CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/12
Paper 12 (Core)

Key messages

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

General comments

Workings are vital in multi-step problems, such as **Questions 12**, **13**, **20**, **21**, and **22** as showing workings enables candidates to access method marks. Candidates must make sure that they do not make arithmetic errors especially in questions that are only worth one mark when any good work will not get credit if the answer is wrong, for example, **Questions 4** and **10**.

The questions that presented least challenge were **Questions 1**, **2(b)**, **5(a)**, **6** and **16**. Those that proved to be the most challenging were **Question 3** the second triangular number, **Question 20** probability without a tree diagram to help and **Question 22** problem solving that combined algebra and geometry. In general, virtually all candidates engaged with most of the questions as there were very few left blank. The exceptions that were occasionally left blank were **Questions 15**, **20** and **22**. The last two of these have already been mentioned as challenging.

Comments on specific questions

Question 1

This opening question was accessible to virtually all candidates.

Question 2

(a) Most candidates gave the correct answer. Occasionally acute or trapezium, the name of the quadrilateral, was given as the answer.

(b) Similarly here, candidates virtually all gave the correct answer of right angle. 90°was not acceptable as this is not the mathematical name for the angle.

Question 3

Many gave a wrong answer of 6 which is the third triangular number.

Question 4

Here, the answer is 9 and most of the wrong answers were either 8 or 10. There are various ways to work out the answer. Candidates could have worked out the function, f(x) = 2x – 1, then substituted x = 5 to get 9. A less formal approach is to look to the gaps, i.e. 8 to 12 is a gap of 4 and15 to 23 is 8 so as the gap between 3 and 5 is 2 then 4 must be added on to 5. This should be checked with at least one more pair to confirm the value of 9.

Question 5

(a) Nearly all candidates plotted the point correctly. A few plotted (4, 3) instead.

(b) Here, there were a choice of correct answers, (1, 0) or (3, 0). Some reversed the coordinates as with the previous part. A few did not appear to realise that the *y*-coordinate is zero so gave (1, 3) as their answer. Occasionally, the minimum value was given instead.

Question 6

Candidates did well here with only a few ignoring the brackets and so worked out $2 \times 3 + 4 = 10$.

Question 7

This question was handled well by many candidates. A small number ignored the indices so answered with 12. Candidates should know that if a question like this is on a non-calculator paper, then the cube roots (or square roots) will be of small numbers that they should know or easily calculate.

Question 8

Most answers were correct. There were a few candidates who did not recognise that the filled in circle is different to the open circle so repeated the given less than sign when it should have been less than or equal. A very small number gave a greater than or greater than or equal sign.

Question 9

(a) Very occasionally the wrong average was used as some calculated the mean instead of picking out the mode. There were a few answers of 1. This is the most common digit but not the most common score in the test.

(b) Here, the candidates had to place the scores in order of size, either from lowest to highest or the highest to lowest. There is no actual median score as there is an even number of scores so the median is mid-way between the fifth and sixth scores. Some candidates missed out one or more score – often one or two of the 11s or did not find the mid-point between 11 and 17 correctly.

Question 10

Any arithmetic errors here meant that a candidate was not awarded the single mark that this question was worth. Similarly, if a candidate correctly found the answer of 9, but then went on to add or subtract it from 45, this also did not get any credit. Candidates must read the question carefully to be certain of what they are being asked.

Question 11

Virtually all candidates gave the correct answer. There were those that either added an extra value (commonly 2) or missed out one of the correct values. A few did not understand the notation and so answered with 40 presumably from multiplying 10 and 4.

Question 12

This ratio problem can be done in stages, first find what one of the 7 parts is worth then multiple by 5. Many candidates got as far as the value of one part and then either stopped or went on to give the amount of the smaller share.

Question 13

This problem was to find the cost of a mobile phone bill which is made up of two parts given in different units, the daily charge was in dollars, but the cost of the call minutes was in cents. Another complication was that as some minutes are free just those over a certain amount had to be paid for. Some answers were not sensible in the context of phone bills for one week and were very high, for example, \$350, \$1000 or \$5000. Occasionally, candidates' workings were so scattered in the answer space that they would not be able to easily check their own work for errors or work through their own logic.

Question 14

(a) This was reasonably well done. The common misunderstanding was to give $\frac{2}{6}$ instead of only $\frac{1}{6}$. Candidates wrote the score required, 2, over the total number,6. On a fair 6-sided die, each face has the same probability of $\frac{1}{6}$.

(b) The next two parts were handled much more successfully by candidates.

(i) The frequencies in the table add to 70 so as Elora rolled the die 100 times that makes the frequency of a 6 as 30. Then the relative frequencies can be worked out by dividing each frequency by 100.

(ii) From the table, the largest frequency, or relative frequency, gives the number most likely to be rolled.

Question 15

In general, this was done well, but a relatively large number of candidates missed this out. Some combined the unlike terms into an incorrect answer of $32xxy$. Some gave a partial factorisation, for example $4x(6y + 2)$ but did not realise that there was a further factor of 2 left in the brackets. Some who factorised out the $8x$ were unsure of what remained for the second term in the bracket. For question like this, candidates must have a correct partial factorisation to score a mark – if there are any errors, for example, changing the sign to minus, then the candidate will score zero marks.

Question 16

Candidates did well here with only the occasional wrong answer of $2x^2$, showing that those candidates could not recall the rules for indices.

Question 17

As 5 and 7 are both prime numbers, their HCF is 1. Some multiplied the numbers to get 35, the lowest common multiple or even 70, the next common multiple.

Question 18

Here, there was no diagram to show the position of the given points. It is perfectly acceptable for candidates to sketch their own diagram to help them understand the situation. It is relatively easy to find the mid x-coordinate, halfway between 3 and 5, but as one y-coordinate is negative, the vertical distance between the points is 10 so half that added on the –2 (or taken off 8) is 3. The common partially incorrect answer of (4, 5) did get one mark for the correct x-coordinate. Some remembered the formula incorrectly as $\frac{x_1 - x_2}{2}$ when it should be addition. For these candidates, a diagram would have helped.

Question 19

Candidates were told that there are two rational numbers so should only answer with two numbers. As this is only worth one mark, both answers must be correct.

Question 20

This appeared to be the most difficult question on the paper for candidates. There is no tree diagram to help. Candidates had to work out the probability of Gill choosing a gold coin and because she replaced it, the probability remains the same for the second draw. This probability is then squared. Sometimes the probability was doubled. There was no need to work out the probability of picking a silver coin.

Question 21

This was the second most demanding question on the paper as well as the one missed out the most. Candidates did not realise that π cancelled out and tried to square root or square π. When π is cancelled on both sides of the equation what is left is $r^2 = 16$. The answer to this question is not $\pm$ 4 as –4 is not a length.

Question 22

This question combined algebra and geometry. Two sides of the triangle are x cm long and the third is $(x + 4)$ cm long. This means that the perimeter is $(3x + 4)$ cm. Many thought the third side was just 4 cm long so gave an answer of $2x + 4$. Although the answer is an expression, some went on to 'solve' it giving a number as their answer.

Question 23

Occasionally, candidates did not leave the answer in correct standard form as asked for in the question. Some wrote the numbers out in full, worked out the multiplication and tried to turn their answer back into standard form. This method has many places when slips can be made and is not recommended; candidates ideally should leave the numbers in standard form. This question is slightly harder than some that have been in past papers in that, here, both powers of 10 are negative. Candidates need to remember that the powers of 10 need to be added not multiplied.

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/22
Paper 22 (Extended)

Key messages

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

There appeared to be confusion for some candidates regarding the difference between stretch and enlargement.

In **Question 10(b)**, candidates had difficulties finding the similarity of areas when given similar volumes.

Candidates are expected to know that log10 = 1.

General comments

Candidates were well prepared for the paper and demonstrated excellent algebraic skills. However, some candidates lost marks through careless numerical slips. 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 showing a good understanding of cubic numbers. Some candidates gave a cubic number outside the given range. Candidates should be reminded to read the question carefully to ensure that they are answering the question asked. In this case, by giving a cube number outside the requested range they were unable to gain the mark.

Question 2

Most candidates answered this correctly although a number of candidates gave their answer as 0.00001.

Question 3

Virtually all candidates answered this question correctly.

Question 4

There were no problems with understanding the question but careless arithmetic occurred in a number of scripts.

Question 5

Most candidates dealt confidently with the fractions but there were some errors when candidates used 24 as the common denominator.

Question 6

This question proved a good source of marks for nearly all of the candidates.

Question 7

Errors were seen when candidates forgot to halve the sphere and mixed up the use of the radius squared or cubed. Candidates should try to show all working in a clear and organised way as this makes it easier for them to check their working and for partial credit to be awarded.

Question 8

Nearly all candidates scored this mark. A few candidates eliminated the negative power but did not evaluate the square index.

Question 9

Although there were many fully correct answers, a significant number of candidates only divided 170 by 30. Some candidates divided 170 by 30 and 70 by 30 and then added their two decimal answers leading to an answer of 7.99.

Candidates should be encouraged to work with exact fractions on this non-calculator paper.

Question 10

(a) The majority of candidates scored both marks. However, there were a significant number of candidates who correctly set up a ratio equation but then made a careless numerical slip.

(b) This part proved to be challenging.

The most common answer was 5400. Candidates were expected to realise that the information given related to volumes and that they needed to cube root the given values to find the ratio of lengths. This ratio then had to be squared to find the ratio of areas before multiplying by 1600.

Question 11

This question was straightforward for many candidates and solutions were well set out.

Question 12

(a) There were many correct answers for this part. The most common error was giving ‘stretch’ as the transformation.

(b) This part proved to be more challenging. Some candidates gave fully correct solutions. The two main errors were candidates who drew a stretch but with the wrong invariant line and candidates who drew an enlargement.

Question 13

This question was correctly answered by nearly all candidates.

Question 14

This question tested candidates understanding of standard form. Candidates realised that they had to evaluate 3.2 divided by 4, giving 0.8 but many gave this as their final answer to **part (a)** instead of 8.

The mark in **part (b)** was a follow through based on their **part (a)** answer and as such, an answer of $2p + 2$ after an answer of 0.8 scored this mark.

Question 15

Many candidates scored full marks. There were a surprising number of candidates who correctly factorised using the difference of two squares, correctly cancelled a factor, but then gave their final answer as $x + 4$, rather than the correct answer of $\frac{1}{x+4}$.

Question 16

Candidates found this question demanding. There were different methods that would lead to the correct answers.

Some candidates used the formula to solve the equation. This gave the answer of $g = -1$ immediately. However, many candidates were then unable to correctly find the value for h.

Other candidates used the two given answers as factors, expanded, and then equated coefficients to find the values for g and h.

Some candidates just substituted one of the solutions in the given equation, leading to an equation in two unknowns that they were unable to solve.

Question 17

Most candidates were able to score full marks on this question. The common mistakes were careless numerical slips.

Question 18

The majority of candidates scored 2 marks in this question. Virtually all candidates were able to use the rules of logs to simplify the terms, leading to the expression log10.

It is expected that candidates know that log10 has an exact value.

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/32
Paper 32 (Core)

Key messages

Candidates should be encouraged to show all their working out so that they can be awarded method marks if their answer is incorrect. Many marks were lost because working out was not written down. Marks were also lost when the candidates did not write their answers correct to 3 significant figures (unless otherwise specified in the question). In order to be able to answer all the questions, the candidates must have a graphic display calculator and know how to use It. Candidates should be familiar with correct mathematical terminology. Teachers should ensure that they cover the full syllabus with their candidates.

General comments

Most candidates attempted all the questions so it appeared as if they had sufficient time to complete the paper. There was also a wide range of marks that indicated that the questions were at the correct standard for Core candidates.

Candidates should be careful when writing their answers. If no specific accuracy is asked for in the question, then all answers should be given exactly or to 3 significant figures. Giving answers to fewer significant figures will result in a loss of marks and, if no working out is seen, no marks will be awarded. When working out is shown and is correct then partial marks can be awarded. Candidates also need to read the questions carefully and answer what is asked in the question.

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

Comments on specific questions

Question 1

(a) The majority of candidates knew how many centimetres were in a metre and only a few divided by 100 instead of multiplying.

(b) Few candidates wrote the correct time in minutes and seconds. A good number of candidates were awarded 1 mark for finding the correct total of 179 seconds.

(c) Approximately half of the candidates found the correct average speed. The most common mistake was dividing 200 by 3.2.

Question 2

(a) (i) All candidates managed to draw the two patterns correctly.

(ii) Most candidates found the correct number of squares for patterns 2, 3, 4 and 5 but a few did not find the correct number of squares for pattern 8.

(b) (i) Most candidates knew that the rule was +4. A few candidates wrote $n + 4$ which was not accepted.

(ii) Quite a few candidates managed to find the correct nth term for the sequence.

(c) (i) All candidates worked out the correct value for T.

(ii) Many candidates managed to rearrange the formula correctly. The most common error was $\sqrt{T-5}$ or $\frac{T+5}{n}$.

Question 3

(a) (i) About half of the candidates correctly found how much the temperature had risen. A few wrote –70 and some others wrote –14.

(ii) Quite a lot of candidates had trouble finding the temperature that was half-way between –42 and 28.

(b) Finding the length of time that the experiment lasted was not well answered. The most common error was 8 hours and 35 minutes.

(c) Most candidates gave the correct answer to the nearest 10.

(d) (i) Nearly all candidates wrote the number correctly in words.

(ii) Few candidates wrote the answer in standard form correct to 2 significant figures. Many candidates were awarded one mark for writing 16 000 or $1.5[503]\times10^4$.

(e) Nearly all the candidates were awarded one mark for putting 18 in the correct place. Few candidates completed the Venn diagram correctly.

Question 4

(a) Most candidates worked out the number of students correctly.

(b) The majority of candidates also answered this part correctly. The most common wrong answer was 2 magazines.

(c) Many candidates gave the correct fraction reduced to its simplest form.

(d) The mean number of magazines was not well answered. Many candidates just added the frequencies and divided the total by 5.

(e) Nearly all candidates gained full marks for the bar graph. Those who did not had drawn the heights of 7 and 3 incorrectly.

Question 5

(a) A good number of candidates found the correct area with the correct units. Some picked up one or two marks for having one of the areas correct and/or the units correct.

(b) Few candidates found the correct value of the perimeter. The most common error was to add (7 + 5 + 7 + 5) + (4 + 12 + 4 + 12) + (7 + 6 + 7 + 6).

Question 6

(a) Many candidates were awarded one mark for finding the number of boys. Many fully correct answers were seen for the ratio but some candidates lost a mark for not reducing the ratio to its simplest form.

(b) Many candidates managed to find the correct number in this part. Others picked up marks for correctly working out $\frac{2}{3}$ of the 540 girls and/or 45% of the boys.

Question 7

(a) The majority of candidates found the correct value of *x*.

(b) Most candidates found the correct value for *p* and *q*. A common wrong answer for *r* was 50°.

(c) All candidates found the correct value for *y*.

(d) Only a few candidates found the correct value for *e*. Some candidates picked up marks for finding the interior or exterior angle of an octagon and/or a hexagon. One mark was awarded if the candidate knew that they were dealing with shapes with 8 and 6 sides but made mistakes after that.

Question 8

(a) Most candidates plotted all four points correctly. Some candidates were not very careful plotting the points and lost one or both marks due to inaccuracy.

(b) Nearly all candidates knew that it was a positive correlation.

(c) Many candidates found the correct mean. Quite a number of candidates divided their totals by 10 instead of 8 and so lost the marks.

(d) A good attempt was made to draw a line of best fit. Not all lines passed through the mean and not all were in the correct tolerance but most candidates were awarded at least one mark.

(e) Here too, the majority of candidates used their line correctly to estimate the score.

Question 9

(a) Most candidates knew that the transformation was a reflection but some mistakenly wrote the *y*-axis or $x = 0$.

(b) Most were awarded one mark for knowing that it was a translation. Not all candidates managed to write down the correct vector though.

(c) Only about half of the candidates drew *P* in the correct place. Some candidates were awarded one mark if *P* was the correct shape but in the wrong place.

(d) Quite a lot of candidates drew *Q* correctly. Here too, some candidates were awarded one mark if *Q* was the correct shape but in the wrong place.

Question 10

(a) (i) All candidates found the correct value for *x*.

(ii) In this part too, nearly all the candidates found the correct value for *x*.

(iii) The correct answer was seen in many scripts. The most common error was to multiply the 9 by 5 but not the 1.

(b) Most candidates managed to multiply out the brackets correctly.

Question 11

(a) Trigonometry was rarely used to find the value for *x*. Some of the candidates who did use trigonometry either used tan or sine or forgot to half the 96 cm. Only a few correct answers were seen for this part.

(b) A few more correct answers were seen in this part – using similar triangles to find the length of *DB*.

(c) Some correct answers were seen for the height. The most common error was to add 75^2 to 48^2 (or 96^2).

Question 12

(a) Many candidates found the correct coordinates for point *A*.

(b) Fewer found the correct coordinates for point *B*. The most common errors were (2, 0) and (0, –9).

(c) Many candidates found the correct coordinates for the minimum.

(d) The majority of candidates managed to draw a straight line with a positive gradient passing through the positive *y*-axis.

(e) Quite a good number of candidates managed to find both intersection points correctly and gave answers to 3 significant figures. Only a few missed out the negative sign in front of 4.85.

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/42
Paper 42 (Extended)

Key messages

Candidates should be reminded to show their working in order to gain method marks.

The general instruction is that answers should be given correct to three significant figures unless the answer is exact or the questions states otherwise. A few candidates lost marks through giving answers too inaccurately.

When asked to show that something is true, it is important to include every step of the working and not jump to later stages.

Almost all candidates were familiar with the use of the graphics display calculator for curve sketching questions, but many did not use them for statistical questions and/or for solving equations.

General comments

The paper proved accessible to almost all the candidates with few candidates scoring very low marks and omission rates were extremely low. There were scores across the entire range, but very low scores were comparatively rare.

There was much very impressive work from a significant number of candidates.

Whilst most candidates displayed knowledge of the use of a graphics display calculator, some are still plotting points when a sketch graph is required.

There was some impressive work from many candidates showing strength in dealing with higher algebra and logarithms.

Most candidates showed all their working and set it out clearly. Answers without working were, in general, very rare. However, some candidates work on a few questions was a jumble of figures which made the award of part marks difficult. Time did not appear to be a problem for candidates as almost all finished the paper.

Comments on specific questions

Question 1

(a) This question was answered well by most candidates. Some errors were made in transforming the given equation to y = $-\frac{3}{4}x + 6$. A fairly common error was to go from $y = \frac{24-3x}{4}$ to $y = 6 - 3x$.

(b) (i) Most candidates were able to find the gradient and the *y*-intercept. A few did not follow this through to the given equation. Some candidates merely substituted the given coordinates into the equation. This was not regarded as satisfactorily showing the equation.

(ii) This was usually correct. The most common mistake here was to give the gradient as –2, perhaps with the perpendicular in mind.

Question 2

(a) This was almost always correct.

(b) This was also almost always correct.

(c) This was done well. The most common mistake was to equate the expression for interest to 612.5 instead of 112.5. There was a small minority of candidates who tried to use compound interest.

(d) (i) Most candidates were able to use the compound interest formula correctly and gave a correct solution. The most common mistake was to give the answer from correct working but not, as required, to the nearest dollar.

(ii) A large number of candidates showed well set out and organised working to arrive at the correct solution rounded up to 24 as required. Many of these used logarithmic methods with great success. There are still some candidates who decide to use a trial and error method, but these also were usually successful. There were some weaker candidates who were unable to make any progress in this part.

(e) Most candidates were able to write down the initial equation in *r*. Most of them then used a correct strategy to solve for *r* but then some of these lost a mark unnecessarily because of unacceptable rounding. Some candidates made errors in solving, often taking the tenth root at the wrong stage.

Question 3

(a) Although this part was answered quite well, the median caused a problem for many candidates. 5 was a very common wrong answer. It was expected that the candidates would enter the data in their graphical display calculator and read off the answers, but it appeared that most did not do this.

(b) This was done very well by most candidates but there remain a few who could not use the mid-interval values correctly. A few used the width of the interval instead of the mid-point and some gave the wrong mid-interval value.

(c) There were a good proportion of correct responses from high and middle ability candidates, showing well organised and detailed working. Of those who did make a mistake, most were able to find an expression for the mean but were unable to deal successfully with the solution of the equation.

Question 4

(a) This part was very well done.

(b) As expected, this proved more difficult but nevertheless there were a fair number of fully correct answers. Almost all reached some of the correct answers with *w* and *x* proving the most difficult angles to find.

Question 5

(a) (i) Most candidates could expand the brackets, but a significant number subsequently spoilt their answer.

(ii) Only stronger candidates were successful here. –4 was a very common incorrect answer.

(iii) The vast majority of candidates gave the correct answer but only a very small number obeyed the instruction to use their answer to **part (ii)**. Usually solutions were from the formula, factorisation or use of their GDC.

(b) (i) This part was answered much more successfully with the great majority of candidates able to deal successfully with the inverse variation involving a square root. Just a few used the wrong variation, for example, direct proportion or square instead of square root.

(ii) Most, who used the correct variation, were also successful here.

(iii) There was a lot of good algebra seen in this part. It was only the weakest candidates who were unable to make any progress at all.

Question 6

(a) Most candidates were able to obtain the given equation and, with work clearly set out, reached the required expression. The most common error was to subtract 84 from the incorrect area and this usually led to some creative algebra to reach the answer.

There were some weaker candidates who were unable to obtain any expression for the difference in areas of the rectangles.

(b) Most candidates were successful in their factorisation. Of those who made mistakes, the most common error was the use of incorrect signs.

(c) Almost all candidates, who were successful in **part (b)**, were able to go on to solve the equation and find the area of the smaller rectangle. It was fairly common, however, to see the area given in terms of x.

Question 7

(a) Most candidates gave good sketches, but a number gave straight lines or wrong curvature for the outside branches. A few candidates answered this part by plotting points rather than using a graphical calculator.

(b) Those with good sketches usually produced the correct answers here. Just a few gave coordinates rather than just the x values and some gave the y-intercept.

(c) The great majority of candidates found the local maximum correctly.

(d) Most gave one of the possible correct values.

(e) (i) Most candidates drew the straight line correctly. The most common error was not having the line pass through the origin.

(ii) Most candidates with the correct sketches gave both answers to the required degree of accuracy. The most common errors were, only giving one solution and/or not giving the answers accurately enough.

(iii) Only a small number of candidates correctly showed both regions and another small number gave one of the regions, but the majority of candidates gave shading on all parts of the graph. There were some candidates who gave different types of shading with a hint of a valid region but no key or indication as to which was showing the candidate's answer.

Question 8

(a) (i) Very few candidates made errors in this question.

(ii) This question also was almost always correct.

(b) This was well answered although a few made sign errors in rearranging the equation.

(c) This was also well answered with a very small number multiplying the functions instead of finding the composite function.

(d) Most candidates were also able to give the correct answer here but there were more errors, the most common of which resulted from making a sign error.

(e) As was to be expected this part proved more difficult. Most candidates could reach $\log(x + 1) = 2$, but many could not make further correct progress.

(f) Here to, many candidates could make the initial step of swapping the x and y variables but only the better candidates could go on to make y the subject.

Question 9

(a) This was well answered with just a very few using the wrong trigonometric function and a few used inappropriate rounding.

(b) (i) Most were able to use the cosine rule correctly to obtain the correct answer. Again, inappropriate rounding was seen. A few candidates started the cosine rule with $10^2 =$ or $9^2 =$, thus finding the wrong angle. A few also rearranged the cosine rule incorrectly.

(ii) Almost all realised that CT was perpendicular to AB and most proceeded to the correct answer. However, a significant number found CT instead of BT.

(c) This proved to be much more difficult and only the best candidates were able to give the correct solution. Most could use the sine rule correctly to reach the acute angle 79.5. However very few realised that the other possible angle was the supplementary obtuse angle. No candidates gave a diagram to illustrate the two possible answers, which would have helped them to visualise the situation. Many thought the other possibility was one of the other angles of the triangle.

Question 10

(a) Almost all candidates were able to place the probabilities in the correct place on the tree diagram.

(b) (i) This was also very well answered.

(ii) Most reached the correct answer, but a number simply multiplied $\frac{7}{10}$ by $\frac{9}{10}$.

(c) (i) This part proved more difficult. The required probability was sometimes seen but was not given as the final answer. Other candidates did not give the correct answer here but did show it on the tree diagram indicating that they had some insight to the question but were unable to clearly understand what was being asked of them.

(ii) As stated above this proved very difficult. Better candidates were able to place the first two probabilities correctly, but only the very best could place the remaining four.

Question 11

(a) All put the weakest candidates were able to make a good attempt at this part. The most common error was to use a formula for area rather than for arc length.

(b) (i) Although this was fairly well done, a number did not put sufficient detail in their proof. If the question says, ‘Show that’, candidates should show each step of the working rather than jumping to later stages.

(ii) This part was extremely well answered.

(iii) Most candidates gave a satisfactory curve, but some did not show the straight line intersecting it. A number of candidates plotted points rather than using the graphic display calculator. The numerical answer was usually correct.

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/52
Paper 52 (Core)

Key messages

Candidates should read the questions carefully and take the time to find the most direct route rather than rushing ahead with their first thoughts. In investigations, candidates should always be looking for patterns, not only to find answers but also to check if their answers are correct. They also need the knowledge to find the *n*th term for sequences algebraically to support their thinking. All diagrams should be carefully drawn whether a demand of the question or part of the candidate's communication.

General comments

Candidates showed a good overall ability to follow sequences and spot patterns. In this investigation there was only a little demand for finding the *n*th term of sequences, but many candidates still needed more practice in order to do this confidently. There are still some candidates who lose marks because they do not always communicate all of their working-out.

Comments on specific questions

Question 1

(a) This was completed successfully.

(b) Candidates noticed the pattern and correctly completed the table.

(c) Candidates wrote down the correct answer.

(d) Candidates need to know the difference between an expression and an equation, and ensure they give the correct one. This question asked for the answer as an expression.

(e) The majority of candidates showed how they reached their answer. The calculation was straightforward and the two marks that could be awarded should have indicated to the candidate that there was a communication mark here.

Question 2

(a) Most candidates took the hint 'You may use the grid to help you' and drew pattern 4 correctly on the grid: For this they were awarded the communication mark. They also completed the table correctly.

(b) This was a linear expression that could quite easily be found from the number of dots in the table. It would be useful if more emphasis was given to finding, and correctly using, the common difference between the numbers in a sequence.

(c) Communication was given for showing the substitution of $n = 40$ in their expression and a follow through mark for the correct answer if their expression was of the form $4n + k$. Several candidates picked up a mark here through writing down their working and some for using their incorrect expression which was in the right form.

Question 3

(a) (i) This was completed successfully by most candidates. Care in drawing is essential as there were some missing/extra dots or dots in incorrect places.

(ii) Many candidates were successful. It was not clear if they counted the dots or extended the sequence. Some poor drawing led to incorrect answers, as did trying to follow the sequence of only three numbers meaning only two differences were given. A minimum of three differences is expected to be required to follow a pattern.

(iii) The implication here was to extend the pattern that was now in the table by one more number of dots. The successful candidates worked out that they needed to add 20, and with the hint again of 2 marks, they wrote this down and gained the communication mark as well.

(b) (i) Most answers were complete; just a few had missed some dots or had not drawn the lines.

(ii) Candidates had drawn pattern 5 on the grid and there was space to draw pattern 6 as well. Careful drawing and counting led to correct answers in this table, with only row 6 to calculate by following the patterns. The last column was for the total number of dots and crosses and could have been used to check all answers were correct.

(iii) By following the patterns in both the previous table and the first three rows of this table candidates were able to complete the remaining three rows successfully. Again, the last column could have been used as a check. Finding another way to calculate answers so that results can be verified should be encouraged.

(iv) The formula could have been written down by looking at a row and using the pattern number and the totals column. Candidates should be encouraged to look for both numeric and algebraic patterns which often lead to straightforward ways of finding expressions and formulae.

Question 4

(a) A grid was not provided for this question although there was space to draw patterns. This lack of grid implied that now the best way to complete this table was to find and use the differences in each column. Some candidates did draw pattern 5 around pattern 4 successfully which earned them the communication mark, which could also have been earned by showing (at least 3) differences of 4 in the 'Number of dots' column.

(b) Most candidates followed the patterns given to them in the first four rows and were able to answer this question successfully. Both the totals column and finding differences could have been used as checks on the pattern spotting.

(c) (i) Reading the question carefully here might have saved some candidates some time. It was only necessary to extend the number of crosses pattern from row 6 and not the sequences in all three columns. Similarly, a little trial and improvement soon gave the answer to many and also, very quickly, to those who noticed a good first step would be to divide 112 by 4.

(ii) A variety of methods were used including extending the totals sequence to the 9th row, extending the dots sequence and adding it to 112, and even substitution into the formula derived in **Question 3(b)(iv)**. Candidates should be reminded that no matter how simple the method they choose they should always communicate every step that they take.

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 0607/62
Paper 62 (Extended)

Key messages

Candidates can use the graphing feature of their calculator to solve any equation in one variable. A relevant sketch gains communication marks in such cases.

While using a graphic display calculator to sketch functions candidates should look carefully at any scale given on the axes and try as much as possible to copy their screen accurately, particularly the key features of intercepts and turning points.

A general algebraic result cannot be shown by numerical examples.

Some candidates spent longer than necessary on the investigation and so had difficulty finishing the modelling.

General comments

There was much proficient algebraic work seen, whether with sets of linear equations or solving quadratic equations. Candidates gave the impression of having been well-prepared for this paper and most showed detailed working as required.

The large majority of candidates showed good understanding of modelling, especially the fact that a model of given data will not provide a perfect match. Candidates were very good at rounding to one decimal place to match the form of the data given.

Comments on specific questions

Section A – Investigation: Sequence of centred polygons

Question 1

(a) (i) Nearly all candidates completed the pattern correctly and completely. A few candidates omitted some dots or lines.

(ii) Very few incorrect answers were seen for continuing the sequence of the numbers of dots. A very small number of candidates thought it was a linear sequence with repeated differences of 4 and 8.

(iii) The quickest method of solution was to continue the sequence by adding first 20 and then 24. A great many candidates preferred to assume a quadratic sequence of $an^2 + bn + c$ and work with three equations to find a general formula for the sequence, before substituting 7 to find the required term. While candidates were often successful using this method it required much more time.

(b) (i) Again, nearly all candidates completed the pattern correctly and completely. A few candidates omitted some dots or lines. Using a ruler would have made the drawing easier and clearer.

(ii) Completing the table for the total number of dots and crosses presented little difficulty for most candidates.

(iii) Nearly all candidates correctly completed the table showing the pattern for the total number of dots and crosses. Some did not check to make sure that the dots and crosses figures added up to the total for each row.

(iv) The answer to this question could be found immediately as $n^2 + (n - 1)^2$ and the word *Complete* implied writing down the answer was possible. Those who preferred the longer method, using equations in **part (a)(iii)**, could gain marks here for their working. Candidates who wrote down $2n^2 - 2n + 1$ without any explanation did not score marks.

(v) Those candidates who had $n^2 + (n - 1)^2$ in the previous part usually went on to expand the second term and so reach the required answer. Candidates, who had chosen to use the general quadratic expression $an^2 + bn + c$ and work with the resulting equations, needed to justify the assumption that it was a quadratic sequence by showing that the second differences were constant. As before, this approach required more time.

Many candidates substituted numerical values to show that the formula was correct. This was not a valid method.

(vi) The large majority of candidates showed substitution of 15 in the given equation in order to find the number of dots in the 15th pattern.

Question 2

(a) While most candidates continued the sequence for the number of dots on the triangular grid, some could have improved their mark by showing how the numbers 19 and 31 were found. For instance, the 19 could be found by extending the given Pattern 3 to give Pattern 4. In doing so, candidates are advised to make any useful diagrams clear. Quite often pencil marks were too faint for good communication. Another possibility was to show the increasing differences 3, 6, 9 and 12.

(b)(i) Many candidates knew that $a = \frac{3}{2}$ in the general quadratic $an^2 + bn + c$ because $2a = 3$, the second common difference. Candidates only gained the mark here if they also showed working to get the second difference of 3.

(ii) The most popular approach was to state without reasons that $3a + b = 3$ and that $a + b + c = 1$, and solve for b and then for c. This method was usually successful although it was not clear whether candidates knew where these equations came from. Another approach was to substitute two pairs of values for n and T into $T = \frac{3}{2}n^2 + bn + c$ to form simultaneous equations in b and c. Whichever method was used a large number of fully correct and well communicated responses were seen.

(c) To find the pattern with 571 dots, candidates had to solve a quadratic equation. Communication was very important in this question, there being many different methods possible. Nearly all candidates gained a communication mark for equating their expression for T to 571. Three major lines of approach followed, each gaining two communication marks:

A few candidates sketched a relevant quadratic graph and then marked the solutions on the graph This showed efficient use of the graphing facility at hand. Others reduced the quadratic equation to a form with the k^2 coefficient equal to 1, which could then be factorised. Most candidates chose to use the quadratic formula, which for good communication, had to be stated.

A significant number of candidates were unsure how to tackle a quadratic equation and could not communicate a suitable method. Some of those were, however, able to find that $k = 20$. There is evidence that a few candidates used the equation solver on the graphic display calculator. This method gains no credit unless accompanied by graphs showing how the solution was read from the calculator.

Question 3

Many candidates found the correct answer to the number of dots in hexagons being 6 more than the number of dots in squares by first writing down a correct equation. A few added the 6 to the wrong expression. Several candidates substituted values for n in each expression until the correct solution was found. The most popular and successful method was to reduce the equation to $n^2 - n - 6 = 0$ and solve it by factorisation, the most common mistake being to swap the signs in the brackets.

Section B – Modelling: Daylight hours

Question 4

(a) Errors in subtracting times and converting the answer to a decimal were infrequent.

(b)(i) The subsequent plot of the answer to **part (a)** was done correctly by nearly all candidates. An accuracy of $\frac{1}{2}$ square was expected of candidates.

(ii) Very occasionally a slip was seen in writing down the maximum and minimum times from the preceding table. A very small number wrote the dates instead of the hours of the shortest and longest days.

(iii) Many candidates showed how to average the times from the previous parts by adding and then dividing by two. The several candidates who reversed these operations, perhaps because of the word *halfway*, were not given credit. A few candidates assumed incorrectly that September must give the halfway value.

Question 5

(a) Candidates generally had no difficulty in correctly subtracting 12.2 from their time in **Question 4(a)**.

(b) (i) As a reason for the number 4.4 in Sofia's model, good candidates mentioned *amplitude* in their answer. Others described amplitude without using the term. Another valid answer was to write down the calculation that gave the 4.4.

(ii) A large number of candidates tried unsuccessfully to relate 30 to the days in a month. There were though, many candidates who correctly wrote that 30 came from 360 ÷ 12. A few tried to see a relevant connection between 30 and $\sin 30° = \frac{1}{2}$.

(c) Most candidates understood that 12.2 should be added on to translate the graph vertically. Instead of correctly adding it to the function as a whole, a very common error was to add it to the 4.4.

(d) (i) Communication was vital here in showing that $x = 1$ and $x = 10$ were the necessary substitutions in their model from **part (c)** for the months of April and January respectively. A large number of candidates showed this clearly. Those candidates, who had an incorrect model, could have sensed here from the previous table that their answers did not make sense, getting a warning to check back for a possible error. A few candidates took March as $x = 1$ although it was at the 0 on the horizontal axis.

(ii) Sofia should not really make conclusions about her model based on only two calculations. In this case however allowance was made for doing so, the answer being dependent on the times found in the previous part. Many candidates understood that a model does not have to be perfect to be a good model. For some candidates this was not clear and a few regarded small differences between model and data as a reason to reject the model.

(iii) Some candidates realised that the model as graphed assumed that each month was of the same length. Other candidates took the shape of the plotted data as an assumption and mentioned how the hours of daylight changed with time.

Question 6

This question was similar to what had gone before, but here candidates had to find the model without any lead-in questions. It was worth ten percent of the whole paper so good communication was important. The better candidates scored well here and set out the reasons with clarity. Others presented a page that was not well set-out. The large majority of candidates correctly gave $B = 30$, which gave sin $(30x)$ in their model.

The key calculations for communication were first, working out the relevant daylight hours and minutes and converting them to decimals and second, using these decimals to find the values of A and C. The manipulation of times was the more difficult process and several errors were seen. Many candidates omitted writing the time in hours and minutes first as part of their communication. Some candidates wrote out a complete table of daylight hours and minutes and the corresponding decimals, which must have been very time-consuming since only two of these were relevant. A common error was to take the maximum value of 14.6 as the value of A rather than 14.6 – 12.2 .

Question 7

(a) With the model for hours of daylight in Cairo given, candidates had to find the minimum value. A good way of communicating this was to sketch the graph and indicate a minimum at (9, 10.2). Most candidates preferred to substitute $x = 9$ in the formula. Several candidates answered the question quite neatly by observing that, since 2 was the amplitude, one only needed to calculate 12.2 – 2. Several candidates did not offer enough communication for their calculation.

(b) A large number of correct answers were seen, the most common mistake was to think that 9 stood for the month of September rather than December (March plus 9).

Question 8

(a) Graphs of trigonometric functions are quite awkward to sketch. Some excellent sketches were seen but generally much tolerance was given to diagrams. Several candidates used thick or feathered lines so that essential points were not clear. A few candidates only sketched the graph for Melbourne. Since the question was about comparison of graphs no marks could be awarded in those cases.

The most common error was to use a vertical scale of 0 to 15 on the graphic display calculator while the axes were labelled 9 to 15. Several candidates thought the 9 marked on the vertical axis was on the horizontal axis and so they only showed only a quarter of each graph.

Good communication implies that, whenever more than one graph appears in a sketch, each graph should be labelled. While it is hard to make the intersections really accurate in this sketch, several candidates had their third intersection well short of $x = 12$.

A key feature of the models was that the amplitude for hours of daylight in Cairo (2) was smaller than the amplitude for Melbourne (2.4). Although a relatively small difference, candidates should have made that difference visible in the sketch. Several candidates did not appear to notice this difference.

(b) A large number of candidates correctly identified that Melbourne had the longest day when Cairo had the shortest day. Some candidates gave the actual hours of daylight, namely 14.6, as a valid answer to the question. Other answers were too imprecise to receive the mark and suggested the question had not been read properly.

(c) Most candidates gave the correct dates for equality of hours of daylight between Cairo and Melbourne. A few candidates omitted 21st and so had not written a date as required.