CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/11
Paper 11 (Core)

Key messages

To succeed with this paper, candidates need to have completed the full Core syllabus, be able to apply formulae, show clearly all necessary working and check their answers for sense and accuracy. 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 10(b)**, **19**, and **21** as showing workings enables candidates to access method marks. Candidates must make sure that they do not make arithmetic errors especially in questions that are only worth one mark when any good work will not get credit if the answer is wrong, for example **Questions 8**, **10(b)** and **20(a)**. Arithmetic errors were commonly seen in **Question 19** which should have been picked up when candidates checked their work.

The questions that presented least difficulty were **Questions 1**, **3**, **8(a)**, **13**, **16** and **18**. Those that proved to be the most challenging were **Question 4(a)** name of a quadrilateral, **Question 10(c)** upper quartile, **Question 11** round a number to 2 significant figures, **Question 14** equation of a line and **Question 21** trigonometry. In general, candidates attempted the vast majority of questions as there were not many questions left blank. The exceptions that were occasionally left blank by candidates were **Questions 10(c)** and **Question 14**, questions that have already been mentioned as challenging.

Comments on specific questions

Question 1

Candidates did well with this opening question. The very occasional wrong answer was 3 from not following the correct order of operations, in effect calculating 15 ÷ (3 + 2).

Question 2

Sometimes a wrong answer contained the figure 4 but the magnitude was incorrect, for example, 40 or 0.04.

Question 3

Virtually all candidates were correct here giving the answer of 7. The numbers went up in 1s in the domain on the left and it could be seen that that is what is happening in the range to the right. If candidates wanted to find the function instead of looking for patterns in the domain and range, in this case it was straightforward to see that $g(x) = x + 2$.

Question 4

(a) Many candidates did not name this correctly with other quadrilaterals, such as parallelogram, being given instead as well as words such as pentagon, decagon, polygon, corresponding and isosceles.

(b) For this question, the words, right angle had to be given as that is the name. 90° was not acceptable as the name.

Question 5

Of the incorrect words given here, some were to do with circles, for example, diameter, radius and chord but there were others such as perimeter, vector or the formula for calculating the circumference itself.

Question 6

North was the most common incorrect answer. Most candidates gave a correct name for a compass direction. There were some diagrams that did not go as far as stating the direction as south.

Question 7

This question was done well with most candidates plotting the point correctly. In some cases there were candidates who marked two points on the grid. These candidates did not get the mark even if one was correct.

Question 8

(a) Occasionally 5 or 20 was seen as the answer – these are the number of girls and boys respectively who chose English as their favourite subject, not the difference between them.

(b) Here, 75 was a common wrong answer. This could have come from the addition of the total number of girls and boys in the chart which showed a misunderstanding of compound bar charts.

Question 9

All candidates realised that there should be one tick per row. Many knew that the number of seats in a car is discrete. They were less certain that kilometres per litre and maximum speed are continuous data or that age in complete years, is discrete. Candidates need a way of remembering the difference between discrete and continuous data – for example, if you can count something it is discrete data (e.g. numbers of siblings), if you measure something with a ruler or against another scale, it is continuous data (e.g. your height).

Question 10

(a) This was only worth one mark so if a candidate showed the correct method but made an arithmetic slip they gained no marks. Leaving the range as 24 to 36 or 36 – 24 is not correct as a single value is required. Others worked out 29 – 17 = 12, (last number in the list minus the first).

(b) Here, the data had to be put in order and the middle value picked out as there were an odd number of values. Some did not order the data and so gave 28 as the answer.

(c) The upper quartile is halfway from the median to the maximum value so this also depended on the correct ordering of the data. This was the question that was most often left blank. Perhaps, many candidates were unfamiliar with the term, upper quartile.

Question 11

Many candidates included extra zeros – as many as the number of digits in the original number. The answer was 530, often candidates gave 520, 5.3 or 526.32.

Question 12

This question was made harder as there was no diagram. The first step in question like this is to draw a diagram to help visualise a problem. Some added the pair of coordinates to give an answer of (6, 6) instead of a length of *AB*.

Question 13

This question did have a diagram and many more candidates got this correct than the previous question. Some did give one of the coordinates, *C* or *D*. Some made an error with the *x*-coordinate while the other was correct. A few reversed the coordinates.

Question 14

This area of the syllabus is one that candidates often find challenging and have difficulties in giving the equation of a line in a correct format. Candidates should remember that the equation for all horizontal lines is $y = c$, where is c is the where the line cuts the y-axis so here the answer is $y = –3$. Giving –3 alone is not correct.

Question 15

Many candidates marked the correct section of the number line. The symbols for the ends of the line were often incorrect or missing entirely.

Question 16

As stated before, many candidates did well with this question. Sometimes a 5 was seen in the working but 20 (the right side of the equation) was given as the answer instead.

Question 17

(a) This was the least well attempted question on the paper. Many candidates reflected the triangle in the wrong line, often the y-axis, instead. A few reflected the triangle in the x-axis or $y = –1$. Of those who drew a correct base, many were not certain where the right angle should be so drew the hypotenuse sloping in the wrong direction making the transformation look like a translation. In questions like this the essential first step is to draw the mirror line.

(b) Here, the first step is to mark the centre of rotation. As the centre of rotation was on a vertex, that point does not move. Some incorrect answers did have this invariant point but other did not, showing that using the correct centre was not understood. Wrong answers seen include rotations of 180° or reflections in various lines.

Question 18

Candidates did very well with both parts of this question.

(a) Slightly more candidates were correct here than with **part (b)**. This was a straightforward question to recognise negative correlation.

(b) Here, a context was given so candidates had to work out which diagram shows the correlation – if the variables are both increasing, as the question says, then this is positive correlation.

Question 19

As no scaffolding was given, candidates had to work out how to approach this problem. The easiest way is to draw a line straight across the base of the shape to turn this into a triangle, find the area and subtract the area of the newly formed rectangle. If candidates tried to cut up the shape into a triangle and the rectangle to the left, this method became complicated when dealing with the trapezium to the right hand side as the length of the top horizontal line is not simple to find. Candidates often prefer to cut up a shape rather than think about making the shape simpler by extending sides and then subtracting the areas that are not needed, for example, finding the area of an L-shaped region by turning it into a rectangle and subtracting the unwanted rectangular area. This was a perfect example to show that extending outside the shape works best for some problems. It is best to think a method through rather than setting off doing random calculations scattered over the page.

Question 20

(a) There are two points to note with tree diagrams. Each pair (or set) of branches adds to 1 so that gives the fraction, $\frac{4}{5}$ for 'Not 4' on the first spin. Next, candidates have to decide whether the probabilities will alter for the next level of the tree. They will only alter if the question is about, for example, choosing one card then another without replacing the first card, but here, the probabilities do not alter as previous spins have no effect on the spinner. So, the probabilities are repeated for both sets of branches in the second spin. For some, the probabilities did not add to 1 or they did not repeat the first pair on the other two sets of branches. Some used $\frac{1}{4}$ and $\frac{3}{4}$ as if they were using probabilities without replacement. Many candidates scored 1 out of the 2 marks for giving a correct $\frac{4}{5}$.

(b) This part was not a continuation of the previous part although the context was the same. The probability of the fair spinner landing on a C is $\frac{1}{5}$ so 40 out of 200 is the expected number of times it will land on C. Many candidates gave the correct answer or got as far as working out the probability as $\frac{1}{5}$ or 0.2 for 1 mark.

Question 21

First, candidates had to realise that they had the trigonometric information about angle *C*, the side adjacent to *C* and have to find the length of the opposite, then they need to use tan *C*. The method mark was for the equation tan $C = \frac{AB}{8}$ and as this is not the complete method, candidates kept the mark even if the calculation went wrong after this. Substituting 0.75 for tan *C* gives $0.75 = \frac{AB}{8}$ and then 0.75 × 8 = 6. Some added 8 to 0.75 Some gave the answer 0.75 but this was not far enough for the mark. Others did not work with tan at all as answers of 0.8 or 6.4 (cos *C*) and 0.6 or 4.8 (sin *C*) showed. Some did not show working at all, just an answer.

Question 22

Answers were split between the correct 60 and the incorrect 2, the highest common factor (HCF). There are various ways of doing this question – maybe the easiest is to list the multiples of each number until the same number appears in both lists. There were a few that gave another, higher, multiple such as 120 – this was worth the method mark.

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/12
Paper 12 (Core)

Key messages

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

General comments

Many candidates showed good understanding of basic arithmetic, algebra and geometry and were able to apply their knowledge competently. There was no general indication that the examination paper was too long, with most candidates making reasonable attempts at nearly all the questions. Overall, the standard of written answers and the quality of communication, when seen, was often easy to follow and led to many candidates receiving the method marks available.

More work is needed to consolidate candidates' understanding of writing inequalities as shown in **Question 13**, enlargements as indicated in **Question 15 (b)** and drawing a line of best fit in **Question 17**. The responses in answering **Question 20** showed a poor understanding in trigonometry ratios. **Question 22(b)** was challenging to some candidates.

Comments on specific questions

Question 1

This proved to be a good starter question with most candidates answering this question correctly.

Question 2

This is a familiar type of question and candidates generally performed well. The rare wrong answer was 42. Some responses showed that 36 is the square number with the written statement $6^2 = 36$ but other candidates wrote 6^2 on the answer line with no indication that it was 36 they were selecting and so the mark could not be awarded.

Question 3

This was a well answered questions with most candidates correctly plotting the point (5, 3) in **part (a)**.The most common answer for **part (b)** was (1, 4).

Question 4

This was another well answered question. Many candidates scored the mark with an estimated area within the acceptable range which included non-integer answers. Only a few candidates left it blank.

Question 5

Again, a well answered question demonstrating a clear understanding of converting fractions to decimals. A rare response was $\frac{0.3}{1}$, which did not score the mark.

Question 6

This question was accessible to all candidates and a good proportion of fully correct answers were seen. Candidates knew that they had to divide 77 by 11 and then multiply by 3, but some candidates tried to multiply the 77 by 3 and then found it difficult to divide 231 by 11 so they lost the mark for this question.

Question 7

Many candidates inserted the brackets correctly. Others showed a few trials (with crossed out brackets) before displaying the correct answer. The majority of candidates scored full marks.

Question 8

The most successful candidates completed the bar chart using the key to show the number of visitors who walked on Saturday and on Sunday. However uneven bar widths and the unshaded bar drawn for Sunday were commonly seen. The most common error in **part (b)** was 50 from subtracting the total number of visitors travelling to the museum by bus from the total number of visitors travelling by car.

Question 9

This question was well attempted with few blank responses seen. Some candidates who realised that the sum of the probabilities equals one, did not gain the mark because of their inability to process the decimal calculations correctly. A few candidates presented their answer as a percentage, but a few were let down by their arithmetic errors or the missing percentage sign.

Question 10

A sizeable group of candidates scored the mark for this question. Many candidates carried on counting in 3s. Some candidates displayed their method as $3 \times 5 = 15$. The most common error was 12.

Question 11

Most candidates knew that they had to add the angles and compare it to 180° in **part (a)**. They also could write down a suitable geometric reason for the calculation using all the key words. Some responses were missing the word 'angles' in the reason, typically 'a line adds up to 180'.

In **part (b)**, many candidates gained the mark for stating $c = 30°$ but did not give the correct reasoning or left it blank. A common answer was 'opposite angles', only a few stated 'vertically opposite angles are equal'.

Question 12

This was another question where most candidates were able to show a good understanding of what is required to estimate the given calculation. A large proportion of candidates gained the method mark from rounding 6.98 to 7 and 79.92 to 80 or from working with $(7 + 3) \times 79.92$.

However, some candidates tried to carry out this calculation by adding 6.98 to 3.04 and then using long multiplication. No marks were awarded as they had not written the numbers to one significant figure as required by the question.

Question 13

Few candidates were able to answer this question correctly. Candidates are used to represent the inequality on the number line rather than writing the inequality. Some candidates were able to write down the correct inequality for one side of the solution, e.g. $x \geqslant -2$ or $x < 4$, but relatively few were able to do this for both sides of the solution. Common incorrect answers included, $-2 > x \geqslant 4$, $-2 \geqslant x \geqslant 4$, $-2 < x \geqslant 4$ and −2, −1, 0, 1, 2, 3, 4.

Question 14

Although a good number of fully correct solutions were seen, this question proved demanding for many candidates. Although some candidates had $\frac{1}{3}Ah$ written down their working out had $\frac{1}{3}\times 3\times 10$ not $\frac{1}{3}\times 3^2\times 10$. Some candidates scored the method mark for finding the area of the base; others scored the two method marks but could not complete the question correctly.

Question 15

Candidates generally found both parts of this question challenging. Many incorrectly reflected the triangle instead of translating it in **part (a)**. Some managed to translate the triangle correctly horizontally but not vertically. However, the majority of candidates found **part (b)** difficult. A few candidates managed to score one mark for enlarging the shape by scale factor 3 but many were confused with the centre of enlargement being inside the shape.

Question 16

As seen previously, it is still apparent that bearings is a topic that many candidates do not understand or practise. Centres need to ensure that candidates are familiar with the topic and can use a protractor to measure angles correctly. Common wrong answers were 125° and 055°.

Question 17

This question tested the candidates understanding of drawing a line of best fit. However, of those who understood that the line needed to go through the mean point with a positive gradient, many did not draw a suitable line within the tolerance region. Many had the line going through the origin.

Question 18

Candidates had little success with changing the subject of this formula. A few candidates managed to gain a method mark for the first step, invariably to subtract *y* from both sides. Errors with algebraic manipulation were common with addition of *y* or even subtraction of *a* from both sides seen. Many candidates did not attempt the question and left it blank.

Question 19

This is a familiar question and candidates generally performed well. Only a few confused the highest common factor (HCF) with the lowest common multiple (LCM) and gave 315 as their answer.

Question 20

Although this style of testing trigonometry has been seen before, many candidates still found it difficult to choose the correct trigonometric ratio and even when choosing the correct one ($\tan x = \frac{5}{12}$) candidates did not know how to proceed. Some tried to use Pythagoras' Theorem, others left this question blank.

Question 21

This question proved challenging to many candidates. Some candidates scored the mark for **part (a)** but only a few answered **part (b)** correctly. The most common answer for **part (b)** was D instead of A. Many candidates clearly simply guessed.

Question 22

This question was also found difficult. Many candidates did not attempt the question or just wrote down 6 for **part (a)** and left **part (b)** blank. Some candidates drew an appropriate triangle on the diagram but did not know how to use, others did use it to find the gradient. However, few then went onto use this value correctly in an equation. It was also relatively common to see $y = mx + c$ written but working showed that the candidate had little understanding of what this meant or how to use it.

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/13
Paper 13 (Core)

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This question was also found difficult. Many candidates did not attempt the question or just wrote down 6 for **part (a)** and left **part (b)** blank. Some candidates drew an appropriate triangle on the diagram but did not know how to use, others did use it to find the gradient. However, few then went onto use this value correctly in an equation. It was also relatively common to see $y = mx + c$ written but working showed that the candidate had little understanding of what this meant or how to use it.

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/21
Paper 21 (Extended)

Key message

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

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

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

General comments

Candidates were well prepared for the paper and demonstrated excellent algebraic skills.
Some candidates lost marks through careless numerical slips, especially when working with negative numbers.

Candidates should make all of their working clear enabling them to access method marks in multi-step problems.

Candidates should always leave their answers in their simplest form.

Comments on specific questions

Question 1

Candidates did very well on the opening question and recognised the need to use Bidmas. A small number of candidates did not subtract correctly and gave a positive answer.

Question 2

Most candidates answered this straightforward calculation without difficulty.

Question 3

This question was not well answered by a significant number of candidates. Some did not give their answer in its simplest form, often leaving x in the numerator and denominator. There were also some candidates who tried to cross-multiply as if they were solving an equation rather than simplifying an expression.

Question 4

There were many very good attempts at solving this equation. Most candidates set their work out in a clear way and were able to gain method marks if they made a numerical slip. There was little evidence of them checking their solution by substituting their answer back into the original equation and this would have helped candidates correct their mistakes.

Question 5

This was answered correctly by most candidates although the few who made errors often gave a pair of numbers that did not add up to 120.

Question 6

Most candidates were able to work out the sum of the 5 or 3 numbers but there were a number of errors in subtraction and the subsequent division by 2.

Question 7

The majority of students were very confident at tackling this problem and used standard methods. Clear working was seen. A small number misinterpreted the question as inversely proportional to $\sqrt{x}$.

Question 8

(a) This question was clearly understood but many arithmetic mistakes were seen, usually dealing with subtracting a negative number.

(b) Some candidates clearly did not know how to find the magnitude of a vector but those who did were successful in answering this question and gained full marks.

Question 9

(a) The majority of candidates found 20% and tried to subtract this from $16. More accurate work was seen from using the decimal multiplier method of 16×0.8.

(b) This question proved to be more difficult for candidates with many not recognising it as a reverse percentage problem. The common incorrect answer was $48 where candidates had found 20% and added it on.

Question 10

(a) Nearly all candidates were able to factorise this simple expression.

(b) Most candidates were able to get at least one mark here if they factorised correctly but had not identified the highest common factor of $2x^2$.

(c) This was very well answered by most candidates. If candidates were encouraged to multiply out to check their answers, then they would spot any mistakes they had made with signs.

Question 11

Candidates did not make their working clear in this question and should try to show each step clearly in order to gain access to method marks in this type of multi-step question.

Question 12

There were a number of candidates who did not seem to be familiar with a cumulative frequency curve and drew a frequency polygon instead. The correct graphs in **part (a)** were of a high standard and most candidates were then able to read off the median mark accurately from their curve.

Question 13

This question was well attempted by many candidates and working was clearly set out.

Most candidates were able to gain method marks even after making an initial mistake. Finding the gradient of the line *AB* caused some problems and candidates should be encouraged to sketch out the problem and then they would realise that the gradient was negative.

Most successfully calculated the mid-point of *AB* but some then did not use this to form their final equation and used the coordinates of *A* or *B*.

Most candidates gave their final answer in the correct form.

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/22
Paper 22 (Extended)

Key messages

Candidates need to show all of their working. Incorrect answers without working cannot be given credit, whereas partial credit can be awarded if a correct method is shown. This is particularly relevant in questions which involve a multi-step approach.

Some candidates do not have a clear understanding of sampling in statistics.

Candidates must read the questions carefully and not make assumptions about the size of angles and lengths that are not given on a diagram.

General comments

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

Some candidates lost marks through careless numerical slips, especially in **Question 7**, where they assumed that the answer would be positive.

Candidates should make all of their working clear and not merely write a collection of numbers scattered over the page. This was particularly true in **Questions 6** and **14**.

Candidates should always leave their answers in their simplest form.

Comments on specific questions

Question 1

A large number of candidates gave an incorrect answer to this first question with parallelogram being popular but even triangle or hexagon were seen, showing a lack of understanding of the basic properties of quadrilaterals.

Question 2

There were many correct answers to this question. The common error occurred when candidates did not find the correct improper fraction.

Question 3

(a) Virtually all candidates answered this part correctly.

(b) The majority of candidates scored full marks for this part. Some were confused as to what was the value of the first term and what was the value of the common difference of the sequence.

Question 4

Weaker candidates were not able to cope with a negative fraction index and did not know how to show their working clearly. Most candidates did score at least one mark.

Question 5

Nearly all candidates gave correct answers to this question. However, 5 – 12 = –17 was a common incorrect answer.

Question 6

Although there were many correct solutions, some good candidates struggled with this question. A significant number of candidates who used Pythagoras' Theorem correctly, then used 10 as the radius of the circle. Some candidates who correctly found $25\pi - 48$ spoilt this answer by attempting an impossible simplification.

Question 7

The majority of candidates scored full marks for this question. The common error occurred when candidates calculated 60 and 54 correctly, but then subtracted incorrectly and gave an answer of 6.

Question 8

Factor trees was the common method used by candidates.

Parts (a) and **(b)** were very well answered.

Due to an issue with **Part (c)**, careful consideration was given to its treatment in marking in order to ensure that no candidates were disadvantaged. It had been anticipated that candidates would use their earlier work to answer this part, and an answer of 50 was anticipated, and was the most common. A significant number of candidates attempted this part without reference to their factor tree. and assumed that *n* could be fractional or negative.

Question 9

Parts (a) and **(c)** were well answered by nearly all of the candidates.

Part (b) proved to be a discriminator and showed a lack of understanding with some candidates in statistical sampling. Approximately half of the candidates gave the correct answer of 'large sample' but there were many other incorrect reasons given.

Question 10

The algebraic skills shown were excellent with virtually all candidates scoring well on this question.

Question 11

Candidates showed good clear shading in this question and the majority of candidates scored at least one mark in **Part (a)**. The common error was candidates omitting to shade outside the two circles in the second part.

Part (b) proved to be a lot more challenging. Many candidates appeared to be unfamiliar in interpreting the diagram and thought that the numbers shown were the elements and not the number of elements.

Question 12

This question was well answered by the majority of candidates. Candidates who made a slip in **Part (b)** could still score the mark in **Part (c)** as a follow-through mark was available.

Question 13

This question was well answered by nearly all candidates, showing an excellent understanding of logs.

Question 14

This question was poorly answered by the majority of candidates.

Although candidates realised that the second diagram involved a factor of 0.5, many were unable to set up an equation connecting the two diagrams and gave an answer of $a = 0.5b$. Many candidates who correctly set up an equation relating to the diagrams were able to complete the question correctly.

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/23
Paper 23 (Extended)

There were too few candidates for a meaningful report to be produced.

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/31
Paper 31 (Core)

Key messages

Candidates should be familiar with correct mathematical terminology.

In order to be able to answer all the questions, the candidates must have a graphic display calculator and know how to use it. The candidates should be encouraged to show all their working out especially for follow through questions. Many marks were lost because working out was not written down. Marks were also lost when the candidates did not write their answers correct to 3 significant figures (unless otherwise specified in the question). Teachers should ensure that they cover the full syllabus with their candidates. It appeared as if some topics had not been taught.

General comments

Most candidates attempted all of the questions so it seemed as if they had sufficient time to complete the paper.

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 result in a loss of marks and, if no working out is seen, then no marks will be awarded. When working out is shown and is correct then partial marks can be awarded.

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

Comments on specific questions

Question 1

(a) Many candidates found the fraction correctly but a few wrote $\frac{4}{5}$.

(b) Nearly all candidates managed to shade 30% of the shape. Some candidates did this more carefully than others.

(c) Many candidates could write the answers as a percentage. Only a few wrote the answer to **part (i)** as a fraction.

(d) There were many correct answers for the cube but fewer correct answers for **part (ii)**. Some candidates worked the sum out wrongly and others did not give their answer correct to two decimal places.

Question 2

(a) (i) A good number of candidates recognised the shape as a parallelogram, even if they could not spell the word correctly. Some candidates wrote trapezium or trapezoid or rectangle as their answer.

(ii) Not many candidates wrote 0 lines of symmetry. The most common answer was 2 or 4 lines of symmetry.

(iii) More candidates managed this part correctly although answers such as 90° or 180° were also seen.

(iv) Only a few candidates did not manage to draw the line correctly.

(b) (i) Most candidates wrote down the coordinates correctly. A few had their coordinates the wrong way around.

(ii) Very few candidates found the exact answer to the area but many picked up one mark for a good attempt.

Question 3

(a) The majority of candidates managed to find the correct selling price but some lost a mark because they did not give their answer correct to the nearest dollar.

(b) A large number of candidates found the sale price correctly. Some found the 12% and then forgot to subtract it from the original price.

(c) All three parts of this question were well attempted. Only a few candidates had a problem changing $4\frac{1}{2}$ years into months.

Question 4

(a) All but a handful of candidates managed to continue the pattern of dots. The table was also completed correctly by most candidates. In **part (iii)** some candidates lost the mark for writing the expression $n + 3$ instead of just +3. Those who correctly wrote the formula for the nth term were awarded the mark here. In **part (iv)** there were few incorrect answers for the number of dots in Pattern 9.

(b) Not all candidates managed to find the first three terms of the sequence. Some appeared not to be familiar with a sequence written in this form.

(c) More candidates are now able to find the nth term correctly. Some candidates just wrote $n + 4$ and a few just wrote down the next term of the sequence.

Question 5

(a) There were many correct answers for the angle in **part (i)** but many candidates had problems expressing why angles in a right-angled triangle cannot be obtuse.

(b) Finding the 3 angles posed a problem for quite a number of candidates. Mostly this was because they assumed that c was equal to 65°.

(c) Not many candidates were successful in finding the size of an exterior angle of a regular hexagon. Some found the interior angle and others managed to pick up one mark by knowing that a hexagon has six sides and wrote that down in the answer space.

Question 6

(a) The total number of points was correctly found by most candidates.

(b) Fewer candidates could work backwards to find the number of games won.

(c) Not many candidates managed this part correctly, with 12 being a common answer.

Question 7

(a) In **part (i)**, most candidates correctly found the distance from *A* to *B*. Some of those who did not managed to pick up one mark for measuring *AB* as 5 cm. In **part (ii)**, many candidates scored full marks or follow through marks. Very few candidates managed to measure the bearing correctly in **part (iii)**. Some misunderstood the question and measured the distance *BC*.

(b) The majority of candidates lost all three marks here by writing Pythagoras' Theorem incorrectly. A few tried to use trigonometry without success.

Question 8

(a) Nearly all candidates managed **part (i)** correctly although a few did write 11 for their answer. In **part (ii)** there were also many correct answers. Those who did not find the correct answer usually picked up a method mark for multiplying the brackets out correctly.

(b) Fewer candidates scored full marks on this part. Many managed to multiply out the brackets correctly but then added the parts incorrectly.

(c) There were very few completely correct answers to the simplification. Some candidates scored one mark for cancelling the *y* and a few for cancelling the numbers.

Question 9

(a) Most of the candidates who had a graphic display calculator and knew how to use it managed to draw a sketch of the graph and find the coordinates of the local minimum. Some tried to work out points but were usually not successful. Many candidates did not attempt any of this question.

(b) As in **part (a)**, those candidates who had a graphic display calculator and knew how to use it managed to draw the graph.

(c) There were few correct answers for the points of intersection. It appeared as if some candidates were perhaps using the trace function on their calculators instead of the intersection function.

Question 10

(a) Very few candidates managed to find the volume of paper. The most common wrong answer was using $\pi \times 4^2 \times 10$.

(b) Only a few candidates managed to write their answer correctly in standard form. Some candidates managed to pick up one mark for multiplying the numbers correctly.

(c) **Part (i)** was well answered but most candidates. **Part (ii)** proved more of a challenge with very few correct answers being seen.

Question 11

(a) Many candidates knew how to find the modal interval.

(b) There were also many correct answers to this part. Some candidates wrote $\frac{22}{100}$ and others just wrote 22.

(c) There were only a few correct answers for the mean. Most candidates just added up 20 + 40 + .. and then divided by 6 or 100. Some others added up the frequencies and divided by 6.

(d) Quite a number of candidates manged to complete the cumulative frequency table correctly in **part (i)**. Most of them also managed to plot the points correctly and draw the curve. Very few found the correct value for the median in **part (iii)**. Those who answered this part incorrectly usually used 60 from the time axis and read of their value from the cumulative frequency axis.

Question 12

(a) In **part (i)**, very few candidates understand the notation n(…). Most just wrote down the letters from set *A*. **Part (ii)** was better answered with more candidates recognising the compliment symbol.

(b) There were hardly any correct answers for either of the two parts here. Candidates either omitted this part or wrote symbols $\cap$ or $\cup$ or = between the entries.

(c) Many could find the correct numbers in the union for **part (i)** but not many managed to find the intersection. Some candidates wrote a few numbers for the intersection, some wrote 0, 1, 6, others wrote 'none' or 'nothing' and very few $\varnothing$.

(d) A good number of candidates manged to draw the Venn diagram with the elements in the correct sets although few of them drew two separate circles for *A* and *B*.

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/32
Paper 32 (Core)

Key messages

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

General comments

Candidates continue to perform quite well on this paper. They were well prepared and, in general, showed a sound understanding of the syllabus content. Presentation of work continues to improve although some candidates are still reluctant to show their working and just write down answers. This means they cannot be awarded marks for method if their answer is incorrect. Calculators were used with confidence, although it does appear that some do not have a graphic display calculator, as the syllabus requires. In questions where candidates need to describe a transformation, it is essential that they refer to **one** transformation only in their description. If more than one transformation is referred to then all marks are lost in that part. Candidates had sufficient time to complete the paper. The majority of candidates attempted every question.

Comments on specific questions

Question 1

In general, candidates answered each part of this question well. Their knowledge of number work was very good.

Errors that did occur were in **parts (e)** and **(f)**.' Rounding to 2 significant figures', 'writing in standard form' and 'finding a multiple' were phrases not well understood by some. In **part (f)** in particular, the confusion between multiple and factor was common.

Question 2

(a) Many candidates correctly found the mean of the list of numbers.

(b) A significant number of candidates did not know how to set out the required stem-and-leaf diagram. Some of the leaves were omitted or not ordered and some candidates had trouble with the key.

(c) Just the final section of this part, finding the interquartile range, caused difficulty. This was often due to candidates not working from an ordered list.

Question 3

(a) and (b) Both parts were answered successfully.

(c) Although **part (i)** was invariably correct, many candidates had trouble answering **part (ii)**. Most knew the calculation had to involve 3, 49 and 100 but the exact arrangement eluded many.

(d) Most candidates had a good understanding of ratio and could perform the calculation accurately.

Question 4

(a) (i) The time was invariably found correctly.

(ii) Many candidates chose the correct calculation to perform although a few multiplied the 150 by 6 as well as the 50.

(b) There is still much confusion between simple interest and compound interest. A significant number of candidates used a simple interest formula for both parts. Some forgot to halve the amount or halved it incorrectly. In **part (ii)**, a number just found the interest and forgot to add this back onto the amount invested.

Question 5

(a) All sections of this part were answered well showing a sound understanding of the terms being examined.

(b) Usually candidates knew that the tangent was at 90° to the radius and were able to successfully answer the first two sub-parts. However, most candidates found the final two sub-parts more challenging. This was usually due to not recognising that triangle *OBD* was isosceles. Many wrote down answers with no working so that part marks could not be awarded.

Question 6

(a) Pythagoras' Theorem was successfully applied by many candidates, although some could not identify the triangle that was needed. There was some confusion in finding the perimeter of the shape. It was common to see candidates finding the perimeter of the inside of the top opening.

(b) Very few incorrect answers were seen to this part.

(c) Candidates found this part more challenging and very few correct answers were seen. Candidates often shaded the third square on the top row, giving a diagram with reflection symmetry again.

(d) Although there were a lot of correct answers to this part, a number did not realise that one shape was an enlargement of the other and did 2 + 4.5 instead of 2 × 2.5.

Question 7

(a) The majority of candidates gave a fully correct answer to this part. Where errors did occur, it was usually through not allocating the correct value to the correct letter in the answer space.

(b) Better candidates had little problem with this part. The majority of candidates remembered that their answers for probabilities should be given as a fraction, decimal or percentage. Of those who got this part wrong, some wrote the correct numerator with no denominator and others wrote the correct numerator with an incorrect denominator.

Question 8

(a) There was some confusion here with the symbol used in the question. Often it was mistakenly taken to be union instead of intersection.

(b) Although there were many completely correct Venn diagrams drawn, a number of candidates omitted to include N on the outside of the two sets. Others included the A and T in each set as well as in the intersection.

(c) The majority of candidates did not realise that the question was asking for the number of elements and either did not give an answer or gave the answer as N.

(d) Many candidates found it difficult to identify the region that was required. As in **part (a)**, many were confused by the union symbol and mistakenly took it to mean intersection.

Question 9

(a) In **part (i)**, the majority of candidates substituted for x in the function and evaluated to the correct answer. Many, incorrectly, went on in **part (ii)** to perform the same calculation with $x = 17$ substituted. A small number set up and solved the equation correctly and a few others spotted that 3 was a solution, by inspection.

(b) The linear equations in this part were invariably solved correctly. This aspect of algebra is well understood.

(c) Candidates could expand brackets, although some incorrectly went on and tried to combine the two terms.

(d) Most candidates tried to deal with the numbers and powers separately, often getting at least one of these correct. 12 and r^4 were the common wrong terms.

(e) Although it was evident that candidates were aware of the rules for combining powers, the form of the question made a correct outcome more unpredictable.

(f) It was clear that candidates knew a correct method for solving simultaneous equations. The accuracy of their work was variable. After an incorrect first value, many could correctly go on to find the second value by substitution and rearrangement.

Question 10

(a) (i) There were many correct sketches. Most candidates showed knowledge of how to sketch a curve using their calculator. It was clear, however, that some did not have a graphic display calculator and reverted to plotting individual points on the curve.

(ii) The point where the curve crossed the y-axis was often given correctly.

(iii) Few candidates knew how to identify the horizontal asymptote of this curve.

(b) Many candidates correctly drew a sketch of the required straight line. Some, however, made the line too steep.

(c) This part was not done well. Even when a correct attempt was made, the answer was often not to the required accuracy. Candidates should remember that answers that are not exact should be given to three significant figures unless the question states otherwise.

Question 11

In this question candidates needed to describe transformations. It is essential that they refer to **one** transformation only in their description. If more than one transformation is referred to then all marks are lost in that part.

Most knew the required transformation in each part. However, often not enough detail was given to describe the transformation fully. Most commonly, in **part (a)** and **part (c)**, the centre of rotation and the centre of enlargement was omitted.

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/33
Paper 33 (Core)

Key messages

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

General comments

Candidates continue to perform quite well on this paper. They were well prepared and, in general, showed a sound understanding of the syllabus content. Presentation of work continues to improve although some candidates are still reluctant to show their working and just write down answers. This means they cannot be awarded marks for method if their answer is incorrect. Calculators were used with confidence, although it does appear that some do not have a graphic display calculator, as the syllabus requires. In questions where candidates need to describe a transformation, it is essential that they refer to **one** transformation only in their description. If more than one transformation is referred to then all marks are lost in that part. Candidates had sufficient time to complete the paper. The majority of candidates attempted every question.

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In this question candidates needed to describe transformations. It is essential that they refer to **one** transformation only in their description. If more than one transformation is referred to then all marks are lost in that part.

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CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/41
Paper 41 (Extended)

Key messages

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

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. Some candidates are also omitting important steps in their method, for example when using the sine rule in **Question 10(b)** and **(c)**. Often the initial substitution was shown but then not the rearrangement to the explicit form. In cases like this where the answer is given correctly then full marks are scored but when the answer is inaccurate, for example given to two significant figures, then it cannot be implied that the correct full method has been used and only partial method marks are awarded. Candidates should be aware that it is inappropriate to leave an answer as a multiple of π or as a surd in a practical situation unless directed to do so.

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

General comments

The majority of candidates were very well prepared for this paper and there were many excellent scripts, showing all necessary working and a suitable level of accuracy. Candidates were able to attempt all the questions and to complete the paper in the allotted time. The overall standard of work was very good and most candidates showed clear working together with appropriate rounding. Only a small number of candidates would have benefitted from being entered for the Core rather than Extended tier.

A few candidates needed more awareness of the need to show working, either when answers alone may not earn full marks or when a small error could lose a number of marks in the absence of any method seen, particularly in 'show that' style questions. There could be some improvements in the following areas:

- Handwriting, particularly with numbers.
- Candidates should not overwrite answers as this can make it difficult to read them.
- Care in copying values from one line to the next.
- Care in reading the question.
- Work should be clearly and concisely expressed with answers finalised to the required accuracy.

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

Topics on which questions were well answered include transformations, linear functions, trigonometry, simultaneous equations, sequences and quadratic equations.

Difficult topics were mensuration, standard form, circle theorems and combined probability without replacement, speed/distance/time, scale factors in similar solids.

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

Comments on specific questions

Question 1

(a) Mostly all correct with the occasional incorrect 'negative, zero, indirect or inverse' answer seen.

(b) Most candidates scored both marks in this part by using the table function in their calculators. The more direct approach of summing the values and division was made easier by the inclusion of ten pieces of data in the question.

(c) (i) This part of the question required readings from a graphic display calculator and candidates need to know that this does not change the rules about 3 significant figure accuracy. There were many candidates who only scored the B1mark here due to rounding to 2 significant figures. A few candidates omitted the x and thus scored 0 as their answer was not in the correct form of $y = ax + b$.

(ii) Most candidates realised that they had to evaluate y given $x = 40$ substituted into their **part (c)(i)** and found the correct answer with many scoring the one mark available on FT. However, a small number solved $0.61x + 28.7 = 40$.

Question 2

(a) (i)&(ii) Both of these parts had the same strictly correct answer of 25.0 only. Most responses were correct, but some candidates lost marks by not including exactly one zero to the right of the decimal point.

(iii) Several incorrect answers were seen in this part with the most common being 20 or 25.

(iv) This was mostly correct but some incorrect answers of, for example 25.048, 2.50467, 25.1, 25.001 were seen.

(v) This part proved to be difficult for some who did not really understand the required format of the answer. With only one mark on offer the candidates had to find a fully correct answer. Because of the values used in the question it was possible to use the minimalist response of 2.5×10 to gain the credit. Several candidates had an incorrect index of –1.

(b) Conversion of units in length, area and volume still causes difficulty for several candidates and this part was no exception. Those who were unable to score well were generally uncertain whether to multiply or divide their quantities by multiples of 10.

(i) Well answered by most candidates but incorrect answers seen included 0.02, 0.002 and 2000.

(ii) There were good answers seen here, but some candidates lost the mark for having the incorrect number of zeroes, often 4 instead of 5. Some recognised that this was a conversion of area and squared the 2 as well. A few gave the correct answer in acceptable standard form.

(iii) This discriminating part was only dealt with well by the stronger candidates. Many either only multiplied by 1000 or only divided by 3600. However, there were several responses where the two functions were reversed. Some candidates are uncertain of the link between speed, distance and time whilst others are unsure of the number of seconds in a minute, minutes in an hour.

Question 3

(a) Most responses were fully correct here although a fair number of responses ignored the instruction to 'show all your working'. Most candidates used the elimination method rather than the substitution approach.

(b) A slight twist on the usual quadratic equation problem, candidates had to first expand the brackets and then rearrange the terms to get it into the form of $ax^2 + bx + c = 0$ before solving which many were unable to achieve. Several either missed or ignored the instruction to 'show all your working' and used their graphic display calculator to produce the correct answers which, without a sketch to show method, was awarded only two marks. Some candidates wrongly solved each of the brackets equal to –5 leading to a correct value of –1 but this could only be earned if the third method mark was awarded. Very few candidates used the graphical approach directly but a sketch was sometimes seen in support of an algebraic solution. Several responses scored just the first method mark for the correct expansion of brackets but did not reach the required quadratic equation. Some good scripts lost the second method mark by not showing their quadratic equation equal to zero, required in this 'show all your working' question.

Question 4

Usually transformations are a high scoring question for the candidates, however in **part (a)** a few candidates lost all marks for use of combined transformations. Candidates should be aware that the number of marks per part give a good indication to how many pieces of information are required to gain full marks.

(a) (i) Almost all candidates gave sufficient information; an angle, direction and centre of rotation, although these were not always correct. A few gave the direction correctly as 270° clockwise or simply 90°. Some responses used the acceptable answer of the origin but 0, *O* or centre did not score.

(ii) This was well answered with a few using stretch instead of enlargement. Almost all candidates gave sufficient information; transformation, scale factor and centre of enlargement even though, again, these were not always correct. Many candidates scored B2 in this part, not recognising that the centre of enlargement was not at the origin.

(iii) A reasonably well answered part although several B1s were awarded for either a stretch with the *x*-axis invariant or in the incorrect position, the left hand point usually plotted at (1, 1).

(b) (i) This was mostly all correct although some candidates only gave one piece of information. Several answers of $y = -2$ seen.

(ii) A reasonably well answered part although several candidates did reverse the *x* and *y* translations and some reversed the signs. A few responses gave the allowed correct vector in words although the term translocation, which is not acceptable, was seen on a small number of responses.

Question 5

Candidates often struggle with circle theorems and in this question the stronger candidates scored well whilst many struggled to gain any credit and there were a number of candidates who did not attempt parts of this question. The nature of this question is that answers to previous parts are essential to calculating answers in ensuing parts.

(a) Mostly all correct however some candidates were not able to relate tangent in the question to a 90° angle at *B*. Incorrect answers included 43, 47, 68 and 133.

(b) Most candidates recognised that triangle *AOB* was isosceles and used their result from **part (a)** to calculate angle *AOB* correctly.

(c) A discriminating part with many correct answers. Candidates needed to be aware of the alternate segment theorem for the straightforward approach or to use their answer from **part (b)** to calculate angle *ACB* and other angles. A few B1s were given for angle *ACB* = 47 seen on the diagram.

(d) A well answered part with the stronger candidates gaining full marks using their knowledge of angles in cyclic quadrilaterals. Several responses picked up M1 here, generally for values written on the diagram.

(e) This part relied on candidates realising that triangle *ACD* was also isosceles using *AD* = *CD* from reading the question carefully.

(f) A discriminating part with only the stronger candidates gaining both marks. The most common incorrect answer seen was 25° from the assumption that angle *TCB* was a right angle.

Question 6

(a) A well answered part with most candidates gaining at least one mark for identifying the next term in the decreasing cubic sequence. The stronger responses also scored the marks for finding the *n*th term in the sequence although some made their task more difficult by then going on to expand out the cubic to find the alternative form. Several picked up a method mark for stating an incorrect cubic function.

(b) Most candidates were able to correctly find the next term in the quadratic sequence, the stronger candidates adopted an algebraic approach but some used the differences between terms method. This part was generally resolved well with most gaining at least one mark for spotting the common second difference of 2. Some reversed their values for *a* and *b* in their final answer.

Question 7

(a) This part was answered well with the majority producing an acceptable sketch of two branches with the correct shapes not crossing the *x*-axis. Some candidates lost a mark for not dealing with the modulus function correctly and some for joining the two branches together or touching the *y*-axis. Some candidates lost a mark for the graph touching the *x*-axis at $x = -1.5$ and $x = 1.5$. Most candidates were able to correctly set their graphic display calculators to obtain suitable images to sketch.

(b) This part was reasonably well answered with most candidates able to interpret the meaning of asymptote. However, some did not write down an equation, simply writing 0, and some gave $y = 0$ and *y*-axis as their answers.

(c) This part was found more challenging with many candidates not giving accurate enough values, usually rounded to 2 significant figures. Several candidates omitted the negative signs on their answers.

(d) Many candidates found this discriminating part challenging and incorrectly used their values from **part (c)**. Very few candidates scored full marks and there were many blank answer spaces seen. Again, some potentially correct answers were lost due to accuracy errors. Only a few candidates used a sketch to support their solution gaining at least the available method mark.

Question 8

This multi-part question was essentially testing candidates' knowledge of Pythagoras' Theorem and basic trigonometry but with the added complication of being able to visually identify 2D triangles correctly from a 3D triangular prism.

(a) This part was generally well answered with most candidates gaining full marks for a routine use of Pythagoras' Theorem to calculate the hypotenuse.

(b) Another well answered part with many candidates gaining full marks for a routine use of Pythagoras' Theorem to calculate one of the shorter sides. However, several lost the accuracy mark for a common answer of 8.9 whilst some added together the two squared values.

(c) Most candidates successfully used the straightforward approach of $\cos^{-1}\left(\frac{8}{12}\right)$ although some used their answer to **part (b)** with sine and tangent trigonometric ratios. Some candidates found the incorrect angle *AED* and did not score.

(d) This was not a well answered part with many candidates struggling to identify the link to **parts (a)** and **(b)** within the required triangle *ACF*. The efficient approach was to calculate $\tan^{-1}\frac{DE}{AC}$.

Question 9

This 3D mensuration question was a composite solid of a hemisphere attached on top of a cuboid, the supplied formula was for a sphere and many candidates forgot to halve values in their calculations. The majority of candidates still fully evaluate their answers rather than leave π in their calculations as long as possible. Many candidates still confuse volume and surface area. Only the strongest candidates fully understood the scale factors required for area and volume.

(a) (i) Most responses gained at least a method mark here, mainly for correctly calculating the volume of the cuboid although a few incorrectly used the formula for a cylinder.

(ii) Only the strongest candidates successfully answered this challenging part by using the scale factor of 0.6^3 multiplied by their answer to **part (a)(i)**. Very few managed to calculate the new lengths of the cuboid and find the correct volume of the shape. Most incorrect solutions found the volume of the new hemisphere but added it to the original cuboid. A few candidates did gain the method mark for showing the correct scale factor for volume. A full method was required here to gain any credit.

(b) (i) Most responses gained at least one mark here, mainly for correctly calculating the surface area of the cuboid. Many candidates scored two marks for a final answer of 1885, overlooking the need to subtract the area of the contact circle.

(ii) Only the strongest candidates managed this challenging part by using the scale factor of 1.2^2 multiplied by their answer to **part (b)(i)**. Very few managed to calculate the new lengths of the cuboid and find the correct total surface area. Most incorrect solutions found the surface area of the new hemisphere but added it to the original cuboid. A few candidates did gain a method mark for finding the correct scale factor for area. A full method was also required here to gain any credit.

Question 10

(a) This was answered very well with most candidates scoring full marks. A small number made a mistake in using the cosine rule, such as omitting the 2 or making a sign error. There were a few who did not evaluate the expression correctly after a correct substitution. A common error was for candidates to subtract $2bc$ from $b^2 + c^2$ before multiplying by cos *A*.

(b) Most candidates also answered this 'show that' part correctly although many lost the accuracy mark for not giving their angle to greater degree of accuracy before rounding. Those who had an incorrect answer for *AC* in the previous part usually earned the method marks in this part by applying the sine rule correctly. Some candidates gave the correct implicit form for the sine rule but made an error when transposing into the explicit form. Only a few candidates used the cosine rule.

(c) Most candidates successfully adopted the sine rule approach again, but many did not correctly calculate angle *BAC* as 72°, using 57°, so gained no credit.

(d) Most candidates identified the arrowhead *ABCD* as the required area. Most then used the formula, $A = \frac{1}{2}ab\sin C$, twice to calculate the areas of the two triangles and then subtracted to find the area of the quadrilateral. With most of the values of the sides and angles either given or previously calculated there were many different approaches to a successful solution. Some longer valid methods used the sine rule to calculate the length of side *AB*. A few gained just one mark for correctly evaluating angle *ACB*.

Question 11

(a) (i) This was mostly correct.

(ii) This was also mostly correct, with several candidates awarded the mark on FT provided their answer to **part (a)(i)** had a probability between 0 and 1.

(b) (i) Again, this part was generally well answered but some candidates missed the replacement comment and their second denominator was often seen as 11.

(ii) Good answers were seen with many gaining full marks.

(iii) Mostly all correct with several awarded the mark on FT provided their answer to **part (b)(ii)** had a probability between 0 and 1. Only a few used the longer alternative approach.

(c) (i) This discriminating part was miscalculated by many who used 12 in all of their denominators. Only the more able candidates scored full marks. Most responses did not include a sum of two fraction products, the most common incorrect solution being $\frac{7}{12}\times\frac{5}{11}\times\frac{3}{10}$ which gained M1 for the correct denominators seen.

(ii) This part proved challenging for many candidates although the more able answered this well. Two method marks were given on a few occasions for those candidates who had a good idea of how to solve this problem but did not consider the 3 different positional choices of the non-red ball. Several single method marks were awarded for correct numerators seen in a fraction product.

Question 12

(a) This was a reasonably well answered part with many scoring full marks. However, a small number of candidates made the mistake of, having got as far as $8x = 2$, giving a final answer of 4. Many candidates attempted to remove the fraction but forgot to multiply the 6 or the –2 terms by x so resulting in $6 - 2 = -2x$ and $6x - 2 = -2$ being seen.

(b) Many responses scored the first method mark, generally for $3 + 8x + 10$ but having a sign error on the second expansion with $1 - 2x + 16$ was a commonly seen error. Those who scored both method marks tended to solve the equation successfully.

(c) Many correct solutions were seen. Most candidates scored at least one mark here, usually for a correct use of the logarithms index law. Many others went on to gain the second method mark for a correct application of the logs division or product law but then were unable to solve to find the final answer of 2.

(d) The more able candidates scored full marks here but there were many partial marks awarded for those who were not able to finish the problem. Many responses used a trial and improvement method which generally led to a final answer of 3.33 which gained no credit.

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/42
Paper 42 (Extended)

Key message

Three figure accuracy is required unless otherwise indicated or when answers are exact. This rule applies throughout the paper including reading values from the graphic display calculator.

Candidates should recognise that in order to give a final answer correct to 3 significant figures, it is necessary to work to greater accuracy. Premature approximations in intermediate answers can lead to much greater inaccuracies in final answers.

The use of diagrams and candidate's own sketches can be helpful and can aid progress through more complex questions

'Show that' questions require all steps of working to be shown.

General comments

The paper was accessible to almost all candidates with few candidates scoring very low marks. The paper was finished by almost all candidates.

Most candidates did show working. There were cases where the working was neither clear nor logical which made the award of part marks difficult.

Some candidates lost marks through giving answers which were not sufficiently accurate.

The use of the graphic display calculator was generally good in the curve sketching.

Coordinate geometry was one area that proved more challenging when candidates had to think their own way through a suitable method.

Comments on specific questions

Question 1

This question was generally well answered.

(a) A reverse percentage question that was generally answered correctly with clear working shown. A few candidates added 15% of 19 975.

(b) (i) This was well done in most cases. There were a few candidates that rounded the exact money answer from \$22 697.50 to either \$22 700 or \$22 698. In money questions, when the answer is exact all the figures should be given in the answer.

(ii) Again this was generally well answered. Most candidates were able to show the compound interest calculation $19975\times\left(1+\frac{2.5}{100}\right)^5$. Notation that would not be sufficient for method marks is

$19975 \times (1 + 2.5\%)$. Very few candidates chose to work out each year separately. The calculation of the difference between the two options was almost always done correctly.

Question 2

This question was well done by most candidates and many gave correct answers to all parts.

(a) There were a few responses without the word 'translation'. Using descriptive words such as move or shift are not sufficient. In a few cases the vector $\begin{pmatrix} 4 \\ 0 \end{pmatrix}$ was replaced with words. If using words it is important that a complete description is given including the vertical movement of 0 as well as the move to the right of 4.

(b) Most were correct for the reflection in $y = -x$ but some only had one correct point at (−1, −1).

(c) The rotation was generally well done. Some credit was given for those candidates who used a different centre of rotation.

(d) Where **parts (b)** and **(c)** were correct this was usually correct.

(e) Many candidates got stretch as the type of transformation with scale factor 2. When giving the invariant line quite a few gave only *x* invariant rather than *x*-axis invariant. Enlargement was given rather than stretch by some.

Question 3

Most candidates did very well on this question.

(a) The plotting of the four points was very well done.

(b) Most candidates were correct.

(c) Usually candidates realised that their calculators were to be used for finding the regression line. There were some who lost the accuracy required. Other candidates tried to use the graph, drawing their line of best fit.

(d) The majority of candidates did use **part (c)** correctly or gained the follow through mark from their equation.

Question 4

(a) There were many good sketches made of the graph. Others were acceptable but could have been drawn more carefully.

(b) Many candidates gave the coordinates of the local minimum to an appropriate degree of accuracy. Reading values from the graphic display calculator should be done to the same degree of accuracy as the rest of the paper. Some candidates lost a mark by approximating the *x*-coordinate of 1.2909… giving (1.3, −1.3) instead of (1.29, −1.30).

(c) The symmetry proved far more difficult with many candidates seemingly unaware of rotational symmetry and, of those who did know about it, there were many who did not state all three required elements. The item most commonly omitted was the centre of rotation. The rotational symmetry might have been more obvious if the graph had been carefully drawn in **part (a)**.

(d) This part was a bit more challenging and some candidates did well to give all three solutions to suitable degree of accuracy. The comment on accuracy from **part (b)** also applies to this question.

(d) (i) Inaccurate answers −2.89, 0.60 and 2.3 were seen.

(ii) More candidates were able to solve the inequality than in the past. Solving the inequality could have been helped by sketching the line for g(x) on their diagram. A minority still tried to use algebraic methods with no success.

Question 5

Most candidates did well on this question

(a) An exception was where candidates did a conversion from hours into minutes but did not convert their answer back to km/h after division. This was seen in only a very few cases.

(b) The majority were correct. There were a few where the 8 hour time difference was subtracted rather than added on. There were a few where simple arithmetic was incorrect. There were a few candidates for whom working with the 24 hour clock appeared to be a difficult concept.

(c) Most candidates did this well. A few multiplied by 0.55. Some lost the accuracy required by converting $\frac{1}{0.55}$ to a decimal and rounding before multiplying by the cost in pounds.

Question 6

(a) Many began with a correct statement and showed correct working down to seeing $\cos BAC = \frac{7117}{8360}$ but neglected to give the value of angle *BAC* to more than three significant figures which is necessary in the context of a 'show that' question.

(b) Most candidates were able to identify the correct angle and evaluate it. Some lost the last mark as they were unable to work out the bearing. Other candidates used an incorrect trigonometric function for angle *DAC*. For example, $\sin DAC = \frac{74}{95}$. Others found the length of *DC* but often did not use a sufficiently accurate value when putting *DC* into their choice of trigonometric function and so ended up with an inaccurate final answer.

(c) Some candidates showed the shorter way to finding the shortest distance from *B* to *AC* using $\sin 31.6 = \frac{d}{44}$. Other candidates used a longer method finding the area of the triangle using $\frac{1}{2} \times 44 \times 95 \times \sin 31.6$ and then using $\text{area} = \frac{1}{2}\text{base} \times \text{height}$ to find the perpendicular height of the triangle *ABC*. Errors occurred when some candidates divided the line *AC* in half or decided that angle *ABC* was a right angle. Suitable accuracy was lost in some cases.

(d) This part was generally well done. For triangle *ABC*, either the formula $\frac{1}{2} \times 44 \times 95 \times \sin 31.6$ or the answer to **part (c)** was used. For the area of triangle *ADC* there were candidates that found the length of *DC* using Pythagoras Theorem and rounded it before calculating the area.

Question 7

Many candidates did well on the first three parts of this question. The last four parts were more challenging.

(a) Most candidates knew how to find the distance between two points. A few rounded to less than three significant figures.

(b) Finding the gradient of the line was well done in most cases. Most candidates correctly substituted either point *A* or point *B* to get the equation of the line. There were a few arithmetic errors seen when calculating the y intercept for the line when dealing with fractions.

(c) Most candidates got the correct equation of the line. There were only a few who did not appreciate the correct connection between the gradients of two lines that are perpendicular. In other cases, the gradient was correct but the midpoint of *AB* was used as a point on this line giving an incorrect intercept of the *y*-axis.

Making good use of the diagram provided or drawing one of their own was seen to be useful in aiding candidates when answering the following parts of this question.

(d) This part was a challenge to some. While there were correct answers seen, some candidates thought that the point to find was the midpoint of *AB*. There were also answers where one coordinate was correct but not the other.

(e) (i) There were some different approaches seen to this part which were not always successful. Some candidates realised that the intersection of the two lines was the mid-point of *CD* and worked out the coordinates of *D* algebraically. Others used the idea of vectors to find the coordinates of *D*. Working was not always shown.

(ii) Answers were varied through most types of quadrilateral.

(f) This part proved to be more challenging. Setting work out clearly could have helped candidates to gain some marks. The use of a clearly drawn diagram could have been of use. Where candidates thought the shape was a parallelogram there were some who used the slant height to try to find area. A few did know the formula for the area of a kite using the lengths of *AB* and *CD*. Others tried to box the shape in with a rectangle and find the area of the triangles outside the kite with some success.

Question 8

(a) This was well answered.

(b) (i) Most candidates gave a correct answer. A few did not realise that the number of balls in bag *B* had altered and their working showed $\frac{2}{7} \times \frac{5}{9}$.

(ii) This was well answered in most cases showing understanding of the question. There were some candidates that only did one of the options of the first ball being black and second white. The option of choosing a white ball from bag *A* and then a black ball from bag *B* was not considered.

(c) Most candidates answered this well. Some did not appreciate that the sampling was done with replacement.

(d) Many candidates obtained the correct answer showing their method.

Question 9

(a) (i) This was very well answered.

(ii) Most candidates were correct. A few subtracted 30 from 90 rather than the readings these figures produced.

(b) This was well answered. When three marks were not awarded there was often a correct calculation of the number of candidates in the top 15%. Making use of the graph provided, drawing lines to show what they are finding could be helpful to candidates.

Question 10

(a) and (b) These parts were answered well.

(c) Many answered this correctly. Others correctly showed $\sqrt{x} = 4$ but instead of squaring both sides they took the square root of 4 to be the answer. A few had problems rearranging the original equation correctly.

(d) Some candidates did answer this correctly. Credit was given for starting off with $z = k(y + 2)$. Others lost the *y* at the start giving $z = k(x + 2)$. There were cases where the brackets were missing, i.e. $z = ky + 2$. In others the constant of proportionality was replaced by *x* at the start, i.e. $z = x(y + 2)$.

Question 11

(a) This question was well done.

(b) Most candidates were correct. Others started with the functions reversed, finding f(g(*x*)).

(c) (i) This question proved more difficult. Many did get this correct. There was not always understanding of the function notation. Instead of seeing $5 - 3x^2 + 2x^2 + 7$ some squared each function giving $(5-3x)^2 + (2x+7)^2$ or $(5-(3x)^2 + (2x)^2 + 7)$.

(ii) Many were correct. There were algebraic problems seen for some candidates who evaluated $5 - 3x + 2x - 7$ incorrectly. Some tried $(5-3x)^2 + (2x+7)^2$. A few thought that $(12-x)^2$ was equivalent to $-(x-12)^2$.

(d) The inverse function was done well by many candidates.

(e) Most candidates did know what to do with the fractions. There were some issues with correctly expanding the second bracket in the numerator with the minus sign outside the bracket. The denominator did not need to be multiplied out. Some multiplied the bracket and a few factorised them again into a different format. The simplest form asked for is with the brackets as they are $(5 - 3x)(2x + 7)$.

Question 12

(a) In **parts (i)** and **(ii)** there were many correct answers seen.

There were some answers where axes were drawn and points plotted where the vectors would end if they started at the origin but no vector was drawn. A few had drawn the component parts of the vector but omitted the actual vector. Arrows indicating the direction of the vector were omitted in some answers.

In **part (iii)** credit was given where the correct vector was seen as $\begin{pmatrix} -4 \\ 1 \end{pmatrix}$ if it was not drawn correctly. A few candidates drew $\begin{pmatrix} 1 \\ -4 \end{pmatrix}$.

(b) Many candidates were able to write down the equations correctly and most of these were successful in both showing their workings and obtaining correct values. Both elimination, usually of *q*, and substitution methods were used. A few candidates were unable to write down the equations but used trial and error with some finding the correct pair of values.

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/43
Paper 43 (Extended)

There were too few candidates for a meaningful report to be produced.

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/51
Paper 51 (Core)

Key messages

Showing that a formula is correct requires not only use of that formula, but also a different way of getting the same result. Many candidates were not sure about the difference between a formula and an expression.

Now that marks for each question are given in this paper it is possible for candidates to get an idea of the amount of working required by looking at the given number of marks.

General comments

This was the first time where candidates were examined on using good communication in most questions. paper. In many questions the candidates showed a willingness to give full details of their working. Some candidates could have scored more marks by showing more working and writing out the calculations before typing them into the calculator. Overall, the standard was high, with many very good responses seen.

Comments on specific questions

Question 1

(a) Nearly all candidates correctly drew the diagrams of patterns of squares. It was advisable to use a ruler to do this, as most candidates did.

(b) (i) Candidates had little difficulty in continuing the sequence of triangle numbers. There was space beneath the table for candidates who wanted to show the differences between terms in the sequence.

(ii) Candidates were asked to use the fact that the 3 rows of squares had 6 squares in order to find the total when there were 4 rows. To gain the mark this information had to be used, stating that one adds the 4 squares to the 6 already there. Several candidates wrote 1 + 2 + 3 + 4 instead or described how the sequence increased.

(c) (i) This question wanted candidates to *write down* the answer. This implies that no communication needs to be shown. The large majority of candidates answered correctly.

(ii) To calculate the number of squares in the pattern, some communication was expected that showed which calculation was used. Many candidates did not gain the C1 mark for this through missing or insufficient explanation, such as writing 45 + 10 with no indication of how the 45 was found. The most popular method was to continue the sequence of triangle numbers.

(d) (i) To find the formula, substitutions were required. Few candidates used $s = 1$ and $T = 1$, which would have been the simplest. Candidates should be advised to use the given elements in a table rather than the ones that the candidate has calculated, as they may be incorrect.

(ii) Many candidates could have scored more marks if they had substituted **all** the letters in the equation. In checking the formula from **part (i)**, it was important to show that it gave an answer that was also checked from first principles, such as adding 1 + 2 + 3 + … + 12. The majority of candidates interpreted this *Show that…* question as only requiring use of their formula.

Question 2

(a) This question introduced another pattern of squares, which nearly all candidates drew correctly and accurately.

(b) (i) All candidates continued this straightforward sequence correctly.

(ii) The large majority were able to write the correct formula. Although not separately rewarded in this part, candidates should remember that a formula for H will start $H =$. As stated in the question, an answer in terms of s was required, and not words or other variables.

(c) (i) Nearly all candidates continued the sequence correctly. A useful piece of communication would have been to show the differences, 4, 6, 8, 10, 12, under the table. Not only does this illustrate from where answers come, but is helpful later in finding the formula. Not many candidates did this.

(ii) The most efficient method was to double the expression found in **Question 1(d)(i)**.

Many candidates usefully observed that the sequence was equivalent to 1×2, 2×3, 3×4, …

The few, who had shown second differences of 2 in the table in **part (i**), immediately knew the expression was a quadratic with first term s^2.

All of these methods gained marks for communication. Some candidates could have increased their communication marks by remembering that a formula for T begins $T =$.

Occasionally incorrect answers of $s \times s + 1$ were seen.

The question asked for an answer in terms of s. Questions should be read carefully to determine the form of the final answer since several candidates introduced other variables.

(iii) The large majority of candidates found the correct answer, most frequently by calculating 15×16. Some candidates omitted writing the calculation they used and could not then gain a mark for communication. The candidates who added up the numbers $1 + 2 + 3 + 4 + \ldots +15$ often omitted doubling their answer, as was necessary.

(d) As the number of black squares was half the total number of squares, the most efficient and popular method that candidates used was to halve their answer to **Question 2(c)(ii)**. Many candidates did not write an answer in terms of s.

(e) There were very many correct answers seen, sometimes without the working that was required for communication. The large majority used one of their formulae with 50 in order to find the total number of squares and then halved their answer to get the numbers of black and white squares.

(f) (i) The most common successful approach was to note that there were 1122 squares in total and that this could be made by taking 33×34. Many correctly used a previous expression to make a quadratic equation. Solving a quadratic equation by the formula or by factorisation was not expected as that is not in the Core syllabus. Instead candidates can find the solution by sketching the graph of the quadratic from their calculator. Hardly any did so, a popular approach being to approximate the solution by taking the square root of 1122 to get 33.5. All these approaches gained credit for communication or method. A frequent error was to write either 34 or 33.5 as the answer.

(ii) With a total of 480 squares, this part could be approached in the same way as **part (i)**.

The successful candidates tried to find two consecutive integers whose product was 480 and showed that this was impossible because $21 \times 22 = 462$ and $22 \times 23 = 506$.

A very large number of candidates did not consider the pattern of squares but decided that 240 white and 240 black squares would suffice. Looking at the number of marks **(3)** for this question gave a strong hint that this simple division by 2 was not enough.

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/52
Paper 52 (Core)

Key messages

Overall, a very high standard was achieved, with many scripts scoring full marks. Candidates showed very good skills in applying Pythagoras' Theorem and in calculating the areas of right-angled triangles. Many candidates exhibited fine communication. A few candidates could have scored more marks by paying more attention to this. Some showed no working or went back and scored out working. Although not penalised on this particular paper, there were a significant number of candidates who did not know the difference between a formula and an expression.

General comments

This was the first time where candidates were examined on using good communication in most questions. In many, the candidates showed a willingness to give full details of their working. Only in the questions where a table had to be completed did few candidates make use of the ample working space given under the table.

Comments on specific questions

Question 1

(a) (i) The single mark in this question was awarded for 5. Although not penalised many candidates did not follow the instruction to 'measure' the length of the line and preferred to use Pythagoras' Theorem. Candidates are also advised in future to be more careful with units as cm^2 was see quite often for this length.

(ii) Nearly all candidates showed the addition sum required to find the perimeter.

(iii) As in **part (ii)** nearly all candidates could find the area of the triangle. Fortunately for some there was no penalty this time for incorrect units.

(b) (i) Candidates had no difficulty in finding the perimeter and most communicated this by showing the required addition.

(ii) The same comments apply here as in **part (i)**. Almost all candidates showed they knew the formula for the area of a triangle.

(c) The great majority of candidates gave the correct values in the five empty cells in the table. This did not give full marks unless some relevant calculation was seen. The large area for working space under the table should have given a hint that some working was required. Many candidates could have improved their mark by making use of that space.

Question 2

(a) Some candidates did not have enough detail in their answers. For this *Show that…* question some simplification of the given formula was expected and a common error was to omit this. As before, the area from the usual area formula was correctly found by a very large majority.

(b) Since this part is similar to the previous, the same comments apply. In addition, there was a mark for communicating how the length of the shortest side of the right-angled triangle was found. Many candidates chose the simple method of subtracting the given sides from the given perimeter. There were a significant number who preferred to use Pythagoras' Theorem. Some candidates need to remember to communicate such calculations as the perimeter of 14 often appeared without explanation.

Question 3

(a) Most candidates could fill in the last three rows of the table correctly and showed that they understood the new formula being presented. The large working space under the table was not always used to good effect. In particular, *b* = 35 in the last row required some explanation. The candidates who did so usually wrote that the area $\frac{1}{2}b \times 12$ equalled 210. A smaller number used Pythagoras' Theorem.

(b) The calculations seen in **part (a)** were sufficiently understood that most candidates could write the correct expression by following the pattern seen. A few candidates tried unsuccessfully to use $\frac{1}{2}$ base x height.

(c) Most marks in this question were for communicating clearly how one found the answer and it was noticeable that very many candidates gave full and accurate working. Nearly all candidates used Pythagoras' Theorem correctly to find the hypotenuse. There were a significant number who did not show the addition necessary to find the perimeter or did not go further than finding the hypotenuse. As before, most candidates knew how to use the formula from **part (b)**.

Question 4

(a) A majority of candidates recognised that the rhombus was composed of 4 congruent triangles and so they multiplied their answer to **Question 3(b)** by 4.

(b) As in **Question 3(c)** it was important for candidates to show how they found the missing lengths, in this case *w* and *P*. A common error was to add instead of subtracting the squared numbers when using Pythagoras' Theorem. Most candidates were successful in this question.

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/53
Paper 53 (Core)

Key messages

Overall, a very high standard was achieved, with many scripts scoring full marks. Candidates showed very good skills in applying Pythagoras' Theorem and in calculating the areas of right-angled triangles. Many candidates exhibited fine communication. A few candidates could have scored more marks by paying more attention to this. Some showed no working or went back and scored out working. Although not penalised on this particular paper, there were a significant number of candidates who did not know the difference between a formula and an expression.

General comments

This was the first time where candidates were examined on using good communication in most questions. In many, the candidates showed a willingness to give full details of their working. Only in the questions where a table had to be completed did few candidates make use of the ample working space given under the table.

Comments on specific questions

Question 1

(a) (i) The single mark in this question was awarded for 5. Although not penalised many candidates did not follow the instruction to 'measure' the length of the line and preferred to use Pythagoras' Theorem. Candidates are also advised in future to be more careful with units as cm^2 was see quite often for this length.

(ii) Nearly all candidates showed the addition sum required to find the perimeter.

(iii) As in **part (ii)** nearly all candidates could find the area of the triangle. Fortunately for some there was no penalty this time for incorrect units.

(b) (i) Candidates had no difficulty in finding the perimeter and most communicated this by showing the required addition.

(ii) The same comments apply here as in **part (i)**. Almost all candidates showed they knew the formula for the area of a triangle.

(c) The great majority of candidates gave the correct values in the five empty cells in the table. This did not give full marks unless some relevant calculation was seen. The large area for working space under the table should have given a hint that some working was required. Many candidates could have improved their mark by making use of that space.

Question 2

(a) Some candidates did not have enough detail in their answers. For this *Show that…* question some simplification of the given formula was expected and a common error was to omit this. As before, the area from the usual area formula was correctly found by a very large majority.

(b) Since this part is similar to the previous, the same comments apply. In addition, there was a mark for communicating how the length of the shortest side of the right-angled triangle was found. Many candidates chose the simple method of subtracting the given sides from the given perimeter. There were a significant number who preferred to use Pythagoras' Theorem. Some candidates need to remember to communicate such calculations as the perimeter of 14 often appeared without explanation.

Question 3

(a) Most candidates could fill in the last three rows of the table correctly and showed that they understood the new formula being presented. The large working space under the table was not always used to good effect. In particular, $b = 35$ in the last row required some explanation. The candidates who did so usually wrote that the area $\frac{1}{2}b \times 12$ equalled 210. A smaller number used Pythagoras' Theorem.

(b) The calculations seen in **part (a)** were sufficiently understood that most candidates could write the correct expression by following the pattern seen. A few candidates tried unsuccessfully to use $\frac{1}{2}$ base x height.

(c) Most marks in this question were for communicating clearly how one found the answer and it was noticeable that very many candidates gave full and accurate working. Nearly all candidates used Pythagoras' Theorem correctly to find the hypotenuse. There were a significant number who did not show the addition necessary to find the perimeter or did not go further than finding the hypotenuse. As before, most candidates knew how to use the formula from **part (b)**.

Question 4

(a) A majority of candidates recognised that the rhombus was composed of 4 congruent triangles and so they multiplied their answer to **Question 3(b)** by 4.

(b) As in **Question 3(c)** it was important for candidates to show how they found the missing lengths, in this case *w* and *P*. A common error was to add instead of subtracting the squared numbers when using Pythagoras' Theorem. Most candidates were successful in this question.

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/61
Paper 61 (Extended)

To do well on this paper a candidate needed to be able to substitute to create simultaneous equations and from there to be able to solve these simultaneous equations.

For the modelling section the ability to work with surds and to rearrange and solve equations formed the basis of several questions.

Teachers and candidates should note that use of Quadratic Regression on a graphics display calculator (GDC) is not allowed in this examination. As stated in the syllabus these calculators may be used for the stated six applications, including the liner regression function, but not for any other in-built applications. Candidates must show a written method when finding formula and models.

General comments

Candidates generally understood the concepts in the tasks and were able to work to the end of both tasks. A sound knowledge of algebraic techniques was shown by many candidates. The communication was good throughout with candidates usually gaining the communication marks. The candidates who did not convert their surds and fractions to decimals were more likely to produce answers that were accurate enough to gain full marks.

Comments on specific questions

Part A Investigation – Piling Squares

Question 1

(a) As expected, this question was answered well. Candidates should be encouraged to use a ruler and pencil for all diagrams.

(b) (i) Many candidates sensibly used the dotty grid in **part (a)** to draw the diagram for 5 squares in the bottom row. Most candidates saw the connection between the totals of the number of squares, with few arithmetical errors.

(ii) Having been given the format of the formula with the coefficients to find, many candidates chose the straightforward route of finding the common second difference. There was a communication mark for showing <u>three</u> second differences of 1, so candidates should be encouraged to find at least three differences to confirm the value. Many other candidates used the general quadratic formula with $2a = 1$ and $3a + b = 2$, which also quickly gave them the correct values for x and y, and by writing these two equations they also earned the communication mark. The third method used was to substitute values from the table into the given format and to use simultaneous equations to calculate the values. In this case the communication mark was awarded for two correct equations using values from the table. When this final method is used, candidates should be encouraged to look for the easiest equations. In this case $x + y = 1$ was not used very often, but would have been a good choice, being simple to work with.

(iii) This final part of **Question 1** was often not completely answered. The substitution of 8 for s using the correctly found values of $\frac{1}{2}$ for x and y into $T = xs^2 + ys$, leading to 36, was very common. The confirmation of T as 36 by another route was not so often seen. Candidates could show 8 added to 28 either in the sequence, as an added difference below the table or separately. A labelled diagram up to 36 was also acceptable.

Question 2

(a) This diagram was also drawn well as in **Question 1**.

(b) Often with a little help from extra diagrams drawn on the grid, this table was completed accurately with most candidates noticing the patterns involved.

(c) (i) 25 was the new number that needed to be added to the table in this part. Most candidates noticed the pattern of square numbers.

(ii) Many candidates struggled here trying to use common second differences or the general quadratic formula. The gap of two between the '*s*' values going 1, 3, 5, 7, 9, … meant that these common methods needed to be adapted and most candidates did not have the knowledge to do this. Those candidates who chose to substitute two pairs of values from the table usually managed to complete the process successfully. As in **Question 1**, candidates should be encouraged to find the simplest equations to work with. By choosing $x + y = 0$ the calculations were very straightforward.

(iii) Most candidates recognised the pattern of square numbers in the table and connected it with half of s. There was a communication mark for writing a formula, i.e. writing 'b =', rather than writing an expression.

(d) (i) The only new value in this separation of the table from **Question 2(b)** was the 30. The easiest way to see this pattern was through finding a common second difference of 2.

(ii) Candidates who continued to use second differences or the general quadratic formula, as they had in **part (c)(ii)**, struggled to find valid values for x and y. Also, as before, those who used substitution to form a pair of simultaneous equations managed to find the correct values for x and y. In this part more candidates chose to use the easiest equation $\left(x + y + \frac{1}{4} = 1\right)$, which really helped them.

(iii) It was quite a step to notice the connection between this question and **part (c)(iii)**. Those who did were able to write down the answer. Many others, who did not get to a correct final answer, gained marks for showing three second differences of 2 or use of the general quadratic formula, and for using $n^2 + n$.

(e) This question hinted that the most straightforward way to solve it was to use the 'total squares' formula, found in **Question 1(b)(ii)**, by giving the information as the total squares being 253, rather than giving a number of black or white squares. Most candidates had the correct total formula and those who used it managed to get at least two marks, for its use (communication) and the number of squares on the bottom row to be 22. Many candidates did manage to complete the whole of this final question successfully.

Part B Modelling – A Bouncing Ball

Question 3

(a) Candidates used a variety of combinations of division and multiplication methods to calculate this height. When an error was made it was in counting the first height as 10 m when the question asked for the height after the bounce.

(b) (i) This question was also well answered with a communication mark for the correct units often being gained. Answers were given in centimetres or metres, usually with the matching units. It was more common to omit the units than to write them incorrectly.

(ii) Most candidates answered correctly, with some wrong answers following the assumption of 10 m for the maximum height after the first bounce in **part (a)**.

(c) This model did not follow the standard look of equations, for example, like those that were used in the investigation. Having made the initial substitution, as indicated in the question, for which they gained a communication mark, some candidates did not know what to do next. Others made a second correct substitution, e.g. $2.5 = pq^2$ but were not able to proceed further. The skill of solving simultaneous equations by substitution as well as the 'addition/subtraction' method is a very useful skill to learn.

Question 4

Solving an equation with the unknown to a power is another skill that, if known, would have made this an easy question to answer. Many candidates managed to write the initial equation with the values correctly substituted. Few had the knowledge that to find the fourth root would solve their equation. Others overcame the perceived difficulty of having a very small number when dividing 0.056 by 35 by dividing 35 by 0.056. Finding the fourth root of 625 was then straight forward but only a few of these candidates then realised that they needed to find the reciprocal of this to give the fraction value of *q*.

Question 5

(a) (i) Many candidates did not resolve the model to $D = p$. This would have told them that the distance travelled was simply the distance that the ball had been dropped, so it did not move any further.

(ii) The mark was also given to those candidates who managed the substitution of 1 for *q* and then explained that the model was not valid.

(b) This question was well answered, even by candidates who had not found a correct value for *q* in **Question 3**. There was a communication mark for the correct units that many candidates achieved.

(c) This question relied on the correct rearrangement of the equation, having substituted the values for *D* and *p* correctly. This is a technique that is often very useful in solving equations.

Question 6

(a) (i) To answer this question it was necessary to be able to add and subtract with surds. Resolving the numerator to be $1-\sqrt{\frac{1}{2}}$ or even $1-\sqrt{q}$ led directly to $\frac{10}{7}\times 1$ and was needed to show that t_1 was $\frac{10}{7}$.

(ii) In this part the calculation of the surds was necessary because a decimal answer was required. Candidates should be aware that calculations within their working need to be to at least 3 significant figures, if not more, otherwise their premature rounding may make their final answer outside the required range, due to loss of accuracy.

(b) Again, candidates who rounded their working values too much or too soon had answers outside the acceptable range. Candidates need to be able to work with the surds in their calculator to achieve greater accuracy.

(c) There were more than usual marks for this sketch because one of the skills here was to find a reasonable scale for the time axis. A scale of 200 produced the curve in the mark scheme whereas a scale of 50 produced quite a different looking curve. Candidates should be aware of how a change in the range can affect the sketch and they need to record on the axis the scale that they have used on their calculator.

(d) (i) A well answered question demanding a calculation once a correct substitution had been made.

(ii) Many candidates did not link the value of *p* with the value of t_1 despite the earlier work, nor did they realise that this meant that t_1 was the fraction part of the model.

CAMBRIDGE INTERNATIONAL MATHEMATICS

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Paper 62 (Extended)

Key messages

Candidates need to know how to answer questions that ask them to 'show' something. On this paper there were two kinds of these questions. Sometimes further lines of working out were needed to be written down to prove that the answer really was correct. Other questions needed a calculation to be done in two different ways, both reaching the same answer.

General comments

Candidates generally understood the concepts in the tasks and were able to work to the ends of both tasks. The communication was good throughout with candidates gaining the communication marks in most places. A good knowledge of algebraic fractions and rearrangement of equations was useful.

Comments on specific questions

Part A Investigation – Area of right-angled triangles

Question 1

(a) (i) Candidates had no difficulty when calculating the perimeter of this triangle.

(ii) Candidates had no problem in calculating the area of this triangle.

(b) This table was usually completed accurately. There was a communication mark for showing a relevant calculation in the space below the table. Candidates should be aware that it is helpful to show all working-out, no matter how trivial they think it is.

Question 2

(a) To gain all three marks candidates had to show that the calculation came to 120, as well as showing separately that the area of the triangle was 120. It was necessary to show at least one intermediate step from the given calculation, so writing down the calculation '= 120' was not sufficient to gain this mark.

(b) Similarly, at least one step of working between the calculation and 336 was needed in this part to gain this mark. Most candidates did show their method to calculate the hypotenuse, whether they used the given perimeter or Pythagoras' Theorem. The majority of candidates also showed the calculation for the area using $\frac{1}{2}$ base × height, which was necessary for the third mark.

Question 3

(a) This table was completed accurately by most candidates. Unlike **Question 1**, many candidates also showed some of their working and gained the communication mark for this.

(b) This question was answered correctly. A few candidates felt the necessity to multiply-out the expression, which was not necessary.

(c) There were four stages to this answer which, for the most part, were all completed accurately. Three communication marks were therefore usually earned. Most candidates showed their method for working out the hypotenuse and then the perimeter. They then showed the calculation with these two values in place and achieved the correct final answer.

(d) Again it was necessary to show the area using the basic area formula as well as the expression. Candidates needed to make sure that they used an alternative method to show that their answer to the expression was correct. A number of candidates wrote $6k \times k$ as $6k$ instead of $6k^2$ and similarly $3k \times 4k$ as $12k$.

Question 4

(a) (i) Most candidates successfully found the expression for the perimeter of this triangle, with a few leaving '− w' instead of replacing this by '− 10'. Most candidates then managed to simplify correctly. Errors occurred when candidates tried to multiply out the brackets as they were, without first consolidating at least the second bracket into either $\left(\frac{2x-10}{2}\right)$ or $(x-5)$.

(ii) Most candidates equated their previous answer to the correct expression for the area of the triangle. Often answers were given as decimals rather than in surd form, indicating that candidates need to know what the 'exact value' means.

(b) (i) Many candidates found the expression in terms of u and w without much problem. Simplifying the expression was made easier again by those candidates who consolidated their second bracket first, as in **part (a)(ii)**.

(ii) This final question in the investigation section was well attempted by most candidates. Those who had not managed to simplify their expression in **part (i)** had a longer task in this section, though many managed to simplify it correctly here. Most candidates showed clear working of all their steps.

Part B Modelling – Hot Air Balloon Flight

Question 5

(a) Being given both the scales made this sketch relatively easy to draw. Mostly the shape was good. Candidates should pay particular attention to the endpoints of a curve, i.e. what is happening at the origin and the gradient as the curve reaches the end of the t scale.

(b) Candidates found no difficulty in calculating the height of the balloon after 3 minutes.

(c) Candidates had no problem with calculating this increase in height.

(d) Most candidates knew they had to divide their distance by 3 and noticed that they needed to convert to metres per second by dividing by 60. How to use recurring decimals, and/or fractions correctly would be a valuable lesson, because some candidates truncated to 2.6 or 2.66 whilst others, who had a perfectly accurate answer of $2\frac{2}{3}$ or $\frac{8}{3}$, then converted this to a decimal.

(e) This was a 'show that' question. Candidates need to know that writing the given model with a substitution, (in this case, a 9 for t), equal to the given answer of 960, is not showing that it works. Even writing cos (20 × 9) as cos 180 is not enough to get to the 960. Some candidates did show that cos180 was – 1, which made the bracket a value of 2, and 480 × 2 = 960.

Question 6

(a) The plotting of these values was mostly correct. Candidates showed that they had worked out the vertical scale correctly and most mistakes were probably reading rather than counting errors.

(b) Not understanding the different situations led to a mixture of correct and incorrect answers for these functions. Answers that rounded to 960 were acceptable for **part (i)**. That an equation was necessary for **part (ii)** was generally observed, with the correct gradient value of 27 found. Many candidates misunderstood **part (iii)**, and even with the interval correct, thought that another equation was necessary and not a constant value.

Question 7

The candidate's answer to **6(b)(iii)** was followed through here, which gave many candidates some, if not all of the marks. Some candidates used only the 180 as their distance, forgetting that at the beginning of **part 3** the balloon was 1230 m above the ground. There were two communication marks here, one for dividing by 2.5 and one for converting the seconds to minutes. The first was almost always achieved. Candidates should be encouraged to write out all calculations: Those who showed the divide by 60 here achieved a second communication mark.

Question 8

(a) It was necessary to understand that *d* is 0 for this point, as well as being able to rearrange an equation with the variable in the denominator of a fraction. This algebraic manoeuvre does need to be emphasised within working with equations and models. Many candidates did complete this successfully.

(b) This more demanding situation was not so well answered. The difference between the two times was often not recorded. With a division into 180 this was worth another communication mark.

Question 9

(a) Unlike **Question 5(e)** this was not a 'show that' question, so to obtain a final answer candidates had to do further working after the substitution of 7.5 for *t*. Consequently full marks were often achieved, even though this question led to an inverse cosine.

(b) Most candidates managed to double their gradient and many attempted to find a '*c*' value for their model. Candidates are better equipped to attempt even the last question of the modelling section.

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There were too few candidates for a meaningful report to be produced.