CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/11
Paper 11 (Core)

Key messages

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

General comments

Candidates need to know the meaning of mathematical terms and how to use them. For example, in this paper, this was required in **Questions 7**, **9**, **17** and **19.** It is crucial that candidates show working in multi-step problems such as **Questions 3**, **15** and **23**, as showing workings enables candidates to access method marks. Candidates must make take care to avoid making arithmetic errors, particularly in questions that are only worth one mark, since credit cannot be awarded if the answer in wrong. Candidates should note the required form for answers, for example **Question 22** required an answer in standard form and **Question 23** in terms of π.

The questions that proved to be the most accessible were **Questions 1**, **2**, **8**, **12** and **18**. Those that proved the most challenging were **Question 7** on describing data, **Question 17** on set symbols, **Question 19** on prime factors, **Question 22** on standard form and **Question 24** on fractions.

Most candidates attempted all questions, with few questions having high omission rates. However, the most frequently omitted questions were **Questions 14**, **17**, **20**, **22** and **24**.

Comments on specific questions

Question 1

This question was very well answered. The few incorrect answers given included 4 (the cube root of 64), 32 and $\sqrt{16}$.

Question 2

This was one of the best answered questions on the paper. All values in the table could be found from separate subtractions, independent of each other, by using the rows. It is a good idea for candidates to check their work. They could do this here by adding the columns to the totals.

Question 3

This question was generally well answered, with the values being substituted into the formula on the right-hand side and then worked out correctly. There was no conversion to be done as the costs were both in dollars. The step that was the most problematic was calculating 0.3 × 1000. Some candidates found the $300 correctly but then gave $30 065 as their answer.

Question 4

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Although many correct answers were seen, answers of the wrong order of magnitude were seen fairly frequently, for example 0.7 per cent, 70 per cent and 700 per cent. A few candidates divided 0.07 by 100 instead of multiplying by 100.

Question 5

Many candidates drew an accurate angle at *A* with their pencil and straight edge. Others drew an angle of 54°, caused by using the other scale on their protractor. A few used the middle of the line or the right-hand end to draw the angle rather than drawing it at *A* as instructed.

Question 6

Many correct answers were seen. The most common error was using an incorrect conversion factor. It is useful for candidates to remember that the prefix milli mean a thousandth so there are 1000 millilitres in 1 litre, the same relationship as milligrams/grams and millimetres/metres. In conversions, candidates must remember to use all figures and not round. Some answers that omitted the 2 were seen.

Question 7

This question proved to be challenging for candidates, with many candidates selecting one of the incorrect options. Candidates needed to consider what sort of numbers they would have for data in context. Here, the context is number of students. This can only be whole numbers, so must be discrete data as there cannot be 28.3 or 35.8 candidates.

Question 8

This was a familiar statistics question that was very well answered. The numbers were already in order so there was no method mark for either answer. Some candidates gave 44 as the mode, maybe as that was the first number with two instances, but the rest of the numbers should have been checked as 52 appeared three times. Reversed answers did not receive any credit.

Question 9

This question proved to be challenging, with a common factor of 8 and 12 (4 or 2 or 1) rather than a common multiple of both numbers being frequently given. Candidates must find a way of remembering the definitions of factors and multiples.

Question 10

This question was very well answered, with the only error being incorrect counting on the grid as the answer of 6 was seen a few times.

Question 11

Many correct answers were seen. A few candidates gave 99.62 as their answer as if the probability, 0.38, was a percentage so subtracted that from 100 per cent, rather than 1. Others made arithmetic errors in their subtraction. Some gave answers of 62 or $\frac{1}{0.38}$.

Question 12

This question was very well answered. Where mistakes were seen, they involved not dealing with the –1 correctly (giving $2x = 7 – 1$) or giving the answer as 6 by subtracting 2 from 8 rather than dividing by 2.

Question 13

This question was also very well answered. The most common incorrect answers were 4 (the power only) or 16 (the value of 2^4).

Question 14

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This question proved challenging for candidates and had the highest omission rate on the paper. Many candidates seemed unsure of working with inequalities. As there was only one mark available, an answer of 7 could not gain any marks. The required answer was $x \geqslant 7$.

Question 15

Many correct responses were seen. Candidates needed to know that the sum of angles in a quadrilateral is 360° and needed to recognise the symbol for 90°. Candidates who gave a low value for x of 18 (from 180 – 40 – 122) should have seen from the diagram that their answer was not likely to be correct. In general, diagrams that are not drawn to scale do still give a rough idea of the relative size of the angles.

Question 16

The question was set up ready for cancelling without any manipulation. Some candidates gained credit for doing some of the cancelling. Some incorrectly manipulated the fractions into an addition sum by treating the multiplication sign as addition. The final answers $6a + 5b$ or $\frac{6a}{5b} = \frac{2a}{1b}$ and $\frac{3ab}{7a}$ were all seen.

Question 17

This proved to be the most challenging question on the paper, and very few correct answers were seen. Many candidates did not use any set notation, and numbers were the most common answers. Set symbols seen included intersection and union. Some candidates wrote 'is a member of', and inequality signs were also seen.

Question 18

This question was very well answered. A small number of responses multiplied out the bracket correctly but did subsequent incorrect working that combined the terms, often into $–16m$.

Question 19

This question proved challenging, although fully correct responses were seen, and others gained partial credit for listing the factors of 30. Incorrect final answers seen listed all the factors of 30, all the prime numbers under 30 or some multiples of 30. Candidates need to know the definition of a prime factor.

Question 20

This question was omitted by a reasonably high number of candidates despite being a standard simultaneous equations question. There was no need for multiplication of the equations before adding to get the equation $8p = 56$ and going on to solve for p. Many responses showed little or no working. Candidates should check their answers are correct for both equations as some gave solutions that fitted one equation only. In these cases, candidates were awarded partial credit.

Question 21

This problem-solving question on set notation was handled much more successfully than **Question 17**.

(a) The parts were set out in the given order as x is found by the shortest method. From the information in the question, x was found by using the total number of elements in A, 9, and subtracting those in the intersection. From the information, the answer had to be less than both 30 and 9. Many candidates did not appreciate restraints on the value of x.

(b) The method to find z was to subtract 15 from 30 to find the total number of students who liked either or both of the two sports, 15. Then, from this 15, the number of students who gave athletics (9) had to be subtracted to get the correct answer of 6. Candidates were slightly more successful here than in **part (a)** as a follow through mark was available for those who correctly carried out a required part-method. It is best practice to use the information give in the question where possible, rather than relying on earlier calculated vales.

Question 22

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This question was one that candidates found challenging and that had a reasonably high omission rate. The problem needed breaking down. Candidates could write out the numbers in full, but this could lead to errors. The powers of 10 could be cancelled to 10^4, making the numbers easier to manage. Changing $\frac{5}{2}$ to a decimal then gave 2.5×10^4 and as this is in correct standard form, no further work was needed. Some candidates gave answers of 10^{11}, coming from $(5 \times 2) \times 10^{(7+3)} = 10 \times 10^{10}$. Answers such as $\frac{50^7}{20^3}$ or 25^4 were seen, which displayed a lack of knowledge of standard form.

Question 23

There were some fully correct answers here and others gained partial credit. This problem-solving question needed the volume of each cylinder found in terms of π and then these two expressions to be added. Some candidates gave a volume as 2π without any labels or any previous method. Some had problems multiplying a circle area by 0.5, for the volume, and doubled instead. Some candidates tried to multiple by 3.14 or 3.142 instead of leaving their answer in terms of π, but if the full method was seen prior to this unrequired step, the candidate was awarded the method marks. Some candidates consistently treated the diameters as if they were radii, leading to an answer of 10π.

Question 24

This question was one that candidates found challenging and that had a reasonably high omit rate. The problem was made more complex than a normal fraction question as the required fraction was the divisor on the left-hand side. The first step was to change the mixed number to a fraction, $\frac{9}{4}$, or to isolate the missing fraction. These processes gained method marks. Answers of whole numbers such as 3 or 6 were seen. The question says that the triangle represents a fraction so these answers cannot be correct.

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CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/12
Paper 12 (Core)

Key messages

Candidates need to have completed the full Core syllabus to succeed with this paper.

Calculators are not permitted on this paper, so candidates are expected to be familiar with a range of non-calculator methods. It is important that calculations are evaluated correctly. Candidates are advised to check their work carefully to avoid making arithmetical errors.

Candidates should be able to manipulate expressions, formulas and equations using appropriate techniques. For example, they should be able to simplify expressions using laws of indices (**Question 17**) and recognise the need to rearrange an equation into the form $y = mx + c$ before finding the gradient of a line (**Question 20**).

Candidates should show working clearly, which is good mathematical practice. Partial credit is often available when a correct method has been used but the final answer is incorrect.

Candidates are expected to understand and use appropriate mathematical vocabulary, including continuous data (**Question 6**), factors (**Question 1**), multiples (**Question 16**) and square numbers (**Question 16**).

General comments

The paper was accessible to all candidates. The majority of candidates attempted every question and reached the end of the paper. The questions that proved to be the most accessible were **Questions 1**, **4**, **8** and **17**. The most challenging were **Question 6** (continuous data), **Question 12b** (mean from a table), **Question 15** (drawing a bearing), **Question 20** (finding a gradient from an equation that is not in the form $y = mx + c$) and **Question 21b** (using a cumulative frequency curve).

Most candidates showed working where appropriate. However, many candidates made basic arithmetical errors in their calculations and were unable to gain the final accuracy marks. Partial credit could be awarded if candidates showed full working.

Comments on specific questions

Question 1

Most candidates identified both factors correctly. The most common error was to state the multiples of 20.

Question 2

Most candidates correctly stated ‘diameter’. The most common incorrect answer was ‘circumference’, although other words were also seen. Some candidates did not understand what was required, with a number writing an expression, such as $2\pi r$, or value, such as 360.

Question 3

Most candidates gave the correct answer, although some place value errors were seen. The most common incorrect answer was 8 000 000, sometimes with spacing or separators that suggested candidates thought a million had five zeros, for example 80 00000.

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Question 4

This question was very well answered, with the vast majority of candidates giving the correct answer and most showing clear working. A small number of candidates made arithmetic errors. There were a few cases where candidates misread or misinterpreted the formula, for example calculating 5 × 10 + 3 or 5 × 10 × 30. Candidates are advised to read the information in the question carefully.

Question 5

Most candidates identified the need to multiply \$7.50 by 50, and many completed this calculation correctly. However, a significant number of place value errors were seen, leading to answers of \$37.50. The use of appropriate checking strategies, such as estimating the size of the answer, would help avoid this. Many arithmetical errors were also seen. Some candidates set 7.50 × 50 out as a long multiplication (often with an unnecessary line of zeros in the working for 7.50 × 0), rather than using methods such as multiplying by 100 and then halving the result. Some candidates did the question mentally, possibly using this method.

Question 6

Some good answers were seen, but this proved to be one of the more challenging questions on the paper. Some candidates gave answers that were too vague, such as 'measurements'. There were many answers that identified discrete data, for example 'cars bought per year', or qualitative data, such as 'colours of cars'. Some candidates gave examples of data that were not relevant to cars, for example 'height of people'.

Question 7

Most candidates identified the need to multiply the amount of juice in one carton by 10 and many went on to reach the correct answer. A significant number either made no attempt to convert from centilitres to litres, or carried out the conversion incorrectly. A variety of incorrect conversion factors were seen, usually 100 or 1000.

Question 8

This was well answered, with the vast majority of responses giving the correct answer. A minority of candidates reached the stage of writing $\frac{85}{100}$ but made arithmetical errors when simplifying.

Question 9

Some good answers were seen. Candidates who found the differences between the terms 8, 13 and 28 usually found the correct answers. Some found that the difference between 13 and 28 was 15, but then incorrectly stated that 5 → 28. Only a small minority of candidates found and used the nth term.

Question 10

Many candidates correctly completed the stem-and-leaf diagram. Most also completed the key correctly, but some omitted it. Some candidates did not understand what was expected and put two-digit numbers in both the stem-and-leaf diagram and the spaces for the key.

Question 11

Whilst there were some very good responses with clearly set out working, this question proved challenging for many candidates. Arithmetical errors were common, including errors such as 40 × 20 = 80. Some candidates found the volume rather than the surface area. Those who attempted to find surface area sometimes omitted one or more faces from their calculation, while others assumed that four of the solid's faces had the same dimensions and found, for example, 40 × 20 × 4 + 15 × 20 × 2.

Question 12

(a) Most candidates gave the correct mode. Some gave the answer 8, suggesting they were looking for the highest frequency, but did not understand that the data point associated with this frequency

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was the mode. Some gave the answer 4, 3, which comes from the bimodal distribution 1, 2, 3, 4, 4, 5, 8, 3 and shows a fundamental lack of understanding of the table of data.

(b) Although some excellent responses with very clear working were seen, most candidates found this question challenging. Some candidates reached $\frac{50}{20}$ but did not simplify their answer or gave $\frac{5}{2}$ as their final answer. A top-heavy fraction is not an appropriate form of answer in this context. As on previous questions, many responses contained arithmetical errors among good working. Some found $1 \times 4 + 2 \times 5 + 3 \times 8 + 4 \times 3$, but then incorrectly divided their total by 4 (the number of categories). Incorrect methods such as $\frac{4+5+8+3}{4}$ and $\frac{1+2+3+4}{4}$ were very common.

Question 13

Most responses demonstrated some understanding of inequalities, and the majority recognised that 0 is an integer. The most common errors were the omission of –1 or the inclusion of 2.

Question 14

This question was well answered, with many fully correct answers seen. Some candidates gained partial credit for a translation where one component was correct, for example completing a translation of $\begin{pmatrix} 3 \\ -2 \end{pmatrix}$. A common error was to reverse the components and show an image after a translation of $\begin{pmatrix} -2 \\ -3 \end{pmatrix}$.

Question 15

Some excellent answers were seen, with protractors used accurately to draw the required bearing. However, most candidates were not able to draw the given bearing, and diagrams showing bearings in the range 0° to 180° were seen on many scripts. A few candidates did not start their bearing at Q.

Question 16

(a) Many correct answers were seen. Some candidates listed some multiples of 4, but did not include all the required values, while others included extras, such as 24. Some candidates listed the factors of 4.

(b) There were some fully correct answers that showed good understanding. Some scripts gave a partially correct answer but either omitted a square number or included a number, such as 2 or 12, that is not square. Candidates who had made errors in **part (a)**, such as listing the factors of 4, were able to gain credit for giving the square numbers from their list.

A significant number of candidates were not able to interpret this question correctly. Some thought that all the even numbers were square numbers. Some did not understand the set notation, with some candidates listing the elements of $A \cup B$ and others treating the symbol $\cap$ as 'not', and consequently listing the values from A that were not square.

Question 17

This question was well answered, with most candidates giving the correct answer. The most common error was to divide the powers, leading to the answer t^2.

Question 18

(a) The majority of responses gave the correct answer. Candidates who used the given information to form the equation $3(10) + k = 38$ almost always reached the correct answer. Unsuccessful attempts used the given values incorrectly, omitted one value (for example writing $3n + k = 38$), or did not attempt to write an equation as the first step.

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(b) Most candidates were able to use their answer from **part (a)** with the given expression for the nth term to find the fifth term in the sequence. A few did not realise that the answer for **part (a)** was needed to answer this part and consequently made no progress.

Question 19

Most candidates started by converting the mixed numbers to top-heavy fractions and many went on to use a common denominator. Some reached the stage of writing $\frac{24}{11} - \frac{8}{5}$, but then subtracted numerators and denominators, leading to the commonly seen incorrect answer $\frac{16}{6}$. A significant number of arithmetical errors in calculations were seen.

Question 20

This question proved to be the most challenging on the paper and was omitted by the highest number of candidates. The form of the given equation, $5y = 3x + 20$, caused difficulty for many candidates, with very few rearranging it to the form $y = mx + c$ to identify the gradient. A significant number of candidates stated that the gradient was 3, which is the coefficient of x in the given equation. Some candidates attempted to use 'rise over run' but were unable to use the equation to find suitable values to work with.

Question 21

(a) There were some fully correct answers. Candidates who drew a horizontal line from 50 on the vertical axis and then a vertical line to the horizontal axis usually reached the correct answer. Some candidates attempted a correct method but were not able to read the value accurately from the graph. Some of these candidates drew lines on the diagram that did not follow the grid lines, while others misinterpreted the scale, giving the incorrect answer 31. 30 was a commonly seen incorrect answer, usually with no work on the graph, suggesting that some candidates had misunderstood what was meant by 'estimate' in this context. Some candidates did not understand that they needed to use the cumulative frequency to reach the median. Instead, they looked at the marks alone and attempted to find a middle value, leading to the common incorrect answers 25 and '20, 30'.

(b) This part proved more challenging than **part (a)**, with few fully correct answers seen. As in **part (a)**, many candidates made errors when reading the graph, including errors interpreting the scales used on the axes. Some candidates attempted to find the cumulative frequency that corresponded to the given mark (gaining partial credit if they did this correctly) but did not realise that they needed to subtract this from 100. A method mark was available here, and many candidates gained credit for showing their value subtracted from 100. However, a significant number of responses showed no working, so the method mark could not be awarded.

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CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/13
Paper 13 (Core)

Key messages

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Candidates should be able to manipulate expressions, formulas and equations using appropriate techniques. For example, they should be able to simplify expressions using laws of indices (**Question 17**) and recognise the need to rearrange an equation into the form $y = mx + c$ before finding the gradient of a line (**Question 20**).

Candidates should show working clearly, which is good mathematical practice. Partial credit is often available when a correct method has been used but the final answer is incorrect.

Candidates are expected to understand and use appropriate mathematical vocabulary, including continuous data (**Question 6**), factors (**Question 1**), multiples (**Question 16**) and square numbers (**Question 16**).

General comments

The paper was accessible to all candidates. The majority of candidates attempted every question and reached the end of the paper. The questions that proved to be the most accessible were **Questions 1**, **4**, **8** and **17**. The most challenging were **Question 6** (continuous data), **Question 12b** (mean from a table), **Question 15** (drawing a bearing), **Question 20** (finding a gradient from an equation that is not in the form $y = mx + c$) and **Question 21b** (using a cumulative frequency curve).

Most candidates showed working where appropriate. However, many candidates made basic arithmetical errors in their calculations and were unable to gain the final accuracy marks. Partial credit could be awarded if candidates showed full working.

Comments on specific questions

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Most candidates identified both factors correctly. The most common error was to state the multiples of 20.

Question 2

Most candidates correctly stated ‘diameter’. The most common incorrect answer was ‘circumference’, although other words were also seen. Some candidates did not understand what was required, with a number writing an expression, such as $2\pi r$, or value, such as 360.

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Most candidates gave the correct answer, although some place value errors were seen. The most common incorrect answer was 8 000 000, sometimes with spacing or separators that suggested candidates thought a million had five zeros, for example 80 00000.

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This question was very well answered, with the vast majority of candidates giving the correct answer and most showing clear working. A small number of candidates made arithmetic errors. There were a few cases where candidates misread or misinterpreted the formula, for example calculating 5 × 10 + 3 or 5 × 10 × 30. Candidates are advised to read the information in the question carefully.

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(b) This part proved more challenging than **part (a)**, with few fully correct answers seen. As in **part (a)**, many candidates made errors when reading the graph, including errors interpreting the scales used on the axes. Some candidates attempted to find the cumulative frequency that corresponded to the given mark (gaining partial credit if they did this correctly) but did not realise that they needed to subtract this from 100. A method mark was available here, and many candidates gained credit for showing their value subtracted from 100. However, a significant number of responses showed no working, so the method mark could not be awarded.

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CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/21
Paper 21 (Extended)

Key messages

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

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

Candidates should be encouraged to check their answers are sensible by using suitable methods such as substitution and reversing calculations.

Candidates must read questions carefully, focussing on key words and instructions.

General comments

Candidates scored across the full mark range on this exam.

The best-answered questions were **Questions 3**, **4**, **10** and **11**.

Numerical slips sometimes meant that full credit could not be awarded. This was noticeable in **Question 12**.

Candidates should show clear working to enable them to access method marks in multi-step problems. This was especially the case in **Questions 13** and **14** where there were many method marks available.

Candidates should be able to give answers in their simplest form.

Comments on specific questions

Question 1

Candidates found this first question challenging, with many giving an incorrect answer of 0.001. Some candidates approached this question by converting to fractions and then multiplying $\frac{1}{100} \times \frac{1}{100}$ before converting to the correct decimal answer of 0.0001.

Question 2

(a) Most candidates demonstrated some ability to cancel fractions but did not always give the fraction in its lowest term. The most common incorrect answer was $\frac{6}{15}$. Candidates should be encouraged to find the HCF of 24 and 60 and simplify the fraction in one step.

(b) This straightforward subtraction of fractions question was very well answered. Almost all candidates used a common denominator of 14. Those who used a denominator of 98 rarely simplified their final answer. It is best practice to give fractions in their lowest terms, although this was not required for full credit as the question did not demand it.

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Question 3

(a) The vast majority of candidates realised the data was not in order and attempted to subtract the smallest value from the highest. However, some candidates just wrote the subtraction sum, without evaluation.

(b) Candidates needed to put the data in order before finding the average of the middle pair of numbers. The most common error was using 22 and 14, leading to an answer of 18. Some candidates found the mean rather than the median.

Question 4

This question was very well answered, with almost all candidates expanding the bracket correctly.

Question 5

This question was quite challenging, and it was rare to see full marks awarded. Candidates recognised that they had to square root the expression but often made an error in either the numerical or algebraic part. Common incorrect answers were $3x^3y^2$ or $4.5x^{4.5}y^2$ or $9x^{4.5}y^2$.

Question 6

This question was most easily approached by dividing 360° by 12. Some candidates approached the question by considering the sum of the interior angles, but this regularly led to numerical slips.

Question 7

Most candidates showed a clear method in tackling this question. However, a significant number of candidates did not read the information carefully when setting up their original equation. Many missed the 'square of', instead using 'square root of', or used an inversely proportional relationship. Nearly all candidates who started with the correct initial equation gained full credit.

Question 8

(a) The majority of students reordered the expression in an attempt to take out a common factor from pairs of terms. The most common error was a sign error when trying to take out a factor of $–8b$. Candidates would have realised this error if they had checked their answer by expanding their brackets.

(b) Candidates struggled to factorise this quadratic where the coefficient of x^2 was not 1. There was evidence in working that some candidates knew they needed to find a pair if numbers with a product of –30 (from $5 \times –6$) and a sum of –7. A number of candidates tried to work backwards by solving the equation using the quadratic formula. This was not a successful method since the solutions were not both integers.

Question 9

(a) Candidates attempted to write the number in the correct form but many rounded 7.609 to 7.6, resulting in an incorrect answer and no credit being awarded. The main conceptual error was to multiply by 10^2, from counting zeros, or by $10^{–5}$.

(b) Some candidates made a similar mistake as in **part (a)** by rounding 8.007. The other common error was to write the power of 10 as 2 rather than –2.

Question 10

(a) The majority of candidates spotted a cyclic quadrilateral and subtracted 124 from 180 to find the correct angle. The most common error was to divide 124 by 2.

(b) Candidates needed to use the fact that the angle at the centre is double the angle at the circumference. Some candidates did not take note of the question requiring an obtuse angle, and gave an answer that was not obtuse.

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(c) Candidates needed to use their answer from the previous part, recognise that this was an angle in an isosceles triangle, subtract it from 180 then divide by 2. Follow through marks enabled candidates to gain credit even if they had made a previous error.

Question 11

(a) The majority of candidates gained partial credit for some correct manipulation, but multiplying surds was not executed well. A number of candidates left their answer as $5\sqrt{16} - 14$.

(b) Nearly all candidates started the question correctly by multiplying both the numerator and denominator by $3 + \sqrt{2}$, but very few reached a correct simplified answer.

Question 12

(a) This was a straightforward probability question, but a significant number of candidates did not realise that the total score could not be more than 12.

(b) Two successful approaches were drawing a two-way table or recording all 36 possibilities. Candidates who attempted to multiply $\frac{1}{6} \times \frac{1}{6} \times 2$ often made numerical slips.

Question 13

This multi-step question required candidates to show all of their steps clearly.

Communication is essential when finding the original gradient, then finding the negative reciprocal, and substituting both the correct gradient and mid-point into $y = mx + c$ to find the final equation.

Many errors were seen when candidates were dealing with negatives in the gradient calculations. Another common error was to use (4, –1) or (8, –3) rather than the mid-point.

Question 14

If candidates recognised the need to use a common denominator of $(4x – 1)(2x + 1)$, they usually made good progress on this question. Errors were commonly seen when expanding and simplifying the expression $8(2x + 1) – 3(4x – 1)$ in the numerator, showing a weakness multiplying negative terms.

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Paper 0607/22
Paper 22 (Extended)

Key messages

Candidates need to show all working clearly, as 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 using suitable methods such as substitution or reversing calculations.

Candidates must read the questions carefully and focus on key words and instructions.

General comments

Many very good scripts, demonstrating strong syllabus knowledge, were seen.

Numerical slips sometimes meant that full credit could not be awarded.

Candidates should be able to give answers in their simplest form.

Comments on specific questions

Question 1

This question was very well answered, with almost all candidates giving the correct common factor, sometimes from listing or from writing each number as the product of prime factors.

Question 2

Many candidates gave a correct answer. However, some candidates made slips or used inefficient methods. A variety of approaches were seen. Some candidates converted to fractions and then attempted to find $2 \div \frac{4}{100}$. This led to the correct answer if evaluated correctly, though not all candidates who chose this approach were able to do so. Other candidates wrote the division as the fraction $\frac{2}{0.04}$ and multiplied numerator and denominator by 100 to get $\frac{200}{4}$, leading to the correct answer of 50.

Question 3

This question was very well answered, with almost all candidates expanding the bracket correctly and no commonly seen errors.

Question 4

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Nearly all candidates worked out the correct simple interest of $16. The common error was to then add it onto the $200 and give a final answer of $216. Candidates must read questions carefully to avoid making this type of error.

Question 5

This question was very well answered, with almost all candidates giving the correct answer, and no commonly seen errors.

Question 6

(a) The vast majority of candidates gave the correct answer of 30 minutes.

(b) Many candidates used the speed, distance, time formula correctly and wrote $\frac{12}{1.5}$. However, as in **Question 2**, some candidates had difficulty dividing by a decimal to evaluate the calculation.

1 hour 30 minutes written incorrectly as a decimal value of 1.3 was rarely seen.

Question 7

(a) This question was very well answered, with almost all candidates giving the correct answer of 15.

(b) Almost all candidates were able to find the lower quartile correctly.

(c) This question was well answered, with the vast majority of candidates finding the correct value of 88 and then subtracting it from 100 to get the correct answer for the number of candidates taking **more than** 20 minutes.

Question 8

There were many excellent solutions. The majority of candidates multiplied $\frac{3}{11}$ by the reciprocal of $\frac{1}{2}$ but some used common denominators and calculated $\frac{6}{22} \div \frac{11}{22}$ to find the correct answer.

Question 9

This question was very well answered, with many correct answers being seen. However, candidates did not always select the most efficient method, and this sometimes resulted in errors being made in attempting to manipulate algebra. In this case, it was expected that candidates would divide 360 by the **exterior angle** of 20° to calculate the number of sides.

Some candidates instead approached this question using interior angles and, although many candidates were successful when using the formula $\frac{n-2}{n} \times 180 = 160$, some had difficulty rearranging the equation.

Question 10

This was answered very well, with many candidates showing their working clearly, starting with $\frac{3 + 5 + 10 + 11 + x}{5} = 7$. Some arithmetic slips were seen and these could have been eliminated by candidates checking their answer.

Question 11

The majority of candidates reached the correct answer and gained full credit. Candidates generally recognised the need to cube root first and then square their answer. The errors seen were mostly with the algebraic term.

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Question 12

(a) Almost all candidates correctly worked out the centre angle of 100°, but some did not then use the correct circle theorem to find the required angle.

(b) Candidates found this question more challenging than **part (a)**. However, a follow through approach was used in marking, allowing candidates to gain credit by using a correct method here, even if their answer to **part (a)** was incorrect.

Question 13

This question was very well answered, with the vast majority of candidates being able to convert each surd to a multiple of $\sqrt{5}$ and then add like surds.

Question 14

The majority of candidates recognised the need to use the area scale factor of $\left(\frac{1}{2}\right)^2$. The common error was to use $\frac{1}{2}$.

Question 15

There were many excellent solutions. Confident attempts were seen using both methods, but candidates who spotted immediately that *p* must be 9, from halving the *x* term, had less work to do to find the value of *t.*

Question 16

This question was very well answered, with almost all candidates finding the correct value of *y*. They were able to set up the equation correctly for inverse proportionality of a root, substitute in correct values and evaluate *k* as 16.

Question 17

Almost all candidates found one correct solution, but fewer found both solutions to gain full credit.

Question 18

This question was very well executed, with competent use of laws of logs seen.

The most common error was candidates not being able to write 2 as log 100. Some candidates gave an answer of ± 5, so did not gain full credit.

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Paper 0607/23
Paper 23 (Extended)

Key messages

Candidates need to show all working clearly, as 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 using suitable methods such as substitution or reversing calculations

Candidates must read the questions carefully and focus on key words and instructions.

General comments

Many very good scripts, demonstrating strong syllabus knowledge, were seen.

Numerical slips sometimes meant that full credit could not be awarded.

Candidates should show all working clearly to enable them to access method marks in multi-step problems. This was especially the case in **Questions 10** and **15**.

Candidates should be able to give answers in their simplest form.

Comments on specific questions

Question 1

(a) This question was well answered, with the vast majority of candidates drawing the correct diagonal line.

(b) Candidates found this part challenging as many struggled with the idea of rotational symmetry.

Question 2

Nearly all candidates gained at least partial credit. However, there was little evidence of candidates converting all numbers into the same form, either decimals or percentages, and this made it more difficult for candidates to ensure all values were in the correct position.

Question 3

Many candidates did not follow the instruction to write each number correct to one significant figure and tried to calculate the accurate answer. Some candidates gave a final answer of 42/21, which gained partial credit.

Question 4

This question proved to be challenging. Many candidates did not seem familiar with the modulus function and used square root, leading to the incorrect answers of +3 and –3.

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Question 5

Candidates need to recognise that standard form requires a number between 1 and 10 multiplied by a power of 10.

(a) There were two common errors: truncating the number and giving 6.7×10^7 or writing 6.72×10^5 by simply counting the zeros.

(b) Candidates were more successful in this part, although some wrote $3 \times 100 \times 10^4 \times 100$.

Question 6

(a) This part was well answered, with the vast majority of candidates stating 'octagon'.

(b) Many candidates used the longer, inefficient method to calculate an interior angle and then subtract their answer from 180°.

Candidates are encouraged to use the easier method to find an exterior angle using 360 ÷ 8 to obtain the correct answer of 45°.

Question 7

This question proved very challenging, with many candidates being unable to make a valid start.

Candidates were expected to recognise that if the solutions are –2 and 5 then the factors must be $(x - -2)$ and $(x - 5)$. Expanding these brackets would lead to the value of b as –3 and the value of c as –10.

Question 8

Nearly all candidates were able to write $\sqrt{18}$ as $\sqrt{9}\sqrt{2}$, leading to the correct answer of $3\sqrt{2}$.

Question 9

Although there were many correct solutions, some candidates found this question challenging.

Many candidates found angle $EAD = 50°$ but then struggled to complete the question.

A significant number of candidates assumed, incorrectly, that the angle between AO and OE was a right angle.

Question 10

Candidates needed to realise that, as d appeared on both sides of the equation, the first step was to isolate terms involving d. A significant number of candidates did not do this, and had d on both sides of their final answer.

Question 11

(a) This question was very well answered, with the vast majority of candidates giving the correct answer.

(b) The majority of candidates correctly used $\frac{1}{4} \times \frac{3}{4}$, but some candidates made arithmetic slips in calculating their final answer.

(c) Again, many candidates attempted to add the correct products but did not correctly evaluate their calculations to reach the correct final answer.

Question 12

(a) Many correct answers were seen. However, some candidates made errors dealing with the surd.

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(b) Most candidates gained at least partial credit by having two of the terms correct. However, fully correct solutions were rarer.

Question 13

This question was challenging and, although there were few fully correct factorisations, nearly all candidates were able to gain at least partial credit by finding a common factor.

Candidates who started by taking out a factor of 9 then usually missed the difference of two squares.

Candidates who initially spotted the difference of two squares often omitted to take out the common factor of 3 from each bracket.

Question 14

(a) This part proved to be demanding, with many candidates not appearing to know how to start the question.

(b) Candidates were able to demonstrate their ability to use the laws of logs, with the majority finding the correct answer of 24.

Question 15

This multi-step question required candidates to show all steps of the method clearly.

Candidates struggled to find a common denominator and clear the fractions successfully. Many candidates tried to 'fiddle' their answer and didn't appreciate the need to show steps clearly, line by line, in this 'show that' question,

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Paper 0607/31
Paper 31 (Core)

Key messages

Candidates should ensure that they know how to use their graphic display calculators to carry out all the functions listed in the syllabus.

Candidates should be encouraged to show all their working. Commonly, marks could not be awarded where working out was not written down and answers were given to only one or two significant figures.

Candidates should be familiar with command words.

Candidates should bring the correct mathematical instruments to the exam.

General comments

Candidates generally attempted all the questions, so it appeared there was sufficient time to complete the paper.

This session, most candidates appeared to have graphic calculators and knew how to use them to draw graphs and find the minimum, maximum and intersection points accurately. Not all candidates had mathematical instruments with them. A ruler is needed to draw straight lines.

Candidates should be careful when writing their answers. If the required accuracy of the answer is not specified in the question, then all answers should be given exactly or correct to 3 significant figures. Commonly, marks could not be awarded where working out was not written down and answers were given to only one or two significant figures. Giving answers to fewer significant figures will result in accuracy marks not being awarded and, if no working out is seen, then no marks will be awarded. When working out is shown and is correct, partial marks can be awarded even where the final answer is incorrect or is given to an incorrect degree of accuracy.

Candidates should be aware that if the question states 'Write down', they do not have to work anything out. Candidates should be familiar with correct mathematical terminology.

Comments on specific questions

Question 1

(a) Nearly all candidates wrote the three coordinates correctly. A few interchanged the x and y coordinates for point C.

(b) (i) Many candidates plotted point D correctly.

(ii) The coordinates of D were correctly written and those who plotted D incorrectly were awarded a follow through mark if their coordinates matched their plotted point.

(c) (i) Not all candidates knew that there were 2 lines of symmetry. The most common incorrect answer was 4.

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(ii) This question was omitted by a reasonable number of candidates. 4 was the most common incorrect answer.

(iii) Many candidates correctly wrote 'rhombus' or 'parallelogram'. A few candidates thought that the shape was a trapezium or a square.

Question 2

(a) The mean was found correctly by many candidates.

(b) Many correct stem-and-leaf diagrams with keys were seen. A few candidates missed a term, and others put the full numbers as the leaf instead of just the units.

(c) The median was also correct in many scripts. The most common incorrect answer was 54.

(d) Although many correct answers were seen, some candidates did not write the fraction in its simplest form. The most common incorrect answer was $\frac{3}{10}$.

(e) There were some correct answers here but not all candidates knew how to find the pie chart angle.

Question 3

(a) The table of values was very well answered, with many fully correct solutions seen.

(b) Many candidates found the correct ratios. The most common error was to divide 575 by 10, then by 8 and then by 7.

(c) Finding the speed proved challenging for some candidates. Some divided the distance by 6.45 or by 405. Not all answers were given to two significant figures.

Question 4

(a) (i) This question was very well answered, with the vast majority of solutions being correct. Very few incorrect terms were seen.

(ii) Most candidates wrote 'plus 4' or '+4' which is the rule for finding the next term. A few candidates gave the nth term, and others wrote 'n + 4', which was not accepted.

(b) This part was also very well answered, with nearly all scripts giving the missing two terms. Only a few gave the terms the wrong was around.

(c) This part proved more challenging, with some candidates multiplying by 2 before squaring, resulting in answers of 4, 16 and 36, which were not correct.

(d) Although many correct responses were seen, the most common incorrect answer was $n + 5$.

Question 5

(a) (i) This question was well answered, with the majority of responses correctly giving 'diameter' as the mathematical name for AB.

(ii) Fewer candidates were able to give the term 'chord' for PQ. Some candidates wrote the correct term with a spelling error. This was not penalised where intention was clear.

(iii) This question was well answered by those candidates who drew a line, with the vast majority drawing a correct tangent. However, a reasonable number of candidates omitted this part.

(b) This question was well answered. Most responses were awarded at least partial credit for finding one or more of the angles correctly, and many fully correct responses were seen.

(c) This part proved more challenging, and the most common incorrect answer was 40°.

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(d) This question proved to be one of the most challenging on the paper, with few correct responses seen. Many candidates thought that this shape also had 9 sides. Others discussed the triangle, rather than the angle at the centre of the polygon.

Question 6

(a) (i) This question was very well answered, with the vast majority of responses giving the correct cost of the printer in the sale.

(ii) Although fewer correct solutions were seen for this part, the majority of candidates found the percentage correctly.

(b) In this part it was important to write down all the working neatly. Candidates had to firstly find either 40% or 60% of \$930. Then they had to work out either $\frac{3}{8}$ or $\frac{5}{8}$ of 930. Finally, they had to compare their two answers to find out which was cheaper. Many candidates managed this well.

Question 7

(a) This question was very well answered, with most candidates correctly selecting the '<' sign. A few put '>'.

(b) This question was well answered, with the majority of candidates collecting the terms correctly.

(c) Here too, many correct solutions were seen, although some candidates omitted this part.

(d) (i) Although many correct answers were seen, the most common incorrect answer was 2.

(ii) Many candidates found the correct value for x in the equation. A few candidates multiplied out the brackets incorrectly.

(e) This proved to be the most challenging part of the question. Although a reasonable number of correct rearrangements were seen, some responses made errors with signs. The most common incorrect answer was $\frac{20-v}{2}$.

Question 8

(a) (i) This part of the question produced the most correct solutions. However, some candidates did not divide by 2 when finding the area of the triangle. Others made mistakes with the lengths and thought they were 4 and 3, making 6 the most common incorrect answer.

(ii) Not all candidates used Pythagoras' theorem here to find the hypotenuse. Many of those who did find the hypotenuse did not then add 2 and 3 to find the perimeter of the triangle.

(b) This question proved challenging and, although many candidates gained partial credit, few fully correct descriptions of the transformation were seen. Some candidates identified that the transformation was a translation, but did not write the vector correctly.

(c) Many responses gained partial credit for rotating the shape but putting it in the wrong position.

(d) Many responses gained partial credit for enlarging the shape by the correct scale factor but putting it in the wrong position.

Question 9

(a) There were many correct answers seen for the pay increase. Some candidates made the mistake of multiplying by 0.7 rather than 0.07.

(b) The most common error here was to forget to add on the 2500 to the 300 found. Only a few candidates tried to use the compound interest formula.

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Question 10

(a) There were many correct answers seen for the number of printers that broke down. However, some candidates worked out the number of computers that broke down instead of the number of printers.

(b) This question was well answered, with many responses gaining at least partial credit for placing 0.1 and 0.9 or 0.1 and 0.15 correctly, and fully correct solutions also seen.

(c) This question proved to be one of the most challenging on the question paper. The most common error was to add the 2 decimals rather than multiplying them.

Question 11

(a) Many candidates drew the hyperbola reasonably well. However, some candidates appeared not to have a graphic calculator and omitted this question.

(b) This question proved to be the most challenging on the question paper, with very few responses giving the equations of the asymptotes.

(c) This question was well answered, with many candidates drawing the straight line.

(d) Fully correct responses to this question were seen and many responses gained partial credit for using their calculators to find (–1, –5) correctly. However, the other point (1.67, 3) was not always written accurately, so full credit could not be awarded in these cases.

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Paper 0607/32
Paper 32 (Core)

Key messages

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

General comments

Candidates continue to perform quite well on this paper. They were well prepared and, in general, showed a sound understanding of the syllabus content. Presentation of work continues to improve, though some candidates wrote answers down without showing working. Calculators were used with confidence, though it appeared that some candidates did not have a graphic display calculator as the syllabus requires. Candidates had sufficient time to complete the paper. Some candidates did not attempt every question.

Diagrams were drawn carefully, though some graphs were sketched using pen, which should be avoided. Calculators were use efficiently and accurately, though there were instances where candidates used 'pencil and paper' methods (not always accurately) when a calculator method was more appropriate. In longer questions, some candidates rounded intermediate values and consequently arrived at an inaccurate final answer.

Comments on specific questions

Question 1

(a) The vast majority of candidates wrote down the coordinates correctly. Very few reversed the x and y values.

(b) The vast majority of candidates plotted point D correctly.

(c) Many candidates knew the correct mathematical name for the quadrilateral. Rhombus and parallelogram were common incorrect answers.

(d) This question was well done by those candidates who answered it, with almost all responses showing the correct line of symmetry. However, a reasonable number of candidates omitted the question.

(e) Finding the coordinates of the mid-point was well done by most candidates. Errors tended to emerge from candidates who used the formula involving the end points of the line evaluating it incorrectly.

(f) Most candidates used the formula involving the end points of the line. This was sometimes quoted incorrectly. Even when correct, the coordinates were often substituted incorrectly or the expression evaluated incorrectly.

Question 2

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Parts (a), (b) (c) and **(e)** were, in general, answered correctly with few errors. **Part (d)**, finding the median, proved more challenging. Some candidates did not arrange the values in order and others found the mean.

Question 3

(a) This question was well answered, with many fully correct answers seen. However, 8.23 (not rounded correctly) and 8.2 (two significant figures rather than two decimal places) were the most common incorrect answers.

(b) This question was very well answered, with the vast majority of responses giving the correct answer.

(c) Many correct answers were seen. The most common errors involved misinterpreting the cube root sign and finding $\sqrt{64}$ or $3 \times \sqrt{64}$.

(d) Though most candidates found 1 450 000 from the multiplication, some did not correctly convert this into standard form. Answers like 14.5×10^4 showed some understanding but were incorrect.

Question 4

(a) This part was very well answered, with the vast majority of answers being fully correct. However, occasional errors were seen in calculating the amount of change.

(b) This part was very well answered, with many correct responses seen.

(c) This part proved very challenging, and few correct solutions were seen. Candidates needed to find the distances for the two parts of the journey and use the total of these and the total of the times to find the average speed for the whole journey. However, it was common to see the total of the speeds divided by the total of the times, giving an incorrect answer. For the total of the times, many candidates used 2.30 or 150 instead of 2.5.

Question 5

(a) Though many candidates found the size of the angles correctly, most had problems with giving a correct 'geometrical reason'. For example, a numerical reason for x like '180 – 70 = 110' and an imprecise reason for z like 'parallel lines' or 'Z angles' were insufficient.

(b) Many candidates recognised BCD as an isosceles triangle and could correctly use its properties to find the value of p.

Question 6

(a) and (b) The standard of algebra continues to improve and the answers to these two parts were often correct. Some candidates, after writing a correct expression, spoiled their answer through further incorrect 'simplification'.

(c) In **part (i)**, a number of answers were not given in their simplest form. Some candidates misunderstood what 'perimeter' was and multiplied two or more of the sides to get their answer. Candidates with a correct expression in **part (i)** often went on to answer **part (ii)** correctly. A few, however, found the value of x but did not add 3 to find the length of the longest side. Some candidates found an incorrect expression in **part (i)** which resulted in them attempting to answer a complicated equation in **part (ii)**. This was often unsuccessful.

Question 7

(a) and (b) The formula was often used correctly in these parts. However, some candidates did not use the 1.8 in the formula and gave answers of 47 and 54.

(c) Though a good number of responses were seen with the formula rearranged correctly, a common incorrect first step was to write $1.8C = 32 - F$.

Question 8

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(a) There were many correct answers here. 0.11 was sometimes given as an answer by candidates thinking there should be some symmetry of the probabilities in the table. Others thought it should be 0.16 or $\frac{1}{6}$, this being the probability for a fair die. A few candidates tried to add the values in the table in their heads and came up with an incorrect answer.

(b) Many candidates correctly added the appropriate two decimals. Some did not use the information given in the table and gave $\frac{2}{6}$ as their answer.

(c) A good number of correct answers were seen, although some candidates incorrectly wrote their answer as $\frac{8}{50}$.

(d) **Part (i)** was reasonably well answered, with many responses containing the correct probabilities on the tree diagram. However, incorrect answers were given by candidates who thought that the probabilities on the second throw would change. **Part (ii)** proved very challenging for candidates, with few fully correct responses seen. It was common to see probabilities being added rather than multiplied.

Question 9

(a) This question was generally well answered, with candidates working out the two areas and subtracting the area of the circle from that of the rectangle. There was sometimes a loss of accuracy in the final answer as candidates rounded their area of the circle before subtracting. Some did not use the calculator value for pi, using 3.14 instead.

(b) (i) This was often answered correctly. However, after the reduction of \$75 was found, some candidates did not know how to progress. A few divided the 75 by 1175 on the way to their answer and others thought that 75% was the answer.

(ii) Many fully correct, well explained answers were seen. Some candidates correctly used the simple interest formula but forgot to add on the original \$1000 to find the total of the money available.

Question 10

(a) Candidates found this part challenging. Though a good number got to the correct answer, some just gave \$350, forgetting to add this to the \$250 to find the total. Others made an incorrect step and did not divide the 250 by 10.

(b) There was much more success with **part (b)**, with many correct answers seen. However, it was clear that some candidates did not check that their two answers totalled 180, which would have given an indication of whether their answers were correct.

(c) This question was well answered in the main. However some candidates did not cancel their ratio to its simplest form, as required.

Question 11

(a) Successful candidates found the area of the rectangle and the area of the triangle, added them and then multiplied by the length. Though the area of the rectangle was readily found, finding the area of the triangle proved more challenging. Many candidates could not work out the units for the volume of the shed.

(b) The instruction in the question to use Pythagoras' Theorem helped many candidates to make a relevant start to a solution. However, some did not correctly identify the 1.1 m, 0.8 m and x m triangle that needed to be used.

Question 12

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(a) Candidates with a graphic display calculator often produced good sketches of the cubic graph. Some candidates used the wrong window for the lengths of the axes and only drew a section of the required graph. Some candidates drew their graph in pen. This should be avoided as any mistake is difficult to alter. The coordinates of the local minimum and the local maximum were regularly found correctly.

(b) The sketch of the straight line was often drawn accurately. However, some drew this freehand when a ruler should have been used.

(c) Many candidates found the x-coordinate of all three points of intersection. A few just found one or two of these values.

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Paper 0607/33
Paper 33 (Core)

Key messages

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

General comments

Candidates continue to perform quite well on this paper. They were well prepared and, in general, showed a sound understanding of the syllabus content. Presentation of work continues to improve, though some candidates wrote answers down without showing working. Calculators were used with confidence, though it appeared that some candidates did not have a graphic display calculator as the syllabus requires. Candidates had sufficient time to complete the paper. Some candidates did not attempt every question.

Diagrams were drawn carefully, though some graphs were sketched using pen, which should be avoided. Calculators were use efficiently and accurately, though there were instances where candidates used 'pencil and paper' methods (not always accurately) when a calculator method was more appropriate. In longer questions, some candidates rounded intermediate values and consequently arrived at an inaccurate final answer.

Comments on specific questions

Question 1

(a) The vast majority of candidates wrote down the coordinates correctly. Very few reversed the x and y values.

(b) The vast majority of candidates plotted point D correctly.

(c) Many candidates knew the correct mathematical name for the quadrilateral. Rhombus and parallelogram were common incorrect answers.

(d) This question was well done by those candidates who answered it, with almost all responses showing the correct line of symmetry. However, a reasonable number of candidates omitted the question.

(e) Finding the coordinates of the mid-point was well done by most candidates. Errors tended to emerge from candidates who used the formula involving the end points of the line evaluating it incorrectly.

(f) Most candidates used the formula involving the end points of the line. This was sometimes quoted incorrectly. Even when correct, the coordinates were often substituted incorrectly or the expression evaluated incorrectly.

Question 2

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Parts (a), (b) (c) and **(e)** were, in general, answered correctly with few errors. **Part (d)**, finding the median, proved more challenging. Some candidates did not arrange the values in order and others found the mean.

Question 3

(a) This question was well answered, with many fully correct answers seen. However, 8.23 (not rounded correctly) and 8.2 (two significant figures rather than two decimal places) were the most common incorrect answers.

(b) This question was very well answered, with the vast majority of responses giving the correct answer.

(c) Many correct answers were seen. The most common errors involved misinterpreting the cube root sign and finding $\sqrt{64}$ or $3 \times \sqrt{64}$.

(d) Though most candidates found 1 450 000 from the multiplication, some did not correctly convert this into standard form. Answers like 14.5×10^4 showed some understanding but were incorrect.

Question 4

(a) This part was very well answered, with the vast majority of answers being fully correct. However, occasional errors were seen in calculating the amount of change.

(b) This part was very well answered, with many correct responses seen.

(c) This part proved very challenging, and few correct solutions were seen. Candidates needed to find the distances for the two parts of the journey and use the total of these and the total of the times to find the average speed for the whole journey. However, it was common to see the total of the speeds divided by the total of the times, giving an incorrect answer. For the total of the times, many candidates used 2.30 or 150 instead of 2.5.

Question 5

(a) Though many candidates found the size of the angles correctly, most had problems with giving a correct 'geometrical reason'. For example, a numerical reason for x like '180 – 70 = 110' and an imprecise reason for z like 'parallel lines' or 'Z angles' were insufficient.

(b) Many candidates recognised BCD as an isosceles triangle and could correctly use its properties to find the value of p.

Question 6

(a) and (b) The standard of algebra continues to improve and the answers to these two parts were often correct. Some candidates, after writing a correct expression, spoiled their answer through further incorrect 'simplification'.

(c) In **part (i)**, a number of answers were not given in their simplest form. Some candidates misunderstood what 'perimeter' was and multiplied two or more of the sides to get their answer. Candidates with a correct expression in **part (i)** often went on to answer **part (ii)** correctly. A few, however, found the value of x but did not add 3 to find the length of the longest side. Some candidates found an incorrect expression in **part (i)** which resulted in them attempting to answer a complicated equation in **part (ii)**. This was often unsuccessful.

Question 7

(a) and (b) The formula was often used correctly in these parts. However, some candidates did not use the 1.8 in the formula and gave answers of 47 and 54.

(c) Though a good number of responses were seen with the formula rearranged correctly, a common incorrect first step was to write $1.8C = 32 - F$.

Question 8

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(a) There were many correct answers here. 0.11 was sometimes given as an answer by candidates thinking there should be some symmetry of the probabilities in the table. Others thought it should be 0.16 or $\frac{1}{6}$, this being the probability for a fair die. A few candidates tried to add the values in the table in their heads and came up with an incorrect answer.

(b) Many candidates correctly added the appropriate two decimals. Some did not use the information given in the table and gave $\frac{2}{6}$ as their answer.

(c) A good number of correct answers were seen, although some candidates incorrectly wrote their answer as $\frac{8}{50}$.

(d) **Part (i)** was reasonably well answered, with many responses containing the correct probabilities on the tree diagram. However, incorrect answers were given by candidates who thought that the probabilities on the second throw would change. **Part (ii)** proved very challenging for candidates, with few fully correct responses seen. It was common to see probabilities being added rather than multiplied.

Question 9

(a) This question was generally well answered, with candidates working out the two areas and subtracting the area of the circle from that of the rectangle. There was sometimes a loss of accuracy in the final answer as candidates rounded their area of the circle before subtracting. Some did not use the calculator value for pi, using 3.14 instead.

(b) (i) This was often answered correctly. However, after the reduction of \$75 was found, some candidates did not know how to progress. A few divided the 75 by 1175 on the way to their answer and others thought that 75% was the answer.

(ii) Many fully correct, well explained answers were seen. Some candidates correctly used the simple interest formula but forgot to add on the original \$1000 to find the total of the money available.

Question 10

(a) Candidates found this part challenging. Though a good number got to the correct answer, some just gave \$350, forgetting to add this to the \$250 to find the total. Others made an incorrect step and did not divide the 250 by 10.

(b) There was much more success with **part (b)**, with many correct answers seen. However, it was clear that some candidates did not check that their two answers totalled 180, which would have given an indication of whether their answers were correct.

(c) This question was well answered in the main. However some candidates did not cancel their ratio to its simplest form, as required.

Question 11

(a) Successful candidates found the area of the rectangle and the area of the triangle, added them and then multiplied by the length. Though the area of the rectangle was readily found, finding the area of the triangle proved more challenging. Many candidates could not work out the units for the volume of the shed.

(b) The instruction in the question to use Pythagoras' Theorem helped many candidates to make a relevant start to a solution. However, some did not correctly identify the 1.1 m, 0.8 m and x m triangle that needed to be used.

Question 12

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(a) Candidates with a graphic display calculator often produced good sketches of the cubic graph. Some candidates used the wrong window for the lengths of the axes and only drew a section of the required graph. Some candidates drew their graph in pen. This should be avoided as any mistake is difficult to alter. The coordinates of the local minimum and the local maximum were regularly found correctly.

(b) The sketch of the straight line was often drawn accurately. However, some drew this freehand when a ruler should have been used.

(c) Many candidates found the x-coordinate of all three points of intersection. A few just found one or two of these values.

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CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/41
Paper 41 (Extended)

Key message

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

Communication and suitable accuracy are also important aspects of this examination and candidates should be encouraged to show clear methods, full working and to give answers to 3 significant figures or to the degree of accuracy specified in the question. Candidates are strongly advised not to round intermediate values during their working but to work at a minimum of 4 significant figures to retain accuracy in their final answers. Candidates should be aware that an answer should not be given as a multiple of π or as a surd in a practical context unless requested.

The graphic display calculator is an important aid and candidates are expected to be fully experienced in the appropriate use of one. 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

There was sufficient time for candidates to attempt all questions. The overall standard of work was good, and most candidates showed clear working together with appropriate rounding.

A few candidates needed to show more working, either when answers alone did not earn full marks or when a small error could prevent marks being awarded in the absence of any method seen. This is particularly noticeable in 'show that' style questions, when working to a given accuracy. There could be some improvements in the following areas:

- Handwriting, particularly with numbers.
- Not overwriting answers. They do not scan well and make it difficult for examiners to read a candidates' intended responses.
- Taking care in copying values from one line to the next.
- Taking care in reading the question, particularly in transformation questions where usually a single transformation answer is required.
- Taking care when reading scales on graphs.

The sketching of graphs continues to improve and there was more evidence of the use of a graphic display calculator, supported by working. This is in the spirit of the syllabus. When drawing graphs, points should be plotted within 1 mm of the correct position. There was, however, evidence of use of facilities in the calculator that are not listed in the syllabus. These facilities often lead to candidates giving answers unsupported by any working and this is a high-risk strategy. Candidates must take care to ensure that their calculator is in the correct mode when calculating angles i.e. degrees not radians.

The most accessible questions were those on transformations, solving linear equations, scatter diagrams, curve sketching, ratio, percentages, linear sequences and compound interest.

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The most challenging questions were those on inequalities within graphs, reverse percentages, simple interest, surface area and volume of solids, combined speed/distance/time problems, Venn diagrams and rearrangement of formulas.

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

Comments on specific questions

Question 1

(a) (i) This question was very well answered, with the vast majority of responses gaining full credit. A small number of candidates misread – 19 as 19 and were able to gain partial credit for correct working shown. Some candidates made the correct first step but often $6x = -19 - 5$ became e.g. $6x = -14$, or $6x = -24$ led to a final answer of 4.

(ii) This was another well answered part with many scripts being awarded full credit. However, $8x - 4x = 24$ and $8x + 4x = 11 - 13$ were seen on several occasions.

(iii) This question presented an equation that was more difficult to solve due to the linear factor in the denominator. Two independent method marks were available for either eliminating the fraction correctly or for rearrangement into the correct form. Several candidates misread – 5 as 5 and this made the problem easier so was not treated as a misread. A reasonably common incorrect approach seen was $8(2x - 3) = -5$. Partial credit was awarded for obtaining $-10x = -7$ but then giving a final answer of –0.7.

(b) This question proved challenging, partly because many candidates did not follow the instructions to show all working and to give the answers correct to 2 decimal places. Some candidates made the 'b' coefficient negative, leading to -2 and -2^2 being seen in the numerator. Often this was not recovered sufficiently to receive credit. Candidates who completed all working on their calculators without showing any working were only able to gain special case credit if both answers were correct to the required degree of accuracy.

Question 2

(a) (i) A wide range of responses were seen in this part. Many candidates gained partial credit for having only one rounding error; this was generally for 150 in the numerator or 6 or $\sqrt{10}$ in the denominators. A common misconception was to perform the operations first and then round to 1 significant figure, for example 2.46^2 is 6.0516, which became 6 when rounded.

(ii) This proved to be the most challenging question on the question paper, with only the strongest candidates gaining credit. A clear explanation using correct mathematical language (numerator and denominator) was required.

(iii) This was a well-answered question, with the accepted responses of 94.(0) or 94.01… seen on many scripts. Some unusual incorrect answers were seen, presumably from incorrect keying operations.

(b) This question was also well answered, with most scripts showing the correct answer of $\frac{2}{3}$. The equivalent fractions $\frac{26}{39}$ and $\frac{104}{156}$ were also given as final answers on many responses. Some candidates gave the decimal equivalent as a final answer, and did not gain full credit if the answer was not sufficiently accurate e.g. 0.666 is not accurate to 3 significant figures. A common incorrect answer of $\frac{2}{13}$ was also seen. Incorrect cancellations following correct answers seen were ignored.

(c) (i) This question was very well answered, with most scripts demonstrating knowledge that there are 1000 grams in a kilogram and giving the decimal answer of 0.506. No correct equivalent answers were seen.

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(ii) This question part was more challenging due to requiring conversion of an area. Many candidates divided 2000 by 1000 to leave the common incorrect answer of 2. The equivalent correct answers of $\frac{1}{500}$ and 2×10^{-3} were seen on a small number of responses.

(d) This question required a carefully thought-out approach to gain full credit. Although fully correct answers were seen, the question proved challenging for many candidates. Many responses took an incorrect approach of calculating the speeds for running and walking individually and then calculating the average of these, instead of dividing the total distance by the total time. Some candidates used a correct full method, but gave an answer that was out of range due to premature rounding earlier in their working. These candidates were awarded partial credit.

Question 3

(a) (i) This question was well answered, with most candidates gaining at least partial credit for plotting 3 or 4 points correctly despite the scales on each of the axes being difficult to interpret.

(ii) This question was very well answered, with nearly all responses recognising negative correlation correctly.

(b) Many correct responses were seen. However, several candidates calculated the mean average speed, with a final answer of 91.2 frequently seen.

(c) (i) Many fully correct responses were seen, although some candidates prematurely rounded values, resulting in an inaccurate final answer. Marks were awarded at the most accurate point, provided the equation was complete and in the correct form.

(ii) Credit was gained by most candidates for an answer in range or for following through their answer to **part (c)(i)**, provided their equation was of the correct form. Some candidates incorrectly tried to read off the scatter diagram to find an answer.

(iii) Many candidates gained credit for giving a correct reason. This needed to identify that the value was outside the range of the data.

Question 4

(a) (i) This question was well answered, with many responses gaining full credit. Othe responses were awarded partial credit for identifying 12 : 8 : 5, which usually led to 25. However, a few candidates summed the three values to 23 or 24.

(ii) Whilst many candidates recognised that the answer was found by simply multiplying \$66 by 1.5, some followed a much more complicated route, usually leading to an incorrect value. Consequently, this part was not answered as well as the previous one.

(iii) This question proved challenging, with many candidates unable to form the correct equation to solve. Some who did form the correct equation then expanded the brackets incorrectly to reach $3x = 2.5x + 1$ and an answer of 2. A few candidates managed to get as far as $0.5x = 2.5$ but then gave a final answer of 1.25.

(b) (i) This question was one of the best answered on the paper, with the majority of candidates successfully obtaining \$79.20. Some candidates only found the discount amount of \$10.80, which gained partial credit. Common incorrect answers were \$102.28, \$100.80 and \$80.38.

(ii) This part was more challenging and fewer fully correct responses were seen. 88 per cent of $x = 440$ did not gain credit. The minimum requirement was $0.88x = 440$. Common incorrect answers seen were \$492.80, \$392.86 and \$387.20.

(c) In this question, many candidates did not set up the initial equation correctly, which was required to gain credit in this 'show that' part. Many candidates placed brackets in the wrong position e.g. $(X + 0.04) \times 6$ often leading to $6.24X = 930$. It was necessary to see 930 divided by 1.24 to award full credit. Any responses that initially used 750 in their answer (i.e. that worked from 750) did not gain credit.

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(d) Many candidates were able to deal with this compound interest question more successfully than simple interest, and many correct solutions leading to the final answer of 3.5 per cent were seen. The vast majority of responses gained at least partial credit for setting up the initial equation correctly, often also getting as far as $\frac{\sqrt[6]{921.24}}{750}$. However, some others were unable to deal with $750\left(\frac{1+y}{100}\right)^6$. A few candidates tried to use logarithms to solve the problem but were unsuccessful, whilst the more direct method of trial and improvement usually met with some success.

Question 5

(a) Most candidates gained at least partial credit for setting up their equation correctly but then found the value of AC to be the given value of 22.0, rather than working to a greater degree of accuracy to establish 21.98…. As this was another 'show that' part, candidates were not permitted to include 22 in their initial equation for the area of a triangle.

(b) The use of the cosine rule was demonstrated well, with many candidates gaining full credit. A common error seen was the omission of a negative sign for the value of cos(115), leading to the square root of e.g. 686.64 instead of the correct 1664.7. Some candidates incorrectly applied Pythagoras' Theorem to this obtuse scalene triangle, with a final answer of 34.3 seen on several responses.

(c) A good use of the sine rule was seen on most scripts, with many fully correct solutions presented. Other candidates gained partial credit for an explicit equation on following through their answer to **part (b)**. A few candidates missed the instruction to 'use the sine rule' and were awarded partial credit only for a correct calculator-found answer without demonstration of the sine rule.

(d) This question proved very challenging, with few fully correct solutions seen. Many candidates struggled to understand what was required, and often tan (29.3) or tan (35.7) were used in their trigonometry. The alternative method of using the area of the triangle and their answer to **part (b)** was rarely seen.

Question 6

In this question, vectors were allowed to be expressed in words but not in coordinate form. Candidates did not gain credit where more than one transformation was given, but extra properties were treated as choice.

(a) (i) This reflection question was made more challenging by the reflection being in the line $y = -x$. Many candidates interpreted this as $y = x$, while some others reflected the image in either the x or y axis, which did not gain credit. It was common for candidates to gain partial credit for a correctly orientated image in the wrong position.

(ii) Credit was usually gained here for either the image in the correct position or for their answer to **part (a)(i)** correctly reflected in the y-axis.

(iii) Rotation was seen on most responses. However, often the direction of rotation was given incorrectly as clockwise. Various correct versions of the origin were also seen. Only a few gave the answers of 270^o clockwise or simply 90^o as correct alternatives.

(b) (i) This question was well answered, with most responses gaining at least partial credit for 'translation', and many fully correct answers seen.

(ii) This question was more challenging, with three pieces of information required to gain full credit. Stretch was often given as 'reduction' or 'enlargement'. The scale factor was sometimes seen as -3 or $-\frac{1}{3}$ and the invariant line as $y = -2$ or $x = 2$.

Question 7

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(a) (i) Many candidates were unable to identify the upper region as $13 - y$ or $25 - 12 - y$. Some candidates replaced their original answers with values found later in **parts (iii)(a)** and **(iii)(b)**. However, many responses gained partial credit for the four values 6, 11, 2 and 12 in the correct regions.

(ii) The correct answer of 5 was seen frequently, although some candidates were unable to make progress to gain any credit.

(iii)(a) This question proved very challenging for candidates, with only the strongest candidates setting up and solving the required equation correctly. Only a few instances of either $30 + x - y$ or $2(8 + x + y)$ were seen for partial credit.

(b) Most marks were given here for candidates recognising the link between this answer and the previous i.e. 13 – their **(a)(iii)(a)** on follow through as opposed to the actual answer of 10. Some responses had non-integer answers in **part (a)(iii)**.

(b) In this part, decimals and percentages were accepted with the usual rules for 3 significant figure accuracy. The vast majority of candidates used fractions here. Incorrect cancelling or converting following a correct answer was not penalised. Ratios or words would not have been acceptable but were not seen on any scripts. The correct answer of $\frac{49}{60}$ was seen on several responses, with $\frac{588}{720}$ evident on occasions. Percentage and decimal equivalents were rarely given. Some candidates did not give triple fraction products or correct denominators so did not gain any credit. Oher candidates gained partial credit for making some progress through either of the alternative methods. It was rare for candidates to show a fully correct method and not achieve the correct final answer.

Question 8

(a) This question was well answered, with most responses recognising that the common difference was – 7, leading to the sixth term of – 19. This usually led to the nth term of $-7n + 23$ being found, although the correct alternative of $16 - 7(n - 1)$ was seen occasionally. The common error of $n - 7$ was seen on several responses.

(b) This question was also well answered, with many responses identifying by inspection that the sequence was the square numbers doubled. Many scripts gained full credit for finding the sixth term as 72 and the general term as $2n^2$. Some responses were awarded partial credit for noting that the second differences were 4 or – 4.

(c) This question proved much more challenging, with very few fully correct solutions seen. Many candidates correctly found the next term as – 11 by working out that the absolute difference each time was 2 but that the sign alternated. However, the nth term of $(-1)^{n+1}(2n - 1)$, or equivalent, was only found by the strongest candidates.

(d) This question also proved very challenging, with the majority of candidates unable to calculate the next term in the sequence. Many candidates recognised that this was a quadratic sequence by finding the second differences of – 2 or 2, but candidates were generally unable to continue on to find the full quadratic expression for the nth term. The acceptable alternative of $-(n - 3)^2 + 10$ was seen very rarely.

Question 9

(a) Candidates used their graphical calculators to good effect to aid with the plotting of the graph, and many responses gained full credit. Some sketches gained only partial credit because they had excessive overlaps on the asymptotes or had the upper branches crossing the x-axis.

(b) The correct values of 1.5 and – 0.5 were often seen, but sometimes answers were not written down as equations or the negative sign was omitted (i.e. $x = 0.5$ was given).

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(c) Many correct answers were given here, again demonstrating good use of the calculator functions, although the x and y values were occasionally reversed. The negative sign was often omitted for the y-coordinate.

(d) Most candidates gained at least partial credit, usually for 1.3(0) although many also found 2.15. The negative value was often only given correct to 2 decimal places as – 0.45, and the special case for all 3 answers correct to 2 significant figures was seldom seen.

(e) This was one of the most challenging questions on the paper, with only a small number of candidates gaining full marks for the three correct inequalities linked to **part (d)**. These inequalities had the added strictness on the asymptote values which was penalised once only, and also f(x) or y for x was not allowed. Very few candidates drew the line $y = x - 2$ on their diagram to aid their solutions.

Question 10

(a) This demanding 'show that' mensuration question required candidates to link the formulas for the curved surface areas of a cone and a hemisphere; this was only done to a successful conclusion by a small minority of candidates. In the first step, many candidates used the formula for a complete sphere, rather than hemisphere. Many did not realise that they had to use Pythagoras' Theorem to find a relationship between r, h and l, the slant length. Candidates are not permitted to use the given answer as the starting point to their solution, and doing so gains no credit. To gain full credit in this question, candidates had to clearly show every step in the working to arrive at the given expression for h.

(b) This was another 'show that' question and required candidates to use the expression for h given in **part (a)** in the context of finding an expression for the volume of a solid made from a cone and a hemisphere. This question was more accessible to candidates and more correct solutions were seen. Again, use of the given answer did not gain credit, and each step of working needed to be clearly shown to gain full credit.

(c) (i) This was a challenging question, where candidates had to initially find the scale factor between the volumes of the two solids and then take the cube root to find the radius of the larger solid. Some candidates gained partial credit for finding 9 but then did not add r as required for a fully correct solution. Only a few fully correct solutions were seen.

(ii) This question proved to be the most challenging on the paper, with only a very small number of responses gaining full marks. The key starting point was to recall that the surface areas were equal, equate either $4\pi R^2$ or $4\pi(9r)^2$ to 5000 and then calculate the radius of either solid. Partial credit was awarded to some candidates who found 2.216… or 19.947…. Often these values were then substituted into the incorrect version of the volume so no further credit was gained.

Question 11

(a) Most responses gained at least partial credit for correctly using the logarithm power law e.g. $2 \log 5 = \log 5^2$, with many response also correctly using the division or multiplication law. A common misconception was that, for example, log 25 – log 32 = log 25/log 32 instead of $\log\left(\frac{25}{32}\right)$.

Several responses progressed as far as $(\log)\ \frac{25}{32} = (\log)\ \frac{64}{x^2}$, but were unable to get to the required final form or one of the acceptable alternatives.

(b) A high number of candidates gained partial credit for correctly squaring both sides of the formula and eliminating the fractions to get to $y^2(2x + 1) = x$. The next stages, to expand the brackets and collect terms into the correct form before subsequent division by a 2-term expression, proved much more challenging and were only seen on a small number of scripts. The correct initial approach of $y\sqrt{(2x + 1)} = \sqrt{x}$ was rarely seen.

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CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/42
Paper 42 (Extended)

Key messages

Communication and suitable accuracy are important aspects of this examination and candidates should be encouraged to show clear methods, full working and to give answers to at least 3 significant figures. Candidates are strongly advised not to round values prematurely but to work at a minimum of 4 significant figures throughout their working. Most candidates followed the rubric instructions carefully but some candidates of all abilities either made premature approximations in the middle of a calculation or did not give answers correct to the specified degree of accuracy. This meant that accuracy marks could not be awarded in these cases.

The graphic display calculator is an important aid and candidates are expected to be fully experienced in its appropriate use, especially in using memory to hold accurate intermediate values. It is expected that the calculator has been used as a teaching and learning aid throughout the course. 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 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.

Many candidates needed to show more working, either when answers alone did not earn full credit or when a small error could prevent marks being awarded in the absence of any method seen. This is particularly noticeable in 'show that' style questions, when working to a given accuracy. When an answer is given, the final line of working before the answer should show a value accurate to at least one significant figure more than the answer. For example, if the given answer is 32.8 cm and correct working leads to a value of 32.8134… then a value of 32.81… should be shown in working prior to the given value of 32.8.

The sketching of graphs continues to improve and there was more evidence of the use of a graphic display calculator supported by working. This is in the spirit of the syllabus

Candidates should try to avoid the following:

- Overwriting answers, for example, in ink over pencil, as these sometimes do not scan well.
- Miscopying their own work from one line of working to the next.
- Not reading the question carefully, for example, in deciding whether a probability question involves probabilities with or without replacement.

The most accessible questions were those on co-ordinate geometry, percentages, compound interest, use of formulas, sequences, number lines and algebraic inequalities, and basic trigonometry.

The most challenging questions were those on standard form, solving an inequality graphically and drawing an asymptote on graph, sketching a stretch, and bearings.

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Comments on specific questions

Question 1

(a) Most candidates gave the correct answers, but some gave them in the reverse order.

(b) (i) Almost all candidates gave the correct answer. The most common error was to reverse the components.

(ii) Almost all candidates gave the correct answer.

(c) Almost all candidates gave the correct answer, and the majority gave a decimal answer to the required degree of accuracy.

(d) This was an exceptionally well answered question, with almost all candidates gaining full credit.

Question 2

(a) Most candidates produced an acceptable sketch, but some allowed the two branches to overlap or had too wide a gap between them. Both of these potential errors were avoided by those who drew the asymptote first to guide the sketching of the branches.

(b) Most candidates showed a correct asymptote, but a reasonably high number of candidates omitted this part.

(c) Most candidates gave both answers, but some gave only one or included the y-coordinate in their answers.

(d) (i) Very few sketches of the quadratic were seen, but most candidates gave the correct answer to a suitable degree of approximation. However, some candidates used an algebraic method despite a graphical approach clearly being required.

(ii) Almost all candidates gave the $x > 1.09$ solution but far fewer realised that $x < -2$ was also a solution. Again, many candidates attempted an algebraic method which led to confusion.

Question 3

(a) Most candidates gave the correct answer. The most common error was an answer of 1.04.

(b) Most candidates gave the correct answer. A few only found the decrease amount of \$9.60 and did not subtract it from the initial price, while others added instead of subtracting.

(c) Most candidates set up this compound interest problem correctly and used their calculators to find the correct answer. A very small minority tried to use a simple interest approach.

(d) This was a routine compound interest problem and was answered successfully by most candidates. However, some candidates showed no working at all, which runs the risk that a very slight error will result in no credit being awarded. There were many examples of good and accurate use of logarithms but there were also many examples of solutions using numerical techniques. When using a 'trial and improvement' method, it was important that the two values either side of 5000 were shown.

Some candidates obtained the answer of 8 but only after an incorrect method which consisted of starting with $13000 \times (1.018)^n = 5000$, solving this to find $n = -8.43$, ignoring the negative sign and rounding to 8. This gained no credit.

Question 4

(a) (i) This was a 'show that' question where the final accuracy mark depended on candidates showing an answer correct to at least 4 significant figures (537.2…) which was then rounded to the given value of 537. Many candidates did not show this more accurate value. Some candidates correctly

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found the sum of the volumes to be 171π but then went straight to 537 without the intermediate step. Most did, however, correctly show the volumes of the two hemispheres and the cylinder.

A small number of candidates used the formula for the surface area of a sphere, which gave the expected result, but which only gained partial credit.

(ii) There were many good responses which gained full credit. The most common source of error was in the conversion of centimetres to millimetres. Those candidates who tried to convert volumes were less successful than those who converted as their final step.

(b) There were many good responses by candidates who demonstrated skilful use of their calculators and set out their working clearly.

Most candidates expressed the area of the segment as the difference between the area of the sector and the area of the triangle, but some were then unable to solve the resulting equation to find the radius. It was important to keep this value in the calculator's memory as those who rounded prematurely usually gave an answer of 11.456…., and did not gain final accuracy mark.

An error which was commonly seen was omitting the area of the triangle, with an equation of $\frac{120}{360}\pi r^2 = 18.4$. However, a follow through mark could be gained by using the incorrect value of the radius to find the arc length.

Some candidates found the length of the line *AB* instead of the length of the arc *AB.*

Question 5

(a) (i) This question was extremely well answered, and occasional errors in rounding were the only issues in this part.

(ii) Some candidates had problems with signs or took the root of the squared term only, but the great majority of responses were correct.

(b) The majority of candidates gained full credit for this question. The only real difficulty for some was finding the general term in sequence *C*.

Question 6

(a) (i) Most candidates gave the correct transformation here. The only issue was an occasional problem with the direction of the rotation.

(ii) Omission of the negative sign for the scale factor was the most common error.

(b) This part had the highest number of incorrect responses for this question, but the majority of candidates gave a correct drawing. Errors included a stretch from the wrong invariant line or drawing an enlargement instead of a stretch.

Question 7

(a) Only a few errors were seen amongst the large number of correct responses. The most common was a reversal of the circle shading at the end of the number line.

(b) (i) The majority of responses were correct, with just the occasional lapse in one of the inequality signs.

(ii) A small minority of candidates omitted 0 and some included 2 in error, but the majority of candidates gave either a correct response or a correct follow through response.

(c) Only a few candidates made a mistake in the expansion of the second bracket.

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(d) (i) This was another 'show that' question and required correct working to obtain the given quadratic equation. Although there were some very minimalistic responses, the great majority of candidates showed every step of their deduction in commendable detail.

(ii) For those candidates who read the question carefully, the quadratic was easily factorised and the two solutions readily obtained. However, some candidates used a method other than factorisation and gained no credit. In general, any correct method can be used in any question, but here a method was specified and, if this is the case, it must be used.

Question 8

(a) This question required a straightforward application of Pythagoras' theorem and almost all candidates gained full credit.

(b) This required the use of a trigonometric ratio and those who used tangent almost always gained full credit. Other ratios were equally valid, but often an inappropriate rounding of the length of *AD* led to a loss accuracy in the final answer. Candidates should use given values if possible, in order to avoid this issue.

(c) This question was very well answered, with almost all candidates giving a correct response.

(d) This part proved more challenging but there was still a high number of correct responses.

The easiest method was to use $\cos 50 = \frac{BP}{12}$ but some candidates found *DP* first and then used Pythagoras' theorem. However, some candidates gave the length of *DP* as their answer. Many candidates used the diagram effectively, marking the right angle at P.

An error sometimes seen was for candidates to assume *P* bisected *BC*.

(e) This was a much more challenging part. However, many correct responses following on from well structured and easy to follow work were seen. The most effective responses made good use of the diagram and clearly set out which angle or length was being calculated.

Efficient use of the calculator was also required as many steps were needed to arrive at the final calculation and some candidates did not gain the final accuracy mark because of premature rounding.

Candidates should be reminded of the rubric requiring angles to be given correct to 1 decimal place.

Candidates needed to find the relevant angles at *A* in order to find the correct bearing. However, many candidates dealt only with the angles at *C* and/or *D*, whose calculation alone was insufficient to gain any credit.

Of the two methods given in the mark scheme, by far the most common approach was the first one, but some candidates used the more elegant second method. Other methods were seen, but usually without success.

Question 9

(a) This straightforward substitution was answered correctly by almost all candidates.

(b) The candidates were split roughly 50:50 between those giving the correct exact answer of $-\sqrt{3}$ and the incorrect inexact answer of –1.73.

(c) Most candidates drew a good sketch, but some did not show the graph starting at the origin and passing through (180, 0) or left too wide a gap between the two branches.

(d) This straightforward substitution was answered correctly by almost all candidates.

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(e) The majority of candidates set up a log expression correctly, but many did not gain full credit because of the omission of brackets in their final answer.

(f) There were many good solutions, but some errors were seen in expanding $\left(x^3+1\right)^2$, for example in the appearance of x^9.

Question 10

(a) (i) The great majority of candidates answered this part correctly, with only the occasional error seen when an incorrect mid-point value was used.

(ii) This straightforward probability question was answered correctly by almost all candidates.

(iii) This was a standard probability question with the two common errors on this type of question being seen quite often. Some did not use a probability without replacement and others only gave one of the two possible outcomes.

(b) (i) The great majority of candidates answered this part correctly, with only a few candidates switching the 31 and 9 values.

(ii) Almost all candidates gave the correct answer or follow through answer.

(iii) A mistake sometimes seen was for candidates to multiply two probabilities, but the majority found the correct answer.

(iv) Most candidates gave the correct answer, but some used an incorrect numerator and/or denominator.

Question 11

(a) Almost all candidates knew the method for rationalising the denominator. The few errors seen resulted from imprecise algebraic manipulation.

(b) This part proved to be more challenging for many candidates. Most gained partial credit for 3 terms correct in the expansion but a common error in writing $+h\sqrt{3}\,x-g\sqrt{3}\;as-gh\sqrt{3}$ resulted in both answers being incorrect. Some candidates seemed to be unfamiliar with this type of question and did not know how to reconcile the terms of their expansion with the values of p and q.

(c) (i) Few candidates gave the correct answer as most candidates were unable to deal with the different exponents and did not attempt to convert one of the numbers to a form compatible with the other.

(ii) There were very few correct answers seen. The most common answer was $2\times10^{\frac{2000}{3}}$ but, as standard form requires the power of 10 to be an integer, this did not gain credit.

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CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/43
Paper 43 (Extended)

Key messages

It is important that candidates have covered all areas of the syllabus. Some candidates produced good work in answering most questions but were unable to give any answers for any part of other questions.

Communication and suitable accuracy are important aspects of this examination. Candidates should be encouraged to show clear methods, full working and to give answers to at least 3 significant figures. Candidates are strongly advised not to round off but to work at a minimum of 4 significant figures throughout their working so that their final answer is accurate to 3 significant figures. Most candidates followed the rubric instructions carefully. However, some candidates made premature approximations at intermediate stages of working or did not give answers to the specified degree of accuracy. In these cases, accuracy marks could not be awarded.

The graphic display calculator is an important aid and candidates are expected to be fully experienced in its appropriate use. It is expected that the calculator has been used as a teaching and learning aid throughout the course. 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

Some excellent scripts were seen, which showed all necessary working at a suitable degree of accuracy. Most candidates were able to attempt all the questions and to complete the paper in the allotted time. The overall standard of work was good.

Many candidates needed a greater awareness of the need to show working, either when answers alone were insufficient to gain full credit, or when a small error could result in an inaccurate final answer, so that working was required to be able to award credit. This is particularly the case in 'show that' style questions when working to a given accuracy. When an answer is given, the final line of working before the answer should show a value accurate to at least one significant figure more than the answer.

The sketching of graphs continues to improve and there was more evidence of the use of a graphic display calculator, supported by working. This is in the spirit of the syllabus. However, some candidates made no attempt to sketch graphs when required.

Candidates should avoid:

- overwriting answers, for example in ink over pencil, as these sometimes do not scan well.
- miscopying their own work from one line of working to the next.
- not reading the question carefully, for example when deciding whether a probability question involves probabilities with or without replacement.

Topics on which questions were well answered included cumulative frequency diagrams, percentages, sharing, composite functions, solving simultaneous equations, basic trigonometry and finding probabilities from a Venn diagram.

More challenging topics included compound interest with an interest rate less than 1 per cent, coordinate geometry, solving an inequality graphically, finding a double transformation, the range of a function and use of set theory notation.

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Comments on specific questions

Question 1

(a) This was a slightly more challenging frequency table than some seen in previous series, with unequal class intervals. However, many candidates found the correct answer. Some candidates used values other than the midpoints, or simply added the midpoints and then divided by 6.

(b) This question was well answered, with the great majority of candidates giving the correct cumulative frequencies.

(c) This question was also well answered, with many excellent, accurate cumulative frequency curves seen.

(d) Although this question proved more challenging than **part (b)** and **part (c)**, many candidates used their cumulative frequency curve to find the correct answer.

Question 2

(a) This was one of the best-answered question on the paper, with the vast majority of candidates calculating the correct value.

(b) The answer was exactly 131.61 but many candidates rounded this to give their final answer as 131.6 or 131. Candidates should be reminded that only non-exact answers should be rounded.

(c) Almost all candidates who realised that the first step was to divide 76 by 4 obtained the correct answer.

(d) Although the majority of candidates answered this question very well, some candidates treated it as a compound interest problem and did not make progress.

(e) (i) Many candidates understood the process for finding a number prior to a percentage increase but were unable to deal with 0.6 per cent correctly. Instead of dividing by 1.006, an incorrect division by 1.06 was often seen.

(ii) The same problem was evident here, with 6 per cent being used instead of 0.6 per cent, so an answer of 4 was frequently seen. Candidates should check whether their answers are reasonable in the context of the question. It was unlikely that the library's books would increase to 40 000 in just 4 years at a rate of increase of less than 1 per cent.

Some candidates showed no working and gave an answer of 33. This answer, with no working, could not gain any credit. However, 33.7 seen would have gained partial credit.

There were also scripts where candidates showed excellent use of logarithms.

Question 3

(a) (i) This question proved challenging, with few correct answers and very few sketches seen. Numbers were often added or squared with no plan evident.

(ii) Candidates were generally more successful with this question, which was answered correctly by most.

(iii) This question, although a standard problem, proved to be very challenging. A reasonably high number of candidates omitted this question, and very few correct answers were seen.

(b) Candidates who used a sketch tended to be more successful in understanding what was required, and therefore to make more progress. However, this question was challenging, and few correct answers were seen.

Question 4

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(a) This question was very well answered, with most candidates giving an acceptable sketch of the cubic.

(b) All 3 values were found by many candidates. However, many candidates did not meet the requirement to give non-exact answers to 3 significant figures, meaning that full credit could not be awarded. It was common that 0.539 was given as 0.54.

(c) Most candidates gave an acceptable sketch of the second function.

(d) This question proved challenging, with very few correct answers seen. $y = 0$ and just 0 were common incorrect answers. This question was also omitted by a relatively high number of candidates.

(e) Some candidates showed the two important values of –1.96 and 2.48 but far fewer went on to give the two required inequalities. Many candidates did not appear to use their graphic display calculators, instead trying to solve the problem algebraically. These attempts were unsuccessful.

Question 5

(a) This question proved very challenging, and was omitted by a relatively high number of candidates. Although some fully correct answers were seen, many candidates had difficulty determining the inverse scale factor.

(b) (i) This question was generally well answered, with the correct image often seen. However, the most common errors were using an incorrect centre or rotating in the wrong direction.

(ii) This was a double transformation with an easy translation followed by a more difficult enlargement with a negative scale factor. It was important for candidates to show both stages of their answer so that partial marks could be awarded for the first transformation. However, many candidates deleted their translation. Where this was that case, no marks could be awarded if the final image was incorrect. Candidates should have labelled both images appropriately.

(c) Most candidates who gave a response gave the correct scale factor, but fewer realised it was a stretch and fewer still gave the correct invariant line.

Question 6

(a) This part was the best-answered on the paper, with almost all candidates giving the correct response.

(b) This question proved to be the most challenging on the paper, with very few correct responses seen. Most candidates did not seem to understand the idea of the range of a function, with many confusing this concept with the range of a data set.

(c) This part was very well answered, with the vast majority of candidates giving the correct answer.

(d) Many good responses to this question were seen. Candidates tended to be more successful when they clearly showed each step of the working.

(e) This question proved to be very challenging, and very few correct answers were seen. Many candidates started off with the correct first step and gained partial credit. However, it was then necessary to simplify the denominator obtain an $x - 1$ term which could be cancelled with the corresponding term in the numerator. Many candidates did not recognise this or were unable to complete this step correctly.

Question 7

(a) (i) Most candidates were able to give the next term in the sequence but far fewer were able to give the nth term, although many realised it was necessary to find the second differences and gained credit for so doing.

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(ii) Again, most candidates were able to give the next term. More candidates were then able to give the *n*th term than were able to do so in the previous part.

(b) Many correct answers were seen. However, a lot of these were obtained by trying out various values with no possibility of method marks for an incorrect answer. Candidates were expected to set up a quadratic equation, and method marks were available for solving by any method including graphically. Some used the formula but showed no working and, in this case, an answer of –14.5 did not gain credit.

Question 8

(a) This was a straightforward formula to find, and many correct answers were seen. However, some candidates included dollar signs in their final answer so did not gain full credit.

(b) Most candidates understood how to use a common denominator, but many responses lacked clarity in the working, often dealing with two of the terms at a time, instead of dealing with all three. A fairly common answer was $\frac{2x}{18}$ but, as the question asked for a single fraction in its simplest form, this did not gain full credit.

(c) There were many correct responses here. However, some candidates correctly worked through the algebra, but then, at the last step, switched the inequality sign**.**

(d) There were many very good responses here, with correct answers following from clear working. Only a few candidates gave answers with no working, thereby gaining only partial credit.

(e) There were some good responses with detailed working, but many candidates did not read the question carefully and started off using the wrong type of variation, for example using a square root or an inverse variation.

Question 9

(a) This was a 'show that' question and many candidates did not gain full credit because they did not show a more accurate answer before rounding to the given answer. In this case, the given value was 13.5 and a value, following correct working, of 13.51… was needed for the final mark to be awarded. Some candidates showed unnecessary working, for example writing down the numerical values of the sines. All that was needed for full method marks to be awarded was a statement of the sine rule using the given data and then a second line of working in which the value to be found – the length of AC – was made the subject of the equation.

(b) This was a well-answered question, with many correct answers seen.

(c) This question proved more challenging than **part (b)**, although many correct answers following on from detailed and clear working were seen.

However, some candidates did not seem to understand that the correct answer was to be found by adding the areas of the two triangles, and were unable to make progress towards the correct answer.

Question 10

(a) (i) Many correct answers were seen, but other candidates found this question very challenging and were unable to make any progress towards the correct answer. Many candidates were able to find the radius of the sphere but did not then realise that the length of the side of the cube was double the radius.

(ii) Although some good solutions were seen, this question proved to be one of the most challenging on the paper. The majority of candidates did not realise that what was required was to divide the volume by the area of the base of the cube.

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(b) (i) This was the best-answered part of **Question 10**, and many correct answers were seen. However, some candidates stopped after finding the length of the base diagonal, FH, rather than continuing on to find the length of the required diagonal, DF.

(ii) This part proved to be more challenging, but there were still some good solutions. Candidates could gain credit even if their answer to **part (b)(i)** was incorrect, and many candidates were able to do this.

Question 11

(a) Most candidates gave the correct answer, but some gave 'all 3 activities' as their answer.

(b) This question was very well-answered, with almost all candidates giving the correct answer.

(c) Many candidates were unable to deal with the notation, and this question was omitted by a relatively high number of candidates. Of the responses seen, by far the most common answer was 5. This was incorrect as the single candidate not contained in any set was omitted.

(d) This question was well answered, with the majority of candidates giving the correct response.

(e) This part was much more challenging than **part (d)**. Many candidates showed $\frac{2}{14}$ or $\frac{3}{14}$ to earn partial credit, but then made little progress. Many candidates worked with probabilities with replacement. Of those who correctly worked with probabilities without replacement, the most common error was to omit the second permutation, thereby ending up with an answer half that of the correct value.

(f) Here again, the main issue was that of using probabilities with replacement. Many candidates used the correct three probabilities, correctly multiplied together, but then omitted to multiply the resulting product by 3.

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CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/51
Paper 51 (Core)

Key messages

When a question requires the continuation of columns of numbers in a table, and this is done by adding on the same difference, at least three of the differences should be shown. Candidates should not worry that these extra numbers will 'spoil' their table.

A better understanding of simplest form in algebra would be helpful for candidates. Collecting like terms and leaving out multiplication signs are part of the process of simplification, as is placing the coefficient before the variable.

If an appropriate expression is available, then setting up an equation with this expression to solve a problem often gains a communication mark.

General comments

Many candidates showed good understanding of using algebra to write expressions. Apart from not indicating differences in tables, there was evidence of good communication in the work of most candidates.

Comments on specific questions

Question 1

(a) Nearly all candidates correctly counted the cards in each category.

(b) (i) Most candidates drew the 4th row of the house of cards correctly. The common error was drawing in four horizontal cards in the final row.

(ii) Nearly all candidates correctly counted the cards in each category.

(c) Most candidates correctly continued the table given, an easy method being to continue the patterns in the columns: 0, 1, 2, 3, 4 and 2, 4, 6, 8. Partial credit was given to candidates who had made errors in previous parts if the totals were correct in each row for their entries.

(d) (i) A good majority of candidates gave the correct expression for the number of horizontal cards in the nth row. A few candidates thought that a specific value was required and did not write an expression.

(ii) A good majority of candidates also gave the correct expression for the number of diagonal cards in the nth row. Errors that were seen in **part (d)(i)** were often repeated here. A few candidates wrote $n + 2$ instead of $2n$.

(iii) With a more complex expression for the total number of cards, communication of how to find the final form was expected. This could be done by showing the appropriate addition of the terms from the previous two parts or by showing differences of 3 in the table. Answers that included $n \times 3$, $3 \times n$, $3 \cdot n$ or $n \cdot 3$ were not in the simplest form.

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(e) There were very many good answers. Candidates who had errors in their formulas could still gain full credit by following the patterns in the table in **part (c)**. Most of the candidates who found the correct numbers also gained credit for showing how one of the numbers had been calculated, either by an appropriate substitution or calculation. Much clear communication was seen.

(f) There were many correct answers for the number of horizontal cards when the total number of cards was 368.

More candidates would have scored communication marks if they had shown the initial equation for finding p or shown the multiplication of that p by 2 to get the final answer.

A few candidates inappropriately used their expression for the diagonal cards instead of for the total cards.

Question 2

(a) Nearly all candidates correctly counted the cards in each category.

(b) Most candidates drew House 4 correctly. The common error was drawing in four horizontal cards in the final row of the house.

Some candidates required a diagram of House 5 for the next question and extended House 4 on the grid given in this part. House 4 could not then be credited unless House 4 was clearly indicated. Candidates who drew House 5 on the grid separately and clearly indicated which house was which gained full credit for drawing House 4.

(c) Most candidates correctly continued the table but, since the sequences in columns were not immediately obvious, a communication mark was awarded for showing a sequence of differences. The majority of candidates did not show the evidence for this communication mark and so it was not often awarded.

(d) Many different ways of describing how to continue the sequence were seen. The common error was to write descriptions that were incoherent or non-specific. Answers like +1 were not accepted. Some candidates wrote a formula for the hth term without writing down how the sequence would continue from term to term and so did not receive credit.

(e) A very large majority of candidates showed the substitution of 6 into the given formula for the number of horizontal cards. This was then evaluated to give 15, and 2 marks were commonly awarded. Very few candidates then gave the necessary step of showing why 15 was correct from the sequence by evaluating 10 + 5.

(f) Only the stronger candidates found a formula for 2, 6, 12, 20, 30, and many candidates gave no response to this question. A communication mark was possible for showing how the numbers in the table could be combined to give the correct number of diagonal cards. Alternatively, finding that there were three differences of 2 between the terms of the sequence showed communication leading to a term involving h^2.

(g) Very few correct answers to this question were seen. Some candidates knew that they had to add together the given expression from **part (e)** and their expression from **part (f)**. However, very few of these candidates reached the algebraic total in its simplest form, and a good number of candidates left this question unanswered.

(h) Many candidates identified that House 8 was the relevant one. This could be found by putting the expression from the previous part equal to 100. Many of the successful candidates showed persistence in trying out values for h that would satisfy their equation or using patterns that they had seen. A few built up a table where the last column ended in 100.

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Paper 0607/52
Paper 52 (Core)

Key messages

Candidates should communicate how they work out values in a table. For lengthy tables, at least one relevant calculation is sufficient to communicate how the values are found.

Candidates should develop skills manipulating algebraic expressions, particularly in removing brackets that are preceded by a negative sign.

Investigating requires skill in spotting patterns, and for that several examples need to be explored.

General comments

Many candidates tried out values on the calculator to find solutions. This showed persistence and was often successful.

The number of marks available often gives a clue as to how much detail is expected. A simple numerical (one-digit) answer without reasons is unlikely to be a sufficient response if a question is worth 2 or 3 marks.

Showing general results using algebra should not be replaced by a numerical example.

Comments on specific questions

Question 1

(a) Nearly all candidates found the correct reverse differences for the numbers given. Any errors were usually in the first reverse difference in the table.

(b) The vast majority of candidates correctly completed the table for two-digit numbers up to 49. However, only a few candidates gained the communication mark, either for showing how the numbers progressed by 9s or, more commonly, for writing out a suitable subtraction.

(c) A very common error was to write that there were 4 numbers giving a reverse difference of 0 because there were only 4 such numbers in the table. Of those who gave the correct answer of 9, many gained the communication mark by listing the relevant 9 numbers. With 2 marks for this question, candidates could have assumed that more than just writing down 9 was required.

(d) (i) The large majority of candidates identified that the highest common factor of the reverse differences was 9. The most common incorrect answer was 3.

(ii) In this question, candidates had to understand how the patterns in the table in **part (b)** extended to the right. Many candidates only extended the table as far as the next pair of columns and gave 50 or 45 as the answer. There were several methods for getting the correct answer of 80, and showing one of these gained a communication mark. The most common method was to complete the reverse difference column from 9 at the bottom up to 72 at the top. A few candidates incorrectly then gave 72 as their answer.

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(iii) Very many candidates did not use the work they had just done and treated this part as a stand-alone question by writing, for example, $6 \times 4 - 6 = 18$, a calculation that would be untrue for other reverse differences. Many others wrote $64 - 46$ though the instruction said that such a calculation was not allowed. Only a few candidates realised that the difference between 6 and 4 gave you the necessary multiple of 9.

Question 2

(a) As in **Question 1(b)**, the table for reverse differences of 3-digit numbers was completed correctly by most candidates, but there was a lack of communication in showing how the differences were calculated. There were more numbers in this question than in **Question 1(b)** and so more numerical errors were seen. These might have been avoided by candidates noticing that the reverse differences along a row were always the same. The most common numerical error was for 120 where a few candidates worked out $120 - 12 = 108$.

(b) Many candidates correctly identified that the highest common factor of the reverse differences of 3-digit numbers was 99. The common incorrect answers were 9 and 792 (the largest multiple of 99 in the table). A few gave an answer of 11.

(c) (i) To investigate a pattern, it is advisable to look at a minimum of 3 examples, and this question explicitly asked for 3 examples. Most candidates only gave one example, usually 601, and so were unable to spot any pattern. It is possible that they took *three examples* to mean *the three calculations in an* example. Several candidates only showed two of the necessary calculations. For this investigation, each example had to show the three calculations needed to determine the general result that $99(a - c)$ equalled the reverse difference. Of those who noticed that the reverse difference was a multiple of 99, only a few related this to $(a - c)$ as required by the question.

(ii) Only the strongest candidates were able to correctly remove brackets from the expression given. Several candidates did not realise that $99a - 99c$ was the same as $99(a - c)$. Many candidates worked with numerical values and so did not answer the question.

(iii) In this question, candidates had to find 3-digit numbers starting with 8 that gave a reverse difference of 594. Most candidates found a correct example, but a significant number did not give the required three examples. Good communication was expected in this question. Those who gained the communication mark usually showed three trials that gave the correct reverse difference of 594 each time. Others used the previous part and, from $594 \div 99 = 6$, showed how to calculate the value of c. Some candidates could have gained one communication mark by showing their trials with an answer, even if that was not 594.

Question 3

There were few complete answers to this question that showed algebraically that the reverse difference of a two-digit number was always a multiple of 9. The majority of candidates had difficulty removing brackets with a preceding negative sign. A significant number of candidates wrote $10b - a$ for the reverse of $10a + b$. Many candidates preferred to use numerical values for a and b, which did not gain credit.

Question 4

(a) This question was quite challenging as it involved 4 variables, as well as brackets preceded by a negative sign. Only the strongest candidates gained full credit. A good number of candidates gained a communication mark for giving the expression for the reverse of $1000a + 100b + 10c + d$. An error seen from a few was to write the reverse number as $1000d + 100b + 10c + a$. Many candidates preferred to work with numerical values, which did not gain credit.

(b) Many candidates found one 4-digit number, starting with 7 and ending with 5, whose reverse difference was 2178. Popular choices were 7535 or 7315. This gained partial credit for showing communication of mathematics that might have led to the correct general conclusion. To investigate and find a general result, candidates needed to try several examples. A minimum of three is recommended so that the pattern becomes clear.

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CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/53
Paper 53 (Core)

Key messages

Candidates should communicate how they work out values in a table. For lengthy tables, at least one relevant calculation is sufficient to communicate how the values are found.

Candidates should develop skills manipulating algebraic expressions, particularly in removing brackets that are preceded by a negative sign.

Investigating requires skill in spotting patterns, and for that several examples need to be explored.

General comments

Many candidates tried out values on the calculator to find solutions. This showed persistence and was often successful.

The number of marks available often gives a clue as to how much detail is expected. A simple numerical (one-digit) answer without reasons is unlikely to be a sufficient response if a question is worth 2 or 3 marks.

Showing general results using algebra should not be replaced by a numerical example.

Comments on specific questions

Question 1

(a) Nearly all candidates found the correct reverse differences for the numbers given. Any errors were usually in the first reverse difference in the table.

(b) The vast majority of candidates correctly completed the table for two-digit numbers up to 49. However, only a few candidates gained the communication mark, either for showing how the numbers progressed by 9s or, more commonly, for writing out a suitable subtraction.

(c) A very common error was to write that there were 4 numbers giving a reverse difference of 0 because there were only 4 such numbers in the table. Of those who gave the correct answer of 9, many gained the communication mark by listing the relevant 9 numbers. With 2 marks for this question, candidates could have assumed that more than just writing down 9 was required.

(d) (i) The large majority of candidates identified that the highest common factor of the reverse differences was 9. The most common incorrect answer was 3.

(ii) In this question, candidates had to understand how the patterns in the table in **part (b)** extended to the right. Many candidates only extended the table as far as the next pair of columns and gave 50 or 45 as the answer. There were several methods for getting the correct answer of 80, and showing one of these gained a communication mark. The most common method was to complete the reverse difference column from 9 at the bottom up to 72 at the top. A few candidates incorrectly then gave 72 as their answer.

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(iii) Very many candidates did not use the work they had just done and treated this part as a stand-alone question by writing, for example, $6 \times 4 - 6 = 18$, a calculation that would be untrue for other reverse differences. Many others wrote $64 - 46$ though the instruction said that such a calculation was not allowed. Only a few candidates realised that the difference between 6 and 4 gave you the necessary multiple of 9.

Question 2

(a) As in **Question 1(b)**, the table for reverse differences of 3-digit numbers was completed correctly by most candidates, but there was a lack of communication in showing how the differences were calculated. There were more numbers in this question than in **Question 1(b)** and so more numerical errors were seen. These might have been avoided by candidates noticing that the reverse differences along a row were always the same. The most common numerical error was for 120 where a few candidates worked out $120 - 12 = 108$.

(b) Many candidates correctly identified that the highest common factor of the reverse differences of 3-digit numbers was 99. The common incorrect answers were 9 and 792 (the largest multiple of 99 in the table). A few gave an answer of 11.

(c) (i) To investigate a pattern, it is advisable to look at a minimum of 3 examples, and this question explicitly asked for 3 examples. Most candidates only gave one example, usually 601, and so were unable to spot any pattern. It is possible that they took *three examples* to mean *the three calculations in an* example. Several candidates only showed two of the necessary calculations. For this investigation, each example had to show the three calculations needed to determine the general result that $99(a - c)$ equalled the reverse difference. Of those who noticed that the reverse difference was a multiple of 99, only a few related this to $(a - c)$ as required by the question.

(ii) Only the strongest candidates were able to correctly remove brackets from the expression given. Several candidates did not realise that $99a - 99c$ was the same as $99(a - c)$. Many candidates worked with numerical values and so did not answer the question.

(iii) In this question, candidates had to find 3-digit numbers starting with 8 that gave a reverse difference of 594. Most candidates found a correct example, but a significant number did not give the required three examples. Good communication was expected in this question. Those who gained the communication mark usually showed three trials that gave the correct reverse difference of 594 each time. Others used the previous part and, from $594 \div 99 = 6$, showed how to calculate the value of c. Some candidates could have gained one communication mark by showing their trials with an answer, even if that was not 594.

Question 3

There were few complete answers to this question that showed algebraically that the reverse difference of a two-digit number was always a multiple of 9. The majority of candidates had difficulty removing brackets with a preceding negative sign. A significant number of candidates wrote $10b - a$ for the reverse of $10a + b$. Many candidates preferred to use numerical values for a and b, which did not gain credit.

Question 4

(a) This question was quite challenging as it involved 4 variables, as well as brackets preceded by a negative sign. Only the strongest candidates gained full credit. A good number of candidates gained a communication mark for giving the expression for the reverse of $1000a + 100b + 10c + d$. An error seen from a few was to write the reverse number as $1000d + 100b + 10c + a$. Many candidates preferred to work with numerical values, which did not gain credit.

(b) Many candidates found one 4-digit number, starting with 7 and ending with 5, whose reverse difference was 2178. Popular choices were 7535 or 7315. This gained partial credit for showing communication of mathematics that might have led to the correct general conclusion. To investigate and find a general result, candidates needed to try several examples. A minimum of three is recommended so that the pattern becomes clear.

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Paper 0607/61
Paper 61 (Extended)

Key messages

Candidates who did well on this paper had sound algebraic skills and a good knowledge of how to use their graphic display calculators effectively. These skills allowed them to to manipulate and rearrange equations including those with fractions or powers, draw accurate sketches from their calculators and use graphs on their calculators to find values, having correctly interpreted questions.

General comments

Strong responses showed all substitutions explicitly and showed all steps when rearranging equations or using patterns to find expressions. Graphic display calculators were used to plot graphs to solve unusual equations, and information from these graphs was interpreted correctly. Diagrams and graphs were drawn accurately, and answers were related to the context where appropriate.

Comments on specific questions

Section A

Investigation

Question 1

(a) This question was very well answered, with almost all candidates completing the table correctly, and just a few arithmetic slips seen.

(b) The three marks available for finding this simple expression indicated to candidates that there was a communication mark available here. Many candidates wrote down the correct answer without showing how they found it.

(c) Many candidates used their expression found in **part (b)** equated to 368. Most of these also realised they needed to double their p value to find the number of diagonal cards. Those who did not see this link between the two questions rarely gained any credit.

Question 2

(a) This question was well answered by most candidates. Some weaker candidates gained partial credit for recognising that the numbers of horizontal and diagonal cards should add up to the total number of cards, even if the table was not fully correct. Most candidates gained a communication mark for drawing House 4 or House 5, although some drew in the bottom line of their House, making it incorrect. Quite often there was also good use of differences in the table.

(b) Many candidates found some form of the correct expression, sometimes rather more complex than needed, for example $1h^2 + 1h + 0$. Poor form such as $h.h + 1$ was condoned for this question. Candidates should be encouraged to use brackets to write expressions in the correct form.

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(c) This question required the answer be written in its simplest form. Correct unsimplified answers gained partial credit. Candidates should be reminded to check the requirements of the question carefully once they think they have reached the answer.

(d) Some candidates used a lengthy method to find the result in **Question 2(c)**, while others simply put that result equal to 737. Most candidates did not show how they solved the resulting quadratic equation. There were several options including factorising or use of the quadratic formula. Transferring a sketch of $y = 1.5k^2 + 0.5k$ from their calculator with a line at $y = 737$ would have earned two communication marks.

Question 3

(a) Candidates found greater difficulty in completing the two rows of this table than the rows in the previous tables. Some did not notice the total was equal to the addition of the number of horizontal and diagonal cards although some gained partial credit for this or for the row of 4 houses being correct.

(b) Those candidates who substituted values for t and h usually managed to find a as 1 and many wrote down the correct formula. Others, sometimes using incorrect form for writing the formula, obtained decimal values for a.

(c) A variety of different methods were used to try to solve this problem. The sketch of the curve with or without the line at $H = 2925$ was rarely seen. Strong attempts saw $t = 26$ appearing, presumably from the use of the equation solver on their calculator. Final correct answers were quite common after this.

Section B

Modelling

Question 4

(a) The question was well answered, with points plotted accurately and usually with a sharp pencil.

(b) (i) In most cases the correct line was drawn accurately between the two plotted points. The line did not go through (30, 9.5) although some candidates drew this.

(ii) Many candidates found the gradient and the constant value of the model equation. Common errors included finding and using the midpoint between the two given values and, after finding $\frac{1}{12}$ as a gradient, working with the perpendicular gradient of –12. Stronger candidates tended to work in fractions rather than decimals and kept accuracy through to their final answer.

(iii) The most efficient method to find this value of x was to find the intersection of $y = 12$ with the graph of the model. The communication mark was awarded to candidates who indicated this by drawing the $y = 12$ line on the graph. Other candidates substituted 12 for y in their model, which also led quickly to the correct answer.

(iv) When commenting on the validity of a model, it is the model that needs to be discussed without any reference to the graph. The model was set up using data that did not include 20, which was key to answering this question. Candidates should note that, for a given piece of data, the model is either valid or not valid and that variations such as 'not very valid' are incorrect.

Question 5

(a) This question was answered well, with most candidates remembering to write in the correct units.

(b) This question proved to be challenging, with many candidates finding the required substitution and rearranging difficult, especially with powers in the equation. Candidates needed to work with at least four figure accuracy, and only round their final answers.

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(c) Few sketches were seen. The correct algebraic method of substituting 10 for y was seen just as often as the substitution of 17 for x, whilst the substitution of both 10 and 17 was also seen. Many candidates did not know how to proceed after $1.0403 = x^{0.0139}$. This question was omitted by a relatively high number of candidates. Candidates should be encouraged to try all questions. Here, the substitution of 10 for y into their model was sufficient working to gain partial credit.

Question 6

(a) Some good sketches were seen. Candidates should sketch graphs carefully. Some dipped their sketches slightly down from the y axis when the gradient was always positive, and some sketches did not reach $x = 105$.

(b) Many candidates wrote down the value of 27 seconds, presumably found from the intersection with $x = 100$ on the graph. Most of these candidates were able to complete the question to reach the correct answer.

(c) The large number of candidates who omitted this and the previous part of this question indicates that many candidates found using graphs to answer follow-up questions challenging.

Question 7

There were some good attempts at this question, and some were well organised with clear substitution of 9.58 into each of the three models. The fact that there was no solution for the last model needed to be interpreted in the context of the question to gain the mark.

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CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/62
Paper 62 (Extended)

Key messages

Candidates needed to read the questions very carefully to make sure that they gave their answers in the format that was required, and that they used the information given and the questions that were referenced. They also needed to write clearly and concisely in an order that could be followed down the page. Explicit substitution is necessary for communication marks in all questions, not just questions that ask for something to be shown. The understanding of conversion of units was also key in the modelling section.

General comments

Algebraic skills used were generally very good in both sections. In the investigation section, most candidates achieved some credit for partial answers even if they did not find complete lists of results. In the modelling section, numerical calculations often needed to be set out more clearly and mistakes carefully deleted and replaced.

Comments on specific questions

Section A

Question 1

(a) This question was very well answered, with only a few slips seen.

(b) Candidates should be encouraged to show how they have reached their answers. There were many values to be given in this table so a couple of examples of calculations or differences would have been sufficient to gain the communication mark.

(c) This question was very well answered, with the occasional wrong answers of 1 or 3 where candidates did not note the requirement to give the largest number possible.

(d) Many candidates completed the Reverse difference column correctly or, with 89 in the bottom left cell, showed that 98 – 89 = 9, for which the communication mark was awarded. Using this to reach the answer of 80 was less common, with an answer of 72 often seen.

Question 2

(a) Most candidates completed the table correctly. Candidates needed to show some working to gain the communication mark and achieve full credit for the question.

(b) This question proved to be the most challenging on the paper, with very few candidates giving a clear explanation. Practice on looking at patterns and explaining how/why they occur would help candidates improve this skill. Answers should have referred to the digits in the number column rather than commentating on the reverse differences.

(c) This question was well answered, with the vast majority of candidates giving the correct answer.

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(d) (i) Some good algebraic work was shown here by many candidates, who paid attention to the negative sign and applied it to all the terms in the following bracket. Candidates should re-read the question when they think they have finished to ensure they have fulfilled the requirements of the question. In this case, some candidates did not factorise their final answer.

(ii) Much very good work was seen for this question, with the communication mark being awarded most of the time. Most of those who reached $c = 2$ were able to write down three possible numbers.

Question 3

(a) Candidates who followed the instruction and linked their answer to **Question 2(d)(i)** often gained full credit. Candidates should be encouraged to read questions carefully. Not only did the question refer to the previous question but it also asked for a comment on each of the three values. Those who followed both of these instructions usually provided good answers.

(b) Many candidates listed nine of the ten numbers, referring to the table in **Question 2(a)** as they were directed. 891 was often missing. The working seen sometimes, but not always, qualified for the communication mark.

Question 4

(a) Most candidates demonstrated very good algebraic skills. Most candidates factorised their expression, although this was not asked for in this particular question.

(b) (i) Many candidates were able to use their expression from **Question 4(a)** with the reverse difference of 33 066 to find the connection between a and e and, by clearly showing their working, they gained full credit.

(ii) Many candidates who found the $a - e = 4$ connection in **part (i)** were able to find the numbers for this question, although it was reasonably common for candidates to omit 41580.

Question 5

(a) This question was well answered, with many candidates reaching 0.0101 kg without error. Some lengthy and some concise explanations were seen.

(b) This question was very well answered, with almost all candidates giving the correct answer.

(c) Many candidates gave answers based on the rounding of figures. The question asked for a practical reason, which indicated candidates should think about an actual newspaper and not the calculations. For example, a possible reason was that the mass calculated in **part (b)** would not include the mass of ink or staples.

(d) (i) Candidates who answered this question successfully noted the instruction to use **Question 5(b)** and also the instruction to give their answer in tonnes.

(ii) Candidates should read questions carefully to make sure that they use all the information given and give their answer in the form requested. Some candidates took a week to be 7 days rather than the 5 (Monday to Friday) given in the question. Most, but not all, candidates gave their answer correct to the nearest thousand.

Question 6

(a) Concise careful writing usually led to the correct model being found. One variable or 5 or 52 were sometimes omitted although follow through credit was given for 7×52. Candidates should carefully cross out incorrect numbers and rewrite the correct one, rather than writing over incorrect numbers.

(b) Some candidates saw the connection with the previous part and used their model. Responses needed to show clear and concise working. Correct, explicit substitution earned the communication mark.

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Question 7

(a) The description of the cone needed to include a reference to the circular base as well as to the narrowing to a point at the top. Both these criteria were needed to distinguish a cone from other 3D objects. The use of mathematical language was necessary.

(b) In this type of question, candidates should work towards the answer given, in this case 12 trees, and not use the 12 trees to work backwards. Candidates should also remember not to round partial calculations, but to wait to show that their final number of trees rounded to 12.

Question 8

Some candidates made this very complicated by considering an approximation for the diameter of the tree. For the communication mark, some used the diagram given or drew their own to demonstrate the area of a square, whilst a few explained this. Candidates should be reminded that a model should always have a subject, in this case, '$N =$'.

Question 9

(a) Credit for the sketch depended on the graph reaching two points. Some candidates were accurate enough to gain full credit. Candidates should sketch the graph from their calculators as carefully as possible.

(b) As is often the case, there was a communication mark for drawing a line on the sketch, in this question at $N = 620$. Yes or No answers must be supported by both the value found on the graph and an explanation of what this value indicates.

Question 10

There were some good attempts at calculating the required area, resulting in at least one communication mark being awarded. Correct units also gained a communication mark. Again, candidates should be aware not to round too much within their calculations so that their final answers are not outside the permitted range.

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CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/63
Paper 63 (Extended)

Key messages

To do well on this paper, candidates need to be familiar with basic algebraic manipulation, such as multiplying out brackets, and with standard connections such as those between speed, distance and time for the modelling section. Candidates should also realise that the numbering of the questions shows where there are links, such as the parts of **9(e)** in the modelling section.

General comments

The strongest responses showed interpretation of graphs and use of the information given in the paper. Candidates who communicated well by showing explicit substitution and step-by-step solutions gained communication marks. These were not awarded where working was not shown or was insufficient to demonstrate a method or justify a result.

Comments on specific questions

Section A

Investigation

Question 1

(a) This question was very well answered, with almost all candidates correctly extending the pattern explained in the stem of **Question 1** to obtain the correct answer.

(b) This question proved more challenging because some candidates gave a numerical answer, where an expression was required.

(c) This question was well answered by most candidates. The most common incorrect answer was 19 instead of 21.

(d) Candidates found several different ways to express this relationship, including mentioning multiplication and area. Few realised that a column was just a rotation of a row.

Question 2

(a) This question was very well answered. Most candidates gained the communication mark for drawing or showing the calculations, as they did both.

(b) Most candidates were successful in moving from numerical to algebraic results. Slips were seen in multiplying $(w – 1)$ by 2 and in simplifying $2w – 2 + w$.

Question 3

(a) This question was very well answered, with most candidates reaching the correct answer and supporting their work with correct working and/or drawing to gain the communication mark.

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(b) As in **Question 2(b)**, many good answers were seen, though there were some slips in algebraic manipulation, e.g. $3(w – 1) = 3w – 1$ or writing the first expression as $3w$, and sometimes the second expression as $2w$.

(c) Most candidates knew to equate their expression for the final total in **part (b)** to 97. This gained the communication mark even if the final answer was incorrect.

Question 4

Candidates needed to be able to multiply out brackets correctly for this question. There were some slips in this multiplication as well as in collecting terms to reach the given answer. Some candidates choose to use numerical values for h and w to show the statement was true. Candidates need to know that no matter how many numerical examples they use, this does not show that a statement or relationship is always true.

Question 5

(a) This question proved to be very challenging, with candidates finding it difficult for one or more of several reasons. Some candidates did not realise that both h and w needed to be replaced by n. Others made the substitution of n followed by incorrect algebraic manipulation, or reached $2n^2 – 2n$ but could not explain how this answered the question. Many candidates used numerical examples, either from the beginning or from whatever stage they got to algebraically. Candidates should practise showing why expressions will always be even or odd or multiples of n.

(b) Candidates need to practise interpreting questions and writing correct algebraic expressions and equations for such situations. A common error was to try $n(n + 1)$ which did gain 1 communication mark for the $(n + 1)$ seen. Some otherwise strong responses contained slips in multiplying out brackets or collecting terms.

Question 6

This question proved challenging, and few candidates found all of the solutions. However, a reasonable number of candidates appeared to understand what they were aiming to find and managed to find at least one correct pair. Some had correct substitutions or solutions without realising that they had found answers. This question was omitted by a relatively high number of candidates. Candidates should be encouraged to attempt all questions as they may gain communication marks even if they do not reach a full or final answer.

Question 7

(a) Some candidates gave an answer of 4 (from $20 \div 5$) and some did not give any units with their answer. Candidates should check their interpretation of values from graphs.

(b) Candidates should think carefully about whether they have been asked for an expression or for an equation/model/formula. They should know that for the latter they must include a subject, in this case, '$d =$'.

(c) This question was quite well answered. Some candidates went back to the graph and managed to answer this correctly even though they had made mistakes in their answers to **parts (a)** and/or **(b)**.

Question 8

(a) This question was well answered by many candidates, who understood how to interpret the graph and read the required value from it correctly.

(b) Many candidates realised that the information they needed was already given. The truck starts at (0, 45) with 45 as the answer to **part (a)**. The speed is given as 20 m/s, so a model could easily be found. Candidates should remember that when a question is divided into parts, the parts are usually related and follow on from each other.

(c) The graph gives a good picture of what is taking place in this situation. Combined with the information given in **part (b)**, candidates should have realised that they needed to equate the two models. Candidates should understand how to interpret graphs in order to make full use of them.

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(d) (i) Some candidates did not draw a line. Others started their line at (0, 0). Some other lines were parallel to the lines for the either the car or the truck. Candidates should take take time and care to read and understand all the information they are given.

(ii) There were several ways to collate the data given to answer this question. Many candidates attempted some calculations and could have earned credit if their working was clear and not confused.

Question 9

(a) Some candidates elaborated their answers with diagrams whilst others wrote a short paragraph explaining what they thought was happening. With the diagrams and information given on the page, neither of these was necessary to answer the question and so did not gain any credit.

(b) Some candidates appeared to think that this was more complicated than it was. Others found a speed of 20 m/s but did not connect this to a model for the distance the truck travelled, perhaps not realising that the graph showed a value of 100 for the distance of the truck at time = 0, or perhaps not connecting the equation of the truck's line as the model.

(c) Some correct answers were seen. However, candidates found this question very challenging, not realising that they needed to equate their expressions for the distance travelled by the car, $25t$, to their expression for the distance of the truck + 55, and then solve for t.

(d) Candidates also found this part very challenging. Some, but not many, fully correct solutions were seen. However, some candidates gained a follow through mark for using their time value in **part (c)** correctly. Many candidates were not able to connect the parts of this question together.

(e) (i) Some candidates found a way to show this difference even though they had not been able to answer the previous parts correctly. This is good exam practice, and candidates should be encouraged to attempt all the questions.

(ii) Various answers such as $20 - x$ and $20 + x$ indicated that there was some misunderstanding from earlier information given. There were also numerical answers given when an expression was asked for.

(iii) A model for distance uses speed × time and time is $\frac{distance}{speed}$. Candidates needed to go back to these basics to find this model.

(iv) A few strong candidates substituted 690 for D in the model in the previous **part (iii)**. There were other methods that could have led to the correct answer. Candidates should look for connections between parts of questions to help them.

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