MATHEMATICS

Paper 0607/11
Paper 11 (Core)

Key Messages

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

General Comments

Working is vital in two-step problems, in particular with algebra and or problem solving such as **Questions 6** and **8(b)**. Showing working enables candidates to access method marks in case their final answer is incorrect. Candidates must make sure that they do not make numerical errors especially in questions that are only worth one mark when any good work will not get the mark if the answer is inaccurate. Candidates must take note of the form or the units that are required, for example, in **Question 7**.

The questions that presented least difficulty were **Questions 1**, **2**, **6**, **8**, and **16(a)**. Those that proved to be the most challenging were **Question 7(b)**, change of units and **Question 13(b)**, describing the most suitable average to use. In general, candidates attempted the vast majority of questions rather than leaving any blank. Those that were occasionally left blank were **Questions 9(a)** and **11**.

Comments on Specific Questions

Question 1

Candidates did very well with this opening question and a large majority gave the co-ordinates of *A* and plotted *B* correctly.

Answers: **(a)** (2, 5) **(b)** Plot at (4, –2)

Question 2

Incorrect answers seen here were mostly due to arithmetic errors made in the addition of the lengths of the three sides.

Answer: 40

Question 3

The most frequent error was for candidates to miss out 35 or 1. Occasionally, multiples of 35 were seen.

Answer: 1, 5, 7, 35

Question 4

This question focused on the order of operations and it could be seen that some candidates went straight to the correct placement of the brackets in both parts but, by the amount of working seen, others tried many different places for the brackets. A small number of candidates gave more than one pair of brackets in their answer.

Answers: **(a)** $(6 + 3) \cdot 4 - 12 = 24$ **(b)** $6 + 3 \cdot (4 - 12) = -18$

Question 5

From the working seen, candidates understood what was being asked of them. Wrong answers were caused by incorrect cancelling, arithmetic errors or by candidates not completing the method so giving answers of 25 or 1750. This question was one of those that is only worth one mark so candidates must not make any mistakes if they are to gain the mark.

Answer: 175

Question 6

In terms of calculation required, this question was similar to the preceding one but candidates were more successful here. One approach was to say that 200 g for 4 people means 50 g for each person so, for 10 people, the 50 must be multiplied by 10. Others said 8 people would be 400 g then found that 2 people needed 100 g so 500 g in total. Here there was a method mark available for those who did not get the final answer correct.

Answer: 500

Question 7

This was not a well answered question. Candidates need to be confident with relationships between units in the metric system. For **part (a)**, candidates could have started with a statement such as 1 kg = 1000 g as this will help them decide if they are expecting the numerical value to be more or less than that in the question. As the question goes from kilograms to grams then the 7.2 is multiplied by 1000 as the numerical value should be greater. **Part (b)** is much more complex as it deals with volume. The starting point is the statement that 100 cm = 1 m and then this has to be cubed to turn it into the units of volume so 1 000 000 cm^3 = 1 m^3. The conversion needed will be a numerically smaller number as the movement is from cm^3 to m^3 so the 86 000 is divided by 1 million. Candidates could start this process with the statement 1 cm = 0.01m but this alternative method can cause other difficulties. **Part (b)** was the question on the paper that candidates found the most challenging but virtually all candidates attempted the question but very often the answer was given as 860 or 86.

Answers: **(a)** 7200 **(b)** 0.086

Question 8

Part (a) was included to enable candidates to use the equation in a straightforward way by substituting 5 for n to find the total cost for 5 days. Candidates then had to reverse the equation to find n given C for **part (b)**. **Part (b)** needs a more complex calculation than that needed in **part (a)** and so is worth more and has a method mark for those who got as far as $104 – 20 = 12n$. Some candidates showed no working and so could not be credited with the method mark if their answer was incorrect.

Answers: **(a)** 80 **(b)** 7

Question 9

Most candidates were familiar with at least some of the set notation used in this question as evidenced by the form of their answers. The common errors seen in **part (a)** were to give 2 alone without the 16, or to give all the members of set A. For **part (b)**, sometimes the members of the union of A and C were given rather than the intersection of A and C.

Answers: **(a)** 2, 16 **(b)** 2, 6

Question 10

The most common error in **part (a)** was that the minus sign in front of the 2 was not dealt with correctly. There was one mark available in **part (b)** for those candidates who factorised out only one of the two factors.

Answers: **(a)** $–3x + 6$ **(b)** $2x(3 – 5y)$

Question 11

Candidates find working with the equation of a line challenging. Often questions on this section of the syllabus have a diagram but there is no need here. However, this lack of a diagram raises the difficulty level of the question as candidates often find a pictorial version of a line more easy to understand. For this question it is necessary to know that parallel lines have the same gradient ($m = 3$, in this case) and that the constant gives the place where the line cuts the y-axis or when $x = 0$ ($c = 7$, here).

Answer: $y = 3x + 7$

Question 12

The most common error seen for **part (a)** was for triangle A to be reflected in the wrong line and this was in most cases, $y = -1$. In **part (b)** there were three marks available which means three pieces of information are needed to define the transformation. Transformations with three pieces of information needed on this syllabus are enlargement and rotation, so most likely, the answer is going to be one of these. As the size of triangle B is the same as triangle A this is a rotation. As the triangle has moved to the next quadrant clockwise, this is going to be a 90° clockwise rotation. The centre is the hardest piece of information to find so candidates should start by seeing whether the triangle has been rotated around one of the vertices or the origin and here, it is the origin that has been used. Candidates did better on **part (b)**, the description, than actually doing the transformation in **part (a)**.

Answers: **(a)** Correct triangle at (–4, 2), (–4, 4), (–5, 4) **(b)** Rotation, 90° clockwise, Centre (0, 0)

Question 13

Candidates found **part (b)** the second most challenging question on the paper. For **part (a)**, many answered with discrete but were not able to give an acceptable reason. Some candidates said that the data stops after 10 days so it was not continuous but this is not describing the type of numbers used in the data. For **part (b)**, some gave a numerical answer (often the value of the median) instead of the word median. Many equated suitable with easy to work out or said that the mean is the most accurate average or that the mean is the average. These type of explanation questions, although they are challenging, do test whether candidates have thoroughly understood points in the syllabus.

Answers: **(a)** Discrete, the data only takes on integer values
(b) Median, there is one value which is much larger than the others

Question 14

Although this question appeared to be a simple fraction calculation, the inclusion of x in the numerator caused some confusion. Some treated this as one fraction answering with $\frac{2x}{5}$ and others ignored the denominator giving just $5x$.

Answer: $\frac{5x}{6}$

Question 15

In this question, to get full marks, the correct method must be seen as well as the values for x and y. Candidates need to check for the most efficient way to tackle simultaneous equations so that they have as little opportunity as possible to make numerical slips. Here, the simplest method to eliminate one variable is to divide the second equation by 2 so that there was a $3x$ term in each equation and then subtract the second from the first. An alternative approach is to double the second equation and add both equations. In recent sessions there has been a rise in the number of candidates who re-arrange both equations into $x =$ form (or $y = ...$), equate them and solve for x (or y). Many other methods, including substitution, will work but often have more opportunities for errors to be made. Candidates should realise that answers to simultaneous equations are unlikely to be inexact decimals.

Answer: $x = 5$ $y = 2$

Question 16

Many candidates were successful plotting the five points and the majority correctly gave negative as the type of correlation shown. Other wrong terms were seen – dispersed, linear, continuous, comparative or discrete, as well as positive or none. If candidates are asked for the type of correlation shown on a scatter diagram, the answer will be positive, negative or none. For **part (c)**, candidates needed to plot the mean marks as a single point and draw the line of best fit through this point. This was a problem-solving question without scaffolding as candidates were not led through the method.

Answers: **(a)** 5 points correct **(b)** Negative **(c)** Line with negative gradient passing through mean

MATHEMATICS

Paper 0607/12
Paper 12 (Core)

Key Messages

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General Comments

Showing working enables candidates to access method marks in case their final answer is incorrect. Working is vital in two-step problems, in particular with algebra and or problem solving such as **Questions 16(b)** and **17(b)**. Candidates must make sure that they do not make numerical errors especially in questions that are only worth one mark when any good work will not get the mark if the answer is inaccurate. Candidates must take note of the form or the units that are needed, for example, in **Question 2**, **Question 7**, **Question 12** and **Question 13**.

The questions that presented least difficulty were **Questions 1(c)**, **4**, **5(a)**, **8**, and **18(a)**. Those that proved to be the most challenging were **Question 10**, bearings, **Question 13**, describing a change of units, and **Question 14**, number of sides of a polygon. In general, candidates attempted the vast majority of questions rather than leaving any blank. Those that were occasionally left blank were **Questions 11** and **19**.

Comments on Specific Questions

Question 1

Candidates did very well with this opening question and chose acceptable numbers. For **part (c)**, if candidates gave more than one answer, all answers had to be from the list given below. Very occasionally, candidates treated the numbers as digits and put two together to make another number, for example, 36 for **part (b)** but this was not acceptable.

Answers: **(a)** 2, 3, 6 **(b)** 4 **(c)** 2 or 3 or 5

Question 2

Incorrect answers seen here were 3%, 3×10^{-2}, $\frac{1}{3}$ or $\frac{3}{10}$. The first two answers showed misunderstanding of the form requred by the question, the second pair a misunderstanding of the value of the decimal.

Answer: $\frac{3}{100}$

Question 3

The most frequent error was for candidates to give 1 20 without indicating that this was in the afternoon. Occasionally, candidates made numerical errors giving answers such as 13 00 or 13 40.

Answer: 13 20 or 1 20 pm

Question 4

This question focused on the order of operations. More errors were made with **part (a)** where a common wrong answer was 24, from the incorrect calculation, $(20 – 8) \times 2$. Some focused on working out 8×2 but then subtracted the 20 instead of doing the subtraction the other way around. The calculation in **part (b)** was more straightforward as the order of operations is the same as the order it is written.

Answers: **(a)** 4 **(b)** 32

Question 5

Candidates did very well picking out the day with the lowest number of books borrowed. It was not correct to give number of books borrowed, only the day of the week. This question was meant as scaffolding for **part (b)** as candidates needed the lowest number of books and the highest number of books in order to work out the range, not simply the last minus the first as seen when some candidates subtracted the Monday number from that of Saturday.

Answers: **(a)** Tuesday **(b)** 1000

Question 6

This question had a few routes to find the missing value. Candidates could find the mapping $y = 3x – 1$ and use $x = –3$ to find the missing value. Another approach is to find the relationship between the adjacent values in the domain and the corresponding relationship in the range, so when –3 is the gap between the 12 and 9, in the domain, –9 is the gap in the range. When –4 is the gap in the domain, –12 is the gap between adjacent values in the range so when there is a gap of –5 to get the value –3 in the domain, to get the value in the range, 15 must be subtracted from 5 to give the correct answer, –10. Some candidates subtracted 12 from 5 giving the wrong answer, –7, other gave the gap, –15. Often the working was non-existent or scattered around with no logic. Many appeared to start and then did not know how to complete the question, but on the whole, this question was more successfully answered than other similar ones in previous sessions.

Answer: –10

Question 7

Candidates were more confident in answering **part (a)**, using decimal places, than answering **part (b)**, using significant figures. In **part (a)**, candidates had to remember to count the zero after the decimal point as the first figure and not start counting at the 8 giving 0.0822 as their answer. Some candidates included two extra zeros after the 2 giving 0.08200 as their answer but it is not correct to add more zeros as they change the number of decimal places so this has 5 decimal places. Others gave 0.08 as their answer as if they were counting decimal places from the first digit. Other multiplied the given number by 1000 i.e. moved the decimal point 3 places to the right. It is not correct to leave **part (b)** as only 3 digits, 610, as this is not an approximation of the given number; here, zeros must be added to show zero tens and zero units.

Answers: **(a)** 0.082 **(b)** 61 000

Question 8

Candidates did very well continuing the sequence. Very occasionally, candidates made arithmetic slips in one or other of the terms – it is well worth candidates checking their arithmetic so as not to lose any marks especially on straight forward questions like this one.

Answer: –1, – 6

Question 9

Most candidates gave both answers correctly, but occasionally calculations such as $4 \times 6 = 18$ were seen. A few candidates divided the measurements by two or four instead of multiplying by four.

Answer: 80 24

Question 10

Candidates had some difficulties with this question. Many appeared to place their protractor on the diagram with the north line at 90° so gave 54°. Others gave 36°, the acute angle, some went on to subtract a measured angle from 180°. Some showed an arc from the north around to the line to *A* but did not follow through with a correct calculation. Some measured the length of the line from *A* to *B* and so gave 5 cm as their answer.

Answer: 324

Question 11

Candidates find working with the equation of a line challenging. Often questions on this section of the syllabus have a diagram but there is no need here. However, this lack of a diagram raises the difficulty level of the question as candidates often find a pictorial version of a line more easy to understand. For this question it is necessary to know that parallel lines have the same gradient ($m = 3$, in this case) so just choosing a different constant produces a parallel line which will cross the y-axis at their chosen constant. An answer of $y = 3x + c$ where c is not defined, does not get the mark as candidates must choose a value for c which can be anything except +5.

Answer: $y = 3x + c$, $c \neq 5$

Question 12

First, candidates had to pick the correct formula for the area of a circle but some used that for the circumference. Next, candidates had to substitute the value of the radius, not the diameter, into the correct formula. The question asked for the answer to be left in terms of π so there was no need to multiply 36 by 3.142 or better.

Answer: 36π

Question 13

Candidates found this to be the most challenging question on the paper for a variety of reasons. First, the candidates had to change 25 m^2 into cm^2, then compare their answer with Jenny's in the question and finally explain whether Jenny was correct or not. Candidates must say No in order for their explanation to score. These type of reasoning questions, although challenging, do test whether candidates have thoroughly understood points in the syllabus.

Answer: No, $25\,m^2 = 25 \times 10\,000\,cm^2$

Question 14

This type of question on the number of sides of a regular polygon sometimes has a diagram to help candidates but there is nothing to stop candidates drawing their own with all the given information. The next step is to work out how many times the external angle, 40°, will divided into 360°, one complete turn. This gives the number of sides of the polygon. Some candidates know the size of the external or internal angles of regular polygons, for example, a regular hexagon has an external angle of 60° or in this case a nonagon or 9-sided regular polygon has an external angle of 40°.

Answer: 9

Question 15

This question used the geometrical property that the angle at the circumference in a semi-circle is 90° and so the answer is found by working out, 180° – 90° – 30° = 60°. Some candidates subtracted just the 30° from 180° (150°) or measured angle *ABC*. Some gave 75° from, presumably, assuming *ABC* is an isosceles triangle with *AC* = *AB*. Candidates who did not get the correct answer were able to gain a mark if they marked the right angle at angle *ACB*.

Answer: 60

Question 16

For **part (a)**, the most common incorrect answers were 0 or 18. The most common answers in **part (b)** were $\frac{3}{9}$ (from multiplying numerator and denominator by 3) , $\frac{1}{9}$ or 1. **Part (c)** involved a more problem-solving approach. Candidates had to realise that $16 = 2^4$ so $n + 1 = 4$ and $n = 3$. Some working was laid out very well but that of other candidates was more illogical.

Answers: **(a)** 6 **(b)(i)** $\frac{1}{27}$ **(ii)** 3

Question 17

Some candidates had difficulties in determining the midpoint of each interval giving 1.5, 3.5 etc. or 2 for each one. **Part (a)** was scaffolding for **part (b)** but some candidates did not use their answers to the previous part in their calculations. Many candidates gave 4 from the incorrect method, 20 ÷ 5. Others gave 5 but from the incorrect method such as the sum of all the midpoints divided by the number of classes so this wrong method did not gain any marks.

Answers: **(a)** 1, 3, 5, 7, 9 **(b)** 5

Question 18

Virtually all candidates gave the correct answer to **part (a)**, whereas in **part (b)** candidates were not so confident, giving incorrect answers such as –2 or –4. In **part (c)**, many candidates wrote $x < 5.5$ and then gave 5.5 or 6 as their answer. Some gave 10, presumably from $2 \times 5 < 11$.

Answers: **(a)** > **(b)** –3 **(c)** 5

Question 19

As a starting point, as this question has only 2 marks, the transformation is likely to be a translation or reflection as rotation and enlargement need 3 pieces of information to be fully described. It is a good idea for candidates to sketch both curves or use different values of x to see the effect of the transformation. The second graph of $y = x^2 - 2$ is 2 units lower than $y = x^2$ at every values of x, so is a translation with the vector shown below.

Answer: Translation $\begin{pmatrix} 0 \\ -2 \end{pmatrix}$

Question 20

Most candidates were successful plotting the 5 points and the majority correctly gave positive as the type of correlation shown. Other wrong terms were seen – scattered, zig-zag, un-correlated, linear and increasing; or a description such as, when temperature rises so does the income; or candidates tried to give the formula of the line of best fit. Very few gave negative. If candidates are asked for the type of correlation shown on a scatter diagram with or without a line of best fit, the answer will be positive, negative on none.

Answers: **(a)** 5 points correct **(b)** Positive

MATHEMATICS

Paper 0607/13
Paper 13 (Core)

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Answers: **(a)** 5 points correct **(b)** Positive

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/21
Paper 21 (Extended)

Key messages

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

Candidates must apply their knowledge to solve problems and not merely follow rules without understanding the concepts involved.

General comments

Candidates demonstrated good algebraic skills.

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

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

Candidates should always leave their answers in their simplest form. Many candidates lost marks through incorrect simplification of a correct answer.

Comments on specific questions

Question 1

Most candidates answered this question correctly but a common mistake was to try to share $48 in the ratio 5:4.

Answer: 60

Question 2

This was well attempted by most candidates.

Answer: A
H
N

Question 3

Nearly all candidates answered parts **(a)** and **(b)** correctly.

Part **(c)** caused many problems demonstrating a lack of understanding of quartiles.

Answer: **(a)** 11 **(b)** 14 **(c)** 16

Question 4

The majority of candidates were successful; a common mistake was to move the decimal point in the wrong direction.

Answer: 0.00407

Question 5

Most candidates gained at least one mark in part **(a)** but mistakes were made with negatives.

Part **(b)** was well attempted showing a good understanding of basic algebra.

Answer: **(a)** 3.5 **(b)** $\frac{v-u}{t}$

Question 6

Most candidates opted for a common denominator of 18, however poor arithmetic was seen especially 16 – 7 = 11. There were also mistakes in cancelling an initial correct answer.

Answer: $\frac{1}{2}$

Question 7

The most common approach was to use the formula $180(n–2) = 176n$ but candidates were unable to complete this method successfully. The alternative method of using the interior angle to calculate the exterior angle and hence the number of sides was more successful.

Answer: 90

Question 8

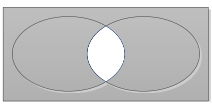
Most candidates were able to attempt this question and demonstrated a good knowledge of circle theorems.

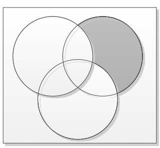
Answer: 50°

Question 9

The first part of this question was well attempted but many candidates found the second part a challenge.

Answer:





Question 10

This question proved to be a good discriminator. Many candidates did not expand the brackets correctly. Candidates who were initially successful made errors when simplifying their correct expressions.

Answer: $4 + 3\sqrt{3}$

Question 11

This question showed a lack of understanding of the modulus function.

The majority of candidates were able to find 4 as a solution but were unable to find the second solution correctly with – 4 as a popular incorrect answer.

Answer: 2 and 4

Question 12

This question was well answered by the majority of candidates, showing a good understanding of the rules of indices.

Answer: $\frac{1}{125}$

Question 13

Full marks were not often seen for this question. Many candidates correctly obtained $\sqrt[8]{81}$.

Answer: $\sqrt{3}$ or $3^{0.5}$

Question 14

This question proved to be challenging for many candidates. A number of candidates who made the correct initial first step of $(x - 5)(x + 2) = 0$ then made careless numerical slips.

Answer: [a =] –3
[b =] –10

Question 15

This question was well attempted by the majority of students, with many gaining full marks.

Answer: $\frac{6}{\sqrt{x-3}}$

Question 16

Many candidates gained one mark for the value of *a*, but were unable to find the value of *b*.

Answer: $a = 2$ $b = 4$

Question 17

This was well attempted by the majority of candidates, who showed a good understanding of the laws of logs.

Answer: **(a)** 9 **(b)** $\frac{5}{2}$

INTERNATIONAL MATHEMATICS

Paper 0607/22
Paper 22 (Extended)

Key messages

Candidates need to show all of their working. Incorrect answers without working cannot be given credit, whereas partial credit can be awarded if a correct method is shown.
Candidates must know that for an answer to be in standard form, the 'number digits' must be between 1 and 10.
Some candidates do not have a clear understanding of the demands of some questions, e.g. in **Question 7**, candidates were asked to 'expand and simplify', not 'expand and factorise'.

General comments

Candidates were well prepared for the paper and demonstrated excellent algebraic skills.
Some candidates lost marks through careless numerical slips, particularly with negative numbers and simple arithmetic operations.
Candidates should make all of their working clear and not merely write a collection of numbers scattered over the page.
Candidates should always leave their answers in their simplest form.

Comments on specific questions

Question 1

Nearly all candidates answered this question correctly, although answers of 26 and 27 were seen.

Answer: 29

Question 2

Although there were many correct solutions to this part, a number of candidates made careless mistakes with the resulting loss of marks.

Answer: 48

Question 3

There were many excellent solutions to this question.

(a) This part was well answered by nearly all candidates.

(b) This was a good discriminator, with weaker candidates finding 30% and adding this to the sale price.

Answer: **(a)** 28 **(b)** 200

Question 4

This question tested the candidates understanding of standard form.

(a) Many candidates struggled to 'convert' the numbers into a common form.

(b) Many candidates started this part correctly, but then left their answer as 40, rather than converting to standard form.

Answer: **(a)** 6.24×10^{-2} **(b)** $4 \times 10^{[1]}$

Question 5

The majority of candidates answered this question correctly, although there were some careless arithmetic mistakes seen.

Answer: **(a)** 83 **(b)** $\frac{1}{3}$

Question 6

(a) This part was well answered.

(b) This part also was well answered by many candidates. This demonstrated that candidates had a good understanding of probability. The common mistake was when candidates used 'with replacement'.

Answer: **(a)** 0 **(b)** $\frac{32}{90}$

Question 7

(a) The majority of candidates scored full marks. The common mistake was a sign error.

(b) There were many correct answers to this part. However, a significant number of candidates having expanded the brackets correctly, proceeded to factorise their answer and then give the question as their final answer.

Answer: **(a)** $2x - 30x^2$ or $2x(1 - 15x)$ **(b)** $12x^2 + 5xy - 2y^2$

Question 8

The majority of candidates scored this mark.

Answer: 4

Question 9

Many candidates scored full marks. However, there were a number of candidates who only found two of the factors.

Answer: $4x^3y$

Question 10

This question was correctly answered by many candidates, showing a clear understanding of surds.

Answer: **(a)** $2\sqrt{3}$ **(b)** $2\sqrt{3 - 3}$

Question 11

This question proved to be an excellent discriminator.
Although many candidates scored full marks, many candidates failed to find the midpoint, others failed to find the gradient of the perpendicular correctly and others, following excellent work, failed to find *'c'* correctly.

Answer: $4y = 3x - 2$

Question 12

Although some candidates scored full marks, many candidates failed to find both solutions in part **(b)**.
Candidates must realise that when solving an equation with a 'squared' term, there will be two solutions.

Answer: **(a)** $y = 0.5x^2$ **(b)** 8 and –8

INTERNATIONAL MATHEMATICS

Paper 0607/23
Paper 23 (Extended)

Key messages

Candidates need to show all of their working. Incorrect answers without working cannot be given credit, whereas partial credit can be awarded if a correct method is shown.
Candidates must be aware of basic statistics, for example the range, when the question is set in context.
Candidates need to be aware of different methods for answering questions, for example, simultaneous equations.
Candidates need to have a better understanding of vectors.

General comments

Candidates were reasonably well prepared for the paper and demonstrated very good algebraic skills.
Candidates should be reminded to read the questions carefully and not 'expect' questions. For example, questions on surds will not always test difference of two squares.
Many candidates lost marks through careless numerical slips, particularly with negative numbers and simple arithmetic operations.
Candidates should make all of their working clear and not merely write a collection of numbers scattered over the page.
Candidates should always leave their answers in their simplest form.

Comments on specific questions

Question 1

Nearly all candidates answered this question correctly. Mistakes occurred when candidates found the *n*th term, rather than the next term as asked for in the question.

Answer: –1

Question 2

Although there were many correct answers, this question showed a lack of understanding of the order on numerical operations in many candidates.

Answer: 64

Question 3

Very few candidates answered this question completely correctly. Many candidates gave an answer of 0.8 in part **(a)** and in part **(b)** marks were lost due to a lack of understanding of the correct method for dividing fractions.

Answer: **(a)** 0.008 **(b)** $\frac{15}{28}$

Question 4

Although many candidates were successful, the common mistake was the inability of candidates to know (or to be able to find) the sum of the interior angles of a pentagon.

Answer: 80

Question 5

This question proved to be too demanding for all but the best candidates. Candidates were unable to realise the difference between similar and congruent. Candidates who drew sketches, in general, scored more marks.

Answer: C, S, S, N

Question 6

There was a surprisingly high number of candidates who could not state the range, with the popular incorrect answer of 32 being given. Part **(b)** was correct for nearly all candidates. Many candidates started part **(c)** correctly by finding their f*x*, but then failed to divide by 100.

Answer: **(a)** 4 **(b)** 1 **(c)** 1.37

Question 7

There were many correct answers to this question. Candidates who multiplied the second equation by 3 normally scored full marks. Candidates who used the 'elimination' method were less successful due to arithmetic mistakes with the ensuing fractions.

Answer: $x = 1\frac{1}{2}$, $y = -2$

Question 8

This question showed the lack of basic understanding of regression. Candidates must be aware that regression can be tested of a non-calculator paper.

Answer: **(a)** Negative **(b)** 12

Question 9

Part **(a)** was well answered but part **(b)** proved to be more challenging. Many candidates failed to see the cyclic quadrilateral *ABCE*.

Answer: **(a)** 40 **(b)** 115

Question 10

There were far more correct answers to part **(b)** than to part **(a)**. It is clear that candidates are able to apply the rules of logs correctly. However part **(a)** showed a lack of understanding of the relationship between indices and the base of logs.

Answer: **(a)** 2 **(b)** 1.8

Question 11

The majority of candidates scored full marks, but a number of candidates made errors with the negative signs.

Answer: $x < 7$

Question 12

This question was challenging for the majority of candidates. It was clear that there is a lack of understanding of vectors, especially when working with the division of sides in a given ratio.

Answer: **(a)** $\frac{1}{2}\mathbf{a}$ **(b)** $\frac{5}{8}\mathbf{a}+\frac{3}{8}\mathbf{c}$

Question 13

Part **(a)** was well answered with the common mistake being the failure to simplify their correct initial work. Full marks were in the minority for part **(b)**. Many candidates assumed that the question was the difference of two squares. Candidates who attempted the correct question struggled to simplify $\left(2\sqrt{3}\right)^2$.

Answer: **(a)** $6\sqrt{2}$ **(b)** $37 - 20\sqrt{3}$

INTERNATIONAL MATHEMATICS

Paper 0607/31
Paper 31 (Core)

Key messages

Candidates need to have covered the entire syllabus in order to well on this paper.

The candidates must have a graphical calculator and know how to use it.

General comments

Most candidates managed to attempt all the questions in the time allocated.

Candidates need to be careful about the accuracy of their answers. If no specific accuracy is asked for in the question, then all answers should be given exactly or to three significant figures or one decimal place for degrees.

Candidates must also show all their working out. When working out is shown and is correct then partial marks can be awarded if the final answer is incorrect.

Candidates should practice writing justifications for their answers.

Comments on specific questions

Question 1

(a) Most candidates managed to score three out of the four marks available by naming the shapes. The majority missed out the word equilateral.

(b) Most candidates were familiar with how to find the perimeter of these shapes and found these values correctly.

Answers: **(a)** square, equilateral triangle, hexagon **(b)** $x = 16$, $y = 8$

Question 2

(a) Nearly all candidates added up the number of people in the rooms correctly.

(b) There were a few line graphs seen but most candidates drew the correct bar graph.

(c) (i) The total cost was found correctly by most candidates.

(ii) This question on the cost per person was also well answered.

(iii) Many candidates made the mistake here of either only giving the cost of the lunches or of the cost of the room plus the lunch for one person, and not the total amount.

Answers: **(a)** 55 **(b)** correct bar chart drawn **(c)(i)** 1800 **(c)(ii)** 30 **(c)(iii)** 348

Question 3

(a) (i) Nearly all candidates knew what a positive integer was.

(ii) Candidates were also able to identify a negative integer.

(iii) Most candidates could identify the square number.

(iv) There were not as many correct answers to this part, asking for a number between 0.5 and 1, with many candidates writing 0.33.

(v) Many were unsure as to what an irrational number was and quite a number of candidates wrote the mixed fraction as their answer.

(b) (i) The main error here was in the rounding with some candidates writing 1.7320 for their answer.

(ii) Many managed to get the answer correct to four significant figures.

(c) A common wrong answer here was $\frac{1}{3}$, in this question on fractions and decimals.

(d) Many candidates wrote 1.2 for the answer here instead of 3.4.

(e) Most candidates were able to answer this question on fractions and percentages.

Answers: **(a)(i)** 21 or 9 **(a)(ii)** –6 or –18 **(a)(iii)** 9 **(a)(iv)** 5/8 **(a)(v)** $\sqrt{3}$ or π **(b)(i)** 1.7321 **(b)(ii)** 1.732 **(c)** $\frac{33}{100}$ **(d)** 3.4 **(e)** 6.25

Question 4

(a) (i) Although there were quite a few correct answers to this question on symmetry, there were also answers where either some of the letters were missing or an incorrect one was added.

(ii) This question on rotational symmetry was less well understood than part **(a)(i)** on reflective symmetry.

(b) (i) Many candidates managed to find the correct lengths either using the similar triangles or using Pythagoras.

(ii) This question on ratio was less well done, with quite a few candidates writing 3 : 1 as their answer.

Answers: **(a)(i)** M, O, E, Y **(a)(ii)** O, N **(b)(i)** $AB = 12$, $DF = 5$ **(b)(ii)** 54 : 6

Question 5

(a) Some candidates remain confused as to which number to write down for the mode. Some still write the frequency in place of the number.

(b) Some candidates managed to find the median correctly.

(c) Not very many candidates managed to find the inter-quartile range correctly.

(d) There were few correct answers seen to this question on finding the mean, with many candidates just finding the mean of the number of petals (ignoring the frequencies) and some finding the mean of the frequencies.

Answers **(a)** 19 **(b)** 18 **(c)** 2 **(d)** 18.34

Question 6

(a) This question on sequences was very well answered with very few incorrect answers.

(b) This question on finding the n^{th} term was less well answered.

(c) Many candidates managed to show that the number was a term in the sequence.

Answers **(a)** 298, 291 **(b)** 333 – 7*n* **(c)** Yes, with correct justification.

Question 7

(a) Some candidates managed to find all four angles correctly. Others could only find one or two correct angles.

(b) Many candidates were able to find some of the angles in this question on circles.

Answers **(a)** $a = 31$, $b = 42$, $c = 107$, $d = 107$ **(b)** $p = 28$, $q = 90$, $r = 62$

Question 8

(a) There were many correct tree diagrams seen.

(b) In this part there were few correct answers seen, with the majority of candidates adding the two fractions instead of multiplying them.

(c) This part on adding the outcomes on the tree diagram proved to be challenging for the majority of the candidates.

Answers: **(b)** $\frac{2}{15}$ **(c)** $\frac{10}{21}$

Question 9

(a) Some candidates managed to find the correct speed and others gained method marks for their working.

(b)(i) There were more correct answers seen for this part of the question on time.

(ii) Many candidates either found the correct answer here or gained follow through marks for finding the time.

(iii) Again, many candidates either answered correctly or gained follow through marks for this question on time.

Answers: **(a)** 1.2 **(b)(i)** 9 **(b)(ii)** 08 04 **(b)(iii)** 07 55 + their (b)(i) + 5 minutes

Question 10

(a)(i) Most candidates managed to solve the equation and find the correct value for *x* here.

(ii) Inequalities proved to be more challenging for the candidates, with fewer correct answers seen.

(b) Even with the correct answer in part **(b)**, many candidates could not represent their answer on the number line. Some filled in the circle at 5, some had the arrow going in the wrong direction and some had no circle at 5 at all.

(c) (i) The majority knew how to simplify the indices.

(ii) Some errors were seen in this question on indices, although there were more wrong answers seen with the division.

(d) Many candidates gained one mark for setting up the equations but not many of them could solve the equations correctly.

Answers: **(a)(i)** 2 **(a)(ii)** $x < 5$ **(c)(i)** $12x^8$ **(c)(ii)** $3y^6$ **(d)** chocolate = 0.85, drink = 1.35

Question 11

(a) Some candidates used the equation of a sphere, instead of a cylinder, to find the volume of the pond.

(b) This part on the difference in area between two concentric circles was also poorly answered, with many using the formula for the area of a circle with 0.5 as the radius.

(c) More candidates managed to answer this part correctly than the previous two parts.

Answers: **(a)** 4.24 **(b)** 5.50 **(c)** 59.4

Question 12

(a) (i) In this question on sketching graphs it was apparent that that some candidates either did not have a graphics calculator or did not know how to use it.

(ii) Those who drew the graph correctly managed to find the *y*-intercept too.

(iii) The *x*-intercepts were found by those who had drawn the graph correctly.

(iv) The co-ordinates of the local maximum were also found by those who'd been able to find the intercepts.

(b) (i) More candidates managed to draw the straight line than had drawn the parabola.

(ii) There were few correct answers seen for finding the intersection points. Some candidates forgot that they needed to answer to 3 significant figures, and so marks were lost for inaccuracy.

Answers: **(a)(ii)** (0 , 6) **(a)(iii)** (–2, 0), (3, 0) **(a)(iv)** (0.5, 6.25) **(b)(ii)** (1.41, 5.41), (–1.41, 2.59)

INTERNATIONAL MATHEMATICS

Paper 0607/32
Paper 32 (Core)

Key messages

In order to succeed, candidates need to have covered the full syllabus. They need to show all their working out especially in multi-step questions. Many marks were lost because working out was not written down. Marks were also lost when the candidates did not write their answers correct to three significant figures (unless otherwise specified in the question). The candidates must have a graphical calculator and know how to use it.

General Comments

Most candidates managed to attempt all the questions in the time allocated and the full range of marks was seen. Candidates need to be careful about the accuracy of their answers. If no specific accuracy is asked for in the question, then all answers should be given exactly or to three significant figures, or one decimal place for angles in degrees. Candidates must also show all their working out. When working out is shown and is correct then partial marks can be awarded if the final answer is incorrect. Candidates would benefit from practising writing justifications for their answers. It appeared as if some candidates did not have a graphical calculator. This is an essential item of equipment for this paper.

Comments on specific questions

Question 1

(a) Most of the candidates knew the square and the triangle but some had problems remembering the name for the trapezium. Some thought that the parallelogram was a rectangle.

(b) (i) The most common answer here was the correct one although some candidates did think that the answer was 4.

(ii) Many candidates drew in four lines of symmetry and so could only score 1 mark.

Answers: **(a)** trapezium, triangle, square, parallelogram **(b)(i)** 2 **(ii)** 2 correct lines

Question 2

(a) (i) The correct total was found by the majority of the candidates.

(ii) Here too, most of the candidates found the correct difference.

(iii) As in the previous two parts, this part was also well answered.

(b) Quite a few candidates managed to find the correct answer but then forgot to round it to the nearest hundred.

(c) The calculations here were also mostly correct. Some candidates found the answer 4.25 correctly and then rounded the answer down to 4 coaches. Some just wrote 4.25 coaches.

Answers: **(a)(i)** 38 **(ii)** 6 **(iii)** 67 **(b)** 4400 **(c)** 5

Question 3

(a) (i) Most of the candidates could measure the angle correctly. Only a few wrote down an acute angle.

(ii) Not all of the candidates knew that 130 was called an obtuse angle. It is a requirement of the syllabus that candidates know the names of different angles.

(b) Many correct answers were seen for this right-angled triangle.

Answers: **(a)(i)** 130 **(ii)** obtuse **(b)** 147, 57, 33

Question 4

(a) The correct pattern was drawn by nearly all candidates.

(b) The majority of the candidates could follow the pattern and find the next two terms.

(c) Finding the rule did not pose a problem for most of the candidates, but they did not always know how to express themselves clearly. This is an area where more practice would benefit candidates.

(d) Once again in this part of the question, the candidates had problems in explaining why they thought that either Sarah or Tom had the correct formula.

Answers: **(a)** correct pattern **(b)** 13, 16 **(c)** +3 **(d)** Sarah, with correct justification

Question 5

(a) The majority of the candidates realised that they had to use 10 trips to find the total distance. Some forgot and only used 5.

(b) This part was not as well attempted. Even those candidates who did get 12.5 as the answer could not all translate this to minutes and seconds. Some wrote 12 minutes 50 seconds or 12 minutes 5 seconds.

Answers: **(a)** 62.5 **(b)** 12 min 30 sec

Question 6

(a) There was a good attempt at this substitution question.

(b) The simplification in this part was also generally well done.

(c) This was a fairly easy factorisation and the majority of candidates could complete it correctly.

Answers: **(a)** 57 **(b)** $5x + 13$ **(c)** $3(2x + 3y)$

Question 7

(a) Although the majority of candidates found the answer correctly, some forgot to divide by 2 to find the area of the triangle.

(b) Although the majority of candidates calculated the surface area of the cheese correctly, this part proved difficult for some candidates.

(c) In this part too, not all the candidates knew how to find the volume of a prism.

Answers: **(a)** 24 **(b)** 336 **(c)** 288

Question 8

(a) Some of the candidates found it difficult to calculate the price of 9 objects after being given the price for 5. Most candidates would have benefited from more experience of this type of question.

(b) A good attempt was made to find the profit in this part and the majority of candidates were successful.

(c) Candidates found this percentage loss question difficult and, again, more practice of this type of question would be beneficial.

Answers: **(a)** 16.11 **(b)** 1.38 **(c)** 12

Question 9

(a) Most of the candidates could solve this fairly simple equation.

(b) This part proved more difficult for some of the candidates as they could not rearrange the terms correctly. However, the majority of candidates were able to solve the equation correctly.

(c) This part was also found difficult by some candidates but, again, the majority of candidates managed to find the correct answer.

Answers: **(a)** 10 **(b)** 2 **(c)** 4.5

Question 10

(a) Most candidates managed to find the correct values. Not all used their calculators correctly and, as a result, did not find the correct values.

(b) The majority of those who found the correct values also managed to draw the correct curve.

(c) (i) Even if candidates had not drawn the curve, they could successfully attempt to draw the straight line, and this was the case for many candidates.

(ii) Finding the intersection was found difficult for many candidates. It is important that candidates know how to use their calculators to find the intersection of lines.

Answers: **(a)** 3, 6, 12, 24 **(b)** correct curve drawn **(c)(i)** correct line drawn **(d)** 1.415 to 1.42

Question 11

(a) Many candidates managed to find the median correctly from the numbers given, but few could find the inter-quartile range correctly.

(b) The cumulative frequency graph was more difficult for the candidates to interpret and not as many managed to find the correct values for the median and inter-quartile range.

(c) The candidates appear to have trouble expressing themselves and giving reasons. Many managed to be awarded one mark here for saying that either Steve or Tam had the tallest plants. However, very few candidates could find another correct comparison.

Answers **(a)** median = 27, IQR = 13 **(b)** median = 23, IQR = 11 or 11.5 **(c)** Steve's plants are taller, Tam's plants have a more consistent height

Question 12

(a) Most candidates could find the correct relative frequencies.

(b) The majority of candidates were unable to give the reason as to why these were good estimates.

(c) The majority of candidates were able to find the number of blues beads, but a sizeable minority did not know how to proceed with this question.

(d) Again, the majority of candidates were able to answer this correctly, but a large minority could not find the correct answer for this last part.

Answers: **(a)** 0.21, 0.335 **(b)** large amount of trials **(c)** 1675 **(d)** 0.665

Question 13

(a) There were very few correct answers seen for this question involving standard form. Using numbers in standard form is a skill that candidates need to develop in order to succeed in this type of question.

(b) Changing from standard form to a number was better attempted, suggesting that candidates had some understanding of standard form.

(c) Many candidates found it difficult to rearrange this formula. A common mistake was to have the square root sign only over the *E* only.

Answers: **(a)** $1.17 \cdot 10^{13}$ **(b)** 0.00013 **(c)** $\sqrt{\frac{E}{m}}$

Question 14

Very few candidates found the total length of the metal rods correctly. Many did pick up some method marks for their attempts though. It is important in this type of question for candidates to show their working so that they can be awarded method marks even if they cannot complete the question, or get the final answer incorrect. A number of candidates did manage to work through the question successfully and reach the final answer.

Answer: 826

Question 15

(a) This part was answered successfully by the majority of candidates, who could find the hypotenuse of the triangle given the other two sides.

(b) Finding the hypotenuse when given one side and an angle proved much more difficult for the candidates. However, this part was still answered successfully by many candidates.

Answers: **(a)** 8.13 **(b)** 27.6

INTERNATIONAL MATHEMATICS

Paper 0607/33

Paper 33 (Core)

Key messages

In order to succeed, candidates need to have covered the full syllabus. They need to show all their working out especially in multi-step questions. Many marks were lost because working out was not written down. Marks were also lost when the candidates did not write their answers correct to three significant figures (unless otherwise specified in the question). The candidates must have a graphical calculator and know how to use it.

General Comments

Most candidates managed to attempt all the questions in the time allocated and the full range of marks was seen. Candidates need to be careful about the accuracy of their answers. If no specific accuracy is asked for in the question, then all answers should be given exactly or to three significant figures, or one decimal place for angles in degrees. Candidates must also show all their working out. When working out is shown and is correct then partial marks can be awarded if the final answer is incorrect. Candidates would benefit from practising writing justifications for their answers. It appeared as if some candidates did not have a graphical calculator. This is an essential item of equipment for this paper.

Comments on specific questions

Question 1

(a) Most of the candidates knew the square and the triangle but some had problems remembering the name for the trapezium. Some thought that the parallelogram was a rectangle.

(b) (i) The most common answer here was the correct one although some candidates did think that the answer was 4.

(ii) Many candidates drew in four lines of symmetry and so could only score 1 mark.

Answers: **(a)** trapezium, triangle, square, parallelogram **(b)(i)** 2 **(ii)** 2 correct lines

Question 2

(a) (i) The correct total was found by the majority of the candidates.

(ii) Here too, most of the candidates found the correct difference.

(iii) As in the previous two parts, this part was also well answered.

(b) Quite a few candidates managed to find the correct answer but then forgot to round it to the nearest hundred.

(c) The calculations here were also mostly correct. Some candidates found the answer 4.25 correctly and then rounded the answer down to 4 coaches. Some just wrote 4.25 coaches.

Answers: **(a)(i)** 38 **(ii)** 6 **(iii)** 67 **(b)** 4400 **(c)** 5

Question 3

(a) (i) Most of the candidates could measure the angle correctly. Only a few wrote down an acute angle.

(ii) Not all of the candidates knew that 130 was called an obtuse angle. It is a requirement of the syllabus that candidates know the names of different angles.

(b) Many correct answers were seen for this right-angled triangle.

Answers: **(a)(i)** 130 **(ii)** obtuse **(b)** 147, 57, 33

Question 4

(a) The correct pattern was drawn by nearly all candidates.

(b) The majority of the candidates could follow the pattern and find the next two terms.

(c) Finding the rule did not pose a problem for most of the candidates, but they did not always know how to express themselves clearly. This is an area where more practice would benefit candidates.

(d) Once again in this part of the question, the candidates had problems in explaining why they thought that either Sarah or Tom had the correct formula.

Answers: **(a)** correct pattern **(b)** 13, 16 **(c)** +3 **(d)** Sarah, with correct justification

Question 5

(a) The majority of the candidates realised that they had to use 10 trips to find the total distance. Some forgot and only used 5.

(b) This part was not as well attempted. Even those candidates who did get 12.5 as the answer could not all translate this to minutes and seconds. Some wrote 12 minutes 50 seconds or 12 minutes 5 seconds.

Answers: **(a)** 62.5 **(b)** 12 min 30 sec

Question 6

(a) There was a good attempt at this substitution question.

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(c) This was a fairly easy factorisation and the majority of candidates could complete it correctly.

Answers: **(a)** 57 **(b)** $5x + 13$ **(c)** $3(2x + 3y)$

Question 7

(a) Although the majority of candidates found the answer correctly, some forgot to divide by 2 to find the area of the triangle.

(b) Although the majority of candidates calculated the surface area of the cheese correctly, this part proved difficult for some candidates.

(c) In this part too, not all the candidates knew how to find the volume of a prism.

Answers: **(a)** 24 **(b)** 336 **(c)** 288

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(a) Some of the candidates found it difficult to calculate the price of 9 objects after being given the price for 5. Most candidates would have benefited from more experience of this type of question.

(b) A good attempt was made to find the profit in this part and the majority of candidates were successful.

(c) Candidates found this percentage loss question difficult and, again, more practice of this type of question would be beneficial.

Answers: **(a)** 16.11 **(b)** 1.38 **(c)** 12

Question 9

(a) Most of the candidates could solve this fairly simple equation.

(b) This part proved more difficult for some of the candidates as they could not rearrange the terms correctly. However, the majority of candidates were able to solve the equation correctly.

(c) This part was also found difficult by some candidates but, again, the majority of candidates managed to find the correct answer.

Answers: **(a)** 10 **(b)** 2 **(c)** 4.5

Question 10

(a) Most candidates managed to find the correct values. Not all used their calculators correctly and, as a result, did not find the correct values.

(b) The majority of those who found the correct values also managed to draw the correct curve.

(c) (i) Even if candidates had not drawn the curve, they could successfully attempt to draw the straight line, and this was the case for many candidates.

(ii) Finding the intersection was found difficult for many candidates. It is important that candidates know how to use their calculators to find the intersection of lines.

Answers: **(a)** 3, 6, 12, 24 **(b)** correct curve drawn **(c)(i)** correct line drawn **(d)** 1.415 to 1.42

Question 11

(a) Many candidates managed to find the median correctly from the numbers given, but few could find the inter-quartile range correctly.

(b) The cumulative frequency graph was more difficult for the candidates to interpret and not as many managed to find the correct values for the median and inter-quartile range.

(c) The candidates appear to have trouble expressing themselves and giving reasons. Many managed to be awarded one mark here for saying that either Steve or Tam had the tallest plants. However, very few candidates could find another correct comparison.

Answers **(a)** median = 27, IQR = 13 **(b)** median = 23, IQR = 11 or 11.5 **(c)** Steve's plants are taller, Tam's plants have a more consistent height

Question 12

(a) Most candidates could find the correct relative frequencies.

(b) The majority of candidates were unable to give the reason as to why these were good estimates.

(c) The majority of candidates were able to find the number of blues beads, but a sizeable minority did not know how to proceed with this question.

(d) Again, the majority of candidates were able to answer this correctly, but a large minority could not find the correct answer for this last part.

Answers: **(a)** 0.21, 0.335 **(b)** large amount of trials **(c)** 1675 **(d)** 0.665

Question 13

(a) There were very few correct answers seen for this question involving standard form. Using numbers in standard form is a skill that candidates need to develop in order to succeed in this type of question.

(b) Changing from standard form to a number was better attempted, suggesting that candidates had some understanding of standard form.

(c) Many candidates found it difficult to rearrange this formula. A common mistake was to have the square root sign only over the *E* only.

Answers: **(a)** $1.17 \cdot 10^{13}$ **(b)** 0.00013 **(c)** $\sqrt{\frac{E}{m}}$

Question 14

Very few candidates found the total length of the metal rods correctly. Many did pick up some method marks for their attempts though. It is important in this type of question for candidates to show their working so that they can be awarded method marks even if they cannot complete the question, or get the final answer incorrect. A number of candidates did manage to work through the question successfully and reach the final answer.

Answer: 826

Question 15

(a) This part was answered successfully by the majority of candidates, who could find the hypotenuse of the triangle given the other two sides.

(b) Finding the hypotenuse when given one side and an angle proved much more difficult for the candidates. However, this part was still answered successfully by many candidates.

Answers: **(a)** 8.13 **(b)** 27.6

MATHEMATICS

Paper 0607/41
Paper 41 (Extended)

Key message

A full coverage of the syllabus is always needed.

Candidates should experience context questions and the use of the graphics calculator throughout the course.

Many marks are awarded for method and candidates are reminded that correct answers without working do not always earn full marks. It is the responsibility of the candidate to communicate.

General comments

The overall standard of work was good, although a small number of candidates found parts of the paper demanding. Good syllabus coverage, good methods and suitable accuracy were usually seen.

The use of the graphics calculator continues to improve, but many candidates seemed unaware of its full potential. This was particularly noticeable when candidates did not use the statistics function to calculate a mean and did a lot of work for only 2 marks, and also in the last part of the last question when a complicated equation could have been solved.

Topics which met with success were money, time, average speed, transformations, graph sketching, probability, statistics and percentages.

Questions involving mensuration, straight line equations, inequalities from graphs, logarithmic functions and a compound interest problem were found to be more challenging.

Context questions proved to be quite demanding and some lack of correct interpretation was evident. Candidates do need to experience different situations within what might be routine topics in order to develop problem solving skills and the ability to choose appropriate strategies.

Comments on specific questions

Question 1

(a) This money conversion question was usually correctly done although many candidates overlooked the requirement to give the answer to the nearest integer.

(b) (i) Most candidates showed a good understanding of average speed. The challenging part of this question was to find the correct journey time. Errors were seen in the actual time in hours and minutes and also in the conversion of minutes into hours.

(ii) Most candidates found this time of day question very straightforward.

(iii) This question required careful interpretation of the information given and proved to demonstrate the need for practice in what leads to a straightforward calculation. Many candidates gained full marks and the common difficulty in interpretation was in distinguishing between a fixed charge and a charge per kilometre.

Answers: **(a)** 201 CHF **(b)(i)** 783 km/h **(ii)** 08 05 **(iii)** 7 km

Question 2

(a) (i) Most candidates added the two column vectors correctly.

(ii) Most candidates also drew the correct translation.

(iii) The magnitude of a vector notation was not always recognised and additions of column vectors or additions of components were often seen. The stronger candidates did realise that the notation did mean magnitude and went on to use Pythagoras successfully.

(b) (i) The description of the reflection was usually correctly answered.

(ii) The description of the enlargement proved to be more challenging with the scale factor often seen as – 2, instead of $\frac{1}{2}$, as well as the centre being incorrect or omitted.

(iii) The description of a stretch is always a discriminating part question and this proved to be no exception. The factor of $\frac{1}{4}$ was a particular challenge and the word "invariant" was occasionally lacking from the description of the line.

Answers: **(a)(i)** $\begin{pmatrix}-8\\-5\end{pmatrix}$ **(iii)** 9.43 **(b)(i)** reflection in *y*-axis **(ii)** enlargement, factor 0.5, centre (10, – 10) **(iii)** stretch, factor 0.25, *x*-axis invariant

Question 3

(a) Although this was an unusual function, most candidates gave a correct sketch. This type of question does need a correct input into the graphics calculator to guarantee a reasonable number of marks in the rest of the question.

(b) The range of a function is quite a challenging topic and candidates often showed some difficulty in this area. There were many correct answers and there were many candidates who looked at ranges of *x* instead of f(*x*) as well as a number who omitted this part.

(c) (i) This part required candidates to find values of f(*x*) for values of *x* outside the given domain of the sketch and most candidates succeeded.

(ii) This part required candidates to find values of f(*x*) for values of *x* outside the given domain of the sketch and most candidates succeeded.

(d) (i) It was hoped that part **(c)** would lead candidates to apply the periodic nature of the function and there were many correct answers to quite a new situation. A number of candidates did find this part too challenging and were unable to attempt it.

(ii) This part depended on the answers to part **(i)** being in a linear sequence and so proved to be another discriminating question.

(e) (i) This sketch, which should have been more familiar, was less successful than part **(a)**. The shape was usually correct but the intersection with the *x*-axis at 360 was often too far out.

(ii) This routine solving of an equation from the points of intersection was much more successful.

Answers: **(b)** $0.5 \le f(x) \le 2$ **(c)(i)** 1 **(ii)** 2 **(d)(i)** – 90, 270, 630, 990 **(ii)** 360*n* – 450 **(e)(ii)** 122.4, 326.2

Question 4

(a) ‘Show that’ questions invariably prove to be demanding and many candidates did not make their working clear enough. Many more knew that the volumes should be equated but decided to calculate the numerical value of the volume of the hemisphere and this did not lead to an exact value for the height of the cone. A few others used the height of the cone and also came to two volumes which were approximately equal. Partial credit was often given. The stronger candidates showed clear cancelling or dividing by π.

(b) (i) This calculation of a surface area was found to be much more accessible with many correct answers. A few candidates only found the curved surface area of the hemisphere.

(ii) The curved surface area of the cone was a little more challenging as the slant height required the application of Pythagoras. There were many correct answers as well as answers which incorrectly used the vertical height.

(c) This part required the division of the volume of the original hemisphere by the volume of a sphere, followed by rounding down to an integer. There were many good answers whilst the common errors were to divide by a hemisphere or to either round up to the nearest integer or to ignore the need to round to an integer.

Answers: **(b)(i)** 763 cm^2 **(ii)** 569 cm^2 **(c)** 45

Question 5

(a) Another “Show that” question and this one met with more success as reasonable lists of numbers of elements were allowed. The more convincing solutions usually used x for the number of elements in the intersection of the two sets.

(b) (i) Almost all candidates gave the correct probability.

(ii) Recognising the region $P \cup Q'$ proved to be much more challenging for this probability question.

(c) Almost all candidates gave the correct probability.

(d) This question required candidates to interpret a given probability value and describe the event. This was a good discriminating question and only the stronger candidates were able to give a clear answer.

Answers: **(b)(i)** $\frac{22}{25}$ **(ii)** $\frac{21}{25}$ **(c)** $\frac{8}{18}$ **(d)** An element chosen from Q is also in P.

Question 6

(a) Co-ordinate geometry questions can often be challenging and the equation of the perpendicular bisector was certainly demanding. There were some good answers. Common errors were to use one of the given points instead of the mid-point or to use the gradient of the line AB and not find the perpendicular gradient.

(b) A slightly unusual question asking for a distance along the y-axis was often not found to be as straightforward as expected. Many answers were from the use of Pythagoras when all that was required was to find the difference between to y intercepts.

Answers: **(a)** $y = \frac{2}{3}x + \frac{5}{3}$ **(b)** $1\frac{1}{3}$

Question 7

(a) This part was usually correctly answered with candidates recognising the right-angled triangle in this three dimensional shape. Some candidates ended up with inaccurate answers by using methods less efficient than the straightforward tangent ratio.

(b) This part required candidates to calculate an angle and show that it was a given value correct to one decimal place. As in part **(a)**, some longer less efficient methods were seen. The most common error was to give a correct method but not give an answer to more than one decimal place and so losing the accuracy mark.

(c) This part was to discriminate between candidates and many candidates were unable to set up the correct triangle, being unsure of the position of *X*. The stronger candidates demonstrated good spatial understanding and went on to use the cosine rule correctly.

Answers: **(a)** 42.0° **(b)** 33.91° to 33.93° **(c)** 12.4 cm

Question 8

(a) Many excellent sketches were seen.

(b) The zeros of the function were usually correctly stated. A few candidates gave one of the answers to only two significant figures.

(c) Inequalities, using the zeros found in part **(b)**, were found to be challenging and many candidates either gave incorrect inequalities with their zeros or gave completely different values in their inequalities. Fully correct answers were not often seen.

(d) Recognising the two asymptotes met with more success, although the one not parallel to an axis was more of a challenge.

(e) The translation of the graph of one function on to another was usually recognised, although there were a few sign errors in the vector.

Answers: **(b)** – 2.62, – 0.382 **(c)** $x < -2.62$, $-0.382 < x < 0$ **(d)** $a = 0$, $b = 3$ **(e)** translation $\begin{pmatrix} 0 \\ -3 \end{pmatrix}$

Question 9

(a) The frequencies from the given histogram were usually correctly given. A few candidates did not multiply the frequency densities by the interval widths and so only gave the first three frequencies correctly.

(b) The estimate of the mean was generally well done. A number of candidates used a long method, overlooking the potential of the graphics calculator.

(c) This probability question was more searching. There were many correct answers, occasionally not to the required accuracy. A number of candidates used 93 as the denominator of both fractions in the product. This part was also occasionally omitted.

Answers: **(a)** 18, 20, 15, 20, 20 **(b)** 3.30 **(c)** 0.649

Question 10

(a) This straightforward equation was almost always correctly answered.

(b) Apart from a careless sign error, the addition of the two algebraic fractions was well answered. The careless error was $3x + 3 + 2x - 2 = 5x - 1$ and this was quite frequently seen.

(c) (i) This indices question was generally well answered. There were slips in the subtracting of indices and a few weaker candidates did not appear to know the rules of indices.

(ii) This higher grade simplification of an algebraic fraction, requiring the factorising of the numerator and the denominator, allowed good candidates to show their strengths. Weaker candidates cancelled parts of the numerator and denominator which were not factors.

Answers: **(a)** $\frac{9}{7}$ **(b)** $\frac{5x+1}{6}$ **(c)(i)** $\frac{2x}{y^2}$ **(ii)** $\frac{x+3}{x+1}$

Question 11

(a) Although one function was logarithmic, most candidates gave correct answers to this compound function evaluation question. Considering answers to part **(b)** and part **(c)(ii)**, it is likely that some candidates simply used their calculators to find log(100) without full knowledge of $\log(100) = 2\log(10) = 2 \times 1 = 2$.

(b) Most candidates reached the stage of log$x$ = – 2 but as already indicated, were unable to convert this into an index statement. The basic rule of $\log_b a = p \Leftrightarrow a = b^p$ was required and many candidates could not apply this.

(c) (i) The inverse of a linear function was much more accessible and usually correctly answered.

(ii) The comment for part **(b)** also applies here as many candidates could not go from y = log$x$ into an index statement.

Answers: **(a)** 2 **(b)** $\frac{1}{100}$ **(c)(i)** $\frac{x-1}{3}$ **(ii)** 10^x

Question 12

(a) (i) The calculation of the percentage increase was usually correctly answered.

(ii) The calculation of one quantity as a percentage of another quantity was almost always correctly answered.

(iii) This reverse percentage question was also well answered.

(b) (i) The comparison of two investments proved to be challenging, often because the simple interest calculation usually gives the interest and the compound interest calculation gives the amount, resulting in many candidates finding the difference between an amount and an interest. These candidates are not taking the context into account when such large answers could not be sensible. Good candidates set their working out clearly and gained full marks or almost full marks.

(ii) This part required good interpretation skills in a context question. There were some good answers, usually from trial and improvement and rarely from a graphical approach. There was a common error of using the simple interest amount being the amount after five years and not using the fact that both investments were increasing year by year. This was a discriminating final question on the paper.

Answers: **(a)(i)** 12% **(ii)** 89.3% **(iii)** $1250 **(b)(i)** $9.30 **(ii)** 16

INTERNATIONAL MATHEMATICS

Paper 0607/42
Paper 42 (Extended)

Key messages

Candidates must show sufficient working to gain any method marks available.

The general instruction is that answers should be given correct to three significant figures unless the answer is exact or the questions states otherwise. Money answers should be to the nearest cent, again unless the question says otherwise. This means that candidates may lose marks if answers are given to fewer significant figures. This was particularly common on some answers following curve sketching.

Candidates should be familiar with the expected uses of a graphics calculator. This is both for graphical questions and statistical questions. When using the calculator to solve equations, candidates are expected to show the sketches of the functions on the paper.

Candidates should use the mark value indicated in the question as an indicator of how much work is required for a question.

When exact answers or answers in terms of π are asked for, then answers like 144π and $\frac{2\sqrt{3}}{3}$ are required, not decimals.

'Not To Scale' on diagrams means that angles cannot be assumed.

General comments

The paper proved accessible to most of the candidates. Just a few a few parts of question proved very difficult for all but the very best candidates.

Whilst most candidates displayed knowledge of the use of a graphics display calculator, a few are still plotting points when a sketch graph is required. This is rarely successful. Familiarity with other uses such as statistical functions was not so apparent.

Most candidates showed sufficient working but there were a significant number who produced answers without justification. The penalties for this are twofold. For certain questions, working is required to get full marks; on others, while full marks are available without working, they depend on an accurate correct answer, with method marks then able to be earned for an incorrect answer if the working is shown.

Comments on individual questions

Question 1

It was expected that this question on mean, median and mode would be done using a graphics calculator but it was clear that many candidates did not do this. Common errors were giving the maximum or the frequency for the mode, giving 168 to 178 for the range and 105–35 for the interquartile range. Part **(e)** was probably the best answered part but a few candidates did not give their answer to 1 decimal place.

Answers: **(a)** 171 **(b)** 10 **(c)** 172 **(d)** 4 **(e)** 172.1

Question 2

This question on bearings and scale diagrams was very well done, with many fully correct answers. A few candidates spoilt their answer to part **(a)** by giving an answer in surd form for this in-context question. Just a few made incorrect sketches of the path and this did lead to mistakes.

Answers: **(a)** 2.83 km **(b)** 225° **(c)** 8 km^2

Question 3

This question on correlation and regression lines was well done by most candidates. Almost all were correct in the first three parts. Those familiar with the statistics functions on their graphics calculator were usually successful with the regression equation and were able to use it for part **(c)(ii)**.

Answers: **(a)** Positive **(b)(i)** 12.15 **(ii)** 66 **(c)(i)** $y = 37.2x + 2.37$ **(ii)** 82

Question 4

It was frequent to see incorrect assumptions made on this question on angles in circles. Despite the 'Not to Scale' being clearly stated, often it was assumed that *QP* was parallel to *AB* and/or angle *AOB* = 90°. This meant that those candidates who did this only scored marks in the parts which were marked on a follow through basis. Candidates who did not make these assumptions did the question well.

Answers: **(a)** 48° **(b)** 84° **(c)** 42° **(d)** 69° **(e)** 55.5°

Question 5

In part **(a)**, the mean was calculated accurately by many candidates, although those using their calculators in a conventional way often made keying errors. Those using the statistical functions were more successful. Weaker candidates often added the mid-interval values and divided by 6.

Part **(b)** was well done by many but some did not know how to calculate frequency density.

Answers: **(a)** 36.7 **(b)** 0.8, 3.6, 2.6, 2.7, 1.47, 0.7

Question 6

Most candidates were able to get one of the marks in each part of this question on transformations, but many struggled in completing the descriptions. Reflection in $y = -x$ was a very common answer to part **(a)** and other common mistakes were incorrect centres in parts **(b)** and **(d)** and reversed values in for the column vector.

Answers: **(a)** Reflection in $y = x$ **(b)** Rotation, centre (2, 3), 90° anticlockwise **(c)** Translation $\begin{pmatrix} -4 \\ 3 \end{pmatrix}$

(d) Enlargement, centre (0, 0), Scale factor $\frac{1}{3}$

Question 7

This question on simultaneous equations was extremely well done by most candidates. The most common method was elimination and this was also the most successful. The fractions involved in the substitution method proved difficult for some. Just a few made *y* the subject of both equations and used the curve sketching capability of their graphics calculator.

Answers: $x = -2$, $y = -\frac{1}{2}$

Question 8

Part **(a)** of this question on trigonometric functions proved very difficult for many as they could not give their answer in surds. Many candidates, however, were able to go on to score in part **(b)(i)**. Part **(b)(ii)** proved difficult as it was necessary to use the surd answer from part **(a)**. That said, there were some excellent solutions from some of the candidates.

Answers: **(a)** $\frac{2\sqrt{2}}{3}$

Question 9

This question on the areas of different shapes was very well done by many candidates. Parts **(a)**, **(b)(i)** and **(b)(ii)** saw very few incorrect answers. Most managed to have a valid attempt at part **(b)(iii)**. The method of subtracting the area of the square from the area of the large equilateral triangle using ½*bc* sin *A* proved the most successful. More mistakes were made by those adding the three separate areas.

Answers: **(a)** 21.5 cm^2 **(b)(i)** 5.77 **(ii)** 21.5 cm **(iii)** 101 cm^2.

Question 10

In part **(a)** of this question on graphs of functions most candidates, using their graphics calculator, produced good sketches. Those trying to plot points were not so successful. Stronger candidates did part **(b)** well but a number just gave values rather than equations. Part **(c)** proved more accessible but many could not use their answers to parts **(b)** and **(c)** to find the inequalities in part **(d)** where $–4 < x < 3$ was very common. Most candidates named the transformations as translation in part **(c)** but the vector was often incorrect.

Answers: **(a)** Sketch **(b)** $x = 2$, $y = 3$ **(c)** –4, 3 **(d)** $x < –4$ or $2 < x < 3$ **(e)(i)** Translation $\begin{pmatrix} 2 \\ 0 \end{pmatrix}$

(ii) Translation $\begin{pmatrix} 0 \\ 3 \end{pmatrix}$

Question 11

All three parts of this question on sequences were well done. Most used the differences in parts **(b)** and **(c)** to show that the formulae were quadratic and cubic respectively and most were successful in finding those functions. Some produced equations and were unable to solve them to find the coefficients.
Many did not spot the connection between part **(c)** and parts **(a)** and **(b)**.

Answers: **(a)** 216, n^3 **(b)** 4^3, $n^2 + n + 1$ **(c)** 173, $n^3 - n^2 - n - 1$

Question 12

It was clear that many candidates did not understand what it meant to leave an answer "in terms of π" and 452 and 339 were seen all too often. Some candidates then used their value with π in which should have been given in part **(a)** to correctly work solutions in part **(b)**. In part **(b)(i)** there were many candidates who used formulae in terms of r^2 instead of the correct volume formula. A greater understanding of dimensions would help candidates in this type of question. Only the strongest candidates were fully successful in part **(b)(ii)** although many candidates were able to gain part marks for working out one or both of the correct areas.

Answers: **(a)(i)** 144π **(ii)** 108π **(b)(i)** 12 cm **(ii)** 1 : 3

Question 13

In part **(a)** many candidates were able to use the rule of logs, $a\log b = \log b^a$ but fewer could use the rule for adding or subtracting logs. Better candidates did part **(b)(i)** well but weaker candidates often used linear equation techniques or trial and error. The latter usually did not reach a sufficiently accurate solution. The quadratic equation was done very well with many completely correct solutions. Some candidates, however, made sign errors in reaching their three term quadratic equation and others only gave the negative solution to 3 significant figures. The most common method was to use the formula and here too some candidates made sign errors. A few sketched either the three term quadratic or the original function and $y = 1$ and these were usually successful. Completing the square often proved too difficult.

Answers: **(a)** $\frac{p^3q^2}{6}$ **(b)(i)** 1.29 **(ii)** 1.57, –0.741

Question 14

Most candidates produced very good sketches in this question on graphing functions. Just a few flattened the left hand portion so no clear maximum and minimum could be discerned. As with **Question 10**, those plotting points were less successful. Parts **(b)** and **(c)** were also done well although a few misread the question and gave the x co-ordinate in part **(b)** and accuracy was sometimes lost. Although part **(d)** was less well done it was pleasing to see the number of candidates who gave the fourth solution even though they had to change the domain of the function on their graphics calculator.

Answers: **(a)** Sketch **(b)** 0.729, –10.3 **(c)** (0.31, 1.73) **(d)** –2.82 0.364 4.23 5.76

INTERNATIONAL MATHEMATICS

Paper 0607/43
Paper 43 (Extended)

Key message

Candidates are expected to answer all questions on the paper, so full coverage of the syllabus is vital.

Communication and suitable accuracy are also important aspects of this examination and candidates should be encouraged to show clear methods, full working and to give answers to three significant figures or to the accuracy asked for in a particular question. Candidates are strongly advised not to round off during their working.

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

Erased and replaced work, or work written in pencil and then overwritten in black or blue, can often make the script very difficult to read.

General comments

The candidates were very well prepared for this paper and there were many excellent scripts, showing all necessary working and a suitable level of accuracy.

Candidates were able to attempt all the questions and to complete the paper in the allotted time.

A few candidates needed more awareness of the need to show working, either when answers alone may not earn full marks or when a small error could lose a number of marks in the absence of any method seen.

The sketching of graphs continues to improve, although the potential use of graphics calculators elsewhere is often not realised.

Topics on which questions were well answered include transformations, percentages, cumulative frequency, histograms, curve sketching and inverse proportion.

Difficult topics were exponential change, the sine and cosine rules, algebraic fraction manipulation, range of a function and a complicated mensuration problem.

Comments on specific questions

Question 1

(a) (i) Nearly all answers seen were correct but a few candidates found the square root instead of the cube root in this question on using a calculator.

(ii) Almost all of the candidates were able to answer this question correctly.

(b) (i) and (ii) Most candidates scored some credit for correct figures seen in their working; several were unable to place their answers in correct standard form with their $k > 10$ or $1 > k$. A few candidates used their calculator display answer, e.g. 3.16 E11.

Answers: **(a)(i)** 43 **(ii)** 14.5 **(b)(i)** 3.16×10^{11} **(ii)** 8.23×10^{7}

Question 2

(a) (i) This "show that" part question using percentages was quite well answered, with most scoring at least a method mark for finding 25% of the amount. A lot of candidates did not read the question accurately or their understanding was not correct for the second method mark.

(ii) This part was poorly answered with a lot of candidates incorrectly using logarithms. 13 was a common wrong answer, where candidates had found the number of years required to gain \$183 168 (total required in part **(a)(i)**). Very few candidates used a complete correct method and calculated 19 years.

(b) This reverse percentage question was well answered. Most candidates realised that the given amount was not 100%.

Answers: **(a)(ii)** 19 **(b)** 256 000

Question 3

(a) The description of the reflection was nearly always correct although some omitted the negative sign and some had $y = -2$.

(b) This 90° rotation was more challenging as the centre was not the origin. There were many correct answers as well as many candidates gaining partial credit for the correct angle of rotation but an incorrect centre.

(c) The stretch was also well described. Candidates need to be aware of the need to indicate that a line is invariant and phrases such as "parallel to…" or "from the …" are not accepted.

Answers: **(a)** Reflection, $x = -2$ **(b)** Rotation, 90 degrees, (5,1) **(c)** Stretch, Stretch Factor 3, x-axis invariant

Question 4

This mensuration question contained parts covering different grade levels. The first parts were found to be straightforward while part **(b)** was designed to be more challenging.

(a) (i) The volume of the pyramid was usually correctly calculated. A small number of candidates used the base measurements as a 6×8 rectangle.

(ii) Most candidates used Pythagoras's theorem correctly although several only gave an answer to 2 significant figures; some did not divide the base length by 2, and used 6 incorrectly.

(b) (i) The volume of the frustum was not a well attempted part, with several candidates having a final answer which was greater than part **(a)(i)**. Several candidates received a method mark for finding 12 but then not subtracting from 96.

(ii) The total surface area of the same solid proved to be very challenging, with only a handful of candidates scoring full marks. The extra difficulty was to be aware that Pythagoras's theroem was required to find the slant height, and the perpendicular height was frequently used instead. Method marks were awarded fairly often for correct addition of their areas.

Answers **(a)(i)** 96 **(ii)** 8.54 **(b)(i)** 84 **(ii)** 122

Question 5

Most parts of this question required readings from a graphics calculator and candidates do need to know that this does not change the rules about three significant figure accuracy. Candidates also need to know that there are specific functions on the calculator to answer these questions and not to simply move the cursor around the screen as this will not lead to accurate answers. A small number of candidates omitted this question, suggesting a lack of experience with a graphics calculator.

(a) The sketch of the given function was very well done. A small number of candidates appeared to have their calculators set in radians.

(b) Many candidates gained all three marks but some lost the second value of 0.524 as they had rounded to 2 significant figures. A small number had all three values with the incorrect signs.

(c) (i) The local maximum and minimum points were almost always correctly stated.

(ii) The range of the function proved to be a searching question with many candidates giving values of *x* or even the domain. Non-standard notation was occasionally seen, while a number of candidates omitted this part. Few fully-correct answers were seen.

(d) This part for the description of the symmetry was not done particularly well with few candidates scoring full marks. Partial marks were awarded, mainly for rotation; a few commented correctly on the centre of rotation.

Answers: **(b)** −2.67, 0.524, 2.15 **(c)(i)** Max (−1.15, 9.08) Min (1.15, 2.92) **(ii)** $k < 2.92$ and $k > 9.08$
(d) Rotational, Order 2, (0, 6)

Question 6

(a) This question on co-ordinate geometry was trickier than first perceived with few candidates scoring all 3 marks. Most gained credit for (4, −1) but not many found the third point of (8, 7). Several candidates reversed their *x* and *y* co-ordinates.

(b) Many correct answers were seen, but several candidates had 1 co-ordinate only. (14, 6) was seen regularly as an incorrect response.

(c) This part question on a perpendicular line was not very well answered, with several using the midpoint answer from part **(b)**. A large number of responses found the gradient of *AC* by dividing the *x* difference by the *y*. A lot of follow-through marks were awarded for candidates correctly inverting and changing the sign of their *m*.

Answers: **(a)** (4, −1) (−6, −1) (8, 7) **(b)** (13, 7) **(c)** $y = -1.75x - 2.75$

Question 7

(a) (i) Most candidates completed the frequency table correctly.

(ii) Most candidates completed the frequency curve correctly, some scored follow-through marks for an incorrect table.

The next three parts required reading from a cumulative frequency graph and most candidates answered each part successfully. The scale of the vertical axis was occasionally misread.

(b) The histogram was generally completed very well with most candidates scoring three or four marks.

Answers: **(a)(i)** 18, 40, 77, 97, 114 **(iii)** 7100 to 7400 **(iv)** 750 to 1150 **(v)** 9 or 10 or 11

Question 8

(a) This question was a 'show that' question on angles in a triangle/straight line which was not answered that well by a lot of candidates who were unable to communicate their reasoning clearly.

(b) This was a straightforward trigonometry question using the tangent ratio but a lot of candidates used a two-step method.

(c) This part was a routine use of Pythagoras's theorem to find the hypotenuse. No attempts were seen where a two-step trigonometric method was used.

(d) This part was an implicit cosine rule question which was not answered very well, with a very large number of candidates unable to correctly evaluate angle *ACD* as they wrongly assumed that angle *ACB* was 25 degrees. Many candidates did not correctly find the product of 2, 100, 75 and cos 63.1 before subtraction from $100^2 + 75^2$, often leading to the square root of 282.77… .

(e) This part-question was poorly-answered, with many candidates not really understanding bearings and consequently which was the required angle. This question was an implicit sine rule question to find angle *CAD* before addition to 25 and 53.1 degrees. Many candidates were unable to correctly calculate angle *ACD*.

Answers: **(b)** 36.9 **(c)** 100 **(d)** 94.0 **(e)** 123

Question 9

(a) Average speed/time problems continue to be more of a challenge than might be expected. It is usually the conversion of hours and minutes that causes difficulties and this caused the common wrong answer of 10 hours 27 mins. Candidates need to be aware that there are not 100 minutes in an hour. Most candidates scored at least a method mark for correct division of distance by speed. Only a few candidates lost the final accuracy mark for not reading the question closely.

(b) (i, ii) This was a worded travel question which leads to an expression in part **(i)** and to a quadratic equation in part **(ii)**. A lot of candidates over-complicated their answer to the first part, giving the second fraction as well, and many had their expression inverted. The usual mistakes were seen in part **(ii)** in the manipulation from the addition of algebraic fractions to the 'show that' equation, i.e. not multiplying the RHS by the common denominator as well.

(iii) Very few candidates were able to score full marks while solving the quadratic equations. The correct factorisation was rarely seen with most relying on their calculators but not showing the evidence, thus losing the method mark available. Partial credit was given to a lot of responses for ignoring the negative answer and very few recognised that they were solving for (x + 4) as a final solution.

Answers: **(a)** 9 hours 52 mins **(i)** $\frac{270}{x}$ **(c)** 14

Question 10

(a) (i) Most candidates gained two marks here for factorising the equation.

(ii) This 'show that' part on algebraic fractions was not well executed, with a lot of difficulty seen in the manipulation of algebraic fractions to the required answer.

(b) (i) This sketch was successfully shown with most gaining a mark for a correct branch.

(ii) This linear sketch was not answered particularly well, with the line crossing below the *x*-axis or intersecting the curve on many responses.

(iii) Most candidates understood the meaning of asymptotes and found at least one of them.

(iv) Many scripts gained both marks here, often through a quite protracted method as several did not solve just the numerator equals 0.

Answers: **(a)(i)** $(2x - 1)(x - 1)$ **(b)(iii)** $y = 2x + 1$, $x = 2$ **(iv)** 0.5, 1

Question 11

(a) Almost all candidates completed the table successfully.

(b) This probability question was not answered particularly well, with many candidates omitting to subtract 1 from either the numerator or the denominator (or both) in the second fraction.

(c) This was a much more challenging probability question, requiring a product of probabilities from only a particular subset rather than the whole set. There were many successful candidates. There were candidates who found the denominator and numerator of the fractions difficult to recognise. There were other candidates who had a correct first fraction but treated the question as a "with replacement" situation. A surprising number of answers had P > 1.

Answers: **(a)** 12, 28, 13, 9, 21 **(b)** $\frac{462}{2450}$ **(c)** $\frac{384}{756}$

Question 12

(a) A potentially tricky part-question on inverse proportionality, which was generally well answered with many successful outcomes. Several candidates did give $\frac{k}{\sqrt{x}}$ as a final answer with $k = 10$ in the body of the script.

(b) Most candidates with full marks in part **(a)** continued to gain full credit here and many others gained follow-through marks, provided it came from a reasonable attempt in part **(a)**.

(c) This question involving combining equations in the context of proportionality was probably the most challenging part-question of the entire paper, with very few responses gaining full marks. Most candidates did not really know where to start with this part and there were a lot of false starts seen in the working.

Answers: **(a)** $\frac{10}{\sqrt{x}}$ **(b)** $\frac{100}{9}$ **(c)** 4000, $-\frac{3}{2}$

INTERNATIONAL MATHEMATICS

Paper 0607/51
Paper 51 (Core)

Key messages

This paper requires candidates to communicate clearly. There were a few cases where candidates' writing was not clear enough to award marks. This happened in numerical answers where two figures appeared on top of each other and also in questions requiring an explanation where key words were illegible.

Since calculations involving fractions can be typed directly into the calculator, full working out of how to add fractions is not necessary for communication in this paper.

General comments

Candidates should remember that if there is more than one part to a question, then these parts will be related and so work in a previous part may be relevant in later parts. This was the case in question 4 where the generalisation in part **(d)** was to be applied in part **(f)**.

Comments on specific questions

Question 1

Most candidates were successful in explaining why there were 5 squares. A few disagreed and saw only 4 squares.

Question 2

The large majority of candidates answered this correctly. A very common error was to read the start of each statement wrongly, writing that there was one 1 by 1 square but nine 3 by 3 squares. There were occasional errors in adding to get 14.

Answer: 9, [4,] 1, 14

Question 3

Nearly all candidates answered this correctly. Those who had used the reverse order in **Question 2** did so here. This was not penalised twice.

Answer: 16, 9, 4, 1

Question 4

(a) For the table it was expected that candidates would see the pattern. Those who continued to count from first principles often made errors. Those who had reversed the order in previous questions were not penalised again.

(b) This was answered correctly by most candidates.

Answer: Square numbers

(c) While there were many correct answers, some candidates did not proceed beyond finding 64 small squares. Credit for communication was given to those who continued the pattern and showed the addition sum which gave the correct answer.

Answer: 204

(d) The majority of candidates could answer this correctly by observing the connection between 5 by 5 and $(n – 4)^2$ and applying this to the other terms. Those who had originally used a reverse order either recovered in this way or wrote expressions which were unrealistic in the context.

While, strictly-speaking, correct, an answer of $(n – 0)^2$ in the first cell was very common.

Answer: n^2, $(n – 1)^2$, $(n – 2)^2$, $(n – 3)^2$, [$(n – 4)^2$,] $(n – 5)^2$

(e) Those candidates who were successful in part **(d)** were often able to answer correctly here.

Answer: $(n – 11)^2$

(f) (i) The application of the result in part **(e)** proved quite difficult. Answers similar to $(5 – 19)^2$ were common, indicating that candidates were not clear about what the expression $(n – 4)^2$ for 5 by 5 squares meant. Many candidates did not realise the help given by the table and instead interpreted the question as finding the number of 5 by 5 squares that filled a 20 by 20 grid, namely 16. Credit for communication was given by showing clearly that $(n – 4)^2$ had been used to find the answer.

Answer: 256

(ii) The same comment applies here as in part **(f)(i)**. Many candidates extended the 5 by 5 column in the table in **Question 4** and found the correct answer in this way. Communication was rewarded if this method was seen in this question or if use of $(n – 4)^2$ was made clear.

Answer: 10

Question 5

(a) A large majority of the candidates gained credit for this question, even though the setting out of the argument lacked clarity. Most substituted $n = 1$ correctly and allowance was made for not completing the argument fully. A few candidates substituted $n = 1$ **and** $T = 1$ to deduce that $d = 0$.

Several candidates attempted to add the terms in the formula and showed a lack of understanding of indices.

(b) Most candidates were able to show that substitution of $n = 4$ into the formula gave the correct answer. $\frac{4^3}{3}+\frac{4^2}{2}+\frac{4}{6}$ is sufficient explanation for what should be typed into the calculator. Many candidates subsequently spoiled this calculation by writing it as 28.3 + 8 + 0.7, with a few writing 28 + 8 + 2.

(c) The most common error was to give only the obvious squares of 100 small ones and 1 large one. The majority of candidates could use the formula in part **(a)** correctly**.**

Answer: 385

Question 6

(a) Only the most able candidates were successful here and saw that the 9 grid intersections on the 2 by 2 square gave the 9 possible positions of the top right corner of the large square. As this was a difficult idea to explain, credit was given if candidates showed that their intent was correct.

(b) A few candidates received marks in this question. Of the successful candidates, many did not use the idea in part **(a)** but used the grid to count afresh. Several candidates ignored the instruction *bigger than 9 by 9* in their answer.

Answer: any two from 10 by 10 on a 14 by 14

11 by 11 on a 15 by 15
12 by 12 on a 16 by 16
etc.

INTERNATIONAL MATHEMATICS

Paper 0607/52
Paper 52 (Core)

Key messages

In questions, such as question 3, where it says *Show that* two items are the same, candidates must work out each item separately and not assume equality.

If a question instructs candidates to use a particular result, then no credit is gained from an alternative method.

Candidates should be encouraged to use the graphics calculator to solve equations, even unfamiliar ones, by finding the intersection of appropriate graphs.

General comments

Candidates were usually very successful in this investigation. There was clear evidence of using good communication to explain methods and working.

Comments on specific questions

Question 1

(a) This was answered correctly by all candidates. Some wrote the letters for a rectangle in an incorrect order but this was not penalised.

Answer: *ABRS* and *CDRS*

(b) Most candidates listed the correct rectangles. In doing so the large majority of candidates continued the logic of the table. A few repeated the same rectangle, using a different order of letters for a rectangle.

Answer: *PQDC, PQFE, ABFE, CDFE* and *EFRS*

(c) Nearly all the candidates found the correct number of rectangles. It was possible to gain credit for communication by showing how this answer was found.

Answer: 15

(d) At this stage, most candidates had spotted the pattern that the number of rectangles increased by 2, 3, 4, etc. and were able to complete the table. A few candidates wrote 0 for the number of rectangles when there were no lines inside it. Candidates who had made an error in part **(c)** recovered here though those candidates did not necessarily return to part **(c)** to correct their answer. Many candidates gained credit for communication by showing how the table continued by using indicating the differences.

Answer: 1, 21 and 28

(e) Only a very few candidates knew that these were triangle numbers. A large variety of other terms were seen with *quadratic* being one that hinted at some relevant knowledge. The required terminology, with which candidates should be familiar, appears in the syllabus under 1.1.

Answer: triangle numbers

(f) Most answers seen were correct, with the usual method being to extend the sequence. Any errors were caused by miscounting the number of terms or making a simple arithmetic mistake. Credit for communication was given to those who indicated the addition sums used.

Answer: 66

Question 2

(a) The large majority of candidates answered this correctly. Allowance was made for those candidates who inserted the lines in one of the rectangles in the diagram.

Answer: 6

(b) Most candidates quickly spotted that this table was the same as the previous one. There were a few who incorrectly continued 3, 6 as multiples of 3 or used other linear sequences to complete the table.

Answer: 1, (3, 6,) 10, 15, 21, 28, 36

(c) In this question, most candidates wrote a sentence indicating that the tables were the same. A very small number of candidates preferred the word *similar*, which is not strong enough to suggest equality.

Question 3

It was rare to see full marks in this question. The large majority of candidates felt they had done enough in calculating the number of rectangles using the formula. For full marks candidates had, in addition, to show that this number was the same as that found from continuing the sequence or from evaluating the sum of the first 13 triangle numbers.

Question 4

(a) This question, with its algebraic content, discriminated between candidates. The easiest method was to generalise $\frac{12^2+3\cdot\ 12+2}{2}$, seen in the previous question, and get $T=\frac{n^2+3n+2}{2}$. A very common error was then to write a = 3 and b = 2 or $T = ½n^2 + 3n + 2$.

For an alternative method, several candidates substituted values for n into $T = ½n^2 + an + b$. Many of those were not sure what to do with the T and so did not form any useful equations in a and b.

Communication was rewarded for candidates who wrote two relevant equations.

Answer: $a=\frac{3}{2}$, b = 1, $T=\frac{1}{2}n^2+\frac{3}{2}n+1$

(b) The most common error in here was in ignoring the instruction *Use your formula in part **(a)***, which resulted in no credit being given. Some candidates tried to alter the working from their formula to give the answer 36. The mark for this question was only given for substituting 7 into their formula.

(c) Candidates were expected to use their formula to find the number of vertical lines inside the rectangle when there were 231 rectangles altogether. A few showed great skill in correctly factoring to get the result. Candidates could also use their calculators and find the solution by examining the intersection of $T = \dfrac{n^2 + 3n + 2}{2}$ and T = 231. More success might have been seen if candidates had used this method. A few erroneously substituted the 231 into the formula.
Candidates were in fact most successful in this question when they continued the sequence carefully up to 231. There were indeed many correct answers using this method.

Answer: 20

Question 5

Successful candidates, of which there were many, made note of the result $\dfrac{12^2 + 3 \cdot 12 + 2}{2}$ given in **Question 3** and evaluated $\dfrac{30^2 + 3 \cdot 30 + 2}{2}$. There was a reward for communicating this method or for showing 30 substituted into their formula in **Question 4(a)**. Some candidates managed to extend the sequence to find the answer. Of those who did so, a few made errors of counting or of addition.

Answer: 496

INTERNATIONAL MATHEMATICS

Paper 0607/53
Paper 53 (Core)

Key messages

In questions, such as question 3, where it says *Show that* two items are the same, candidates must work out each item separately and not assume equality.

If a question instructs candidates to use a particular result, then no credit is gained from an alternative method.

Candidates should be encouraged to use the graphics calculator to solve equations, even unfamiliar ones, by finding the intersection of appropriate graphs.

General comments

Candidates were usually very successful in this investigation. There was clear evidence of using good communication to explain methods and working.

Comments on specific questions

Question 1

(a) This was answered correctly by all candidates. Some wrote the letters for a rectangle in an incorrect order but this was not penalised.

Answer: *ABRS* and *CDRS*

(b) Most candidates listed the correct rectangles. In doing so the large majority of candidates continued the logic of the table. A few repeated the same rectangle, using a different order of letters for a rectangle.

Answer: *PQDC, PQFE, ABFE, CDFE* and *EFRS*

(c) Nearly all the candidates found the correct number of rectangles. It was possible to gain credit for communication by showing how this answer was found.

Answer: 15

(d) At this stage, most candidates had spotted the pattern that the number of rectangles increased by 2, 3, 4, etc. and were able to complete the table. A few candidates wrote 0 for the number of rectangles when there were no lines inside it. Candidates who had made an error in part **(c)** recovered here though those candidates did not necessarily return to part **(c)** to correct their answer. Many candidates gained credit for communication by showing how the table continued by using indicating the differences.

Answer: 1, 21 and 28

(e) Only a very few candidates knew that these were triangle numbers. A large variety of other terms were seen with *quadratic* being one that hinted at some relevant knowledge. The required terminology, with which candidates should be familiar, appears in the syllabus under 1.1.

Answer: triangle numbers

(f) Most answers seen were correct, with the usual method being to extend the sequence. Any errors were caused by miscounting the number of terms or making a simple arithmetic mistake. Credit for communication was given to those who indicated the addition sums used.

Answer: 66

Question 2

(a) The large majority of candidates answered this correctly. Allowance was made for those candidates who inserted the lines in one of the rectangles in the diagram.

Answer: 6

(b) Most candidates quickly spotted that this table was the same as the previous one. There were a few who incorrectly continued 3, 6 as multiples of 3 or used other linear sequences to complete the table.

Answer: 1, (3, 6,) 10, 15, 21, 28, 36

(c) In this question, most candidates wrote a sentence indicating that the tables were the same. A very small number of candidates preferred the word *similar*, which is not strong enough to suggest equality.

Question 3

It was rare to see full marks in this question. The large majority of candidates felt they had done enough in calculating the number of rectangles using the formula. For full marks candidates had, in addition, to show that this number was the same as that found from continuing the sequence or from evaluating the sum of the first 13 triangle numbers.

Question 4

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For an alternative method, several candidates substituted values for n into $T = \frac{1}{2}n^2 + an + b$. Many of those were not sure what to do with the T and so did not form any useful equations in a and b.

Communication was rewarded for candidates who wrote two relevant equations.

Answer: $a = \frac{3}{2}$, $b = 1$, $T = \frac{1}{2}n^2 + \frac{3}{2}n + 1$

(b) The most common error in here was in ignoring the instruction *Use your formula in part **(a)***, which resulted in no credit being given. Some candidates tried to alter the working from their formula to give the answer 36. The mark for this question was only given for substituting 7 into their formula.

(c) Candidates were expected to use their formula to find the number of vertical lines inside the rectangle when there were 231 rectangles altogether. A few showed great skill in correctly factoring to get the result. Candidates could also use their calculators and find the solution by examining the intersection of $T = \frac{n^2 + 3n + 2}{2}$ and $T = 231$. More success might have been seen if candidates had used this method. A few erroneously substituted the 231 into the formula.
Candidates were in fact most successful in this question when they continued the sequence carefully up to 231. There were indeed many correct answers using this method.

Answer: 20

Question 5

Successful candidates, of which there were many, made note of the result $\frac{12^2 + 3 \cdot 12 + 2}{2}$ given in **Question 3** and evaluated $\frac{30^2 + 3 \cdot 30 + 2}{2}$. There was a reward for communicating this method or for showing 30 substituted into their formula in **Question 4(a)**. Some candidates managed to extend the sequence to find the answer. Of those who did so, a few made errors of counting or of addition.

Answer: 496

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/61
Paper 61 (Extended)

Key Messages

These papers usually test a candidate's knowledge of a graphics calculator in some way. Every candidate, therefore, should have one and know exactly how to use it. Some of the modelling questions relied on the candidate using graphs drawn on the calculator.
Secondly, as with many things, you do not get anywhere without trying something. Candidates should be encouraged to make attempts at the questions even if they cannot see the way to a final answer.

General Comments

Candidates often left many questions unanswered and/or wrote numbers on the answer lines which had little relevance to the question. They should be encouraged to always look back at previous answers and diagrams to help them because the questions are all linked together as one investigation or modelling scenario.

Comments on Specific Questions

Part A: Investigation

Question 1

(a) Most candidates found it quite easy to explain where the fifth square was formed.

Answer: 4 small and 1 large

(b) Some candidates may not have understood the meaning of '1 by 1' etc. and in both this question and **part (c)** they put the answers in the reverse order. Most candidates, however, were able to count the squares correctly and record them for the right size squares.

Answer: 9 1 14

(c) There were few candidates who did not get their numbers of squares to add up to 30. The most common error was to write them in reverse order, i.e. with one 1 by 1 square and sixteen 4 by 4 squares.

Answer: 16 9 4 1

Question 2

(a) Candidates were able to transpose their already acquired information into this table and extend it, either by calculation but mostly by continuing the patterns they found. Even some who had reversed the order in their answers to **Questions 1(b)** and **1(c)** were able to complete this in the correct order. Some did not but they were awarded the marks if they had continued their patterns correctly from the reversed **1(b)** and **1(c)**. There were very few mistakes in the totals column.

Answer:

Size of grid	Number of …						Total number of squares
	1 by 1	2 by 2	3 by 3	4 by 4	5 by 5	6 by 6	
1 by 1							1
2 by 2	4	1					
3 by 3	9		1				14
4 by 4	16	9	4	1			
5 by 5	25	16	9	4	1		55
6 by 6	36	25	16	9	4	1	91

(b) This question was difficult to answer if the candidate had reversed the numbers in the previous questions. Most candidates answered this correctly, with integers being the next most popular answer.

Answer: Squares

(c) Many candidates worked this out from the beginning by adding $1^2 + 2^2 + 3^2$ etc. or 1 + 4 + 9 although some did realise that they only needed to add 7^2 (49) and 8^2 (64) to the 91.

Answer; 204

(d) Candidates should know that the words 'Write down' infer that there is little or no working needed to get the answer. Many used the differences method to find the *n*th term with some making little mistakes which were unnecessary and cost them a mark. Those who did not have the table correct, however, could not write down the answer from their table and by this time they might have noticed that something had gone wrong.

Answer: $(n - 1)^2$

Question 3

(a) This question caused a lot of problems for many candidates. Some had no idea where to start. Those who realised that they needed to substitute values often chose large numbers when they could have made things easier for themselves by choosing, for example, $T = 1$ and $T = 4$. Some could not handle the fractions competently even though they had a calculator to do the working out. Many reverted to decimals, often as soon as they could, and even when the rest of the working out was correct they ended up with rounded decimals that did not fit in this case. Many candidates made this into a much more difficult problem than it really was and candidates should be made aware that although this is easy to do, with a little thought it is also easy to avoid making extra work for themselves.

Answer: $c = \frac{1}{6}$, $d = 0$

(b) Even students with, for example, c = 0.6667, were unable to make a total of exactly 385 because they did not treat it as a recurring decimal. Candidates should be aware of the real meaning of recurring decimals like this one and how to calculate accurately with them.

Answer: $T = \frac{1}{3}\times 10^3 + \frac{1}{2}\times 10^2 + \frac{1}{6}\times 10\ [+0]$ leading to 385

(c) Many candidates achieved the correct answer here, probably by Trial and Improvement, which was fine, but without writing down any of their trials. Candidates should be shown that Trial and Improvement is a respectable method to use but that trials with subsequent improved trials should be shown.

Answer: 15

Question 4

It is important that candidates know the difference between an expression and an equation. The equation $T = n$ was allowed in this case but not $n = n$. Again it should have been clear to the candidates that 'Write an expression' meant that this answer could be found by observation and did not need to be calculated.

Answer: n

Question 5

(a) This question was well answered, being a straightforward counting question with an example preceding it. A noticeable number of candidates, however, probably did not follow the example through and, by giving an answer of 10, had presumably not counted one of the 2 by 2 squares, probably the one in the middle.

Answer: 11

(b) This table did not cause any problems to all those candidates who were familiar with linear sequences. Interestingly many of the candidates did not simplify their last answer as they were not asked to do so. Small slips were unusual and it was more likely that a candidate could not complete most of the cells than that a single answer was wrong.

Answer:

2 by 1			
2 by 2	4	1	5
2 by 3	6	2	
2 by 4	8	3	11
2 by 5	10	4	14
2 by n	$2n$	$n - 1$	$3n - 1$

Question 6

This table seemed to cause a few more problems and even with the correct numerical values many did not manage to calculate the *n*th terms correctly.

Answer:

3 by 1				
3 by 2				
3 by 3		4		14
3 by 4		6	2	20
3 by 5		8	3	26
3 by n		$2n - 2$	$n - 2$	$6n - 4$

Question 7

Few candidates showed trials using 4 by n grids nor any method of checking. Some candidates did get the correct answer but did not show any evidence of how they had achieved it.

Answer: [n] < 3

Communication

The communication was not particularly good on this part of the paper. Most candidates showed their working for **Question 2(c)** but many went wrong in their attempt to substitute and solve two simultaneous equations in **Question 3(a)** and did not achieve the communication mark. Hardly any candidates showed working for **Questions 3(c)** or **7**.

Part B: Modelling

Question 1

(a) This was well answered with very few incorrect responses.

Answer: Cylinder

(b) Most candidates read the question correctly and perceived that ‘correct to the nearest centimetre’ inferred that an unrounded measurement for the length was required to show this. Some candidates did not realise this, or rounded too early. Some got into problems with the units and some of these managed to obtain the correct answer despite incorrect working. A mistake that was seen, but not very often, was to use the length of 153 cm and show that the capacity rounded from 1201.6 to 1200 litres. This was not what the question asked.

Answer: 152.7…

Question 2

(a) A practical reason was asked for. Candidates should be aware of what this kind of question is asking. Many candidates had the right idea but many stated that the ‘width’/’length’ was more than 100 cm as the reason.

Answer: Must be able to hold it

(b)(i) Despite the lack of space on the paper some candidates tried to do some quite complicated working-out for this question. Most of these did not manage to get the correct answer. More often the correct answer was just written on the answer line.

Answer: 50

(b)(ii) Even when they understood this concept, many candidates found it very difficult to explain, or else they went for brevity and did not give enough detail. A common answer was 'because it is a cylinder'. These candidates probably did not realise that if a cylinder is 'standing up' rather than on its side, like this one, that the quarter-way mark would be 300 litres. The question asked the candidates to explain this so it required more than one short phrase or a few words.

Answer: Cross-section narrows

Question 3

(a) When candidates chose the correct formula from the box on page 8 they were easily able to show the substitution stage which gave this answer. Others looked for two numbers that multiplied to make 1250 such as 25 × 50. Candidates must realise that answers will be based on information given and that it is often easier to re-read the question than to trial numbers in the hope of finding the correct answer.

Answer: $\frac{1}{2} \times 50 \times 50 \times \sin x$

(b) Some candidates did not know how to find the area of a sector of a circle and many who did went straight from the formula to the given answer without showing the intervening step of how the 21.8 was an approximate value. Many did not answer this question.

Answer: $\frac{x}{360} \times \pi \times 50^2$, $21.81x$ to $21.82x$

(c) This answer was simply a combination of the formula given at the beginning of question 3 completed by using the information given in **parts (a)** and **(b)**. Many candidates realised this and were able to gain this mark despite not being able to answer **parts (a)** and/or **(b)** correctly.

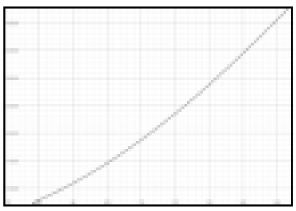
Answer: $21.8x - 1250\sin x$

(d) This question was usually left unanswered. It was dependent on the candidate having answered **part (c)** and of those who had, many were not confident enough with their answers to continue.

Answer: $153(21.8x - 1250\sin x)$

(e) The parameters of this sketch were given as the values on both axes. Most candidates started the graph around the (80, 80 000) point but most also made their graphs too steep so that the curve was drawn off the top of the axes well before x = 150. Straight lines were also produced although they were not very common. Even without a graphics calculator it would not have been difficult to calculate the y co-ordinates of the points where x is 80 and 150. Then, maybe with a point in the middle, a good guess of the sketch of the graph could have been drawn. Candidates should know how to get a sketch of a graph in this way even if it only as a check that what they have drawn is correct.

Answer:



(f)(i) This was a difficult question to answer without the graph drawn on a graphics calculator. Very many candidates did not answer this. Candidates should not only have a graphics calculator but should know how to use it to trace points etc.

Answer: 132 to 132.2

(f)(ii) This question was rarely attempted. Candidates did not appear to see a way forward; not even a first step. Of those few who tried it, most of them were correct. Many just wrote a number on the answer line.

Answer: 29.6 to 29.75

(g) Candidates did not see the significance of 'write down' and did not understand the link between **parts (f)(ii)** and **(g)**. Of those who wrote numbers on the answer lines hardly any wrote an answer here of 100 minus their value of *d*.

Answer: 70.2 to 70.3

Question 4

This question was very rarely attempted and there were very few instances of any work being done e.g. a line on the sketch at v = 100 000 or a value of 87 for x, (read from the graph on the calculator). Candidates should always be prepared to look back to previous work and diagrams to gain the inspiration to solve a current problem.

Answer: 13.7

Communication

Communication marks were rarely achieved. The candidates did not draw lines on their sketch for either **Question 3(f)(i)** or **Question 4** to show how they could obtain the values needed. **Question 3(f)(ii)** was also rarely attempted so a further line of working was not seen.

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/62
Paper 62 (Extended)

Key Messages

More work could still be done on how to answer 'Show that …' and 'Explain' questions, although these were not too poorly answered on this paper. Another key topic is that of rounding in different situations: For example, how to round when working in units of money, the ability to round 19.9993 correctly, either to 3 or 4 significant figures, and in a modelling situation or scenario, when it is necessary to round up (even from 24.04 to 25) and when decimals should not be used.

General Comments

The majority of candidates seemed well prepared in approaching both investigation and modelling questions. They showed workings in many places and mostly showed quite good use of a graphics calculator.

Comments on Specific Questions

Part A: Investigation

Question 1

(a) This question was well answered. There were very few mistakes and the letters for each of the three rectangles were allowed to be in any order.

Answer: *PQDC* *ABDC* *CDRS*

(b)(c) These questions were well done. Counting systems were sometimes missing or muddled but usually correct.

Answers: **(a)** 10 **(b)** 15

(d) The numbers in the table were quite easy to complete especially if the answers to **parts (b)** and **(c)** had been correct. The candidates who went wrong, usually based on incorrect answers to **parts (b)** and/or **(c),** still created a pattern within their numbers, just not the correct pattern. When these candidates realised that 36 did not fit into their pattern they should have tried to find out where they had gone wrong and, if possible, rectified their answers. It might help candidates to be shown how to do this.

Answer:

0	1	2	3	4	5	6	7
1			10	15	21	28	

(e) Very few candidates knew the name of this sequence.

Answer: Triangle numbers

(f) This was usually correct based on correct numbers in the table in **part (d).** 55, the ninth term, was a common wrong answer.

Answer: 66

Question 2

Most candidates wrote the same entries in this table as they had in **part 1(d)**. Those with the wrong pattern either did not notice their mistake when writing in the 36 or did not think to try to amend it. Very few changed the 36 to fit their pattern.

Answer:

0	1	2	3	4	5	6	7
1		6	10	15	21	28	36

Question 3

(a) Some good candidates who knew the triangular number sequence were able to write this down from memory. Most of the others recognised and knew how to work on the practised procedure of creating and solving simultaneous equations. For many, however, this meant lengthy working out when they did not use the first value of $n = 0$, which gave them $c = 1$ straight away. Candidates still need to do more work on solving equations with three unknowns and to learn not to make assumptions. A common incorrect answer was $a = \frac{1}{2}$, $b = \frac{1}{2}$ and $c = 0$.

Answer: $a = \frac{1}{2}$, $b = \frac{3}{2}$, $c = 1$

(b) This question was answered well especially by those candidates who had correctly answered the previous question. Quite often an incorrect answer in **part (a)** was still followed through by correct factorising into the form requested in **part (b),** which included cases of $(n + 0)$ instead of n, which showed a very good understanding of factorising quadratics.

Answer: $\frac{1}{2}(n + 2)(n + 1)$

Question 4

(a)(b) Back to counting again for many candidates, which, helped by the drawing and 'tallying' evidenced, meant that they reached both correct answers. The better candidates probably read more carefully the explanation at the start of the question and used their understanding of this, as shown by their correct answers and multiplication sums, to find the answers much more quickly.

Answers: **(a)** 9 **(b)** 60

(c) Good candidates, who had used the multiplication explained at the beginning of the question to answer **parts (a)** and **(b)**, were able to write down the correct answer straight away. Some ignored the instruction 'Do not simplify …' and often made mistakes, but their first statement was marked. Candidates who did not see the link with the previous work found it difficult to get a correct answer.

Answer: $\frac{1}{2}(n+2)(n+1) \times \frac{1}{2}(m+2)(m+1)$

Question 5

For this stage in the paper there were many good candidates who made excellent attempts at this last question. Following their correct answers to **Question 4**, candidates were able to replace *m* by *n* and produce a pair of quadratics to solve. This was not the only possible method although sketching was not seen and Trial and Improvement and extending sequences were not always completed successfully. The loss of a mark in all the methods was often the result of this being a 'Show that …' question, because many candidates reached a root with 76 and said that this was non-integer but did not show this by evaluation. More work on what is necessary to complete a 'Show that' question successfully would always be useful.

Answer: $\left(\frac{1}{2}(n+2)(n+1)\right)^2$

Valid working to the point where 76 gives a non-integer solution and 78 gives an integer solution.

Communication

The candidates communicated well on this paper and showed at least three examples of their working which earned them the communication mark. The most commonly seen examples were in **Questions 1(b), (c), (d)** and **(f)**.

Part B: Modelling

Question 1

A well answered question. Candidates had no problems in understanding the scenario and the mathematics involved in this question.

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

Answer: 30

(b) Several different approaches led to several different ways of writing this model, almost all correctly. If omitted, the '$A =$' was not required at this early stage of the paper.

Answer: $A = 5n + 5$

(c) Candidates substituted correctly into their chosen form of the model. There were some candidates who 'worked backwards' and substituted 105 into their model and reached an answer of $n = 20$. This was acceptable for this question.

Answer: $5 \times 20 + 5$

Question 2

(a) Well answered. Almost all candidates found the correct answer by summing amounts.

Answer: 100

(b) (i) Again, candidates succeeded well here although a few used the answer to **Question 1(a)** instead of **part (a)** of this question.

Answer: 2.5

(ii) Almost all candidates correctly substituted values into the model and evaluated to find 1150.

Answer: $2.5 \times 20(20 + 3)$ leading to 1150

(c) Most candidates achieved the correct answer and there were several ways that this was achieved. There were many correct substitutions and working on the quadratic. Use of the quadratic formula was not always seen although the correct answer did result. Trial and Improvement was also seen quite often, either as a method for the complete question or as a method for solving the quadratic. Few sketches were seen as the means of a solution.

Answer: 39

Question 3

Repeated interest calculations usually gave the correct answer although this working was not without errors in several cases. Many candidates recognised the link to the compound interest formula and used it straight away, but some candidates misused it and found the answer for his sixth birthday, forgetting to use $n - 1$ as the power for 1.1. Although 14.641 was accepted in this case, 14.60 and 14.6 were not. Candidates should be advised that accurate answers are needed and that rounding to 3 significant figures in money is not correct.

Answer: 14.64

Question 4

(a) Candidates do not usually do well on 'Explain' questions but this time there were many who achieved full marks. Of those who did not, most used the language of the compound interest formula and did not put their explanation into the context of the model. So "$10 is the base and 1.1 is the annual increase" scored zero but "10 is the amount given on his first birthday and 1.1 is $1 + 10\%$" scored full marks.

Answer: 10 is the first amount
1.1 is 110%

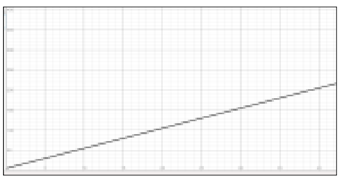
(b) This question was usually well done. A few candidates did not use the correct index and so miscalculated for 20 years. Some rounded to 61.2 so either missing or misunderstanding the requirement for 'correct to the nearest cent'.

Answer: 61.16

Question 5

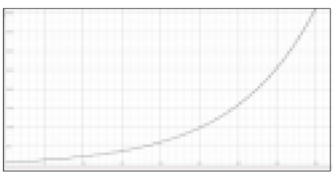
(a) (i) Most candidates managed to draw a line although maybe not with a ruler. Some candidates mistakenly started their line at 0 but many more ignored the value of 40 on the n axis and drew a steep line which did not match the given scale.

Answer:



(ii) This curve was also quite well sketched although some of them, like the line, started from 0, and others dipped before they rose. Again, the value of 40 on the n axis was often ignored and the curve rose too steeply.

Answer:



(b) Even candidates with graphs that rose too steeply or started at zero managed to obtain the correct answer here. Probably their sketches were not accurately copied from their calculators. Candidates did know, however, that they needed to find the value of n at the intersection of the line and the curve and most used their calculators correctly to find this value and then to round it up to the nearest whole number.

Answer: 30

(c) This question was not particularly well answered. Many candidates referred to the interest rates or the amount given, both of which were incorrect answers. The best solutions showed a sketch of two labelled curves intersecting with Rosie's straight line and used this to explain the reasons. Other candidates found the intersection of A with Rosie's line as 24, with some noticing that this was 24.04 and rounding up to 25. Few of these candidates continued to find the intersection of B with the line to support their findings and to earn full marks.

Answer: A, with 25 (or 24.04) and 27 (or 26.7) or with a sketch showing two labelled curves and a straight line crossing A before B.

Question 6

(a) This question was well answered but with a common error being to omit the '$A =$'. This was not acceptable at this stage of the paper and these candidates lost a mark. Candidates should know that a model, like a formula and an equation, needs both a subject as well as an object.

Answer: $A = d \times 1.1^{n \times 1}$

(b) Most candidates reached this point and many correct answers were seen. Some candidates gave the answer as 19.99 which would not result in \$148 as the question stated, so these candidates lost the mark.

Answer: 20

Communication

Most candidates showed evidence of communication throughout the paper. The most common questions were **2(a)**, **4(b)** and **6(b)**.

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/63
Paper 63 (Extended)

Key Messages

As always it is important to go back during an investigation and check that a new answer cannot be used to complete or change a past answer. Candidates showed recovery, especially in the middle of the investigation and it would have been to their advantage to then go back over their previous answers and make some changes using this new-found knowledge.

General Comments

These answer papers showed good use of a graphics calculator by many candidates, especially in the modelling section. Generally, the questions were well answered and most candidates attempted almost all the questions showing good evidence of exam preparation and technique.

Comments on Specific Questions

Part A: Investigation

Question 1

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

Answer: 10

(b) Again this second answer was easily obtained by counting the triangles.

Answer: 36

(c) By comparing the diagrams and answers for **parts (a)** and **(b)** most of the candidates were able to deduce the correct formula for finding the area of a parallelogram on a triangular grid. At this stage those who omitted to write 'A =' were still awarded the mark.

Answer: [A =] $2rs$

(d) This question was answered correctly, presumably by counting the triangles, as the example implied.

Answer: 16

(e) Just a few incorrect answers here when candidates did not see the connection when the 2-triangle-sided triangle had an area of 4 and the 4-triangle-sided triangle had an area of 16. Most candidates knew to write this as squared although $x \cdot x$ was accepted for the mark. Again a missing A = was allowed.

Answer: [A =] x^2

(f) Many candidates drew a triangle and used the formula to calculate the area of their triangle but they did not link the two parts: In other words they did not show, by counting or similar method, that the formula gave the same answer for the number of triangles as on the drawing. Candidates may need to be shown that it takes more than just evaluating a formula to actually show that it works for the equivalent practical situation.

Answer: Diagram [+ area stated] + reference to $A = x^2$

Question 2

(a) Excellently answered. It was rare to find any incorrect answers in this table.

Answer:

B			4
C		5	3
D		7	
E	0	9	7
F			

(b) Most candidates did well on this 'Show that' and better than they had done on **Question 1(f)**. Candidates need to be reminded that they must always answer questions that ask for a 'Yes' or 'No' answer, because some did not do so. A few others did not follow through their substitutions to obtain an answer for *A* and so had not used the numbers properly to support their answer as requested.

Answer: No, supported by one correct calculated substitution.

(c) By looking for a pattern between the numbers in the table most of the candidates were able to write down the formula for *A* in terms of *P*. Some candidates forgot to write it in the form of a formula, i.e. with 'A =', and this cost them a mark at this stage.

Answer: $A = P - 2$

(d) This was the first question on the paper that really caused any difficulties for some candidates. Despite this it was still well answered and rarely left blank with no answer. Candidates who had lost the mark for forgetting the 'A =' in **part (c)** were not penalised again here.

Answer: $A = P + 2R - 2$

(e) Again, very little misunderstanding here and a well answered question with only arithmetical slips being the cause of lost marks.

Answer: Values for *R* and *P* which satisfy their formula in **part (e)**

Question 3

(a) Names and properties of shapes were well known. Very few candidates did not know what shape a hexagon is and a very small number indeed did not draw a regular shape.

Answer: True and drawing of a regular hexagon

(b) This part was also well answered with most candidates choosing a point with positive x and positive y co-ordinates rotated to negative x and y co-ordinates. Very few candidates supported their example by using the co-ordinates of the points.

Answer: True and two points plotted to show statement is true.

(c) Some candidates faltered at this stage and reflected in the x-axis instead of the y-axis. The main error, however, was to not take into account the fact that the axes are not at right angles to each other. This meant that, for example, (2, 1) was drawn at (−2, 1) for the reflection instead of (−2, 3),.

Answer: False, and two points plotted to show the statement is false.

(d) This last question was better answered than **part (c)** and here many candidates used co-ordinates to try to help them support their answer. The arithmetic of the co-ordinates did not always show the same answer as their illustration but good attempts were usually made.

Answer: True. Two points plotted to show statement is true.

Communication

The communication mark relied on co-ordinates being used to support answers in one of the last three parts of **Question 3**. This was usually seen in **part (d)**, so the majority of candidates achieved this mark.

Part B: Modelling

Question 1

(a) Most candidates showed the value of dividing 58.37 by 20 to the full four decimal places to gain the mark. Some did truncate or round the number to three decimal places but these answers were still in range. It is advisable not to round or truncate before reaching the final answer.

(b)(i) Most candidates realised that they needed to double H and then make a comparison between that and the highest wave of 5.20. It did not matter if the candidates chose the given rounded value or the un-rounded number that they had calculated in **part (a)**. Most comparisons said that this was not a good approximation because the $2H$ was too high. More than a few, however, did no more than the calculation, so candidates should be shown what is expected by the words 'Comment on' in a question.

Answer: Relevant comparison between 5.836 to 5.84 ($2H$) and 5.20

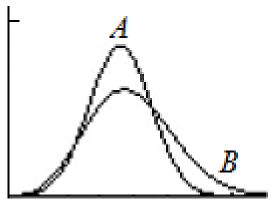
(ii) There was less understanding than in **part (i)** shown about this question although it was still answered well by the majority of candidates. Most multiplied H by 1.27. A few left it there. The rest found that 10% was 6, added the highest six waves and calculated the mean, mostly correctly. Like **part (i)** some candidates did no more than one or two of the calculations and did not add a comment about the accuracy.

Answer: Mean of 6 highest waves = 3.855 to 3.86. Relevant comparison with $1.27 \cdot 2.92 = 3.706$ to 3.71

Question 2

(a) The sketches of both models were good and most candidates managed to show the differences between them. Many lost a mark for not labelling the graphs in any way so that it was impossible to tell which was which.

Answer:



(b)/(c) These questions were well answered. Most candidates obviously had a good working knowledge of their graphics calculator, knowing how to obtain sketches within given ranges for x and y and for these questions how to trace the maximum points. It was rare for these questions to be unanswered even after mistakes or omissions in the sketches in **part (a)**. The incorrect answers usually gave the maximum frequency instead of the height of the wave.

Answers: **(b)** 1.8 **(c)** 1.86 to 1.862

(d) The majority of candidates choose the correct model and gave one good reason for its choice. Too many candidates just said that the data fitted better but did not give specific points for reasons. The two most obvious places were the maximum wave height and the continuation of the tail after 3 m.

Answer: B and two valid reasons

Question 3

(a)(i) Many candidates felt the need to include h in their equation and others used x or y instead. 'y =' was also quite common. The main lack of understanding was what the equation of a horizontal line should look like; where the candidates understood this they wrote the correct answer.

Answer: $s = 3.2$

(ii) Even some candidates with **part (i)** correct were unable to explain the connection between s and h for this question. Some candidates talked about correlation but rarely said there was no correlation implying they did not really understand the meaning of this word. There were, however, a good many candidates with correct answers and it was the weaker ones who faltered over the whole of **Question 3**.

Answer: Speed does not change with height

(b)(i) The quadratic model was very popular as a choice here. This and the correct answer accounted for most answers.

Answer: $s = a\sqrt{d} + c$

(ii) It should be well known by candidates that two unknowns (a and c here) means two equations are needed to be solved simultaneously. Many candidates only made one pair of substitutions and tried to find the values for a and c from one equation. Even when two equations were seen the work that followed was not particularly strong. More work on forming and solving simultaneous equations is recommended.

Answer: a = 2.99 to 3.24 c = −0.1 to 0.11

(c) Most students did not attempt this question. Of those that did, most managed to obtain a distance in metres by measuring, although this was very rarely correct. These candidates also went on to find a value for *s* and although some also managed to substitute this into their model, a correct answer was not found. This was mainly due to the incorrect distance, incorrect formula chosen and/or incorrect values for *a* and *c*.

Answer: 1.75 to 2.15

Communication

Most candidates achieved the communication mark by showing their calculations for *H* in **Question 1(a)**. The opportunities in **Questions 1(b)(ii)** and **3(c)** were not seen so often.