CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/11
Paper 11 (Core)

Key messages

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

General comment

Workings are vital in 2-step problems, such as **Questions 5**, **17** and **19** as showing workings enables candidates to access method marks if the final answer is inaccurate. Candidates must make sure that they do not make arithmetic errors especially in questions that are only worth one mark when any good work will not get credit if the answer is wrong, for example **Questions 4**, **12** and **15**. Candidates should note the form their answer should take, for example, **Question 16** in terms of π and **Question 19** in standard form.

The questions that presented least difficulty were **Questions 1**, **3**, **4**, **8** and **15**. Those that proved to be the most challenging were **Question 13** simplification of an algebraic fraction, **Question 16** arc length of a semicircle, **Question 21** equation of a line, **Question 22(a)** class interval containing the median and **Question 23** finding the *n*th term of a sequence. In general, it could be seen that candidates attempted most questions as there were few left blank. Those that were occasionally left blank were **Question 7**, **Question 16,** and **Question 21**. **Question 7** was a problem-solving question to find non-adjacent terms in the sequence of triangular numbers.

Comments on specific questions

Question 1

Candidates did very well with this opening question.

Question 2

Some candidates thought that a word or π needed to be inserted into the sentence when what they were being asked was to turn the equation, $d = 2 \times r$, into words. Wrong answers included ‘longer than’, ‘length’, ‘circumference’, ‘radius’ and ‘180’.

Question 3

The very few incorrect answers included 3, $9\sqrt{9}$, 9×9 or 9^2.

Question 4

This was a question that was handled well by a very large majority of candidates. Of those that got the answers wrong, it was clear that they knew which numbers to extract from the table and the method to use. Some of these candidates made arithmetic slips which meant they were awarded zero.

Question 5

This was the first problem-solving problem. The are various method that could have been used but they all depend on knowing the conversion factor between millilitres and litres, 1000 ml equal 1 litre. Stating this conversion factor was not enough for the method mark as a relevant figure from the question had to be converted. Many thought that 5 litres = 500 ml. 10 cups was a common incorrect answer which came from 5×2 instead of using 5×5 or $5 \div \frac{1}{5}$. Finally, the answer 40 (from $200 \div 5$) was given by some candidates.

Question 6

Most candidates used a straight edge and pencil to draw the angle. Some drew an angle of 43 which might be because 50 was found on the protractor then the scale was read in the wrong direction giving 50 – 7 instead of 50 + 7. Others drew the obtuse angle 123 using the wrong scale on the protractor. Some drew their angle in the middle of the line or at the right-hand end instead of at *A*.

Question 7

This was one of the three questions that was most often left blank, which might have been due to fact that the candidates did not recognise the triangle numbers. This question was made more complex as the only adjacent pair of terms was the first two, so the pattern was not obvious. Some did draw diagrams of the triangle numbers and these candidates were likely to gain the two marks. Often, no workings were shown so it was impossible to see what methods were being employed.

Question 8

This was a familiar question that was answered correctly by many candidates. Others gained 1 mark for correct conversions or having three numbers in the correct order.

Question 9

The two points are on the same vertical line, $x = 3$, so it is only necessary to find the y coordinate of the mid-point. Saying this some candidates gave a different x-coordinate. Some used point E to find the x coordinate as the mean of 3 and 7, then the same method with point F. This gives an answer of (5, 7) and is a totally incorrect procedure. Another incorrect method seen was to subtract the coordinates of F from E giving (0, –4). It would have helped if candidates drew a sketch of the two points to focus on what they had been asked to do.

Question 10

Candidates need to recall that like terms can be combined and unlike terms, cannot be combined, so the terms in k can be collect together into one term and the ones with d, into another. Also, with BIDMAS, the subtraction operation only applies to the terms either side and many made errors dealing with the signs.

Question 11

There were many correct answers. Candidates whose first stop was 3×100 frequently went on to get the correct answer. Those that were not successful, often gave the answer 5 per cent, from $15 \div 3$.

Question 12

The correct answer is found by substituting 6 for x in the function, leading to $6^2 - 2 = 34$. Some misunderstood this and wrote $6 = x^2 - 2$, then tried to solve for x. Some started correctly by writing $f(6) = 6^2 - 2$, reached $f(6) = 34$, and then did a further calculation involving the 6, usually $34 \div 6$, spoiling their answer.

Question 13

This was one of the question that candidates found the most challenging. Some understood that this can be written as $\frac{2m}{5} \times \frac{3}{1}$ then went on give the correct answer. Many inverted the first fraction or multiplied both top and bottom by 3 or just the denominator. Others tried to solve an equation in *m*. Those that found the correct fraction sometimes spoiled it by doing more processing so did not gain any marks.

Question 14

Even though this type of transformation question is familiar to candidates, this question was not very well answered. The three items of information that must be given for this transformation are the name, the angle and direction of rotation as well as the centre of rotation. Sometimes the direction was wrong for the angle they stated. Candidates often gave the centre of rotation incorrectly as (4, 3), where the two shapes touch, but the centre was (5, 2). Candidates must remember to just give a single transformation otherwise they will be awarded no marks even if some of the information is correct.

Question 15

A majority of candidates did well here. However, there were those who multiplied the terms correctly and then went further to combine the two unlike terms into one in a similar way to **Question 10**. A few tried to solve an equation, for example 10 = 4y.

Question 16

This was a question that candidates found complex and was sometimes not attempted. There are various aspects to be considered here, first the diameter not the radius was given, the correct formula for circumference (or arc length) and the answer must be given in terms of π. Some candidates who tried to multiply out 3π to give 9.24…, might have been influenced by the fact that the answer line has units of metres but the answer of 3π m is perfectly correct. Some candidates used the area formula.

Question 17

This was another problem-solving question that, this time, combined ratio and geometry. The first stage is to work with the ratio to find there are 12 parts, which means that 180° must be divided by 12 (each part is 15°) then multiplied by 3, 4 and 5 to find the 3 angles. Some candidates showed clear logical workings, gave all 3 answers with no wrong working so gained all the marks. Some ignored the ratio and divided 180° by 3, 4 and 5 in turn to give 60°, 45° and 36°. A quick check to find the total of these angles should have shown there were errors in this method.

Question 18

Solving simultaneous equations is a familiar exercise. It is well worth studying the equations to work out which method is the simplest one to use as there are various methods to eliminate one variable and, in this case, as $x = -2y$, x can be substituted for $-2y$ in the second equation giving $4x = 16$. Many showed little or no working. Candidates should check their answers are correct for both equations as some gave solutions that fitted one equation only. In this case, candidates were awarded one mark for showing some understanding of the process.

Question 19

There were some completely correct answers for 2 marks and other candidates gained 1 mark. Here, the method is to multiply 3 and 4 to get 12 and then add the indices on the 10s to get 6. This value of 12×10^6 gained candidates only a B-mark as this is not in correct standard form. To get both marks, the candidates had to turn the answer into correct standard form with only one digit in front of the decimal point.

Question 20

(a) All 4 elements had to be listed for the single mark – many omitted the 3 which is also in set *B*. Some gave 4 as their answer but this is the number of elements.

(b) This question was not done as well as the last. 3 is the only number in both set *A* and set *B*. As there are 10 numbers all together, the probability is $\frac{1}{10}$. Some gave their answer as 3, $\frac{3}{10}$, $\frac{1}{9}$ or $\frac{1}{4}$ (from using just the total number of elements in set *A*). A probability must never be written as a ratio or using the words, ‘out of’.

Question 21

This was the question most likely to be left blank as well one that candidates found complex. Candidates often find working with the equation of a line problematic. It could be helpful, if candidates draw a diagram to help them visualise the situation as there is no diagram given to aid candidates. All the information required is given in the question without the need to do any calculations. To write down the equation of a line in the form, $y = mx + c$, the gradient, m, and the y-intercept when $x = 0$, c, are required. The question gives the gradient as 1 and the point, (0, 5) giving c = 5, where the line crosses the y-axis. Few recognised that the point (0, 5) gave them the y-intercept.

Question 22

(a) Few candidates were successful here. The form of the answer is given on the answer line with candidates having to insert the ends of the interval. This is, in effect, a multiple-choice question as the answer is one of the 4 given intervals. Some candidates did not write one of the given intervals, for example, $50 < t \leqslant 60$ (which follows the pattern of the intervals) or $8 < t \leqslant 35$ (uses the frequencies). Some candidates wrote $20 < t \leqslant 30$ which might have been because this interval contains 25 which is half of 50. The choice of the interval, $40 < t \leqslant 50$, might have been because that is the modal interval. Not many candidates chose the first interval.

(b) Some candidates understood what was being asked for but made arithmetic slips. It was obvious that some candidates were not certain of what cumulative frequency meant as many repeated the frequencies written in the first table. Candidates were more successful with this than the previous part.

Question 23

There were some fully correct answers here. A common method was to try to use the formula a + (n – 1) d. Candidates often made errors either in recalling this formula or when substituting in values. The most frequent wrong working was to give the next term, 215, or the common difference, –2 (sometimes the common difference was incorrectly given as +2), or nth – 2 or n – 2. There was an added complication in this question as the term in n is negative so sometimes 227 + 2n or 2n – 227 were seen as the answer, the first of these gained a mark but not the second as neither term was correct.

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/12
Paper 12 (Core)

Key messages

To succeed with this paper, candidates need to have completed the full Core syllabus.

Key formulae are provided; candidates need to learn other formulae, such as volume of a cuboid (**Question 10**), simple interest (**Question 14**), angle sum of a polygon (**Question 15**), and $speed = \dfrac{distance}{time}$ (**Question 23**). Candidates need to know how to apply these formulae to solve problems.

Candidates also need to be familiar with the subject-specific vocabulary for this syllabus, including discrete and continuous data (**Question 7**), simple interest and investment (**Question 14**).

Calculators are not permitted on this paper, so candidates need to perform calculations accurately using appropriate non-calculator methods. It is important for candidates to show their working clearly; this is good mathematical practice and allows part marks to be awarded if candidates do not reach the correct final answer. Candidates need to calculate with fractions where appropriate; using non exact decimals introduces errors and leads to a loss of marks. Candidates need to be able to convert between measures such as grams and kilograms (**Question 4**).

General comments

The paper was accessible to all candidates, most attempted every question and reached the end of the paper. A few candidates omitted **Question 6** (cube root of 1000), **Question 10** (volume of a cuboid) and **Question 22** (simultaneous equations).

The questions that presented the least difficulty were **Questions 2**, **4**, **5**, **8** and **9**. Those that proved to be the most challenging were **Question 3** stating the rule to continue a simple sequence, **Question 7** stating whether a set of data is discrete or continuous, **Question 12** finding the interquartile range, **Question 15** finding the number of sides on a polygon when given the sum of its interior angles, **Question 20** completing a Venn diagram, **Question 21** probability of combined events and **Question 23** solving a problem involving speed, distance and time.

Most candidates showed their working; the stronger candidates set their work out clearly and in a logical order. Calculations need to be evaluated correctly, otherwise candidates will not gain full marks. A significant number of candidates lost marks because of basic arithmetic errors. Some worked with decimals, rather than fractions, leading to rounding errors that affected the accuracy of their final answers.

Comments on specific questions

Question 1

This was a straightforward opening question, and most candidates gave the correct answer. Incorrect spelling was condoned if the intention was clear. The most common wrong answer was ‘diameter’. Some gave incorrect words that started with the letters ‘ra’, including radium, radio, and ratio.

Question 2

This was done well, with most candidates reaching the correct answer of 8. Some weaker candidates had difficulty with the idea of complete weeks, with the answers 8.5 and 9 seen on a number of scripts, others made calculation errors, leading to varied answers including 7, 10 and 12.

Question 3

This is a straightforward question where candidates had to state the rule to continue the sequence. An answer of '$\times$ 2' was sufficient to score here. This question caused real difficulty, with fewer than half the candidates gaining the mark. Many answered in words, but some gave answers that were too vague, such as 'Add the previous number' without saying what it was being added to. Others worked out the next term, 96, rather than stating the rule. Many attempted to find the *n*th term rather than stating the term-to-term rule, often giving answers such as $n \times 2$ or $2n$; these did not answer the question and so gained no marks.

Question 4

This was done well, with the majority reaching the correct answer. A few of the weaker candidates used an incorrect conversion factor which usually led to an answer that could not possibly be the mass of a person. Candidates are advised to check that their answers are reasonable in the context of the question.

Question 5

Successful candidates were able to select an efficient calculation strategy and perform it accurately. Those who realised that the cost of posting two letters was $1 almost always went on to reach the correct cost for 160 letters, scoring two marks. Many, particularly the weaker candidates, opted to start by working out 160×0.50 before converting their answer to dollars. This is a completely correct approach, but a significant number made calculation or place value errors when evaluating 160×0.50; these candidates gained M1 for showing the calculation but did not score full marks.

Question 6

This question was done well by some candidates. Some had obviously reached the correct answer, but spoiled it by writing 10^3, which is not correct. A number simply wrote $\sqrt[3]{1000}$ on the answer line, which does not score. 100 was a common wrong answer, suggesting a misunderstanding of what was required here. A few tried to divide 1000 by 3 or found the square or cube of 1000.

Question 7

All attempted this question. A few candidates produced completely correct answers and some scored B1 for 3 correct. Many did not score at all, showing that they did not have a good understanding of discrete and continuous data.

Question 8

This was done well, with most giving the correct answer.

Question 9

Most did well here, and the majority gave the correct answer. Some made sign errors, in some cases writing $4 - 9 = 5$ as part of their working. A few gave the answer -0.33, suggesting they had evaluated the bracket correctly, then divided the answer by 15, rather than performing the division in the correct order. This suggests a significant misconception about order of operations; candidates need to understand that evaluating a bracket first does not change the order of the remaining calculation.

Question 10

The majority reached the correct answer here with many also showing clear working. Some worked out the total surface area, rather than volume, whilst others added the three dimensions. A few showed no working at all, and a small number omitted this question entirely.

Question 11

The strongest candidates overall often gave the correct answer here; the weaker candidates frequently had some difficulty. A common error was to list all the integers between 2 and 10, rather than just the even numbers. A small number identified the even numbers, but did not interpret the inequality signs correctly, so they included 2 or 10 in their answers.

Question 12

This proved to be a challenging question and very few candidates gave fully correct answers. A minority reached the stage of identifying either the upper or lower quartile, gaining 1 mark. Some were clearly attempting to find quartiles but made errors when doing this. Some candidates circled or crossed out values in the list to try to locate the quartiles, but this approach often led to errors. A few attempted to find quartiles, then added the results. A very common response was to find the range rather than the interquartile range.

Question 13

There were many good answers to this problem requiring proportional reasoning with various correct methods seen. Some candidates found out how much yellow was needed for 1 litre of red paint, then multiplied this by 3; others worked out that 10 litres is 5 times as much as 2 litres and then multiplied 3 by 5. A common wrong answer was 11. In some cases, this was from calculating the difference between 2 and 10 and then adding it to 3; in others, candidates incorrectly reasoned that 1 more litre of red paint was being used so they needed to use 1 more litre of yellow. Neither of these approaches show any understanding of ratio.

Question 14

Many candidates used a correct method for calculating the interest, gaining 1 mark. A significant number did not go on to find the value of investment. Careful reading of the question and highlighting key words could help candidates to identify exactly what is required of them. Another common error was to multiply 400 by 2, but to omit the division by 100, reaching a value of $800 for the interest.

Question 15

This was one of the most challenging questions on the paper and only a minority reached the correct answer. Many attempted to use a formula for the sum of interior angles, but a large number of candidates wrote an incorrect formula, for example $\frac{180(n-2)}{n} = 720$. Some divided 720 by 180 and gave the answer 4, omitting the final step. A large number showed incorrect calculations involving 360. A significant number showed no working at all.

Question 16

Most drew a ruled line. Many of these lines were within the required tolerance but some did not pass through the mean. A significant number joined the line to the origin or drew lines that zigzagged from point to point.

Question 17

There were some very good responses with clear working that led to the answer. Many candidates made sign errors when collecting terms. Some collected the terms correctly, but then made a sign error when performing the final division, leading to the common wrong answer 2.

Question 18

Most attempted to write the number in the required form with many reaching the correct answer. A considerable number made place value errors, for example adding seven zeros after 102.

Question 19

There were some good answers here. Sign errors were common, some candidates reached the correct values but did not associate them with the correct component, putting c = 2 and d = –4. A number of candidates did not attempt this question, leaving it completely blank.

Question 20

Almost all candidates attempted this question and wrote integer values in the Venn diagram. Only a minority gave a fully correct answer. Some candidates realised that sandwiches ∩ fruit = 20, gaining 1 mark. A few found the total of 30, 40 and 70, but did not subtract 120 and so did not get far enough for 1 mark to be awarded. A number of candidates made some progress by placing three integers with a total of 50 in the regions for sandwiches and fruit; others found three integers that gave the correct totals of 30 for sandwiches and 40 for fruit. Both these approaches showed sufficient understanding for 1 mark to be awarded. Many simply wrote 30, 40 and 70 in the Venn diagram, leaving the section for sandwiches ∩ fruit blank. This showed no understanding and consequently no marks were awarded.

Question 21

This question should be familiar to candidates, but there were few fully correct answers. Most realised the need to use fractions and common wrong answers included $\frac{1}{6}$, $\frac{2}{6}$ and $\frac{2}{12}$, often without any working. Some used $\frac{4}{6}$ in working, suggesting a misconception that P(4) will include the value of 4 in the numerator. Denominators of 21 were seen; 21 is the sum of the integers on the spinner. Many added two probabilities rather than multiplying them.

Question 22

This was a straightforward question that should be familiar to candidates. There were some excellent responses with very clear working. Both elimination and substitution methods were seen. Some candidates made sign or arithmetic errors when solving. Some showed no working at all. A number were able to gain 1 mark for a pair of values that fitted one of the given equations.

Question 23

Many candidates were able to gain 1 mark for calculating the journey time in minutes. Candidates then had to convert this to hours, but many were unable to convert 12 minutes to $\frac{1}{5}$ or 0.2 hours. Those that did were usually able to calculate $200 \times \frac{1}{5}$ or 200×0.2, reaching the correct final answer. A number omitted the time conversion but found 200×12 minutes, reaching 2400 and gaining two marks for having two steps out of three correct.

Question 24

Many identified the need for a common denominator here. The simplest approach was to convert one fraction to reach a common denominator of 8. Converting both fractions to have a denominator such as 16 or 32 is also possible, but this has a greater chance of an arithmetical slip being made. A few candidates who took this approach gave a fraction that was correct, but not simplified. Some used a correct common denominator, but made errors with the numerators, for example writing $\frac{3a}{8} + \frac{a}{8}$, so no marks were awarded. The most common error was to add the given numerators and denominators, reaching the incorrect answer $\frac{4a}{12}$.

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/13
Paper 13 (Core)

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CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/21
Paper 21 (Extended)

Key messages

To succeed with this paper, candidates need to have completed the full syllabus.

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

Candidates should be encouraged to check their answers are sensible, by using suitable methods, e.g. substitution and reversing calculations.

Candidates are reminded to read questions carefully, focusing on key words or instructions.

General comments

Candidates scored across the full mark range on this exam.

Candidates did not seem to be as fully prepared for this paper as in previous years and found **Questions 8**, **11** and **14** very challenging.

Some candidates lost marks through careless numerical slips, which was noticeable in **Questions 3** and **7(a)**.

Candidates should make all of their working clear to enable them to access method marks in multi-step problems, especially in **Question 14** where there were many method marks available.

Candidates should always leave their answers in their simplest form.

Comments on specific questions

Question 1

Candidates performed well on the opening question using their knowledge of angles in parallel lines. The common wrong answer of 75 could have been avoided if candidates had realised that x was an obtuse angle.

Question 2

(a) This question was not well answered and candidates struggled with interpreting data in a frequency table. Sometimes an answer of 5 was seen, showing some understanding of looking for the most popular score, but giving the frequency rather than the score.

(b) Candidates struggled finding the interquartile range from a simple frequency table. Candidates who wrote the scores as a list were usually more successful. A common error was to subtract 2.5 from 7.5 to give an answer of 5.

Question 3

Mostly correct answers were seen in calculating the mid-point. Occasionally candidates subtracted the values before dividing by 2 and there were arithmetic slips, usually with the negative value for the *x*–coordinate.

Question 4

(a) Candidates struggled to round to significant figures and it was common to see the zero omitted.

(b) This was well attempted but some candidates lost marks by leaving their answer as 5^2 or $\sqrt{625}$.

(c) This showed a poor understanding of modulus notation and many candidates omitted –1 and occasionally 0.

(d) This part was not well answered. Although most candidates wrote a common factor, i.e. 2 or 3, it was not the HCF. Occasionally candidates gave the LCM.

Question 5

This question was well attempted however candidates should realise that they do not need to include units in their formula. Many candidates seemed unfamiliar with shorthand notation.

Question 6

Most of the candidates found the next term correctly by looking at the differences between terms rather than recognising the square numbers. Most candidates did realise that the sequence was quadratic with the second differences being constant.

Question 7

(a) The majority of students were able to substitute the values into the formula but there were many errors in either evaluating the cubes or in the final addition.

(b) Most candidates attempted to subtract and cube root but not always in the correct order.

Some candidates spoilt their final answer by rewriting their formula as $h = \sqrt[3]{J} - k$.

Question 8

Many candidates failed to recognise the need to use Pythagoras' theorem. Of those who did, it was still common to find them simply squaring and adding, whereas they needed to subtract their squares before square rooting because they were calculating the length of one of the shorter sides.

Question 9

It was rare to see the correct fraction answer although many picked up a mark for $\frac{2}{7}$ or $\frac{1}{6}$ seen.

Question 10

This question showed a weak understanding of the laws of indices. Candidates who rewrote 25 as 5^2 were usually more successful.

Question 11

This was a challenging question for many candidates with very few realising the need to replace *h* with 2*r* in their formula. Work was often poorly set out and difficult to follow.

Question 12

Most of the candidates recognised at least one of the circle theorems.

Question 13

This was very well attempted and executed with standard working shown. The main errors were to miss the inverse or square root in their formula.

Question 14

This proved to be a very demanding question. The multi-step nature of the question demands clear working from candidates in order to gain method marks following an incorrect final answer.

Candidates initially had to rearrange the equation of the given line to find the gradient. Then they had to find the negative reciprocal of this to find the gradient of line *L*. Finally, they should have substituted the values of $x = 2$ and $y = 3$ and $m = 2$ into $y = mx + c$ to find the final correct equation of the line.

Question 15

Many candidates started this question well and attempted to multiply top and bottom by $\sqrt{5}+1$. Many mistakes were then seen when squaring $\sqrt{5}$ on the numerator and expanding and simplifying the double brackets in the denominator.

Question 16

There was evidence that candidates were able to use the laws of logs however the main problem here was candidates not recognising that $2 = \log 100$.

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/22
Paper 22 (Extended)

Key messages

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

Candidates need to be familiar with significant figures when there is a ‘zero’ in ‘the middle’ of a number.

Candidates need to know the difference between an irrational number and a recurring decimal.

Candidates should be familiar with Venn diagrams and their applications.

Candidates need to realise that if an algebraic fraction is equal to zero then the numerator must be zero.

General comments

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

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

Candidates should make all of their working clear and not merely write a collection of numbers scattered over the page.

Some candidates lost marks through incorrect simplification of a correct answer.

Comments on specific questions

Question 1

This question was well answered by virtually all of the candidates. A small number of candidates gave their answer as –3.

Question 2

This question was a good discriminator. Although the modal mark was 1, many candidates gave their answer as 4050, as they didn’t realise that ‘0’ could be a significant number.

Question 3

This question was correctly answered by nearly all of the candidates.

Question 4

This question was correctly answered by nearly all of the candidates.

Question 5

Nearly all of the candidates scored the mark in **part (a)**.

The range was slightly more challenging with a number of candidates giving their answer as 1 to 7 rather than 6.

Question 6

This question was correctly answered by nearly all of the candidates.

Question 7

This question was more challenging as the modal mark was 0.

There were many correct answers with candidates giving their answer as π, or a correct square root, e.g. $\sqrt{10}$, but the most popular (incorrect) answer was to give a recurring decimal.

Question 8

This question was correctly answered by nearly all of the candidates.

Question 9

Nearly all of the candidates scored full marks.

Question 10

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

(b) Candidates found this part more demanding, although the modal mark was 3. Some candidates were unable to find the gradient of the perpendicular line, others lost marks by not substituting the correct point into their equation of the line.

Question 11

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

(b) This part proved to be more challenging. The most popular correct answer was $P \cap Q'$, although some candidates correctly defined the region with a more complicated expression.

(c) This part was a good discriminator. Many candidates were able to give the correct values inside the two circles but were unable to correctly find the value of ‘11’ for the region inside the universal set but outside the two circles.

Some candidates simply wrote the values of 15 and 14 in the circles for *A* and *C* without considering the ‘5’ in the intersection.

Question 12

Nearly all of the candidates were able to score at least one mark on this question but less than half of the candidates scored full marks.

Candidates were able to substitute the correct values into the quadratic formula but were then unable to simplify the expression $\frac{2 \pm \sqrt{28}}{2}$ correctly.

Question 13

Many candidates scored full marks. Candidates realised how to find the magnitude of a vector. Some candidates made careless slips when squaring –6.

Question 14

This question was poorly answered, with modal mark being 1. Candidates realised that initially they had to either combine the fractions or eliminate the fractions.

There were careless slips when simplifying – (x – 1).

Many candidates who had scored the first method mark were unable to solve the fractional equation equal to zero, with the common error being equating the denominator to zero.

Question 15

(a) Although the majority of candidates correctly found the value of a, finding the value of b was more demanding with 180 being a common incorrect answer.

(b) The majority of candidates scored this mark. The most common incorrect answer was 90.

Question 16

(a) Nearly all of the candidates scored this mark.

(b) This question was well answered with the majority of candidates scoring full marks, showing an excellent understanding of the rules of logs.

Marks were lost with candidates combining 'numbers' correctly but missing out 'log' in their final answer.

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/23
Paper 23 (Extended)

Key messages

Candidates need to read and answer the questions carefully.

Candidates need to be able to work with tricky standard form questions.

Candidates need to be familiar with significant figures when there is a 'zero' in 'the middle' of a number.

Candidates need to know the meaning of 'relative frequency'.

Candidates need to be familiar with circle theorems.

Candidates need to be familiar with trigonometric values of key angles.

General comments

The majority of candidates were well prepared for the paper and demonstrated very good algebraic skills.

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

Candidates should make all of their working clear.

Candidates should always leave their answers in their simplest form.

Some candidates lost marks through incorrect simplification of a correct answer.

Comments on specific questions

Question 1

(a) Nearly all candidates scored this mark. The most common incorrect answer given was 0.0301.

(b) This part proved to be far more challenging with 0.0301 being the most common, but incorrect, answer given.

Question 2

Less than half of candidates gave the correct answer. Candidates who drew a sketch of a kite were more successful.

Question 3

The majority of candidates scored full marks. The common slips occurred when simplifying a correct answer.

Question 4

(a) This part was well answered, although there were some careless mistakes when dealing with the negative sign.

(b) Nearly all of the candidates scored this mark as this followed through from their answer to **part (a)**.

Question 5

(a) This part was poorly answered. Candidates did not know how to complete the relative frequency as the majority completed a cumulative frequency table.

(b) This part was well answered with the majority of candidates giving the correct answer of 84.

Question 6

The majority of candidates scored full marks in this question.

Some of the other candidates correctly identified that there were 12 parts, but then divided 360 by 12.

Question 7

This question provided a good test of indices and standard form, but unfortunately the modal mark was zero.

Some candidates were able to find a correct value, but not in standard form, to score 1 mark.

Question 8

(a) Nearly all of the candidates gave the correct answer of 26.

(b) This part was very well answered. Some candidates realised that the expression had to be a quadratic, other candidates worked out 'difference' rows before coming up with the same correct answer.

Question 9

This question tested the understanding of similar figures.

There were very few correct answers. The majority of candidates simply used the ratio of volumes as 30 : 24.

Candidates who correctly used the ratio of the cube of lengths nearly always went on to score full marks.

Question 10

This question proved to be tricky with many candidates knowing some circle theorems but not having a complete understanding, as there were very few candidates who scored full marks.

The alternate segment theorem in **part (b)** proved to be the most troublesome.

Question 11

There were many good attempts to expand double brackets but difficulties arose with multiplying $2\sqrt{3}$ with $-\sqrt{3}$ correctly.

Some candidates lost the final mark by not simplifying 20 – 6.

Question 12

This question gave candidates the opportunity to show their clear understanding of proportionality with nearly all of the candidates scoring full marks.

Question 13

This question was very demanding for candidates.

The modal mark was 1, which was earned by candidates using the correct formula to find the area of the sector.

Very few candidates realised that they could use $\frac{1}{2} \times 6^2 \times \sin 30$ to find the area of the triangle.

A small number of candidates quoted $\sin 30 = 0.5$ for 1 mark.

Question 14

The majority of candidates showed an excellent understanding of the rules of logs and scored full marks.

The main problem for candidates was not recognising that $3 = \log 1000$.

Some candidates lost the last mark as they gave their answer as 2 rather than $\log 2$.

Question 15

This question was a good discriminator with only the strongest candidates scoring full marks.

The majority of candidates were able to score the first method mark for finding the common denominator but were then careless with the signs in the expansion of their brackets in the numerator.

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/31
Paper 31 (Core)

Key messages

Candidates should ensure that full use is made of all the functions of the graphic display calculator that are listed in the syllabus.

Candidates should be encouraged to show all their working out especially for questions worth more than one mark.

Teachers should ensure that candidates are familiar with command terms.

General comments

Most candidates attempted all the questions, so it appeared as if they had sufficient time to complete the paper. There was also a wide range of marks that indicated that the questions were at the correct standard for Core candidates.

This session most candidates appeared to have a graphic display calculator and knew how to use it to draw graphs and find intersection points accurately. Many candidates did not have mathematical instruments with them. A ruler is needed to draw straight lines and measure the length of lines and a protractor for measuring angles and drawing pie charts.

Candidates should be careful when writing their answers. If no specific accuracy is asked for in the question, then all answers should be given exactly or correct to three significant figures. Many marks were lost because working out was not written down and the answer given to only one or two significant figures. Also, in some cases the answer was given to three significant figures but was rounded incorrectly. If the unrounded answer was shown, then the candidate could be awarded a mark if it was correct. But, if the unrounded answer was not seen, then all marks were lost.

Candidates should be aware that if the question states ‘Write down’ then they do not have to work anything out. Candidates should be familiar with correct mathematical terminology. Many candidates had problems with the ‘show that’ question. They must learn that you cannot use what you are expected to ‘show’ and work backwards.

Comments on specific questions

Question 1

(a) Only about half of the candidates managed to write the number correctly. The other half wrote 8502 instead.

(b) Many candidates could write the fraction correctly.

(c) Rounding to the nearest 10 proved challenging for some candidates. Many candidates were awarded a method mark for writing 357.9.

(d) Many candidates lost marks here. Some worked the problem out incorrectly on their graphic display calculator and found an answer of 18.76. Others were awarded method marks for writing 1.1057… before an incorrect answer. Those candidates who just wrote 1.105 with no working out seen were awarded 0 marks.

(e) Nearly all candidates managed to correctly write down the next 2 terms in the sequence.

(f) Most candidates found the correct amount and correct change.

(g) Fewer candidates were able to find both the HCF and LCM. More candidates knew how to find the HCF than the LCM.

Question 2

(a) A good number of candidates knew how to set up a correct stem-and-leaf diagram. A few forgot to complete the key. Some candidates missed this part out and others had various wrong answers such as 20, 30, etc. in the stem and then 24, 29, etc. in the leaf.

(b) (i) Most candidates could find the mode correctly.

(ii) There were fewer correct answers for the median with 42 and 48 being common answers.

(iii) Very few candidates knew how to find the IQR. They should have put the numbers into a list on their calculator and then used the calculator to find one-variable statistics. This gives them all the information they need to find the IQR. Many candidates found the range of the numbers instead.

(iv) Many managed to find the correct answer for the mean of the numbers even if this was calculated the ‘long way’ by adding up the numbers and dividing by 15.

Question 3

(a) The simple interest was well attempted by many candidates. A few forgot to add on the 12 000 and some others attempted to use the compound interest formula instead of the simple interest formula. Some candidates forgot to divide by 100.

(b) It appeared as if many candidates did not have a protractor to measure the angles correctly in the pie chart. Many candidates who attempted the question managed to work out the 120° angle correctly.

Question 4

(a) Most candidates managed to work out the total distance correctly.

(b) Only a few candidates found the correct time for one lap. Many used the total distance rather than the length of one lap. If the candidate found an incorrect answer but then converted it correctly to minutes and seconds, they were awarded 1 mark.

(c) Changing km / h to m / s proved challenging for many candidates. A good number knew that there were 1000 m in 1 km and gained 1 mark for multiplying 290 by 1000.

(d) A good number of candidates found the correct attendance. Some made a mistake writing the 90 million and put too few zeros, but, if they divided their number correctly by 450 then they were awarded 1 mark.

Question 5

(a) Most candidates knew that the probability was $\frac{1}{6}$. A few only wrote down 16% and so were not awarded the mark.

(b) The most common answer here was $\frac{2}{12}$. Only a few knew to multiply the 2 fractions.

(c) Many correct answers were seen in this part. A few candidates divided 300 by 5 instead of 6.

Question 6

(a) Most candidates managed to find the coordinates of the 2 points correctly. Only a few put the x-coordinate and y-coordinate the wrong way around.

(b) Fewer candidates knew the correct name for the quadrilateral. Rectangle and trapezium were common incorrect answers.

(c) The majority of candidates found the correct area with only a few forgetting to divide by 2.

(d) Many candidates thought that there were 2 or 4 lines of symmetry. Only a few knew that the answer was 0.

(e) Most candidates were able to find the correct order of rotational symmetry.

Question 7

(a) Nearly all the candidates managed to plot the 4 points correctly.

(b) Most candidates knew that it was a positive correlation.

(c) Many candidates drew a line that was within the tolerance, but it did not pass through the mean point. Some others just joined up all the points that were plotted. Not all candidates had a ruler to draw a straight line.

(d) Most candidates who drew a straight line managed to find the correct answer to this part.

Question 8

(a) Most candidates found the correct amount. Only a few multiplied by 85 instead of adding it.

(b) Many candidates found the correct time. A few managed to get a method mark for writing the correct numbers in the formula but then worked it out incorrectly.

(c) There were many good attempts at rearranging the formula seen.

Question 9

(a) The function question was answered well by many candidates.

(b) Both equations were well answered with only a few candidates making mistakes when rearranging.

(c) The inequality was fairly well answered. Some candidates did work out the correct values of the 2 numbers before adding the less than symbol.

(d) Those candidates who knew how to factorise did well with only a few taking out only the 3 or only the y.

(e) Many candidates found the correct value for x in both parts.

Question 10

(a) The majority of candidates managed to find all 4 angles correctly. One or two gave the reflex angle rather than the acute angle but, since this was not specified in the question, they were awarded the marks.

(b) A good number of candidates knew how to find the missing angle. Those who did not, usually were awarded 1 mark for adding up the other angles correctly to get 770.

Question 11

(a) The area of the triangle was found correctly by most candidates.

(b) Those candidates who knew Pythagoras' theorem managed to find the length correctly.

(c) This part proved to be difficult for the candidates. Many left this part blank or tried to use Pythagoras' theorem incorrectly. Very few tried to use their answers to **parts (a)** and **(b)** as was stated in the question.

Question 12

(a) This 'show that' question was performed correctly by only a handful of candidates. The majority of candidates used the answer in the formula for the surface area and showed that it was equal to 581. No marks were awarded for this.

(b) Many candidates found the correct volume for the sphere. Only a few wrote $\frac{3}{4}$ instead of $\frac{4}{3}$.

(c) Not very many candidates used the cube root of their answer to **part (b)** to find the length of one side of the square. The most common wrong method was dividing their answer to **(b)** by 4.

Question 13

(a) It was clear from this question that not all candidates had a graphic display calculator and some of those who did, did not know how to use it properly. A good number managed to find (0, –1) but few found the second point correctly.

(b) Those who knew how to use their calculator knew how to find the maximum point but many of the answers had rounding errors. The candidates need to remember that their answers must be correct to 3 significant figures.

(c) Both in this part and **part (b)**, it appeared as if some candidates were using the 'trace' function on their calculator. This does not give an accurate answer. They should use the calc-maximum or calc-minimum function.

(d) Only a few candidates realised that they had to use their answers to **parts (b)** and **(c)** to answer this part of the question. It was not well attempted.

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/32
Paper 32 (Core)

Key messages

To succeed in this paper, it is essential for candidates to have completed the full syllabus coverage.

Candidates should be encouraged to show all their working out especially for questions worth more than one mark.

Candidates should ensure that full use is made of all the functions of the graphic display calculator that are listed in the syllabus.

General comments

Candidates continue to perform quite well on this paper. Many were well prepared and were able to demonstrate a sound understanding of the syllabus content. Presentation of work continues to improve with most showing their working and not just writing down answers. Calculators were used with confidence, though it does appear that some do not have a graphical calculator, as the syllabus requires. Candidates had sufficient time to complete the paper.

Work on Algebra questions continues to show improvement. Most candidates have a firm grasp of the conventions and procedures required. In Statistics, a stem-and-leaf diagram appears to be a topic unfamiliar to many. Number work is sound though some candidates continue to use 'pencil and paper' methods to solve arithmetic problems (not always successfully), even when they have a calculator available.

Comments on specific questions

Question 1

(a) The vast majority of candidates could write down the coordinates correctly.

(b) The favoured way of finding the coordinates of the mid-point was to use the formula involving the end points of the line. This was often evaluated incorrectly.

(c) The point was invariably plotted correctly.

(d) Most candidates could draw a line through *C* that was roughly parallel to *AB*.

(e) Drawing a line through *B* perpendicular to *AB* caused many more problems than in **part (d)**. A large number drew a horizontal line or a vertical line.

Question 2

(a) **Parts (i)** and **(ii)** of this question were answered well with few errors. Candidates' understanding of writing a value to a number of significant figures caused problems with some writing 18, forgetting the trailing zeros, while others introduced a decimal point or rounded or truncated the final two digits in the number.

(b) There was some confusion between factors and multiples in the first two sections of this part though many knew the difference. In **part (iii)**, most candidates correctly identified a prime number in the range though some gave values outside the range.

(c) When a calculator was used, answers here were invariable correct. Some, however, tried to work the powers out 'by hand', not always successfully.

(d) **Part (i)** was answered successfully by most. In **part (ii)**, those who chose to change the fractions to decimals to make their comparison fared better. Less successful were those who changed to fractions with a common denominator. Others seemed to guess the order.

(e) Once again, candidates who knew how to use their calculator to subtract and multiply the fractions usually ended up with correct answers. Those who worked them out 'by hand' did less well. This was particularly true with **part (ii)** where an incorrect answer of $\frac{11}{60}$ as common.

Question 3

(a) There were many fully correct answers here. Some candidates occasionally made a slip and got one of the parts of the final expression wrong.

(b) Again, there were a number of correct answers though some candidates only partially factorised the expression. A small number made false attempts to factorise.

(c) There were many correct answers to the solution of the equation. A few did make an occasional slip in their manipulation of the equation.

(d) In **part (i)**, dealing with the inequality was less successful. Many seemed to be put off by the inequality sign. Some reversed the sign at the final stage when dividing by 3. In **part (ii)**, 'integer' was a stumbling block. An answer of 1.9 was common. There were many wrong answers that appeared to be guesses.

Question 4

The whole of this question was answered well with few errors made in any of the parts.

Question 5

(a) Though many understood the complexity of the question, some failed to realise that the total included the cost of 12 golf balls, not just 3.

(b) Most knew how to find the percentage of an amount. However, some only found the reduction in the cost and others only found the reduced price for one player. A few tried to include the cost of purchasing golf balls as well.

(c) The majority correctly found the number of males and females. A common wrong method was to divide 288 by 5 and by 4 to find the answers.

(d) There were many correct answers for the mean and the median with a few mixing the two values. In **part (iii)**, it was evident that some candidates had not come across stem-and-leaf diagrams and did not know how to display the data on the grid. Of those who made a correct attempt, a small number made the odd slip and a few omitted to complete the key. This topic needs further work by some centres. In **part (iv)**, the range was usually found correctly and most made a good attempt at **part (v)**, though many only found one of the two possible answers.

Question 6

(a) Most did not know the mathematical name of the quadrilateral and only a very small number knew that 'it has one pair of parallel sides' was the description needed in **part (ii)**. Clearly, some candidates did not have access to a protractor to answer **part (iii)**. There were many guesses. A small number read the scale on the protractor incorrectly and gave an answer of 146° instead of 34°

(b) There were many correct answers to both parts of this question.

(c) In **part (i)**, most candidates realised that they could split the shape into a rectangle and a triangle to work out the area of the trapezium. However, in many cases this was not completed successfully. A few knew the area of a trapezium formula and applied it correctly. When finding the perimeter in **part (ii)**, most did use Pythagoras' theorem to find the length of the fourth side, though this was not always done correctly.

Question 7

(a) & (b) Invariably, the graph was used correctly to find the answers.

(c) Along with a good number of fully correct answers, there were those that had an equation with either the gradient correct or the intercept correct but not both. Some remembered the formula for finding the gradient incorrectly and found 'change in *x* divided by change in *y*' rather than the other way round.

(d) A lot knew to substitute 350 for the value of *x* in their equation to find the answer. However, a similar number of candidates did not know how to proceed even though the question indicated that they should use their answer to **part (c)**.

Question 8

Many correctly found the area of the circle but then did not know how to proceed to find the length of the side of the square. A common wrong approach was to divide by 4 instead of taking the square root.

Question 9

(a) Both parts of this question were answered well by most candidates. A common wrong answer to **part (ii)** was $5x^5$.

(b) Many obtained the correct 4 terms on multiplying out the brackets. Though most of these went on to combine the terms correctly, some made errors.

(c) A pleasing number of candidates were able to rearrange the formula correctly. Others failed to realise that multiplying by 2 was the first step needed.

Question 10

(a) The key to a successful solution was finding angle *YXZ* to be 40°. Those that managed to do this often went on to a correct answer. Some others, with an incorrect value, did go on and use a correct method to find *XY*.

(b) As in **part (a)**, many candidates were unsure about bearings and which angle was needed.

Question 11

(a) There were many correct sketches. Some plotted points to establish the shape of the curve. A small number did not attempt the question; maybe they did not have a graphical calculator. There were many correct answers for coordinates of the minimum. Surprisingly a lot of answers were spoilt by the omission of a negative sign in the *y*-coordinate.

(b) Again, there were many correct sketches of the required graph.

(c) Many candidates correctly found the *x*-coordinate of both points of intersection. Some found just one of these.

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/33
Paper 33 (Core)

Key messages

To succeed in this paper, it is essential for candidates to have completed the full syllabus coverage.

Candidates should be encouraged to show all their working out especially for questions worth more than one mark.

Candidates should ensure that full use is made of all the functions of the graphic display calculator that are listed in the syllabus.

General comments

Candidates continue to perform quite well on this paper. Many were well prepared and were able to demonstrate a sound understanding of the syllabus content. Presentation of work continues to improve with most showing their working and not just writing down answers. Calculators were used with confidence, though it does appear that some do not have a graphical calculator, as the syllabus requires. Candidates had sufficient time to complete the paper.

Work on Algebra questions continues to show improvement. Most candidates have a firm grasp of the conventions and procedures required. In Statistics, a stem-and-leaf diagram appears to be a topic unfamiliar to many. Number work is sound though some candidates continue to use 'pencil and paper' methods to solve arithmetic problems (not always successfully), even when they have a calculator available.

Comments on specific questions

Question 1

(a) The vast majority of candidates could write down the coordinates correctly.

(b) The favoured way of finding the coordinates of the mid-point was to use the formula involving the end points of the line. This was often evaluated incorrectly.

(c) The point was invariably plotted correctly.

(d) Most candidates could draw a line through *C* that was roughly parallel to *AB*.

(e) Drawing a line through *B* perpendicular to *AB* caused many more problems than in **part (d)**. A large number drew a horizontal line or a vertical line.

Question 2

(a) **Parts (i)** and **(ii)** of this question were answered well with few errors. Candidates' understanding of writing a value to a number of significant figures caused problems with some writing 18, forgetting the trailing zeros, while others introduced a decimal point or rounded or truncated the final two digits in the number.

(b) There was some confusion between factors and multiples in the first two sections of this part though many knew the difference. In **part (iii)**, most candidates correctly identified a prime number in the range though some gave values outside the range.

(c) When a calculator was used, answers here were invariable correct. Some, however, tried to work the powers out ‘by hand’, not always successfully.

(d) **Part (i)** was answered successfully by most. In **part (ii)**, those who chose to change the fractions to decimals to make their comparison fared better. Less successful were those who changed to fractions with a common denominator. Others seemed to guess the order.

(e) Once again, candidates who knew how to use their calculator to subtract and multiply the fractions usually ended up with correct answers. Those who worked them out ‘by hand’ did less well. This was particularly true with **part (ii)** where an incorrect answer of $\frac{11}{60}$ as common.

Question 3

(a) There were many fully correct answers here. Some candidates occasionally made a slip and got one of the parts of the final expression wrong.

(b) Again, there were a number of correct answers though some candidates only partially factorised the expression. A small number made false attempts to factorise.

(c) There were many correct answers to the solution of the equation. A few did make an occasional slip in their manipulation of the equation.

(d) In **part (i)**, dealing with the inequality was less successful. Many seemed to be put off by the inequality sign. Some reversed the sign at the final stage when dividing by 3. In **part (ii)**, ‘integer’ was a stumbling block. An answer of 1.9 was common. There were many wrong answers that appeared to be guesses.

Question 4

The whole of this question was answered well with few errors made in any of the parts.

Question 5

(a) Though many understood the complexity of the question, some failed to realise that the total included the cost of 12 golf balls, not just 3.

(b) Most knew how to find the percentage of an amount. However, some only found the reduction in the cost and others only found the reduced price for one player. A few tried to include the cost of purchasing golf balls as well.

(c) The majority correctly found the number of males and females. A common wrong method was to divide 288 by 5 and by 4 to find the answers.

(d) There were many correct answers for the mean and the median with a few mixing the two values. In **part (iii)**, it was evident that some candidates had not come across stem-and-leaf diagrams and did not know how to display the data on the grid. Of those who made a correct attempt, a small number made the odd slip and a few omitted to complete the key. This topic needs further work by some centres. In **part (iv)**, the range was usually found correctly and most made a good attempt at **part (v)**, though many only found one of the two possible answers.

Question 6

(a) Most did not know the mathematical name of the quadrilateral and only a very small number knew that ‘it has one pair of parallel sides’ was the description needed in **part (ii)**. Clearly, some candidates did not have access to a protractor to answer **part (iii)**. There were many guesses. A small number read the scale on the protractor incorrectly and gave an answer of 146° instead of 34°

(b) There were many correct answers to both parts of this question.

(c) In **part (i)**, most candidates realised that they could split the shape into a rectangle and a triangle to work out the area of the trapezium. However, in many cases this was not completed successfully. A few knew the area of a trapezium formula and applied it correctly. When finding the perimeter in **part (ii)**, most did use Pythagoras' theorem to find the length of the fourth side, though this was not always done correctly.

Question 7

(a) & (b) Invariably, the graph was used correctly to find the answers.

(c) Along with a good number of fully correct answers, there were those that had an equation with either the gradient correct or the intercept correct but not both. Some remembered the formula for finding the gradient incorrectly and found 'change in *x* divided by change in *y*' rather than the other way round.

(d) A lot knew to substitute 350 for the value of *x* in their equation to find the answer. However, a similar number of candidates did not know how to proceed even though the question indicated that they should use their answer to **part (c)**.

Question 8

Many correctly found the area of the circle but then did not know how to proceed to find the length of the side of the square. A common wrong approach was to divide by 4 instead of taking the square root.

Question 9

(a) Both parts of this question were answered well by most candidates. A common wrong answer to **part (ii)** was $5x^5$.

(b) Many obtained the correct 4 terms on multiplying out the brackets. Though most of these went on to combine the terms correctly, some made errors.

(c) A pleasing number of candidates were able to rearrange the formula correctly. Others failed to realise that multiplying by 2 was the first step needed.

Question 10

(a) The key to a successful solution was finding angle *YXZ* to be 40°. Those that managed to do this often went on to a correct answer. Some others, with an incorrect value, did go on and use a correct method to find *XY*.

(b) As in **part (a)**, many candidates were unsure about bearings and which angle was needed.

Question 11

(a) There were many correct sketches. Some plotted points to establish the shape of the curve. A small number did not attempt the question; maybe they did not have a graphical calculator. There were many correct answers for coordinates of the minimum. Surprisingly a lot of answers were spoilt by the omission of a negative sign in the *y*-coordinate.

(b) Again, there were many correct sketches of the required graph.

(c) Many candidates correctly found the *x*-coordinate of both points of intersection. Some found just one of these.

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/41
Paper 41 (Extended)

Key messages

Candidates are expected to answer all questions on the paper so full coverage of the syllabus is vital. The recall and application of formulae and mathematical facts to apply in familiar and unfamiliar situations is required as well as the ability to interpret mathematically and problem solve with unstructured questions.

Communication and suitable accuracy are also important aspects of this examination and candidates should be encouraged to show clear methods, full working and to give answers to 3 significant figures or to the required degree of accuracy specified in the question. Candidates are strongly advised not to round off during their working but to work at a minimum of 4 significant figures to avoid losing accuracy marks. Candidates should be aware that it is inappropriate to leave an answer as a multiple of π or as a surd in a practical context unless requested to do so.

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

General comments

The candidates were well prepared for this paper and there were many good 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. The overall standard of work was good and most candidates showed clear working together with appropriate rounding.

A few candidates require 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. This is particularly noticeable in 'show that' style questions when working to a given accuracy. There could be some improvements in the following areas:

- Handwriting, particularly with numbers.
- Candidates should not overwrite answers as they do not scan well.
- Care in copying values from one line to the next.
- Care in reading the question, particularly noticeable in transformation questions where usually a <u>single transformation</u> answer only is required.
- Care in reading scales on graphs.

The sketching of graphs does continue to improve and there was more evidence of the use of a graphics calculator supported by working, this is in the spirit of the syllabus. Candidates need to be aware that in drawing graphs points should be plotted within 1 mm of the correct position. There was however evidence of use of facilities in the calculator that are not listed in the syllabus. These facilities often lead to answers given by candidates without any working and this must be seen as a high-risk strategy. Candidates must take care to ensure that their calculator is in the correct mode when calculating angles i.e. degrees not radians.

The most accessible topics were those on transformations, averages, linear functions, cumulative frequency diagrams, curve sketching and compound interest.

The most challenging topics were inequalities, reverse percentages, indices and standard form, surface area of solids, forming quadratic equations from given linear information, solving 2 term quadratic equations and simplification of algebraic fractions.

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

Comments on specific questions

Question 1

(a) A relatively straightforward part which the candidates did not deal with particularly well. Many incorrect answers were seen, principally 66.7%.

(b) The best answered part on the paper with most gaining full marks, however a few scripts had final answers of 0.018 and 0.188. Several candidates gained the method mark initially but then spoiled the method by subtracting 0.18 from 2.5.

(c) Another well answered part with most candidates understanding how to apply compound interest correctly using the slicker method of the making the index equal to 6. Some used the longer method of applying trials often losing the accuracy mark in doing so. The incorrect answer of 443.2 from using simple interest calculations was rarely seen. A few candidates spoiled their final answer by subtracting the original investment.

(d) (i) This type of question often causes problems for candidates with a variety of incorrect answers seen, the most common being 28 454 and 30 875, resulting from incorrect multiplication or division by 0.96 or 1.04. The approach of $1.04x = 29\,640$ was rarely seen written down as a first step.

(ii) Candidates have become very adept at solving these questions with the majority gaining all 4 marks although some lost the final accuracy mark for solutions left as, e.g. 7.64. Both the direct method using logarithms correctly and the more time-consuming trial and improvement method were seen in equal measure. Only a few scripts had a final answer of 8.74 found using simple interest.

Question 2

(a) Many candidates scored full marks as curve sketching continues to improve with the better use of graphical calculator functions being seen. Some lost a mark for too large a gap, or too much overlap, between branches, whilst only a few lost a mark for their curves touching or crossing the x-axis. Some sketches had the incorrect period of the function with extra branches being drawn.

(b) Mostly correct answers seen but some gave the coordinates of the local maximum point. Other responses had the next point given, e.g. (450. 1) whilst a few others gave their answer in radians.

(c) Most candidates gained at least a single B mark here, generally for $x = 180$, many gave $x = 0$ but omitted $x = 360$, which are both in the domain. Some confusion was seen with y given instead of x, particularly $y = 0$ seen on many responses. Many others did not give equations but just stated the values however they could pick up a SC1 for all 3 correct values seen.

(d) This was a discriminating part with only the more able candidates gaining full marks for the correct strict inequality in k, both $f(x)$ and y were allowed in the final answer although x was not. Only a small number gained a single B mark for one correct inequality whilst the SC1 was awarded very rarely here. It was unusual to see answers given in words or using other notations.

(e) Many candidates used their calculators correctly to find both answers to the required degree of accuracy and gained full marks. The first value was sometimes given as 37.9 and on many responses the y-coordinates were also given leading to a 1-mark penalty. Candidates were then able to score an independent B mark for following the instruction ‘to sketch another graph’.

Question 3

(a) (i) Most candidates understood the term ‘median’ and were able to correctly use their cumulative frequency curve to read off 170 by using 100 on the vertical axis. Some only gave 100 as their final answer and a surprising incorrect answer often seen was 155.

(ii) Equally the majority understood how to calculate the interquartile range by subtracting their lower quartile from their upper quartile. Many scored both marks for finding the IQR as 22, whilst several others scored a single B mark for correctly finding one of the quartiles, either in their working or the answer space. An UQ of 150 and LQ of 50 was seen on several scripts.

(iii) The correct answer of 172 was seen on many responses but several candidates did not score any marks in this part as they misread the scale on the vertical axis, with 24 leading to the common incorrect answer of 176. A few scored the B1 for correct identifying 28, either in their answer space or on the graph itself.

(b) To gain both marks candidates had to ensure that their 4 values were in range and totalled exactly 200, This part caused more difficulties than anticipated as many simply read off the vertical axis values corresponding to 150, 170, 180 and 190 and not dealing with cumulative frequency totals correctly. Also, those that misread the scales in **part (a)** tended to do the same here with the B1 often being awarded for a final pairing of, e.g. 50 and 50.

(c) A minority of responses gained both marks here owing to inaccuracies seen in **part (b)** resulting in the calculated ‘estimated’ mean outside the given range. However, a high number of candidates picked up a method mark for showing sufficient mid-points in their working or on the table.

Question 4

In this question an overall penalty of –1 mark was applied once only for candidates adding a fraction bar into their vector answers. Vectors were allowed to be expressed in words or coordinate form. More than one transformation lost all marks but extra properties were treated as choice.

(a) (i) Nearly all correct responses, an occasional slip was for 2**q** seen in the working as $\begin{pmatrix} -10 \\ 1 \end{pmatrix}$ but most scored at least B1.

(ii) Nearly all responses correct.

(iii) This part tested the understanding of the term ‘magnitude’ and then how to calculate the magnitude of a vector. Many good solutions were seen with the correct final answer given to the required degree of accuracy or in surd form. On several responses candidates omitted the brackets when squaring – 5 which was often, but not always, recovered in the next line of working. This unfortunately sometimes proved costly when the final answer was inaccurate, e.g. 5.09 which resulted in no marks being awarded.

(b) Nearly all responses correct but some candidates had the signs reversed here.

(c) (i) Most candidates scored at least B1 here for correctly stating translation, there were a few who used transition or translocation which does not score. The vector was found correctly in many responses although several reversed the signs whilst others reversed the *x*- and *y*-coordinates. Coordinate form was seen on several responses whilst only a few candidates used words to describe the vector.

(ii) Nearly all responses gained one mark for stating rotation. 90° was seen on many scripts with the unnecessary addition of the direction of rotation as anti-clockwise. The alternative correct answer of 270° clockwise was rarely seen. The centre of rotation was usually correct but some gave the origin (0, 0) or (0, – 2).

(iii) Mostly all correct but the occasional image was reflected in the *x*-axis.

(iv) Many candidates were unable to distinguish the difference between a stretch and an enlargement in this trickier part with few gaining both marks. Several responses showed the correct image but not in the correct position. This scored B1 if it was a stretch in $y = k$. The other B1 for a stretch in $x = 3$ was rarely seen. Many variations of incorrect images were seen here.

Question 5

(a) This more discriminating part required the candidates to know how to calculate the range given the domain, the key values being – 5 and 15. An inequality then had to be formed in $f(x)$ or y (but strictly not x) for full marks, some scored the SC1 for both correct values seen.

(b) (i) Most candidates scored both marks for solving $f(x) = -2$, although the common incorrect answer of – 9 was seen on many scripts where they had found $f(-2)$. Several misreads were seen here for those who solved $f(x) = 2$, usually enabling them to pick up the method mark for a correct first step.

(ii) Most candidates picked up at least the method mark for equating $g(x)$ to $3 - x$ and then went to score B2 for setting up a correct quadratic equation in 2 terms. The final mark was often lost for not correctly finding both answers. Several incorrect solutions saw $(3 - x)$ substituted into the $g(x)$ function with $(3 - x)^2 + (3 - x) + 3$ seen. This usually resulted in a lot of extra work for no reward when expanding the brackets and collecting terms.

(c) A lot of correct answers of 15 seen with many scoring at least the B1 for successfully finding $f(4)$ as 3 or the method mark for substituting $f(x)$ into $g(x)$. A few managed to switch the functions and found $f(g(4))$.

(d) This was a well answered part with most gaining both marks for calculating the difference between $h(2)$ and $j(2)$ as – 1.

(e) Most candidates understood what they had to do to find the inverse function and gained the mark, unfortunately some left y in their answer. The alternative form of $x^{\frac{1}{3}}$ was seen occasionally.

(f) This was a more challenging inverse function with candidates needing to use logarithms to rearrange. The more able found $\log_3 x$ and sometimes $\dfrac{\log x}{\log 3}$ was seen. Many candidates picked up the method mark for stating $x = 3^y$ in their working or final answer, as well as writing acceptable first steps in their rearrangements.

Question 6

(a) This part caused more difficulties for the candidates than was anticipated with only the more able gaining both marks for the correct simplified form. Many divided 160 by 2 but then added and subtracted 8 to these values (instead of 4) leaving common incorrect answers of 88:72 and 11:9. SC1 was awarded on several scripts for candidates finding the correct values but unfortunately writing them down the wrong way round.

(b) This part was dealt with much better with many more gaining full marks. Most were successful at setting up an equation for the first method mark and many went on to gain M2 for dividing by 1.2 and then taking the sixth root. Several candidates then lost the final mark for mainly accuracy and rounding errors in earlier working, e.g. 1.056 seen on many good responses, then leading to an incorrect final answer.

(c) (i) Many candidates were awarded the first B1 for successfully finding 13.5×10^{121} and then went on to gain both marks. Unfortunately, several divided 13.5 by 10 and also subtracted 1 from the index for a common final incorrect answer of 1.35×10^{120}. A few candidates clearly had the correct values but did not give their answer in the required standard form, merely reading off from their calculators, e.g. 1.35 E 122.

(ii) This was one of the most discriminating questions with only the better prepared candidates gaining two marks. It was essential to understand the relationship between the two standard form numbers which were being added together. The B1 for figs 202 was not awarded very often although figs 4 was seen on the majority of incorrect responses.

Question 7

(a) This discriminating part was generally either awarded full marks or no marks. The majority of candidates were unable to form the appropriate equation to solve by using the relationship between speed, distance and time for the two disciplines correctly. A common incorrect answer seen on many scripts was 4.666….

(b) (i) Similar comments for this even more difficult 'show that' part as candidates had to initially form another equation. On this occasion two fractional terms in time had to be added together, this then required successful rearrangement to obtain the printed quadratic equation. To gain the final accuracy mark no errors or omissions were allowed. Some omitted the zero whilst others dropped the *y* from the linear term. Some candidates attempted to solve the given equation whilst several did not respond at all.

(ii) Whilst many responses gained full marks, some had answers not to the required degree of accuracy, so only gained M2 for the correct substitution in the formula or M1 for the correct discriminant seen. Very few scored SC2 for the correct solutions given in surd form after scoring 0. No graphical attempts were seen.

(iii) This seemingly straightforward part was not dealt with very well by the candidates, all that was required was to subtract 7 from their positive solution in **part (ii)**, provided the final answer was also positive.

Question 8

(a) (b) Candidates had to know the formulae for the circumference and area of a circle. In each case they then had to multiply by $\frac{140}{360}$ to find either the arc length or the area of the sector. Often accuracy marks were lost for use of 3.14 for π and sometimes the method mark was also lost for not substituting $r = 9$ into the relevant formula. Some candidates confused these formulae and reversed their answers. Full marks were awarded for final answers with π left in them. In **part (a)** some responses used trigonometric methods to calculate the line PQ, not the arc.

(c) This discriminating part required a reasonable amount of thought and processing to gain full marks. Individual method marks were available for calculating:

their **(a)** multiplied by 20 to find the area of the rectangle formed from the arc PQ,
their **(b)** multiplied by 2 to find the area of the two 'end' sectors and
(2 ×) 9 × 20 to find the area of the rectangle(s) formed from radii OP and OQ, which then needed to be summed.

Many candidates confused surface area with volume and assumed that they only had to multiply their answer to **(b)** by 20. Others incorrectly used the formula for the curved surface area of a cone, $A = \pi rl$.

(d) Another discriminating part in which the more able candidates recognised the need to multiply their **(c)** by the required area scale factor of $\frac{100}{81}$. Some candidates went down the lengthy route of starting the whole problem again using $r = 10$ with varying results. Several scored the available full marks on FT here, whilst many left the question out.

Question 9

In this question decimals and percentages were accepted with the usual rules for 3 significant figures accuracy, however the vast majority tended to use fractions. Incorrect cancelling or converting following a correct answer was not penalised. Ratios or words were not acceptable but were not seen on any scripts. In **parts (c)** and **(d)** their fractions had to satisfy the usual boundaries of probability, i.e. $1 \geqslant \text{P (event)} \geqslant 0$.

(a) A well answered part with the majority earning the one mark available for multiplying 54 by $\frac{5}{6}$ to find 45. A final answer of $\frac{45}{54}$ did not gain the credit.

(b) One of the better answered questions on the paper with most gaining the first B1 for $\frac{1}{6}$ and $\frac{1}{5}$ correctly placed with fewer doing so for the placement of $\frac{2}{5}$ and $\frac{3}{5}$.

(c) Most candidates understood the need to multiply fractions together to find the combined probability. Two routes had to be found and then the results summed to obtain $\frac{11}{15}$, many scored full marks although some just found the upper route for one method mark. A common incorrect answer seen was $\frac{8}{25}$, found by multiplying the 'Yes' fractions together, i.e. $\frac{4}{5}$ and $\frac{2}{5}$.

(d) The final part of this question was a demanding combined probability one in which only the more able candidates scored marks, most scored 2 or 3 with the M1 awarded very rarely.

Question 10

(a) (i) A straightforward part which caused some difficulty, some candidates confused the rules when dealing with the different mathematical operations and fractions. Some found a common denominator of 6*p* and then added the numerators, others did not fully simplify their answers thus losing the mark, e.g. $\frac{kt}{2p\,x\,3}$.

(ii) This time the candidates were required to find a common denominator, use equivalent fractions and then add the numerators. Similar confusion was seen. A large number only gained the method mark for not fully simplifying their answer, e.g. $\frac{35u}{147}$. Common incorrect answers included $\frac{3u}{28}$ and $\frac{5u^2}{21}$.

(b) Most candidates managed to gain some credit here, usually for either fully or partially factorising the numerator. The denominator was made a bit trickier by the inclusion of a factor of 2, leading to 3 correct possibilities, e.g. the fully simplified $2(x + 7)(x - 7)$, $(2x + 14)(x - 7)$ or $(2x - 14)(x + 7)$. The latter 2 made cancellation with the numerator very difficult and was often taken no further, scoring 3 out of the 4 marks available.

(c) A discriminating part in which candidates had to find a common denominator for 3 terms, however many were awarded the B1 for the correct denominator seen from multiplying together $(g + 1)$ and 5. The negative sign in front of the second term caused problems when multiplying out the numerator and often $+ 2g$ was incorrectly found. The single term of 4 caused many issues when expanding and collecting terms in the numerator with many responses simply omitting it.

Question 11

(a) A well answered part with most gaining both marks for using the formula for the area of a triangle given in the formula list. Some lost a mark for truncating their answer to 29.2 and a significant number found 4.94, having left their calculator in radian mode.

(b) The technique required here was to drop a perpendicular from C down to the base, AB, and then use trigonometry to calculate the 'height' of the triangle. Many did this very well and scored full marks. Several gained a single method mark for indicating this on the diagram with the mandatory inclusion of the right-angle symbol. However, many common incorrect answers of 7.41 were seen.

(c) The candidates managed to use the cosine rule to find the length of BC in this 'show that' part but a large number lost the final accuracy mark to not showing their final answer to at least 3 decimal places before giving 7.41.

(d) The toughest question on the paper was left to last with only the more able candidates gaining full marks. Rarely was the M3 or M2 awarded with a few picking up a single method mark for recognising that angle BOC = 94°. Without the knowledge that the angle at the centre was double the angle at the circumference there was no realistic starting point for this problem. The sketching of a circle onto the diagram was also very beneficial to solving this part.

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/42
Paper 42 (Extended)

Key messages

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

Candidates need to understand that different parts of a question are often related. The answer to one part may need to be used in a subsequent part.

The efficient use of a graphic display calculator is required and sketching from a graphic display calculator will usually be regarded as working. Such sketches should show all points of interest, for example, when sketching a quadratic function, the points of intersection with the *x*-axis should be clearly indicated.

Full syllabus coverage is necessary as candidates must answer all questions. This includes all core topics.

Experience of questions that combine topics is also essential for success at Extended level.

General comments

Candidates were generally very well prepared, and all candidates were able to complete the paper in the time allowed. Most candidates found the paper to be quite straightforward and scored high marks.

Most candidates gave answers to the required accuracy. Sometimes, in longer questions candidates' final answers were outside the accepted range because of premature rounding in intermediate calculations.

Topics which were successfully answered included transformations (except a stretch), composite functions, inverse variation involving a square, line of regression, showing a region formed by multiple straight lines, working with sketches of cubic and quadratic functions, distance, time and speed calculations, use of sine and cosine rule, volumes of similar shapes, and circle geometry.

Difficulties were seen in using a stretch transformation, finding a back bearing, finding the angle between a face and the base of a pyramid, and forming simultaneous equations to solve a probability problem.

Comments on specific questions

Question 1

(a) This question was answered well by most candidates

(b) This question was answered well by most candidates

(c) Most candidates gave the correct rotation of 180°. Fewer chose the alternative of an enlargement of scale factor –1

(d) The stretch transformation proved to be more difficult with many candidates drawing an enlargement.

Question 2

(a) This question was answered well by most candidates.

(b) This question was answered well by most candidates.

(c) Some candidates gave an incorrect first step, but the majority gave a correct solution.

(d) Most candidates multiplied the two terms correctly and simplified to the correct answer, the most common error being the omission of one of the x-terms in the expansion.

(e) This was the only question on functions which caused many candidates some problems. The most common error was in not removing the second bracket correctly which resulted in a sign error.

Question 3

(a) Most candidates chose the correct variation and scored both marks.

(b) This question was answered well by most candidates.

(c) This part proved to be more difficult. Most candidates set up the correct equation but then tried to deal with it algebraically instead of numerically. The algebraic approach led to a cubic equation which could not be solved by factorisation. Very few candidates used a sketch to illustrate the solution.

Question 4

(a) (i) There was only a very small minority of candidates who omitted to complete the diagram.

(ii) Most candidates gave the correct median but some found the mean.

(iii) Both values were required to 3 significant figures or better (following the general rubric for this paper) and the most common error was an inaccurate value for the gradient.

(iv) Most candidates realised the need to add 5 to the value of the constant term and those who lost a mark in the previous part could score a follow through mark here.

(b) This question was answered correctly by most candidates. The most common error here was in finding 36 per cent of 8 hours and either adding or subtracting this value.

(c) Most candidates answered this part correctly, but some candidates did not find the required products or divided their sum by 4 instead of 23. Many candidates rounded their answer to 4 but scored full marks because they had shown a more accurate answer in their working.

Question 5

(a) (i) Most candidates drew the required lines correctly.

(ii) Most candidates gave a clear indication of the required region, but, for others, the problem was that in some cases it was difficult to know which area was meant to be the region.

For these candidates there was not a clear enough indication of their answer. Indicating the region with an 'R' would have been sufficient.

(b) (i) The graph was sketched correctly by the majority of candidates.

(ii) Both answers should have been given to 3 significant figures and the most common error was to give 0.709 as 0.7 or 0.71.

(iii) Many candidates did not realise that the required solutions were the *y*-coordinates of the turning points of the cubic function and that the *y*-coordinate of the previous part was one of the solutions here. Many gave answers which were the positive *x*-intercepts of the graph but this was using a value of $k = 0$ and this equation had 3 solutions instead of the 2 specified.

(iv) The quadratic function was well sketched with the great majority of candidates correctly showing that the curve did not cross the *x*-axis. Some sketches were not as neat as they should be and candidates should erase unnecessary lines.

(v) As in **part (ii)** the main issue here was one of accuracy with the correct answer of –0.599 being often given as –0.598 or –0.6.

Question 6

(a) (i) Most candidates found this to be a difficult question and an answer of 75° was often seen, as was 255° from 360 – 105. A method mark was available for a sketch showing an angle of 75° or 105° at B but few candidates drew a sketch.

(ii) (a) This question was answered correctly by most candidates.

(b) This part proved to be difficult for many. Common errors were to multiply 1.5 by 25 000 or to convert kilometres to centimetres incorrectly.

(b) Most candidates were able to deal correctly with the problem of finding the distance and converting into consistent units but were then unable to deal with the length of the train. Hence an answer of 5200 was often seen (omitting the length of the train) or 5970 (adding it on). Many successful candidates had drawn a sketch of the situation to help in their understanding of the need to subtract the length of the train. Some candidates chose to work in hours converting the time of 156 seconds into 0.043… hours but then rounded this, thus losing accuracy in their final answer. Many candidates gave clear step by step calculations, but others were less well organised.

Question 7

(a) This was a question which required candidates to obtain a given angle, correct to 1 decimal place. Most candidates used the cosine rule correctly and set out their working clearly, but then lost the final accuracy mark by not showing the answer to their calculations to more than 1 decimal place, in this case 76.96…

(b) This question was answered correctly by most candidates.

(c) Most candidates realised that the best approach was to use the given angle of 77° to give $\angle DBC$ as 103° and hence, after finding $\angle BCD$, use the sine rule to find the answer. Some candidates chose to find other angles in the triangle ADB and then find the length of AC, subtracting 5 to reach the required answer. The problem here was that intermediate angles were often rounded or truncated leading to a loss of accuracy in the final answer.

Question 8

(a) (i) This question was answered correctly by most candidates.

(ii) This question was answered correctly by most candidates. In both this and the previous part, candidates made good use of the diagram by writing in appropriate lengths and angles.

(iii) Most candidates realised they could use the answer found in the previous part together with the length of MF to find the required angle. Others decided to find the length of EF first. The most common error was to find the angle between a sloping edge and the base of the pyramid. Better use made of the diagram would have helped to avoid some of the errors.

(b) (i) This question was answered well by the majority of candidates who correctly used the cube root of the ratio of volumes to find the required height. The error most commonly seen was an answer of 23.6 where the cube root had been omitted.

(ii) Most candidates gave a correct answer, but a common error was to give the answer as 2.5 instead of 2.51 to the required 3 significant figures. If working was not shown, the 2 significant figures answer was not enough to imply the method.

Question 9

(a) (i) Most candidates completed the tree diagram correctly, but some placed numbers instead of probabilities on the branches.

(ii) Many candidates gave a fully correct answer with working clearly set out. Most candidates realised that 3 separate probabilities were needed but some had one incorrect (usually the black, white, black outcome). Those who had given an incorrect tree diagram in the previous part were able to score follow through marks here, but, for some, this was not possible as they had not added a set of branches for the third disc so that any probabilities used could not be checked.

(b) (i) This question was answered correctly by most candidates.

(ii) (a) This required a simple rearrangement of the equation $\frac{x}{10+y}=\frac{1}{3}$, but some candidates used a more complicated approach which was usually unsuccessful.

(b) Some candidates used a trial and improvement method, and many were successful. Of those who followed the question's direction to write another equation, many did so and used the equation from the previous part to enable them to solve a pair of simultaneous equations to find the required answers. There were, however, some candidates who were able to give a second equation but did not realise they had to use the equation which had already been given. As a result, there was often a good deal of fruitless effort in trying to solve one equation in 2 variables with the help of various probabilities.

Question 10

(a) This question was answered correctly by most candidates.

(b) Most candidates knew they had to use the angle at the centre of the circle rule, but a common error was for candidates to give the reflex angle instead of the obtuse angle required.

(c) (i) In order to answer this question correctly, it was essential to find the correct angles in the pentagon, and many candidates made good use of the diagram to determine which trigonometric ratio to use. The majority of candidates had a fully correct method, but some lost the final accuracy mark by not showing a more accurate answer, 10.89…, prior to rounding it to the given answer of 10.9 to 3 significant figures.

(ii) There were many good solutions seen here, with work well organised and clearly set out. The most common reason for a mark being lost was because of a lack of accuracy in the final answer. As 3 intermediate calculations were required, it was important that no approximations should be made in order to maintain accuracy in the final answer. For example, the radius of the circle was 9.2705… but some candidates rounded this to 9.3 when finding the area of the sector.

Question 11

(a) This question was answered correctly by most candidates.

(b) Some candidates used a trial and improvement method and others used logs. The most common error was to give the product as 6^{2x}.

(c) (i) Most candidates set out their working clearly and correctly manipulated both the numerator and denominator in order to obtain the required equation.

(ii) This answer followed on for most candidates from their successful work in the previous part.

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/43
Paper 43 (Extended)

Key messages

It is important to use the required method if it is specified in the question.

Candidates need to understand that different parts of a question are often related. The answer to one part may need to be used in a subsequent part.

When working through a multi-step problem, candidates need to maintain accuracy. Intermediate values should not be approximated if the final answer is to be sufficiently accurate. In these types of question, it is important to show the method clearly so that marks can be awarded if the final answer is incorrect.

The efficient use of a graphic display calculator is required and sketching from a graphic display calculator will usually be regarded as working. Such sketches should show all points of interest, for example when sketching a quadratic function, the points of intersection with the *x*-axis should be clearly indicated.

Full syllabus coverage is necessary as candidates must answer all questions. This includes all core topics.

Experience of questions that combine topics is also essential for success at Extended level.

General comments

Candidates were generally well prepared, and all candidates were able to complete the paper in the time allowed. Many candidates found the paper to be quite challenging but were still able to score well on many questions.

Most candidates gave answers to the required accuracy. Sometimes in longer questions candidates' final answers were outside the accepted range because of premature rounding in intermediate calculations.

Topics which were successfully answered included basic statistical measures, sketching graphs, interpreting a cumulative frequency graph, basic algebraic manipulation, and finding an inverse function.

Difficulties were seen in commenting on the usefulness of the mode as an average, enlargement involving a negative scale factor, working with a truncated pyramid, calculating individual frequencies from a cumulative frequency graph, dealing with a modulus sign, using a Venn diagram to show a set, dealing with probabilities involving a subset of a population, and interpreting shortest distance in a triangle.

Comments on specific questions

Question 1

(a) Most candidates answered this question correctly. Some candidates failed to give their answer to 3 significant figures as required in the Instructions on the first page of the paper.

(b)(i) Most candidates answered this question correctly.

(ii) Most candidates correctly divided the distance by the speed, but the conversion of units was less successful.

Question 2

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

(ii) Most candidates understood the need to list the values in order, but then did not find the median correctly.

(iii) Most candidates answered this question correctly.

(iv) Some candidates found the minimum and maximum values but did not subtract them.

(v) This proved to be more difficult than the previous parts. Attempts were often made to use a formula instead of counting through their ordered list.

(b) Many candidates did not answer in the context of Sunni's scores and gave an answer based only on the definition of the mode. The important idea was that, in this case, the mode happened to be the highest score and therefore unsuitable as a measure of average.

Question 3

(a) The correct transformation was shown by most candidates.

(b) Many candidates gave the correct centre of the enlargement but omitted the negative sign for the scale factor.

(c) (i) This was a more difficult double transformation, but many candidates gave a correct triangle. However, few showed the triangle resulting from the first transformation and this made it difficult for any credit to be awarded if the second transformation was correct after an incorrect first transformation. The image after the first transformation, the reflection, should have been shown, perhaps using dotted lines to differentiate it from the final answer.

(ii) Most candidates who drew the correct triangle in the previous part gave the correct answer here.

Question 4

(a) Most sketches were correct, but some candidates lost a mark because of an untidy drawing with multiple lines which had not been erased**.**

(b) Few candidates gained all 3 marks. At least one of the values was often omitted and the values were sometimes not given to 3 significant figures. This was most common with 0.537 which was often given as 0.54.

(c) There were few correct answers here with candidates not realising that the *y*-coordinates of the turning points gave the required values.

(d) This proved to be too difficult for most candidates who are more used to meeting the concept of gradients in the context of straight lines.

Question 5

(a) Common errors here were to subtract 60 per cent giving an answer of 8 000, or to find 60 per cent of 20 000, giving 12 000.

(b) Most candidates showed the single calculation required but many took time to calculate the three intermediate values.

(c) There were many good solutions seen here with some candidates using logs accurately. Some candidates calculated the required number of time periods correctly, but then tried to interpolate a value between 2060 and 2065 although the first part of the question indicated the value of a picture was only recorded every 5 years.

Question 6

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

(ii) Most candidates answered this question correctly, although some poor notation was occasionally seen when the square root was taken.

(b) (i) This question proved to be too difficult for most candidates. Two methods were available; the first, using the scale ratio of 8:10 and cubing it to find the volume of the truncated pyramid, was seldom seen; the second, finding the height of the truncated pyramid, and using this to find its volume, was the more usual approach, but was still rarely seen.

(ii) This part proved to be even more difficult, but some candidates scored a method mark by finding the areas of the base and top surface of the shape. Few candidates realised that the answer to **part (a) (ii)** needed to be used to find the height of each of the trapezoidal side faces of the shape.

Question 7

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

(ii) Most candidates answered this question correctly. Many of those who did not do so were able to score a mark for showing one of the quartiles.

(b) Many candidates answered this correctly and many of those who did not still scored a part mark for showing 48, the number of runners who made up the fastest 20 per cent.

(c) This required a standard method of converting cumulative frequencies into actual frequencies, but this proved to be difficult for many candidates, many of whom gave cumulative frequencies in the table.

(d) Incorrect frequencies in the previous part led to an incorrect answer here, but many candidates scored a method mark for showing the mid-points. However, these were often used incorrectly, for example by those candidates who added them before dividing by 7.

Question 8

(a) Most candidates answered this question correctly.

(b) (i) Most candidates answered this question correctly.

(ii) Most candidates found it difficult to interpret the modulus. Many obtained the answer of 5 but few found the –2 answer. A common error was for candidates to change the sign of the expression inside the modulus sign, leading to $2x + 3 = 7$ and the incorrect answer of 2.

(c) The question required the quadratic to be solved by factorisation, but many candidates used the formula instead.

(d) Some good algebraic manipulation was seen here, but many candidates only scored the first method mark by correctly transposing the $5x$ term to the left-hand side of the equation. The second step of gathering together the two terms involving x was rarely seen.

(e) Similarly, some good algebraic manipulation was seen here, particularly in dealing with the numerator of the expression. Many candidates, however, did not recognise the difference of 2 squares in the denominator.

Question 9

(a) Many candidates shaded the first set correctly but far fewer did so for the second set.

(b) (i) Most candidates answered this question correctly.

(ii) Most candidates answered this question correctly.

(iii) Two errors were seen here; the first was that many candidates used a population size of 120 instead of 33 (those who studied Economics) and, secondly, probabilities with replacement were used instead of those without replacement.

(iv) The same error in using probabilities with replacement was seen here. However, many candidates did give the correct numerators for their probabilities, but then did not realise that there were 3 permutations involved.

Question 10

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

(ii) Most candidates answered this question correctly.

(iii) Many candidates answered this question correctly, but errors were made by candidates who removed the bracket incorrectly and by those who treated the expression as an equation which they went on to solve.

(iv) Most candidates answered this question correctly

(b) (i) Many good sketches were seen; when a mark was lost it was usually because of an overlap of the two branches or because the first branch did not have a clear negative intercept on the *y*-axis.

(ii) Many candidates gave the correct asymptote of $x = 1.5$ but some omitted the '*x*'.

(iii) Few candidates gave both answers, but those who did usually gave their answers to the required degree of accuracy (3 significant figures). A method mark was available for sketching the function *h(x),* but most candidates did not add this straight line to their previous sketch.

(iv) There were many correct solutions, with candidates showing good manipulative skills in dealing with the algebra. When errors did occur, it was usually because of a sign error in the expansion of the expression $4(2-x)(3-2x)$.

Question 11

(a) Most candidates answered this question correctly.

(b) (i) This question proved to be difficult for many candidates, but good detailed solutions were also seen. Most candidates realised the need to use Pythagoras theorem to obtain the length of AC and some went on to use the cosine rule correctly to find the required angle. However, two errors were often seen, the first in using an approximate value for AC and, more commonly, omitting to give a more accurate value, (any value between 67.03 and 67.04), before writing down the given answer.

(ii) There were few correct answers to this part. Most candidates did not realise that the length required was that of a line from A which was perpendicular to the line BC. A common error was to find the length of the line from A which bisected BC.

Question 12

(a) (i) Many candidates gave the correct answer here, but some candidates did not realise that the value of the *x*-coordinate was 0.

(ii) There were also many correct answers here but some candidates omitted the negative sign, and others did not give the value of the *y*-coordinate as 2.

(b) There were some very good solutions here, and stronger candidates showed their working in a clear and organised way and were able to break the problem into straightforward steps. A simple sketch of the given points, A and B, the line joining them, and its midpoint would have helped other candidates to visualise the problem, In particular, it would be apparent that the line AB has a negative gradient, and its perpendicular bisector a positive gradient. This would have helped prevent some of the sign errors which were seen here. An error was sometimes seen in the final step where the constant term was often given as 21 instead of $\frac{21}{5}$.

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/51
Paper 51 (Core)

Key messages

When candidates are asked to show that a given expression gives the correct answer to a calculation, they are required to give a response that contains two elements.

These are:

- the original calculation leading to a particular value and
- a substitution in the expression leading to the same value.

These two elements must be shown clearly.

If a question requires the use of algebra to find a general result, this cannot be done by working with numerical values.

General comments

Communication marks are often awarded when the numbers and calculations that have been entered into the candidate's calculator are written in the working space. The majority of candidates were very good in this respect.

Most candidates seemed to have little difficulty in understanding the subscripts, apart from when writing a general term.

Comments on specific questions

Question 1

(a) Nearly all candidates found the next two terms in the *F*-type sequence.

There were a significant number of candidates who did not show the calculation that gave their answers. It is likely that a calculator needed to be used for the calculation (49 + 79) and this is a strong hint that the calculation should be written down.

(b) The great majority of candidates completed the table correctly. There were a few who did not spot the pattern and gave an incorrect expression and a sum rather than a subtraction in the final cell.

(c) Many candidates were successful and completed the statement using the pattern seen in the table from **part (b)** but a small number did not attempt the question.

(d) Writing the general result was more difficult since one of the subscripts was algebraic. There were a few correct answers. These noticed that a subscript of $n + 2$ was required for the sum to term F_n. Several candidates did not know how to answer this question and left it blank. Several candidates interpreted the dots for the missing terms between F_3 to F_n as representing a single term.

(e) Those who struggled with **part (d)** often missed this question out.

Part (d) was the general result from the pattern in a table, however credit could still be given for using that pattern, even if the algebraic form of the result had not been found.

It was expected that candidates would find the sum of the first 7 terms and write down the numbers put into their calculator rather than write $F_1 + F_2 + F_3 \dots =$.

Many candidates were not clear enough here.

There are two necessary calculations:

- adding the 7 terms and
- using the result $F_9 - F_2$.

These were not always seen separately.

Candidates should avoid writing the equality 5 + 3 + 8 + 11 + 19 + 30 + 49 = 128 – 3 before the calculations have been done as it suggests the result is assumed. This statement led to 125 = 125 which is bad form.

Many candidates only added 5 terms instead of 7. A common error was to interpret

$F_1 + F_2 + F_3 + \cdots + F_7$ as $F_1 + F_2 + F_3 + F_4 + F_7$ suggesting that candidates had incorrectly interpreted this notation.

Question 2

(a) Finding the next three terms of the sequence was usually well done.

The most common error was to assume that 3, 1 was the start of a linear, rather than an *F*-type, sequence resulting in 3, 1, –1, –3, –5.

(b) To check the general result two calculations were expected:

- the sum of the 5 terms and
- 7th term – 2nd term.

While many showed that the sum was 22, the 7th term was written down without finding the 6th term by many candidates. This cost them a communication mark.

A small number of candidates assumed that this sequence referred to the sequence in **question 1**. These candidates were given credit for both of their calculations but not for finding the 7th term since that had previously been given.

Question 3

Candidates, who were clear about the general result, or at least the pattern that gave rise to it, usually found the correct answer and showed the calculation 652 – 3 for a communication mark.

Many candidates did not relate the information given in the question to previous results and attempted to construct, by trial and improvement, all the terms of the sequence with a 2nd term of 3 and a 12th term of 652. Not many were successful, but a few were, and these scored a communication mark for listing the terms. This required effort, beyond what the question intended.

Question 4

(a) A good number of candidates correctly found the simplest algebraic expression for the 4th term $(6 + k)$. A few multiplied terms together instead of adding and $6 + k = 6k$ was occasionally seen. Many tried to work with numerical values to find the numerical 4th term and scored 0 marks. Some candidates correctly gave $k + 6 + k$ and did not simplify this expression.

(b) Most candidates did not make use of an expression for the 4th term and preferred to try out numbers to find the required *F*-type sequence. Consequently, many did not get a communication mark for showing a method.

Since the terms were small numbers the large majority of candidates did find the correct sequence.

Question 5

(a) Most the candidates created three correct sequences of 5 terms and a great variety of *F*-type sequences were seen. Some candidates did not read the question carefully and used sequences that had already been used,

Many candidates saw the relationship but had difficulty describing it. Many stated that the sum was a multiple of the middle term but not that it was multiplied by 3. Others, from their results, observed that the sums were even or odd and some gave a different relationship for each sequence. Others did not read the demand carefully and stopped after only writing three sequences.

The majority of candidates set out their work clearly in this question. This made it easier for them to spot the relationship.

(b) (i) This question explored the general *F*-type sequence with the first two terms being x, y.

To find the 5th term it was expected that candidates would write algebraic expressions for the 3rd and 4th terms, for which communication marks were awarded. Many candidates wrote $x + y$ for the 3rd term but were unable to progress further, often due to faulty algebra, with multiplication of terms frequently seen instead of addition, giving xy and xy^2 for the 3rd and 4th terms.

(ii) There were very few correct answers justifying the result of **part (a)** in algebraic form and most candidates omitted this question or gave a numerical justification.

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/52
Paper 52 (Core)

Key messages

When candidates use numbers beyond the information given in previous parts then they should communicate how these numbers were found.

Even in tables, communication as to how entries are found is expected. There are often patterns where three differences can be shown. Candidates should make use of blank space below or alongside a table for such communication.

General comments

Candidates showed good skill and often good communication in calculating the angles on a clock face. Using algebra to describe the angle between the hands and using the resulting expression proved more challenging.

Comments on specific questions

Question 1

(a) (i) Nearly all the candidates knew that the angle shown was acute. Some did not know the correct word in the English language.

(ii) Most candidates understood the situation, but reasons were often incomplete. The better candidates mentioned the circular motion or rotation as well as the fact that in 12 hours that rotation has to be complete. Many candidates only repeated the question and wrote that the hand goes 360° in 12 hours.

(iii) The large majority of candidates realised that dividing the complete turn of 360° by 12 hours would give 30° turned in one hour. A few candidates chose to divide 180° or 90° by 6 or 3 respectively. Although those candidates probably understood the process some further explanation was necessary showing why 180° or 90° could be used.

(iv) Most candidates wrote 360 – 30 as the calculation to give the anticlockwise angle. Using the previous parts, 11 × 30 was also a quick way of getting the answer.

(b) (i) Nearly all candidates found 120° correctly. In this question many candidates gained a mark for communication, usually by writing 4 × 30, which follows directly from information given in **part (a)(iii)**. If candidates used other ideas, such as 90 + 30, then further explanation was required, for instance by drawing a line on the diagram to show 90°.

(ii) Most candidates showed the subtraction from 360 of their answer to **part (b)(i)**. Again, a communication mark was usually gained for writing the subtraction.

(c) Nearly all candidates knew that the angle was 180°. A few wrote ‘straight angle’, which was condoned.

(d) The large majority of candidates completed the table correctly. Most did not give any communication as to how they did this and so lost a communication mark. The few candidates who got the first entry wrong were unable then to get subsequent entries correct and scored 0.

(e) Many candidates could write down the general expression. The most common error was to write $x + 30$ instead of $30x$.

(f) Most candidates knew that subtracting 30 would lead to the next anticlockwise angle in the table.

Several gave ‘subtracting the clockwise angle’ as their answer and this was also accepted.

(g) Those who had the correct expression in **part (e)**, normally gained the mark for the general expression for the anticlockwise angle. Many candidates did not write the correct expression and either omitted this question or gave a numerical answer.

Question 2

(a) The large majority of candidates wrote that $30 \div 60 = 0.5$. Some candidates interpreted the question as checking that 0.5 was the answer and wrote $60 \times 0.5 = 30$. This was condoned although seen as bad style.

(b) The large majority of candidates wrote that $360 \div 60 = 6$. The same comment as in **part (a)** about bad style also applies here.

Question 3

(a) (i) Most candidates found the correct angle for the hour hand by writing a multiplication, which also gave a communication mark. Sometimes the communication was not seen. Candidates should always try to show which operation was used, with which numbers, even if the calculation can be done mentally. The most common wrong answer was 6°.

(ii) Most candidates found the correct angle for the minute hand by writing a multiplication which also gave a communication mark. As in **part (a)(i)** this communication was sometimes not seen.

(iii) The correct calculation was given by many candidates. Some candidates, who did not know how to get 25°, made up other calculations that were inappropriate and 5×5 or 50×0.5 were often seen.

(b) The majority of candidates could fill in the first two columns of the table correctly using information from **question 2**. Far fewer managed to give the correct angles for the last column.

As usual, it was expected that candidates would explain how they found the values of their entries. Many candidates would have scored more if they had taken time to do this and very few candidates scored the full 6 marks. Good communication could be for showing the common differences or for showing the calculation required for an entry in each column. The large cells in the table, the blank space below the table, and the fact that the question was worth 6 marks, give candidates a hint that more than the numbers in the table were required.

(c) Candidates who could not find the angles in the last column in **part (b)** were unable to answer this part. Of those who did find the last column correctly, only the better candidates were able to write the general expression correctly. Finding differences in the last column would have helped candidates in realising that it was a linear expression and so of the form $5.5m + k$. Candidates are therefore strongly recommended to show differences in tables.

(d) Those candidates who did not find an expression in **part (c)** had great difficulty with this part. There were hardly any fully correct answers seen. Some candidates could have scored much more if they had written their expression in **part (c)** equal to 270 and then solved their equation.

Most candidates preferred starting anew with the idea that in 45 minutes the minute hand had moved 270° and final answers of 45 minutes were often seen. This approach ignored the movement of the hour hand.

A significant number of candidates gave unrealistic answers. Any answer greater than 60 minutes should have been reconsidered. Answers over 400 (minutes) were often the result of incorrectly finding the time in seconds.

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/53
Paper 53 (Core)

Key messages

When candidates use numbers beyond the information given in previous parts then they should communicate how these numbers were found.

Even in tables, communication as to how entries are found is expected. There are often patterns where three differences can be shown. Candidates should make use of blank space below or alongside a table for such communication.

General comments

Candidates showed good skill and often good communication in calculating the angles on a clock face. Using algebra to describe the angle between the hands and using the resulting expression proved more challenging.

Comments on specific questions

Question 1

(a) (i) Nearly all the candidates knew that the angle shown was acute. Some did not know the correct word in the English language.

(ii) Most candidates understood the situation, but reasons were often incomplete. The better candidates mentioned the circular motion or rotation as well as the fact that in 12 hours that rotation has to be complete. Many candidates only repeated the question and wrote that the hand goes 360° in 12 hours.

(iii) The large majority of candidates realised that dividing the complete turn of 360° by 12 hours would give 30° turned in one hour. A few candidates chose to divide 180° or 90° by 6 or 3 respectively. Although those candidates probably understood the process some further explanation was necessary showing why 180° or 90° could be used.

(iv) Most candidates wrote 360 – 30 as the calculation to give the anticlockwise angle. Using the previous parts, 11 × 30 was also a quick way of getting the answer.

(b) (i) Nearly all candidates found 120° correctly. In this question many candidates gained a mark for communication, usually by writing 4 × 30, which follows directly from information given in **part (a)(iii)**. If candidates used other ideas, such as 90 + 30, then further explanation was required, for instance by drawing a line on the diagram to show 90°.

(ii) Most candidates showed the subtraction from 360 of their answer to **part (b)(i)**. Again, a communication mark was usually gained for writing the subtraction.

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(e) Many candidates could write down the general expression. The most common error was to write $x + 30$ instead of $30x$.

(f) Most candidates knew that subtracting 30 would lead to the next anticlockwise angle in the table.

Several gave ‘subtracting the clockwise angle’ as their answer and this was also accepted.

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(a) (i) Most candidates found the correct angle for the hour hand by writing a multiplication, which also gave a communication mark. Sometimes the communication was not seen. Candidates should always try to show which operation was used, with which numbers, even if the calculation can be done mentally. The most common wrong answer was 6°.

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(b) The majority of candidates could fill in the first two columns of the table correctly using information from **question 2**. Far fewer managed to give the correct angles for the last column.

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(c) Candidates who could not find the angles in the last column in **part (b)** were unable to answer this part. Of those who did find the last column correctly, only the better candidates were able to write the general expression correctly. Finding differences in the last column would have helped candidates in realising that it was a linear expression and so of the form $5.5m + k$. Candidates are therefore strongly recommended to show differences in tables.

(d) Those candidates who did not find an expression in **part (c)** had great difficulty with this part. There were hardly any fully correct answers seen. Some candidates could have scored much more if they had written their expression in **part (c)** equal to 270 and then solved their equation.

Most candidates preferred starting anew with the idea that in 45 minutes the minute hand had moved 270° and final answers of 45 minutes were often seen. This approach ignored the movement of the hour hand.

A significant number of candidates gave unrealistic answers. Any answer greater than 60 minutes should have been reconsidered. Answers over 400 (minutes) were often the result of incorrectly finding the time in seconds.

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/61
Paper 61 (Extended)

Key messages

Good algebraic skills, especially algebraic thinking, were an important requisite for doing well in this investigation. It was necessary to generalise algebraically rather than only use numerical examples. There were also questions where it was necessary to be able to set out working correctly without assuming what is to be shown.

In the modelling section, the ability to sketch and understand graphs was crucial, as well as creating and solving simultaneous equations containing logs.

General comments

Good algebraic thinking was best addressed by those candidates who used previous expressions as directed and did not use numerical examples/tests unless told to do so. In a 'show that' question it is best to work the left-hand-side separately to the right-hand-side rather than to make assumptions at the very beginning. A good understanding of solving by using graphs was beneficial in several places.

Comments on specific questions

Section A Investigation

Question 1

(a) Most candidates gained two marks by showing the addition sum for their working out to gain the communication mark as well as the mark for the answer.

(b) (i) This question was well answered with only a few candidates not noticing the pattern.

(ii) Many candidates noticed the pattern although some worked out the correct answer numerically.

(c) (i) This table was also correctly completed most of the time.

(ii) Again, this was often correctly answered although many candidates used numbers.

(d) In this question the candidates were directed to use the statements in two previous questions. To gain marks this method needed to be followed, so answers using just numerical examples did not score. Some candidates showed the combination of the two general results but did not show the F_1 terms cancelling out or $F_{10} + F_{11} = F_{12}$.

(e) Candidates should be encouraged to follow any directions given in the question. The statement referred to in this question indicated the pattern to use to obtain the correct answer. The most common error was to put a specific result such as $F_7 – F_2$,

Question 2

(a) A straightforward question with only one mark so working out was not required to be shown.

(b) Candidates needed to show that the statement was correct by working out both sides of the statement and finding the same answer for both. Many candidates set out their working based on the assumption that it was correct. Candidates should be encouraged to work the left-hand side and the right-hand side separately rather than writing them equal from the start.

Question 3

(a) Often correct although some candidates did not show their working and so did not gain the communication mark. Making use of the statement meant 652 – 3 was all that was required.

(b) Some candidates did much work trying to find a way in to solve this problem. Many saw the connections or had shown at least enough working to gain a communication mark. Others did not use previous results and made little progress.

Question 4

(a) Although most candidates answered **Question 1(c)** correctly, they found this question challenging and many of those who attempted it did not write the correct simplification. Various incorrect methods included using the expression $3n - 80$ and numbers (as before), and $F_{2n} + F_1 - F_2$ was popular.

(b) Now back to a numerical question some candidates used the correct values, usually in a sequence, to gain the communication mark. The correct 8 terms were more rarely seen for the answer.

Question 5

(a) There were some good attempts to finding this relationship although many candidates lost marks through not choosing new F-type sequences of their own. Some used at least one of the sequences given and others wrote down sequences of numbers that were not F-type. Candidates should be encouraged to make sure that they explicitly show what is happening. For example, using the sequence 1, 2, 3, 5 followed by $3^2 - 2^2$ (= 5) and then stating $c^2 - b^2 = ad$ is not enough. The $1 \times 5 = 5$ must also be seen. A relatively common result was $c^2 - b^2 = a + d$ whilst others did not give an algebraic relationship.

(b) (i) Some candidates were not able to find c and consequently could not find d either, whilst others with c correct did not realise how a straightforward substitution would give them d.

(ii) Throughout this investigation candidates had found communicating using algebra far more difficult than using numbers and this question was no exception. Without the algebraic expressions for c and d it was unlikely that candidates could make any progress after writing down their equivalent of $c^2 - b^2$ or $a + d$. Numerical evidence was again a common approach.

Section B Modelling

Question 6

(a) Some candidates did not gain the communication mark because they did not show how they had calculated the gradient of 7. Many gained all 3 marks by remembering to write an equation for the model and not an expression. There were several quite common misinterpretations including $b = a - 63$ and $10.5b + 7$ and $m = \frac{1}{7}$.

(b) The sketches were good. Many candidates lost the communication mark because they failed to show any scale. Some benefitted by using their knowledge and therefore quickly ruled a line. There was some plotting of points which was often inaccurate, and some wavy, curved or feathered lines.

(c) A straightforward substitution that was answered well.

Question 7

(a) This was not answered as well as **Question 6(a)**. Not only was $\frac{b}{12}$ quite a common answer but also some candidates used inequalities giving a range such as $2 \leqslant a \leqslant 24$.

(b) (i) Pairs of ages were often listed to find this answer instead of the substitution of 2 and 24. If the candidates used correct values and a correct method, they usually scored the communication mark as well. Common errors such as using the initial model or *b* as 10, led to answers of 64 or 120.

(ii) There was only one communication mark for this part, and this was quite easily achieved because it was acceptable to give the gradient embedded in an equation. Some candidates found the answer with very little working shown. Candidates should be advised that questions scoring more than 1 mark quite often have communication marks within their scheme, so it is always good to write a complete method down. Many incorrect answers were seen often showing little understanding of the question.

(c) Few candidates attempted this sketch and very few sketches were correct. Some candidates scored one mark for a straight line from the origin with a gradient larger than the graph in **Question 6(b)**. There were very few sketches of the second part of the model and those that were drawn were rarely linked to $b = 12a$.

Question 8

(a) Most candidates found the correct values from the graph.

(b) (i) Many candidates did not realise that this was a straightforward substitution of the values from **part (a)**. Some wrote $2 = 42\log(a) + h$ and some used 2 as a base. Other used 2 and 42 for their first equation and then rearranged this for their second equation. The wording ‘write down’ infers that there is little, if any, working required and no simplification of the two equations. Candidates should be aware of the meaning of the command words in a question.

(ii) Very few candidates correctly solved their equations. Most did not realise that they should just treat these as ordinary simultaneous equations and tried to use log rules to solve them.

(c) Some candidates did write their model equal to 70 for which there was a communication mark. Correct solutions were rare.

Question 9

There were some good attempts to find the biological ages of the goat for each model. This meant that by correct substitution of 18 for *a*, candidates could gain a mark for each correct age recorded if the candidate had used their model correctly. Deciding whether each model was valid or not was often misinterpreted. Values in the 60s, 70s, and 80s were often deemed invalid and where ages of over 100 or as young as 25 were thought to be valid.

Question 10

Very few candidates attempted this question. Many gave answers without any working shown. Candidates should show or refer to a sketch if that is their method of solving a problem.

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/62
Paper 62 (Extended)

Key messages

The candidates who realised that all the ‘show that’ questions were giving them information to be use further on did much better than those who treated each question separately and did not look for connections between them. For the modelling section the candidates needed to be able to use formulae correctly, especially for trigonometry and the sector of a circle.

General comments

Candidates who worked numerically through the short ‘show that’ questions performed better than those who tried to explain their answers. Candidates who showed even small steps in working, like how to obtain a number in a table or three common differences for an expression scored higher than those who missed this communication. The candidates who did well in the modelling section were the ones who did not skip steps in algebraic manipulation, like expanding square brackets and who also showed substitution explicitly in every formula used.

Comments on specific questions

Section A Investigation

Question 1

(a) This ‘show that’ question at the very start should have indicated to candidates a straightforward method for calculating the angles of and between the hands of the clock. For the two marks it was necessary to show both the division of 360 by 12 and by 60. Some candidates tried to make this far more complicated than it was. Others tried to explain what was happening. Candidates should know the meaning of command words in questions.

(b) With **part (a)** this question gave the candidates vital information to help them with questions further on in the paper. $\frac{360}{6} = 6$ was all that was required to gain the one mark. Candidates should be aware that the first questions in the paper will always be straightforward.

Question 2

(a) Most candidates used the information given in **Question 1** to answer this. There were, however, numerous ways of showing this angle is 25° and some candidates did get muddled in their working and arrived at the value without showing all their steps. The muddled working also showed a need for candidates to indicate which step follows which step and not just to write working out in what appear to be random places all over the answer space.

(b) There were two communication marks for the working out for values in this table. There were various opportunities including differences and calculations. Seeing the four-mark allocation should alert candidates to be aware that working needs to be shown. Many candidates misunderstood what was being asked for, particularly for the Hand H angle. This was despite being given all the information in both parts of **Question 1** and **Question 2(a)**. Candidates should know that ‘show that' questions are often included to allow correct information to be available to answer further questions.

(c) Successful completion of the last column of the table enabled candidates to find this expression easily. It was well answered.

(d) This question was also well answered with many candidates gaining both communication marks. All but the final answer mark were available to those who had an incorrect expression in **part (c)** but worked correctly in this part. The main weakness was in converting their answer in minutes to minutes and seconds.

Question 3

(a) This 'show that' question should have helped the candidates to find the angles in **part (b)**, the expression in **part (c)** and led them to be able to correctly answer all of **Question 4**. There was one mark for any combination of correct calculations. Sometimes this working-out was confused and did not follow-on properly, as in **Question 2(a)**.

(b) Generally, if the candidate had managed to find a method to show that the angle between the hands in **part (a)** was 22.5° then they were able to calculate the next four angles for this table. One correct calculation would have scored a communication mark but was rarely seen.

(c) Well answered. This did not present any problems to those who were still working their way steadily through this investigation.

Question 4

(a) With **Questions 2(c)** and **3(c)** correct the candidates were able to complete this table correctly. Problems only arose when one or both incorrect answers from those questions meant that a pattern was not produced. Some candidates lost the mark for not presenting their answers in the form $am + b$.

(b) Similarly, the correct answers in the table in **part (a)** led quickly to the expression required here. Despite the help in **Question 3(a)** many candidates could not generalise to achieve the marks for this part and **part (a)**.

(c) (i) Some candidates were confused by the negative answer to the substitution into the expression. A good number managed to calculate at least one of the correct answers.

(ii) Again, candidates who had an incorrect expression in **part (b)** could still gain two communication marks for their working here if correct. Too many candidates did not attempt this question. Candidates should be encouraged not to leave any questions without some attempt at an answer.

Section B Modelling

Question 5

(a) A straightforward 'write down' answer. Candidates should know that 'write down' means no working is required or even possibly needed. Given that there were two marks for this answer it is likely that there is a mark for the correct units, which many candidates missed.

(b) The formula for the circumference of a circle was given at the top of the page. Some candidates did not achieve the communication mark because they were too quick to do the simple arithmetic in their heads or on their calculators and did not write it down. Too many candidates also lost a mark for not being able to correctly round their answer in metres to the nearest centimetre.

Question 6

(a) (i) Two stages were necessary to answer this question. Since it was a 'show that' question both stages needed to be seen but in either order. Many candidates completed this correctly. Others took many steps to show the split into fractions and then sometimes missed the explicit substitution.

(ii) Scales were given on both axes for this sketch, so it was important that candidates used these scales to fit in their curve correctly. More practice is needed on curve sketching with particular attention to detail. The minimum of (4, 4) needed to fit into the given scales, albeit approximately and the curve should not turn back on itself at either end. Curves should also be drawn as smoothly as possible, with care.

(iii) Usually correct, candidates should be reminded about units.

(b) (i) Correctly answered by many candidates, this radius could have been easily calculated or read from the graph. Many calculations were seen. Reading from the graph should be encouraged.

(ii) Many correct answers. Also, many answers that were confused or poorly set out, or incorrect. Some candidates confused θ with $\frac{1}{2}\theta$ or found one of these whilst labelling it as the other. Some candidates used elaborate mixes of the sine and cosine rules when a single statement using right-angled trigonometry was all that was needed.

(iii) Good use of the formula and substitution shown meant that many candidates got both marks here and one mark if either their radius or angle was incorrect. Some candidates tried to use the formula in radians and several of these were confused and did not score.

Question 7

(a) Candidates were unable to get very far with this if they did not realise that the base length of the triangle was $r - \frac{1}{2}w$. Those who did write this correctly into Pythagoras' Theorem often manipulated the algebra well and succeeded in reaching the given model. Candidates who make a mistake and do not get to the given model should be encouraged to check their work or to try starting again.

(b) (i) The substitution of 8 for *w* in the model was all that was required here. This was done successfully by most of those who attempted this question.

(ii) The curve needed to be continuously rising from the *r* axis. For this, most candidates achieved one mark. The communication mark was for labelling the *r* intercept at (0, 2), which many candidates failed to do. Candidates should pay more attention to the window for the graph and think about important characteristics of the graph.

(iii) The correct answers of 4 for both *h* and *r* were very common. The fact that this meant that both the arches were semi-circular was missed by most candidates. Many said they were the same but did not describe their shape.

(c) (i) Well answered. With only one mark available there was nothing for communication, but most candidates showed their working using either the model or Pythagoras' Theorem.

(ii) Some confusion with the sides of the triangle or with trig ratios. It appeared that since it was the last question candidates thought it would be difficult although in fact it used right-angled trigonometry and the sector length formula that they had used before.

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/63
Paper 63 (Extended)

Key messages

To gain high marks on this paper candidates needed to be able to take information from questions and apply this to further questions. They needed, in both the investigation and the modelling sections, to know how to rearrange one algebraic equation to form another. Being able to sketch graphs was essential for some questions and useful for others.

General comments

In the investigation most of the information about geometric sequences was given in the first question and used in several further questions. In the modelling the volume of containers was required in slightly different ways in several questions. In both sections candidates were asked to find a model when the starting point was not given in that part of the question. Once started, the algebra was not particularly difficult, but candidates need to practise how to start these questions. Improvement on curve sketching would have increased the marks of many candidates and solving problems by sketching rather than by algebra is good practice that should be encouraged.

Comments on specific questions

Section A Investigation

Question 1

(a) (i) Mostly correct. Candidates showed that they understood this information on geometric sequences.

(ii) Mostly correct too. There was also a communication mark for showing how the answer was calculated, which most candidates achieved.

(iii) The *n*th term was given with 4 as the base number. The correct answer using 2 as the base was also accepted. 4*n* was quite a common answer showing a lack of understanding.

(b) (i) It is recommended that for all 'show that' questions the candidates should write down everything that contributes to their answer. This was important here because for only one mark there was one statement that had to be seen – 3×2^0.

(ii) Well answered. The candidates had no problem with finding the first four terms of this sequence.

(c) Similarly, this sequence did not present any problems to most candidates

(d) Now working on the third geometric sequence most candidates found no difficulty in finding the *n*th term using the patterns given in the previous parts.

Question 2

Candidates now had a chance to show that they understood about geometric sequences. Some candidates found the multiplier as 0.75 whilst others used it as a fraction. Many candidates were able to show both steps to give a third term of 9.

Question 3

(a) (i) This question was usually well answered and well communicated. Most candidates showed the two steps separately.

(ii) In two previous questions candidates had been shown what the *n*th terms of geometric sequences look like. They had to follow this pattern to find the *n*th term for this sequence. Many candidates who had managed to find the first term easily in **part (a)** found it much more difficult to write down the correct *n*th term for this question.

(b) This question acted as the conclusion to the first part of the investigation. Candidates needed to work out how to find the *n*th term, given terms 2 and 7, to then find the 6th term. Candidates should be encouraged to write down all their working. Some only achieved two out of the three communication marks because of gaps in their working.

Question 4

(a) (i) Candidates often gave part of the comment required and more rarely gave a complete explanation. They should be encouraged to give as detailed an explanation as they can without contradicting themselves.

(ii) Confusion was common here. Most candidates did not know what to do and solved the equation using either the quadratic formula or by factorising. Most of those few candidates who used the formula given in **part (i)** managed to complete the algebra to reach the given equation.

(b) Candidates now realised that they had done the wrong thing in **part (a)(ii)**. Some started again, some now factorised when they had used the formula in the previous part, some drew arrows to move their working down the page. Some answers appeared on the answer lines with no working shown. Candidates were asked to give their answers as an integer and a fraction, and many changed their fraction answer into a decimal. Others disregarded the negative sign.

(c) Many candidates did not attempt this question. There were some reasonable attempts at substitution of the answers to **part (b)** and marks were awarded for the correct sequence using $x = 3$.

Section B Modelling

Question 5

(a) The volume was usually correctly calculated. Candidates should know that they do not need to convert into other units (such as m^3 here) unless they are asked to do so.

(b) (i) The two correct steps were often shown.

(ii) This question was usually well answered.

(c) (i) Candidates often find explanation questions difficult. It is good to practice explaining what simple models like this show.

(ii) This was answered well. Most candidates explicitly showed the substitution and so gained the communication mark.

(iii) Despite being such a simple model there were still candidates who did not rule a straight line, whilst others plotted points or sketched curves. There was a communication mark, as there often is, for indicating the scale on the *t* axis which some candidates achieved even though their sketch was awarded 0.

Question 6

(a) Explicit substitution into the formula given at the top of the page gained many candidates a mark. Candidates should be shown to read the questions carefully especially when they think they have reached their answer. This question asked for the answer to be given correct to 3 significant figures which was not always followed.

(b) (i) There were many ways in which to answer this question and a simple use of ratio was the quickest but was rarely used.

(ii) This was another straightforward substitution that was answered well.

(iii) Candidates should be encouraged to try to answer all questions. They could have gained a follow through communication mark here even if their answer to **part (ii)** was wrong.

(c) (i) Most candidates did not realise that the starting point for this answer was to take the volume formula and then to eliminate *r*. Many tried to start with the model that was given. Those who did make the correct start often made mistakes and could not reach the model.

(ii) This was another straightforward substitution that was answered well.

(iii) More practice is needed on curve sketching with particular attention to detail. The curve should have been constantly increasing and not turn back on itself on its approach to h = 24. Curves should also be drawn as smoothly as possible, without feathering or ruling. Candidates should know that there is often a communication mark for scale indicated.

(d) Not many candidates made a valid attempt at this question.

Question 7

(a) The calculation for this question was quite straightforward once the two models were equated. Few candidates who attempted calculations made any progress because they tried to work separately with each model. Those who sketched the two graphs found the value of *h* at the intersection point quite easily. Candidates should be reminded that if they find the solution by sketching on their calculator, they should also draw a sketch in the answer space indicating the position of the answer, in this case the intersection.

(b) Most of the candidates who had an answer to **part (a)** completed this question.