# 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, clearly show all necessary working and check their answers for sense. As calculators are not permitted, it is vital that candidates carry out their calculations accurately. Candidates should be reminded of the need to read questions carefully, focussing on key words or instructions.

## General comments

Workings are vital in two-step problems, such as **Questions 8**, **15** 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 final answer is wrong, for example **Questions 1**, **4** and **10**. Candidates should note the form their answer should take, for example, **Question 2**, to nearest hundred and **Question 23**, in seconds.

The questions that presented least difficulty were **Questions 1** to **6**. Those that proved to be the most challenging were **Question 11(a)**, complete a stem-and-leaf diagram, **Question 17**, equation of a line, **Question 19**, probability and **Question 20**, find the highest common factor of two numbers. In general, candidates attempted almost all questions as there were very few left blank. The exceptions that were occasionally left blank were **Questions 9**, **12** and **21**.

## Comments on specific questions

### Question 1

Candidates did very well with this opening question. Many of those who did not gain the mark, wrote the correct method but made arithmetic errors when evaluating.

### Question 2

Here, candidates had to round the given value to the nearest hundred. Some candidates started at the right-hand figure and rounded each digit in turn so 6847 became 6850 then 6900. This value, 6900, was the most common wrong answer. Other incorrect answers included 7000, 6850 and 685.

### Question 3

The few incorrect answers included drawing a diameter, not using a ruler or the line extending beyond the centre point or the circumference.

### Question 4

Again, this was a question that was handled well by a large majority of candidates.

### Question 5

Most candidates drew the correct number of squares in the correct formation even though the question asked for a pattern in the middle of the sequence rather than the next after the 3rd or 4th which were given.

The most frequent error was to reverse the shading – the bottom right square was always shaded with this particular pattern. There were some candidates who did not follow the formation of the pattern.

**Question 6**

This was answered very well. The function was f($x$) = $3x + 2$ but it was much easier to look for the patterns in the domain and range for this question than to find the function. Here, in the domain the values were consecutive integers and in the range the numbers increased by 3 each time. For $x = 4$ the value in the range would be 3 less than the next value, so 10.

**Question 7**

The most common error here was for candidates to treat this as $12f - (2f + 4f) = 6f$ rather than remembering that the operation applies to just the number that follows.

**Question 8**

There were a couple of approaches to this question, either to say if $\frac{2}{7}$ are girls then $\frac{5}{7}$ are boys so $\frac{5}{7}\times 42$ is 30 or to find the number of girls and take that from 42. Whichever approach was chosen, it was possible to gain a method mark if the method was completed or the final answer was incorrect. Some candidates worked out the number of girls then went no further. Others made arithmetic errors with their subtraction.

**Question 9**

This problem-solving question required some consideration. 39 is between two square numbers, 36 and 49, which means the square root is between 6 and 7. Candidates had to realise that 6 is going to the nearest integer as 39 is nearer 36 than 49. As calculators are not allowed on this paper, candidates could not check whether they were correct or not. Some gave the answer as 36 or $\sqrt{36}$.

**Question 10**

Candidates had to work out the bracket first, –5 and multiply by –4. Some did not handle the two negative signs correctly, giving –20 as their answer.

**Question 11**

**(a)** Two marks were available for adding the leaves in the correct order and one for the key. Some candidates did not appear to be confident about what was required as answers varied from just one number written per line, to random filling in the lines or tallies. Some candidates knew that numbers are grouped in a stem-and-leaf diagram with some putting the numbers in order but using the tens digit (when that should not be shown) or using just the units digits but not ordered. The key was more often left blank or not completed correctly. The key could be completed in many ways.

**(b)** Once data had been ordered into a stem-and-leaf diagram, the diagram could be easily used to answer this and **part (c)**. Candidates could still answer this part if they did not get the previous part correct, by looking at the original data, but this took longer and was more prone to slips.

**(c)** The median is the middle value in a stem-and-leaf diagram, in this case the 10th number from either end. Some candidates used their stem-and-leaf diagram but gave a single digit answer omitting the stem. If candidates were not confident of the accuracy of their stem-and-leaf diagram, they could have gone back to the original data, ordered that and picked the central value.

**Question 12**

Here, the number 2 had to be substituted for $x$ in $\frac{5x-1}{2}$, giving $\frac{9}{2}$ or 4.5 Some candidates used $2 = \frac{5x-1}{2}$ instead, giving the incorrect answer of $x = 1$. This was one of the questions a number of candidates left blank. Some others made arithmetic slips. Some gave an answer with no workings so it was impossible to determine what they were trying to do.

**Question 13**

Many candidates showed workings here. The first stage was to find a common denominator and 20 was the smallest one but candidates could use others. Then they needed to add the numerators. Some candidates multiplied the fractions instead of adding them or added the numerators and denominators given in the question to get $\frac{11}{25}$.

**Question 14**

This was often answered as 0, *y* or $y^1$ instead of 1. The answers of $y^0$ or $\frac{y}{y}$ were not fully simplified so did not gain the mark.

**Question 15**

Here, there was a method mark for the full method or for finding the area of the triangle but nothing for the area of the rectangle alone. A few candidates added all the lengths. Some worked out the area of the triangle as if it was a rectangle by omitting the division by 2.

**Question 16**

**(a)** Many candidates completed set *M* correctly but then did not go on to put the other numbers from the universal set in the rectangle outside set *M*.

**(b)** Many misunderstood the notation for the number of elements in a set and listed those elements not in *M*. Some gave 3 as their answer, possibly as they did not include the number that was already in *M*. Alternatively, some may have written 3 because this value was printed on the diagram.

**Question 17**

Candidates often find working with the equation of a line problematic. Here, there was no diagram to aid candidates, but all the information needed was 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*, was 2 as the two lines were parallel and the *c* value was the *y*-coordinate when $x = 0$, and for this, that point, (0, – 3) was given in the question as well, so $m = 2$ and $c = -3$. If candidates gave just one of *m* and *c* correct in an equation of a line, they were awarded a mark. It could have been helpful for some candidates to draw a diagram to help them visualise the situation.

**Question 18**

This question was not answered well by most candidates even though questions to describe a transformation are common. There were not many fully correct responses. Under this transformation, the triangles were the same size so this is a rotation, reflection or a translation. Triangle *D* was mapped onto triangle *E* by a reflection in a mirror line at $x = 1$. Use of the word 'mirrored' instead of 'reflection' was not acceptable. Candidates should not have given more than one transformation as the question said to 'describe fully the single transformation'. Giving two transformations was the most common error along with only giving one of the two pieces of information needed to describe this transformation.

**Question 19**

Here, the question did not give a probability tree or a probability space. However, candidates could have drawn a diagram to aid their understanding. The probability that the die lands on a 4 was $\frac{1}{6}$ each time so the probability of having a 4 both times was $\frac{1}{6}\times\frac{1}{6}$. Misunderstandings included giving the probability of $\frac{4}{6}$ for getting a 4 once or $\frac{2}{12}$ or $\frac{2}{6}$ for two 4s.

**Question 20**

This question was challenging for many candidates. This was a slightly unusual highest common factor (HCF) question as the first number, 26 is a factor of the second number, 78. So, 26 is the HCF. Other common factors such as 13, 78, 4 ($78 \div 26$) and 2028 ($26 \times 78$) were seen.

**Question 21**

Working with inequalities is often challenging for a significant number of candidates. Some arrived at a correct value, but gave the answer as –2 or $x = -2$, rather than $x \geqslant -2$. There was a method mark for a first correct step. This was most frequently for saying $5x \geqslant -10$. Instead, occasionally, candidates' first step involved sign errors or combining unlike terms, for example $12x \geqslant -3$ sometimes became $12 \geqslant -3$.

**Question 22**

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 remembering the correct formula or when substituting values. The most frequent incorrect working was to give the next term, 18, or the common difference, +4, instead of the expression for the $n$th term. Also, $n + 4$ or $-2n + 4$ were seen frequently. Some candidates gave 30 as their answer. This was the ninth term implying a misunderstanding of what the $n$th term means.

**Question 23**

In this speed-time question Idris' average speed was given in metres per second, the distance was in kilometres and the answer needed to be in seconds. The first step should have been to turn the distance into metres, 3000m. Then dividing this by speed gave the answer in seconds. Instead of this method, some candidates converted the speed from m/s into km/h, and then had to convert the time back from hours to seconds which increased the places where an arithmetic error could be made. Some candidates multiplied the distance by the speed instead of dividing. Many candidates gained 1 or 2 marks for a part or full method. Not many candidates gained all 3 marks. This was a good example where candidates needed to read the question very carefully to work out the most efficient method that would limit the places where arithmetic errors could be made.

**Question 24**

There were various methods to eliminate one variable but as the coefficients of $x$ were the same, subtracting one equation from the other would produce $5y = -5$ (or $-5y = 5$) so $y = -1$. Substituting this into either of the equations produced $x = 2$. Candidates could have written the first equation as $x = 4 + 2y$, the second as $x = -1 - 3y$, equate these as $4 + 2y = -1 - 3y$ and solve. If candidates multiplied each equation to make the coefficients of $y$ plus and minus 6 then added the equations, then this introduced more places where errors could be made. Many showed little or no working. Some gave solutions that fitted one equation and were awarded one mark for showing some understanding.

# CAMBRIDGE INTERNATIONAL MATHEMATICS

**Paper 0607/12**
**Paper 12 (Core)**

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Candidates should check their final answers for sense, ensuring that they are reasonable in the context of the question. For example, on **Question 14** the answer should have been within the range specified.

Candidates should be reminded of the need to read questions carefully, focussing on key words and instructions.

## General comments

The paper was accessible to all candidates, with the majority attempting every question and reaching the end of the paper. The exceptions that were sometimes left blank by candidates were **Question 5** (bearings), **Question 12a** (showing an inequality on a number line), and **Question 17** (describing a transformation)**.** Generally, candidates appeared to understand the questions, in most cases there did not seem to be any confusion about what was being asked.

The questions that presented the least difficulty were **Questions 1**, **3**, **4**, **8**, **10** and **11**. Those that proved to be the most challenging were **Question 5** (bearings), **Question 6** (writing a decimal number correct to the nearest 10), **Question 12a** (showing an inequality on a number line), **Question 17** (describing a transformation), **Question 22** (probability of combined events) and **Question 23** (surface area of a prism).

Most candidates showed some working. Stronger candidates set their work out clearly showing the steps in order. Calculations need be evaluated correctly, otherwise candidates will not gain full marks. A significant number of candidates made arithmetic errors, including on some very straightforward calculations.

Candidates should note the form their answer should take, for example, the answer to **Question 7** should have been in km and the answer to **Question 10** was an amount of money, so a decimal was expected.

## Comments on specific questions

### Question 1

Most candidates gave the correct answer. A small number of candidates omitted or misplaced a 0.

### Question 2

Most candidates listed correct factors here, gaining one or two marks. A number of candidates omitted one or more of the required factors; 39 was the most common omission. Some candidates included incorrect factors, such as 8 or 9. A few did not list factors, but either split the number into tens and units or listed multiples.

**Question 3**

Most candidates arrived at the correct answer. However, some made arithmetic errors and so did not score here. A common approach was to convert $3\frac{1}{2}$ into an improper fraction and many candidates went on to multiply this by 12 and arrive at the correct answer. A few worked out 3 × 2 + 1 = 7 and then gave either 7 or 12 × 7 as the final answer.

**Question 4**

Most candidates gave the correct answer. Those who did not get full marks were often awarded partial credit for the total length of thread in metres on 100 spools. It was evident that some candidates did not know how to convert the length in metres to kilometres.

**Question 5**

Only the very strongest candidates answered this correctly. Most other candidates realised the need to indicate a direction here and many gave an angle as their answer, with 90, 45, 180 and 270 seen frequently. Many candidates offered a compass point, usually west or east, rather than a bearing. Other words and phrases, such as ‘downwards’, ‘positive’, ‘negative’ and ‘from home’, were also given as answers.

**Question 6**

There were some completely correct answers showing good understanding of rounding. Many candidates were not able to answer this correctly with a wide variety of errors seen here. Some arrived at the correct significant digits, but with the wrong place value, for example 37. A number of candidates rounded to the nearest tenth rather than the nearest ten. Some incorrect answers were rounded the whole number part correctly, but then included a decimal, for example 370.000 or 370.280.

**Question 7**

Most candidates worked out the whole time for each type of seed and then found the difference. This method involves several steps and a significant number of candidates made arithmetic errors. Few took the approach of finding the difference in soaking time (1 hour) and sprouting time (1 day or 24 hours), but those that did almost always arrived at the correct answer. Candidates who showed working almost always scored at least partial credit. Some showed working that was not in order and was difficult to follow, this made it difficult for candidates to check their own work.

**Question 8**

Most candidates recognised the need to complete the division first and went on to arrive at the correct answer. Some candidates did the division correctly, but then reversed the subtraction, putting the answer to the division first, leading to 9 – 6 = 3. Some started the question by completing the subtraction and many of these ignored the resulting negative sign, leading to answers of 12 or –12.

**Question 9**

This was answered well, with many fully correct answers. A large number of candidates took the risky strategy of showing no working at all on this question, but fortunately almost all of these gained one mark for ordering three of the values.

**Question 10**

Most candidates arrived at the correct answer. The majority showed working and most realised the need to divide \$1 by 4, but some made arithmetic errors. A few wrote 4 ÷ 1, but some of these candidates recovered from this error and went on to get the correct answer. Some worked out 4 × 5 = \$20. A few candidates gave their final answer as a fraction or a mixed number, which was not appropriate in this context.

**Question 11**

Most candidates gave the correct answer. Many, including a large number of those who gave the correct answer, did not show any working. Almost all candidates who showed a correct method that reached 100 went on to arrive at the correct answer. Common errors were to assume that the missing angle was 50°, or that the triangle was equilateral, so the missing angle was 60°.

**Question 12**

**(a)** Stronger candidates usually did well here but other candidates found this more challenging. Many started at –2 but either omitted the end circle, went to the right, or included an additional circle at the left-hand end, usually at –5. A significant number of candidates omitted this question.

**(b)** This was answered better than **part (a)** but was still challenging for some candidates. A range of incorrect answers were seen here, with 5 and –5 being seen very frequently. Some attempted to write an inequality rather than giving a single value. Fewer omitted this part than **part (a)**, but there were a significant number of blank answer spaces seen.

**Question 13**

There were some good answers, especially from stronger candidates. Some gained one mark for a correct partial factorisation. A few attempted to remove an incorrect factor, often 3. A significant number of candidates did not seem to know what to do here, with a variety of errors including trying to solve $6x^3 = 8x$ and attempting to collect terms to get $-2x^3$.

**Question 14**

Most candidates were able to identify at least one prime number within the required range. The most common error was to include 61, 63 or 69 as one of the prime numbers. Most candidates were able to find the difference between their two numbers. Some put 60 and 70 as the prime numbers, suggesting they had not understood the question. Some of these candidates went on to give an incorrect difference, often 9.

**Question 15**

There were some excellent answers, with clear and concise working, particularly from stronger candidates. Some started off correctly but were unable to evaluate the final answer and a very common error was to state $\sqrt[3]{27} = 9$. A significant number of candidates made little progress here, with many not even substituting 9 for *x*. Some attempted to answer the question, but used an incorrect method, doing calculations such as $27^3$ or $27 \times 9$.

**Question 16**

This was answered well by many candidates. Some showed partially correct answers which did not achieve the one mark available here. The most common error was to assume that the missing values would all be either 0.3 or 0.4. Some candidates made the total of all four values on the right-hand side equal to 1, rather than each set of outcomes totalling 1. A few wrote values that were 0.1 less or greater than the next or preceding branches, which may have been an attempt to treat this as a 'without replacement' question.

**Question 17**

There were some clear and concise descriptions here. Most gave much longer explanations than necessary, often giving a description in words rather than, or in addition to, using a vector. Some gave the correct values but showed these as coordinates. The word translation was required but some candidates used incorrect alternatives, such as move or translocation. Some used the word transformation, which was not sufficient.

**Question 18**

This question required candidates to apply problem-solving skills to reach an answer. Many candidates produced good work here, with a large number arriving at the correct answer. Most realised the need to start by working out Benji's speed and many did this correctly. Those who arrived at the correct figure of 5 km/h usually went on to find Wyn's speed correctly. Some misunderstood how to start and added 1 to the distance Benji walked in 4 hours, often giving 21 as their final answer.

**Question 19**

The majority of candidates showed clear working on this question. Most gained at least one mark here, often for multiplying out the first bracket correctly, and many of these went on to arrive at the correct final answer. Sign errors were seen in a large number of responses. These often arose when multiplying out the second bracket, but some candidates multiplied correctly and then made sign errors when collecting terms. Some candidates attempted to collect unlike terms, but these often scored one mark for expanding at least one of the brackets correctly. A few candidates attempted to use methods for multiplying out two brackets.

**Question 20**

This was answered well by most stronger candidates. There were a few errors in calculation, often in the positioning of the decimal point in the final answer, but those who used a correct method usually arrived at the correct answer. A significant number of candidates were not able to access the question at all. These candidates often worked with the differences between lengths or performed calculations such as 5 + 8 = 13, showing a lack of understanding of similar shapes. Some had difficulty selecting the measurements that were needed to calculate the missing length. The 12 cm was only included to test that candidates could do this, but a significant number used it in their calculations. Many showed no working at all, so it was impossible to analyse the methods used.

**Question 21**

Most candidates arrived at the correct answer, but some misunderstood what was required and gave the answer $8^6$ when the question asked for the power that 8 is raised to. Weaker candidates often had difficulty with this question. The most common error was to divide the exponents, leading to the answer 3. A few multiplied the exponents, leading to the answer 27.

**Question 22**

This question did not include a tree diagram, but it was perfectly acceptable for candidates to draw one as an aid. Many were able to get as far as writing $\frac{5}{11}$, the probability of selecting a black counter on one attempt, scoring credit for this method. Few progressed from here to arrive at the correct final answer. A common approach was to attempt to double this to find the probability of picking black twice, often arriving at $\frac{10}{22}$. A few candidates used ratios when probability should be expressed as a fraction, decimal or percentage, with a fraction being the most sensible form in this case. Some treated this as a without replacement question. Some gave answers greater than 1, which showed a fundamental misunderstanding of probability.

**Question 23**

Stronger candidates did well here. The key to success was organised working so that candidates found the area of all five faces. Many gained partial credit for successfully working out the area of one face but relatively few went on to find the correct areas of all five faces. The most common errors were to omit one face, often the second triangle or the sloping face, or to use an incorrect method for the area of a triangle, usually omitting the division by two. Some candidates made arithmetic errors. Some struggled to access this question at all, with a significant number attempting a volume by multiplying the three dimensions, while others simply added dimensions.

# CAMBRIDGE INTERNATIONAL MATHEMATICS

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**Paper 13 (Core)**

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Most candidates arrived at the correct answer, but some misunderstood what was required and gave the answer $8^6$ when the question asked for the power that 8 is raised to. Weaker candidates often had difficulty with this question. The most common error was to divide the exponents, leading to the answer 3. A few multiplied the exponents, leading to the answer 27.

**Question 22**

This question did not include a tree diagram, but it was perfectly acceptable for candidates to draw one as an aid. Many were able to get as far as writing $\frac{5}{11}$, the probability of selecting a black counter on one attempt, scoring credit for this method. Few progressed from here to arrive at the correct final answer. A common approach was to attempt to double this to find the probability of picking black twice, often arriving at $\frac{10}{22}$. A few candidates used ratios when probability should be expressed as a fraction, decimal or percentage, with a fraction being the most sensible form in this case. Some treated this as a without replacement question. Some gave answers greater than 1, which showed a fundamental misunderstanding of probability.

**Question 23**

Stronger candidates did well here. The key to success was organised working so that candidates found the area of all five faces. Many gained partial credit for successfully working out the area of one face but relatively few went on to find the correct areas of all five faces. The most common errors were to omit one face, often the second triangle or the sloping face, or to use an incorrect method for the area of a triangle, usually omitting the division by two. Some candidates made arithmetic errors. Some struggled to access this question at all, with a significant number attempting a volume by multiplying the three dimensions, while others simply added dimensions.

# CAMBRIDGE INTERNATIONAL MATHEMATICS

**Paper 0607/21**
**Paper 21 (Extended)**

## Key messages

Candidates need to have completed the full syllabus to be able to answer this paper well.

Candidates need to show all of their working clearly. 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, e.g. by reversing calculations.

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

## General comments

Many candidates did not seem to be fully prepared for this paper and found **Questions 6**,**10**,**12**,**13** and **14** very challenging.

Some candidates made numerical slips which impacted on the marks they achieved, even when adding and subtracting in **Questions 7(b)** and **9**.

Candidates should make all of their working clear to enable them to access method marks in multi-step problems. This was particularly the case in **Question 10** where there were many method marks available.

Candidates should always leave their answers in their simplest form.

## Comments on specific questions

### Question 1

**(a)** Candidates performed well on the opening question and demonstrated a good knowledge of order of operations. Occasionally candidates started correctly but then used 12 – 3 resulting in the incorrect answer of 9.

**(b)** Again, candidates answered this part well, with the occasional mistake of working from left to right and giving an incorrect answer of 5.

### Question 2

**(a)** This question proved to be straightforward for most candidates.

**(b)** Candidates attempted this confidently with most using a common denominator of eight. Those who used a denominator of 32 were not penalised if they failed to simplify their correct answer.

### Question 3

Almost all candidates expanded the brackets correctly.

**Question 4**

This question proved challenging for many candidates and only stronger candidates gave the correct answer of 2000. The most common error was to multiply or divide by 100.

**Question 5**

This question was answered well. However, some candidates only gave a partial solution and gave answers of $2^3$ or $\sqrt{64}$ , both of which scored zero.

**Question 6**

**(a)** Standard form was not answered well and many candidates were unable to gain any marks in this part. Some candidates were able to find an answer equivalent to the correct standard form answer that was required and scored one mark.

**(b)** Candidates found this addition very demanding and it was rare to see the correct answer in standard form, but some candidates gained a method mark.

**Question 7**

**(a)** The majority of candidates were able to find the range correctly. Some candidates left their answer as 25 – 5 which scored zero and a few did not recognise that the scores were not in order and used 15 – 12 to give an incorrect answer of 3.

**(b)** Most candidates attempted to sum the scores and divide by 10 but there were many arithmetic slips. This showed a lack of evidence of checking their calculations, which is strongly recommended.

**Question 8**

**(a)** Most candidates realised that the terms were increasing by 6 but many simply gave an incorrect answer of $n + 6$ , providing a term–to-term rule rather than an expression for the *n*th term.

**(b)** This was challenging for most candidates who were unable to realise that the answer must include an expression of the form $(-1)^k$ to alternate the sign of the terms. Many candidates unsuccessfully tried to find the difference or second differences which did not prove successful.

**Question 9**

**(a)** Although attempted by all candidates, this part was challenging for most candidates. Many candidates incorrectly assumed that angle *BAE* was equal to angle *DBA* and gave an answer of 73°.

**(b)** This was equally as challenging as **part (a)** but most candidates were able to gain a method mark for calculating angle *BAC* correctly and this was often seen in the correct place on their diagram.

**Question 10**

This question was attempted well but there were many careless arithmetic errors and misconceptions.

The multi-step nature of this question allowed candidates to gain some of the four method marks, but regularly an incorrect final answer was given. Candidates were expected to find the gradient of *AB*, then find the negative reciprocal in order to determine the gradient of the perpendicular bisector. Candidates also needed to find the mid-point of *AB* and use all the information to find the equation of the line.

**Question 11**

**(a)** Many candidates chose to solve the quadratic by using the formula which rarely led to correct solutions. Those who factorised the expression were much more successful.

**(b)** Many candidates were unable to deal with the absolute value. Although most candidates were able to give a correct solution of $x = 1$, it was rare to see a second correct solution and often it was followed incorrectly with $x = -1$.

**Question 12**

Many candidates gave perfect solutions to this question. However, a significant number of candidates found this probability question demanding and tried multiplying three probabilities together, rather than working out the probability for each individual bag, and then multiplying by $\frac{1}{3}$.

**Question 13**

Candidates struggled to solve this question and even some stronger candidates made a careless slip when dividing $10^5$ by 2.

**Question 14**

Only the very strongest candidates answered this correctly. Most candidates were able to score at least one method mark, normally by trying to work out the area of a sector correctly. Some candidates were able to use the correct formula to find the area of the triangle**.**

Some weaker candidates were confused about which formula for the circle was required and used the formulae for the circumference of a circle.

A few candidates were unfamiliar with being able to work out the exact area and submitted calculations from using 3.142 rather than working in terms of $\pi$.

# CAMBRIDGE INTERNATIONAL MATHEMATICS

**Paper 0607/22**
**Paper 22 (Extended)**

## Key message

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

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

Candidates need to be familiar with the reasons why angles are equal, not just be able to find the values of angles.

## General comments

The majority of candidates were well prepared for the paper and demonstrated very good algebraic skills. However, many candidates made careless numerical slips on otherwise good answers. In some cases, there was incorrect simplification of a correct answer.

Candidates should make all of their working clear and should organise it well on the page so that this can be followed.

Candidates should always leave their answers in their simplest form.

## Comments on specific questions

### Question 1

**(a)** The majority of candidates made a good start to the paper and scored two marks. A common error occurred when candidates did not put scores in order and found the middle between16 and 6, giving an answer of 11.

**(b)** Most candidates scored the method mark for attempting to sum and divide by 10, but there were a number of candidates who did not score the accuracy mark due to careless arithmetic slips.

### Question 2

The majority of candidates took the more challenging approach of working with the sum of interior angles and then struggled to execute $\frac{22 \times 180}{24}$ correctly. However, candidates who found an exterior angle had a greater degree of success, but some forgot to subtract their answer from 180.

### Question 3

This question was very well answered with almost all candidates able to deal with the negatives.

### Question 4

This question tested understanding of surds. Some candidates gave two correct answers, but many were unable to understand the context of the question.

**Question 5**

This question proved to be straightforward for nearly all candidates.

**Question 6**

This question was answered well. There were occasional slips with the inequality sign and a small number of candidates gave their answer as 5.3.

**Question 7**

**(a)** Candidates knew that the inverse of a translation was a translation, but there were many mistakes in identifying the correct vector. Some candidates gave a description of their vector in words.

**(b)** Many candidates were able to give two of the three properties of the transformation. Common errors were giving a negative scale factor or an incorrect centre.

**Question 8**

Most candidates scored the mark. A common error was not dealing with the negative index and giving a final answer of 5.

**Question 9**

Although this question was challenging, requiring a multi-step approach, the performance of candidates was excellent with nearly all scoring full marks.

**Question 10**

The majority of candidates realised that a tan ratio was required, but some of these candidates could not recall the exact value of tan 60. There were a significant number of careless slips in rearranging a correct equation.

**Question 11**

Candidates were able to demonstrate excellent algebraic skills, recognising the difference of two squares, then factorising and cancelling correctly. There were occasional careless errors that spoilt a perfect solution.

**Question 12**

**(a)** The majority of candidates scored full marks, showing a good understanding of functions and their inverses.

**(b)** Although there were many perfect solutions, the most common answer was sin 90, which scored one mark.

**Question 13**

Most candidates scored two marks for finding correct numerical answers to both parts but explanations were neither clear nor accurate. Candidates needed to know the exact reasons for angles being equal relating to the properties of a circle.

**Question 14**

Although candidates knew the rules of logs and were able to score at least 1 mark, many could not rewrite 2 as log 100 and so could not complete the question.

# CAMBRIDGE INTERNATIONAL MATHEMATICS

**Paper 0607/23**
**Paper 23 (Extended)**

## Key message

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

Candidates need to read and answer the questions carefully.

Candidates need to be able to convert units accurately.

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

## General comments

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

Candidates should make all of their working clear and should organise it well on the page so that this can be followed. They should also remember to leave their answers in their simplest form. However, many candidates could not be awarded marks through incorrect simplification of a correct answer.

Many candidates need to be more familiar with the notation for the number of elements in a set and with circle theorems.

## Comments on specific questions

### Question 1

Many candidates scored full marks. There were a few candidates who gave the same answer for both parts and scored 1 mark.

### Question 2

Nearly all candidates scored full marks. A common error was the sign following their attempt at transposing two terms.

### Question 3

There were only a few correct solutions to this question, with the most common incorrect answer being 2.

### Question 4

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

### Question 5

Virtually all candidates scored full marks on this question.

**Question 6**

This question was challenging for most candidates and full marks were rarely awarded.

Many candidates who correctly equated the volume of a hemisphere to the volume of the cone were unable to rearrange their equation correctly. In addition, a common error was to use volume for a sphere rather than hemisphere.

**Question 7**

This question provided a good test of indices with the majority of candidates scoring full marks. Some candidates gave their final answer as $25t^{25}$ or $6t^{6}$, both of which scored 1 mark.

**Question 8**

**(a)** Many candidates did not recognise that the triangles were similar.

**(b)** Candidates realised that the ratio of the lengths of sides was 1:1.5, but only stronger candidates were able to use the scale factor of the area as 2.25.

**Question 9**

This question tested the understanding of Venn diagrams and set notation. The first two parts were answered well by nearly all candidates but there were very few correct answers for **part (c)**, with many candidates listing the elements in the required set, rather than the number of elements.

**Question 10**

This question proved to be challenging and many candidates made mistakes in the first stage of squaring both sides. These candidates were still able to gain other method marks if their later working was correct, following on from their initial mistake. Candidates will always benefit from setting out their work in a clear and logical fashion.

**Question 11**

Only the very strongest candidates answered this correctly and many others showed a lack of preparation for answering circle theorem questions.

**Question 12**

This question tested basic understanding of numbers in standard form. Many candidates found an initial answer of $21\times10^{100}$ but were unable to correct this to a number in standard form.

**Question 13**

**(a)** Although the majority of candidates scored full marks, a significant number did not realise that the question was the difference of two squares.

**(b)** There were very few fully correct answers. Candidates who started by reordering the four terms were more successful.

**Question 14**

Most candidates showed a good understanding of surds and were able to score full marks. Some candidates made careless slips in their surd calculations.

**Question 15**

Almost all candidates scored this mark showing an excellent understanding of the rules of logs.

**Question 16**

The strongest candidates scored full marks on this question. The majority of candidates were able to score the method mark for 16.

**Question 17**

This question proved to be a suitable challenge for stronger candidates. Many candidates did not attempt to express the expressions over a common denominator. Of those who did, there were slips in handling the negative signs.

# CAMBRIDGE INTERNATIONAL MATHEMATICS

**Paper 0607/31**
**Paper 31 (Core)**

## Key messages

Candidates should be encouraged to show all their working out especially for questions worth several marks.

Candidates should be familiar with correct mathematical terminology.

Candidates should practice answering 'show that' questions and understand that they cannot work backwards in these questions.

Centres should ensure that they cover the full syllabus with their candidates. It appeared as if some topics had not been taught.

Centres should also ensure that candidates are familiar with command words. They should realise that if the question states 'write down' then they do not have to work anything out.

## General comments

Most candidates attempted all the questions and there was no evidence of candidates being short of time. However, candidates need to read the questions carefully and answer exactly what is asked in the question.

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 to 3 significant figures. Giving answers to fewer significant figures will mean that marks cannot be awarded.

When working out is shown and is correct then partial marks can be awarded even if the final answer is incorrect.

Candidates should bring the correct equipment to the examination. Many appeared not to have a ruler with them to draw a straight line. It also appeared that some candidates did not have a graphic display calculator.

## Comments on specific questions

### Question 1

**(a)** Some candidates added 45 to the \$15 before multiplying by \$0.25 and could not be awarded any marks.

**(b)** Many candidates worked out the correct cost for the bicycle and car but a few wrote the answer incorrectly as "car by \$48".

**(c)** There were many correct answers to the number of kilometres.

**(d)** Some candidates had a problem writing down the formula for the travel expenses. The main error was to write $E = 40k$ – or to multiply their answer by 7.

**Question 2**

**(a) (i)** Nearly all candidates found the correct total that Toby spent.

**(ii)** Most candidates also answered this part correctly.

**(iii)** This part was quite well answered but not all candidates gave the answer as a fraction in its simplest form.

**(iv)** Not all candidates added the travel amount to the accommodation amount. Some divided by 100 rather than 400.

**(b) (i)** The majority of candidates measured the angle correctly. A few did not use their protractor accurately and gave an answer of 80° and a few read off the obtuse angle instead of the acute angle.

**(ii)** Candidates found finding the fraction of the total amount spent on accommodation challenging. Some candidates attempted to use the information in **part (iii)** to find this answer.

**(iii)** There were many correct answers to this part. Some candidates gained one mark for recognising that the angle was 90° or dividing by 4.

**Question 3**

**(a) (i)** Only a few candidates knew that this shape was a kite. The most common answers were rhombus, parallelogram or diamond.

**(ii)** Many candidates were able to give all three coordinates correctly.

**(iii)** Only a few candidates managed to find the correct area. Most candidates used 6 for *CA* and 2 and 6 for the heights of the triangles.

**(b)** Many candidates drew the correct line of symmetry on the kite. Only a few candidates included a horizontal line as well.

**(c) (i)** Most candidates knew that the scale factor was 2.

**(ii)** Not all candidates completed the enlargement correctly. However, some drew the kite to touch the top of the grid and some drew it to touch the side of the grid as well.

**(d)** Not all candidates managed to work out the correct size of the angle. The most common incorrect answer was 60°.

**Question 4**

**(a)** Only a few candidates wrote the number incorrectly.

**(b) (i)** Most candidates could work out the square but some wrote their answer as 70.6 which was not the exact answer to the question.

**(ii)** Many candidates gained one mark for writing 5.46… but few gave their answer correct to 2 significant figures.

**(c) (i)** This part was answered well by the majority of candidates.

**(ii)** This part was also answered well.

**(d) (i)** Many candidates knew that 36 was the square number between 30 and 40. A few wrote 6 and some candidates gave a square number that was not between the limits given in the question.

**(ii)** Most candidates could give one of the prime numbers between 30 and 40. Here too, some candidates gave a prime number but not between 30 and 40 and some gave a number that was not prime.

**Question 5**

**(a)** Not all candidates were aware of what factorise means and tried to solve the expression as if it were an equation. Some others took out 4 as common and then ended up with a fraction inside their brackets.

**(b)** There was a good attempt seen at expanding the expression with most candidates being awarded one or two marks for this part.

**(c)** Many candidates managed to solve the equation correctly.

**(d)** Writing the fraction in its simplest form was reasonably well attempted. A few candidates inverted the first fraction instead of the second one.

**Question 6**

**(a)** Many candidates managed to plot the points correctly.

**(b)** Most candidates knew this was a positive correlation but there were also other answers given such as "negative", "no correlation", "more time revising the better the score".

**(c) (i)** Many candidates found the correct mean time and mean score.

**(ii)** There were only a few candidates who scored both marks for drawing a line of best fit. Very few candidates plotted their mean point and, as a result, their line did not pass through the mean point. Also, many candidates drew their line through (0, 0) which was out of tolerance.

**(d)** Many candidates knew how to use their line of best fit to read off the score and therefore scored a follow through mark.

**Question 7**

**(a)** Not many candidates scored full marks for the volume of ice on the lake. Some gained one mark for multiplying 3500 by 0.68 or 0.12.

**(b)** The ratio was reasonably well answered. Only a small number of candidates divided the number by 5 and 3 separately.

**(c)** Writing the standard form number as an ordinary number proved rather difficult for most candidates. Very few gave the correct answer.

**(d) (i)** There were also problems with writing the number in standard form. Some candidates wrote $257 \times 10^8$.

**(ii)** This also proved difficult for candidates with very few correct answers seen.

**Question 8**

**(a) (i)** Many candidates knew to use the formula for the area of a circle. A few used the formula for the perimeter instead.

**(ii)** Very few correct answers were seen for this part. Many candidates were awarded one mark for dividing their answer to **part (i)** by 120. Very few candidates knew how many cubic centimetres were in a litre.

**(b)** There were some correct answers for the surface area seen. Many candidates found the volume instead of the surface area. A large number of candidates wrote $50 \times 30 \times 2 + 80 \times 30 \times 4$ as their answer and were awarded one mark only.

**Question 9**

**(a)** Very few correct answers for the mean time were seen. Some candidates knew that they had to find the mid-points but then did not know what to do with them after that. Some added up the mid-points and divided by 6 and others added up the frequencies and divided by 6.

**(b)** The modal group was found correctly by many candidates.

**(c)** The probability was also reasonably well answered.

**(d)** Almost all candidates drew the correct bar chart.

**Question 10**

**(a) (i)** Candidates generally found this 'show that' question difficult. In this part, a number of candidates managed to score two marks for writing $5.5^2 - 2.7^2$ but then just gave the answer 4.79. They should have written 4.791… first to show that the answer rounds to 4.79.

**(ii)** Finding the angle between the ladder and the ground was not very well answered. Many candidates tried to answer this without using trigonometry.

**(b)** A few candidates managed to find 5.168… but forgot to subtract 4.79 from their answer. Some candidates tried to use cosine and others did not know how to tackle the problem at all.

**Question 11**

**(a) (i)** Those candidates who had a graphic display calculator managed to draw the parabola correctly.

**(ii)** Most candidates found the correct coordinates for the local minimum.

**(b) (i)** There were quite a number of correct answers seen for the cubic graph. A few candidates did not place a maximum or a minimum and their graph looked more like that of $y = x^3$.

**(ii)** Only the strongest candidates were awarded full marks for the local maximum, mainly due to rounding errors or not giving answers correct to three significant figures.

**(c)** Finding the $x$-coordinates of the points of intersection was well attempted.

# CAMBRIDGE INTERNATIONAL MATHEMATICS

**Paper 0607/32**
**Paper 32 (Core)**

## Key messages

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

Candidates should be familiar with correct mathematical terminology.

Candidates should practice answering 'show that' questions and understand that they cannot work backwards in these questions.

Centres should ensure that they cover the full syllabus with their candidates. It appeared as if some topics had not been taught.

Centres should also ensure that candidates are familiar with command words. They should realise that if the question states 'write down' then they do not have to work anything out.

## General comments

Candidates performed quite well on this paper. Many were well prepared and in general showed a strong understanding of the syllabus content. To succeed in this paper, it is essential for candidates to have completed full syllabus coverage. Compound Interest and trigonometry were topics less well understood. This year, some candidates did not attempt every question but there was no evidence to suggest that candidates did not have sufficient time to complete the paper.

Some candidates did not show their working and just wrote down final answers. Calculators were generally used with confidence, but it appeared that some candidates did not have a graphic display calculator, as the syllabus requires. Some candidates used pencil and paper methods to solve arithmetic problems, when they should have been using a calculator.

Work on algebra questions was good this year. Candidates had a firm grasp of the conventions and procedures required. Drawing work was also good, with many candidates taking their time to measure angles and plot points accurately.

## Comments on specific questions

### Question 1

**(a)** Most candidates identified the sequence as linear with a difference of 7 and managed to find the missing two terms.

**(b)** Although many candidates found the value correctly in **part (i)**, there were those who, after obtaining the correct answer, deleted the negative sign. Some candidates performed the calculation in **part (i)** in the wrong order; (256 – 31) × 68 was the common wrong calculation used. In **part (ii)**, $4^3 - 4^2 = 4^1$ was seen often.

**(c)** A number of candidates thought the cube root symbol was asking them to divide 105 by 3. Those that could use their calculator to find the cube root often failed to round their answer to 4 significant figures. Many rounded to 4 decimal places.

**(d)** There were many correct answers but some candidates did not read the question clearly enough and wrote the fraction as a decimal correct to 3 decimal places, rather than a percentage correct to 3 decimal places.

**(e)** This part was answered well with few errors.

**(f)** This part was answered well with few errors.

**(g)** Many candidates did not know how to use their calculator to add the two standard form numbers. A lot tried to do this manually often making errors with the number of zeros needed. A common incorrect answer was $5.7 \times 10^9$.

**Question 2**

**(a)** Radius and diameter were well known properties of a circle. Tangent was less well known and many candidates did not know what a chord of a circle was.

**(b)** Although many candidates could work out the circumference correctly, the formula is given on page 2, many used the incorrect formula and $\pi r^2$, $2\pi rh$ and $\pi r^2 h$ were all seen. A significant number of candidates used 3.14 for pi, not the calculator value as specified in the instructions on the front cover of the examination paper.

**Question 3**

**(a)** Many candidates split the cross into five equal squares of side 10 cm and went on to correctly find the total area.

**(b)** Most candidates correctly found the total area of the flag and many went on to find the required percentage.

**(c)** Rotational symmetry was not well known. Many candidates gave an answer of 4, the rotational symmetry of the cross not the flag. Only stronger candidates gave the correct answer of 2.

**(d)** Once again, many candidates focused on the line symmetry of the cross and not the whole flag.

**Question 4**

**(a)** Most candidates correctly completed the frequency table in **part (i)** and were able to identify the mode in **part (ii)**. However, in **part (iii)**, a significant number of candidates found the median instead of the mean. The probability in **part (iv)** was usually found correctly.

**(b)** In **part (i)**, a number of candidates used the value 60° in their calculation. The question asked that a calculation be performed where the answer is 60°. Many candidates correctly completed the pie chart in **part (ii)**. Angles were measured and drawn accurately and all sectors were labelled correctly.

**Question 5**

**(a)** This part was usually answered correctly.

**(b)** There were many fully correct answers to all parts of this question. Some candidates mistook the formula to be $T = (25 + 35) \times h$ which meant the answers were often incorrect.

**(c)** Very few candidates used the compound interest formula here with many thinking it was a simple interest calculation that was required. Of those candidates who did use the compound interest formula, many gave the value of the investment rather than going further to find the interest gained.

**Question 6**

**(a)** Many candidates answered both parts correctly. Many of the candidates that had difficulty with **part (ii)** joined the $y$ terms incorrectly as $-y + 2y = -3y$.

**(b)** Candidates found **part (iii)** the most challenging part of this question. Dealing with the negative $x$ term and the inequality sign was the main problem, but a significant number of candidates ended with an answer involving $x$ and 10.5.

**(c)** Many candidates coped well with these algebraic fractions. In **part (i)** it was common to see candidates trying to write the fractions with a common denominator and in **part (ii)**, although many combined the fractions correctly, some did not reduce their answer to its simplest form.

**Question 7**

**(a)** Many candidates correctly identified the class with the highest frequency as the modal class.

**(b)** The cumulative frequency table was completed correctly by many candidates. The values given in the table gave a good clue as to how to proceed.

**(c)** Although most candidates plotted points correctly and joined these with a smooth curve, some misread the scale on the horizontal axis.

**(d)** There were many incorrect answers to **parts (i)** and **(ii)**. For the median and the lower quartile, a lot of candidates started at 60 and 30 on the horizontal axis and found the corresponding cumulative frequency values on the vertical axis, rather than starting from 30 and 15 on the vertical axis. Some just gave 60 and 30 as their answers. In **part (iii)**, most found the cumulative frequency when $t = 80$. Some candidates forgot to subtract this value from 60 for their answer.

**Question 8**

**(a)** The two points were usually plotted correctly.

**(b)** Few candidates knew the term 'scalene' for the mathematical name of the triangle.

**(c)** Although the coordinates of the mid-point were often found correctly, candidates found finding the gradient more challenging. Many tried to use the formula but often this appeared upside down. Some tried to draw a triangle with $AB$ as hypotenuse but when working out the gradient, decided it could not be a fraction so divided the wrong way.

**(d)** Some candidates correctly used the formula based on the end points. Many thought that $ABC$ was a right-angled triangle with the right angle at $B$. They then measured the length of $AC$ and $BC$ to the nearest whole number (8 cm and 4 cm) and used Pythagoras' Theorem with these values.

**(e)** Most candidates reflected the triangle in the $x$-axis.

**Question 9**

**(a)** Many candidates confused odd and even numbers and gave set $A$ as all the even numbers between 10 and 21. Set $B$ was usually correct and most candidates knew the meaning of the intersection symbol. Completing the Venn diagram was done well, although some candidates forgot to include all the elements outside the two sets.

**(b)** Most candidates realised that the first diagram was the union of the two sets. However, some worked out the set notation for the second diagram. $Q - P$ was a common wrong answer.

**Question 10**

**(a)** Many candidates found this challenging and did not even try to use trigonometry. Of those who did, there was much confusion as to which of sin, cos or tan to use.

**(b)** A number of candidates found *BX* to be 16 m but then did not know how to progress. A number found the angle *BOX* instead of the angle *XBO*.

**Question 11**

**(a)** There were many correct sketches. Some candidates plotted points to establish the shape of the curve. A number did not attempt the question. It is possible they did not have a graphic display calculator.

**(b)** This was answered well, with many fully correct answers.

**(c)** Again, this was answered well, even when there was no graph drawn in **part (a)**.

**(d)** Many candidates found this coordinate correctly.

# CAMBRIDGE INTERNATIONAL MATHEMATICS

**Paper 0607/33**
**Paper 33 (Core)**

## Key messages

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

Candidates should be familiar with correct mathematical terminology.

Candidates should practice answering 'show that' questions and understand that they cannot work backwards in these questions.

Centres should ensure that they cover the full syllabus with their candidates. It appeared as if some topics had not been taught.

Centres should also ensure that candidates are familiar with command words. They should realise that if the question states 'write down' then they do not have to work anything out.

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Some candidates did not show their working and just wrote down final answers. Calculators were generally used with confidence, but it appeared that some candidates did not have a graphic display calculator, as the syllabus requires. Some candidates used pencil and paper methods to solve arithmetic problems, when they should have been using a calculator.

Work on algebra questions was good this year. Candidates had a firm grasp of the conventions and procedures required. Drawing work was also good, with many candidates taking their time to measure angles and plot points accurately.

## Comments on specific questions

### Question 1

**(a)** Most candidates identified the sequence as linear with a difference of 7 and managed to find the missing two terms.

**(b)** Although many candidates found the value correctly in **part (i)**, there were those who, after obtaining the correct answer, deleted the negative sign. Some candidates performed the calculation in **part (i)** in the wrong order; (256 – 31) × 68 was the common wrong calculation used. In **part (ii)**, $4^3 - 4^2 = 4^1$ was seen often.

**(c)** A number of candidates thought the cube root symbol was asking them to divide 105 by 3. Those that could use their calculator to find the cube root often failed to round their answer to 4 significant figures. Many rounded to 4 decimal places.

**(d)** There were many correct answers but some candidates did not read the question clearly enough and wrote the fraction as a decimal correct to 3 decimal places, rather than a percentage correct to 3 decimal places.

**(e)** This part was answered well with few errors.

**(f)** This part was answered well with few errors.

**(g)** Many candidates did not know how to use their calculator to add the two standard form numbers. A lot tried to do this manually often making errors with the number of zeros needed. A common incorrect answer was $5.7 \times 10^9$.

**Question 2**

**(a)** Radius and diameter were well known properties of a circle. Tangent was less well known and many candidates did not know what a chord of a circle was.

**(b)** Although many candidates could work out the circumference correctly, the formula is given on page 2, many used the incorrect formula and $\pi r^2$, $2\pi rh$ and $\pi r^2 h$ were all seen. A significant number of candidates used 3.14 for pi, not the calculator value as specified in the instructions on the front cover of the examination paper.

**Question 3**

**(a)** Many candidates split the cross into five equal squares of side 10 cm and went on to correctly find the total area.

**(b)** Most candidates correctly found the total area of the flag and many went on to find the required percentage.

**(c)** Rotational symmetry was not well known. Many candidates gave an answer of 4, the rotational symmetry of the cross not the flag. Only stronger candidates gave the correct answer of 2.

**(d)** Once again, many candidates focused on the line symmetry of the cross and not the whole flag.

**Question 4**

**(a)** Most candidates correctly completed the frequency table in **part (i)** and were able to identify the mode in **part (ii)**. However, in **part (iii)**, a significant number of candidates found the median instead of the mean. The probability in **part (iv)** was usually found correctly.

**(b)** In **part (i)**, a number of candidates used the value 60° in their calculation. The question asked that a calculation be performed where the answer is 60°. Many candidates correctly completed the pie chart in **part (ii)**. Angles were measured and drawn accurately and all sectors were labelled correctly.

**Question 5**

**(a)** This part was usually answered correctly.

**(b)** There were many fully correct answers to all parts of this question. Some candidates mistook the formula to be $T = (25 + 35) \times h$ which meant the answers were often incorrect.

**(c)** Very few candidates used the compound interest formula here with many thinking it was a simple interest calculation that was required. Of those candidates who did use the compound interest formula, many gave the value of the investment rather than going further to find the interest gained.

**Question 6**

**(a)** Many candidates answered both parts correctly. Many of the candidates that had difficulty with **part (ii)** joined the $y$ terms incorrectly as $-y + 2y = -3y$.

**(b)** Candidates found **part (iii)** the most challenging part of this question. Dealing with the negative $x$ term and the inequality sign was the main problem, but a significant number of candidates ended with an answer involving $x$ and 10.5.

**(c)** Many candidates coped well with these algebraic fractions. In **part (i)** it was common to see candidates trying to write the fractions with a common denominator and in **part (ii)**, although many combined the fractions correctly, some did not reduce their answer to its simplest form.

**Question 7**

**(a)** Many candidates correctly identified the class with the highest frequency as the modal class.

**(b)** The cumulative frequency table was completed correctly by many candidates. The values given in the table gave a good clue as to how to proceed.

**(c)** Although most candidates plotted points correctly and joined these with a smooth curve, some misread the scale on the horizontal axis.

**(d)** There were many incorrect answers to **parts (i)** and **(ii)**. For the median and the lower quartile, a lot of candidates started at 60 and 30 on the horizontal axis and found the corresponding cumulative frequency values on the vertical axis, rather than starting from 30 and 15 on the vertical axis. Some just gave 60 and 30 as their answers. In **part (iii)**, most found the cumulative frequency when $t = 80$. Some candidates forgot to subtract this value from 60 for their answer.

**Question 8**

**(a)** The two points were usually plotted correctly.

**(b)** Few candidates knew the term 'scalene' for the mathematical name of the triangle.

**(c)** Although the coordinates of the mid-point were often found correctly, candidates found finding the gradient more challenging. Many tried to use the formula but often this appeared upside down. Some tried to draw a triangle with $AB$ as hypotenuse but when working out the gradient, decided it could not be a fraction so divided the wrong way.

**(d)** Some candidates correctly used the formula based on the end points. Many thought that $ABC$ was a right-angled triangle with the right angle at $B$. They then measured the length of $AC$ and $BC$ to the nearest whole number (8 cm and 4 cm) and used Pythagoras' Theorem with these values.

**(e)** Most candidates reflected the triangle in the $x$-axis.

**Question 9**

**(a)** Many candidates confused odd and even numbers and gave set $A$ as all the even numbers between 10 and 21. Set $B$ was usually correct and most candidates knew the meaning of the intersection symbol. Completing the Venn diagram was done well, although some candidates forgot to include all the elements outside the two sets.

**(b)** Most candidates realised that the first diagram was the union of the two sets. However, some worked out the set notation for the second diagram. $Q - P$ was a common wrong answer.

**Question 10**

**(a)** Many candidates found this challenging and did not even try to use trigonometry. Of those who did, there was much confusion as to which of sin, cos or tan to use.

**(b)** A number of candidates found *BX* to be 16 m but then did not know how to progress. A number found the angle *BOX* instead of the angle *XBO*.

**Question 11**

**(a)** There were many correct sketches. Some candidates plotted points to establish the shape of the curve. A number did not attempt the question. It is possible they did not have a graphic display calculator.

**(b)** This was answered well, with many fully correct answers.

**(c)** Again, this was answered well, even when there was no graph drawn in **part (a)**.

**(d)** Many candidates found this coordinate correctly.

# CAMBRIDGE INTERNATIONAL MATHEMATICS

**Paper 0607/41**
**Paper 41 (Extended)**

## Key message

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 graphics calculator is an important aid and candidates are expected to be fully experienced in the appropriate use of this 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 in the syllabus and candidates should be aware that the more advanced functions will usually remove the opportunity to show working. There are often questions where a graphical approach can replace the need for some complicated algebra and candidates need to be aware of such opportunities.

## General comments

Candidates were well prepared for this paper and there were many good responses showing all necessary working and a suitable level of accuracy. Candidates were able to attempt all 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 needed more awareness of the need to show working, either when answers alone may not earn full marks or when a small error could mean that marks cannot be awarded in the absence of any method seen. This was 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 may not be clearly legible.
- Care in copying values from one line to the next.
- Care in reading the question.

The sketching of graphs was fairly good and there was evidence of the use of a graphics calculator supported by working, which is in line with the syllabus. Candidates need to be aware that in drawing graphs points should be plotted within 1 mm of the correct position. There was 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.

The most accessible topics were those on transformations, averages, circle theorems, simultaneous equations, linear functions, cumulative frequency diagrams, curve sketching and quadratic equations.

The most challenging topics were compound functions, indices, asymptotes on graphs, 3D spatial awareness for Pythagoras and trigonometry, combined probability, compound/simple interest and compound fraction questions.

**Comments on specific questions**

**Question 1**

**(a)** Most candidates scored at least 1 mark here, generally for rotation, with stronger candidates scoring all 3 marks. The direction of rotation was often included but it was not required due to the correct answer being 180°. The centre of rotation saw the fewest correct responses with many candidates inverting the *x* and *y* coordinates. Several candidates gained no credit for stating more than one transformation. The alternative fully correct answer of enlargement, (SF) –1, centre (0, 5) was rarely seen.

**(b)** Nearly all candidates gained full marks but some scored 1 mark for either their *x* or *y* translation correct.

**(c)** This was a well answered part aided by the fact that the centre of rotation was actually on the original image. However, some candidates rotated in the wrong direction and others used the incorrect centre gaining one mark.

**(d)** This was another well answered part with most candidates gaining full marks but some scored one mark for a reflection in $y = k$ or $x = 1$. Several candidates had the image in the correct position but the image was a translation, not a reflection of the original triangle.

**Question 2**

**(a) (i)** The standard of plotting was very good with most candidates scoring both marks. In this case, plotting was aided by the scale being the same on both axes and only integer values being used.

**(ii)** Nearly all answers were correct but the occasional positive, linear, no (zero), direct, inverse was seen.

**(b)** Only stronger candidates answered this part well with many other candidates calculating the wrong mean using the number of barrels (*x* million) data. This part was misinterpreted by many candidates who used group data to find a mean of 48(.0) or 48.01… which was allowed.

**(c)** Most candidates scored at least 1 mark here, but many made mistakes with accuracy with early rounding, especially $– 0.78x$. Many responses also had the correct values but then omitted the negative sign, whilst others did not form an equation by omitting the x from their final answer. Several candidates gave very accurate values in their working but did not actually form an equation so these values did not gain credit unless included later.

**(d) (i)** There were many correct responses here including follow through positive answers provided that **part (c)** was a linear equation. However, some candidates tried to solve for *x* given $y = 90$. A generous range of answers was used to cover all possibilities from **part (c)**. Correct rounded integer values were also allowed here.

**(ii)** This part was not answered as well with many candidates making the assumption that this part would involve solving for *x* when $y = 120$.

**(e)** A variety of acceptable reasons were seen here with valid comparisons to the data sets. The words outlier, extrapolation, interpolation etc. were used by the stronger candidates.

**Question 3**

**(a)** Many correct solutions were seen with candidates showing a good understanding of ratio but several candidates prematurely rounded to 1 decimal place, but $420.2 scored three marks. Many candidates could not successfully convert Alana or Bev's share into minutes and could only earn two marks.

**(b) (i)** Overall this part was not answered particularly well with many candidates obtaining the correct final answer from incorrect methods, usually multiplying \$255 by 0.98 leading to \$249.90 and then rounding to \$250. Several candidates also misinterpreted the question and multiplied \$255 by 1.02 leading to an incorrect answer of \$260.10.

**(ii)** This was answered fairly well with most candidates gaining at least one mark for 247.35 or 397.8 seen but the majority of candidates went on to score full marks.

**(c)** Only stronger candidates answered this correctly. The first step was to add together $\frac{1}{4}$ and $\frac{2}{9}$ and then subtract the result from 1 for the first method mark. The second part required obtaining $\frac{2}{3}$ of this answer for two marks and this was rarely seen. Finally, candidates had to form and solve an equation in $x$ equating $\frac{19x}{54} = 152$ to obtain a final answer of 432. Most responses scored zero or were left blank but a few method marks were awarded for $\frac{19}{36}$ or $\frac{19}{108}$ seen.

**(d)** This was a reasonably well answered part with many candidates scoring full marks but several only scored a mark for finding 21.23 by not including the initial sum of \$500 in their calculations. Many others did not read the question carefully and used compound interest for a final answer of 1.2(00) to 1.201.

**Question 4**

**(a)** This part tested the knowledge of mathematical language in circle theorems and it was essential that candidates used both the words tangent and radius. This was not achieved in the majority of responses.

**(b) (i)** This was generally answered well.

**(ii)** Most answers were correct including those correctly evaluating on follow through from **part (b)(i)**.

**(iii)** Most answers were correct including those correctly evaluating on follow through from **part (b)(i)** provided their final answer was an acute angle.

**(c) (i)** The majority of responses were correct but many other incorrect combinations were seen.

**(ii)** Only stronger candidates earned the mark for knowing that the scale factor had to be squared and the correct alternative of 16:144 was seen in several responses. The most common incorrect answer was 1:3 and some had their values the wrong way round.

**Question 5**

**(a)** Many candidates scored full marks here. However, excessive overlaps were sometimes seen particularly with their asymptotes and there was also excessive feathering or curl backs. Generally, the rectangular hyperbola branches did not cross the $x$-axis. Sometimes one of the four branches was missing so the maximum mark available was one.

**(b)** This part was not answered very well with many candidates prematurely rounding or omitting the negative sign. Some responses of – 6 were also seen. The sensible approach was to leave the answer as a fraction, that is $-\frac{1}{6}$.

**(c)** Only stronger candidates scored full marks for all four asymptotes. The most common error was to forget the $x$-axis, that is $y = 0$. Many scored at least one mark for one correct equation.

**(d)** Nearly all answers were correct but there were some candidates who did not give a response. A few sketches had the graph cutting the positive $y$-axis whilst others had a negative gradient.

**(e)** Many correct answers were seen but still a large number of candidates prematurely rounded or truncated. 0.48, 0.49, 3.17 and 3.2 were regularly seen.

**(f)** Only the strongest candidates answered this fully correctly. $x < 0.487$ was awarded a mark on some responses but a lot of candidates did not give an answer. Candidates needed to use $x$ only in their inequalities, f($x$) or $y$ were not allowed.

**Question 6**

**(a)** This potentially more challenging part was generally answered very well but some candidates tried to solve for a direct relationship not an inverse one. Many responses gained two marks for setting up the relationship correctly and then accurately calculating $k$ using the initial boundary conditions but then were unable to solve for $y$ correctly using the new parameters.

**(b)** This was a reasonably well answered follow on part. Many candidates scored at least two marks for finding one correct answer but forgetting the negative root of $\frac{100}{16}$ when square rooting. Most scored a mark for completing the first step in rearranging their equation. Unfortunately, those that did not have a direct relationship in **part (a)** could gain no credit here. A few examples of curve sketching as a valid alternative were seen.

**Question 7**

**(a)** This simultaneous equation question was generally well answered but the fact that the answers were not integers caused more numerical errors than usual. The most successful method was eliminating one variable by equating coefficients. Candidates who expressed one variable in terms of the other may have been more successful by using the graphics calculator and drawing a sketch.

**(b) (i)** The value of the function was almost always given correctly.

**(ii)** The value of a composite function was also well answered. A small number of candidates treated the composite function as a product of two functions.

**(iii)** The equation involving another composite function proved to be more challenging, usually as a result of the algebra involved. Stronger candidates did not expand $(x-1)^3$ and then found the answer quite easily. Many candidates did expand $(x-1)^3$ with little or no success. An error quite frequently seen was $5(x-1)^3 = (5x-5)^3$.

**(iv)** This question was challenging for many candidates. As g($x$) contained a fraction, g(g($x$)) contained a fraction within a fraction and only stronger candidates were able to cope with this. Many candidates gained the first method mark by simply writing $\dfrac{1}{2\left(\dfrac{1}{2x-1}\right)-1}$. A quite common error was to write $2\left(\dfrac{1}{2x-1}\right)=\dfrac{2}{4x-2}$.

**Question 8**

**(a)** Almost all candidates drew a correct cumulative frequency curve.

**(b) (i)** The median was almost always correctly stated.

**(ii)** The interquartile range was generally well answered. A few candidates subtracted the cumulative frequencies which led to them giving the median as their answer.

**(c)** This part involved finding a percentage from reading a cumulative frequency for a given value of the mass. The question was quite well answered. One error seen was to give the cumulative frequency reading as a percentage instead of subtracting the reading from the total cumulative frequency. This earned one of the two marks. Another error was to express the mass in the problem as a percentage of the largest mass.

**(d)** The frequency table found from the cumulative frequency table was very well done.

**(e)** The calculation of the mean, using the table found in **part (d)**, was generally well answered. As this was expected to be done using the graphics calculator only two marks were available. One mark was given for mid-values seen or implied and so a lengthy calculation did not earn any extra marks. A large number of candidates wrote the mid-values beside the table in **part (d)** and some gained this mark after making an error with their graphics calculator. Several answers of 221.6 were seen. Here candidates had added together their mid-values and divided by 6. This was close to the actual correct answer.

**Question 9**

**(a) (i)** There were many correct answers here and more would have been correct if it had not been for writing the area of the square of side $2a$ as $2a^2$ instead of $(2a)^2$.

**(ii)** The substitution of two values into the answer to **part (a)(i)** was usually successfully carried out.

**(b)** The perimeter of the area between the two squares was more challenging. Many candidates subtracted the perimeter of the small square from the perimeter of the large square, presumably because the area in **part (a)(i)** involved a subtraction.

**(c)** This part involved equating the expressions in **part (a)(i)** and **part (c)**. Incorrect answers to those two parts were still able to earn three marks as long as the candidates' equation led to a three-term quadratic. This was not always the case as some equations led to a two-term quadratic or a linear equation, resulting in only the first method mark. A few candidates equated **part (c)** to **part (a)(ii)** even though the values of $a$ were different.

**Question 10**

**(a) (i)** This probability question involving a product in a 'with replacement' situation was well answered. Almost all candidates treated it as a 'with replacement' correctly. A small number of candidates gave a simple fraction for a single event instead of a product of two events.

**(ii)** This part was a little more challenging as it required the sum of three products, still in a 'with replacement' situation. There were many correct answers and, if not fully correct, many partially successful answers.

**(b)** This part involved the same context but 'without replacement'. The question was more challenging in so far as choosing two balls of different colours from balls with three colours required a careful strategy. There were many correct answers. As **part (a)(ii)** involved the same colour, many candidates chose this method and subtracted their sum from 1. This was the most successful approach. Candidates choosing the other method usually considered, for example, red with blue and red with green separately rather than red with not red. This required the sum of six products and quite common errors seen were the omission of a product or a numerical slip in one or more products.

**Question 11**

**(a)** This first part of a triangular prism context was very well answered with most candidates recognising the right-angled triangle and using the sine ratio.

**(b)** In the same way, many candidates recognised another right-angled triangle and correctly used Pythagoras Theorem.

**(c)** This question involved a scalene triangle which was not in any of the faces of the prism. Only one side length of the triangle was available at this stage, that being the answer to **part (b)**. Many candidates gained some credit by using Pythagoras twice more to find the other two sides of the triangle. Many of these candidates then went on to use the cosine rule, often successfully. Quite a large number of candidates used values of sides or angles which were not in the required triangle. Some candidates did not attempt this part.

**(d)** This part really depended on information used in **part (c)** and so the only successful candidates were those who had used a correct approach in **part (c)** and had an answer to **part (c)** to be able to use the appropriate formula for the area of the triangle.

**Question 12**

**(a) (i)** The first part of this question was answered well by most candidates. Quite a number of candidates thought that the value of 13 would come into the answer when the interpretation required was that 1 raised to any power is still 1.

**(ii)** This part was probably a little more successful than **part (i)** with candidates being very familiar with any non-zero value to the power of 0 is equal to 1.

**(b) (i)** This part followed on from **part (a)(ii)** and most candidates who understood **part (a)** then correctly solved $x - 5 = 0$.

**(ii)** This part followed on from **part (a)(i)** and most candidates who understood **part (a)** then correctly solved $x - 5 = 1$.

**(c) (i)** The instruction in this part was to use **part (a)** and candidates had to realise that they had to connect to both *a* and *b* in the expression. There were some fully correct answers and also many candidates scored two marks for one correct answer, usually from $x - 3 = 0$.

**(ii)** This part also required the use of $a^b = 1$ with both *a* and *b* being quadratic expressions. As the instruction was to use **part (a)** the mark scheme required the method to be seen and so marks could only be awarded if $x^2 - 4x + 4 = 1$ and/or $x^2 - 9x + 20 = 0$ were present in the working. Stronger candidates usually earned two or four marks. A small number of candidates simply tried to give answers without working and a large number of candidates did not attempt this part.

# CAMBRIDGE INTERNATIONAL MATHEMATICS

**Paper 0607/42**
**Paper 42 (Extended)**

## Key messages

Candidates should give final answers with 3 significant figure accuracy except when the answer is exact or if a different degree of accuracy is required for a particular question. Intermediate answers should not be rounded or truncated and the memory functions of the calculator should be used to maintain accuracy in subsequent calculations.

If a final answer is given in the question to a stated degree of accuracy, then candidates should maintain accuracy throughout and should show a more accurate value, usually in the penultimate line of their working, before rounding correctly to obtain the required final answer.

Some questions will direct candidates to use a particular method of solution and it is important that candidates use the method required.

If a question requires candidates to show a general result, then they need to provide structured evidence that leads to the given result. In order to show a result involving integers expressed algebraically it is important for candidates to understand that giving numerical examples which validate the result is insufficient and that a more general approach is required.

Candidates demonstrated good use of the graphics calculator in sketching functions and finding local maxima and minima and in determining asymptotes. Better results could be obtained by some candidates by including these values on their sketches.

## General comments

The paper was accessible to almost all candidates. Questions involving algebraic manipulation and equation solving were done well, but many candidates found the final question more difficult.

Most candidates showed working which was usually clear and logical.

Some candidates could not be awarded marks as they gave answers which were not sufficiently accurate, usually due to premature rounding of figures used in calculations.

Good use of the graphics calculator was seen with many excellent sketches produced.

## Comments on specific questions

### Question 1

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

**(b) (i)** This proved to be a difficult question for many candidates. The most common error was the incorrect use of the 24-hour clock, with 02 05 often given as the answer.

**(ii)** The main error here was in forgetting the 6 hours difference and obtaining a value of 14 hrs 17 mins instead of 8 hrs 17 mins. Changing hours and minutes to a single decimal proved difficult for some candidates, with 8.17 being a common error.

**Question 2**

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

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

**(c)** Most candidates answered this part well, but the most common error was in not giving the coefficients to the required degree of accuracy.

**(d)** This was answered well by most candidates. Those candidates who were not awarded the accuracy mark in the previous part usually gained a follow through mark here.

**(e)** This was answered well by most candidates who showed an excellent understanding of the potential problems caused by extrapolation.

**Question 3**

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

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

**(c) (i)** Some candidates incorrectly showed 1.8 per cent × 1500 in their calculation instead of the required fraction or decimal. A small minority of candidates used compound interest.

**(ii)** Errors here usually occurred by using the compound interest formula on $500 or $1500 over three years. Some candidates made use of simple interest. Those that succeeded best laid out their working clearly, calculating the value a year at a time adding $500 each year.

**Question 4**

**(a)** Most candidates answered this question well. The most common error made was in subtracting the negative numbers. A simple sketch may have helped some candidates to correct errors.

**(b)** This question was answered well by almost all candidates with working set out clearly. Where errors were seen, they usually arose from an incorrect calculation of the gradient of the perpendicular bisector or an incorrect mid-point being used.

**(c)** This proved to be difficult with many candidates using algebra when a simple diagram would have helped to clarify what was needed.

**Question 5**

**(a) (i)** This was answered well by most candidates.

**(ii)** This was answered well by most candidates.

**(b)** Many candidates found this to be a difficult question because it required going from cumulative frequencies back to the original class frequencies.

**(c)** Only stronger candidates answered this correctly.

**(d)** Most candidates used their calculator successfully to find the mean, but it is still good practice to show the mid-points so that if an error is made, a method mark can still be scored. This was important here because many candidates had incorrect class frequencies which led to an incorrect mean. A common error was to calculate the mean of the mid-points.

**Question 6**

**(a) (i)** Most candidates scored full marks but many did not deal with the negative sign correctly when removing brackets.

**(ii)** The same error in dealing with the negative sign was seen here.

**(b) (i)** Most candidates found the required rearrangement to be straightforward.

**(ii)** This rearrangement proved to be more difficult and many candidates gave a final answer with a term involving *b* on both sides of their expression.

**(c) (i)** This was answered well by most candidates.

**(ii)** This was answered well by most candidates.

**(iii)** Most candidates found both values, but there were some who omitted the negative solution.

**(d)** The question required the quadratic equation to be solved by factorising. Many candidates chose to use the formula instead and therefore scored only 1 of the 3 marks available for a correct solution. Some candidates incorrectly gave an answer for the negative root as a decimal with less than 3 significant figure accuracy.

**Question 7**

**(a)** This was answered well by most candidates but some answers were not correct to 3 significant figures.

**(b) (i)** Many different methods were used here to arrive at the correct answer and many candidates scored full marks with work clearly set out and easy to understand. However, not everyone realised the link to their work in **part (a)**. The most common approach was to find the areas of 4 sectors and 4 segments and then subtract their sum from the area of the full circle and this was successful for most. Not many candidates realised that the shaded area could be found by subtracting the areas of 2 segments from the area of one sector and then doubling the result. There were some errors in the accuracy of answers caused by premature rounding.

**(ii)** Most candidates realised that the required perimeter was made up of 6 equal arc lengths and scored full marks. For those who did not use 6 for the number of arc lengths, a method mark was still available.

**Question 8**

**(a)** This was answered well by most candidates, with the second part proving slightly more difficult because of some confusion between intersection and union signs.

**(b) (i)** This was also answered well by most candidates, the most common errors being the omission of those elements outside sets *A*, *B*, and *C* and the inclusion of elements which were not part of the universal set.

**(ii)** Most candidates answered this well, often gaining a follow through mark after an incorrect diagram.

**(iii)** Most candidates also answered this well, often also gaining from the follow through mark.

**(iv)** This part proved more difficult with many candidates unsure of the notation n( ). A common error was to add the numbers of the elements instead of counting them.

**Question 9**

**(a)** Almost all candidates answered this part correctly.

**(b)** Almost all candidates answered this part correctly.

**(c)** Most candidates answered this correctly, the most common error being the use of probabilities with replacement instead of without replacement.

**(d)** Most candidates were able to deal with the different population successfully, but there were still some issues for those who used a ‘with replacement’ approach.

**(e)** This proved the most difficult part of the question, with many candidates not dealing with the two ways of achieving the outcome, and so giving an answer which was half that required.

**Question 10**

**(a)** The majority of candidates demonstrated a good knowledge of the cosine rule and its application and produced good detailed working. However, only a minority went on to gain full marks. Most candidates used their calculated angle in the formula for the area using the sine of this angle, but many had rounded this angle prematurely. It is expected that final answers involving angles are given to one decimal place accuracy but this angle was not the final answer and its accurate value should have been kept in the calculator memory. The answer was given to 2 decimal places and so a value of 18.330… should have been shown before the final answer.

**(b)** This was answered correctly by most candidates, but some chose to divide the volume by 3.

**(c)** Most candidates realised that the total surface area was the sum of the areas of 3 rectangles and 2 triangles, but many did not identify the dimensions of the 3 rectangles correctly.

**(d)** There were some very good answers here, with many candidates showing good understanding of the ratios of areas and volumes of similar figures. However, there were a substantial number of candidates who simply multiplied out without dealing with the square and cube factors.

**Question 11**

**(a)** There were many very good sketches, showing candidates' excellent use of their graphics calculator. Many candidates also showed the asymptotes on their sketch. A few candidates showed an excessive overlap in at least one of the branches of the graph.

**(b)** Most candidates identified the asymptotes correctly.

**(c) (i)** Most candidates gave the coordinates correctly, but some answers were not given to at least 3 significant figure accuracy.

**(ii)** Most candidates gave the coordinates correctly, but there was sometimes a loss of accuracy.

**(iii)** Most candidates recognised they needed to use their two answers to the previous part and were successful.

**(d) (i)** The majority of candidates answered this part correctly, but there was some loss of accuracy or candidates gave their answers as coordinates instead of just the values of $x$.

**(ii)** There were some excellent answers to this inequality. However, some candidates tried to solve the inequality algebraically with an inevitable lack of success.

**Question 12**

**(a)** This was a challenging question for many candidates. Some made a start with a correct algebraic expression for the square, but then used numbers to demonstrate the validity of the statement. However, this did not meet the requirement of the question to 'show that..'. This needed a demonstration of the statement's validity considering the individual terms of their algebraic expression and/or by using the properties of even and odd numbers and their products and sums.

**(b) (i)** More candidates were successful in this part.

**(ii)** Many candidates experienced difficulties here similar to those in **part (a)**. There was some correct algebra shown, but again candidates resorted to the use of numerical examples in order to show a general result. Subtracting the two squares led to an answer of $8n + 8$ and it was sufficient to say that because both terms are multiples of 8 then so is their sum. Some candidates factorised to give $8(n + 1)$ and this was also sufficient.

# CAMBRIDGE INTERNATIONAL MATHEMATICS

**Paper 0607/43**
**Paper 43 (Extended)**

## Key messages

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

Working through calculations needs to be to sufficient accuracy.

The efficient use of a graphic display calculator is required and sketching from a graphic display calculator will usually be regarded as working. Candidates should not use facilities of a graphic display calculator that are not in the syllabus.

Experience of questions that combine topics is also essential to succeed 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 gave answers to the required accuracy. Only occasionally in longer questions did candidates finish with answers outside the accepted range as a result of premature rounding during the calculation.

Topics which were successful were transformations (except a stretch), problems using a sketch from a graphic display calculator, linear and simultaneous equations, sequences (except exponential), ratio and proportion, percentages, simple and compound interest, coordinates and vectors, estimate of a mean value of continuous data using a graphic display calculator, probability tree diagram, sine rule and cosine rule.

Difficulties were seen in describing a stretch, algebraic manipulations, exponential sequence, number of years in a compound interest situation, equation of a perpendicular bisector, area of a shape made up of three triangles, shortest distance from a point to a line, trigonometric and logarithmic functions and variation.

## Comments on specific questions

### Question 1

In **parts (c)** and **(d)** a small number of candidates gave combined transformations where the demands of the questions were for single transformations. In these cases, no marks could be awarded.

**(a)** The rotation was often correctly drawn. A number of candidates gained one mark for a rotation of 90° clockwise but with an incorrect centre of rotation. Almost all candidates earned at least one mark.

**(b)** The enlargement with a fractional scale factor proved to be more challenging. Many candidates were fully correct but a large number of candidates drew an image with the correct size and orientation but in the incorrect position. A number of candidates gave images with a factor greater than one and a few candidates did not attempt this question.

**(c)** The name and description of the translation were usually correct. There were a few errors in the vector of the translation.

**(d)** The stretch was much more challenging with only stronger candidates gaining all three marks. The particular challenge was in giving the correct invariant line with many candidates stating the *y*-axis or omitting this part of the description. A few candidates gave the stretch factor as –2 instead of $\frac{1}{2}$ and a few stated that the transformation was an enlargement.

**Question 2**

**(a)** The sketch was almost always correctly drawn.

**(b)** The value of the function was reasonably well answered. The substitution of a negative number caused some sign errors.

**(c)** Solving the function equal to zero was usually correct. Candidates were clearly more familiar with using the graphic display calculator as opposed to using the algebra in **part (b)**.

**(d)** Candidates were very familiar with maximum points but quite a number were unable to distinguish between a maximum point and a maximum value.

**(e)** The vertical asymptote was almost always correctly given but $y = 0$ was not often seen. The sketch together with the fractions in the function was expected to lead to more success with the asymptote $y = 0$.

**(f)(i)** The solving of an equation involving the original function and a new function was quite well answered even though there was no command to add the new function to the sketch. Clearly candidates added it to their graphic display calculator as one or both correct answers were frequently seen. There were some candidates who did not give their answers to three or more significant figures when using the graphic display calculator meaning they could not be awarded full marks.

**(ii)** Clearing the fractions from the equation in **part (i)** proved to be more challenging with only stronger candidates carrying out a correct manipulation.

**Question 3**

**(a)** Setting up and solving a linear equation was very well done. Most candidates earned full marks.

**(b)** Setting up and solving simultaneous equations was usually successful. Almost all candidates gave two correct equations from the information given in the question. There were a few errors in eliminating a variable and these were often in the method of writing one variable in terms of the other and then substituting, largely due to the fractions involved. A small number of candidates did not read the question carefully enough and omitted the working.

**Question 4**

Most candidates scored quite highly in this sequence question.

The next term and *n*th term of a linear sequence was very well answered. The next term and *n*th term of a cubic sequence was also very well answered. The exponential sequence was more challenging, especially the *n*th term. The different versions of correct answers were all seen even though the tidiest answer of $2^{n-3}$ was the least frequent of these correct answers. Candidates were more successful with the quadratic sequence. Most candidates gained one mark for the *n*th term by giving a quadratic expression or by finding a common second difference.

**Question 5**

**(a) (i)** This 'show that' ratio question was almost always correctly answered.

**(ii)** Most candidates successfully calculated a percentage of a given amount.

**(iii)** The amount in a simple interest calculation was quite well answered, but one error quite often seen was to omit a division by 100 when calculating the interest. Another fairly common error was to give the interest as the final answer and not the amount.

**(b) (i)** This reverse compound interest question was well answered. A few candidates multiplied by 0.98 instead of dividing by 1.02. A few other candidates incorrectly rounded $1.02^3$ before the division.

**(ii)** This more normal compound interest question was very well answered with all candidates who gave correct answers to **part (i)** succeeding here.

**(c)** This question required candidates to find the number of years it takes a compound interest investment to increase by 50%. There were many candidates who appeared to be well practised with this type of question and they gained full marks, some using sensible trials and others using logarithms. The increase by 50% together with no given starting amount was an extra challenge. A number of candidates chose a starting amount and increased it by 50% and this was usually successful. Some other candidates treated an increase of 50% as doubling the original investment.

**Question 6**

**(a) (i)** This multiplication of a column vector by 2 was almost always successfully answered.

**(ii)** This multiplication of a column vector by $\frac{1}{4}$ and a subtraction of column vectors was also successfully answered, although some numerical errors were seen.

**(iii)** A number of candidates were not familiar with the term ‘magnitude’ of a vector with some omitting the question and others adding the components. The candidates who recognised the meaning of magnitude were usually successful.

**(b) (i)** The result of a vector displacement of a point with given coordinates was very well answered.

**(ii)** The reverse of a vector displacement from a point with given coordinates was also very well answered.

**(c)** This was one of the most discriminating questions on the paper requiring candidates to find where the perpendicular bisector of the line joining two points meets the *x*-axis.

The most common strategy seen was to find the equation of the perpendicular bisector and then find where it crossed the *x*-axis. This was the expected method and stronger candidates were able to gain either full marks or 4 or 5 out of the 7 marks available. These stronger candidates showed their working in a clear and organised way and were able to break the problem into straightforward steps. There were many candidates who found it difficult to present their working in such a clear way.

Many candidates did not find the mid-point of the line joining the two given points. The gradient of the line joining the two points was usually correct. The perpendicular gradient was less successfully found with some candidates using the same gradient as that of the line joining the two points and others found the reciprocal of the original gradient instead of the negative reciprocal.

The substitution of $y = 0$ into their equation of the perpendicular bisector was also less successful with some candidates putting $x = 0$ and others not attempting to use their equation.

**Question 7**

**(a) (i)** The angle on the pie chart was usually correctly calculated. A small number of candidates struggled with a question more normally seen at core level, perhaps as a result of no recent practice of pie charts.

**(ii)** The calculation of the estimate of the mean of a continuous distribution was well answered. A number of candidates carried out the full calculation without using the statistics facility on the graphic display calculator which was a lot of work for only two marks.

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

**(ii)** The equation of the regression line was well answered. A few candidates gave the coefficient of $t$ to only two significant figures.

**(iii)** The use of the equation found in **part (ii)** was usually correctly applied, but many candidates did not round their answer to an integer as the context required.

**(iv)** This question asked about an estimate of sales in 14 weeks based on the data for one week. The most common response was to mention that the weather may not be the same for 14 weeks and this was accepted. The other acceptable answer was to mention that one week is a small sample.

**(c) (i)** The tree diagram was almost always correctly completed.

**(ii)** Candidates found applying a tree diagram a straightforward procedure and this question requiring the addition of two products was well answered. A few candidates ignored the probabilities of the weather and multiplied the two 'yes' probabilities of cycling together.

**Question 8**

**(a) (i)** The third angle of a triangle was almost always correctly found.

**(ii)** This was a straightforward application of the sine rule and most candidates realised the purpose of **part (i)**. The question was well answered.

**(b)** This required the use of the cosine rule to calculate an angle. Again, this part was well answered especially by those candidates who started with the formula for the cosine of the angle.

**(c)** Although the given diagram splits the pentagon into three triangles, many candidates did not realise that they could use the formula $\frac{1}{2}ab\sin C$ three times with values either given or found earlier.

Many candidates found correct areas of one or two of the triangles but a correct sum of three correct areas was not often seen. A few candidates did not attempt this part.

**(d)** This question proved to be very challenging to almost all candidates. There appeared to be a lack of clarity on shortest distance from a point to a line as some of the stronger candidate worked out the shortest route from $C$ to a point on the line $AE$. There was a mark for drawing a line from $C$ to $AE$ and indicating a right angle at the point on $AE$. However, the line was not often seen and many of the lines that were seen did not show the right angle.

A small number of candidates extended $AB$ to meet a line across from $C$ and correctly calculated the length of this extension line using right-angled trigonometry, and then simply added this to the length of $AB$. This was the only successful strategy seen.

Another small number of candidates found the length of $AC$ but were then unable to continue to find an angle in triangle $ABC$, which would have led to a complete method.

**Question 9**

**(a) (i)** The substitution of –2 into a linear function was almost always correct.

**(ii)** The inverse of the same linear function was also well answered. A small number of candidates confused inverse with reciprocal.

**(iii)** Almost all candidates set up $g(x) = 2f(x)$ correctly and many candidates went on to solve the resulting quadratic equation. It appeared that the function aspect of the question resulted in some candidates not rearranging the equation into a simple quadratic equal to zero.

**(iv)** The algebra in this compound function question was more accessible as candidates had to square ($2x + 3$) and add 1. There were a few errors in the squaring and some candidates omitted the addition of 1 even though they had it in their first line of working. The given form in the demand was helpful to candidates.

**(v)** The amplitude and period of a trigonometric function are more challenging concepts but this part was answered well by stronger candidates.

**(vi)** Here, only stronger candidates found the two angles. Some candidates found one of the angles and some attempted to write inequalities. Many candidates omitted this part.

**(b) (i)** This logarithm function was particularly challenging. Many candidates would probably have been able to deal with, for example, $\frac{1}{3}\log_2 512 = \log_2\left(\sqrt[3]{512}\right) = \log_2 8 = 3$ , but did not see the connection between the cube root and $\frac{1}{3}$ in this question.

**(ii)** The equivalence of $y = \log_a x$ and $x = a^y$ was challenging for some candidates. This basic equivalence seems to be overlooked with the rules of logarithms being more thoroughly practised.

**Question 10**

**(a)** This proportion question was answered well.

**(b)** This variation question involved three variables together with a challenge of a different situation to the usual variation questions. Most candidates were able to earn two marks by obtaining the correct expression for *t* in terms of *x*. The next step involving *x* in terms of *y* often saw candidates using the square root of *y* instead of the square of y. Stronger candidates who obtained a correct expression for *x* in terms of *y,* were often able to go on to find *y* in terms of *x* and then found that the product *ty* eliminated the square root of *x*.

# CAMBRIDGE INTERNATIONAL MATHEMATICS

**Paper 0607/51**
**Paper 51 (Core)**

## Key messages

It is not possible to show that an expression is correct just by checking particular numerical examples. What is required must be general and an algebraic approach is usually expected.

*Show that…* questions expect full reasoning showing all the working.

## General comments

There were plenty of useful diagrams seen and usually these were accurate.

Many candidates showed good skill in completing patterns of numbers

## Comments on specific questions

### Question 1

**(a)** Most candidates correctly drew the next trapezium in the sequence. The most common error was to draw a length of 3 for the shorter parallel side, with 4 being the number of dots on that side.

**(b)** Most candidates were able to fill in the correct values for the side and the perimeter. The table also contained patterns as confirmation of their answers.

**(c)** Nearly all candidates noticed that the longer parallel side was 1 more than $x$, the length of the shorter parallel side. While most candidates wrote an expression, a few wrote a formula instead. This was not penalised but candidates are advised to learn the difference between a formula and an expression.

A few candidates wrote the equation, $x = x + 1$. This was a false statement which scored no marks. Candidates who did this often continued with this error in similar questions. A significant number of candidates gave a numerical answer.

**(d)** A large number of candidates gave the correct expression for the perimeter but could have gained more marks by showing how the result could be found, either by adding up the lengths of each side or by observing differences of 2 in the list of perimeters in the table in **part (b)**. Using the arithmetic sequence formula for the sequence of perimeters needed to be backed up by showing these differences if a communication mark was to be gained.

### Question 2

**(a)** Very few incorrect diagrams were seen and the most common error was miscounting the length for the shorter parallel side.

**(b)** Nearly all candidates produced the correct table.

**(c)** Most candidates gave the correct expression.

**(d)** Although this question was similar to **Question 1(d)** candidates were less successful here. Some candidates realised that $2x$ formed part of the answer but were unsure how to determine + 6. Candidates would have benefited from stating why $2x$ is part of the expression.

**Question 3**

**(a)** Nearly all candidates made sensible use of the dotty grid for which a communication mark was given. The correct expression for the longer parallel side was found by most candidates.

**(b)** Most candidates checked that the expression was correct for a particular value of $x$, but that did not show a general result as required. Very few correct algebraic additions were seen and these were necessary to answer this question correctly.

**Question 4**

**(a)** This question introduced the general isosceles trapezium with sides labelled $x$ and $y$.

While the question was similar to **Questions 1(c), 2(c)** and **3(a)** the increase in algebra caused a challenge for many candidates. In spite of that, many correct answers were seen for the longer parallel side.

**(b)** To find the perimeter in its simplest form required the addition of algebraic terms. Some candidates showed this addition but should have gone further when simplifying it. Many candidates produced an answer but could have gained a communication mark if they had shown how it was found. Another method was to observe that the perimeters found so far were $2x + 3$, $2x + 6$ and $2x + 9$, which would lead $2x + 3y$.

**(c)** In a *Show that ….* question, full details are expected. It was important in this question to show the substitution into the formula clearly and some candidates omitted details of their calculation. Some showed a clear substitution into their expression in **part (b)** and some showed addition of sides to find the perimeter. Few candidates did both, which was required to demonstrate that the expression was valid.

**(d)** With sloping side $x$ instead of $y$, candidates had to put $x$ in place of $y$ in this question. Many did this in their expression from the previous part. Others determined expressions in $x$ for each side.

**Question 5**

**(a)** Almost all candidates used the grid to draw the complete trapezium and divided it into unit triangles and gained full marks. A few trapezia were not large enough.

**(b)** Candidates were very successful in filling in the table for the number of unit triangles in trapezia of different dimensions. Most errors occurred in those trapezia with a sloping length of 3 where the pattern depended on previous correct answers.

**Question 6**

**(a)** Nearly all candidates carefully counted up the 48 small triangles which they had drawn in the trapezium. Occasionally counting errors were seen.

**(b)** The table contained several clues about the patterns that occur, and candidates were mostly successful at finding these. A few candidates assumed the number of unit triangles formed a linear sequence. Some of these candidates gave the correct values in the last column but did not check by working from right to left across the table to confirm the correct total number of unit triangles.

**(c)** Many candidates used the pattern in the final column of the table to get an answer in terms of $x$. Others tried to bring $y$ into the expression.

**(d)** This was a challenging question as candidates had to combine ideas from different questions to solve the problem. The correct answer of 75 was seen in many responses. Candidates could have improved their mark by one or two marks if their communication had been better and if they had laid out their work more clearly. In particular, expressing the information as the equation $3x^2 = 675$ communicated clearly what has to be solved. Having solved the equation, showing the substitution of 15 into their expression for the perimeter made it clear how the correct answer of 75 was reached.

# CAMBRIDGE INTERNATIONAL MATHEMATICS

**Paper 0607/52**
**Paper 52 (Core)**

## Key messages

Only a minority of candidates remembered to write the order of operations correctly: multiplication comes before addition, so brackets are necessary if an addition is to precede any multiplication.

Candidates need to be clear about the difference between an expression, a formula and an equation.

Candidates should remember to show all the steps in their working in order to earn communication marks.

## General comments

Candidates were very successful on this paper and there were many very strong performances. In particular, the pattern-spotting to find general results was very well done.

## Comments on specific questions

### Question 1

**(a)** The large majority of candidates gained full marks showing clearly how they found the next term of the sequence. Some only wrote the answer and so could not be awarded a communication mark.

**(b)** Nearly all candidates completed the pattern in the table for working out the terms of the sequence. A few candidates could have gone back and corrected their answer to **part (a)** by noticing that $2^5 – 1$ gave that answer

**(c)** The majority of candidates correctly found the 20th term, writing out correctly the 7 figures on their calculator as required. While $2^{20} – 1$ was often seen for the communication mark, there were many candidates who chose to work out each term from the 2nd to the 20th using the two steps given in the question. This method was more likely to lead to error.

**(d) (i)** For nearly all candidates, the pattern was clear and so a correct expression was usually seen. Several candidates wrote a formula instead. This was allowed but others wrote the equation $n = 2^n – 1$ for which the mark was not awarded. A few candidates thought that only the next term in the sequence was required.

**(ii)** This question was generally well-answered but a significant number of candidates only noted that $2^6 – 1 = 63$. The check needed to show that the two-step method also gave 63.

### Question 2

**(a)** Very few incorrect answers were seen in working out the second, third and fourth terms. Some candidates would have benefited from considering communication and showing how they calculated these terms.

**(b)** Most candidates produced the correct table and any errors suggested a slip rather than inability to handle the mathematics. A few candidates did not complete the expression in the last row of the table.

**(c)** This question was answered correctly by most candidates.

**Question 3**

This was another question where candidates had to check the correctness of an expression for a particular term in the two-step sequence. Communication of the working using the two steps was expected and so those candidates who only evaluated $4^3 - 1$ could not access a significant number of marks. With 4 marks for this question, candidates should have realised that just writing $4^3 - 1 = 63$ was insufficient. Some candidates showed the two steps but then did not check that their expression gave the same answer. A few candidates took the second term, 13, as the first term and so used $n = 4$ instead of 3 in the expression.

**Question 4**

**(a)** The table to be completed summarised the expressions for the *n*th term of different two-step sequences. Most candidates noticed the patterns that appeared and successfully answered the question. Candidates made errors in finding the term to add, as some had not identified those numbers as square numbers and used multiples of 2 instead.

**(b)** Stronger candidates showed their two-step calculations clearly and gained a communication mark for finding the second term. A few candidates interpreted the third term of the sequence as meaning the third row of the table.

**(c)** This question focussed on moving from the expression for the *n*th term to finding the two steps. While most candidates knew that one step was multiplication by 22, those who had not recognised the square numbers in the table could not find the correct number to add for the second step. A few confused the numbers in the expression with those for the two steps and adding 21 was the most common incorrect answer.

**(d) (i)** Many candidates chose to evaluate each term in the sequence using the two steps until a number close to 20 million was reached. Stronger candidates, who had understood the importance of the general expression, realised that using $11^n - 10$ was a more efficient method. In either case credit for communication was given for showing the approach clearly.

**(ii)** A correct answer here usually depended on candidates answering successfully in **part (d)(i)**. The most common incorrect answer was 6th, which happened when candidates did not take 1 for the first term.

**Question 5**

**(a)** A few candidates did not read the question carefully enough and continued using the same order as before for the two steps. Many candidates found the three terms correctly by first adding and then multiplying. The communication of how the calculations were written often assumed reading from left to right. But if addition is to be done first, then brackets are necessary. Incorrect statements like $4 + 1 \times 2 = 10$ were very often seen.

**(b) (i)** Many candidates were unsure about the significance of the information that the first term of the sequence was 1. Stronger candidates correctly interpreted this and formed an appropriate equation. Others found the correct value of *a* but lacked clear communication as to how it had been worked out. Some chose to use a term other than the first term, but the question specifically asked that candidates use the first term. A few candidates left this question unanswered.

**(ii)** For those candidates who had an incorrect value of *a* in the previous part there was still an opportunity to gain a communication mark for substituting what they had found into the expression. Several candidates who had experienced difficulty in the previous part did not provide a response.

# CAMBRIDGE INTERNATIONAL MATHEMATICS

**Paper 0607/53**
**Paper 53 (Core)**

## Key messages

Only a minority of candidates remembered to write the order of operations correctly: multiplication comes before addition, so brackets are necessary if an addition is to precede any multiplication.

Candidates need to be clear about the difference between an expression, a formula and an equation.

Candidates should remember to show all the steps in their working in order to earn communication marks.

## General comments

Candidates were very successful on this paper and there were many very strong performances. In particular, the pattern-spotting to find general results was very well done.

## Comments on specific questions

### Question 1

**(a)** The large majority of candidates gained full marks showing clearly how they found the next term of the sequence. Some only wrote the answer and so could not be awarded a communication mark.

**(b)** Nearly all candidates completed the pattern in the table for working out the terms of the sequence. A few candidates could have gone back and corrected their answer to **part (a)** by noticing that $2^5 - 1$ gave that answer

**(c)** The majority of candidates correctly found the 20th term, writing out correctly the 7 figures on their calculator as required. While $2^{20} - 1$ was often seen for the communication mark, there were many candidates who chose to work out each term from the 2nd to the 20th using the two steps given in the question. This method was more likely to lead to error.

**(d) (i)** For nearly all candidates, the pattern was clear and so a correct expression was usually seen. Several candidates wrote a formula instead. This was allowed but others wrote the equation $n = 2^n - 1$ for which the mark was not awarded. A few candidates thought that only the next term in the sequence was required.

**(ii)** This question was generally well-answered but a significant number of candidates only noted that $2^6 - 1 = 63$. The check needed to show that the two-step method also gave 63.

### Question 2

**(a)** Very few incorrect answers were seen in working out the second, third and fourth terms. Some candidates would have benefited from considering communication and showing how they calculated these terms.

**(b)** Most candidates produced the correct table and any errors suggested a slip rather than inability to handle the mathematics. A few candidates did not complete the expression in the last row of the table.

**(c)** This question was answered correctly by most candidates.

**Question 3**

This was another question where candidates had to check the correctness of an expression for a particular term in the two-step sequence. Communication of the working using the two steps was expected and so those candidates who only evaluated $4^3 - 1$ could not access a significant number of marks. With 4 marks for this question, candidates should have realised that just writing $4^3 - 1 = 63$ was insufficient. Some candidates showed the two steps but then did not check that their expression gave the same answer. A few candidates took the second term, 13, as the first term and so used $n = 4$ instead of 3 in the expression.

**Question 4**

**(a)** The table to be completed summarised the expressions for the *n*th term of different two-step sequences. Most candidates noticed the patterns that appeared and successfully answered the question. Candidates made errors in finding the term to add, as some had not identified those numbers as square numbers and used multiples of 2 instead.

**(b)** Stronger candidates showed their two-step calculations clearly and gained a communication mark for finding the second term. A few candidates interpreted the third term of the sequence as meaning the third row of the table.

**(c)** This question focussed on moving from the expression for the *n*th term to finding the two steps. While most candidates knew that one step was multiplication by 22, those who had not recognised the square numbers in the table could not find the correct number to add for the second step. A few confused the numbers in the expression with those for the two steps and adding 21 was the most common incorrect answer.

**(d) (i)** Many candidates chose to evaluate each term in the sequence using the two steps until a number close to 20 million was reached. Stronger candidates, who had understood the importance of the general expression, realised that using $11^n - 10$ was a more efficient method. In either case credit for communication was given for showing the approach clearly.

**(ii)** A correct answer here usually depended on candidates answering successfully in **part (d)(i)**. The most common incorrect answer was 6th, which happened when candidates did not take 1 for the first term.

**Question 5**

**(a)** A few candidates did not read the question carefully enough and continued using the same order as before for the two steps. Many candidates found the three terms correctly by first adding and then multiplying. The communication of how the calculations were written often assumed reading from left to right. But if addition is to be done first, then brackets are necessary. Incorrect statements like $4 + 1 \times 2 = 10$ were very often seen.

**(b) (i)** Many candidates were unsure about the significance of the information that the first term of the sequence was 1. Stronger candidates correctly interpreted this and formed an appropriate equation. Others found the correct value of *a* but lacked clear communication as to how it had been worked out. Some chose to use a term other than the first term, but the question specifically asked that candidates use the first term. A few candidates left this question unanswered.

**(ii)** For those candidates who had an incorrect value of *a* in the previous part there was still an opportunity to gain a communication mark for substituting what they had found into the expression. Several candidates who had experienced difficulty in the previous part did not provide a response.

# CAMBRIDGE INTERNATIONAL MATHEMATICS

**Paper 0607/61**
**Paper 61 (Extended)**

## Key messages

To do well on this paper candidates needed good algebraic skills as well as being able to set out working for answers in an organised way. They needed to recognise the context of some questions, giving an answer in relation to that context. It was also important to be able to use a calculator efficiently to produce a good sketch of a model. Candidates should know that generalisations cannot be made based on one or two trials.

## General comments

Good algebraic skills includes showing explicit substitution at all times whether in the context of finding a variable or using trials to find a value. A good sketch should include labelling all intersections with the axes as well as using ranges sensibly and showing turning points. Candidates should be aware that the context of the question may indicate how they should give their answers, for example, when asked for a minimum or maximum value this may not follow standard arithmetical rounding rules.

## Comments on specific questions

***Section A Investigation : Isosceles Trapeziums***

**Question 1**

**(a)** This was a well answered question.

**(b)** Most candidates recognised the sequence of square numbers. The answer was sometimes written as an equation rather than an expression and sometimes in terms of a different variable and not $x$. Candidates should know the difference between an expression and an equation and should have learnt the meaning of 'in terms of …'. Unsimplified answers included $x \times x$ and incorrect answers included $2 \times x$.

**Question 2**

**(a)** This question was also answered well with only occasional arithmetic slips.

**(b)** There were several approaches to this question. The most usual was to use the common second difference of 2 to give $(1)y^2$ and then to complete the expression correctly. Again, there were some answers in the form of equations and some using other variables. Communication was good with the majority of candidates gaining at least one mark of the two available. Working out often needed to be more organised.

**Question 3**

**(a)** The patterns were straightforward and numbers could be written in squared form making them easier to follow. Some candidates converted the squares to real numbers and occasional arithmetical slips were made. Some candidates did not spot the pattern of squares but they still managed to get the final answers correct.

**(b)** Few candidates started with the expression in terms of *w* and compared the number of unit triangles written in the table to the value of *w* for each row and then simplified that expression. Many candidates used the common difference between the answers to quickly obtain a short expression that did not need simplifying. Equations and the use of another variable were quite common.

**Question 4**

**(a)** Like **Question 3** the patterns to follow were straightforward and if errors were made it was usually through multiplying out the squares or not spotting the pattern of squares.

**(b)** The expression could again be found by writing the pattern in terms of *w* and simplifying. As before, many candidates used the common difference of 6 to find the correct linear expression very quickly. Equations and use of another variable were not uncommon.

**(c)** Most candidates equated the expression they had found in **part (b)** to 93. Some substituted 93 instead of *w*. Candidates should practice recognising and understanding the standard wording of questions. Finding a value, such as 14 here, and then substituting it in as a check does not count as a correct method or good communication.

**Question 5**

**(a)** Most of those candidates who had followed the patterns to obtain their expressions in **Questions 3** and **4** were able to make at least some progress towards the given expression. Those who had used the differences method often did not get very far. Many candidates tried to start with the given expression with some of these testing values to try to find one that worked. Candidates should know that they should not make generalisations from one or two values that work. It is very important that they know to find a starting point that will lead to the given expression rather than working backwards.

**(b)** Many candidates made some very good attempts at this question, especially those who took the words of the question as a starting point and wrote '$y = w$'. From this, two different methods followed. Most popular was to trial one or more values for $y$ or $w$ in the expression $y(y + 2w)$. These candidates often only showed the trial of $y = w = 10$ and should know that in the cases when trial and improvement is acceptable as a valid method it is usually the requirement to show at least three trials which can include the answer value if found. Candidates will only gain communication marks for substitution work if the substitution is clear and not if only the combined values are shown. The algebraic method, of substituting $y$ for $w$ or vice versa, was straightforward and led quickly to the answer of 10.

**(c)** A general misreading of the question meant that very few candidates gained all four marks. The question asked for the lengths of the sides which meant answers in sets of three were required. Many candidates found one or more correct pairs of values for $y$ and $w$ and did not write down the length of the base, $w + y$. Candidates should know that explicit substitution of values is necessary to gain the communication mark where available. More organised writing of working out would always help, particularly for weaker candidates.

***Section B Modelling: Pizza Business***

**Question 6**

**(a)** Most candidates showed that the 1000 came from $400 + 2 \times 300$. Some candidates did not show what the $8n$ represented. Every part of a model needs to be explained when the question asks to show what the model represents.

**(b)** It was very rare to see the inequality sign rather than the equals sign used for 'at least'. Nevertheless 187.5 was commonly seen for the number of pizzas and this was also frequently rounded to 188 to make the answer into whole pizzas.

**(c)** Candidates chose either to compare the number of pizzas that could be made with the answer to **part (b)**, the minimum number to make a $500 profit, or they, rather unnecessarily, worked out the profit using the model given in **part (a)** to show that it was more than $500. Candidates' arithmetical work was good and the majority showed good communication by writing every step of their working, but lack of organisation was common. The final answer to the question, a comparison of 288 pizzas to the minimum required 188, was often omitted.

**Question 7**

**(a)** Similar to **Question 6(a)** most candidates explained the \$600 and \$900 and many made a good attempt, if not always complete, at the $(x – 2)n$. When asked to show how a model is derived it should be remembered that every value and variable must be explained. The fact that $n$ represented the number of pizzas was often omitted.

**(b)** This question was answered quite well. Candidates should be reminded to show every step of their calculations in order to gain communication marks.

**(c)** This was a well answered question. Most algebraic steps were correct with many candidates reaching an answer of 6.629… and most of these realising that for a minimum selling price this needed to be rounded to \$6.63. Candidates needed to read the information very carefully. Some candidates replaced $x$ by their 432 instead of $n$ and some rounded their final answer to \$7 which was greater than the minimum.

**Question 8**

Most candidates were able to set up the two simultaneous equations and solve them. They should know that it is often not necessary to multiply both equations by different values to get a common coefficient. In this case the coefficient of $b$ was already 1 in both cases. For good communication, they should also show every step of their working and explicit substitution when it comes to finding the second variable.

**Question 9**

**(a)** Good algebraic skills were shown here by many candidates. They expanded the brackets and collected terms correctly. Some candidates initially substituted $(ax + b)$ for $n$ and replaced $a$ and $b$ by their numerical values later. Much of the work was disorganised and hard to follow.

**(b)** Some good sketches were spoilt by not intersecting with the $P$ axis. It is also important to use scales properly. The value of 25 as given on the $x$-axis corresponded to –3340 on the $P$-axis. When this scale is used on the $P$-axis the sketch shows a quadratic and not two separate, almost vertical lines. For good communication the sketch also required intercepts to be labelled on both the $x$-axis and the $P$-axis.

**(c)** Many candidates marked the maximum point on their sketch and most had no difficulty in writing down these values. When considering rounding answers candidates should look at the context of the question. This point on the graph represented maximum profit and the selling price that gave that profit in dollars, and so these figures should have been rounded as money, to two decimal places.

**(d)** The words ‘Write an ….’ Indicated that complex working was not necessary here. This answer could be read from the graph and for good communication a line should have been drawn on the sketch in **part (b)** at $P = 500$.

# CAMBRIDGE INTERNATIONAL MATHEMATICS

**Paper 0607/62**
**Paper 62 (Extended)**

## Key messages

To do well on this paper candidates needed to be able to differentiate between expressions and equations. They were asked to create expressions and to form equations and then to use them. They needed to make good use of patterns to develop the investigation and throughout this paper good algebraic skills were very important.

## General comments

On more than one occasion, candidates were asked to write and solve some very simple linear equations. Those who worked with expressions were unable to complete this satisfactorily. Candidates should be aware that they need to show all working out steps in detail not only for good communication but to show, when asked, that something is true. In the modelling section there were several questions that required explicit algebraic manipulation including clearing fractions and fractions within fractions as well as changing the subject and collecting like terms.

## Comments on specific questions

***Section A Investigation : Two-step Sequences***

**Question 1**

**(a)** Good communication was seen in this question, following the pattern that was written in the question. A few candidates used differences to find the fifth term.

**(b)** This was well answered with very few mistakes.

**(c)** Correct answers here showed that candidates had read carefully and followed the pattern by combining the information given and their answers to **parts (a)** and **(b)**.

**Question 2**

**(a)** Again, good communication with calculations was shown and there were few errors.

**(b) (i)** Most candidates chose the value of 2 for $n$ giving themselves a simple equation to write down. This did not have to be simplified. An example of an equation using the first term was given to help candidates use the term value rather than the term number. Some candidates needed to read the information more carefully and to distinguish between an expression and an equation.

**(ii)** The pair of simultaneous equations were straightforward to solve. For good communication candidates must remember to show explicitly the substitution of the first value when finding the second value.

**Question 3**

Most candidates showed the correct second, third and fourth terms by using the two steps and writing out the working. The fourth term was then also found by substitution into the $n$th term expression. Incorrect mathematical statements such as 7 × 2 = 14 + 5 = 19 were allowed here. Nevertheless, it is important that candidates know how to write these statements correctly.

**Question 4**

**(a)** Candidates completed this table correctly, again following the pattern as given.

**(b)** At this point, the investigation became more challenging for many. This question differentiated between those who were confident with algebra and those who were not so comfortable with it. It is important to know the difference between an expression and an equation. It was also necessary to know what is meant by 'in terms of *k*'. Many candidates gave answers using *n* or *a* or *b* either instead of or as well as *k*.

**(c)** The necessity to write their *n*th term = 286 meant that those candidates who had found the correct expression had a very simple linear equation to solve. Others used trial to find the correct answer of 18. Other interesting and valid but longer approaches included finding the fifth term of the sequence in terms of *k* and using the term-to-term process described earlier in the question.

**Question 5**

**(a) (i)** This was a well answered question.

**(ii)** Similar to **Question 2(b)(i)**, candidates needed to know the difference between an expression and an equation. They were not asked to simplify their equations but the majority did this, which made **part (b)** that much easier. A few candidates used other terms rather than the first two.

**(b)** When the two very simple linear equations were found in **part (a)(ii)** then one subtraction quickly led to the solution for *a*, and *b* followed easily. Some candidates did not use the first two terms of 1 and 5 to equate to their expressions. Other candidates complicated their working by multiplying both equations by an integer when there was no need to do this.

**Question 6**

**(a)** This was very well answered. Most candidates were good at pattern spotting.

**(b)** There was a mixed selection of methods used to answer this question. Many candidates succeeded in achieving all three marks. The simplest method was to show substitution and find a term above and a term below 20 million, with the one with $n = 10$ being much closer above than that with $n = 9$ which was below. The majority of candidates used logs either to base 10 or to base 6 which took a little more time but was still just as successful. A repeated error was to equate $2 \times 6^{n-1} - 1$ to 20 million and then to subtract 1 from 20 million instead of adding one. Another common error was in misusing the order of operations in the rearrangement of the initial equation.

***Section B Modelling: Driving to my Place of Work***

**Question 7**

**(a)** This was a well answered question with most candidates communicating both the distance divided by speed as well as the conversion to minutes.

**(b)** Candidates should be aware of the necessity to convert to a single unit when working with mixed units, as well as to make sure they present their answer in its simplest form when asked to do so.

**Question 8**

**(a) (i)** Even though this was simple, candidates showed their working and consequently gained the communication mark available.

**(ii)** Candidates needed to show both steps required to calculate the time as 40 minutes.

**(b)** Some very good algebraic skills were shown in answering this question and many candidates successfully manipulated their expression to reach the required answer. Candidates should be aware that they need to show every step to qualify for the marks. They needed to start with the speed as $50 - \frac{x}{2}$, to rearrange this over a common denominator of 2, to convert the units by multiplying by 60 and to show the rearrangement to achieve the final answer. Candidates need to know how to simplify a fraction within a fraction. In this case, they needed to multiply by $\frac{2}{2}$ not just by 2.

**(c)** Some very good sketches were seen. Candidates should be aware of how important it is to use the range, in this case $0 \leqslant x \leqslant 90$, to be able to sketch the graph with a reasonable gradient. They should also label all intersection points. Here, 24 on the $T$-axis was required.

**(d)** This answer could be read from the graph and written down. The communication mark was then awarded for drawing a straight line at $T = 30$ on the graph drawn in **part (c)**. There was no need to show algebraic working by equating the model to 30.

**(e) (i)** As in **part (d)**, once the value of $x$ had been calculated as 95 the value for $T$ could be read from the graph. For communication it was necessary to draw a vertical line at $x = 95$. This line would not intersect the graph due to the scale given. Most candidates chose to calculate this algebraically, which was not any longer or more complicated than using the graph. Candidates could convert to hours and knew how to calculate the time correctly. Only occasional minor arithmetical slips were made with both methods.

**(ii)** Candidates need to include as much accurate detail as possible when asked to make a statement. An appropriate suggestion for the time when the model became unsuitable was required. Candidates should be given practice interpreting results from using a model and making meaningful, precise statements regarding the suitability of the model in the given context.

**Question 9**

**(a)** Being able to explain precisely what different parts of a model are calculating is an important skill. It was necessary to define both parts of this model and not just to say, for example, ‘travelling time plus *x*’.

**(b) (i)** As in all ‘show that’ questions, candidates need to find a starting point and to develop it to reach the given conclusion. In this case, it was necessary to start with the model equated to 120. Again, all steps needed to be shown which included writing in and expanding the brackets when clearing the denominator. Some candidates solved the given equation which was the requirement in **part (ii)**.

**(ii)** In this well-answered question the most popular methods were factorising or using the quadratic formula. Sketching, trials and even completing the square were also used. Candidates need to understand the importance of accuracy in writing mathematical statements, for example, making sure the square root sign covers the whole of the discriminant. Many candidates eliminated the unacceptable value of 160.

**(iii)** This was a well answered question.

**Question 10**

**(a)** As in **Question 8(b)** the speed, this time in terms of $v$ and $x$, needed to be written out first. Then again, every step needed to be shown including the unit’s conversion (× 60) and the multiplying by $\frac{2}{2}$, not 2, to clear the fraction within the fraction.

**(b)** It was necessary to replace $x$ by 30 and $T$ by 90 minutes at some stage in the working for this question. Those candidates who started with these replacements found it easier. The algebraic manipulation was then not difficult and although a reduction to simplest form was not asked for, many candidates did their best to simplify their answer as much as possible.

# CAMBRIDGE INTERNATIONAL MATHEMATICS

**Paper 0607/63**
**Paper 63 (Extended)**

## Key messages

To do well on this paper candidates needed to be able to link questions together and to use previously found answers or information given to answer further questions. They needed to be able to distinguish clearly between an equation and an expression and know the meaning of 'in terms of …'. They needed to be able to work with surds rather than decimals and to have a good working knowledge of the graphing function on their calculator.

## General comments

In the investigation there were two parts, the first of which culminated in **Question 3(b)**. This general expression was based on those found in the table in **part (a)**, which was a collection of information and answers that had been found in **Questions 1** and **2**. In the second part of the investigation everything was based on **Question 4** and followed on from there. Several of the questions asked for expressions and when equations were given instead this led to confusion in the following answers. Candidates should be able to use the graphing function on their calculator well enough to transcribe the graph into a sketch on paper, showing asymptotes and labelling intersection points.

## Comments on specific questions

***Section A Investigation: Remaining Shapes***

**Question 1**

**(a)** The diagram was usually clear and correct.

**(b)** The pattern and calculation were simple and this question was well answered.

**(c)** Most candidates used a difference method which resulted in the correct answer. It was expected that versions such as $2 \times n - 1$ and $n + n - 1$ would be simplified but these were allowed for this question. A common error was an answer of $2n + 1$. Candidates need to be sure that they know the difference between an expression and an equation. They also need to understand that 'in terms of $n$' means the expression has the variable $n$ in it and not that it is an equation equal to $n$.

**(d)** Most candidates showed their working to gain the communication mark as well as the answer mark.

**Question 2**

**(a)** Most candidates used some diagrams to calculate the areas of the remaining shapes. Many of the diagrams were drawn on top of each other making it difficult to decipher one from another but the answers were usually correct.

**(b)** This was a very well answered question. There were some answers of $4n - 4$ and $+ 4$.

**Question 3**

**(a)** Candidates needed to calculate the expressions for the side differences of 3 and 4. Quite a number of correct expressions were seen but hardly any calculations. Some of the diagrams, one on top of the other, were difficult to follow.

**(b)** To find this expression candidates needed to identify the patterns in the table in **part (a)**. They needed to compare the side differences (1, 2, 3, 4) with the sequence of the coefficients of *n* and then with the sequence of the constants. Some candidates gained at least part marks for either $2dn$ or $d^2$.

**(c)** Candidates needed to show explicit substitution to earn communication marks. A correct answer of 28 was often seen earning the answer mark when the communication mark could not be awarded because 14 was written instead of 2 × 7 and/or 49 was written instead of 7 × 7 or $7^2$.

**Question 4**

**(a)** Candidates needed to take the given formula for the area of a triangle and to substitute the correct information for the equilateral triangle. Clear substitution should have been seen at all times but especially as the question was asking candidates to show that something is correct. *b* and *c* should have been replaced by *n* and sin *A* replaced by sin 60. A further step was to show that sin 60 = $\frac{\sqrt{3}}{2}$ and the final step was to bring all this together. Some candidates missed linking the $\frac{\sqrt{3}}{2}$ to the sin 60 and did not show how the $\frac{\sqrt{3}}{4}$ was reached.

**(b)** Candidates who realised that they needed to subtract the smaller triangle's area from the area of the larger one found a simple subtraction led them immediately to the correct answer. This was another 'Show that …' question which should not be worked by taking the answer and trying to work backwards. Those candidates who tried this found that 7 was achieved by 4 plus 3 and consequently continued this incorrect pattern in further questions. Some candidates worked in decimals and did not gain the mark.

**(c)** Those candidates who had used the subtraction method in **part (b)** had no difficulty in calculating this answer correctly. Those who added 5 plus 4 also answered $\frac{9\sqrt{3}}{4}$ but did not gain the communication mark for incorrect working as did those who worked in decimals.

**(d)** Many candidates correctly wrote in the areas for sides of 2 and 3. Working out, for example, $2^2 - 1^2$, was rarely seen.

**(e)** For those who had worked with subtracting areas this was a simple case of correctly replacing the values with *n* and *d*. The algebra that followed was not difficult as long as candidates were careful with signs. The final answer was not seen very often due either to an inability to simplify correctly or because candidates may have used pattern spotting in **part (d)** and/or addition in **parts (b)** and **(c)**.

***Section B Modelling: Escalators***

**Question 5**

**(a)** Every step of working should always be shown but especially in a 'Show that' question. One mark for converting the hours to seconds was often awarded. Candidates rarely showed the × 1000 for converting the km to metres.

**(b)** This was a well answered question and most candidates used the Time/Distance/Speed formula correctly but 40 × 0.5 was seen quite often.

**Question 6**

**(a) (i)** This question was also answered well with working shown but some candidates multiplied 24 by 50. Others tried to convert the 24 metres to km and the 50 seconds to hours.

**(ii)** Most candidates answered this correctly and showed their working.

**(iii)** Most candidates answered this question correctly too, some with rather complicated methods other than the simple 24 ÷ 1.28.

**(b) (i)** Most candidates understood exactly what was happening and found Matt's walking speed. Many also showed the working of 24 divided by 24.

**(ii)** This was also answered well with most candidates earning the communication mark for writing seconds as the correct units for the answer.

**Question 7**

**(a) (i)** Candidates need to learn how to explain a model. The strongest answers included use of the Time/Distance/Speed formula as well as explaining, with reference to the relevant part of the model, about the time or speed going up and the time or speed going down. Candidates should be encouraged to give concise explanations.

**(ii)** To start to answer this question the model should have been taken from **part (a)(i)** and the two fractions combined over a common denominator. All working needed to be shown especially as this was a 'Show that' question. Many candidates moved straight to the given common denominator of $0.64 - v^2$ instead of showing the first step of $(0.8 + v)(0.8 - v)$. Similarly, candidates also missed out at least one line for the numerator, most often missing $6.2(0.8 + v) + 6.2(0.8 - v)$. After this, there were still two steps; expanding the brackets and collecting terms. When the final result reached was not correct candidates tried to change their working rather than starting again. It would also have helped candidates if they had set their working out in a more organised way. Other candidates tried to work backwards which did not gain any marks for this type of question.

**(iii)** A correct answer was usually seen after this straightforward substitution. Candidates should know to write recurring decimal answers correct to 3 significant figures or at least, in this case, $20.\dot{6}$ rather than 20.6.

**(b) (i)** Adding 10 to the model given in **part (a)(ii)** was the simplest way to answer this question. Some candidates added 10 to the model in **part (a)(i)** which was also perfectly acceptable. Some added 10 to the denominator which did not work.

**(ii)** There was a scale on both axes which should have helped candidates to get a good sketch. Some candidates did not transfer the presence of the asymptotes, particularly the vertical one, from their calculator to their drawing. Candidates should practice graph sketching on their calculators as well as converting what they see on their screen to their sketch on the paper. They also should make sure that they label all intersections with the axes.

**(iii)** Candidates could use their calculators to find the value of $v$ when $T$ was 138 seconds. An easy communication mark was awarded for drawing the horizontal line for $T = 138$ on the sketch in **part (b)(ii)**.

**(iv)** Candidates should know that questions about a model need answers referring to the situation of the model and not about the graph.

**(v)** Few candidates connected the fact that if the speed of the escalator was faster than or equal to Matt's walking speed then it would be impossible for him to walk down the escalator when it was moving up. A common incorrect answer was $v < 5$.