Principal examiner reports for teachers

Principal examiner reports for teachers summarise what candidates did well and what candidates needed to improve for this examination series only.

This report is to be used in conjunction with the question paper and mark scheme.

For guidance on teaching and learning we provide resources for many of our syllabuses.

Resource	Where to find it
Grade descriptions – Grade descriptions describe the level of performance typically demonstrated by candidates achieving the different grades awarded for a qualification.	School support hub Select: Subject > Resource finder > Syllabus and specimen materials
Schemes of work – Schemes of work are designed to support you in your teaching and lesson planning.	School support hub Select: Subject > Resource finder > Teaching and learning
Lesson planning – Guidance on how to plan a lesson.	Lesson planning
Resource plus – There may be additional resources such as teaching packs containing lesson plans, resources and worksheets and videos for aspects of your syllabus.	School support hub Select: Subject > Resource finder > Teaching and learning
Teaching tools	Teaching Tools
Exemplar candidate responses	School support hub Select: Subject > Resource finder > Teaching and learning
Learner guide – A guide for students to help them understand what the course involves.	School support hub Select: Subject > Resource finder > Teaching and learning
Community forums – Do you have a question or something to share? Our online forums are great way to keep up to date with your subject and the global Cambridge community.	Community forum on the school support hub
Access to scripts for this series.	Access to scripts service
Results analysis is available for some syllabuses.	Results analysis
Test maker is available for some subjects.	Test maker

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CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/11
Non-calculator (Core)

Key messages

What candidates did well

- Candidates showed knowledge of many aspects of the syllabus.
- The majority attempted every question, including the problem-solving questions and those with more than one mark.
- Most candidates showed clear working, with the steps shown in a logical order.
- The majority understood the mathematical vocabulary used in the questions and interpreted the command words correctly.
- Many candidates showed good understanding of recognising types of numbers, solving algebraic equations, working out probabilities and finding a length using mathematically similar shapes.

What candidates needed to improve

- Candidates needed to have attempted every question.
- Candidates needed to show full, clear working.
- Candidates needed to ensure that their answers are fully processed and checked for sense and accuracy.
- Candidates needed to read the information in the question carefully in order to give their answers in the required form.
- Candidates needed to become more familiar with working with the equation of a line, finding bearings, calculating probabilities from a tree diagram and set notation.

Comments on specific questions

Question 1

(a) Comprehensive responses

- Most candidates were able to write the given number correctly in figures.

Limited responses

- A few candidates needed to pay close attention to place value, giving answers such as 411, or the decimal, 0.4011.
- A small number misinterpreted the words ‘four thousand and eleven’ and wrote 400 011.

(b) (i) Comprehensive responses

- Most reached $\frac{60}{4}$ and the majority then went on to simplify correctly.

Limited responses

- Some partial processed the fraction giving $\frac{30}{2}$ or $\frac{15}{1}$ as their final answer.
- A few candidates made arithmetic errors in the numerator, denominator or both.

(ii) Comprehensive responses

- Most performed the division correctly.

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- The candidates who showed formal written methods for division often reached the correct answer.

Limited responses
- Similarly with the previous part, some made arithmetic errors when attempting the division.
- Some attempted to find the right answer by multiplying 9 by various values; this approach was not always successful.

Question 2

(a) Comprehensive responses
- Most candidates drew a ruled line that was the required length.

Limited responses
- A few candidates drew a line that was 1 cm too short, suggesting that they had started measuring at 1 cm, rather than 0 cm, on their ruler.

(b) Comprehensive responses
- Most drew the angle accurately and at the correct point.

Limited responses
- Some drew an angle that was not sufficiently accurate.
- Some drew an angle of 110°. This used the wrong scale on their protractor.
- A few drew an angle that was not at *A*, often in the middle of the line.

Question 3

Comprehensive responses
- Many candidates were able to identify the mathematical name of the first two triangles correctly.
- A minority labelled all three triangles correctly.

Limited responses
- Most candidates were able to name at least one triangle correctly.
- Common errors included labelling the final triangle as ‘isosceles’ or ‘obtuse’.

Question 4

Comprehensive responses
- Candidates who did well on this question interpreted the instructions carefully, realising that only one number was required in each part of the question.
- A large majority were able to identify the odd number and the prime number in the list.
- Many correctly identified the irrational number and the reciprocal of 4.

Limited responses
- A significant number gave 0.33 as the irrational number.
- Some gave –4 as the reciprocal of 4.
- A few included additional incorrect values from the list in their answers.
- Some gave numbers that were not on the list, for example, 3, for the prime number.

Question 5

Comprehensive responses
- Many candidates gave a fully correct answer showing logical work starting with the ‘units’ column.
- Some added working to the given calculation to show ‘borrowing’ or showed column subtractions.

Limited responses
- Some started with the ‘hundreds’ column, writing 3 in the missing space and then did not to make any further progress.
- Some started with the ‘units’ column and identified that the missing value was 4, then attempted to work with 6 and 7 without considering the necessary adjustments that were needed.

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Question 6

(a) **Comprehensive responses**

- Candidates who substituted 3 for x, almost always went on to arrive at the correct answer.
- Most showed very clear working.

Limited responses

- A few substituted correctly and then made arithmetic errors.
- Some incorrectly wrote that f(x) = 3 and proceeded from there to solve for x.

(b) **Comprehensive responses**

- Candidates who reached the correct answer usually showed full working, starting with the substitution and showing each step as they solved the equation.

Limited responses

- Some substituted correctly but needed to pay closer attention when solving the equation.
- Some incorrectly attempted to find f(20).

Question 7

(a) **Comprehensive responses**

- Most reached the correct solution to this one-stage algebraic question.

Limited responses

- Some made sign errors, leading to the common wrong answers, $x = 4$ and $x = 2$.

(b) **Comprehensive responses**

- A majority reached the correct solution of this three-stage algebraic question.
- Most showed clear working with every step shown in order.
- No instructions were given to the required format of the answer. Most chose to write their answer as an improper fraction, avoiding the need for a conversion to decimal form; this is where errors could have been made.

Limited responses

- Some did not collect the terms in x, with a number stating that $9x = 9$, and others showing $9x + 2 = 11x$.
- Some did not perform the last step of division by 5 after stating, $5x = 9$, often attempting to divide 5 by 9.

Question 8

(a) **Comprehensive responses**

- Many correctly wrote the standard form number as an ordinary number.

Limited responses

- Some made place value errors, leading to answers such as 0.000 64.
- Some did not deal correctly with the negative exponent and gave the answer 6400.

(b) **Comprehensive responses**

- Candidates who started by writing $\frac{1}{5^3}$ usually went on to reach the correct answer.
- Other candidates started by finding 5^3.

Limited responses

- Many were not successful using the negative exponent as common wrong answers included -125, $\frac{125}{1}$, and $\frac{5}{125}$.

(c) **Comprehensive responses**

- Candidates who evaluated each part correctly almost always went on to reach the correct answer.

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- Many knew that 2^4 is equivalent to 16.

Limited responses
- A significant number made errors evaluating both parts of the calculation.
- Few candidates knew that $\sqrt[3]{27}$ is 3.

Question 9

Comprehensive responses
- A minority correctly rearranged the equation to $y = 3 – 2x$ and then identified the gradient as the coefficient of x.

Limited responses
- A significant number gave answers that include x when only the coefficient of x is required.
- Some did not rearrange the equation and gave the gradient as −6 or 6.
- Some, who gave 2 as the gradient, omitted the negative symbol.
- This was one of the questions that was most often not attempted by candidates.

Question 10

(a) **Comprehensive responses**
- Most candidates were able to collect the terms correctly.

Limited responses
- A few did not simplify fully, giving answers such as $5h – 4h$.

(b) **Comprehensive responses**
- Many showed a correct expansion and collected the x terms correctly.

Limited responses
- Some showed the correct expansion but needed to pay closer attention when simplifying.
- Some made errors with one or more terms, for example, writing $2x \times x = 3x$ so gave a partially correct expansion.
- Some made sign errors collecting up the x terms.
- A few omitted terms in the expansion, with some only showing two products.

(c) **Comprehensive responses**
- A majority identified x as the common factor and went on to give the correct factorisation.

Limited responses
- Some were unable to identify x as the common factor.
- Some did not follow the command word, factorise, and instead incorrectly attempted to simplify the given expression by combining the unlike terms.

Question 11

Comprehensive responses
- Candidates who completed the first step in the rearrangement usually went on to reach the correct answer.

Limited responses
- Some candidates made sign errors when subtracting R from both sides.
- A significant number needed to pay closer attention when dividing by 4, either dividing only two of the three terms by 4 or multiplying by 4 instead of dividing.
- Some attempted to subtract 4 instead of dividing by 4.

Question 12

(a) (i) **Comprehensive responses**
- Most gave the correct list of elements in the intersection of set A and of set B.

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Limited responses

- Some listed all the elements or gave the elements of A and B that were not in the intersection or the elements of $A \cup B$.

(ii) Comprehensive responses

- A minority understood that number of elements was required and so gave the correct answer.

Limited responses

- Some gave a number that was the number of elements in either set A' or $A \cap B'$.
- Some listed the elements of either A, A', or $A \cap B'$ instead of giving the number of elements.

(b) Comprehensive responses

- Most identified $P \cup Q$.
- A minority also identified S'.

Limited responses

- Some described the shaded regions in words.
- Some confused union with intersection.
- Some incorrectly used the wrong labels, for example A and B, instead of the set labels in each diagram.
- Many included both R and S in their answer to the second part.

Question 13

Comprehensive responses

- Some set out very clear working, showing how they were applying the index laws to reach the answer.

Limited responses

- Most were able to simplify the numbers correctly, reaching an answer in the form $2x^n$, fewer candidates were able to simplify the index for x.
- A common error when working with the exponents was to find 5 – 2, leading to an answer of $2x^3$.

Question 14

(a) (i) Comprehensive responses

- Most gave the correct probability as a fraction.

Limited responses

- A few gave incorrect probabilities, some of which were greater than 1.
- Some used long division to give a decimal answer which will not give an accurate probability.

(ii) Comprehensive responses

- Most gave the correct answer as a fraction.
- Candidates who gave an incorrect answer in the pervious part usually followed through correctly in this part.

Limited responses

- Some made arithmetic errors and gave the answer $\frac{4}{11}$ following a correct answer in the previous part.

(b) (i) Comprehensive responses

- Most completed the first set of branches correctly and some candidates went on to complete the whole diagram successfully.

Limited responses

- Some wrote integers on the branches.
- Some wrote the words ‘apple’ and ‘not apple’ on the branches.
- A few attempted this as a ‘without replacement’ question so the second set of branches had probabilities with 10 as the denominator.

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(ii) Comprehensive responses

- A minority identified the correct two probabilities from their tree diagram and multiplied them to reach the probability for the combined event.

Limited responses

- Some read the probability from the second branch of the tree diagram and gave this as their final answer.
- Many attempted to add the probabilities.

Question 15

Comprehensive responses

- There were a minority of candidates who calculated the height of the cone correctly.
- Some gave the correct first step of equating the volume given to the formula with 6 substituted for *r*.
- Many responses included clear working.

Limited responses

- Some wrote the formula correctly, then substituted 48, rather than 48π, for the volume.
- Some attempted to use numerical values for π, resulting in unnecessary decimal calculations.
- Some candidates did not use the correct formula for the volume of a cone provided on the formula sheet.
- Some gave working such as 48 × 6 or 48 ÷ 6.

Question 16

Comprehensive responses

- Successful candidates often drew sketch diagrams to help them identify the required bearing.

Limited responses

- Very few candidates drew a correct diagram to show the given bearing and the required bearing.
- Many subtracted the given bearing from 180° or 360°.
- This was one of the questions that was most often not attempted by candidates.

Question 17

(a) Comprehensive responses

- A minority gave both correct answers about the symmetries of the parallelogram.
- A few attempted to draw lines of symmetry before giving the correct response that a parallelogram has 0 lines of symmetry.

Limited responses

- A significant number thought that a parallelogram has 1, 2 or 4 lines of symmetry.
- Some of candidates drew attempts at lines of symmetry or marked sides of equal length on the diagram.
- Some gave an angle as the order of rotation symmetry.
- The second part on the order of rotational symmetry was one of the questions that was most often not attempted.

(b) Comprehensive responses

- Most candidates were able to find the scale factor and reach the correct length of side *BC*.

Limited responses

- The most common error was to subtract 2 or 3 from 15.

Question 18

(a) Comprehensive responses

- Candidates used the correct mathematical terminology, stating ‘reflection’ or ‘reflects’.
- Some gave the correct equation for the line of symmetry.

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Limited responses

- Some candidates used non-mathematical vocabulary, such as ‘mirror’ or ‘flip’.
- Some did not give the correct equation for the line of symmetry.
- Occasionally the line was given as $y = 1$.
- Some described a single point or a value on one axis instead of giving the line of symmetry.
- Some candidates said that the transformation consisted of a reflection and a translation when a single transformation is required.

(b) **Comprehensive responses**

- Candidates used the correct mathematical terminology, stating ‘translation’ or ‘translates’.
- Many gave the correct translation vector.
- A few gave a correct description in words instead of giving a translation vector.

Limited responses

- Some candidates used non-mathematical vocabulary, such as ‘move’.
- Some made errors in the translation vectors, usually either sign errors, or reversing the components.
- A few incorrectly included a horizontal line between the components in their vector.

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CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/12
Non-calculator (Core)

Key messages

What candidates did well

- The majority attempted every question, including the questions that required multiple steps.
- Most candidates showed clear working, with each step shown in a logical order.
- The majority understood the mathematical vocabulary used in the questions and interpreted the command words correctly.
- Most worked accurately and used suitable techniques when calculating with integers and many were able to calculate accurately with decimals.

What candidates needed to improve

- Candidates need to read the questions carefully. For example, in **Question 4b**, some candidates found the number of candidates who are not right-handed, when the question asked for the number that are right-handed.
- A significant number made arithmetical or place value errors in some of their calculations. Candidates are advised to check their calculations carefully.
- Answers should be fully processed. Some candidates gave final answers that were not fully processed, for example writing $\frac{0.2}{1}$ instead of 0.2.
- Candidates need to know and use the mathematical vocabulary required by the syllabus, including names of shapes, such as hexagon (**Question 6**), and the vocabulary required to describe transformations (**Question 12c**).
- Candidates should be able to use and interpret set notation (**Question 11a** and **Question 11b**), including the symbols for union, intersection and the number of elements in a set.
- Candidates need to understand the relationship between the properties of a straight-line graph and the general equation $y=mx+c$ (**Question 15b**).

Comments on specific questions

Question 1

(a) **Comprehensive responses**

- Most candidates were able to find the correct costs.
- Many showed clear working at the side of the table.

Limited responses

- Some candidates omitted the decimal point in the cost of the peppers.
- A few candidates left the cost per kilogram for onions blank.

(b) **Comprehensive responses**

- The majority of candidates gave the correct amount of change for their total cost.

Limited responses

- A common error was to give an amount of change that was $1 too high, suggesting candidates had not dealt with the cents correctly when subtracting.

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Question 2

(a) **Comprehensive responses**
- Almost all candidates gave the correct value for the mode.

Limited responses
- A very small number found the mean or the range.
- A few gave the answer 3, which is the smallest value in the list.

(b) **Comprehensive responses**
- Most gave the correct value for the mean.
- The majority showed clear working.

Limited responses
- A small number made arithmetical errors.
- A few found the median.

(c) **Comprehensive responses**
- Most candidates placed the values in order and then gave the correct value for the median.

Limited responses
- Some candidates did not place the values in order and gave the middle value from the unordered list as their answer.
- A few found the mean.

Question 3

(a) **Comprehensive responses**
- Most gave the correct answer.

Limited responses
- A very small number of candidates thought there are 12 hours in a day.

(b) **Comprehensive responses**
- Most reached the answer 18:50.

Limited responses
- Some reached 18:50 and then included pm in their final answer, meaning their answer was in an incorrect form.

(c) **Comprehensive responses**
- Most candidates were able to work out Ali's arrival time, and many went on to work out the correct appointment time.

Limited responses
- Some candidates added 10 minutes to Ali's arrival time instead of subtracting 10 minutes.

Question 4

(a) **Comprehensive responses**
- Most gave the correct answer as a decimal.

Limited responses
- A few candidates subtracted the probability from 100 instead of subtracting from 1.
- Some candidates gave answers that were not fully processed, for example $\frac{0.2}{1}$.

(b) **Comprehensive responses**
- Most reached the correct answer.

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Limited responses
- Some made arithmetical or place value errors when evaluating 0.8 × 200.
- Some gave the fraction of candidates, instead of the number of candidates, as their final answer.
- A few found the number who are not right-handed.

Question 5

(a) Comprehensive responses
- Most candidates drew the correct pattern.
- Candidates' diagrams were neat and clear.

Limited responses
- A few candidates included extra vertical lines between the cross shapes.

(b) Comprehensive responses
- The majority gave the correct number of sticks for patterns 3 and 4 and many went on to find the correct number for pattern 8.
- Most used efficient calculations to find the number of sticks in pattern 8. A few wrote the numbers of sticks for patterns 5, 6 and 7 to help them reach the answer for pattern 8.

Limited responses
- Some candidates made errors when finding the number of sticks in pattern 8; many of these candidates did not show any working.

(c) Comprehensive responses
- There were many correct answers seen.
- Candidates who used the formula $a + (n - 1)d$ sometimes reached the correct answer.

Limited responses
- The most common error was to give the answer $n + 3$.
- Some candidates who attempted to use the formula $a + (n - 1)d$ either wrote the formula incorrectly or substituted incorrectly.

Question 6

(a) (i) Comprehensive responses
- A minority of candidates gave a fully correct formula in terms of P and x.

Limited responses
- A few gave an expression, such as $6x$, instead of a formula.
- Some candidates did not know how many sides are on a hexagon, with a number thinking a hexagon has 5 or 8 sides.
- A significant number attempted to use formulas relating to the angles in a polygon.

(ii) Comprehensive responses
- Most used the number of sides from their answer in **part (a)** in a correct calculation and many of these candidates reached the correct answer.

Limited responses
- Some candidates multiplied the perimeter by the number of sides.
- Some used values such as 180 or 360 in their working, suggesting that they were calculating with angles instead of lengths.
- A significant number did not attempt this part of the question.

(b) Comprehensive responses
- The most successful approach was to find the total of the interior angles, then divide this by the number of angles.

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Limited responses

- A number of candidates found the exterior angle correctly, then did not go on to calculate the size of the interior angle.
- A few used 72 (the perimeter) in their calculations.
- A significant number did not attempt this part of the question.

Question 7

(a) **Comprehensive responses**

- Most candidates showed a correct calculation, and the majority reached the correct answer.

Limited responses

- A significant number made arithmetical errors when attempting to divide 13 by 20 or when attempting to convert $\frac{13}{20}$ to an equivalent fraction with a denominator of 100.
- Some candidates showed a correct calculation to find the percentage, then did not attempt to evaluate the answer.

(b) **Comprehensive responses**

- Many candidates showed clear working.
- The most successful approach was to find 5 per cent of \$420 and then subtract this from the original price.
- A few candidates found 95 per cent of \$420.

Limited responses

- Some candidates made arithmetical errors when finding 5 per cent or 95 per cent of \$420.
- A significant number showed a division by 5 in their attempt to find 5 per cent, suggesting that they thought 5 per cent was equivalent to $\frac{1}{5}$.

Question 8

(a) **Comprehensive responses**

- Most candidates showed clear algebraic working and reached the correct answer.

Limited responses

- A small number made sign errors when solving the equation.
- A few candidates reached the stage of writing $2x = 9$, then were unable to find x. Some showed $9 \div 2$, then evaluated the answer incorrectly.

(b) **Comprehensive responses**

- Most candidates added the given equations to eliminate *y,* and the majority went on to reach the correct answers.
- Some opted for longer methods, such as eliminating *x* or using a substitution method; many of these candidates were able to go on to reach the correct answers.

Limited responses

- Some candidates subtracted the given equations, which is not a correct method for eliminating a variable in this case.

Question 9

Comprehensive responses

- Most candidates showed very clear working.
- Most candidates worked in stages, finding the volume of the first cuboid, then multiplying 10 by 6, and finally dividing 75 by 60.
- A few candidates wrote an equation in *x* and solved it.

Limited responses

- Some reached the stage of finding 75 and 60 then did not make further progress.

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- Some showed $75 \div 60$ and could not evaluate this.

Question 10

Comprehensive responses
- The majority reached the correct answer.
- Some showed clear calculations.
- Some wrote the correct answer with no working, suggesting they had done this mentally.

Limited responses
- A common error was to divide 64 by 2 and give the answer 32.
- Some showed $2 \times 2 = 4$, $4 \times 2 = 8$, $8 \times 2 = 16$, $16 \times 2 = 32$, and $32 \times 2 = 64$, then went on to give the answer $n = 5$. This suggests that these candidates had counted the number of calculations instead of identifying the number of times that 2 appeared in the multiplications.
- Some gave the answer 2^6 instead of finding the value of n.

Question 11

(a) **Comprehensive responses**
- Most were able to list the elements in the universal set.
- Some candidates demonstrated an excellent understanding of set notation and gave fully correct answers.

Limited responses
- Some omitted all the elements of A and B from the universal set.
- Some candidates listed the elements in $A \cup B$; others listed the elements in the union of the two sets, minus the intersection.
- Some candidates listed the elements in A' instead of giving the number of elements; a few listed the elements in set A.

(b) **Comprehensive responses**
- Some candidates used correct set notation in their answers.
- Many were able to identify $P \cup Q$.

Limited responses
- Some used the intersection symbol where the union symbol was required and vice versa.
- Some candidates gave answers that included R', instead of T'.
- Some included 'n' in their answers, for example writing $\mathrm{n}(R \cap T')$.
- Some used the letters A and B instead of using the letters given in the question.

Question 12

(a) **Comprehensive responses**
- The majority drew the correct shape in the correct position.
- Most used a pencil and ruler to draw the shape accurately.

Limited responses
- Some drew the lines freehand.
- Some drew a shape with one or two vertices correct and the remaining vertices incorrect, meaning that their image was not congruent to the given shape.
- A few drew a reflection or rotation of the given shape.

(b) **Comprehensive responses**
- The majority drew the correct shape in the correct position.
- Most used a pencil and ruler to draw the shape accurately.

Limited responses
- Some drew the lines freehand.
- A few drew a rotation or translation of the given shape.

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- A small number reflected the shape and then translated it.

(c) **Comprehensive responses**

- Most identified that this was a rotation.
- Some described the rotation fully.

Limited responses

- Some only identified the type of transformation and did not identify the centre or angle of rotation. Candidates should be aware that the number of marks available on the question is a guide to the number of points that should be included in a full description of a transformation.
- Some identified the angle of rotation, then omitted the direction in which the shape was rotated. For angles other than 180°, candidates need to identify whether a rotation is clockwise or anticlockwise.
- A few used words such as 'turned', instead of 'rotation'; candidates are expected to use correct mathematical vocabulary.
- Some gave answers that were combinations of transformations, for example a rotation followed by a translation.

Question 13

Comprehensive responses

- Some candidates gave fully correct responses, showing clear working and writing any angles that they found on the diagram.
- Most recognised that angle *BPQ* and angle *x* were equal.

Limited responses

- Some candidates did not recognise that angle *PBQ* was 90°.
- Some incorrectly assumed that triangle *PBQ* was isosceles.

Question 14

(a) **Comprehensive responses**

- The majority gave the correct answer in standard form.

Limited responses

- Some candidates gave a positive value for the power of 10.
- Some gave the power of 10 as –4 or –6.

(b) **Comprehensive responses**

- Many showed both stages in their working clearly; they evaluated the multiplication correctly and then converted their answer into standard form.

Limited responses

- A few did not give their final answer in standard form.
- Some completed the multiplication correctly, then made errors when converting to standard form.
- Some made arithmetical errors when evaluating the multiplication. Some of these candidates were able to convert their answer into correct standard form.

Question 15

(a) **Comprehensive responses**

- Some used the diagram to help them, by marking the midpoint on the diagram and then writing down the coordinates.

Limited responses

- A significant number used a longer method where they wrote the coordinates of points *A* and *B* and then used calculations to find the midpoint. A number of these candidates made arithmetical errors.
- Some candidates gave coordinates of points that were not on the line. Candidates are advised to check that their final answers make sense in the context of the question.

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(b) **Comprehensive responses**

- Some candidates used the graph to help them reach the answer, demonstrating a clear understanding of the relationship between the properties of the graph and the general equation $y=mx+c$.
- Most realised they needed to find that gradient and many used the formula $m=\frac{y_2-y_1}{x_2-x_1}$.

Limited responses

- Some candidates made errors when substituting into the formula $m=\frac{y_2-y_1}{x_2-x_1}$ or when evaluating the result.
- Some performed calculations to find *c*, instead of reading this value from the graph.
- A significant number did not attempt this part of the question.

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CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/13
Non-calculator (Core)

Key messages

What candidates did well

- Candidates showed knowledge of many aspects of the syllabus.
- Many candidates showed clear working, with the steps shown in a logical order.
- Many understood the mathematical vocabulary used in the questions and interpreted the command words correctly.
- Many candidates showed good understanding of converting decimals to percentages, working with bar charts and pie charts.

What candidates needed to improve

- Candidates needed to have attempted every question.
- Candidates needed to show full, clear working.
- Candidates needed to ensure that their answers are fully processed and checked for sense and accuracy.
- Candidates needed to read the information in the question carefully in order to give their answers in the required form.
- Candidates needed to become more familiar with questions requiring a result to be shown, giving mathematical reasons and working out lengths of 3D shapes given the volume.

Comments on specific questions

Question 1

(a) **Comprehensive responses**

- Many candidates translated the phrase into the correct calculation.
- Many worked out 42 ÷ 6, then correctly multiplied the answer by 5.

Limited responses

- Some candidates worked out a decimal value for $\frac{5}{6}$ and then multiplied that by 42.
- Some calculated 42 ÷ 6 correctly as 7 and then gave an incorrect answer to 7 × 5.

(b) **Comprehensive responses**

- Most candidates converted the decimal to correct percentage.

Limited responses

- Incorrect responses included 1.5 per cent or 150 per cent showing that candidates did not multiple by 100.

(c) **Comprehensive responses**

- Some candidates were successful at finding the numerator of the fraction.
- Most of those who were successful, showed clear working.

Limited responses

- Many gave 20 as the numerator and other numbers such as 9, 12 or 40 were seen.

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- Many showed no working and only a number in the answer box.

Question 2

Comprehensive responses
- Many listed all four factors.

Limited responses
- Many gave only two of the factors, most commonly, 3 and 7.
- Occasionally, a few gave multiples of 21 instead of factors.
- Some gave other numbers that were neither factors or multiples such as 9, 10, 20 or 0.

Question 3

Comprehensive responses
- Most candidates worked out the how many questions Robin answers.

Limited responses
- A few counted up to 1 hour in jumps of 5 minutes and made slips in their listings.

Question 4

(a) Comprehensive responses
- A small number were successful in handling this calculation as the second part was a number rather than another fraction. Candidates needed to turn the mixed number to an improper fraction and to change the division by 5 into $\times\frac{1}{5}$ before going on to calculate the correct answer.
- Some succeeded with one of the two parts of the method.

Limited responses
- Many did not correctly change the mixed number to an improper fraction giving $\frac{4}{5}$ or $\frac{4}{20}$.
- Most showed no or fragmented workings.

(b) Comprehensive responses
- More candidates were correct with this part of the question, applying BIDMAS to work out the calculation.

Limited responses
- A few wrote 12 – 7 as they worked from left to right and omitted the multiplication sign.
- Others gave 12 × 7 = 84.
- Occasionally, a few treated the multiplication sign as a variable, x, and made other errors producing $12x - 7 = 5x$.

Question 5

Comprehensive responses
- Some recognised 1 as the cube number.
- More candidates picked out 45 as the common multiple of 3 and 5.

Limited responses
- 33 and 49 were the numbers most often chosen for the cube number.
- Occasionally some gave more than one answer when the question asks for ‘the cube’ and ‘the common multiple’. This form of the question means that there is only one of each type of number in the list.
- 1 was picked as the common multiple when it actually is a common factor of both 3 and 5.
- A few candidates gave a common multiple such as 15 which was not on the list.

Question 6

(a) Comprehensive responses

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- Most candidates drew bar charts with accurate heights and equal width bars using the guidelines provided.

Limited responses
- A few made one or more height error.
- Some drew bars of different widths.

(b) **Comprehensive responses**
- Many gave the correct simplified fraction.

Limited responses
- Many did not simplify their faction completely, for example, $\frac{20}{40}$ or $\frac{10}{20}$ were often given.
- A few inverted the fraction showing misunderstanding of fractions and probability.
- Some gave a percentage when the question as for a fraction in its simplest form.

Question 7

Comprehensive responses
- Only a small minority did well with all the parts to this question working with the equation of a straight line.

Limited responses
- Many did not attempt one or more parts to this question.

(a) **Comprehensive responses**
- Only a minority extracted the required information from the equation of the straight line to give the correct coordinates of the point where the line crosses the *y*-axis.

Limited responses
- Many candidates did not show full understanding of the meaning of the '*c*' in the equation of a straight line, $y = mx + c$.
- Some incorrectly gave (2, – 5), using both numbers given in the equation.

(b) **Comprehensive responses**
- A similar small number got this second part correct, picking out the coefficient of *x* as the gradient.

Limited responses
- Many candidates did not show full understanding of the meaning of the '*m*' in the equation of a straight line, $y = mx + c$.
- A few gave $2x$. Only the coefficient of x represents the gradient in this context.

(c) **Comprehensive responses**
- A few candidates showed the given result with clear, logical working.
- Those that did well, substituted one coordinate into the equation and solved it to show that the result was the other coordinate.

Limited responses
- Most candidates gave very little working showing that they were unsure how to start the question.
- Some drew diagrams, which is not part of showing that point *B* is on the line although it can help with visualisation. A diagram had to be followed by an algebraic approach working from one coordinate to the other to show that the point was on the line.
- This was the question most frequently left blank on the paper.

(d) **Comprehensive responses**
- A higher number of candidates were successful here finding the midpoint of line *AB* than with the previous parts. This required use of their coordinates of *A* found in the first part of the question.

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Limited responses
- Some found one coordinate either correctly or following on from their point *A*.

Question 8

(a) **Comprehensive responses**
- Some candidates gave the correct name for the quadrilateral.

Limited responses
- Some answered in other languages other than English.
- Parallelogram was often given as the answer. A parallelogram has two pairs of parallel sides, and this only has one pair.
- Others gave words which were not names of quadrilaterals, for example, obtuse and pyramid.
- Some gave trapezoid, which is the name of a 3D solid.

(b) (i) **Comprehensive responses**
- A majority of candidates were correct with both the size of the angle and the geometric reason.

Limited responses
- Some gave the correct angle.
- Fewer were correct with the reason.
- Some gave a calculation rather than a reason in words.

(ii) **Comprehensive responses**
- Quite a few candidates realised that this angle and the last were the same size.
- Fewer candidates were able to demonstrate understanding here compared to the last part.

Limited responses
- Many did not realise the two angles were both 40°.
- Again, candidates gave methods of how to find the angle or a calculation rather than the geometric reason.

(c) (i) **Comprehensive responses**
- Only a very small number knew that this was a scalene triangle.

Limited responses
- This was the question on paper that had the fewest correct answers with equilateral, isosceles or right angled seen the most often.
- Also seen were acute and obtuse, types of angles rather than triangles.

(ii) **Comprehensive responses**
- Candidates were much more likely to name the angle correctly than the triangle in the previous part.

Limited responses
- Words seen here include regular, right, rectangle, internal, straight and equilateral. The only names used to describe angles are acute, obtuse, reflex and right angle.

Question 9

(a) **Comprehensive responses**
- Most candidates were successful at finding all three missing angles.

Limited responses
- A few candidates gave one sector angle correct.

(b) **Comprehensive responses**
- A large majority of candidates drew the pie chart accurately and gave the correct category labels.
- Most candidates used a ruler to draw the sectors.

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Limited responses
- Some tried to draw the pie chart using their angles which did not add up to 360°.
- Some, who drew the sectors correctly, did not add the category labels.

Question 10

Comprehensive responses
- Some were very successful with this problem-solving question.
- Candidates, who did well here, started by listing the square and cube numbers that were in the given range. Those candidates then worked though the lists to see the pair of satisfied the last condition.
- Many candidates showed that the square number must be the larger number.
- Some candidates provided two lists but did not continue with the rest of the question. To improve, candidates should ensure they address all parts of the question, not just the initial requirements.

Limited responses
- Some did not use the conditions given in the question so answers of less than 26 or greater than 65 were given.
- A few showed some correct working towards the answer.
- Some gave two integers with no working to explain how they had been produced.

Question 11

(a) **Comprehensive responses**
- Many were able to complete the Venn diagram with all 12 integers.

Limited responses
- Some who filled in the numbers in sets A and B, did not show the numbers in the universal set that were outside sets A or B.

(b) **Comprehensive responses**
- Slightly fewer candidates than for the previous part, were able to describe the sharded region with set notation.

Limited responses
- Some described the shaded region in words rather than with set notation.
- Some wrote $P \cup Q$, when it should have been $P \cap Q$ as this is the intersection of P and Q not the union.
- Some wrote the wrong letters for the names of the sets – the correct letters must be used.

Question 12

(a) **Comprehensive responses**
- A majority of candidates brought ratios and expected frequency together.
- Successful candidates found the probability of taking a green counter from the ratio of red: green counters in the bag and multiply by 200.

Limited responses
- Some candidates could convert the ratio into a probability for taking a green counter and went no further.
- Some did not apply the information that Sammy repeated the experiment 200 times.
- A few formed an incorrect equation such as, $2x + 3x = 200$, and got to an answer of 40.
- Others added on to the ratio to find when the sum of red and green was 200 and made arithmetic errors.

(b) **Comprehensive responses**
- Only a few were able to explain that there cannot be 88 counters as the parts of the ratio add to 5 so that there must be a multiple of 5 counters in the bag.

Limited responses

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- A few understood that the ratio contained 5 parts or that every for 5 counters this meant there were 2 red and 3 green. This did not progress into a statement that 88 cannot be the number as it is not a multiple of 5.
- Some said that as Sammy did the experiment 200 times there must be 200 counters. This does not take into amount the information that Sammy replaced the counter each time.

Question 13

(a) **Comprehensive responses**

- Only a small number were able to factorise the expression fully.

Limited responses

- Some candidates factorised out one factor of the two.
- Some combined the two unlike terms to gives answers such as $9b^3$ or $9b^4$.

(b) **Comprehensive responses**

- More candidates were successful with this part of the question, multiplying the brackets by the number outside then collecting up like terms.

Limited responses

- Some worked out the $16x$ or the + 23.
- A few showed some correct method and then combined unlike terms the same as was done in the previous part.
- Some treated this as almost two brackets to multiply out, giving answers such as $7(6x^2 + 4)$ or $7(4x^2 + 5)$.

Question 14

Comprehensive responses

- A small number worked through this multi-step question from an initial correct statement, $900 = \frac{1}{3} \times 10 \times 10 \times h$ to achieve the correct value for h.
- Of those that started with the equation given above, some candidates needed to deal with the fraction correctly.

Limited responses

- Mostly the starting statement did not use the correct formula provided on the formula sheet.
- Candidates used 10 cm (the length of the base) instead of the area, 100 cm^2 in the formula.
- Some used values such as 40 (the perimeter of the base) or 10^3.
- Others gave the height as 90 from, 900 ÷ 10.

Question 15

Comprehensive responses

- Some of candidates were successful with this well know type of question showing fully correct methods and answers.
- Some made a single arithmetic error in the multiplication of the equations and went on to complete their method, giving answers that satisfied one of the equations.

Limited responses

- Some candidates used matrix methods to attempt to solve this pair of simultaneous equations. There were many method and arithmetic errors in candidates' work. Candidates needed to have a full understanding of this type of method as it is harder to find, and correct, errors compared to elimination methods.
- Some made many arithmetic errors at different stages of method. The candidates could have checked that their solutions work in both equations and if not, gone back through their work.

Question 16

Comprehensive responses

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- Candidates were more successful here than with the last question, with many finding r and then going on to calculate the area of the circle.
- Some candidates showed clear, logical working to this multi-stage problem.
- Some candidates found that the radius was 6, worked out the area was 36π and then multiplied this out.

Limited responses

- Some used 12 as the radius of the circle ignoring the information that 12π is the circumference of the circle, so their answer for the area was 144π. Sometimes this last value was multiplied out as about 446.
- Others correctly found the radius was 6 and then used the wrong formula so gave 6π or 18.84 or 18.84π as their answer for the area.
- A few worked out 6 (the value of r) and went no further.

Question 17

(a) **Comprehensive responses**

- Many were successful here, giving all four of the integer values of n.
- Most knew that 2 was not a value for n showing that they understood the less than symbol.

Limited responses

- Many gave three values with no incorrect values.
- Some gave values outside the range of the inequality, for example 7.

(b) **Comprehensive responses**

- A good number were correct, drawing two symbols joined by a line in the correct places.

Limited responses

- Some did not show the two ends of the inequality with circles – a filled in circle for the less than or equal and an empty circle for the more than.
- Similarly, for this type of inequality, there should a straight line joining the two circles – this often missing or there was an arc between integers.
- Some used the same type of circles for both ends.

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CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/21
Non-calculator (Extended)

Key messages

What candidates did well
- Many candidates demonstrated expertise across the full range of questions.
- Many candidates demonstrated competence in completing questions that required standard mathematical processes.
- Many candidates demonstrated skills in algebraic manipulation, factorising, simplifying and solving linear equations.
- The majority of candidates showed working for each question.
- Some candidates produced accurate and well set out solutions when answering the longer problem solving questions, such as **Questions 20(b)** and **23**.

What candidates needed to improve
- Candidates should take care with basic arithmetic.
- Candidates should write numbers clearly, for example making sure their 3 and their 5 are distinct and their 1 and their 7 are distinct.
- Correct mathematical wording should be used when giving a geometrical reason (**Question 13(b)**) or describing a transformation (**Question 12**).
- Candidates should be careful when using negative signs both in calculations and in algebra.
- Candidates should be careful when writing algebraic answers, ensuring that brackets are correct and that answers are written correctly on the answer line.
- Candidates should set their working out in a logical order working down the page. Many candidates have working scattered all over the answer space.
- Some candidates make a number of attempts to answer a question. Working that is not part of an answer should have a ruled line put through it as otherwise it will be considered to be part of the solution.

Comments on specific questions

Question 1

Comprehensive responses
- Most candidates gave the correct value as a mixed number.

Limited responses
- A few candidates made arithmetic errors when dividing 31 by 7.
- A few candidates gave their answer as a decimal number.

Question 2

Comprehensive responses
- Most candidates gave the correct fraction.

Limited responses
- A few candidates gave the answer as the decimal 0.3.

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- A few candidates gave the answer $\frac{3}{100}$.

Question 3

Comprehensive responses
- Most candidates gave the correct answer.

Limited responses
- A few candidates unsuccessfully used trials to try and find a number whose square is 196.

Question 4

Comprehensive responses
- Most candidates found the correct value for *W*.

Limited responses
- A few candidates made arithmetic errors after the correct substitution of *H* and *X*.

Question 5

Comprehensive responses
- Most candidates gave the correct vector.

Limited responses
- Some candidates treated the vectors as fractions and gave $\frac{1}{2}\boldsymbol{a}$ as $\begin{pmatrix} 3 \\ -4 \end{pmatrix}$ or $\begin{pmatrix} 6 \\ -8 \end{pmatrix}$ rather than $\begin{pmatrix} 3 \\ -2 \end{pmatrix}$.
- Some candidates worked out $\frac{1}{2}(\mathbf{a}+\mathbf{b})$ rather than $\frac{1}{2}\mathbf{a}+\mathbf{b}$.

Question 6

Comprehensive responses
- Many candidates gave the correct answer of 144.

Limited responses
- Some candidates calculated 8×180 incorrectly.
- Some candidates worked out the exterior angle rather than the interior angle.
- Some candidates did not know that a decagon has 10 sides.

Question 7

(a) (i) Comprehensive responses
- Almost all candidates completed the sample space correctly.

Limited responses
- A few candidates made slips when completing the sample space.

(ii) Comprehensive responses
- Most candidates correctly found the probability.

Limited responses
- A few candidates showed incorrect calculations rather than selecting H1 and H3 out of the 8 possibilities in the sample space.

(b) Comprehensive responses
- Many candidates worked out the probability correctly.

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Limited responses

- Some responses showed a correct method with arithmetic errors.
- Some candidates calculated $3 \times \frac{4}{5}$ instead of $\left(\frac{4}{5}\right)^3$.
- A few candidates calculated $\left(\frac{1}{5}\right)^3$.

(c) **Comprehensive responses**

- Many candidates showed the two correct products and added them together.

Limited responses

- Some candidates only considered one colour of balls being the same.
- Some candidates added instead of multiplying the probabilities.
- Some candidates made arithmetic or method errors when multiplying or adding the fractions.
- A few candidates used with replacement rather than without replacement.

Question 8

Comprehensive responses

- Most candidates were able to correctly give at least one of the gradient or y-intercept.

Limited responses

- Some candidates rearranged the given equation incorrectly.
- Some candidates took their answers from the given equation.
- A few candidates gave the gradient incorrectly as $\frac{x}{4}$.
- A few candidates gave the coordinate of the *y*-intercept rather than just the *y* value.

Question 9

Comprehensive responses

- Most candidates expanded and simplified the expression correctly.

Limited responses

- After expanding and simplifying correctly, candidates needed to handle negative signs when collecting or re-ordering the terms.
- A few candidates had less than four terms when expanding the brackets.

Question 10

(a) **Comprehensive responses**

- Most candidates solved the equation correctly for *x*.
- Some candidates made arithmetic errors in an otherwise correct solution.

Limited responses

- A few candidates expanded the brackets as $10n - 3$.
- A few candidates subtracted 15 from 40 rather than adding 15 and 40.
- A few candidates, after reaching $10x = 55$, gave their final answer as $x = \frac{10}{55}$.
- A few candidates left their answer as $x = \frac{55}{10}$ rather than simplifying it.

(b) **Comprehensive responses**

- Most candidates solved the pair of simultaneous equations using either elimination or substitution.

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Limited responses

- A few candidates only multiplied some terms before elimination rather than multiplying all terms.
- A few candidates made sign errors were made when adding or subtracting equations.
- Some candidates were able give a pair of values that satisfied one of the equations.

(c) **Comprehensive responses**

- Most candidates correctly solved the inequality.

Limited responses

- A few candidates made sign errors when collecting like terms.
- A few candidates needed to use the correct mathematical notation with the inequality sign, writing $n < 9$ or $n + 9$.
- A few candidates, after finding $n > 9$, gave their final answer as $n \geq 10$. This is incorrect as n is not defined as only an integer in this question.
- A few candidates attempted to find n by using trials.

Question 11

Comprehensive responses

- Many candidates correctly found the perimeter.
- Most candidates were able to find the arc length.
- Some candidates gave the incorrect final answer of 15π after trying to simplify $3\pi + 12$.

Limited responses

- Some candidates found the area of the quadrant rather than the circumference.
- Some candidates worked out the circumference of the whole circle and did not divide it by 4 to find the arc length of the quadrant.

Question 12

Comprehensive responses

- Some candidates described the transformation completely.

Limited responses

- Some candidates used words such as shift, move, enlarge, reflect instead of translation.
- Many candidates gave vectors such as $\begin{pmatrix} 0 \\ 2 \end{pmatrix}$ or $\begin{pmatrix} -2 \\ 0 \end{pmatrix}$.
- Some candidates tried to use words to describe the movement by two units using an incorrect direction such as left, up or down.

Question 13

(a) **Comprehensive responses**

- Some candidates gave the correct angle and stated that opposite angles in a cyclic quadrilateral add to 180.

Limited responses

- Most candidates were able to give the correct angle.
- Many candidates tried to describe the geometrical reason without including, cyclic quadrilateral, opposite angles and sum to 180.
- A few candidates said the opposite angles equal 180 rather than sum to 180.

(b) **Comprehensive responses**

- Some candidates were able to find angle *SOR* or one of the 50° angles.

Limited responses

- Many candidates were able to correctly identify at least one correct angle on the diagram.
- Many candidates made incorrect assumptions about the diagram such as *OR* is perpendicular to *QS* or *OS* = *RS*.

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- Many candidates showed a range of calculations that were not clearly connected to an identified angle.

Question 14

Comprehensive responses
- Most candidates were able to complete at least a first step towards finding the value.
- Many candidates chose to first find the cube root of 27 before squaring.

Limited responses
- Some candidates attempted to square first rather than cube root first.
- A few candidates thought the negative power made the whole answer negative.
- A few candidates tried to find the cube rather than the cube root or the square root rather than the square.

Question 15

(a) **Comprehensive responses**
- Most candidate gave the number correctly in standard form.

Limited responses
- A few candidates had the power as negative 4.
- A few candidates gave answers such as 204×10^2.
- A few candidates had incorrect powers such as 3 or 5.

(b) **Comprehensive responses**
- Many candidates gave answer correctly in standard form.

Limited responses
- Some candidates added 4.2 and 3.1 and added the powers, giving an incorrect answer of 7.3×10^{31}.
- Some candidates incorrectly changed 4.2×10^{16} to 0.42×10^{15}.
- Some candidates had the figures 451 in an answer that was either not in correct standard form or the power of 10 was incorrect.

Question 16

Comprehensive responses
- Many candidates gave the correct answer or simplified at least two of the parts correctly.

Limited responses
- Some candidates were able to simplify one of the parts correctly.
- Some candidates needed to use the correct method when expressing each number as a product of its prime factors.
- A few candidates simplified, for example $\sqrt{5^2 \times 3}$ as $3\sqrt{5}$.
- A few candidates simplified $\sqrt{75} + \sqrt{48} - \sqrt{12}$ as $\sqrt{75 + 48 - 12}$.

Question 17

Comprehensive responses
- Many candidates were able to give at least two parts of the final answer correctly.

Limited responses
- A few candidates found the lowest common multiple.
- A few candidates gave the numerical coefficient as 2, 4, 16, 40 or 48.
- A few candidates found the product of the two expressions.

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Question 18

Comprehensive responses
- Many candidates gave the correct answer 3.

Limited responses
- Some candidates gave incorrect answers such as 4, 8 and 16.
- A few candidates gave no response.

Question 19

Comprehensive responses
- Most candidates gave the correct answer 4.

Limited responses
- Some candidates divided the powers on the left-hand side rather than subtracting them.
- Some candidates made sign errors, when collecting like terms, after reaching $12 – n = 2n$.

Question 20

(a) **Comprehensive responses**
- Many candidates gave the length correctly in surd form.
- Some candidates made an arithmetic error in an otherwise correct method that used Pythagoras.

Limited responses
- Some candidates were able to show 8 – (–4) and –1–3.
- Some candidates added the coordinates rather than finding the difference between them.
- Some candidates needed to correctly apply negative signs both when setting up Pythagoras' theorem or when trying to work out the differences.
- Some candidates thought that the squares and root in Pythagoras' theorem cancelled, so that $\sqrt{12^2 + 4^2} = 12 + 4$.

(b) **Comprehensive responses**
- Some candidates gave the correct equation of the line.
- Many candidates were able to show a substantially correct method for finding the mid-point, the gradient of *AB*, the perpendicular gradient and the constant *c*.
- Some candidates made a slip with the arithmetic or negative signs in an otherwise correct method.

Limited responses
- Some candidates were able to show a correct method for finding one of the midpoint, the gradient of *AB*, the perpendicular gradient or the constant *c*.
- Some candidates found the perpendicular line passing through *A* or *B*.
- Some candidates found the equation of the line *AB.*
- Some candidates made multiple arithmetic and sign error slips.
- Some candidates working was unsystematic and hard to follow.

Question 21

(a) **Comprehensive responses**
- Some candidates combined the fractions correctly.
- Many candidates needed to correctly apply signs after combining the two fractions over a common denominator.

Limited responses
- Most candidates were able to give a correct denominator.
- Many candidates needed to apply the correct methods when dealing with $–5x(x – 3)$ with the $+15x$ often seen as $–15x$ or +15 or –15.
- Some candidates added the numerators with no multiplication.

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- A few candidates reversed the terms.

(b) **Comprehensive responses**

- Many candidates simplified the fraction correctly.
- Some candidates incorrectly simplified a correct answer from $\frac{2x+3}{x+4}$ to $\frac{x+3}{4}$.

Limited responses

- Many candidates were able to correctly factorise either the numerator or the denominator.
- Some candidates made an attempt at factorising without being able to find any factors.
- Some candidates tried to subtract individual terms in the given fraction with $\frac{4x^2-9}{2x^2+5x-12}$ becoming $\frac{2x^2-9}{5x-12}$.

Question 22

Comprehensive responses

- Some candidates gave both values for *w*.
- Some candidates were able to give one of the two correct values for *w*.

Limited responses

- Many candidates were able to reach *cos w* = –0.5.
- Many candidates did not work with 60°, and with angles such as 30° and 45°.
- A few candidates gave two angles with a sum of 180.

Question 23

Comprehensive responses

- Some candidates showed clear and mathematically precise workings to reach the required equation.
- Some candidates reached the required result with working that was unclear, often missing brackets around the 5*x* and writing $5x^2 = 25x^2$.
- Many candidates worked out the height of the cone as 12*x*.
- A few candidates recognised the 5, 12, 13 Pythagorean triple to give 12*x* immediately.

Limited responses

- Many candidates made an attempt at using Pythagoras to work out the height of the cone.
- Some candidates used 13*x* for the height of the cone.
- A few candidates used 5*x* as the radius of the sphere.
- A few candidates used incorrect formulae for the volumes of the solids.
- Many candidates had working throughout the working space which was unclear and hard to follow.
- Some candidates had several attempts and did not make it clear which one was to be marked.
- Some did not show a full correct statement linking the volume of the cone and of the sphere, which was required for this show that question.

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CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/22
Non-calculator (Extended)

Key messages

What candidates did well
- Candidates demonstrated excellent mathematical skills across the full range of questions.
- The standard of written work was very good.
- Many candidates demonstrated competence in completing questions that required standard mathematical processes.
- Many candidates demonstrated skills in algebraic manipulation, factorising, simplifying and solving linear equations.
- The majority of candidates showed working for each question.

What candidates needed to improve
- Candidates must show all of their working.
- Incorrect answers without working cannot be given credit, whereas partial credit can be awarded if a correct method is shown.
- Candidates should check their working in each question to ensure that they haven't made any careless numerical slips.
- Candidates should be careful when using negative signs both in calculations and in algebra.
- Questions where candidates are required to show a given result, candidates must show all of the correct details of their working to score full marks.

Comments on specific questions

Question 1

(a) **Comprehensive responses**
- Most candidates measured the acute angle accurately and subtracted their answer from 360° showing they understood the word reflex.

Limited responses
- A small number of candidates subtracted 40 from 180°.

(b) **Comprehensive responses**
- This part was well answered. Candidates were able to calculate the required angle using a combination of angle facts.
- Candidates should annotate the diagram in case of arithmetic mistakes.

Limited responses
- Some candidates thought that $m = 70°$ as it was an alternate angle.

Question 2

(a) **Comprehensive responses**
- Nearly all candidates demonstrated that they knew the sum of probabilities is equal to 1.

Limited responses
- A small number of candidates made an arithmetic mistake.

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(b) **Comprehensive responses**

- Most candidates realised that they had to calculate $\frac{5}{6} \times 72$.

Limited responses

- Some candidates started the question correctly and were unable to obtain the correct answer.

Question 3

Comprehensive responses

- This question was well answered. Candidates were able to calculate the time difference in hours and minutes

Limited responses

- Some candidates gave the answer as 14h 5 min.

Question 4

(a) **Comprehensive responses**

- Most candidates were able to translate the triangle correctly.

Limited responses

- Some candidates needed to translate the triangle by the vector $\begin{pmatrix} 3 \\ 1 \end{pmatrix}$.

(b) **Comprehensive responses**

- There were many excellent descriptions with candidates giving all 3 parts of the transformation. This showed a clear understanding of transformations.

Limited responses

- Some candidates did not give the direction of the rotation. To improve, candidates should ensure they specify both the direction and the angle and centre of rotation when describing a rotation.

Question 5

Comprehensive responses

- Most candidates who used the fact that the interest was \$12 were then to find the correct value of *r*.

Limited responses

- A significant number of candidates worked with \$212 which resulted in an answer of 53%. An answer of this magnitude was clearly incorrect.

Question 6

(a) **Comprehensive responses**

- Many candidates were able to show their working in vector form.

Limited responses.

- Some candidates only showed the subtraction of numbers or coordinates in their response. To improve, candidates should ensure they provide a full calculation, as required by the question.

(b) **Comprehensive responses**

- Most candidates understood the notation and were familiar with the modulus of the vector as being its magnitude and were able to find the correct answer.

Limited responses

- Some candidates didn't realise that the question related to a 3, 4, 5 triangle.

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(c) **Comprehensive responses**

- Nearly all candidates started the question correctly by multiplying the given vector by 2. Many candidates then completed the question correctly.

Limited responses

- Some candidates didn't realise they needed to 'add' the vector $\begin{pmatrix} 8 \\ -6 \end{pmatrix}$ to the point *P*. A diagram would have helped candidates

Question 7

Comprehensive responses

- The majority of candidates were able to tackle the addition of fractions, requiring them to convert from mixed number to top heavy fraction, use a common denominator and then simplify.

Limited responses

- Some candidates simplified their working to 61/12 and needed to convert this to a mixed number as requested in the question.

Question 8

(a) **Comprehensive responses**

- Nearly every candidate was able to answer this part correctly.

Limited responses

- A few candidates gave their answer as 3.

(b) **Comprehensive responses**

- The majority of candidates were able to demonstrate excellent algebraic skills in rearranging the given equation.

Limited responses

- A small number of candidates who started the question correctly, then simply moved the 'root sign' from one side of the equation to the other side.

Question 9

Comprehensive responses

- There were many very good attempts at this question with candidates showing use of the correct formulae.
- The surface area of the hemisphere was usually found correctly.
- The curved surface area of the cylinder was also found correctly.
- Many candidates left π in their answer. Candidates should ensure their responses are concise and only include the required information, as this helps to demonstrate clear understanding.

Limited responses

- A very popular incorrect answer was 78, which resulted when candidates did not include the area of the circle.

Question 10

Comprehensive responses

- Candidates who added a point on the major arc *AC* on the diagram, demonstrated a clear understanding of the geometric requirements.
- There were many ways to approach this problem. It is essential that candidates annotate their diagram and use correct angle notation. Angle *O* = 260° isn't sufficient as there are two angles at *O*.

Limited responses

- A significant number of candidates assumed that angle *AOC* was also 130 implying that two other equal angles were both 50°.

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Question 11

Comprehensive responses
- There were many very well attempted and executed solutions to this question.
- Candidates were able to clear fractions, expand the brackets and rearrange their equation, leading to a solution of 26/9.
- The majority of candidates left their answer in a fractional form.

Limited responses
- A small number of candidates who started the question correctly, then tried working with decimals which affected the accuracy of their final answer.

Question 12

(a) **Comprehensive responses**
- Nearly all candidates gave the correct answer.

Limited responses
- A very small number of candidates gave their answer as a set rather than the number of students.

(b) **Comprehensive responses**
- Most candidates demonstrated a good understanding of the required concept in their responses.

Limited responses
- Some candidates included the '9' to give an incorrect answer of 15.

(c) **Comprehensive responses**
- Again, nearly all candidates gave the correct fraction.

Limited responses
- A small number of candidates discounted the '1' and gave an answer of $\frac{14}{23}$.

(d) **Comprehensive responses**
- This part was more demanding.
- Many candidates started the question with the correct product and didn't realise that the students could be in either order and didn't multiply their answer by 2.

Limited responses
- Some candidates used fractions with both denominators being 15.
- A small number of candidates needed to realise that the question only related to students who study German and calculated with fractions with a denominator of 24 and 23.

Question 13

(a) **Comprehensive responses**
- The majority of candidates were able to show a good understanding of laws of indices.

Limited responses
- A small number of candidates gave the answer as $12y^{12}$.

(b) **Comprehensive responses**
- This part was well answered with many candidates giving the correct answer as $2x^4$

Limited responses
- A significant number of candidates gave an answer of $4x^4$ or $2x^2$.

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Question 14

(a) **Comprehensive responses**

- Candidates who drew a sketch were able to find the intercepts and then the correct value of the area.
- The majority of candidates demonstrated a good understanding of the required concept in their responses

Limited responses

- Some candidates gave their answer for the area as a negative. To improve, candidates should check their calculations and ensure that area is always presented as a positive quantity.

(b) **Comprehensive responses**

- Most candidates knew that the perpendicular gradient was the negative reciprocal of 3.
- Candidates were able to use this fact and that the line went through (0, 5) to find the correct equation of the line.

Limited responses

- The small number of candidates gave their answer as $y = 3x + 5$, which was the equation of the line parallel to the given line.

Question 15

(a) **Comprehensive responses**

- The majority of candidates knew the exact trigonometric values and gave the correct the correct answer.

Limited responses

- Some candidates gave the answer as 0.5, confusing sine and cosine.

(b) **Comprehensive responses**

- Candidates found this part tricky, although the majority were able to give the correct answer.
- Some candidates sketched the cosine curve or used the CAST diagram.
- Candidates who gave an incorrect answer to part (a), were able to provide a consistent response in **part (b)** if they gave the same answer as before.

Limited responses

- A significant number of candidates gave their answer as $\frac{11\sqrt{3}}{2}$, following after a correct answer in **part (a)** possibly due to 330 is equal to 11 × 30**.** Candidates can improve by carefully checking their calculations and ensuring that their reasoning follows the requirements of the question

Question 16

(a) (i) **Comprehensive responses**

- Most candidates demonstrated a clear understanding of this concept.

(ii) **Comprehensive responses**

- The majority of candidates used the standard method to find the correct inverse function.

Limited responses

- A small number of candidates made a mistake with the signs of their expression.

(b) **Comprehensive responses**

- Nearly all candidates demonstrated a clear understanding by writing $\frac{1}{\frac{1}{x+2}+2}$.

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- Candidates who simplified this fraction to $\frac{2x+5}{x+2}$, were then able to invert this fraction correctly.

Limited responses
- Many candidates needed to write the denominator as a correct single fraction before inverting

(c) (i) Comprehensive responses
- There were many good attempts on a tricky log manipulation question with the majority of candidates demonstrated a clear understanding of this concept.

Limited responses
- Some candidates correctly calculated $\log_3 x = 2$, and then they simplified incorrectly to 2^3 instead of 3^2.

(ii) Comprehensive responses
- Many candidates were able to set up the equation correctly and interchange the variables and were able to complete the question correctly.

Limited responses
- Some candidates were unable to complete final step of the solution.
- A small number of candidates tried to divide by log.

Question 17

(a) Comprehensive responses
- Most candidates were able to simplify both surds to a form of $k\sqrt{2}$.

.

Limited responses
- Some candidates wrote the simplified surds as $2\sqrt{10}$ and $2\sqrt{7}$.

(b) Comprehensive responses
- There were many perfect solutions to this question.
- Most candidates were able to multiplying the expression by $\frac{5-\sqrt{5}}{5-\sqrt{5}}$.

Limited responses
- Some candidates who started the question correctly didn't cancel their expression of $\frac{25-5\sqrt{5}}{20}$.

Question 18

(a) Comprehensive responses
- There were many excellent attempts to set up the equation for the journey time.
- Candidates used a common denominator, multiplied out brackets and rearranged into the given form.
- The majority of candidates set out their work clearly, setting out line by line with all steps shown and it was relatively easy to follow.

Limited responses
- Some candidates didn't split the question into the two stages and simply tried to manipulate the information to fit the given answer.

(b) Comprehensive responses
- The factorising wasn't easy for candidates and with the coefficient of x^2 being prime, candidates had a good prompt.
- Candidates who factorised correctly were able to find the two initial solutions.

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- Some candidates didn't reject the answer of $x = -100/7$, not interpreting the fact that speed couldn't be negative

Limited responses

- Many candidates chose to use the formula rather than following the instruction in the question.
- Candidates would benefit from further practice with calculations, ensuring accuracy and confidence.
- Candidates who used the formula correctly and provided the answer as 40 demonstrated a clear understanding of the required method.

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Paper 0607/23
Non-calculator (Extended)

Key messages

What candidates did well
- Candidates demonstrated mathematical skills across the full range of questions.
- The standard of written work was good.
- Many candidates demonstrated competence in completing questions that required standard mathematical processes.
- Many candidates demonstrated skills in algebraic manipulation, factorising, simplifying and solving linear equations.
- The majority of candidates showed working for each question.

What candidates needed to improve
- Candidates must show all of their working.
- Incorrect answers without working cannot be given credit, whereas partial credit can be awarded if a correct method is shown.
- Candidates should check their working in each question to ensure that they haven't made any careless numerical slips.
- Candidates should be careful when using negative signs both in calculations and in algebra.
- Questions where candidates are required to show a given result, candidates must show all of the correct details of their working to score full marks.

Comments on specific questions

Question 1

(a) **Comprehensive responses**
- Most candidates were able to calculate the value correctly.

Limited responses
- A number of candidates made were unable to apply BODMAS correctly.

(b) **Comprehensive responses**
- Most candidates were able to multiply the decimas correctly.

Limited responses
- Some candidates identified the numerical value as 121 and were unable to give their final decimal answer correctly.

(c) **Comprehensive responses**
- This part was quite well answered, candidates knew that they had to convert the mixed number to an improper fraction before finding the square root.

Limited responses
- A small number of candidates tried to find the square root of 2 and the square root of a square root of a quarter separately.

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Question 2

Comprehensive responses
- Some candidates were able to give the answer as a rhombus.

Limited responses
- A significant number of candidates gave their answer as a trapezium.

Question 3

Comprehensive responses
- This question was well answered.

Limited responses
- Some candidates were unable to find a common denominator.

Question 4

Comprehensive responses
- The majority of candidates were able to simplify the algebraic expression correctly.

Limited responses
- A small number of candidates were unable to simplify the *y*-term correctly.

Question 5

(a) **Comprehensive responses**
- Nearly all candidates were able to state that the mode was 16.

Limited responses
- A small number of candidates found the range of numbers.

(b) **Comprehensive responses**
- Many candidates gave a correct answer, usually by re-writing the list in numerical order, finding the two middle numbers leading to the answer of 18.5.

Limited responses
- A small number of candidates used the original list and found the middle number as 20.

Question 6

(a) **Comprehensive responses**
- Most candidates used the information to draw the correct line, including the correct notation at the end points.

Limited responses
- Some candidates were unable to highlight the difference in the end points, depending as to whether or not the point was to be included.

Question 7

(a) **Comprehensive responses**
- The majority of candidates were able to find the time of the journey correctly.

Limited responses
- Some candidates subtracted 1738 from 1923 without considering that the time difference was required.

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(b) **Comprehensive responses**

- The majority of candidates successfully divided the distance by time.

Limited responses

- Some candidates did not convert 30 minutes into 0.5 hours correctly and divided 96 by 1.3.

Question 8

(a) **Comprehensive responses**

- A significant number of candidates were able to correctly find the answer of 1080.
- Candidates were equally successful using the interior angle method or the exterior angle method.

Limited responses

- Some candidates multiplied 180 by 8.

(b) **Comprehensive responses**

- A small number of candidates were able to correctly use an algebraic expression for an exterior angle.

Limited responses

- The majority of candidates were unable to write down an exterior angle must equal $180 - \alpha$.

Question 9

(a) **Comprehensive responses**

- Most candidates were able to partially factorise the expression.
- Some candidates showed excellent algebraic skills with a complete factorisation of the complicated expression.

Limited responses

- A few candidates were unable to find the common factor of x^3 and x^5.

(b) **Comprehensive responses**

- Many candidates were able to set up a correct factorisation method with two linear brackets.
- A few candidates were able to find both correct terms.

Limited responses

- A small number of candidates were unable to find two terms that multiplied to give the quadratic term as $4x^2$.

Question 10

Comprehensive responses

- Good attempts made by candidates who realised that \$18 was equivalent to 120%.

Limited responses

- Some candidates found 20% of \$18 and subtracted their answer from \$18.

Question 11

Comprehensive responses

- There were many excellent solutions to this question, showing that candidates have a good understanding of probability.

Limited responses

- A few candidates found the probability of both discs being red with replacement.

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Question 12

(a) **Comprehensive responses**

- This surd question was well answered by many candidates.

Limited responses

- Some candidates didn't simplify the correct expression $5\sqrt{3}-3\sqrt{3}$.

(b) **Comprehensive responses**

- Most candidates were able to multiply the expression by $\frac{4+\sqrt{2}}{4+\sqrt{2}}$.

Limited responses

- Some candidates who started the question correctly didn't cancel their expression of $\frac{21\left(4+\sqrt{2}\right)}{14}$.

Question 13

(a) **Comprehensive responses**

- The majority of candidates were able to correctly shade the diagram.

Limited responses

- A small number of candidates shaded the union of the three sets and not the compliment.

(b) **Comprehensive responses**

- Approximately half of the candidates were able to shade the correct region.

Limited responses

- The common error made by candidates shaded the intersection of the two sets.

Question 14

Comprehensive responses

- Some candidates were able to set up a correct variation equation, substitute the given values, and then re-arrange to give their answer in the correct form.

Limited responses

- The majority of candidates were unable to translate the given information into an equation of the form $y=k\sqrt{(x-1)}$.

Question 15

(a) (i) **Comprehensive responses**

- Nearly all candidates demonstrated a clear understanding of the required method in their responses

Limited responses

- A very small number candidates made a slip in their arithmetic.

(ii) **Comprehensive responses**

- The majority of candidates gave the correct answer of 32.

Limited responses

- Some candidates gave the answer as 10.

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(iii) Comprehensive responses

- Some candidates correctly stated that log1 = 0 demonstrating a clear understanding of the required method.

Limited responses

- Many candidates left their answer as log1.

(b) (i) Comprehensive responses

- This part was very well answered by many candidates.

Limited responses

- Some candidates were able to set up the correct equation $3x = 13 - 1$, and were unable to solve this equation.

(ii) . Comprehensive responses

- Many candidates successfully set up the equation, demonstrating a good understanding of the initial steps required.

Limited responses

- Some candidates were able to write down the equation $2^x = \frac{1}{4}$, and were unable to solve this equation successfully.

(c) Comprehensive responses

- Many candidates needed to demonstrate a clearer understanding of this part. Candidates can improve by reviewing the relevant concepts and practising similar questions.
- Some candidates were able to write down $2^{3x+1} = 2^3$ and then solve this equation.

Limited responses

- Many candidates were unable to make progress in this part.
- Candidates who clearly stated h(100) = 2 or gf(x) = 2^{3x+1} demonstrated a good understanding of the required process.

Question 16

(a) Comprehensive responses

- Some candidates were able to give a complete geometrical reason.

Limited responses

- Candidates needed to use correct mathematical terminology, for example ‘tangents from an external point are equal in length’.

(b) Comprehensive responses

- Some candidates demonstrated excellent skills in interpreting the diagram into expressions that would lead to the radius of the circle being 2 cm.

Limited responses

- Candidates who added the given lengths on the diagram made some progress and they were unable to link this information to finding the radius.

(c) Comprehensive responses

- Some candidates realised that this part question was testing similar shapes and realised that the answer was one quarter of the previous part.

Limited responses

- Candidates who started this part as if it were a completely new question, were, in general, unsuccessful.

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Question 17

(a) **Comprehensive responses**

- The majority of candidates recognised the need to use Pythagoras to find the length *BC*.

Limited responses

- Some candidates started with an incorrect application of Pythagoras finding a value of $\sqrt{26}$. They were then unable to rearrange correctly to show the given result.

(b) (i) **Comprehensive responses**

- The majority of candidates realised that the cosine rule had to be used in this question.
- Candidates who used *PR* as the subject of the equation were able to complete the question successfully.

Limited responses

- Some candidates tried to find *PQ* or *QR* and were then unable to prove the given result

(ii) **Comprehensive responses**

- Only a small minority of candidates were able to start this question correctly.
- To find the area of the triangle, candidates needed to use the previous two results and the area of a triangle as A = ½ ab sin ϑ and substitute the given values.

Limited responses

- Candidates need to consider the previous two results and how they might be applied into the final part of the question.

Question 18

Comprehensive responses

- Some candidates made good progress in this question.
- Candidates who showed clear working in the four stages—eliminating fractions, expanding brackets, collecting like terms, and isolating x—demonstrated a good understanding of the process.

Limited responses

- Some candidates were unable to eliminate fractions correctly and had *x* on both sides of their final equation.

Question 19

(a) **Comprehensive responses**

- This question was well answered by the majority of candidates, showing that they had a good understanding of finding the distance between two points.

Limited responses

- Some candidates subtracted the *x*-coordinate from the *y*-coordinate.
- A small number of candidates who started the question correctly, made errors in their arithmetic.

(b) **Comprehensive responses**

- There were a number of excellent solutions to this question.
- Candidates were able to find the gradient of the line *AB*, the gradient of the perpendicular to *AB*, and then used this information to find the equation of the required line.

Limited responses

- Some candidates were unable to interpret the requirements of the question into separate sections.
- A number of candidates attempted to find the gradient of *AB* and then didn't use this information.

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Paper 0607/31
Calculator (Core)

Key messages

What candidates did well
- Candidates performed well in questions with a familiar content.
- Many candidates set out their working in a clear and logical manner.
- Many candidates used their graphing calculator well.

What candidates needed to improve
- Candidates need to give answers to the required degree of accuracy.
- In questions that involve multiple parts, candidates should keep any intermediate answers to more than 3 significant figures to avoid their final answer being inaccurate.
- Candidates should use the value of pi from their calculator or 3.142.
- When sketching graphs, candidates need to practice copying what is on their screen onto the exam paper. They should pay attention to where their graph crosses the *x*-axis and *y*-axis and the position of any turning points.
- Any errors should be crossed out leaving the one solution to be marked.
- Full working out should be shown.
- Candidates should be familiar with the formulae given on page 2 of their exam paper.
- Candidates should be more familiar with the circle theorems.

Comments on specific questions

Section A

Question 1

(a) **Comprehensive responses**

- Most candidates knew that $\frac{3}{5}$ as a decimal is 0.6 .

Limited responses
- Some examples of incorrect answers are 0.35, 0.375 and 0.06 .

(b) **Comprehensive responses**
- Many candidates changed the fraction into a percentage correctly.

Limited responses
- A few candidates did not change the fraction correctly and wrote 6% or 0.006 or $\frac{6}{100}$ for their answer.

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Question 2

(a) **Comprehensive responses**

- Candidates used their calculators to work out the answer. Once the answer was found the candidate was asked to give their answer to the nearest ten. Some candidates had underlined this on the question paper, and this helped them to remember to give the correct answer.

Limited responses

- Some candidates forgot to give their answer to the nearest ten and gave the answer as 43.4…
- Other candidates did not work out the sum correctly on their calculator and gave a wrong answer. A few candidates did take their incorrect answer and round it to the nearest ten correctly.

(b) **Comprehensive responses**

- Many candidates worked out the answer correctly on their calculator and remembered to give the answer correct to two decimal places.

Limited responses

- Some candidates worked out the answer correctly and then did not remember to give their answer correct to two decimal places.
- Some candidates made a mistake with the rounding and gave their answer as 0.32 instead of 0.33 .
- A few candidates worked out the sum incorrectly and only a few of these candidates remembered to round their answer correct to two decimal places.

Question 3

(a) (i) **Comprehensive responses**

- The majority of the candidates found the next term in the sequence correctly.

Limited responses

- Only a few candidates wrote the difference between the terms instead of the next term.
- A few candidates counted the differences incorrectly and wrote 38 as their answer.

(ii) **Comprehensive responses**

- There were many correct answers for writing down the rule for finding the next term. The most common correct answers were +6 and add 6.

Limited responses

- Some candidates wrote the expression for the nth term for their answer rather than the rule.
- Some candidates wrote $n + 6$ for their answer.

(iii) **Comprehensive responses**

- A good number of candidates found the correct expression for the nth term of the sequence.

Limited responses

- Some candidates wrote $n + 6$ for their answer.
- Some candidates wrote another integer term for their answer.
- A few candidates wrote $6n^2 + 1$ or $6n^2 - 1$ or $7n + 1$ for their answer.

(b) **Comprehensive responses**

- There were many correct answers for the first three terms of the sequence.

Limited responses

- Some candidates did not put the numbers into the formula in parenthesis and their answers were incorrect.
- Some candidates wrote three random numbers such as 3, 2, 1 or 3, 6 and 9.
- A few candidates omitted this part.

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Question 4

(a) **Comprehensive responses**

- Many candidates managed to write the coordinates of the point correctly.

Limited responses

- A few candidates wrote the coordinates in reverse and wrote (2, 4) for their answer.
- A few candidates misread the scale and wrote (4, 3) or (4, –2) or (5, 2) for their answer.

(b) **Comprehensive responses**

- Candidates often showed their working out to find the midpoint and many were successful.

Limited responses

- Some candidates wrote down the coordinates of the point where the line crossed the *y*-axis as their answer.
- Some candidates used the midpoint formula incorrectly.
- Some candidates wrote their coordinates in reverse order.
- Some candidates wrote down coordinates that were not on the line for their answer.

(c) **Comprehensive responses**

- Some candidates managed to find the correct gradient and point where the line crossed the y-axis and wrote their answer for the equation correctly.

Limited responses

- Many candidates wrote the gradient as +0.5 rather than –0.5.
- Some candidates did not write their answer in the given form.
- Some candidates found an incorrect gradient.
- Some candidates omitted the *x* in their answer.
- Some candidates did not find the correct y intercept.
- A few candidates omitted this part.

Question 5

Comprehensive responses

- There were many correct answers for all three angles.

Limited responses

- A few candidates treated the triangle as isosceles and found an answer of 50° for *z*.
- A few candidates worked out the value for *x* incorrectly and then used this value to find *y* rather than using vertically opposite angles.
- A few candidates wrote three incorrect answers without showing any working out.

Question 6

Comprehensive responses

- Many candidates were able to find the correct value for one of the chocolate bars.

Limited responses

- A few candidates found the cost of the five chocolate bars correctly and then forgot to divide by five to find the cost of one bar.
- A few candidates subtracted 2.20 from 10 incorrectly.

Question 7

(a) **Comprehensive responses**

- The majority of candidates managed to find the most common age correctly.

Limited responses

- A few candidates were perhaps unfamiliar with stem-and-leaf diagrams and wrote 8 for their answer.

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(b) (i) **Comprehensive responses**

- Many candidates found the median correctly.

Limited responses

- The most common incorrect answers were 38, 38.5 and 9.

(ii) **Comprehensive responses**

- Fewer candidates were able to find the lower quartile correctly.

Limited responses

- The most common answers for the lower quartile were 27. 48, 35, 34.5 and 4.

(c) **Comprehensive responses**

- Many candidates knew how to find the mean and did so successfully.

Limited responses

- A few candidates added the numbers up incorrectly.
- Some candidates appeared not to use their calculator to add up the numbers often resulting in an incorrect total being found.
- Those candidates who were unfamiliar with a stem-and-leaf diagram added up all the single digit numbers in an attempt to find the mean.

Question 8

(a) **Comprehensive responses**

- The majority of the candidates knew how to work out 8% of 640.

Limited responses

- A few candidates gave an answer of 512 rather than 51.2 .
- Some candidates found an answer and then subtracted it from 640.

(b) **Comprehensive responses**

- Many candidates managed to work out 35 as a percentage of 250 correctly.

Limited responses

- The most common error was to multiply 35 by 250 and divide by 100 to arrive at an answer of 87.5 .
- Another error was to divide 250 by 35 and arrive at an answer of 7.14 .

Question 9

(a) **Comprehensive responses**

- Most candidates found the correct amount that Ryan was paid.

Limited responses

- The most common error was to forget to add on the $12.

(b) **Comprehensive responses**

- Some candidates managed to find the correct formula for P in terms of D and A.

Limited responses

- Some candidates wrote D + 1.5A for their answer.
- A few candidates wrote 12D + A for their answer.
- Other common incorrect answers were $D \times$ A and $\frac{D}{A}$.

(c) **Comprehensive responses**

- There were many correct answers seen for the number of kilograms even if an incorrect formula was given in part **(b)**.

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Limited responses

- Some candidates attempted to use their incorrect formula to find the number of kilograms.
- Some candidates subtracted 60 from 189 correctly and then did not divide by 1.5 .
- Some candidates just divided 189 by 1.5 for their answer.

Question 10

(a) **Comprehensive responses**

- There were many correct answers for the surface area of the sphere seen.

Limited responses

- A few candidates used 3.14 for pi and, as a result, their answer was not accurate.
- A few candidates forgot to square the radius.
- Some candidates used an incorrect formula for the surface area of the sphere.

Question 11

(a) **Comprehensive responses**

- Many candidates found the correct size of angle *BCD* and showed all their working out clearly.

Limited responses

- The most common error was to write 56° for the answer.
- A few candidates found the correct answer and then wrote 56° on their answer line.
- A few candidates appeared to be unsure of what was meant by angle *BCD* and wrote the size of all three angles or 180°on their answer line.

Question 12

(a) **Comprehensive responses**

- The majority of the candidates knew that the total of the probabilities is one and managed to find the correct value for x.

Limited responses

- A few candidates just divided 72 by 6 and 12 was a common incorrect answer.

(b) **Comprehensive responses**

- Many candidates found the correct expected number of times that the die landed on a 4.

Limited responses

- Some candidates were unsure as to how to write their answer and wrote $\frac{25}{180}$ for their answer.
- A few candidates divided 180 by 6 and wrote 30 for their answer.
- A few candidates omitted this part.

Question 13

(a) **Comprehensive responses**

- Some candidates set out their working methodically and found the correct time the Lavinia arrived at the cinema.

Limited responses

- A few candidates worked out the correct number of minutes and then forgot to add it onto the time given.
- The most common incorrect answer was 18 40.
- Some candidates could set their work out neatly to make well-organized and clear to follow their train of thought.
- Some candidates knew that to find the time they had to divide the distance by the speed.
- Candidates did not always convert the distance and/or speed correctly.

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Question 14

(a) **Comprehensive responses**

- Most candidates correctly found 4 for the value of x.

Limited responses

- The most common incorrect answers here were 3 and 5.

(b) **Comprehensive responses**

- Many candidates worked the sum out correctly and also converted it into standard form correctly.

Limited responses

- Some candidates did not convert their answer correctly to standard form.
- Some candidates left their answer as 500 000.
- A few candidates gave their answer as 50 000.

Question 15

(a) **Comprehensive responses**

- Most candidates recognised that diagram *B* was the correct answer.

Limited responses

- A few candidates thought that it was diagram *A* and some that it was diagram *C*.

Question 16

(a) **Comprehensive responses**

- Nearly all the candidates realised that the tangents from an external point to the circumference are equal in length and correctly wrote 11.3 for their answer.

Limited responses

- A few candidates tried to work out the length using Pythagoras's theorem.
- When the question states 'write down' then no working out is necessary.

(b) **Comprehensive responses**

- There were few correct geometrical reasons for the angle being 90°.

Limited responses

- The most common incorrect answers were 'because it is a right angle' or 'because it is a right-angled triangle'.
- Some candidates knew that the reason was something to do with the tangent.

(c) **Comprehensive responses**

- Few candidates used trigonometry successfully to find the size of angle *ABC*.

Limited responses

- Some candidates knew to use the tangent to find an angle and then double their answer.
- Some candidates rounded their answer to 3 significant figures before doubling it and this resulted in a less accurate answer.
- Some candidates used sine or cosine rather than the tangent.
- Some candidates did not use any trigonometry.

(d) **Comprehensive responses**

- There were more correct answers for the length of *OB* with candidates using Pythagoras theorem correctly.

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Limited responses

- The most common incorrect answer was when the candidate used Pythagoras theorem incorrectly and used $OB^2 = 11.3^2 – 6.4^2$.
- Some candidates did not use Pythagoras theorem and just added 11.3 and 6.4 .
- Some candidates wrote down an incorrect answer with no working to support their answer.
- A few candidates omitted this part.

(e) Comprehensive responses

- Some candidates knew to multiply the two numbers together to find the area.

Limited responses

- A few candidates found the correct area for half of the shape and then forgot to double their answer.
- Some candidates multiplied their answer to part **(d)** by 6.4.
- A few candidates omitted this part.

Question 17

(a) Comprehensive responses

- Some candidates sketched a correct parabola with axes intersections correct and the minimum in the correct quadrant.

Limited responses

- A few candidates did not copy the screen from their calculator accurately and the place where their curve crossed the y-axis was below the origin.
- Some candidates omitted this part perhaps due to not having a graphing calculator.

(b) Comprehensive responses

- A few candidates found the correct intersection points and wrote their answers correct to 3 or more significant figures.

Limited responses

- There were few completely correct answers for where the graph crosses the *x*-axis.
- Many candidates gave their answers to fewer than 3 significant figures.
- It appeared as if some candidates used the Trace icon rather than calculate the intersection.

(c) Comprehensive responses

- A good number of candidates managed to find the x-coordinate of the local minimum correctly.

Limited responses

- A few candidates wrote their answer incorrectly as 1.2 or 1.3 or 1.24 .
- Only a few candidates omitted this part.

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Paper 0607/32
Calculator (Core)

Key messages

What candidates did well
- Most candidates had a sound knowledge of the syllabus content.
- Candidates, in general, presented their work in a clear and orderly fashion.
- Candidates used their calculator well.

What candidates needed to improve
- All candidates should have access to a graphical calculator.
- Candidates should avoid premature rounding of a value within their answer.

Comments on specific questions

Question 1

(a) **Comprehensive responses**
- Most candidates correctly chose ‘rectangle’ for their answer.

Limited responses
- A common error was to choose ‘square’.

(b) **Comprehensive responses**
- Most candidates correctly identified the coordinates of the two points.

Limited responses
- A few candidates gave (–4, 2) as their answer for point *C*.

(c) **Comprehensive responses**
- The majority correctly found the area and the perimeter of the shape.

Limited responses
- Instead of counting unit lengths for the perimeter and unit squares for the area, some used formulae, not always successfully. A few just miscounted.

Question 2

(a) **Comprehensive responses**
- The majority could correctly write the number in words.

Limited responses
- There were too few responses to this question to make a general comment appropriate.

(b) **Comprehensive responses**
- The majority could write down a multiple of 3 between the two given values. Some gave all three possible values.

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Limited responses
- There were too few responses to this question to make a general comment appropriate.

(c) **Comprehensive responses**
- Many identified the cube number correctly.

Limited responses
- 25 was a common incorrect answer.

(d) **Comprehensive responses**
- Many could identify one of the prime numbers.

Limited responses
- Some gave a prime number outside the range. 21 and 25 were common wrong answers.

Question 3

Comprehensive responses
- Many candidates found the two values and gave a correct conclusion.

Limited responses
- Though most found 16% of $360 correctly, a number changed $\frac{2}{9}$ to 0.22 and lost accuracy in their answer for B.

Question 4

(a) **Comprehensive responses**
- The majority gave the correct answer of 18.

Limited responses
- There were too few responses to this question to make a general comment appropriate.

(b) **Comprehensive responses**
- The majority knew that the tallest bar gave the most common time.

Limited responses
- There were too few responses to this question to make a general comment appropriate.

(c) **Comprehensive responses**
- Most candidates correctly found the height of each bar and added their answers together.

Limited responses
- Some candidates misread the height of one or more of the bars. Others read the heights correctly and did not add the values correctly.

(d) **Comprehensive responses**
- There were many correct answers for the probability.

Limited responses
- Some candidates had the correct fraction and then did not cancel correctly.
- Others misunderstood the question and found the probability that the runner took more than 5 hours or less than 5 hours.

Question 5

(a) **Comprehensive responses**
- Many changed the 2 kg into 2000 g and cancelled the ratio correctly.

Limited responses
- Not changing the two values into the same units was a common oversight.

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- Others used an incorrect conversion of 2kg to 200 g.

(b) **Comprehensive responses**

- Most divided the mass by 9 and multiplied the result by 8 to give the answer.

Limited responses

- Dividing the 171 by 8 was a common incorrect start to the calculation.

Question 6

(a) **Comprehensive responses**

- Candidates used their calculators successfully to find the cube root.

Limited responses

- Some misunderstood the symbol and found the square root or divided by 3.

(b) **Comprehensive responses**

- Many correctly used their calculators, wrote down the decimal value it gave and then rounded that to 3 decimal places.

Limited responses

- Some performed the calculation correctly and then rounded incorrectly, often to 3 significant figures.

Question 7

(a) **Comprehensive responses**

- There were many correct answers where candidates correctly collected the x and y terms.

Limited responses

- Some gave partly correct answers like $4x + 7y$ or $4x – 7y$. Very few did not understand what was required.

(b) **Comprehensive responses**

- Many identified the common factor of 3 and gave a correct algebraic expression.

Limited responses

- After identifying the common factor of 3, some just gave $p – 6$ as their answer.

(c) **Comprehensive responses**

- Many found the four terms and simplified correctly.

Limited responses

- A number of candidates made a sign error in one or more of the four terms.
- Some others did not find all four terms.

Question 8

Comprehensive responses

- Many correctly used the simple interest formula to find the interest gained. These then added on the amount invested to find the value of the investment.

Limited responses

- Some forgot to add the amount invested to the interest gained.
- A number used 0.25 for 25% instead of 0.025.
- Others used the compound interest formula.
- A few quoted and used the simple interest formula incorrectly.

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Question 9

Comprehensive responses
- Many found the missing internal angle of 96° and went on using the sum of angles in the quadrilateral to be 360°.

Limited responses
- Some found the missing internal angle of 96° and then used 270° or some other value as the total of angles in the quadrilateral.
- Others set up and solved $x + 63 + 108 + 84 = 360$ or just $x + 63 + 108 = 360$.

Question 10

(a) **Comprehensive responses**
- Most could substitute –9 into the formula and evaluate the answer.

Limited responses
- Some candidates omitted the negative sign from their answer.

(b) **Comprehensive responses**
- There were too few responses to this question to make a general comment appropriate.

Limited responses
- Many candidates needed to show clearer steps when rearranging the formula. They knew the operations required and not necessarily how, or the order in which, to perform them. Interim stages like $2y = x - 3$ and $y = x - 6$ lead to answers $x = 2y + 3$ and $x = y + 6$.
- A few did a numerical solution, substituting $y = -7.5$ and rearranging to find x.

Question 11

(a) **Comprehensive responses**
- Candidates chose the appropriate formulae, substituted correctly and evaluated accurately.

Limited responses
- Some chose the wrong formulae or wrote them down incorrectly.
- Others evaluated the expressions incorrectly or prematurely rounded intermediate values.
- A few forgot that there were two balls in the tube.

Question 12

(a) **Comprehensive responses**
- Many completed the tree diagram correctly.

Limited responses
- Some entered only one of the values correctly onto the tree diagram.

(b) **Comprehensive responses**
- Some correctly multiplied the appropriate probabilities to find the answer.

Limited responses
- It was common to see candidates adding the probabilities instead of multiplying.

Question 13

(a) **Comprehensive responses**
- Some candidates correctly chose the cosine ratio to find the required angle.

Limited responses
- Many chose the wrong trigonometric ratio.
- Some thought to use Pythagoras' rule and did not know how to proceed to find the angle.

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(b) **Comprehensive responses**

- Most candidates with a correct solution used Pythagoras' rule correctly to find the missing length and added all three lengths to find the perimeter.
- Some tried a trigonometric method. This often ended up with an inaccurate answer due to intermediate rounding of the values calculated.

Limited responses

- Some correctly found the missing length and did not go on to find the perimeter.
- Others added the squares of the two given lengths instead of subtracting.

Question 14

(a) (i) **Comprehensive responses**

- There were many accurately drawn sketches of the quadratic graph.

Limited responses

- Some sketches were not placed accurately on the given grid.
- Many candidates did not have a graphical calculator and were unable to sketch the graph.

(ii) **Comprehensive responses**

- Many could locate the local minimum on the graph.

Limited responses

- Those without a graphical calculator could not answer this question.

(b) **Comprehensive responses**

- There were many accurately drawn sketches of the cubic graph.

Limited responses

- Some sketches were not placed accurately on the given grid.
- Many candidates did not have a graphical calculator and were unable to sketch the graph.

(c) **Comprehensive responses**

- Some candidates found all three values of x from the points of intersection of the two graphs.
- A number did not give the two decimal answers correct to 3 significant figures as is required.

Limited responses

- Some gave x = 0 as one of their values and did not give the other two.
- Others did not understand the question and gave an algebraic expression for each answer.
- A few gave their answers as coordinates.
- Those without a graphical calculator could not answer this question.

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Paper 0607/33
Calculator (Core)

Key messages

What candidates did well
- Most candidates had a sound knowledge of the syllabus content.
- Candidates, in general, presented their work in a clear and orderly fashion.
- Candidates used their calculator well.

What candidates needed to improve
- All candidates should have access to a graphical calculator.
- Candidates should avoid premature rounding of a value within their answer.
- Candidates should always show their working.

Comments on specific questions

Question 1

(a) **Comprehensive responses**
- Most candidates correctly wrote the value correct to the nearest hundred.

Limited responses
- Some gave the value correct to the nearest thousand.

(b) **Comprehensive responses**
- The majority of candidates correctly wrote the value in figures.

Limited responses
- –

(c) **Comprehensive responses**
- Many correctly gave 10 000 or 30 000 as the answer.

Limited responses
- A common incorrect answer was to think the place value of the 3 was thousands.

Question 2

Comprehensive responses
- Many correctly multiplied 2.7 by 60 to achieve the answer..

Limited responses
- Some could not deal with the decimal part of the time. A common wrong approach was to work out $2 \times 60 + 7$.

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Question 3

Comprehensive responses
- Many correctly changed all values to the same unit and were able to write their answers in the correct order.

Limited responses
- Some candidates were not able to place 8000 cm thinking this was the same as 8 m.

Question 4

Comprehensive responses
- Most coped with adding on the 1 hour 35 minutes to the time and converting the 75 minutes to 1 hour 15 minutes.

Limited responses
- 08 75 was a popular incorrect answer where candidates did not deal properly with the 75 minutes.
- A small number subtracted the journey time.

Question 5

Comprehensive responses
- Many ticked the correct statement.

Limited responses
- Some candidates ticked more than one statement.
- A number ticked the first statement which read ‘less than 5’ not ‘less than or equal to 5’.

Question 6

Comprehensive responses
- Many correctly worked out the two amounts, added and changed the total to dollars.
- Some forgot to change their answer in cents to dollars.

Limited responses
- Some correctly worked out the cost of the 140 units but then did not successfully work out the cost of the remaining units of electricity.

Question 7

(a) **Comprehensive responses**
- Candidates knew their calculator functions and could find the cube root of the given value.

Limited responses
- Some misread the cube root as a square root.
- Others knew the answer had something to do with 13 and wrote $13\sqrt{13}$ or $39\sqrt{13}$.

(b) **Comprehensive responses**
- Many used their calculators to good effect here.

Limited responses
- A few worked out the expression in the wrong order. This gave $1.5^2 - \left(\frac{0.25}{0.4}\right) = 1.625$.

Question 8

(a) **Comprehensive responses**
- Most could write the decimal as a fraction.

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Limited responses

- Some had the correct idea of what was required but did not go far enough. These gave answers like $\frac{1.7}{10}$ and $\frac{0.17}{1}$.

(b) **Comprehensive responses**

- Just a few knew how to proceed with this question and correctly inverted the fraction. Some went further and correctly changed their answer to a mixed fraction.

Limited responses

- Many were not sure what the word 'reciprocal' meant. Some wrote the given fraction as a decimal and others gave the complement of the given fraction, $\frac{11}{16}$.

Question 9

(a) **Comprehensive responses**

- Many could insert the ordered leaves into the table along with a correct key.
- Some, after correctly giving the leaves, either neglected to give a key or gave an incorrect key.

Limited responses

- Some gave the values in the rows not ordered.
- Others gave the double digits in the tens row.
- A few missed one or more of the values from the diagram.

(b) **Comprehensive responses**

- Only a very small number knew how to find the upper quartile. Those who did usually rewrote the list of values in order and worked from that.

Limited responses

- The upper value, 18, was often quoted as the upper quartile.
- The mode was another popular wrong answer.

(c) **Comprehensive responses**

- Many found the number of values greater than or equal to 12 and divided by the total number of values.

Limited responses

- Some just found the number of values greater than 12 for their answer.

Question 10

Comprehensive responses

- Most knew the order of operations needed and reached an answer of $\frac{9}{5}$ or 1.8.

Limited responses

- Many achieved a correct first step in their solution but then did not proceed correctly from that. Some of these gave $\frac{5}{9}$ as the answer.
- Others gave an incorrect first step such as $5x = 7 - 2$.

Question 11

(a) **Comprehensive responses**

- Only a small number of candidates knew that the mathematical name of the quadrilateral was a kite.

Limited responses

- Most thought the quadrilateral was a rhombus with a few saying diamond.

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(b) **Comprehensive responses**

- Most reflected shape A in a horizontal line, not necessarily $y = 4$.

Limited responses

- Reflection in $y = 5$ was a common wrong answer.
- Reflection in $x = 4$ was also seen.

(c) **Comprehensive responses**

- Most knew the transformation was a rotation but few gave all three elements that describe the rotation fully.

Limited responses

- Rotation 90°, with no direction of rotation and no centre of rotation, was a common incomplete answer.

Question 12

(a) **Comprehensive responses**

- 'Add 2.5' or '+2.5' were often seen as the correct answer.

Limited responses

- Some wrote 2.5 as the answer without the necessary + or an equivalent explanation.

(b) **Comprehensive responses**

- Some gave the full, correct answer. Others just gave $2.5n$, missing the constant term of the expression.

Limited responses

- $n + 2.5$ was a common incorrect answer.
- A few gave 11.5, this being the next term in the sequence.

Question 13

(a) **Comprehensive responses**

- Many successfully substituted $r = 3$ into the equation and evaluated the result correctly.

Limited responses

- Some forgot that there is a × between the 1.5 and the r in the formula.

(b) **Comprehensive responses**

- A number worked this out by solving an equation and others used a trial and improvement method.

Limited responses

- Some performed the calculation in the wrong order, working out $\frac{11}{1.5} - 0.5$.

(c) **Comprehensive responses**

- Many followed the same steps as in the numerical solution of **part (b)** and arrived at the correct rearrangement.

Limited responses

- Some managed a correct first step of $w - 0.5 = 1.5r$ but then gave $r = \frac{w}{1.5} - 0.5$ or $r = w - \frac{0.5}{1.5}$.
- As in **part (b)**, there were some candidates who tried to divide through the equation by 1.5 first but did not divide every term by 1.5.

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Question 14

(a) **Comprehensive responses**

- There were many successful attempts at the percentage reduction, candidates finding 18 per cent of the value and subtracting or finding 82 per cent of the value.

Limited responses

- Some found 18 per cent of the value but then did not subtract the answer from the original value.

(b) **Comprehensive responses**

- Most successful candidates used $\frac{increase}{original} \times 100$ to get the percentage increase.

Limited responses

- It was common to see candidates dividing the values the wrong way round like $\frac{9000}{11070}$ or $\left(\frac{9000}{2070}\right)$.

Question 15

(a) **Comprehensive responses**

- Some candidates knew how to use their calculator and interpret the display.
- Others knew to move the decimal point and count the powers of 10 required.

Limited responses

- Some misinterpreted the calculator display and wrote 1.7E – 5 or 1.7^{-5}.
- Others had 17×10^{-6} or just 0.17.

(b) **Comprehensive responses**

- Very few knew that '*a*' had to be between 1 and 10.

Limited responses

- Lots of candidates did not attempt this part. Others just guessed.

(c) **Comprehensive responses**

- A minority managed to combine numbers and powers on the left side of the equation and match this to the right side of the equation.

Limited responses

- Very few spotted that $2.3 \times 6.1 = 14.03$.
- Wrong answers of 12, –12 and 2 were common.

Question 16

Comprehensive responses

- Most successful were those candidates who listed multiples of each number until they matched.

Limited responses

- The most common answer was 7, this being the highest common factor (HCF) of the two numbers.

Question 17

Comprehensive responses

- Setting up an equation using the two areas and matching led many to the correct value of *x*.
- For those with an incomplete solution, finding the area of the triangle was most successful.

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Limited responses
- When finding the area of the triangle, some halved one of the lengths and then used that value in the formula.
- Some matched the area of the triangle to the perimeter of the rectangle.

Question 18

Comprehensive responses
- Some correctly worked out 360 ÷ 24 for their answer.

Limited responses
- Some gave an answer (usually incorrect) with no working.
- Others just wrote down a random number.

Question 19

Comprehensive responses
- This was a multi-step question involving trigonometry (and possibly Pythagoras' rule). Even those performing the calculations required often did not keep enough accuracy in their calculated values to get a correct answer.
- When finding the perimeter of the shape, some incorrectly added in the length *EB*.

Limited responses
- Many did not realise that trigonometry was required here.
- Some chose the correct trig. ratio but could not manipulate it correctly.

Question 20

(a) **Comprehensive responses**
- Some candidates accurately drew a sketch of the quadratic graph.

Limited responses
- Some sketches were not placed accurately on the given grid.
- Many candidates did not have a graphical calculator and were unable to sketch the graph.

(b) **Comprehensive responses**
- Some successfully found where the curve crosses the *x*-axis.

Limited responses
- Many candidates did not have a graphical calculator and were unable to answer the question.
- Some candidates did not know what 'the zeros' were.

(c) **Comprehensive responses**
- Very few found the equation of the line of symmetry.

Limited responses
- Most candidates did not know what the line of symmetry was in this context.

(d) **Comprehensive responses**
- Some candidates knew how to use their graphical calculator to locate the local minimum.

Limited responses
- Many candidates did not have a graphical calculator and were unable to answer the question.
- Some candidates gave inaccurate answers when using the facilities on their graphical calculator.

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CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/41
Calculator (Extended)

Key messages

What candidates did well
- Many candidates dd numerical work on percentages and simple and compound interest well.
- The work on statistics showed a good understanding of the topics involved.
- For most candidates, the trigonometrical methods used were appropriate to the question.
- Most candidates gave sufficient working and organised their work methodically.

What candidates needed to improve
- Candidates need to improve the knowledge of units of area and their conversion.
- Candidates need to improve the accuracy of their working in longer questions.
- In order to give a final answer to at least 3 significant figures, working and intermediate answers need to be given to at least 4 significant figures.
- Candidates need to include sufficient working to establish the method used.
- The working needs to be set out logically and follow one step to the next.

Comments on specific questions

Question 1

Comprehensive responses
- The vast majority of candidates answered the question correctly.

Limited responses
- A very small proportion of candidates answered this question incorrectly, mostly as a result of incorrectly cancelling fractions manually.

Question 2

Comprehensive responses
- This was almost always answered.

Limited responses
- Just a few candidates divided by 3 or 8 rather than 11.

Question 3

Comprehensive responses
- Candidates multiplied by 100^2 correctly.

Limited responses

- The most common error was an answer of 470 when candidates multiplied by 100 instead of 100^2.
- Some candidates tried to multiply by 100^2 but omitted a 0 so that 4700 was sometimes seen.
- A few candidates divided instead of multiplying.

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Question 4

(a) **Comprehensive responses**

- Most candidates gave the correct answer.

Limited responses

- A few candidates gave $40 < t \leqslant 50$ or $0 < t \leqslant 70$.

(b) **Comprehensive responses**

- There were many correct answers with candidates multiplying class midpoints by class frequencies and showing their working.
- A number of candidates clearly used the statistics functions on their GDC which is totally acceptable.

Limited responses

- Many candidates did not use the midpoints and used either the lower- or upper-class boundaries or, sometimes, the class widths.
- Other candidates did use the midpoints but added them together and then divided the sum by the number of classes, 5.

Question 5

(a) **Comprehensive responses**

- Most candidates answered this correctly.

Limited responses

- A significant of candidates reflected the triangle in $x = c$ where $c \neq -1$.
- A small number of candidates reflected the triangle in $y = -1$.

(b) **Comprehensive responses**

- Almost all candidates recognised the transformation as an enlargement.
- Comprehensive responses completed the description with a scale fact of $-\frac{1}{2}$ and a centre of $(1, -1)$

Limited responses

- Candidates often gave the scale factor as $\frac{1}{2}$ or -2.
- Some candidates omitted to give the centre of enlargement or gave an incorrect one.
- Candidates need to recognise that the demand in the question for a 'single' transformation precludes a combination of transformations.

(c) **Comprehensive responses**

- Almost all candidates recognised the transformation as a rotation.
- Comprehensive responses completed the description with an angle of 90º anticlockwise and a centre $(2, -1)$

Limited responses

- Some candidates gave the angle as 90º anticlockwise
- Some candidates omitted to give the centre of rotation or gave an incorrect one.
- Candidates need to recognise that the demand in the question for a 'single' transformation precludes a combination of transformations.

Question 6

(a) **Comprehensive responses**

- Almost all candidates drew an acceptable sketch, making sure that the local minimum was above the y-axis.

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Limited responses

- There were very few incorrect sketches.
- Just a few candidates tried to plot the graph rather than use a GDC.

(b) Comprehensive responses

- Many candidates gave the value required, correct to 3 significant figures.

Limited responses

- There were many candidates who gave a value which was rounded to only 2 significant figures.
- A common incorrect answer was 3.5.

Question 7

(a) (i) Comprehensive responses

- Almost all candidates reached the correct answer.

Limited responses

- There were very almost no correct answers.

(ii) Comprehensive responses

- Some candidates found the composite function as ff(x) = 3(3x – 2) – 2 and then solved that equal to 46.
- Other candidates solved 3x – 2 = 46 as x = 16. Then they solved 3x – 2 = 16 as x = 6.
- Both methods proved equally successful.

Limited responses

- Some candidates solved 3(3x – 2) = 46, omitting the second '–-2'.
- Candidates need to appreciate that ff(x) represents a composite function and not $(f(x))^2$.

(b) Comprehensive responses

- Many candidates put y = 3x – 2 and then immediately swapped x and y round before making y the subject.
- Other candidates put y = 3x – 2 and then made x the subject before swapping x and y round.

Limited responses

- Some candidates made errors in rearranging the equation.
- Some candidates gave the function with y as the variable.
- Candidates need to understand the difference between $f^{-1}(x)$ and $(f(x))^{-1}$.

Question 8

(a) Comprehensive responses

- Most candidates gave the correct two values.

Limited responses

- There were some candidates who gave the first value, and then an incorrect second value.
- Some candidates made an error when calculating the differences of the given terms and thus could not find a pattern.

(b) Comprehensive responses

- Most candidates set the nth term equal to 16843, added 5, divided by 13 and then took the square root to give the correct answer.

Limited responses

- Some candidates subtracted the 5 or took the square root prematurely.
- A small number of candidates gave the answer with a ± sign.

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(c) **Comprehensive responses**

- Only a minority of candidates gave the correct answer and almost all of these first showed that the third differences were 12, indicating that a cubic *n*th term was required. Some then went on to find the answer quickly by comparing the given values with the appropriate cubed numbers; others took more time by using an algebraic approach.

Limited responses

- Many candidates did find the third differences; there was then no strategy as to how to use that information to make further progress.
- Some candidates only went as far as finding the second differences.

Question 9

(a) **Comprehensive responses**

- Many candidates used the correct simple interest formula and added the interest onto the principal.

Limited responses

- A fairly large number of candidates gave the answer \$70 i.e. only the interest.
- A significant number of candidates used the compound interest formula.

(b) (i) **Comprehensive responses**

- The vast majority of candidates successfully used the correct compound interest formula.

Limited responses

- A few candidates, using a year-by-year approach, lost accuracy.

(ii) **Comprehensive responses**

- A large majority of candidates understood this topic well.
- Both a year-by-year approach and a logarithmic approach proved equally successful.
- Very few candidates used a graphical approach.

Limited responses

- A few candidates, using a year-by-year approach, started with year 1 = 600, year 2 = 618 and so on instead of year 1 = 618.
- A few candidates gave the same interest each year rather than use an exponential approach.

Question 10

Comprehensive responses

- Candidates isolated the x^2 term first, then divided by ± 16 and finally took the square root.

Limited responses

- The most common error was when candidates took the square root at the wrong time. $\sqrt{P} = \sqrt{9r^2} - \sqrt{16t^2}$ was often seen as a first line.
- Other candidates made a sign error when isolating the term involving t^2.

Question 11

(a) **Comprehensive responses**

- Just a small number of candidates realised that the 'is a subset of' or 'is a proper subset of' symbol was required. Either was acceptable.

Limited responses

- A variety of incorrect symbols were seen, the most common of which was 'is an element of'.

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(b) **Comprehensive responses**

- This part proved very much more accessible with a fairly large number of candidates shading the correct region.

Limited responses

- There was no common incorrect response.
- Candidates need to use pencil for shading as it is very difficult to correct an incorrect first attempt if a pen is used.

Question 12

Comprehensive responses

- Most candidates successfully extracted the factors from each pair of terms and then correctly gave the final factorised expression.

Limited responses

- A few candidates factorised the pairs of terms successfully but found difficulty in proceeding to the final form.
- Some candidates made errors in factorising each pair of terms. Thes errors were often sign errors.

Question 13

(a) **Comprehensive responses**

- Candidates wrote down the upper quartile, 139, and the lower quartile, 120, subtracted them and gave the correct answer of 19.

Limited responses

- Many candidates did not know how to find the interquartile range; a common error was to subtract 30 from 90 to give an answer of 60.
- A number did the same as above but then read off at 60, in effect finding the median.

(b) **Comprehensive responses**

- The majority of candidates gave the correct answer.

Limited responses

- The most common error was when candidates did not subtract their value, 106, from 120 in order to give an estimate for the number of candidates who had a height of more than 145 cm.
- Some candidates misread the value required from the graph; 103 was sometimes seen.

Question 14

Comprehensive responses

- Successful candidates found the curved surface area of the cylinder, added the care a of the circular base.
- They then either added the circular top as 9π and added $4x^2$ or calculated the area of the top as $9\pi - x^2$ and added $5x^2$.
- It was then necessary to equate their expression for area to 300 and solve for x.

Limited responses

- A significant number of candidates used the volume formula for the cylinder rather than the surface area and/or the circumference of the circle rather than the area.
- Some candidates added the incorrect number of sides of the square.
- The surface area of the cube was sometimes given as x^3 or $6x$.
- A significant number of candidates subtracted the total surface area of the cube from the total surface area of the cylinder.

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Question 15

(a) **Comprehensive responses**

- Most candidates gave the correct answer, either by using a scale factor or equating ratio of sides.

Limited responses

- There were very few incorrect responses and no common errors.

(b) **Comprehensive responses**

- The most common method was to square the ratio of lengths and then multiply by the area of the smaller trapezium.
- A small number of candidates found the height of the smaller trapezium, multiplied this by the ration of the lengths and went on to find the area of the bigger trapezium.

Limited responses

- The most common error was to omit the squaring of the ratio of lengths.

Question 16

(a) **Comprehensive responses**

- Most candidates quoted the correct equation for the given proportionality.
- They were then able to substitute the correct values to find the constant term in the equation.

Limited responses

- The most common error was to use the wrong proportionality.
- This was usually either direct proportion to x^3 or inversely proportional to x^2.
- A number of candidates maintained the proportional sign throughout ever changing it to the = sign.

(b) **Comprehensive responses**

- Most candidates were able to correctly get r in terms of p.
- Then it was necessary to substitute p in terms of x from **part (a)** and convert the result to the correct form $r = 12x^{-\frac{3}{2}}$.

Limited responses

- Many candidates did not manage to substitute their answer from **(a)** into $r = 3\sqrt{p}$.
- Candidates found changing the equation to the require form very difficult.

Question 17

Comprehensive responses.

- The vast majority of candidates gave a correct sketch of the curve and were able to find the x-intercepts.
- It was then necessary to identify the correct regions required and write them as inequalities.

Limited responses

- A few candidates did not draw a satisfactory curve.
- Many candidates did not identify the correct inequalities and –4.37 < × < 1.37 was very common.
- Some candidates attempted algebraic solutions.
- Some candidates only gave answers to 2 significant figures.

Question 18

Comprehensive responses

- There were many very good responses with candidates following a systematic approach and showing detailed working.

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- It was also important that candidates kept full accuracy for intermediate values; the final answer often fell outside the acceptable limits for those who had approximated these intermediate values.

Limited responses

- Candidates needed to show sufficient detail in their working. Necessary rearrangements of the cosine rule and the sine rule needed to be written down, as values given to only 2 significant figures were insufficient to show the method used.
- Some candidates did not use the optimal method to find the angle *DBC*, preferring to first find the angle *BDC*. Another calculation was then needed in order to find the required angle.
- A small number of candidates bisected the 140º angle.

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CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/42
Calculator (Extended)

Key messages

What candidates did well
- Most candidates interpreted the questions well and presented their solutions with an efficient and methodical approach.
- Most candidates showed a good understanding of mathematical procedures and were able to apply them accurately in standard questions.

What candidates needed to improve
- Candidates should use the most direct and efficient methods of calculation, for example, in trigonometry questions involving right-angled triangles, basic trigonometric ratios should be used instead of the sine or cosine rules.
- Candidates should present all steps clearly in multi-stage questions and ensure they reread the questions carefully to ensure accuracy and completeness of their solutions.
- When a question requires several steps in the method, candidates should make each step clear and not try to combine steps into one line of working.
- Candidates should present work in a readable form, especially not overwriting values or signs or positioning work in unusual places in the answer booklet.
- Candidates need to work to a sufficient degree of accuracy to be able to give non-exact answers to at least three significant figures, or one decimal place in the case of angles. Candidates are also reminded that using values to 2 degrees of accuracy will not normally imply the correct method.

Comments on specific questions

Question 1

Comprehensive responses
- Most candidates gave the correct mathematical name of kite for the quadrilateral.
- Few candidates used the alternative answer of isosceles trapezium.

Limited responses
- Several candidates gave the incorrect answers of trapezium and rhombus.

Question 2

Comprehensive responses
- Most candidates correctly simplified to a two-term expression.

Limited responses
- There were insufficient incorrect answers to pick out common errors.

Question 3

Comprehensive responses
- Most candidates correctly multiplied the algebraic fractions together.

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Limited responses
- There were very few incorrect answers so there was no pattern of common errors seen.

Question 4

Comprehensive responses
- Most candidates fully factorised giving the correct final answer.

Limited responses
- A few candidates factorised only partially, for example p (2p – 8t).
- A few candidates incorrectly tried to apply the difference of two squares.

Question 5

(a) **Comprehensive responses**
- Most candidates demonstrated use of their graphical calculators to provide an accurate and clear sketch within the provided axes.
- Some candidates showed excessive feathering and sometimes drew straight lines from the turning point.

Limited responses
- A few candidates did not select the axes carefully on their calculators with the turning point off screen and their sketches showing 2 unjoined parts.
- Several no responses (NR) were seen in this part.

(b) **Comprehensive responses**
- Most candidates were familiar with the term 'zero of the f(x)' and found – 0.2, although some omitted the negative sign.

Limited responses
- Several candidates gave both coordinates of the crossing point as their answer.

(c) **Comprehensive responses**
- Mostly correct answers seen; it was rare to see the y-coordinate given in fractional form.

Limited responses
- Several candidates omitted the negative sign for the x-coordinate or it was not accurate enough.

(d) **Comprehensive responses**
- Some candidates needed to take greater care with the direction of inequality signs. Responses should reflect the strict inequality required for 18.5, as specified in the question.

Limited responses
- Several candidates incorrectly gave their inequalities as a range in x.
- Many candidates used – 0.2 or – 0.3 as their lower limits instead of zero.

(e) **Comprehensive responses**
- Most candidates were able to identify the 'translation' or the correct vector; the vector was allowed to be given in words provided there was no contradiction in their statement.

Limited responses
- Some candidates incorrectly used translocation or transformation.
- A few candidates needed to use the correct coordinate form for their vector.
- A small number of candidates stated more than one transformation. Candidates should ensure that only the required transformation is given.

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Question 6

(a) Comprehensive responses

- The majority of candidates answered this part correctly.

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CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/43
Calculator (Extended)

Key messages

What candidates did well
- Questions involving mathematical knowledge and basic techniques were well presented by most candidates.

What candidates needed to improve
- Most candidates need to improve in problem solving questions.
- Candidates must use more than 3 figures in their intermediate calculations to ensure that the final answer is accurate.
- When a question requires several steps in the method candidates should make each step clear and not try to combine steps into one line of working.
- Candidates should always show their working clearly.
- Candidates should give numerical answers to the appropriate degree of accuracy. Usually 2 significant figure answers are not accepted.
- Candidates need to cover the whole syllabus fully.
- The use of the graphical calculator can be improved upon and extended.

Comments on specific questions

Question 1

(a) Comprehensive responses
- Most candidates answered this correctly, giving the answer to the nearest 10.

Limited responses
- Few candidates gave incorrect values.

(b) Comprehensive responses
- Most candidates answered this correctly, giving the answer to 3 decimal places.

Limited responses
- A few candidates omitted the third decimal place as it was 0.

Question 2

Comprehensive responses
- Most candidates solved this equation correctly.

Limited responses
- Few candidates gave incorrect values.

Question 3

Comprehensive responses
- Most candidates answered this use of calculator question correctly.

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Limited responses
- Few candidates gave incorrect values.

Question 4

(a) **Comprehensive responses**
- Most candidates answered this numerical substitution correctly.

Limited responses
- Few candidates gave incorrect values.

(b) **Comprehensive responses**
- Many candidates transformed the formula correctly.

Limited responses
- Some candidates combined steps which often led to these steps being carried out in the incorrect order.
- Some candidates only took the square root of the numerator instead of the whole fraction.

Question 5

(a) **Comprehensive responses**
- Most candidates gave the correct probability.

Limited responses
- Few candidates gave incorrect values.

(b) (i) **Comprehensive responses**
- Most candidates gave the correct modal class.

Limited responses
- A few candidates only gave a number instead of a class interval.

(ii) **Comprehensive responses**
- Most candidates gave the correct class that contained the median.

Limited responses
- A few candidates only gave a number instead of a class interval.

Question 6

Comprehensive responses
- Few candidates were able to find the length of the side of the cube in terms of x.

Limited responses
- The surface area of the cube was impossible to find without the length of a side.
- Some candidates lost the x and gave numerical answers.

Question 7

Comprehensive responses
- A few candidates gave correct expressions in terms of x and y.

Limited responses
- Many candidates did not divide the 480 by $(x + y)$.

Question 8

(a) **Comprehensive responses**
- Many candidates gave the correct image under the reflection.

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Limited responses
- Some candidates interpreted the line $x = 0$ as the x-axis.

(b) Comprehensive responses
- Most candidates gave the correct image under the rotation.

Limited responses
- Few candidates gave an incorrect image.

(c) Comprehensive responses
- Few candidates gave the single transformation as required.

Limited responses
- Some candidates simply wrote the two transformations given in the stem of the question.
- Some candidates omitted this question.

Question 9

(a) (i) Comprehensive responses
- Many candidates produced a good sketch.

Limited responses
- Candidates should try to avoid overlaps of branches.
- A few candidates had feathering on their curves.

(ii) Comprehensive responses
- Most candidates gave correct equations of the asymptotes.

Limited responses
- A few candidates omitted this part.

(iii) Comprehensives responses
- Some candidates demonstrated the understanding of the curve crossing the x-axis only once.

Limited responses
- Many candidates omitted this part or gave an incorrect value.

(b) Comprehensive responses
- Most candidates sketched a correct straight line.

Limited responses
- Few candidates produced an incorrect sketch.

(c) Comprehensive responses
- Many candidates gave correct x-coordinates of the three points of intersection.

Limited responses
- A few candidates set up an algebraic equation when it is expected that this type of question requires the use of the graph sketch.

Question 10

(a) Comprehensive responses
- Most candidates calculated the mean value correctly.

Limited responses
- There were very few incorrect answers,

(b) (i) Comprehensive responses
- Some candidates gave the correct line of regression.

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Limited responses
- Candidates should know that the line of best fit is not the line of regression.
- Many candidates omitted this part.

(b) (ii) Comprehensive responses
- The candidates who were successful in part **(a)** gave a correct value.

Limited responses
- A few candidates were able to follow through their incorrect answer to part **(a)**.
- Many candidates omitted this part.

(c) Comprehensive responses
- Many candidates gave a correct probability from a correct product.

Limited responses
- Some candidates used all 10 students instead of the 6 who scored more than 40 in French.

Question 11

Comprehensive responses
- Many candidates gave a correct simplified product.

Limited responses
- A few candidates needed to correctly handle multiplication of brackets.
- Most candidates were able to correctly multiply out two pairs of brackets.

Question 12

(a) Comprehensive responses
- Some candidates used the alternate segment theorem correctly.

Limited responses
- A few candidates gave numerical answers.
- Some candidates omitted this question.

(b) Comprehensive responses
- Most candidates who succeeded in part **(a)** applied parallel lines correctly.

Limited responses
- A few candidates gave numerical answers.
- Some candidates omitted this question.

(c) Comprehensive responses
- Few correct answers were seen.

Limited responses
- Many candidates omitted this question.

(d) Comprehensive responses
- Few correct answers were seen.

Limited responses
- Many candidates omitted this question.

Question 13

(b) (i) Comprehensive responses
- Some candidates factorised correctly.

Limited responses
- Candidates should be able to recognise a difference of two squares situation.

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Question 14

(a) **Comprehensive responses**
- A few candidates found the volume of the frustum correctly.

Limited responses
- Most candidates found the volume of the larger cone correctly.
- Most candidates did not find the radius or the height of the smaller cone correctly, with the height often being given as 20 instead of 10.

(b) **Comprehensive responses**
- Few correct answers were seen.

Limited responses
- Some candidates found the sloping edge of the larger cone correctly.
- Some candidates gave the areas of the two circles.
- The sloping edge of the smaller cone was usually incorrect or not seen.
- Some candidates omitted this question.

Question 15

(a) **Comprehensive responses**
- Some candidates gave the correct bearing.

Limited responses
- Many candidates used lengthy calculations to find an angle which was not the bearing required.

(b) **Comprehensive responses**
- Most candidates used Pythagoras correctly.

Limited responses
- Few incorrect answers were seen.

(c) **Comprehensive responses**
- Few correct answers were seen.

Limited responses
- Only a few candidates applied the sine rule to find a relevant angle.
- Many candidates omitted this question.

Question 16

(a) **Comprehensive responses**
- Many candidates correctly divided by 1.05 and by 1.08.

Limited responses
- A few candidates divided by 1.13.

(b) **Comprehensive responses**
- Many candidates used logarithms correctly.
- Some candidates used trials correctly.

Limited responses
- Some candidates did not apply 5% exponentially.

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Question 17

(a) **Comprehensive responses**

- Only a few candidates gave a correct sketch.

Limited responses

- Many candidates omitted this part.

(b) **Comprehensive responses**

- Very few candidates gave correct inequalities.

Limited responses

- Many candidates omitted this part.

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CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/51
Investigation (Core)

Key messages

What candidates did well

- Candidates fully understood the numerical applications needed to connect the frames with the grids.
- Candidates communicated well especially showing complete numerical solutions.

What candidates needed to improve

- Use of brackets and the negative sign in algebraic expansions, for example $(n + 13)(n + 13) – n(n + 24) = (n + 13)(n + 13) – n^2 – 24$.
- To answer a 'Show that' question start with something else not with the expression/equation that is given in the question.
- Algebraic expressions/equations need to be shown to be true by using algebra. One or more numerical substitutions do not show that it is true.

Comments on specific questions

Question 1

(a) Comprehensive responses

- Most candidates fully understood the process of calculating the frame sum.

Limited responses

- A few candidates could improve accuracy by carefully checking their calculations and reviewing their working at each stage.

(b) (i) Comprehensive responses

- Most candidates found the missing number in the frame and used this to correctly calculate the frame sum.

Limited responses

- A few candidates could improve accuracy by carefully checking their calculations and reviewing their working at each stage.

(ii) Comprehensive responses

- Most candidates were able to identify both the missing numbers and used them correctly to find the frame sum.

Limited responses

- A few candidates made calculation errors or squared the wrong number from the frame.

(c) Comprehensive responses

- Almost all candidates completed the statement correctly.

Limited responses

- Very few candidates miscounted to give an incorrect increase.

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Question 2

(a) **Comprehensive responses**

- Most candidates, possibly by looking back at the grid, recognised the link between the top and bottom squares of the frame and were able to give the correct answer of $n + 16$.

Limited responses

- Candidates were not asked to simplify their answers although most did do this.
- A few candidates gave numeric rather than algebraic answers.

(b) **Comprehensive responses**

- Many candidates calculated 81 correctly for the first answer
- Some candidates were able to substitute and expand correctly on the second line.
- A few candidates were able to apply the steps for calculating the frame sum to the algebraic terms to complete the expansion correctly.

Limited responses

- Some candidates were able to complete the first line with 81.
- Few candidates were able to complete the second line by substituting in the $n + 16$ and then expanding the brackets.

(c) **Comprehensive responses**

- Many candidates worked out the other numbers that would be in the frame and applied the frame sum calculations, rather than using the formula given to them in the previous part.

Limited responses

- Candidates did not use the frame sum formula that they had been given in **part (b)**.
- Some candidates calculated the correct values for the other numbers in the frame.

(d) **Comprehensive responses**

- Some candidates used the formula given in **part (b)** to find the number in the top square.
- Some candidates successfully managed to use trials to find this number.

Limited responses

- Candidates tried unsuccessfully to use trial and improvement to find the missing numbers from this frame.

Question 3

(a) **Comprehensive responses**

- Most candidates were able to use the grid to find the missing number in the bottom of the frame.
- Most candidates also showed correct working to calculate the correct frame sum.

Limited responses

- A few candidates did not find the correct bottom number of the frame.
- A few candidates did not show all the steps of their working.

(b) **Comprehensive responses**

- Most candidates saw the link between the top and bottom squares of the frame and used this successfully to find the expression of $n + 13$ for the square on the right.

Limited responses

- A few candidates gave a numerical rather than an algebraic answer.

(c) **Comprehensive responses**

- Some candidates were able to expand both $(n + 13)(n + 13)$ and $n(n + 24)$ correctly.
- A few candidates clearly showed the correct combination of the two expressions that led to $2n + 169$.

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Limited responses

- Many candidates did not get any further than the correct 4-term expansion of $(n + 13)(n + 13)$.
- Of those who managed to write out both expansions most could not deal correctly with the signs in the subtraction step.
- Some candidates took a numerical approach and used a set of frame numbers to show that $2n + 169$ was true for their specific values.

(d) Comprehensive responses

- Some candidates were able to set up the equation by writing $2n + 169 = 205$ and solved it to find $n = 18$. Then they completed the frame correctly.
- Some of the successful candidates did not show how they found their 31 or their 42 from their $n = 18$.

Limited responses

- Many candidates used trials again to try to find three numbers from the grid that fitted the frame with a sum of 205.

Question 4

(a) Comprehensive responses

- Most candidates used the grid to find the missing number in the frame successfully, and from there were able to calculate the frame sum correctly.
- A few candidates omitted to show the subtraction in their working.

Limited responses

- A few candidates made calculation errors; mostly in finding 151 rather than the frame sum calculation.

(b) Comprehensive responses

- Most candidates used the grid successfully to find the two missing numbers in the frame.

Limited responses

- Some candidates did not connect 167 to its correct place in the grid.

Question 5

(a) Comprehensive responses

- Few candidates managed to set up the required equation.
- A few of these candidates subtracted 40 from both sides to reach $d(w + 1) = 18$.

Limited responses

- Many candidates tried a numeric approach by substituting values into the given equation.
- Candidates tried to start with $d(w + 1) = 18$ instead of working towards it.

(b) Comprehensive responses

- Few candidates recognised that w could not be 0.
- Many reasons given were to do with different placings of 58.

Limited responses

- Candidates were looking for a value or position of d rather than considering d not equal to 0.

(c) Comprehensive responses

- A few candidates showed substitutions into $d(w + 1)$ and found most, if not all, of the correct pairs that gave an answer of 18.
- Candidates often did not recognise that $d = 9$ with $w = 1$ and $d = 18$ with $w = 0$ were not possible pairs.

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Limited responses

- Candidates gave separate lists of numbers for d and w rather than giving their answers as pairs.
- Few candidates showed their substitutions into $d(w + 1) = 18$ for good communication.
- Candidates did not consider all possible pairs of numbers.

(d) **Comprehensive responses**

- A few candidates used $n + 2dw$ to write an equation equal to 106 with n equal to 76.
- Some of these rearranged to find $dw = 15$.

Limited responses

- Some candidates tried to use the formula $n + d(w + 1)$ with a value they calculated using 76 and 106.
- Some candidates tried to use trial and improvement to find the number on the right for this frame.

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CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/52
Investigation (Core)

Key messages

What candidates did well
- Candidates were able to successfully complete most of the numerical tables showing a good understanding of the introduction of the investigation.
- Candidates showed a good knowledge and use of multiples.

What candidates needed to improve
- Candidates need to refer back to previous questions to see patterns that are then helpful to answer future questions.
- Finding a linear sequence and its *n*th term.

Comments on specific questions

Question 1

(a) Comprehensive responses
- Almost all of the candidates answered this correctly, showing that they understood the instructions on how to win the game.

Limited responses
- Most candidates were able to complete the table correctly.

(b) Comprehensive responses
- Most candidates completed the tables correctly by finding two different ways of winning.

Limited responses
- Almost all candidates completed the table correctly.

(c) Comprehensive responses
- Most candidates found the way to remove sticks and win the game even when starting with 9 stick.

Limited responses
- Most candidates completed the table correctly.

(d)(i) Comprehensive responses
- Most candidates used the idea of multiples to correctly complete the statement.

Limited responses
- Just a few candidates thought these were factors instead of multiples.

(ii) Comprehensive responses
- The majority of candidates wrote down the correct two terms.

Limited responses
- A few candidates only wrote down one term.

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(iii) Comprehensive responses

- Some candidates realised that since 18 is a multiple of 3 you should win.
- Some candidates found this was not easy to explain.

Limited responses

- Some candidates did not see that the previous two questions were building up to answering this question.

(iv) Comprehensive responses

- Some candidates saw the connection of the multiple and correctly choose an answer of 2.

Limited responses

- Some candidates did not see the connection between the previous parts of this question.

(e) Comprehensive responses

- Since you are starting with 18 sticks the object is to always leave a multiple of 3 in order to win. Some candidates realised this and completed the whole table accurately.
- The question referred to the fact that you always take the number of sticks to insure you win. Many candidates chose to take 1 stick on their first move leaving 16 which is not a multiple of 3.
- Some candidates recovered to make the correct choices further down the table.

Limited responses

- Few candidates had picked up on the fact that leaving a multiple of 3 was a guide to the number of sticks to take.

Question 2

(a) Comprehensive responses

- This question was based on the sequences given in the table. Some candidates realised this and were able to extend the sequence as far as 16 moves.
- There were several ways of finding the 16. Some candidates communicated how they did this.

Limited responses

- Candidates did not realise that this question could be answered by using sequences.

(b) Comprehensive responses

- A few candidates realised that this part **(b)** could be treated as an extension of part **(a)**.
- One solution was to extend the sequence in part **(a)** from the 16 number of moves to 40.
- Some candidates did not communicate how they had reached the answer of 60.

Limited responses

- Some candidates were not sure how to answer this question.

Question 3

(a) Comprehensive responses

- Many candidates had the correct idea for the reason.
- Some candidates were able to explain this in words.

Limited responses

- Many candidates did not realise that whatever number the friend took left you in a winning position.

(b) Comprehensive responses

- Some candidates realised that whatever they put in the first row for the friend to take they must then take the number that would leave 4. This was the most efficient method.
- Some candidates found an alternative method that also worked in four rows.

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Limited responses

- Many candidates created a table where it appeared that you had won when actually if your friend had taken a different number of sticks then they could have one.
- A few candidates omitted to complete the column for the number of sticks left.

(c) **Comprehensive responses**

- A few candidates realised that they were looking for multiples of 4.
- Some candidates gave one or two even numbers.

Limited responses

- Some candidates gave a variety of different numbers.

Question 4

(a) **Comprehensive responses**

- Most candidates completed the numerical sequences correctly.
- Some also found the nth term of these sequences, and a few completed the whole table correctly.

Limited responses

- With at least most of the numerical sequences correct some candidates tried the nth terms.

(b) **Comprehensive responses**

- A few candidates saw the connection with the factors of 30.
- A few of these wrote equations such as $2n = 30$.
- A few candidates found some of the values for k.

Limited responses

- Some candidates tried to use trials to find values for k.

Question 5

(a) **Comprehensive responses**

- Most candidates completed the table with one of the two correct solutions.

Limited responses

- Very few candidates made an error in this table.

(b) **Comprehensive responses**

- Most candidates answered this correctly.

Limited responses

- Very few errors were seen.

(c) **Comprehensive responses**

- A few candidates realised that because the question was now back to taking only 1 or 2 sticks, you needed to leave a multiple of 3.
- Some of these candidates gave a series of numerical steps to show how you could win.

Limited responses

- Candidates did not realise the connection between the number of sticks that could be picked up and multiples of a number.
- Some candidates did not show an understanding of multiples.

(d) **Comprehensive responses**

- Some candidates realised that it could have been 13 or 14 sticks because either one or two could have been removed.

Limited responses

- Candidates only wrote one of the two answers.

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Question 6

(a) **Comprehensive responses**

- A few candidates found the correct sequence realising it had to increase by 4.
- Some of these did not show the increase of 4.

Limited responses

- Some incomplete sequences and some without a common difference were seen.

(b) **Comprehensive responses**

- A few candidates were able to follow on from their correct sequence given in part **(a)**.
- Some candidates did not place the 4 as the coefficient of n and used it as the constant.

Limited responses

- Some candidates appeared unaware of the format of an nth term.

Question 7

Comprehensive responses

- A few candidates were able to follow through on finding a difference of 5 related to the fact that up to 4 sticks could be taken.
- A few of these managed to find the correct nth term.

Limited responses

- Candidates did not see the connections that the investigation had been working towards.

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CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/53
Investigation (Core)

Key messages

What candidates did well

- Candidates generally accurately completed tables involving factors and multiples.
- Many candidates were able to recognise patterns within tables.
- Many candidates effectively organised and summarised information at the start of a question.

What candidates needed to improve

- Candidates should clearly demonstrate their understanding of the mathematical processes required to arrive at their answers. Communication of the steps in their working in the early stages of an investigation is as important as in later questions that require several steps to reach the answer.
- Candidates should consider what they learn at each stage of the investigation. Often a previous answer, or a previously given expression or equation, can help in answering a new question.

Comments on specific questions

Question 1

(a) **Comprehensive responses**

- Most candidates were able to accurately complete the lists of factors of 6 and 8.

Limited responses

- Very occasionally the largest factor, 8, was omitted or a multiple of 8 was given.

(b) **Comprehensive responses**

- Most candidates recognised 2 as being the highest number to appear in both lists of factors.

Limited responses

- The few misunderstandings included writing the highest number out of the two lists (8) or writing the highest number in each of the two lists (6 and 8).

(c) **Comprehensive responses**

- Almost all candidates were able to accurately complete the two lists of multiples.

Limited responses

- There were too few incorrect responses to make a general comment.

(d) **Comprehensive responses**

- This question was generally well understood and correctly answered.

Limited responses

- Misunderstandings, if they occurred, were similar to those in **Question 1(b).** Sometimes the lowest of all the numbers in the two lists (6) was written, or the lowest number in each list (6 and 8).

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(e) **Comprehensive responses**

- Most candidates accurately completed the table of factors and multiples.

Limited responses

- A few candidates wrote one incorrect value.
- A small proportion of candidates entered incorrect values in several answer spaces. In this case the errors were more likely to appear in the factors list than in the list of the first six multiples.

(f) (i) **Comprehensive responses**

- The highest common factor was generally correctly recorded.

Limited responses

- Very occasionally a candidate wrote the highest multiple of 2 and/or of 6 in the table.

(ii) **Comprehensive responses**

- The lowest common multiple was generally correctly recorded.

Limited responses

- Very occasionally other multiples, for example 12, were given as the least common multiple.

(iii) **Comprehensive responses**

- Most candidates found the correct HCF and LCM for 3 and 9.

Limited responses

- Various responses were seen from those who did not have correct answers to this question. A single incorrect response was as likely to be for the highest common factor (HCF) as for the lowest common multiple (LCM).
- Occasionally the HCF and LCM were written the wrong way round.

(iv) **Comprehensive responses**

- Many candidates were able to answer both parts of this question correctly.
- Some candidates also demonstrated how they found the LCM, usually by continuing the list of multiples of 7 up to 63.

Limited responses

- Where candidates answered just one of the two questions correctly, it was more likely to be the HCF than the LCM.
- Sometimes 0 was recorded for the LCM, perhaps due to there being no common multiple shown in the lists of the first six multiples.
- Many candidates did not show any working either on the table or in the working space and missed the opportunity to communicate their approach to answering this question.

Question 2

(a) **Comprehensive responses**

- The lists of factors and multiples of 12 were generally completed accurately.

Limited responses

- Very occasionally a single factor was incorrectly recorded.
- More than one error or omission was extremely rare.

(b) **Comprehensive responses**

- The HCF and the LCM of 9 and 12 were frequently recorded correctly.

Limited responses

- Incorrect answers to these questions varied. No general comment can be made in this case.

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Question 3

(a) **Comprehensive responses**

- Many candidates were able to complete the table with the correct values for the HCF, the LCM and $a \times b$.
- Sometimes candidates communicated their approach to this question, more often by writing the first four multiples of 14 in the working space. The factors of 14 were seen less frequently.

Limited responses

- If incorrect values were written in the table, they tended to be for the HCF or LCM, rather than for the product of a and b.
- A few candidates, having identified the relationship between the HCF, the LCM and $a \times b$, used this relationship to complete the final column rather than multiplying the numbers a and b. The opportunity to check their HCF and LCM values in this case, was not always recognised.
- Many candidates only completed the table in this question and did not communicate how they had approached finding the HCF or LCM of 8 and 14.

(b) **Comprehensive responses**

- The connection between the HCF, the LCM and $a \times b$ was correctly identified by many candidates. Some candidates showed this connection as an equation as well as explaining the connection in words.

Limited responses

- Sometimes candidates identified patterns and relationships between just two of the elements.
- Sometimes a connection was identified that was only true for some of the number pairs given in the table.
- Some responses were not clear or precise.

(c) **Comprehensive responses**

- In a 'show that' question such as this, candidates need to clearly and fully demonstrate why the statement in **Question 3(b)** is correct for the given values. Comprehensive responses identified and labelled the correct values of the HCF and LCM and then showed calculations and final answers for both HCF $\times$ LCM and $a \times b$.

Limited responses

- Although the HCF and LCM were often identified, sometimes only one calculation was shown. This was usually the calculation for HCF $\times$ LCM.
- In some responses, the HCF and/or LCM were incorrect or not both clearly identified at the outset.

(d) **Comprehensive responses**

- Some candidates gave concise and efficient answers to this question. Using the connection identified in **Question 3(b)**, appropriate values were substituted to obtain an equation of the form $16 \times b = 4 \times 80$. The answer 20 was then obtained by dividing both sides of the equation by 16.

Limited responses

- Candidates who did not realise that they could use the results they had previously found in **Question 3(b)**, were often less successful in finding a route to the solution in this question.
- Different values were often tried out in searching for the unknown number. Some candidates succeeded in finding the correct answer of 20, although frequently there was no evidence of a clear strategy and process.

Question 4

(a) **Comprehensive responses**

- This part of the final question was well done. Almost all candidates completed the products of prime factors correctly.

Limited responses

- There were too few incorrect responses to make a general comment.

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(b) **Comprehensive responses**

- A small proportion of candidates used their answers to **Question 4(a)** and found the HCF and LCM from the numbers 20 and 30 written as products of prime factors. Many other candidates found the HCF and LCM directly from the numbers 20 and 30 and then attempted to write these values as a product of prime factors for the final answers.

Limited responses

- Some candidates found the values 10 and 60 for the HCM and the LCF respectively and then wrote these values as the final answers.
- Some candidates found incorrect values for the HCF and LCM of 20 and 30 and wrote these values as their final answers.

(c) **Comprehensive responses**

- Most candidates attempted this final question and some succeeded in communicating one or two appropriate mathematical steps towards the solution, even if the LCM was not found or not written as a product of prime factors.
- In a few succinct responses, candidates substituted the values for A and B into the given equation, which was then solved to find $p = 17$. The LCM of 3570 was subsequently found by dividing 24990 by the HCF of 7. The number 3570 was then written as a product of prime factors.

Limited responses

- Most candidates did not reach the final stage of this question by expressing the LCM as a product of prime factors.
- Some candidates found the correct value of p without clearly communicating the mathematical steps taken that lead to this solution.
- Some candidates could improve accuracy by carefully checking each step when solving equations, which would help ensure the final value for p is correct

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CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/61
Investigation & Modelling (Extended)

Key messages

What candidates did well

- Many candidates showed a good understanding of the investigation and were able to generalise the frame sum rules.
- Many candidates were able to identify the similar triangles they needed to use to find models for cylinders inside cones.
- The overall performance was of a very high standard.
- There was good communication from many.

What candidates needed to improve

- Candidates need to recognise that the investigation and the modelling sections both build up and that answers to earlier questions help with later questions.
- Questions where something has to be shown must be in enough detail to show separate stages and not combine stages that may seem trivial to the candidate.
- Sketches from graphical display calculators need to cover the right range and have the right shape and should also include an indication of scale.

Comments on specific questions

Section A Investigation Frame Sums

Question 1

(a) **Comprehensive responses**

- Most candidates were able to find 22 and follow the instructions for finding the frame sum.

Limited responses

- A few candidates made arithmetical errors whilst finding the frame sum.

(b) **Comprehensive responses**

- Most candidates were able to find 46 and 53 and use these numbers to find the frame sum.

Limited responses

- A few candidates found a frame sum using the wrong numbers.
- A few candidates made arithmetical errors whilst using 46 and 53.

Question 2

(a) **Comprehensive responses**

- Most candidates found the correct expressions.

Limited responses

- A few candidates used an expression that was not simplified, for example $n + 9 + 7$ rather than $n + 16$. This made answering **Question 2(b)** harder.

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(b) **Comprehensive responses**

- Many candidates were able to make an algebraic expression, expand the brackets and then subtract them correctly to show that an expression for the frame sum is $2n + 81$.

Limited responses

- Some candidates expanded $(n + 9)^2$ incorrectly making it $n^2 + 81$ or expanded $– n(n + 16)$ incorrectly to make $– n^2 + 16n$ and were then unable to show that the frame sum is $2n + 81$.

(c) **Comprehensive responses**

- Most candidates communicated clearly how they had equated $2n + 81$ to 197 and solved it to get 58.

Limited responses

- Some candidates did not realise that they should use $2n + 81$ from **Question 2(b).**

(d) **Comprehensive responses**

- Most candidates subtracted 16 from 223 to find $n = 207$ and then used this value in $2n + 81$.

Limited responses

- Some candidates who found $n = 207$ did not substitute it into the expression $2n + 81$.
- Some candidates put $2n + 81 = 223$ instead of $n + 16 = 223$.

Question 3

(a) **Comprehensive responses**

- Most candidates were able to find 159 and 183 and calculate the frame sum correctly.

Limited responses

- Some candidates who found the wrong 159 and 183 were able to use the numbers they did find to calculate a frame sum.

(b) **Comprehensive responses**

- Some candidates found $n + 32$ and $n + 56$ and combined them to make the correct unsimplified expression as required.

Limited responses

- Many candidates who found $n + 32$ and $n + 56$ went on to simplify their expression unnecessarily, some did so correctly, but many did not manage to.
- A few who found the wrong $n + 32$ and $n + 56$ were able to combine them correctly in an unsimplified expression.

Question 4

(a) **Comprehensive responses**

- Some candidates were able to combine all the variables to find $n + 2dw$.

Limited responses

- A wide variety of incorrect combinations of n, w and d were given.

(b) (i) **Comprehensive responses**

- Some candidates showed five clear stages presented as separate and distinct steps, without omission, and not combined.
- Good and concise algebraic manipulation was shown.

Limited responses

- Many candidates combined or missed steps, commonly combining the subtraction of $176d$ with square rooting or with division by d or d^2.
- A few candidates tried to start with the answer which is not allowed.
- Some candidates expanded the brackets unnecessarily.

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(ii) Comprehensive responses

- Most candidates were able to use the given formula correctly to fill in the table.

Limited responses

- Some candidates did not round to 2 decimal places.
- Some candidates altered the negative answer to positive.

(iii) Comprehensive responses

- A few candidates were able to realise that the answers required were only the integer values as w is the width of a grid.

Limited responses

- Many candidates wrote down all the values from their table as a list or as an inequality.
- A few candidates wrote 3.00 and 5.00 where a width must be an integer.

Section B Modelling Cones and Cylinders

Question 5

(a) (i) Comprehensive responses

- Most candidates were able to identify XY as the correct line segment.

Limited responses

- A few candidates put OY or OA or YA.

(ii) Comprehensive responses

- Most candidates were able to identify the missing number as 20.

Limited responses

- A few candidates wrote 12 or gave an answer in letters.

(iii) Comprehensive responses

- Most candidates were able to cross multiply their fractions or isolate x to communicate their method and find the correct value of x.

Limited responses

- A few candidates started with new incorrect fractions leading to an incorrect answer.

(iv) Comprehensive responses

- Most candidates were able to use their answer from **Question 5(a)(iii)** to correctly find the volume of the cylinder also communicating the squaring of their x value and use of the formula.

Limited responses

- Some candidates did not show their use of the formula for the cylinder.
- Some candidates gave a numerical answer for the volume but had missed out the stage where it was a multiple of pi.

(b) Comprehensive responses

- Many candidates were able to set up correct ratios between the cone and cylinder and use them to find either $x = 7$ or $x = 3$ and then communicate how they used a radius of 7 to find the volume of the cylinder in terms of pi.

Limited responses

- Some candidates did not set up correct ratios between the cone and cylinder.
- Some candidates gave a numerical answer for the volume but had missed out the stage where it was a multiple of pi.
- Some candidates did not communicate how they got from a radius of 7 to the volume.

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Question 6

(a) **Comprehensive responses**

- Some candidates were able to set up the correct ratios that they then rearranged for x and substituted into V leading to the required model.
- There was some good algebraic manipulation.

Limited responses

- Some candidates were able to set up a correct ratio and start the process of isolating x.
- Some candidates were unable to manipulate their expression for the radius into a form that could lead to the required model.

(b) **Comprehensive responses**

- Some candidates produced a sketch that indicated the correct shape and concavity of the graph and communicated the scale on the V axis.

Limited responses

- Some candidates drew a sketch that was too symmetrical as the maximum should be skewed to the left and the concavity different on either side of the maximum.
- Many candidates did not indicate a scale either using coordinates or on the V axis.
- Some candidates drew a maximum above where they had indicated 1000 or 930.
- Some candidates had used ranges on their graphical display calculators that made sketching difficult to do.

(c) **Comprehensive responses**

- Some candidates were able to answer this question to the required degree of accuracy.

Limited responses

- Some candidates rounded down to 930.
- Some candidates gave the height instead of the volume.

(d) **Comprehensive responses**

- A few candidates found the height at which the cylinder had a maximum volume from their sketch on their graphical calculator. Then communicated how they used the expression connecting the height and the radius to find the radius.
- The required degree of accuracy was used for the height and the radius.

Limited responses

- Many candidates did not use the required degree of accuracy.
- Many candidates tried to find the height from a formula rather than from their sketch of the graph.
- Many candidates used the formula for volume and their height to find the radius.

Question 7

(a) **Comprehensive responses**

- Some candidates were able to set up the correct ratios that they then rearranged for H.

Limited responses

- Many candidates were unable to find the correct ratios.
- Some candidates were unable to rearrange the correct ratios for H.

(b) (i) **Comprehensive responses**

- Many of those candidates who found H correctly in **Question 7(a)** were able to substitute H into the formula for the volume of a cone.

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Limited responses

- Many candidates were unable to show the required model because they had the wrong expression for H.
- Some candidates had the correct H but were using an incorrect formula for the volume of a cone.

(ii) Comprehensive responses

- Some candidates were able to find a numerical answer for the minimum volume of the cone to a suitable degree of accuracy.
- A few candidates provided a suitable sketch to communicate how they had found that minimum.

Limited responses

- Many candidates just gave a numerical answer.
- Some candidates attempted a trial and substitution method but focused on integer values of R only.

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CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/62
Investigation & Modelling (Extended)

Key messages

What candidates did well

- Algebraic work was often correctly performed.
- Nearly all candidates successfully found the *n*th terms of the linear sequences.
- Many candidates showed very good understanding of how to use logarithms.
- In the modelling money was usually given to a sensible level of accuracy.
- When showing tables of values in steps of 1 unit, candidates knew to take values immediately before and after the required value.
- Most candidates showed good communication by writing down the equations and expressions in their working that would lead to the answer.

What candidates needed to improve

- There was frequently a lack of annotation, such as 'The factors are….' or 'k = …..', to show communication of the candidate's strategy.
- The organisation on the page in the more open-ended questions needs attention. Candidates should start their method at the top left of the workspace and score out any previous method if they choose to re-start the question.
- There were many examples where the use (or lack) of brackets was too casual and the rules for brackets need to be clearly understood.
- In modelling candidates should always keep the context in mind. In this case answers that were sums of money should not be written with three decimal places.
- With the graphics display calculator, the method of 'trial and improvement' for integer values is redundant. Instead, candidates can simply show the relevant consecutive rows using the table function in the calculator.

Comments on specific questions

Section A

Question 1

(a) Comprehensive responses

- Almost candidates showed they understood how the game worked.

(b) (i) Comprehensive responses

- The most detailed responses noted briefly that 9 is a multiple of 3 or that, after two moves, it was always possible to leave the opponent with 6 sticks.

Limited responses

- Many candidates wrote beyond the given answer space and described what they would do without relating it to the number of moves or getting 6 sticks remaining.
- Several gave answers such as 'it leaves an odd number'.

(ii) Comprehensive responses

- Just over half of the candidates gave the correct answer of 2.

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Limited responses

- Of those who recognised that a multiple of 3 was required, several took away more than the allowed 2 sticks to achieve that and answers of 11 or 14 were frequent.
- Answers of 1 or 10 were also seen often.

(c) Comprehensive responses

- Most candidate could complete the table to show how to win in a game starting with 18 sticks

Limited responses

- Errors occurred when the number of sticks taken did not give a multiple of 3. This happened by subtracting 2 when there were 16 sticks, subtracting 1 when there were 8 sticks, or subtracting 2 when there were 4 sticks.

Question 2

(a) Comprehensive responses

- The sequences and their *n*th terms were found by nearly all candidates

Limited responses

- The most common error was in finding the general term, where *k*n was seen several times.
- Some candidates left the general term unanswered.

(b) Comprehensive responses

- The well-developed strategy was to find the factors of 30 and these gave the values of *n*.
- Some candidates preferred to set up equations to do this.
- In both of the above cases the most common error was to omit the factors 1 or 30 or both.
- There were 7 possible values for *k*, with *k* = 1 sometimes missing. A single omission was condoned.

Limited responses

- Candidates, whose *n*th term in the previous part was incorrect, often gave the factors of 30 as the final answer.
- Some candidates used a prime decomposition, which did not lead to a complete list of factors.
- Other candidates tried out various numbers but, without a strategy, did not find enough solutions.
- Candidates could have improved their mark with well-developed organisation in the workspace.

Question 3

Comprehensive responses

- Correct answers, recognising that 18 was a multiple of 3, were frequent.
- There were more correct answers than in **Question 1(b)(i)**, which was a similar question.

Limited responses

- A common incorrect reason was to say that 19 was odd or 18 was an even number.
- Some lengthy responses were of little value. Candidates should be aware that the single answer line hints that a brief answer was sufficient.

Question 4

(a) Comprehensive responses

- Finding the *n*th term of the linear sequence was very well done.

Limited Responses

- Occasionally 4*n* + 1 was seen as the answer.

(b) Comprehensive Responses

- The completion of the first table was done correctly by many candidates, with many of those communicating the sequence of remaining sticks.

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Limited responses

- Other sequences, such as 1, 2, 3, 4, 5 were seen for the number of moves.
- Some responses did not make good use of the larger blank table to communicate how the answers were found.
- Several candidates did not realise that after you take sticks your friend should always be left with a multiple of 4.

(c) Comprehensive Responses

- The more detailed responses showed the correct formula, though some spoiled their answer in not writing m = before the expression in p.

Limited responses

- These responses often did not account for the fact that p increases in steps of 4, resulting in incomplete or incorrect calculations within their working.
- Several candidates did not understand 'in terms of p' and included other variables.
- Very few candidates showed the common differences in m and in p.

Question 5

Comprehensive responses

- A small number of candidates completed the column for the sticks removed. An even smaller number then calculated the number of moves correctly.
- Candidates could have improved their mark by communicating their ideas more clearly, showing how the value of k was related either to the removal of sticks or to the number of moves to win.

Limited responses

- Several candidates gave the correct number of sticks to remove when $k = 2$, but this showed no general understanding in helping them with the other cells.
- Some candidates assumed incorrectly that there was a pattern to the answers, such as the number of sticks to remove was always 2, or was 1 less than k.
- For the number of moves, 25 was seen often, sometimes from $50 \div 2$.
- Communication of any working was often neither clear nor systematic.

Section B

Question 6

(a) Comprehensive responses

- Nearly all candidates calculated the amount and showed the substitution into the given compound interest formula.

Limited responses

- Answers to three decimal places were not accepted since that is not realistic for a sum of money.

(b) Comprehensive responses

- The large majority of candidates, after writing down a suitable equation, found the number of years to accumulate \$1000.
- Most preferred to use logarithms and so $\frac{\log 2}{\log 1.04}$ as well as $\log_{1.04} 2$ was often seen.
- Typing the function into the graphics calculator was quite an efficient way to find the answer by sketching a graph or listing values from a table.

Limited responses

- Of those using a list of values, several did not give the value for 17 as well as 18 in order to show when the investment went beyond \$1000.
- Several candidates did not show any method for solving the initial equation.

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Question 7

Comprehensive responses
- The large majority of candidates found the amount for regular investment over two years and communicated this by showing the addition of the sums from the two compound interest formulas.

Limited response
- Some candidates only calculated the amount for a single sum of $300 over two years.

Question 8

(a) **Comprehensive responses**
- The large majority of candidates continued the series correctly.

Limited responses
- Any error was usually seen in the first term of the second line where P or P×1.04 was seen a few times.

(b) **Comprehensive responses**
- The well-developed responses showed good algebraic skills following on from cancelling out terms in **part (a)** and then factorising each side of the statement.
- As a correct alternative to factorising $1.04T - T$, a few candidates wrote $1.04T - T = 0.04T$ and then divided by 0.04 to get $T =$. In the final stage 0.04 was then rewritten as 1.04 – 1.

Limited responses
- The main source of errors was in cancelling out the terms incorrectly in the expansion.
- Several candidates assumed the result and wrote the factorisation of the right side without giving the necessary expression obtained by cancelling out terms.
- Responses often gained credit for factorising $1.04T - T$ correctly.

(c) **Comprehensive responses**
- Many candidates communicated the equation they used to accumulate $700 using regular investment.
- Most of those then found the correct answer by rearrangement of their equation, often calculating numerical expressions at each stage.

Limited responses
- Some candidates did not rearrange the equation sufficiently for the purpose. Communication of method should show clearly what is to be typed into the calculator.
- The most common source of error was to round off too early during the stages of the calculation and a common answer was $124. This however would not give Joe the necessary $700 in his account. In modelling, candidates should always consider the context of the question.
- Answers with three decimal places were considered unrealistic.
- Many responses looked at a single investment at the start of the 5 years, instead of regular investment each year for 5 years.

Question 9

Comprehensive responses
- The correct application of the formula was seen in the large majority of responses.

Limited responses
- This question showed the importance of careful reading as there were more misreads of numbers than usual.
- Several candidates omitted important brackets. This was condoned only for this question.

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Question 10

(a) **Comprehensive responses**

- There were several excellent responses to this question, which required careful algebraic skills of sound quality.
- Each step in reaching the model was clearly set out in the working space.

Limited responses

- Many candidates only wrote down the first line correctly and needed to demonstrate greater confidence and accuracy when manipulating the algebraic expressions of the formula.
- Some candidates needed to take more care in writing down the formula, and a frequent error was to omit essential brackets.
- Many candidates did not know how to deal with division by $\frac{R}{100}$.
- Many responses would have benefited from clearer written expressions and placing of the lines of argument in the workspace,
- There were many whose reasoning did not proceed logically and did not show how one step followed from the previous one. In a *Show that…* question it is vital to show every step clearly and not jump to the given answer.

(b) **Comprehensive responses**

- The majority of candidates saw from the calculator that the model was indistinguishable from a straight line through (0, 750).
- A ruler can be used to draw this line, and many candidates did this carefully.

Limited responses

- Some candidates thought that such a function could not give a straight line and so drew a slight curve. There was some tolerance for this.
- A common error was not extending the straight line as far as (0.8, 800).
- Some candidates drew a curve which deviated too far from the straight line.
- A few could not use, or did not have access to, a graphics display calculator, with some leaving the question unanswered.

(c) **Comprehensive responses**

- The detailed responses found the equation of the model as a linear function.
- The easiest approach was to find the gradient by using the points (0, 750) and (0.8, 800). Several candidates chose other points that were less easy to work with and sometimes led to numerical errors.

Limited responses

- Several candidates used y and x instead of T and R as required.
- Some candidates did not write the full model and omitted $T =$.
- Many candidates, especially those with inaccurate graphs, could not give an appropriate answer to this question.
- A few candidates thought that the given function was itself a linear function or should be rearranged to make one.
- There was a large number of candidates that left the question unanswered.

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CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/63
Investigation & Modelling (Extended)

Key messages

What candidates did well

In the investigation
- Candidates generally showed a good understanding of factors and multiples and were able to find highest common factors and least common multiple values.
- Candidates recognised patterns within tables.
- Candidates considered different approaches to problem solving using relationships they had found.

In the modelling task
- Many candidates were able to relate the two-dimensional diagram to the line drawn by the pencil on the rotating cylinder.
- Many candidates had some understanding of the application of Pythagoras' Theorem to finding the length of the hypotenuse of a right-angled triangle.

What candidates needed to improve
- Candidates need to ensure that they have a good knowledge and understanding of the whole syllabus in preparation for Paper 6. In the Modelling task, candidates needed to be able to work with Pythagoras' Theorem and trigonometrical ratios to find unknown angles and sides in a right-angled triangle.
- Candidates should show their working on the answer paper in the space provided, even in the early part of a task when this might just involve simple processes. Clearly demonstrating their understanding of the mathematical processes used to arrive at solutions is an important aspect of a candidate's progression through both tasks in this paper.
- Candidates should reflect on what they learn at each stage of an investigation or modelling exercise and consider whether a previous question might help them begin to answer a new question.
- 'Show that' questions frequently appear in Paper 6 and candidates need to be prepared for what is required in their answers. Working should be clearly set out, have a logical progression and include all mathematical steps leading to the given answer. Sometimes candidates do not reach the anticipated results, and this should be a signal to return to their previous work to check their calculations.
- Candidates should be aware that when they are required to show how a result can be obtained, it is not appropriate to use expressions or results that are given later in the task.

Comments on specific questions

INVESTIGATION

Question 1

(a) **Comprehensive responses**
- Most candidates were able to correctly complete the table with the factors and multiples of the numbers listed.

Limited responses
- Very occasionally a factor or multiple was omitted. In this case, it was often the last one in the list.

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(b) (i) Comprehensive responses

- Most candidates were able to write down the correct values for the highest common factor (HCF) and the least common multiple (LCM) of 4 and 10 using the table in **Question 1(a)**.

Limited responses

- There were too few incorrect responses to make a general comment.

(ii) Comprehensive responses

- This question was accurately answered by almost all candidates.

Limited responses

- Very rarely another common multiple, for example 42, was given as the LCM.

Question 2

(a) Comprehensive responses

- Most candidates were able to accurately complete the table with the required HCF and LCM values. Multiples of 14, rather than factors of 14, were more likely to be shown as communication of an approach used, although a few candidates listed both sets of values.

Limited responses

- There was frequently no evidence of the working done to find the values in the table.
- Any incorrect answers tended to occur in the LCM entries rather than in finding the HCF.

(b) Comprehensive responses

- The connection between the HCF, the LCM and $a \times b$ was generally correctly identified, with some candidates showing this connection as an equation as well as explaining the connection in words.

Limited responses

- Sometimes candidates identified patterns and relationships between just two of the elements.
- Some responses were unclear and not precise.

(c) Comprehensive responses

- Some candidates gave concise and efficient answers to this question. Using the connection identified in **Question 2(b)**, appropriate values were substituted to obtain an equation of the form $16 \times b = 4 \times 80$. The answer 20 was then obtained by dividing both sides of the equation by 16.

Limited responses

- Candidates who did not realise they could use the results they had previously found in **Question 2(b)** were often less successful in finding an appropriate route to the solution.
- Different values were often tried out in searching for the unknown number. Some candidates succeeded in finding the correct answer of 20, although frequently there was no evidence of a clear strategy and process.

Question 3

(a) Comprehensive responses

- A small proportion of candidates wrote down the correct values of the HCF and LCM, with little evidence of working.
- Some candidates were seen to work out the HCF and LCM using the given values of *a* and *b* expressed as products of '*x*'s and '*y*'s.

Limited responses

- Many candidates were unable to find the required HCF and LCM from values of *a* and *b* expressed in terms of *x* and *y*.
- A clear strategy to find these values was often not evident.
- Sometimes the two values were transposed.
- A few candidates attempted to substitute numbers for *x* and *y* but were then not generally successful in finding the correct expressions for the HCF and LCM.

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(b) **Comprehensive responses**

- In a 'show that' question such as this, candidates need to clearly and fully demonstrate why their statement in **Question 2(b)** is correct for the given values of *a* and *b*. Comprehensive responses identified and labelled the correct values of the HCF and LCM and then showed the calculations and final answers for both HCF $\times$ LCM and $a \times b$.

Limited responses

- Often calculations appeared in the answer space without an indication of what they represented.
- Frequently one calculation was shown, for example HCF $\times$ LCM, but the working and answer for the other calculation, $a \times b$, was omitted.
- Some candidates, including those who had not been able to find the HCF and LCM in **Question 3(a)**, did not attempt this question.

Question 4

(a) **Comprehensive responses**

- Many candidates were able to accurately complete the table with the required HCF and LCM values. As in **Question 2(a)**, the approach used to find the required values was frequently not communicated.

Limited responses

- Occasional errors were seen in the table, but most candidates managed to write down at least 5 correct values.
- Some candidates did not realise that in the last 3 columns they only had to find the HCF of two of the given numbers and appeared to be considering all three.

(b) **Comprehensive responses**

- The completion of the equation in this question was very well done by most candidates. Some candidates also illustrated this result with one or two numerical examples, thereby communicating how they had checked the generalisation.

Limited responses

- Many candidates only completed the table in this question and did not write numerical statements that illustrated the relationship.

(c) **Comprehensive responses**

- Several different approaches to this question were seen. Candidates who used a systematic approach to obtain the two pairs of numbers, often started by substituting the given values into the equation from **Question 4(b),** to find $d \times e = 864$.
- Many candidates then considered factor pairs of 864. Some candidates identified 12 as the HCF of *d* and *e* before considering suitable factor pairs.
- Very few candidates were seen to work with an approach that involved expressing 864 and/or the given values as products of prime numbers.

Limited responses

- Some candidates were unsure how to proceed once they had found $d \times e = 864$ and final answers sometimes appeared with no clear indication how they had been found.
- Some candidates managed to obtain one pair of the required values by considering different pairs of numbers from the outset, but this approach was frequently unsuccessful.

MODELLING

Question 5

Comprehensive responses

- This first question in the modelling task was well done. Candidates generally demonstrated a good understanding of the relationship between the circumference of the cylinder and the length of the line drawn by the pencil. The calculation required to find the circumference was also usually clearly shown.

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Limited responses

- There were too few incorrect responses to make a general comment.

Question 6

(a) **Comprehensive responses**

- Some candidates recognised angle *a* to be $45°$ and wrote down the answer as instructed.

Limited responses

- Some candidates attempted calculations involving the length of AA and the speed of 2 cm/s. Different values for angle *a* were subsequently seen.

(b) **Comprehensive responses**

- Some candidates recognised that the right-angled triangle with angle *a* was isosceles and were able to write down the pitch with little or no working needed.
- The length of the helix was subsequently calculated using a trigonometrical ratio or Pythagoras' Theorem. Candidates who correctly calculated the required lengths often also communicated the mathematical processes used.
- Many candidates gave the correct units with the answer for the pitch and/or the length of the helix.

Limited responses

- Many candidates did not recognise that the pitch was 31.4 cm.
- Many candidates did not work appropriately with trigonometrical ratios to calculate the pitch and the length of the helix. Sometimes Pythagoras' Theorem was used incorrectly.

Question 7

(a) **Comprehensive responses**

- Candidates who answered this question correctly, sometimes did so by considering $\tan a = \frac{2}{3}$.
- Some candidates found the required angle by first calculating the side opposite angle *a*. Some of these candidates considered speed, distance and the time taken in the given context to find the length of this side.

Limited responses

- Many candidates did not know how to use the given information to calculate the angle *a*.
- Sometimes a circular argument based on the given result was used.
- Some candidates did not give a response to this question.

(b) **Comprehensive responses**

- Candidates who had shown a good knowledge and understanding of Pythagoras' Theorem and trigonometrical ratios in **Question 6(b)**, were often also able to answer this question where they were required to work out two sides of a right-angled triangle.

Limited responses

- Some candidates who had successfully found the pitch and helix length in **Question 6(b)** were not able to replicate this in **Question 7(b)**. Sometimes they had worked with Pythagoras' Theorem in **Question 6(b)** and were not able to work with the angle *a* and use trigonometrical ratios here.

Question 8

(a) **Comprehensive responses**

- Some candidates showed of good understanding of the context and the generalisation required in this question, and by considering equal ratios, the model for the pitch, *P,* was correctly found.

Limited responses

- Many candidates were unable to take the contextual information given in the question and use this to find a model. Often candidates did not appear to relate this to previous work in

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Question 7 which could have guided them towards generalising the pitch P in terms of h, t and D.

(b) **Comprehensive responses**

- Some of the candidates who had developed a model for P in **Question 8(b)** started this question with a correct equation using Pythagoras's Theorem.
- A few of these candidates were able to do the appropriate algebraic manipulation to arrive at the required model for the length H_1.

Limited responses

- Some candidates were able to set up an equation using Pythagoras' Theorem and their model for P correctly.
- Many candidates did not attempt this question.

(c) **Comprehensive responses**

- A few candidates recognised that they needed to divide L by their expression for P that they had obtained in **Question 8(a)**.

Limited responses

- Many candidates did not recognise how to find the required model and a variety of different answers in terms of D, h, L and t were seen.
- Many candidates did not attempt this question.

(d) **Comprehensive responses**

- A very small proportion of candidates were able to set up the model for H_2 using the given result in **Question 8(b)** and their result in **Question 8(c),** and then carry out the necessary algebraic steps to show the model in the form given in this question.

Limited responses

- Many candidates had not been able to answer the previous two questions and did not attempt this question.

Question 9

Comprehensive responses

- Candidates who recognised that they could use the model for H_2 in **Question 8(d)**, and substitute the values given in this question, often also managed to solve the equation to find the required speed. Most of the candidates who reached this stage in the question solved the equation analytically, rather than using their graphic calculator to draw graphs and find the point of intersection.

Limited responses

- Many candidates did not use the model given **Question 8(d)** and were not successful in progressing very far in this question.

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