was frequently 1.015 or 1.15.

Answers: **(b)(i)** \$120 **(ii)** 69.5% **(iii)** \$211.60 **(iv)** \$183 **(c)** September or October, 2035

Question 3

(a) This three part question required reading from a cumulative frequency graph and most candidates answered each part successfully. The scale of the vertical axis was occasionally misread.

(b) Average speed continues to be more of a challenge than might be expected. It is usually the conversion of hours and minutes that causes difficulties and this was no exception. Very few candidates found the average of speeds so the concept is basically understood. Quite simply there needs to be an emphasis that there are not 100 minutes in an hour.

Answers: **(a)(i)** 60 km/h **(ii)** 8 km/h **(iii)** 12 **(b)** 68.6 km/h

Question 4

(a) This worded question leading to a linear equation was well answered. Occasionally there was some confusion between dollars and cents. Almost all candidates gave a correct total amount in terms of *w*. The correct answer was 24 cents and an answer of 0.24 was only accepted if the \$ sign was shown.

(b) This was another worded question but leading to a quadratic equation. It required the sum of two areas to be added and then led to a quadratic equation in terms of *x*. The question asked for an answer correct to 2 decimal places and so almost all candidates realised that this quadratic would not factorise. Many simply wrote down one or two values of *x* without any working and lost one mark for this. The most popular method was to use the formula, although there may have been a slight increase in the use of the graphics calculator, where a simple sketch sufficed. A small number of candidates divided the equation by 2 and completed the square. The final answer was from multiplying the value of *x* by 4, to find a perimeter, and a few candidates thought that they had finished when they had found the value of *x*.

Answers: **(a)** 24 **(b)** 4.49 cm

Question 5

(a) This part of the whole question was found to be the most challenging as it required stating pairs of equal angles supported by reasons. Many candidates identified two pairs of angles correctly and many of these also gave correct reasons. There were reasons given which could not be seen as an appropriate circle property and so often a mark was lost here. Candidates do need to not only know the properties of angles but also know and understand the vocabulary to use.

(b) The calculation of a side of one of the similar triangles was found to be very straightforward.

(c) Good working and correct answers were usually seen from efficient use of the cosine rule.

Answers: **(b)** 7.5 cm **(c)** 67.2°

Question 6

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

(a) The sketch of the given function was very well done. A small number of candidates appeared to have their calculators set in radians.

(b) The two zeros were usually correct.

(c) The local maximum point was almost always correctly stated.

(d) The local minimum point was almost always correctly stated.

(e) The range of the function proved to be a searching question with many candidates giving values of *x* or even the domain. Clumsy notation was occasionally seen whilst a number of candidates omitted this part.

(f) This part required candidates to add another sketch to their diagram and then find the *x*-coordinate of the point of intersection. The correct answer was usually given, although the absence of the sketch was quite frequent.

Answers: **(b)** 13.4, 19.0 **(c)** (9.49, 1) **(d)** (16.4, – 1) **(e)** $-1 \leqslant f(x) \leqslant 1$ **(f)** 5.48

Question 7

This lengthy mensuration question contained parts covering different grade levels. The first parts were found to be straightforward whilst part **(b)** was A* standard.

(a) (i) The volume of this compound shape was usually correctly calculated. A few candidates gave the volume of a sphere instead of the hemisphere. The cone was usually correctly calculated. A small number of candidates used the radius equal to 2.5 cm.

(ii) The calculation of the mass of the solid, in kilograms, was usually correctly carried out.

(iii) Finding the number of solids made from 1 tonne of plastic was a little more challenging as a result of a lack of knowledge of the number of kilograms in 1 tonne. A few candidates did not truncate their decimal answer and a few rounded up.

(iv) The total surface area of the same solid proved to be more challenging and some of the errors already mentioned also occurred here. The extra difficulty was to be aware that Pythagoras was required to find the slant height and the perpendicular height was frequently used instead. The other problem seen was the addition or subtraction of the area of the circle joining the two parts. Candidates were allowed to keep their method marks in these cases.

(b) This was probably the most searching question on the whole paper as candidates had to deal with several steps to find the radius of the cone. The squaring of the 3*r* was the first issue and it was so often seen as $3r^2$. The next step was to include the area of the base. These two demands resulted in not many candidates reaching $\pi r^2 + r^2\sqrt{10}$. Those who did reach this expression usually went on to succeed. Any candidate scoring full marks in this part is likely to have earned a high final grade.

Answers: **(a)(i)** 576 cm^3 **(ii)** 0.547 kg **(iii)** 1827 or 1828 **(iv)** 361 cm^2 **(b)** 5.37 cm

Question 8

(a) Most candidates demonstrated a good knowledge of asymptotes. The *x*-axis appeared to be more challenging suggesting that candidates were more experienced with recognising vertical asymptotes.

(b) The interpretation of this question was to find the integer value of *y* where there was only one intersection with the graph of $y = f(x)$. The two difficulties seen were the actual understanding of the question and, more surprisingly, the definition of an integer. A few candidates omitted this part.

(c) This interpretation was to find the only integer value of *x* where the graph of $y = f(x)$ was below the *x*-axis. The comments in part **(b)** apply in exactly the same way here.

(d) This question asked for a suitable graph to be added to the sketch to give five intersections. Although a rather unusual question, candidates answered this quite well. There were curves of the correct shape which did not give the required number of intersections and a number of candidates omitted this part.

Answers: **(a)** $a = -2$, $b = 1$, $c = 2$, $d = 0$ **(b)** -1 **(c)** -1

Question 9

(a) This straightforward question asking for the number of elements in a Venn diagram was very well answered.

(b) This simple probability from information in the Venn diagram was also very well answered.

(c) This was a much more challenging probability question requiring a product of probabilities from only a particular subset rather than the whole set. There were many successful candidates. There were candidates who found the denominator and numerator of the fractions difficult to recognise. There were other candidates who had a correct first fraction but treated the question as a "with replacement" situation.

(d) This part required the shading of a region in the Venn diagram. The region was not one of the most obvious ones and there were many candidates who did not recognise it correctly. The common error was the omission of the intersection.

Answers: **(a)** 11 **(b)** $\frac{7}{23}$ **(c)** $\frac{55}{91}$

Question 10

This function question contained some straightforward parts as well as some demanding algebra.

(a) This was a straightforward compound function with a numerical answer and was extremely well answered.

(b) This inverse function was also very successfully answered.

(c) This question was a compound function and required the final answer to be factorised. This was a much more challenging problem and the two areas of difficulty were the expanding of the square of a linear expression and the factorising of the quadratic expression. Many candidates gave their final answer as the quadratic not factorised.

(d) This question also required the factorising of quadratics in an algebraic fraction situation. There were many fully correct answers and almost all candidates did earn some marks with some correct factorising. There were very few candidates who did not realise that the numerator and denominator needed to be factorised.

Answers: **(a)** 31 **(b)** $\frac{x-7}{2}$ **(c)** $(2x + 13)(2x + 1)$ **(d)** $\frac{x+5}{x+6}$

Question 11

(a) This question was a straightforward trigonometry calculation in a right-angled triangle and was well answered by almost all candidates. The rounding of 5.396 to 5.39 was quite common and the candidates who only wrote down 5.39 lost the accuracy mark.

(b) This was a challenging question with the best approach being the use of the sine rule. A different angle to the one asked for had to be found first. There were two triangles which could be used with this described method. Most candidates used triangle *BCD* after finding the value of angle *BDC* by simple geometry. The stronger candidates answered this question extremely well and maintained good accuracy throughout their working. A few used this method and rounded too much during their working and in some cases did not always write down the full method.
Some candidates attempted to use the cosine rule to find *DC* and this led to a quadratic equation, which very few candidates were able to solve correctly since there were decimal coefficients in this equation.
There were also candidates who could not find the appropriate strategy and they usually earned one mark for indicating the value of angle *BDC*.

(c) This part asked for the total area of the large triangle and the candidates who had succeeded in part **(b)** usually gained full marks here, with a few demonstrating a correct method but with a final answer out of the acceptable range of accuracy. A few candidates only found the area of one of the two smaller triangles. The candidates who had been unable to do part **(b)** usually did not attempt this part.

Answers: **(a)** 5.40 cm **(b)** 20.4° **(c)** 48.1 cm^2

Question 12

(a) Most candidates recognised the *n*th term of this sequence.

(b)(i) Most candidates looked at the differences in this sequence and correctly reached the second or third differences. They then usually went on to find the correct numerical value of the next term in the sequence.

(ii) This part required candidates to find the *n*th term of the sequence in part **(i)** and was a much more challenging question. There were many correct answers with candidates quickly recognising that this *n*th term would be a cubic expression by connecting part **(a)** together with the differences in part **(b)(i)**.

Answers: **(a)** n^3 **(b)(i)** 392 **(ii)** $n^3 + n^2$

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 vital.

Communication and suitable accuracy are also important aspects of this examination and candidates should be encouraged to show clear methods, full working and to give answers to three significant figures or to the accuracy asked for in a particular question. Candidates are strongly advised not to round off during their working.

The graphics calculator is an important aid and candidates are expected to be fully experienced in the appropriate use of such a useful device. It is hoped that the calculator has been used as a teaching and learning aid throughout the course. In the syllabus there is a list of functions of the calculator that are expected to be used and candidates should be aware that 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.

Erased and replaced work or work written in pencil and then overwritten in black or blue can often make the script very difficult to read and so this should be avoided.

General comments

Almost all candidates were well prepared for the examination and were able to attempt all or most of the questions. The presentation of work was usually clear and methods often fully shown. The sketching of graphs does continue to improve although the use of graphics calculators elsewhere is often not seen. All candidates appeared to be able to finish the examination in the time allowed.

A number of questions did prove to be challenging for some candidates, as will be explained in comments on individual questions. Topics on which questions were well answered include simple transformations, circle geometry, curve sketching, sine rule and cosine rule and area formula, mean and regression, factorising, algebraic expressions and percentage changes. Difficult topics appeared to be inequalities, variation, probability with algebraic fractions, vector geometry and a problem involving triangles and sectors.

Comments on specific questions

Question 1

(a) (i) The rounding to 1 decimal place was usually correctly carried out.

(ii) The rounding to 3 significant figures was usually correctly carried out. A few candidates gave the given number correct to 3 decimal places.

(iii) The rounding to the nearest 10 was usually correctly carried out.

(iv) The rounding correct to the nearest 0.001 proved to be challenging since, to many candidates, it was a more unusual way of rounding.

(b) The number here was already to the nearest 10 so all candidates had to do was to write down the actual question. Most candidates realised this.

Answers: **(a)(i)** 13 205.2 **(ii)** 13 200 **(iii)** 13 210 **(iv)** 13 205.73 **(b)** 120

Question 2

(a) Many candidates factorised the quadratic expression correctly although the coefficient of x^2 being 3 did prove to be challenging to some.

(b) The inequality from the factors in part **(a)** was found to be quite difficult to many candidates. A sketch of the function would have been helpful and was rarely seen. Candidates who did use this approach were much more successful than others.

(c) This question involving trigonometric equations from the factors in part **(a)** was a very discriminating question. The stronger candidates were able to see the connection between the two parts and met with some success. A few candidates used a graphical approach, which was successful when a suitable domain was used.

Answers: **(a)** $(3x+2)(x-4)$ **(b)** $-\frac{2}{3} < x < 4$ **(c)** 221.8, 318.2

Question 3

This variation involved (x + 1) where it would usually be x and this provided an extra challenge.

(a) This part involved finding the constant, y in terms of x and then a value of y for a given value of x. The stronger candidates answered it well whilst others found dealing with the (x + 1) together with the constant being a fraction rather demanding.

(b) Finding x for a given value of y was straightforward to the candidates who had y in terms of x in part **(a)**.

(c) As in part **(b)**, those who had a correct expression in part **(a)** were able to attempt this re-arrangement of the expression to make x the subject. It involved multiplying by 2 then taking the cube root and finally subtracting 1. This order of the operations was not found to be easy.

Answers: **(a)** 62.5 **(b)** 2 **(c)** $\sqrt[3]{2y}-1$

Question 4

(a) (i) The algebraic expression for a shaded area was usually correctly answered.

(ii) Most candidates were able to either substitute a value in their expression or simply start the question again.

(b) The expression for the perimeter was a little more challenging with the side of the square being $2r$ but many candidates were successful. The error of subtracting one length from another occurred all too frequently, presumably because of subtracting an area in part **(a)(i)**.

Answers: **(a)(i)** $4r^2-\pi r^2$ **(ii)** 30.9 **(b)** $8r+2\pi r$

Question 5

(a) Most candidates were able to demonstrate good use of the $\frac{1}{2}ab\sin C$ formula.

(b) Good working and correct answers were usually seen from efficient use of the cosine rule.

(c) Most candidates used the sine rule successfully in this part whilst a few were also successful using the cosine rule. A few took the triangle to be isosceles and candidates should be reminded that they must only use information given in the question.

(d) The length of the perpendicular from a vertex to the opposite side proved to be the most challenging part of this question, although it only required right-angled triangle trigonometry. The candidates who added this perpendicular to the diagram were generally much more successful.

Answers: **(b)** 6.21 **(c)** 62.3 or 62.4 **(d)** 6.2

Question 6

(a) The calculation of a mean, using the graphics calculator, was usually well done. A few candidates carried out the calculation manually, thus doing a lot of work for two marks. A few ignored the frequencies.

(b) (i) The frequency densities were generally calculated correctly, although a few candidates multiplied some height by the frequencies.

(ii) Most candidates demonstrated good knowledge of histograms and were also able to choose and use a suitable scale for the frequency density axis.

Answers: **(a)** 166 **(b)(i)** 2.6, 13.2, 16.4, 23.6, 16.4, 1.73

Question 7

(a) This reverse percentage question was quite well done by dividing by two different factors, namely 1.05 and 1.1. A few candidates made the error of adding the percentage increases and divided by 1.15.

(b) This repeated percentage increase question was quite well done by a variety of methods, the most frequent being trial and improvement. It was expected that candidates would either use logarithms or use a graphical approach. These latter two methods were seen and met with success and probably took less time.

Answers: **(a)** 90 000 **(b)** 2028

Question 8

This vector geometry question was found to be challenging for many candidates. A small number attempted to use Pythagoras and a few others did not seem to be able to find correct or appropriate routes.

(a) This was the most straightforward part as the vector asked for was along the two given vectors. It was reasonably well answered.

(b) This part required the use of a fraction of one of the given vectors and appeared to make the question more difficult. The fact that one part of a line was $\frac{2}{3}$ of the whole line caused more problems than expected.

(c) This part was similar to part **(b)** so performances of candidates here were the same as in that part.

Answers: **(a)** $6\mathbf{p} - \mathbf{q}$ **(b)** $3\mathbf{p} + \mathbf{q}$ **(c)** $3\mathbf{p} - 2\mathbf{q}$

Question 9

(a) This question involved recognising combinations of transformations without any diagram provided. Space was available for diagrams but most candidates chose not to do this. The first parts were found to be straightforward and then later combinations were demanding, making a very discriminating question.

(b) (i) Most candidates were able to draw the reflection in the line $y = x$.

(ii) Most candidates were able to draw the required reflection of the image in part **(i)**.

(iii) Full marks in this part depended on success in parts **(i)** and **(ii)** and many candidates were also successful here. Those who drew two reflections in parts **(i)** and **(ii)** were able to give a rotation in this part and so earned at least one mark.

Answers: **(a) P**, **Q**, **Q**, **T**, **T**, **S** **(b)(iii)** Rotation, 90°, (0, 0)

Question 10

(a) (i) The scatter diagram was almost always completed correctly.

(ii) The correct type of correlation was almost always stated.

(b) (i) The mean was almost always correctly calculated.

(ii) The mean was almost always correctly calculated.

(c) (i) The equation of the regression line was usually correctly answered. Fewer candidates than in previous sessions seemed to use fewer than three significant figures.

(ii) Using the equation in part **(i)** was almost always correct.

(iii) The interpretation of a value outside the range of data proved to be more challenging although there were many good answers.

Answers: **(a)(ii)** positive **(b)(i)** 32.7 **(ii)** 23.6 **(c)(i)** $y = -5.57 + 0.892x$ **(ii)** 21.2

Question 11

(a) There were many very good sketches. These continue to improve and only a small number of candidates seemed to lack experience in sketching graphs.

(b) Asymptotes are found to be more challenging with many candidates giving all three correctly and many others giving the two parallel to the *y*-axis correctly. A few candidates were unable to answer this part.

(c) Most candidates gave the local maximum point correctly.

(d) Most candidates were able to add the straight line to the sketch and give the *x* co-ordinates of the points of intersection.

Answers: **(b)** $x = 1$, $x = 3$, $y = 3$ **(c)** (2, 2) **(d)** 1.38, 2, 3.62

Question 12

(a) This part required use of angles in a cyclic quadrilateral and was well answered.

(b) This part required the answer to part **(a)** together with angles in a triangle and this was also well answered.

(c) There were several ways of finding this final angle and it was also often correctly answered. Those candidates who filled values in the diagram met with more success than those who preferred to only write down values.

Answers: **(a)** 18 **(b)** 18 **(c)** 90

Question 13

This question was a sequence of triangles and sectors of a circle and tested some problem solving skills. Answers in terms of π were accepted and in some ways were perhaps helpful in building up the figure in part **(b)**.

(a) (i) This was a gentle starter asking for the area of a sector of a circle. Most candidates were successful at this stage.

(ii) In this part a triangle was joined to the sector and candidates had to calculate two of the sides of the triangle using trigonometry and possibly Pythagoras. There were many good answers to this part, which led to a more complicated scene. A few candidates only gave the area of the triangle instead of finding the combined area.

(iii) A second and larger sector was added and the total of three areas was now required. The challenge in this part was to recognise the radius of the new sector and this was the beginning of the discriminating aspect of the whole question. The better candidates were successful and some others were partially successful whilst weaker candidates found this too challenging.

(b) This part was the more demanding question, requiring much clear thinking. The stronger candidates were able to draw or visualise the new diagram consisting of three triangles and three sectors. If so they were usually able to reach a correct answer. The weaker candidates either left this part completely or were able to earn a mark or two by finding the next areas.

Answers: **(a)(i)** 4.71 **(ii)** 12.5 **(iii)** 31.4 **(b)** 263

Question 14

The whole question required good knowledge of probability together with the ability to express the fractions algebraically. The combination of the two topics was found to be demanding for many candidates.

(a) (i) This part was choosing two balls of the same colour without replacement. This was quite well answered as many candidates realised that they had to simply square the fraction. Many multiplied out the denominator which, although not necessary, was acceptable.

(ii) This part was choosing two balls of different colours without replacement. This was more demanding and a number of candidates overlooked the fact that this could happen in two ways.

(b) (i) This was the same question as part **(a)(i)** but without replacement. This naturally made the algebraic fractions more complicated and the rate of success was less than in part **(a)(i)**, largely because of the algebra. The stronger candidates had no problem with this as they did not try to simplify the fractions.

(ii) This was the same question as part **(a)(ii)** but without replacement. This naturally made the algebraic fractions more complicated and the rate of success was less than in part **(a)(i)**, largely because of the algebra. The stronger candidates had no problem with this as they did not try to simplify the fractions. Those candidates who could do part **(b)(i)** correctly were also successful in this part.

Answers: **(a)(i)** $\left(\frac{x}{x+y}\right)^2$ **(ii)** $\frac{2xy}{(x+y)^2}$ **(b)(i)** $\frac{x(x-1)}{(x+y)(x+y-1)}$ **(ii)** $\frac{2xy}{(x+y)(x+y-1)}$

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/51
Paper 51 (Core)

Key messages

This investigation required candidates to spend some time making sure that they really understood the connection between rectangles and scale-rectangles. Candidates should be aware that rushing on or scan reading will most probably not help them to make progress in an investigation.

General comments

Many candidates helped themselves by drawing their own diagrams for many of the questions and part questions. This is a good way to communicate both to help them and to show the Examiner what they know. Candidates who clearly sorted out the information were able to proceed correctly to almost the end of the paper with only arithmetical mistakes, if any.

Comments on specific questions

Question 1

(a) Candidates answered this well. They had a good understanding of scale. Some did not know how to write the answer as a scale factor, as requested. Fractions, like $\frac{3}{1}$ were acceptable but not ratio answers, like 1 : 3.

Answer: 3

(b) This question was very similar to part **(a)** so again, it was well answered by all except those who wrote the answer as a ratio.

Answer: 2

(c) Use of scale factor was well known and there is only one way to write this answer so the majority of candidates were correct.

Answer: 40

(d) This question used similar knowledge to part **(c)** and was, again, very well answered.

Answer: 15

Question 2

It was now necessary for candidates to read carefully the explanation about scale-rectangles. Their level of understanding of this was portrayed in their answers to the next questions.

(a) Some candidates could not visualise the comparison of the two rectangles. Many made drawings of the two separate rectangles both with the longest side horizontal which really helped and should be encouraged with all practical questions and investigations.

Answer: $\frac{9}{3}$ and $\frac{3}{1}$

(b) There were too many mistakes in simple arithmetic in this 'show that' question. Again many, but especially those with a supporting diagram, chose the correct combinations of lengths here.

Answer: $\frac{3}{2}$ and $\frac{2}{1}$ and No

(c) (i) This question was quite well answered and rarely spoiled by mistakes in arithmetic. The two horizontal diagrams were drawn on the question paper so helping those who had not thought to draw their own in the previous parts **(a)** and **(b)**.

Answer: 147

(ii) This question was marked as a follow-through answer so incorrect answers in part **(i)**, if used correctly in this part, could score full marks. This helped many candidates to gain a mark for understanding here.

Answer: 21 by 150

(d) (i) Like part **(c)(i)** the diagrams were drawn on the paper and although this question was not as straightforward as part **(c)** more candidates now understood the links and were able to answer this part correctly.

Answer: 15

(ii) Like part **(c)(ii)** this was a follow-through answer which helped some candidates. Some did show a lack of understanding by adding to one of the numbers when no addition was needed; probably not reading the situation carefully enough.

Answer: 15 by 78

Question 3

(a) (i) Again, it would have been good to see more candidates drawing an extra diagram here to help themselves. This question was well answered, being the simplest of the parts in question **3(a)**.

Answer: 12

(ii) This question was completed correctly by those who understood the relationship between the scale-rectangles. It was not as straight forward as part **(i)** and unlikely to be correct by guessing.

Answer: 72

(iii) This was a follow-through answer so candidates who understood the connection between z and x could achieve this mark even if they had not been able to evaluate z correctly in part **(ii)**.

Answer: 36

(iv) Some candidates who saw this connection answered the question numerically, which was acceptable. Most of those who had not answered the earlier parts of question **3(a)** correctly were unable to find a correct answer here.

Answer: n^2

(b) (i) Again, sketches of the two rectangles helped some candidates. Some answers of 9 showed understanding but forgetting to find the square root.

Answer: 3

(ii) Candidates had begun to find difficulty with this paper from the end of question 2. This part was not particularly well answered and these last parts were also omitted by several candidates. As always candidates should be encouraged to try to find an answer to all questions rather than leaving them blank.

Answer: 6 by 20

(c) It was rare to find all the cells in this table completed correctly but many candidates either knew how to calculate the dimensions from earlier work or saw the patterns once the table was presented to them.

Answer:

n	x	y	z	Dimensions
2	2	4	8	4 by 10
6	2	12	72	12 by 74
3	2	6	18	6 by 20
5	7	35	175	35 by 182
4	1	4	16	4 by 17
2	5	10	20	10 by 25

Question 4

(a) Most candidates were unable to move into the algebraic expression. It was good to see that many attempted this question and also secured one mark for their answer. Diagrams of the two scale rectangles would have helped candidates to work out these dimensions in terms of only n and x once they had formed equations and then eliminated y and z.

Answer: nx by $n^2x + x$

(b) The easiest way to answer this question was to follow on from the answer to part **(a)**. Not many candidates saw this and quite often nothing was attempted.

Answer: $nx : (n^2 + 1)x$ seen

Communication

Communication is an area that could have been improved on this paper. Candidates should communicate their method of working no matter how simple or straightforward this might be. Candidates missed opportunities maybe because they thought the method was trivial or too obvious. They should be encouraged to write down all working out including calculations they might do in their heads or on the calculator.

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/52
Paper 52 (Core)

Key messages

Candidates who set out their thinking and working clearly were less likely to make errors on this paper. Several arithmetical slips could have been avoided had the candidates written down more working and checked their answers to be reasonable.

General comments

Many candidates performed well having read and understood the connections between the median, sum and number of terms of a sequence of consecutive positive integers. They found it more difficult to extend these ideas, as in the last question, and should be encouraged to work on extensions to investigations once they have sorted and answered the basic steps.

Comments on specific questions

Question 1

(a) Many candidates illustrated one number – another number + 1 correctly but they did not link this to a sequence and so were not awarded the mark. They could have chosen any sequence either from the examples given in the introduction to **question 1** or composed one of their own. Without the reference to a particular consecutive integer sequence the illustrated sum had no meaning.

(b) This was well answered compared to part **(a)** and many candidates were able to explain simply how to find the median, in a variety of ways.

Answer: (first + last) ÷ 2

Question 2

(a) Candidates completed this table exceptionally well. They showed a good understanding of the information in **question 1** and a good capability of following patterns.

Answer:

Sequence	Number of terms	Median	Sum
3, 4, 5, 6, 7, 8, 9	7	6	42
7, 8	2	7.5	15
20, 21, 22, …, 40	21	30	630
5, 6, 7	3	6	18
2, 3, 4, 5, 6, 7, 8, 9	8	5.5	44
2, 3, 4, 5, 6, 7	6	4.5	27
5, 6, 7, 8, 9	5	7	35

(b) Candidates answered this question well, presumably by using the numbers in the table in part **(a)**.

Answer: Multiply

(c) Maybe this answer was too obvious, but many candidates did not recognise these numbers as the set of odd numbers. It implies that often more work on the names of sets of numbers would be useful.

Answer: Odd

(d) Many more candidates answered this correctly than part **(c)**, which infers they found naming the set of odd numbers in that part difficult. They found it easier to describe the similarity of the medians without having to give this a name. Words such as decimal and 'not integer' were also acceptable.

Answer: ends in .5

Question 3

Another exceptionally well answered question. There were a few arithmetical slips which went undetected and therefore were not corrected, but generally the candidates understood the connections between the number of terms, the median, the sum and the terms of the sequence. Good checking might have increased the number of correct answers with mistakes rectified.

Answer:

Sequence	Number of terms	Median	Sum
4, 5, 6	3	5	15
7, 8, 9, 10	4	8.5	34
4, 5, 6, 7, 8, 9, 10 or 24, 25	7 or 2	7 or 24.5	49

Question 4

Some candidates did not use the hints of looking back to **questions 1** and **2(b)** and were unable to decide on the correct calculations. Many others made different arithmetical slips some of which meant that, although they had found the correct method, they did not even get as far as one mark out of the two. Candidates need to be made aware of such traps as 15 + 985 ÷ 2 without equalling the addition first; this meant they had 507.5 instead of 500. Many forgot to add 1 to 985 – 15.

Answer: 485 500

Question 5

A very good number of candidates found all three sequences that had a sum of 77. Candidates should be encouraged to set out their working as clearly as possible for questions like this. It was often difficult to follow the thread of a candidate's work in order to award method marks. Some candidates used trial and improvement rather than the connection of sum = number of terms × median.

Answer: 38, 39
8, 9, 10, 11, 12, 13, 14
2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12

Question 6

(a) Candidates need to be able to distinguish between factors and multiples. It is a common occurrence for candidates to muddle these two. The first step was to identify all the factors of 16, which often was not a complete set. As the number of terms is always even, discounting 1 of course, the median needed to be a .5 number which could not happen to get this total. Some candidates did not appear to realise this was all they needed to do and were looking for something more complicated.

Answer: 1, 2, 4, 8, 16
median not an integer when even number of terms

(b) Many candidates did not see the connection here with powers of 2 and there was evidence of numerous different answers. They did try to answer this question however, and not many left it blank.

Answer: 32 or 64 or 128, etc.

Communication

The communication by the candidates taking this paper was good. Most often a numerical calculation was shown, as in **question 4**. Little evidence was seen for the completion of the tables in **questions 2(a)** and **3**. Candidates should be encouraged to show how they obtain answers in tables as well as in other answers.

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/53
Paper 53 (Core)

Key messages

As with most investigations, the questions at the end of the paper relied upon information found and used at the beginning of the paper. Candidates always need to continually look back at previous work to help them solve the next problem.

General comments

The candidates' numerical work was quite good although slips were still made. Many, however, did not have the basic algebraic skills to cope with simple equations and expressions. Much work needs to be done on forming and equating expressions.

Comments on specific questions

Question 1

(a) All candidates could find the area of the rectangle correctly.

Answer: 30

(b) Virtually all the candidates could find the further three ways to calculate the area of 6.

Answer:

6	1
2	3
3	2

(c) (i) Most candidates chose one of the three prime numbers in the range and completed the table successfully. A few chose 9 and just gave two of the ways of making 9. Probably they did not base this on the word 'exactly' because they also gave the answer of 9 for the next question.

Answer:

7	
1	7
7	1

or

11	
1	11
11	1

or

13	
1	13
13	1

(ii) If 9 was correctly chosen then all three rows of the table were also correctly completely. All candidates answered the question but some chose numbers with more than 3 ways and just wrote in 3 ways; again the word 'exactly' had been ignored.

Answer:

9	
1	9
9	1
3	3

(iii) This part was very well answered. 12 was chosen by most candidates and a combination was only missed on rare occasions.

Answer:

12	
1	12
12	1
2	6
6	2
3	4
4	3

Question 2

(a) (i) Some candidates lost this mark because they either included non-prime numbers or they left out a prime. Most candidates did realise this was related to prime numbers even if they made mistakes in the list.

Answer: 2, 3, 5, 7, 11, 13, 17, 19

(ii) Even those candidates who made a mistake in their list in part **(i)** knew the name of these numbers.

Answer: Prime

(b) (i) This question needed a little more thought than part **(a)** and some candidates did not find all three answers. Many were not looking specifically at square numbers but found at least two of them anyway. Candidates should be encouraged to use trial and improvement if they cannot see any other way to work out an answer.

Answer: 4, 9, 16

(ii) As opposed to prime numbers, which candidates knew the name of but might not have been able to list them all within a certain range, square numbers seemed to be known to far fewer candidates. Candidates should work with, and learn the names of, all the different sets of numbers.

Answer: Square

Question 3

This question was basically asking for a square number between 150 and 200. Many candidates reached a correct answer although they did not appear to use square numbers. Some used the pattern they had started in **Question 2(b)(i)**.

Answer: 169 or 196

Question 4

This was a question on straightforward perimeter and most candidates could answer this. A few, but not many, made arithmetical slips.

Answer: 26
22

Question 5

(a) This question was answered well. Some candidates used algebra but most used a numerical method and easily found the appropriate length. Again trial methods should be encouraged as they may be simpler than other methods.

Answer: 6

(b) A correct answer in part **(a)** meant all those candidates also scored a mark for finding the perimeter in this part.

Answer: 18

Question 6

(a) This question was well answered. In effect it was asking for an algebraic area of a rectangle whereas this was asked numerically in **Question 1**.

Answer: $4x$

(b) This was also very well answered, although some students who could find the area could not also find the perimeter. Very few candidates got area and perimeter mixed up.

Answer: $8 + 2x$

(c) This was quite a straightforward linear algebra question but it caused a problem to some candidates. Some did not manage to solve the simple equation correctly and others could not move forward positively because they had incorrect answers to parts **(a)** or **(b)** or both. Many of these, however, managed to find the correct answer. This showed good use of trial and improvement, using substitution, to calculate an answer that was otherwise too difficult to find.

Answer: $8 + 2x = 4x$, 4

Question 7

This was not well answered despite being a follow on from **Question 6**. The same method needed to be used to create a simple linear equation to which there were no solutions. Very few candidates managed this, although most wrote something down but not enough was correct to score a mark.

Answer: $2x$ and $2x + 4$, No solutions

Communication

The communication could have been better on this paper. There were some very simple calculations in **Questions 2** and **3** which were rarely written down. Candidates should be encouraged to write down every calculation, even those that they can do in their heads, and especially those that involve the use of a calculator.

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. In order to do well in this examination, candidates needed to give clear and logical answers to questions, showing sufficient method so that marks could be awarded. Correct mathematical terminology and presentation, including the correct use of brackets in algebraic expressions, for example, is also expected where appropriate.

In **Part A**, candidates who considered how the scale factors of the similar triangles related to what they were trying to find or show were more successful than those trying to establish relationships from more complicated, algebraic proportions based on equating the scale factors themselves. In **Part B**, candidates needed to take more time and think carefully about what they were being asked to find. Those candidates who did not think carefully enough gave, for example, frequencies when notes were required. Some candidates referenced notes outside the model given. The expectation is that candidates will work with the information given and not change the basis for the model unless they are specifically required to do so in a question. When candidates are asked to "show that" a result is valid, they should produce clear, mathematical explanations, rather than lengthy, worded descriptions.

General comments

Many candidates were well prepared for this examination and gave good, clearly presented and well explained answers. The level of communication was very good in **Part A** and good in **Part B**. A good number of candidates scored highly and found both parts accessible. Other candidates engaged well with the initial questions in both **Part A** and **Part B**. The later questions in each part proved challenging, with fewer candidates seeing the most straightforward and logical solutions. The candidates who scored highly usually presented their work neatly, clearly and with correct mathematical form. In order to improve, other candidates need to understand that their working must be well-presented and detailed enough to show their understanding clearly. The need for this was highlighted in **Part A, Question 5**, **6** and **7**. 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**, **Question 5** and **6** and in **Part B**, **Question 5(c)** in this examination. In **Part B**, candidates were asked to find an exact value. Candidates need to understand that the full decimal value found using a calculator is generally not an exact value. Some candidates checked or established their algebraic expressions using numerical values. This is a sensible approach. Other candidates would improve if they understood that using numerical values only to verify that a result is valid for specific values does not demonstrate the result is true in general.

Comments on Specific Questions

Part A: Investigation

Question 1

(a) This question provided a straightforward introduction into the task. Candidates rarely made errors. The few candidates not scoring the mark would probably have done better if they had read the question more carefully.

Answer: 2

(b) Again, this question was generally well answered, with a high proportion of candidates giving the correct three values. These candidates fully considered each row of the table and how each scale factor changed the lengths in the second and third columns. Some candidates gave the length of *PS* in row 3 as 8. These candidates seemed to think there was a pattern in the first two columns of values.

Answer:

Scale factor	Length of *PS*	Length of *PB*
		12
5		
	2	

(c) Candidates were expected to use the correct terminology here and most of them did so. This was usually well answered.

Answer: Similar

Question 2

(a) This was a "show that" type of question to which candidates offered a variety of correct solutions. Most solutions used proportions or ratios and were well justified and clear. Other candidates would have done better to have given a full and clear demonstration of why the value of x was actually half of 20, rather than just stating it was so. Some candidates attempted to use trigonometry or Pythagoras' theorem here. This was not necessary and usually meant that candidates introduced a rounding error, which was not condoned.

(b) Very well answered – almost universally correct. Candidates also communicated well in this question, giving a calculation to support their answer.

Answer: 8

(c) Most candidates found the correct expression. Some candidates misinterpreted the question and found an expression for y in terms of x. A few candidates used *PB* and *PS* in their expressions, rather than y and 2 respectively. The use of the general *PS* rather than the specific value 2 was not allowed.

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

Question 3

Candidates were able to demonstrate, once again, that they had understood the proportional relationships between the sides of the triangles. Those who misinterpreted **Question 2(c)** and found an expression for y in terms of x usually did so here also.

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

Question 4

Again, many candidates showed very good understanding of how the triangles changed when *P* moved from *A*. Candidates also communicated well in this question, detailing calculations to support their answers. In **parts (a)** and **(b)** they generally were successful in calculating the relevant scale factors and used these correctly to find the length of *y* and *z*. Occasionally, candidates confused themselves by adding 3 to *y* and 2 to *z*. Almost all candidates did as instructed in **part (c)** and used the values they had found for *y* and *z* to calculate the length of *AP*. This question was intended as a specific lead into the general cases considered in **Questions 5** and **6**.

Answer: **(a)** 18 **(b)** 12 **(c)** 6

Question 5

This proved to be the first part to challenge many candidates. A good number of candidates realised how the method they had used in **Question 4** could be applied in this general case. These candidates, who found $y = 5x$ and $z = 4x$ and subtracted these, gave the neatest and simplest form of the correct solution. Other candidates over-complicated the question by equating $\frac{y}{5}$ and $\frac{z}{4}$ and attempting some rearrangement. These candidates often used circular arguments and provided solutions that were difficult to follow. Correct solutions from this starting point were not common. Some candidates stated or used $x = 6$ or used other specific, numerical values for *x* to verify that the result was true. Unless the correct general working in *x*, or equivalent, was also seen, these candidates were not credited.

Question 6

Candidates usually used the same approach in this question as they had in **Question 5**. For a good number of candidates, this resulted in using $nx - (n - 1)x = x$. This was the simplest and most direct method of demonstrating what was required. These candidates also communicated well in this question, stating expressions for *y* or *z* in terms of *x*. Some candidates using this approach made sign errors or omitted necessary brackets. These candidates would improve if they took a little more care with the correct form. The candidates who equated $\frac{y}{5}$ and $\frac{z}{4}$ in **Question 5**, usually tried to work with $\frac{y}{n} = \frac{z}{n-1}$ in some way. Again, success using this approach was very rare and candidates' presentation of work was often poor and difficult to follow. The candidates who verified certain values in **Question 5** generally repeated that approach, with the same lack of success.

Question 7

A good number of candidates fully understood what was needed and provided correct expressions in both parts of this question. These candidates usually used the approach of earlier questions to find the expressions required. In most cases, candidates communicated well and gave clear evidence of their method. Some candidates did not realise that an expression "in terms of *x*" should not contain other variables and did not simplify their difference of terms. A few candidates gave their answer as $x = 2AP$, again, misinterpreting the requirement of the question. Other candidates simply wrote that $AP = 2x$ and provided no evidence of how they had arrived at that answer. A few candidates found the correct expression for **part (b)** but not for **part (a)**. Perhaps these candidates would have improved if they had realised that parts of questions are, most often, connected.

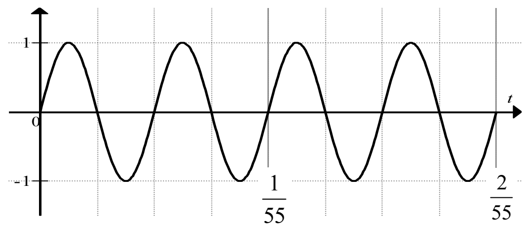
Answer: **(a)** $\frac{x}{2}$ **(b)** $\frac{x}{m}$

Part B: Modelling

Question 1

Many candidates drew accurate and neat curves. They were clearly well practised in doing this and did it very well. Most drew a curve of 4 cycles. Some drew the sine wave for the note A_0, which had one cycle. A few candidates produced curves which were insufficiently accurate. A very few attempted cosine curves or curves which were reflections of the given one in the *t*-axis. Some candidates drew their diagrams using pen and then had a second attempt. It would have been better if these candidates had used a pencil, rather than a pen, in the first instance.

Answer:



Question 2

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

Answer: 32.7

(ii) Many candidates did not read the question carefully enough and gave the frequency of the note, rather than the note itself. A few candidates gave the note, but did not give the correct subscript, which was required. A few candidates also introduced the notation $B\#_1$. This was not part of the original model and was not condoned.

Answer: C_1

(iii) This part of the question was well answered once again, with candidates most often finding the correct frequency. Candidates also communicated well in this part, stating that they needed to use the value $n = 7$.

Answer: 41.2

(b) This question tested candidates' understanding of the model. Some candidates showed that they had fully understood that, as the value of *n* changed, the frequency changed and the note changed. These candidates listed the correct values of *n* that produced all the notes A on the piano. All 12 notes in the scale had different frequencies. Some candidates thought that the note A# should also be included. Reading the information at the beginning of **Question 2** more carefully may have avoided this error. Some candidates, who were not sure, listed the values for A and for A# and clearly identified them as such. These candidates were credited as they had shown what was required. A small number of candidates gave only the values of *n* for the notes given in the table. Re-reading the information given may have, again, avoided this error.

Answer: 0, 12, 24, 36, 48, 60, 72, 84

(c) The answers to this question were variable. Many candidates either found the correct frequency or the correct note, but not both. Again, some candidates introduced notation outside of that provided in the model and gave the answer B#. This was not condoned. Some candidates calculated the frequency of the note B_7, as this was the highest note given in the table. These candidates did not observe the final column of the table or make the connection between the table and the function modelling the frequency. $G\#_7$ was also a common incorrect answer, this being the last of the 12 notes in the list. This was commonly seen with the correct frequency. It is likely that candidates offering this as an answer made the assumption that the piano would end on this note. This indicated that they had not fully engaged with the model given, as the number of notes on this piano was not a multiple of 12.

Answer: C_7 and 4190

Question 3

The majority of candidates either did not observe or understand the word “exact” in the question. Very few candidates gave the answer as a power of 2. The intention of the question was to help candidates understand how the number of notes in the scale was related to the power of 2 in the function.
Those who gave decimal answers from calculating a ratio of values often omitted to notice this. Some candidates had difficulty in interpreting f(n + 1). Commonly this was treated as f(n) + 1.

Answer: $2^{\frac{1}{12}}$

Question 4

(a) Candidates were able to use their graphics calculators appropriately here. A very high number of candidates sketched a graph of suitable shape and earned the mark.

(b) Good communication was seen in this question. A good number of candidates drew a horizontal line at an appropriate position on their sketch in part **(a)**. Other candidates stated the equation they were attempting to solve or gave trials from which this could be implied. Some very able candidates used logarithms. Many candidates seemed to be using their graphics calculators to find the point of intersection of the curve in part **(a)** and the line y = 1400. Candidates usually realised that the decimal value 68.03… needed to be an integer to be applied to the model and stated this as 68. Many candidates gave 68 as their final answer, and did not find the note as the question required.

Answer: F_5

Question 5

(a) This was usually well answered with most candidates realising that the value of a was the same as the frequency of the note Q_0.

Answer: 600

(b) Candidates found this question challenging. A reasonable number of candidates determined or stated that b = 0.1. The majority of candidates gave the answer b = 1. This often arose from $1200 = 600 \times 2^b$.

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

(c) In this question, candidates were asked to show that the terms were connected by a common ratio and were asked to find that ratio. Some candidates divided one pair of frequencies only. This was not enough to show that the ratio was common. In **Question 3**, candidates were given the relationship and only had to find the value of k. In this question, they had to show the relationship between the frequencies was of this form. Very few candidates used an algebraic method to find the constant. A small number of candidates at least showed that the ratio was common to more than one pair of frequencies and this was credited. There was further evidence of h(n + 1) being treated as h(n) + 1 in this question.

Answer: $2^{\frac{1}{10}}$

Question 6

(a) The majority of candidates disregarded the exponential models they had been working with up to this point in the task and adopted a linear form. The most common solution offered was to divide 75 by 23 and then add this to 75. Another common wrong solution was to multiply 75 by 2. Some candidates did realise that the exponential model was still valid in this question. Occasionally, these candidates used n = 2 rather than n = 1, forgetting that the model started with 0 not 1.

Answer: 77.3

(b) Candidates found this part of the question easier than **part (a)**. A good number of candidates found the correct solution. Many methods were applied. Very good candidates used logarithms. Other candidate stated a correct relationship using the ratio of frequencies – such as $1.08^n = 2$ and used that to find the value of *n.*

Answer: 9

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/62
Paper 62 (Extended)

Key messages

In *Show that* or *Explain why* questions, candidates should not use specific numerical examples to justify a general result. An example may be useful in addition to the explanation as this might contribute towards credit for communication. A graphics calculator is a requirement for this paper. Candidates who do not have one are at a severe disadvantage, especially in the modelling task.

General comments

The large majority of candidates produced sustained answers to both **Parts A** and **B**. They usually showed sufficient working to gain credit for communication. Candidates generally showed good communication skills but should note credit is often not possible if a short cut is used. An important numerical skill in the investigation was breaking numbers down into two factors, subject to certain conditions. Candidates are advised to check back to see that answers are consistent with what has gone before.

Candidates could relate well to the practical context of the modelling task. In *Show that* questions, where results appear in the question, it is important to show clearly which operations were used to calculate those results. For graphing questions it is necessary for this task to set the window on the graphics calculator so that the full domain is covered and the height is adjusted to show any local maxima. Sketches should include approximate intercepts, labelled if possible. A rough scale often gains credit for communication in this paper. Candidates should be aware that there is no expectation to solve complex equations algebraically but that they should use the graphics calculator to find the intersection of the relevant functions.

Comments on specific questions

Part A: Investigation

Question 1

This first question was successfully answered by nearly all candidates. It introduced the basic idea of multiplication. Many candidates interpreted the question as requiring a sequence. In this case, credit for communication could not be given.

Answer: 27

Question 2

(a) The table of sequences, number of terms, means and sums was answered well by most candidates, with the most common errors occurring in the last row of the table. For that last row candidates could either write the sequence 24, 25: 2 terms with a mean of 24.5 (totalling 49); or the sequence 4, 5, 6, 7, 8, 9: 7 terms with a mean of 7 (totalling 49). Credit for communication was given for the few candidates who indicated how a cell had been calculated, for example by writing $31 \times 25 = 775$.

(b) Most candidates could successfully define how to calculate the mean using the first and last terms of the sequence. A few descriptions were lengthier than necessary involving subtracting the first term from the last term, dividing by 2 and adding the first term. A small number of candidates wrote about adding all the terms and so did not score the mark and a few described how to find the number of terms. An example to illustrate the method would have gained credit for communication.

Answer: (first term + last term) ÷ 2

Question 3

(a) Nearly all candidates realised the sequence had 100 terms although some wrote 99.

Answer: 100

(b) Those candidates who had the correct description for finding the mean, had little difficulty in writing an expression for this sequence. A few candidates tried unsuccessfully to add all the terms and divide by 100.

Answer: $(2k + 99) \div 2$

(c) To find the sum of the sequence, candidates were expected to multiply their previous answers together. Most were successful. A few candidates introduced the formula for the sum of an arithmetic series, thus making the question more difficult and so those candidates were less successful. This task did not in fact give any advantage to those who knew this formula, which is not part of the syllabus.

Answer: $50(2k + 99)$

Question 4

Here candidates were asked to show that the given expression was the sum of a general sequence of consecutive integers. In such questions it is important to show where the different components come from. Several candidates only stated that the expression was the number of terms times the mean without then identifying the parts of the expression to which they were referring.

Question 5

(a) This question tested communication skills by asking candidates to explain why the expression was an integer when n was odd. There are three parts to that: $n - 1$ is even; the numerator is then an even number plus an even number, which is even; and an even number divides exactly by 2. An omission of just one of these parts was usually not penalised. In spite of that many answers were too vague and seemed to assume that parts were obvious. For instance, an answer that the numerator is even is not sufficient. Some candidates showed the result from numerical examples, which did not gain credit. The successful candidates showed they were competent at dealing with the terms even and odd in calculations. Several candidates lost credit through confusing the terms *even*, *odd, positive*, *negative*, *integer*.

(b) Similar comments to part **(a)** apply. Statements like odd ÷ 2 is not an integer was not precise enough to gain credit.

Question 6

(a) The most efficient way to find the number of terms and the mean for a sequence adding up to 84 was to look at solving $n \times$ mean = 84, subject to the information given in **question 5**. This was a more searching question and produced few completely correct answers. Of the three solutions, the most frequent omission was $n = 8$ with mean 10.5. Some candidates wrote down lots of multiplication pairs making 84 ignoring the results in **question 5**. Several candidates saw the equation $n \times (2k + n - 1)/2 = 84$ as a quadratic equation to solve. This line of approach usually led to little success. A significant number gave n and k but did not calculate the mean. Others spent much time unnecessarily searching for values of k for each value of n.

Answers: n = 3 7 8
Corresponding mean = 28 12 10.5

(b) The required sequences were found by most candidates, even if they had not managed part **(a)**, and those candidates were rewarded for persevering with their less efficient methods. Having written the correct sequences, few returned to part **(a)** to correct their previous answer in the light of what they found.

Question 7

This was a difficult question to which only the best candidates found the correct answer. Credit for communication was given if the candidate identified that the number had to have only even factors (apart from 1). The most common incorrect answers given were all in the twenties.

Answer: 32 (or 64, 128, etc.)

Part B: Modelling

Question 1

(a) While the majority of candidates gave the correct answer, two errors were often seen. One was to multiply rather than divide by 3600 when converting km/h to m/s. The other was to convert to m/min only. Some candidates lost track of a 0 and so ended up with 1.5. In addition to a mark for the correct answer, this question also gave an opportunity for communication. Communication was not rewarded if candidates showed only a short-cut method or knowledge in addition to the syllabus, such as multiplying by $\frac{5}{18}$ or dividing by 3.6.

Answer: 15

(b) Most candidates were able to satisfy themselves that $0.278x$ was correct, but there was a lack of explanation from several. In this *Show that* question, x should have been present in the working from the start. Some candidates assumed too much, for example rewriting $0.000278x$ as $0.278x$ without mentioning kilometres or multiplication by 1000. Others converted m/h to m/min and m/s without mentioning division by 60.

Question 2

The great majority of candidates were successful in finding the expression for the braking distance. Some spoilt their work by writing x as if it should be in m/s. There were a large number of candidates who found $k = 0.008$ correctly but did not write the subsequent expression as required.

Answer: $0.008x^2$

Question 3

(a) This was intended as a straightforward introduction to forming the model. However, many candidates thought that they should be using information from the diagram above and tried to work that into their answer for the number of metres in x kilometres.

Answer: $1000x$

(b) This question wanted candidates to realise that the number of cars will be found by dividing the total distance they travel in an hour by the safety distance between them, which was made up of a reaction distance, a braking distance and the length of a car. Many candidates incorrectly used distance = speed/time in their explanation. Others did not appreciate that the denominator is composed of distances rather than speeds or times. Some only interpreted the terms in the denominator.

(c) The graph of the model was well drawn by many candidates who showed clearly the key features of its shape. Candidates should realise that $x = 0$ gives $N = 0$ in the expression for N, yet some did not take enough care in showing that their graph went through the origin. This may have been due to the way the graph appeared on their graphics calculator. There was an opportunity for communication by giving an approximate scale on the N-axis or by labelling the local maximum with its co-ordinates. Judging by some of the diagrams seen, it appeared that several candidates had not entered the function correctly into their calculator, perhaps omitting the necessary brackets round the denominator. With others it seemed that their window had not been set with x from 0 to 60.

(d) Candidates who had a correct form of the graph usually had little difficulty in finding the maximum value. The exceptions were those who, judging from their answer to part **(c)**, did not possess a graphics calculator and so had no access to this question.

Answer: 1572

(e) (i) A similar comment to that above applies here.

Answer: 22.4 km/h

(ii) A key skill in modelling is to interpret the model in the light of the actual physical situation that it represents. Some candidates showed good understanding here and many commented that a speed of 22.4 km/h is very slow for cars travelling along a road a safe distance apart. Some incorrectly read the question as asking for a particular speed and several referred to the number of cars rather than their speed.

(f) (i) Further evidence of the ability of candidates to think about the context was seen in this question. Even without considering changes in the algebraic model, many understood the situation and concluded correctly that an increase in the average length of a car would decrease the maximum number that could pass safely.

(ii) Although not as successful as in part **(i)** many candidates realised that with longer cars the speed would be greater for the maximum number passing. Candidates could use their graphics calculator to good effect here by replacing the 4 in the model by 5, for example, to see the effect.

Question 4

(a) The majority of candidates understood that, since the reaction time was twice as long, the reaction distance would be $0.556x$. Candidates should remember to keep to three-figure accuracy here as that was what was given in the original model. A common error seen was the doubling of the wrong term or indeed not changing the reaction distance at all. Communication was rewarded in this question for those who indicated that a multiplication by 2 gave $0.556x$.

Answer: $\frac{1000x}{0.556x+4}$

(b) Many candidates sketched the correct graph with some not being careful enough in ensuring it passed through the origin as can be quickly deduced from its equation. Candidates are advised in such questions to adjust the graphics calculator window so that the graph is seen across the whole domain and does not disappear from view at an early stage.

(c) This more challenging question tested algebraic skill, with candidates being expected to find that it was impossible to have 1800 cars passing safely in an hour. Some candidates did not understand, or perhaps did not read, the phrase *Use algebra* and made a conclusion based on work with their graphics calculator. This scored no marks. Some excellent algebra was seen from the successful candidates, who made an equation by setting their model equal to 1800, solved the equation and found that this led to either an impossible equation or one in which x was negative. Some candidates wrongly assumed that the speed could not be larger than 60km/h and made a conclusion based on the number of cars passing at 60km/h. Credit for communication was given to those candidates who showed the first stages of algebraic work.

Question 5

Only a minority of candidates enjoyed success here and found when the two models were equal. Although it was intended as an exercise in the use of the graphics calculator, the equation could also be solved algebraically by equating the denominators of the models. The best responses showed communication of the method by a small sketch illustrating the point of intersection.

Answer: 34.7 km/h

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/63
Paper 63 (Extended)

Key messages

There were many candidates who struggled to get into the modelling task. Candidates should be aware of which formulas they need to learn. Some candidates could not get started on the modelling task because they could not find the area of the circle in the first question.

General comments

In general candidates scored better on the Investigation than the Modelling with some weaker candidates giving up fairly early on in the second section. In general, there was good evidence of communication in both sections and no evidence of candidates running out of time.

Comments on specific questions

Part A: Investigation

Question 1

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

Answer: 30, 26

(b) This was generally correct.

Answer: **(i)** 6 **(ii)** 18

(c) Parts **(i)** and **(ii)** were usually correct, but weaker candidates struggled to form an equation from their two expressions.

Answer: **(i)** $7x$ **(ii)** $14 + 2x$ **(iii)** $x = 2.8$

Question 2

(a) This was usually correct.

Answer: **(i)** xy **(ii)** $2x + 2y$

(b) This was the first challenging question in the paper for many candidates. Most candidates were able to set the equation up but only the stronger could show all the necessary manipulation. Some candidates attempted to justify the equation by substituting values.

Question 3

(a) This was nearly always correct.

Answer: 2.4

(b) This was nearly always correct although a few candidates struggled with the negative value.

Answer: –2

(c) There were many good sketches here. A few weaker candidates lost a mark by only sketching for $x > 2$. The best sketches showed the asymptote and indicated a vertical scale. A very few merely plotted points suggesting they did not have, or could not use, a graphics calculator.

(d) Only the strongest candidates realised that this question related to the section below the *x*-axis on their sketch. Many were confused by being asked for an inequality and there were many apparently random answers seen.

Answers: $x < 2$

Question 4

(a) Strong candidates that had answered **question 2(b)** correctly could usually reproduce their method as a series of inequalities. However many regressed to substituting values. The strongest candidates considered how $x > 2$ impacted on their argument.

(b) Only the very strongest candidates understood to which area of their sketch the inequalities were directing them. Most candidates plotted a point on their curve.

(c) A few candidates did not realise that they simply had to work out the area and perimeter for their point and confused themselves by substituting in the inequality.

Question 5

Many candidates could find the correct answer here. Some used trial and improvement, but plenty could manipulate the algebraic expressions for volume and surface area.

Answer: Side of 6

Part B: Modelling

Question 1

Nearly all candidates were awarded the mark here and most communicated their method clearly. A few struggled to remember the formula for the area of a circle which was a portent for what was to come later.

Answer: 314

Question 2

(a) Most candidates realised that they needed to find $\frac{3}{4}$ of the circle.

Answer: 236

(b) Most candidates showed what happened diagrammatically. This was acceptable.

Question 3

(a) Many candidates showed good quality diagrams with the best showing dimensions clearly.

(b) Many weaker candidates did not have sufficient understanding of the geometry of the scenario to work out areas past this point.

Answer: 239

Question 4

(a) Whilst a number struggled with the inequalities both here and in part **(b)**, many candidates could give an appropriate model. Many gave it in an unsimplified form such as $\pi x^2 - \frac{1}{4}\pi x^2$ and this gained full credit.

Answer: **(i)** $0 < x < 8$ **(ii)** $\frac{3}{4}\pi x^2$

(b) Only the stronger candidates could manipulate the algebra necessary to model this harder situation. It was disappointing that many of the weaker candidates did not understand what was meant by a model and gave numerical expressions.

Answer: **(i)** $8 < x < 15$ **(ii)** $\frac{3}{4}\pi x^2 + \frac{1}{4}\pi(x-8)^2$

(c) Very few of the candidates who could express the model correctly in part **(b)** could go on to analyse this harder situation. Whilst many could get an expression involving $\frac{1}{4}\pi(x-15)^2$ they tended to ignore the term in $(x-8)^2$. This was possibly due to a lack of a good quality diagram. In part **(ii)** most realised the need to put their model equal to 700.

Answer: **(i)** $\frac{3}{4}\pi x^2 + \frac{1}{4}\pi(x-8)^2 + \frac{1}{4}\pi(x-15)^2$ **(ii)** 16.5

(d) This part proved too hard for all but the very best who could manage to interpret their models in relation to the limits of validity from their inequalities.

Answers: 14.1