Location Entry Codes

UNIVERSITY OF CAMBRIDGE International Examinations

As part of CIE's continual commitment to maintaining best practice in assessment, CIE has begun to use different variants of some question papers for our most popular assessments with extremely large and widespread candidature, The question papers are closely related and the relationships between them have been thoroughly established using our assessment expertise. All versions of the paper give assessment of equal standard.

The content assessed by the examination papers and the type of questions are unchanged.

This change means that for this component there are now two variant Question Papers, Mark Schemes and Principal Examiner's Reports where previously there was only one. For any individual country, it is intended that only one variant is used. This document contains both variants which will give all Centres access to even more past examination material than is usually the case.

The diagram shows the relationship between the Question Papers, Mark Schemes and Principal Examiner's Reports.

Question Paper	**Mark Scheme**	**Principal Examiner's Report**
Introduction	Introduction	Introduction
First variant Question Paper	First variant Mark Scheme	First variant Principal Examiner's Report
Second variant Question Paper	Second variant Mark Scheme	Second variant Principal Examiner's Report

Who can I contact for further information on these changes?
Please direct any questions about this to CIE's Customer Services team at: international@cie.org.uk

MATHEMATICS

Paper 0580/11
Paper 1 (Core)

General comments

The responses from candidates showed that the questions were a fair test of the basic elements of the syllabus. However, many candidates seemed to ignore showing mathematical method on questions requiring working to be done. Candidates, in preparing for the examination, should be made aware that more than 1 mark generally indicates that progress towards a correct solution may be credited even if the final answer is incorrect. Some questions, such as **11(b)** on this paper, specify the working must be shown, and in these cases no marks, regardless of a correct answer, would be given without working. All working and answers must be done on the question paper in the space allowed for it.

It was noticeable that many marks were lost this year by careless use of numbers in calculations, both with errors in reading the calculator display or the question and premature rounding of figures. Lack of observing specific accuracy, decimal places or significant figures, often meant that a candidate who fully understood and applied the required mathematics did not gain full marks for the question.

However, the vast majority of candidates tackled the paper well and demonstrated thorough preparation on most topics. It was pleasing that most were aware of what was required for most sections of the syllabus, even if they did not always have the ability to gain all the marks for the questions.

In general **Questions 2a**, **3**, **5**, **6b** and **13a** were found to be the most challenging, while **Questions 10**, **11a**, **12a**, **14b**, **18c**, **19a** and **19bi** were well done by the majority of candidates.

There was little evidence of candidates being unable to complete the paper in the time allowed.

Comments on specific questions

Question 1

Although this question was quite well done, there was little working shown. Those who did not get it correct, usually by giving equals, would have benefited from showing a conversion of the fraction to a decimal.

Answer: $<$ or $\le$

Question 2

An estimate was not required in this question but candidates should always think about the approximate size of the answer when doing a calculator question. Many answers bore no relation to the expected result of the calculation. A common wrong answer due to wrong order of operations was 37.64. It should have been clear to candidates that answers of this size had to be incorrect.

In **part (b)** a positive rather than negative index and the first part not being a number between 1 and 10 were often seen. Owing to lack of careful reading of the question a number of candidates put their answer to **part (a)** into standard form.

Answers: **(a)** 0.00193(4….) **(b)** 7.63×10^{-2}

Question 3

There were two main areas of error in this question that caused it to be one of the worst done on th
First, incorrect conversion between cubic centimetres and litres resulted in 450 or 45000 divided by
Secondly, many candidates divided the wrong way round and the answer of 44 was often seen. Those w
worked the mathematics correctly often did not interpret the wording of the question that asked fo
completely filled glasses and so gave answers with $\frac{1}{2}$ or rounded up.

Answer: 22

Question 4

The algebra involved in this question confused many of the less able candidates. Many seemed to just guess the answer or work from 5*a* = 180 leading to *a* = 36°. Some took the sum of the two angles to be 360°.

Answer: 30

Question 5

This question was a little more involved than usual on this topic and as a result few candidates gained the 2 marks available. Many candidates could identify lower and upper bounds. Some subtracted before adjusting for rounding, but most did not choose the correct combination for the maximum height difference.

Answer: 6.999… to 7

Question 6

The vast majority of candidates did not seem to understand the equation of the straight line in the form $y = mx + c$. In **part (a)** an answer for the gradient was often 3*x* or 4. **Part (b)** was very often omitted and only the more able succeeded in finding a correct equation. Many responses were a repeat of the given equation or no equation at all, simply 3*x*.

Answers: **(a)** 3 **(b)** $y = 3x$

Question 7

Many candidates did not know which angle to measure or how to use the one that they did use. The first mark for correctly measuring one of the possible angles enabled most to score but few showed a clear understanding of bearings necessary to gain the second mark.

Answer: 328 ± 2

Question 8

The error of adding rather than subtracting the squares of the numbers was quite common. This question was in context, using compass directions rather than a right angle symbol, and this may have confused some candidates. Furthermore, a considerable number of correct solutions were spoiled by rounding to a whole number or two significant figures, rather than the (minimum) 3 significant figures required by the rubric.

Answer: 9.33 or 9.327(….)

Question 9

Many candidates gained 1 mark by dividing 30700 by 79.6. The more able showed better understanding of the situation but unfortunately some good, clear solutions were spoiled by not observing the instruction of the question for a two decimal place answer.

Answer: 35.68

Question 10

The algebra was understood by most candidates and both parts of this question were often fully However, quite a number of candidates who coped with the brackets in **part (a)** failed to simplify co often adding 15*c* and 8*c*. In **part (b)**, most attempts were correct although some managed to find *p* as common factor.

Answers: **(a)** $7c - 20d$ **(b)** $q(p - q)$

Question 11

Some confusion was evident over multiples and factors. This resulted in answers of 1 or 3 being seen. However, many managed the correct answer to **(a).** Unfortunately, the connection with **part (b)** was usually not realised. Most started again, finding a common denominator. Full method for the subtraction of fractions was needed for any marks in **part (b)** and most followed the instructions, although some did not leave the answer as a fraction. Only rarely was a completely incorrect method, such as subtracting numerators and denominators, seen.

Answers: **(a)** 63 **(b)** $\frac{(7x8-5x9)}{\textit{their}\ 63} = \frac{11}{63}$

Question 12

The vast majority of candidates coped with the directed number multiplication and subtraction in **part (a)** and only a few offered responses such as –10, 1, –11, 11 or 13. **Part (b)** was more demanding and a minus, rather than plus was common. Another common wrong answer was $x = 2z - y$.

Answers: **(a)** $(z =) -13$ **(b)** $(x =) \frac{z+y}{2}$

Question 13

There were a lot of ‘no responses’ to this question as candidates find it difficult to realise that a line equidistant from two lines is simply the angle bisector. The vertices at *B* and *C* were often used for arcs and the bisector of a line was common. Many responses showed understanding of the line required but without construction arcs. There was opportunity for a mark in **part (b)** provided there was an identified point on the line *BC*. If this stage was reached very often a correct multiplying by 15 was performed.

Answers: **(a)** Correct ruled bisector of angle *A* with correct arcs **(b)** 105(m) to 112.5(m)

Question 14

Apart from **part (a)** this question was well done by most candidates. In the first part it was very common to see an answer of 64, thus ignoring ‘odd’ in the question. Also 9 or 9^2 were not sufficient for the answer. **Part (b)** was correctly answered by nearly all, but it was quite common in **parts (c)** and **(d)** for the range 60 to 90 to be ignored. 58 in **part (c)** and 2 in **part (d)** were quite common. There was also evidence again of confusion between factors and multiples in these later parts of the question.

Answers: **(a)** 81 **(b)** 64 **(c)** 87 **(d)** 73

Question 15

In **part (a)** adding instead of multiplying the integers and not adding 1 to 3 for the index were common errors. Similar errors often spoilt **part (b)**, namely subtracting integers and adding, or even attempting to divide, the indices. Consequently many candidates only gained one of the two marks in each part.

Answers: **(a)** $15p^4$ **(b)** $3q^5$

Question 16

Many less able candidates did not have a strategy for finding this complex area. Most could gai usually for the area of the square. Often there was confusion of methods between square subtract circ finding area of a quarter circle. Occasionally it was observed that candidates ignored the given 10 cm len and used a measured length. Over-rounding in the course of the solution sometimes produced incorrec answers and there was a weakness in formula knowledge for area of a circle.

Answer: 21.45 to 21.6

Question 17

A lot of candidates did not seem to know what a rhombus was and there were as a variety of quadrilaterals produced in **part (a)**. Counting was quite poor in **part (b)** and this, together with the lack of correct interpretation of a negative distance meant that this part was not done well. The scale, though quite straightforward was often misunderstood, and the vector $\begin{pmatrix} -2 \\ 2 \end{pmatrix}$ was often seen. **Part (c)** was better done than **part (b)** but still many errors occurred, producing the vector $\begin{pmatrix} 1.5 \\ 1.5 \end{pmatrix}$.

Answers: **(a)** *D* plotted at (3, 7) **(b)** $\begin{pmatrix} -4 \\ 4 \end{pmatrix}$ **(c)** $\begin{pmatrix} 3 \\ 3 \end{pmatrix}$

Question 18

There were quite a number of candidates who got the types of triangle the wrong way round. Strangely, triangle and pyramid were not uncommon answers. Generally, the order of symmetry was known but there were a significant number of omissions and some responses of 1 and 4. The main error in **(c)** was to put in the diagonals and some candidates left their lines short of the limits of the figure.

Answers: **(a)(i)** Isosceles **(a)(ii)** Equilateral **(b)** 2 **(d)** Correct vertical and horizontal ruled lines

Question 19

Poor reading of the question by a significant number of candidates resulted in 96%, rather than 4% being found. Nearly all knew how to find the mean of the five numbers, but errors such as dividing by 7, not dividing at all or using the calculator incorrectly resulted in loss of marks. Also quite a number confused mean and median. In **part (b)(ii)** some did not attempt to order the numbers and so just gave 348 or Wednesday as their answer. While the last part was well answered there were quite a lot of cases of candidates leaving the range as 348 – 323.

Answers: **(a)** 14h **(b)(i)** 335 **(b)(ii)** 334 **(b)(iii)** 25

MATHEMATICS

Paper 0580/12

Paper 1 (Core)

General comments

The responses from candidates showed that the questions were a fair test of the basic elements of the syllabus. However, many candidates seemed to ignore showing mathematical method on questions requiring working to be done. Candidates, in preparing for the examination, should be made aware that more than 1 mark generally indicates that progress towards a correct solution may be credited even if the final answer is incorrect. Some questions, such as **11(b)** on this paper, specify the working must be shown and in these cases no marks, regardless of a correct answer, would be given without working. Some clearly were allowed rough paper, usually not handed in, and so just answers were often seen. All working and answers must be done on the question paper in the space allowed for it.

It was noticeable that many marks were lost this year by careless use of numbers in calculations, both with errors in reading the calculator display or the question and premature rounding of figures. Lack of observing specific accuracy, decimal places or significant figures, often meant that a candidate who fully understood and applied the required mathematics did not gain full marks for the question.

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Answer: $>$ or $\geq$

Question 2

An estimate was not required in this question but candidates should always think about the approximate size of the answer when doing a calculator question. Many answers bore no relation to the expected result of the calculation. A common wrong answers due to wrong order of operations was 36.44. It should have been clear to candidates that answers of this size had to be incorrect.

In **part (b)** a positive rather than negative index and the first part not being a number between 1 and 10 were often seen. Owing to lack of careful reading of the question a number of candidates put their answer to **part (a)** into standard form.

Answers: **(a)** 0.00153(48….) **(b)** 5.84×10^{-2}

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There were two main areas of error in this question that caused it to be one of the worst done on th
Firstly incorrect conversion between cubic centimetres and litres resulted in 350 or 35000 divided by
Secondly many candidates divided the wrong way round and the answer of 44 was often seen. Those w
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Answer: 30

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Answer: 8.999… to 9

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Answer: 9.64 or 9.643(6….) or 9.644

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often adding 20*c* and 7*c*. In **part (b)**, most attempted were correct although some managed to find *n* as
common factor.

Answers: **(a)** 13*c* – 12*d* **(b)** *m*(*m* – *n*)

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Answers: **(a)** $24d^5$ **(b)** $4t^7$

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MATHEMATICS

Paper 0580/21

Paper 21 (Extended)

General Comments

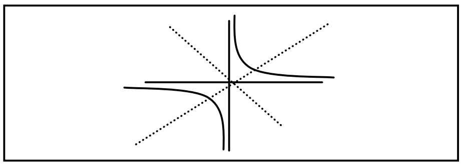
The level of the paper was such that all candidates were able to demonstrate their knowledge and ability and the standard of that was very good. The paper was again challenging for the most able this year but a number of candidates still scored full marks. There was no evidence at all that candidates were short of time. The general level of performance was much better than last year. A few Examiners reported some candidates who should have been entered for the Core paper but the entry choice seemed to be much more appropriate this year. Failure to show enough working was evident in one or two questions but in general the standard of presentation was very good.

Particular Comments

Question 1

This was generally very well answered by most candidates but some of the more able seemed not to have revised this topic. A few candidates tried to include the axes in **part (b)**

Answers: **(a)** 2 **(b)**



Question 2

This question was generally well done. A number of candidates failed to show any working and Examiners were unable to give a method mark. The most common mistake was to evaluate $\sqrt{\frac{9}{17}}$ as $\frac{\sqrt{9}}{17}$.

Answer: $\frac{5}{7}$ 72% $\sqrt{\frac{9}{17}}$ $\left(\frac{4}{3}\right)^{-1}$

Question 3

This question was generally well done. There was some evidence of the use of 100 minutes in an hour in **part (a)**. In **part (b)** the common errors were to find the profit for one fish or to find the percentage profit.

Answers: **(a)** 06 41 **(b)** $204

Question 4

Very few candidates scored full marks. The intersection was generally well done but most candidates failed to shade the intersection of the two sets in the second question.

Answers: first diagram: overlapping area of all three sets shaded

second diagram: entire area of set A plus all area outside circles shaded

Question 5

Most candidates knew what to do but made a mistake somewhere in the process. The negati caused problems in finding the determinant. Some candidates made errors in rearranging the matrix. candidates who tried to use simultaneous equations almost always made errors in the process.

Answer: $\frac{1}{2}\begin{pmatrix} 5 & -3 \\ 4 & -2 \end{pmatrix}$

Question 6

This question was better answered this year than any previous year. It is however a very good discriminator between candidates, and less than half the candidates were able to score full marks on this topic. Many could find the upper bound for one of the numbers but did not always attempt the other bound, before multiplying the two numbers. Many had difficulty with the millions part of the number 9 000 000. It was not common to see 6.55 and 9 500 000 being used. There are also some candidates trying to work with recurring decimals, which is not advisable.

Answer: 62 225 000

Question 7

This topic, surprisingly, caused considerable problems for candidates and only just over half the candidates scored full marks. Many confused this with gradient and some confused it with distance between two points. Others subtracted co-ordinates and divided each by two instead of adding.

Answer: (4, 2)

Question 8

Most candidates answered **part (a)** correctly. The term position vector seems to have caused the problem and candidates often used a different format, column or row vectors to give usually incorrect answers. The most common error in **part (b)** was ½ **a** + ½ **g**

Answers: **(a)** 2**a** – **g** **(b)** 2½ **a** + ½ **g**

Question 9

The question was very well done with most candidates scoring some marks. Some candidates lost method marks for failing to show their working clearly. It is often very difficult for Examiners to tell whether a statement is an answer or an instruction. Candidate need to make their working very clear on this topic to gain method marks. Common errors were $x + \sqrt{y} = 9$ when multiplying through by 9 and also $x^2 + \frac{y}{81} = 1$ when squaring incorrectly.

Answer: $81(1 - x)^2$

Question 10

This topic was very well done and most candidates scored some marks. Once again, failure to show clear working was a common loss of marks. Most candidates understood the need for a common denominator but failed to handle the sign change in the numerator correctly. The most puzzling loss of marks was those candidates who left their answers as $\frac{2d}{cd}$ or who simplified it to $\frac{d}{c}$.

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

Question 11

This question was very well answered with most candidates scoring at least two marks.

Answer: £3000

Question 12

This topic is well understood by most candidates. The most common error was to incorrectly rearrange the equations into the standard format.

Answer: x = 4 y = –3

Question 13

This was generally very badly done and only the more able candidates could answer this question correctly. The standard structure of $t = \frac{k}{d^2}$ followed by substitution to find k was rarely seen. The most common error was the omission of the square.

Answer: 0.128

Question 14

Part (a) was very well done although some candidates failed to note that the answer was required in standard form. **Part (b)** caused real problems and most candidates, having chosen to multiply out the brackets, could not multiply 3×10^6 by 5. Another common error was to divide by 15×10^6 instead of subtracting it.

Answers: **(a)** 3×10^{11} **(b)** 5×10^6

Question 15

This question was very well done. Those that made errors chose the wrong ratio.

Answers: **(a)** 24.7 **(b)** 11.5

Question 16

This was undoubtedly the worst answered question on the paper. This is probably because this aspect of locus construction has not been tested for some time. Most candidates did not appreciate that angle bisectors were required and the most common response was to construct perpendicular bisectors of the sides. Those who did understand what to do either produced just one bisector or failed to extend the locus all the way across the quadrilateral.

Answer: The four angle bisectors of the angles at the centre.

Question 17

This was very well done. Loss of marks was usually due to carelessness rather than lack of knowledge. Common errors in **part (a)** were not to give the mirror line or to use two transformations. In **part (b)** the common error was to use the wrong centre.

Answers: **(a)** reflection in y = x **(b)** triangle at (4, 6), (4, 7) , (7, 7)

Question 18

This topic continues to be one of the least understood on the syllabus. Less than half the candidates scored full marks on either part. Many just multiplied or divided by 1.5, failing to appreciate that volume requires the cubing of the scale factor and area requires the squaring of the scale factor.

Answers: **(a)** 320 **(b)** 567

Question 19

It was very pleasing to see an almost complete absence of circumference formulae. Most ca understood the question but Examiners reported that the presentation of the solution often left a great d be desired and it was not clear what the candidates were trying to find, making it very difficult to aw method marks. Many candidates chose to find the two large sectors and the circle area but forgot to subtrac the overlap areas of OBC and OEH. Very few candidates used the alternative method given in the mark scheme. Most candidates did score some marks on this question and there were a large number of fully correct solutions.

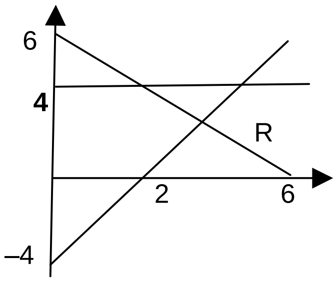
Answer: 314

Question 20

Part (a) was very well answered with most candidates scoring 3 or 4 marks.

Examiners however reported that more than half the candidates incorrectly chose the small triangle as their answer to **part (b)**.

Answer:



Question 21

Most candidates understood this question. The mistakes that occurred were usually algebraic and 2x + 12 often became 14x. Full marks were scored by over a quarter of the candidates and most scored some marks.

Answers: **(a)** $\begin{pmatrix} 2x+12 & 3x+6 \\ 14 & 15 \end{pmatrix}$ **(b)** 5

Question 22

This was generally well done by over half the candidates or else was completely wrong. Those with mistakes were usually making incorrect assumptions about the diagram, such as AC bisecting OAB or that AC was perpendicular to OB or angle BOA = OAB. Such information would always be given in the question.

Answers: **(a)** 58 **(b)** 32 **(c)** 58 **(d)** 24

MATHEMATICS

Paper 0580/22
Paper 22 (Extended)

General comments

The level of the paper was such that all candidates were able to demonstrate their knowledge and ability and the standard of that was very high. The paper was again challenging for the most able this year but a number of candidates still scored full marks. There was no evidence at all that candidates were short of time. The general level of performance was considerably better than last year. A few Examiners reported some candidates who should have been entered for the Core paper but the entry choice seemed to be much more appropriate this year. Failure to show enough working was evident in one or two questions but in general the standard of presentation was very good.

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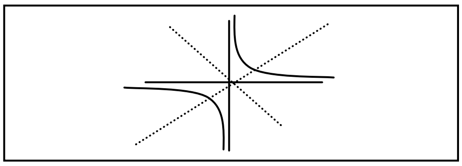


Question 2

This question was generally well done. A number of candidates failed to show any working and Examiners unable to give a method mark. The most common mistake was to evaluate $\sqrt{\frac{8}{15}}$ as $\frac{\sqrt{8}}{15}$.

Answer: $\frac{18}{25}$ $\sqrt{\frac{8}{15}}$ 74% $\left(\frac{27}{20}\right)^{-1}$

Question 3

This question was generally well done. There was some evidence of the use of 100 minutes in an hour in **part (a)**. In **part (b)** the common errors were to find the profit for one fish or to find the percentage profit.

Answers: **(a)** 06 43 **(b)** $247

Question 4

Very few candidates scored full marks. The intersection was generally well done but most candidat[es] to shade the intersection of the two sets in the second question.

Answers: first diagram: overlapping area of all three sets shaded

second diagram: entire area of set A plus all area outside circles shaded

Question 5

Most candidates knew what to do but made a mistake somewhere in the process. The negative signs caused problems in finding the determinant. Some candidates made errors in rearranging the matrix. Those candidates who tried to use simultaneous equations almost always made errors in the process.

Answer: 1/10 $\begin{pmatrix} 3 & -7 \\ 4 & -6 \end{pmatrix}$

Question 6

This question was better answered this year than any previous year. It is however a very good discriminator between candidates, and less than half the candidates are able to score full marks on this topic. Many could find the upper bound for one of the numbers but did not always attempt the other bound, before multiplying the two numbers. Many had difficulty with the millions part of the number 9 000 000. It was not common to see 6.55 and 9 500 000 being used. There are also some candidates trying to work with recurring decimals, which is not advisable.

Answer: 62 225 000

Question 7

This topic, surprisingly, caused considerable problems for candidates and only just over half the candidates scored full marks. Many confused this with gradient and some confused it with distance between two points. Others subtracted co-ordinates and divided each by two instead of adding.

Answer: (6, 3)

Question 8

Most candidates answered **part (a)** correctly. The term position vector seems to have caused the problem and candidates often used a different format, column or row vectors to give usually incorrect answers. The most common error in **part (b)** was ½ **a** + ½ **g**

Answer: **(a)** 2**a** – **g** **(b)** 2½ **a** + ½ **g**

Question 9

The question was very well done with most candidates scoring some marks. Some candidates lost method marks for failing to show their working clearly. It is often very difficult for Examiners to tell whether a statement is an answer of an instruction. Candidates need to make their working very clear on this topic to gain method marks. Common errors were x + √y = 9 when multiplying through by 9 and also $x^2 + \frac{y}{81} = 1$ when squaring incorrectly

Answer: $64(1 – x)^2$

Question 10

This topic was very well done and most candidates scored some marks. Once again, failure to sh working was a common loss of marks. Most candidates understood the need for a common denominat failed to handle the sign change in the numerator correctly. The most puzzling loss of marks was for th candidates who left their answers as $\frac{2d}{\mathbf{cd}}$ or who simplified it to $\frac{d}{\mathbf{c}}$.

Answer: $\frac{2}{\mathbf{c}}$

Question 11

This question was very well answered with most candidates scoring at least two marks.

Answer: £2400

Question 12

This topic is well understood by most candidates. The most common error was to incorrectly rearrange the equations into the standard format

Answer: x = 5 y = –2

Question 13

This was generally very badly done and only the more able candidates could answer this question correctly. The standard structure of $t = \frac{k}{d^2}$ followed by substitution to find k was rarely seen. The most common error was the omission of the square.

Answer: 0.625

Question 14

Part (a) was very well done although some candidates failed to note that the answer was required in standard form. **Part (b)** caused real problems and most candidates, having chosen to multiply out the brackets, could not multiply 3 x 10^6 by 5. Another common error was to divide by 15 x 10^6 instead of subtracting it.

Answers: **(a)** 4.8×10^{11} **(b)** 5×10^6

Question 15

This question was very well done. Those that made errors chose the wrong ratio.

Answers: **(a)** 24.7 **(b)** 11.5

Question 16

Undoubtedly the worst answered question on the paper. This is probably because this aspect of locus construction has not been tested for some time. Most candidates did not appreciate that angle bisectors were required and the most common response was to construct perpendicular bisectors of the sides. Those who did understand what to do either produced just one bisector or failed to extend the locus all the way across the quadrilateral.

Answer: The four angle bisectors of the angles at the centre.

Question 17

This was very well done. Loss of marks was usually due to carelessness rather than lack of kn... Common errors in **part (a)** were not to give the mirror line or to use two transformations. In **part (...** common error was to use the wrong centre.

Answers: **(a)** reflection in y = x **(b)** triangle at (4, 6), (4, 7) , (7, 7)

Question 18

This topic continues to be one of the least understood on the syllabus. Less than half the candidates scored full marks on either part. Many just multiplied or divided by 1.5, failing to appreciate that volume requires the cubing of the scale factor and area requires the squaring of the scale factor.

Answers: **(a)** 320 **(b)** 567

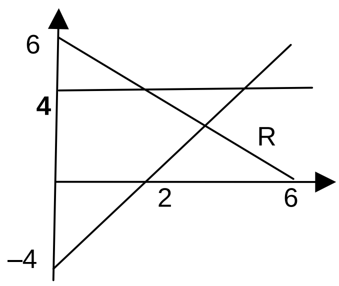
Question 19

It was very pleasing to see an almost complete absence of circumference formulae. Most candidates understood the question but Examiners reported that the presentation of the solution often left a great deal to be desired and it was not clear what the candidates were trying to find, making it very difficult to award method marks. Many candidates chose to find the two large sectors and the circle area but forgot to subtract the overlap areas of OBC and OEH. Very few candidates used the alternative method given in the mark scheme. Most candidates did score some marks on this question and there were a large number of fully correct solutions.

Answer: 314

Question 20

Part (a) was very well answered with most candidates scoring 3 or 4 marks. Examiners however reported that more than half the candidates incorrectly chose the small triangle as their answer to **part (b)**.
Answer:



Question 21

Most candidates understood this question. The mistakes that occurred were usually algebraic and 2x + 12 often became 14x. Full marks were scored by over a quarter of the candidates and most scored some marks.

Answers: **(a)** $\begin{pmatrix} 2x+12 & 3x+6 \\ 14 & 15 \end{pmatrix}$ **(b)** 5

Question 22

Generally well done by over half the candidates or else it was completely wrong. Those with mistakes were usually making incorrect assumptions about the diagram, such as AC bisecting OAB or that AC was perpendicular to OB or angle BOA = OAB. Such information would **always** be given in the question.

Answers: **(a)** 58 **(b)** 32 **(c)** 58 **(d)** 24

MATHEMATICS

Paper 0580/03

Paper 3 (Core)

General comments

This year's paper was felt to be comparable with previous years and again gave the candidates a positive opportunity to demonstrate their knowledge and application of Mathematics. Whilst the majority were able to use the allotted time to good effect and complete the paper it was noticed that a significant number omitted whole questions. The methods to be used may not have been recognised and the linkages between various parts of the question may not have been fully appreciated. The standard of presentation and amount of working to show the methods used was generally good although there is always room for improvement and the procedure of showing clear working, formulae used, substitution and calculations performed should continue to be encouraged by centres. Working was considered essential in **Questions (1)(a)(i)**, **(c)**, **(d)**, **(2)(c)(i)**, **(c)(ii)**, **(4)(b)**, **(6)(c)(i)**, **(e)(ii)**, and useful in **Questions (1)(b)(i)**, **(ii)**, **(2)(d)**, **(3)(b)(ii)**, **(c)**, **(4)(a)(iv)**, **(6)(b)**, **(c)(ii)**, **(e)(i)**. Method marks were available in these questions. If a candidate "crosses out" or deletes an attempt they should do so clearly and unambiguously. **Questions 2**, **4** and **6** proved to be the most demanding whilst **Questions 1**, **7** and **8** were the high scoring questions. A detailed breakdown of each question follows.

Question 1

(a) This style of question where candidates are asked to show that a given value is correct was much better answered this year with the majority of candidates able to show a correct method for 2800 involving both division by 15 and multiplication by 7. Only a small number of circular arguments using the given value of 2800 were seen. Having completed **part (i)** successfully almost all were then successful with **part (ii)**. Incorrect working of 6000/5 and 6000/3 (simply dividing by the ratio number) was rarely seen.

(b) **Part (i)** was generally well answered although a number of variations of multiplication and division of the given numbers and 12 were seen. Common errors included 1.4x2800, 1.4x12, 1.4 x 365 x 2800, and use of 6000. **Part (ii)** was also generally well answered particularly on a follow through basis although a small minority divided by 3/5 in error or found 3/5 but then subtracted this amount from 2800.

(c) This part on the calculation of simple interest was generally well answered although common errors of dividing by 8 and/or 3 were seen, though rare.

(d) This part was less successful although more candidates do now seem more familiar with compound interest. A significant number failed to gain the final mark available by not rounding their answer to the nearest dollar as instructed.

A significant number of candidates do seem to be confused between simple and compound interest since the latter came onto the syllabus. Confusion between interest and amount also often caused a loss of marks.

Answers: **(a)(i)** 2800 correctly shown. **(a)(ii)** 2000 (Stephano), 1200 (Tania). **(b)(i)** 47040 **(b)(ii)** 28224. **(c)** 1200. **(d)** 14292.

Question 2

This question proved difficult for many candidates, which was disappointing as it was an attempt shape and space to a physical situation. A significant number have problems with the three-letter desc of an angle, the understanding of which is essential for shape and space work.

(a) Having been given that the travel had been one third of the circumference it was expected that most would use 360 degrees in their answer with 1/3 of 360 = 120 the expected response. This was not the general case with many candidates using a variety of “wordy” explanations involving 30,60 and 180 degrees instead.

(b) The realisation that angle BAC was 90 degrees, being the angle in a semi circle was crucial for the rest of the question.

(c) The knowledge of trigonometrical ratios, their recognition and consequent application was significantly weak although the positioning of triangle ABC did seem to cause extra problems. Stronger candidates were able to demonstrate their ability and gain full marks. A significant number attempted to use Pythagoras which was rarely successful. In **part (i)** the working of 30 cos30 or 30 sin60 was expected. In **part (ii)** the full method needed to be shown and 26 sin60 was required. A number of circular arguments involving the given value of 22.5 or 48.4 degrees retrospectively from **part (d)** were seen.

(d) This part proved more accessible to candidates who were then able to demonstrate their application of trigonometrical methods correctly, although a significant number simply calculated an answer by the use of a combination of 45,30,60,90 or 180 degrees.

Answers: **(a)** 120 correctly shown. **(b)(i)** 30, **(ii)** 90, **(iii)** 60. **(c)(i)** 26.0,
(ii) 22.5 correctly shown, **(d)** 48.4

Question 3

(a) A minority of candidates were able to score full marks on this travel graph though most were able to gain some marks particularly with a follow through given when appropriate. Poor interpretation and reading of the question information caused many to make errors in the drawing of the graph. Common errors included having the plane land after 350 rather than 380 kilometres, the waiting times ignored, and inaccurate use of the time axis; although the position of the London office was indicated, this was not always used and indeed a small minority drew a line returning to Paris.

(b) In **part (i)** a significant number did not find the time in hours as requested and 45 or 0.45 were commonly seen in the answer space. Given units should be observed. In **part (ii)** it was generally understood that 350 divided by their **part(i)** was required. However the given data was often misread as incorrect distances of 380 or 420 were used. Lack of working in this part often meant that the method mark could not be given.

(c) The “whole journey” was often misunderstood with the common error being the use of 45 minutes for Pierre’s journey time instead of 3 hours 30 minutes. The majority however were able to score one mark for Annette’s time of 2 hours 55 minutes. Those who did get both times correct were able to calculate the time difference correctly.

Answers: **(a)** line from (08 30 , 30) to (09 30 , 30) then line to (10 15 , 380) then line to (10 50 , 380) then line to (11 30 , 420).
(b)(i) 0.75 or ¾, **(ii)** 467 **(c)** 35

Question 4

This proved to be a difficult question on algebraic techniques with the difference between expression and equation causing some problems.

(a) The first expression was generally well done though $x + 4$, $4 - x$ and $4x$ were common errors. The second expression was less successful with x^2 being the common error. A significant number of candidates could not interpret the words and meaning of the question to produce an equation and simply wrote down another expression involving one or sometimes both of the previous answers. Consequently relatively few candidates were able to demonstrate that they could solve such an equation. Those who included a bracket, usually correctly as 3(x –4), were able t… t correctly. Those candidates who were able to write down an equation were usually abl… the follow-through method marks.

(b) This part of the question on simultaneous equations, however, was generally done well with m… candidates, particularly those who chose to solve by eliminating the y values, scoring full marks. Numerical errors were seen more by those who chose to eliminate x by using a subtraction method even after correctly forming two equations in a suitable form. The method of substitution was not seen so often as in previous years and generally these candidates only scored the method mark available as they were unable to process the correct substitution.

Answers: **(a)(i)** x –4, **(ii)** 2x + 5, **(iii)** 2x + 5 = 3(x –4) **(iv)** x = 17. **(b)** x = 2 , y = 1.5

Question 5

This question was generally well done with the vast majority able to attempt both the drawings and descriptions of the transformations involved.

(a) The two required transformations of reflection and translation were generally recognised and stated. The full description was less successful with x-axis, line y, y = 0 and incorrect notation for the column vector, use of –8, (0,0) being the common errors.

(b) This part was generally well answered with the reflected pentagon correctly drawn.

(c) This part was also well answered although often a different centre of rotation was used resulting in the loss of an accuracy mark.

(d) This part was also generally well answered, with a significant number gaining full marks though equally a significant number omitted some of the detail in their description. A small minority gave a composite transformation.

(e) This was the least successful part as, whilst most candidates were able to demonstrate their understanding of enlargement, often this was with scale factors of either 2 or – ½ or from a different centre. A significant number omitted this part of the question.

Answers: **(a)** reflection in y axis , translation of $\begin{pmatrix}8\\0\end{pmatrix}$

(b) correct reflected pentagon, **(c)** correct rotated pentagon
(d) rotation, 180, centre (0,0) **(e)** correct enlarged pentagon.

Question 6

This question proved too long for some candidates. It did test their ability to think through a detailed question with several linked parts but a significant number were unable to attempt this question. The comment made in the introduction of this report was most relevant here.

(a) This was generally well done though a full variety of spellings and other mathematical terms were seen.

(b) The calculation of the interior angle was less successful with a number of incorrect or incomplete formulae used, often resulting in 1080 degrees. The possible method of 180 – (360 ÷ 8) was rarely seen.

(c) This **part (i)** was not well done with only the stronger candidates recognising the use of the tangent ratio to be the best method. A significant number omitted this part, whilst others used a circular argument involving the given value of 9.66 or the area of 38.6 retrospectively from **part (ii)** were seen. **Part (ii)** was more successful and most candidates recognised the use of A = ½ x b x h with the given values. The majority then recognised the follow through method of x8 for **part (iii)** and were again successful.

(d) This part was less successful with fewer recognising the expected follow through me… find the volume of the prism. A variety of incorrect formulae were seen.

(e) **Part (i)** was generally well answered although a significant number stopped at 12 rathe… finding the total volume of 2400. **Part (ii)** was often omitted even by candidates who had answe… the rest of the question. The two possible methods were equally seen though few gained fu… marks. Common errors included the reciprocal division, incorrect rounding and the calculation of percentage filled.

Answers: **(a)** Octagon, **(b)** 135, **(c)(i)** 9.66 correctly shown, **(ii)** 38.6, **(iii)** 309,
(d) 3710, **(e) (i)** 2400, **(ii)** 35.2

Question 7

(a) This part was well answered by virtually all candidates and full marks were common.

(b) The plotting and drawing of the required curve seemed to have improved this year and most candidates were able to score three or four marks on this part. However the drawing of a smooth continuous curve still proved difficult for some and a “flat top” to the curve was a common error.

(c) This was generally well answered though a common error was to offer the choice of x = 4, 5 with y = 20 possibly by using the table rather than the graph.

(d) The drawing of the line y = 6 in **part (i)** was generally correct and accurate. Those candidates who used this line to answer **part (ii)** were generally able to give two answers in the required range. A small but significant number attempted to solve the equation algebraically but few were successful. A number of candidates omitted this part entirely.

Answers: **(a)** 0,14,18,18,14, **(b)** correct curve drawn, **(c)** (x =) 4.4 to 4.6 , (y =) 20.1 to 20.5
(d)(i) correct line drawn, **(ii)** 8.1 to 8.5 , 0.5 to 0.9

Question 8

(a) This part was generally well answered although the calculation of the required angles proved more difficult for some. These candidates would be advised to check that the angle sum was 360 degrees.

(b) The vast majority of candidates understood what was required to complete the frequency table although some numerical errors were made. A small yet significant number left their answer as tally marks. **Part (ii)** was less successful although those candidates who understood the term histogram were generally able to draw it correctly. Common errors included drawing line graphs, frequency polygons, just coordinate points plotted and bar charts, usually with small gaps.

(c) A disappointing number of candidates were unable to answer this part of the question on scatter diagrams. But for the majority, the scatter diagram was plotted well, and many attempts scored full marks. **Part (ii)** was less successful with many candidates still attempting to describe the connection between the two variables in words rather than simply stating the correlation, in this case zero. In **part (iii)** most candidates were able to use their scatter diagram to answer this question on probability though a common error was to include the point (4, 9100) giving an answer of 4/20.

Answers: **(a)** 5, 126 , 90, **(b)(i)** 3,5,6,4,2, **(ii)** correct histogram drawn
(c)(i) correct scatter diagram drawn, **(ii)** zero, **(iii)** 3/20

Question 9

(a) **Part (i)** was correctly answered by the vast majority of candidates. In **part (ii)** a numb possibly looking for a more complicated answer than the one expected. The simple term to rule of "subtract 5" was all that was required with a number of candidates spoiling their answer stating n –5 or x –5. **Part (iii)** requiring the position to term rule proved more difficult and the correct answer was seldom seen, with n –5 being the common error. Those few candidates who started with the expression a + (n –1) x d were generally successful.

(b) This second sequence met with the same response as the first with n + 5 being the common error.

(c) This linked part consequently proved difficult for a number of candidates.

Answers: **(a)(i)** –8 , –13 **(ii)** subtract 5 **(iii)** –5n + 17 **(b)** 5n – 8 **(c)** 9

MATHEMATICS

Paper 0580/04

Paper 4 (Extended)

GENERAL COMMENTS

This paper is the first Paper 4 to be a question and answer booklet and the examination will continue to be in this form. It has certainly proved to be more "user-friendly" to the candidates and this may have contributed to the generally higher marks gained this year. The paper was probably also slightly easier than last year's.

The presentation of work was very good, with almost all candidates being able to show their working in the spaces provided. Any script with poor presentation almost certainly belonged to a weak candidate. In the cases where a candidate needs more space, usually when re-attempting a question, a supplementary sheet may be tied to the booklet. As long as there is an indication that some work is on a supplementary sheet, this is acceptable. However, it is not recommended that candidates are given sheets for working or even rough working since they tend automatically to use these sheets and write only answers in the booklet. Rough work, if attached, is checked, but it is strongly urged that candidates are only issued with the booklet, and only given additional sheets if they have run out of space.

In addition to bringing about an improvement in presentation, the booklet also provided grids for graphs, thus eradicating the opportunity for candidates to make small but expensive scale errors.

Most candidates proved to be very accurate with their working, either by holding values in their calculator or working with 4 or more significant figures. It must be pointed out however that the small number of candidates who worked with 3 or less figures did lose quite a number of accuracy marks.

The "show that" questions posed more problems, and candidates are encouraged to practise these more and realise that they have more to do than when a question asks for an answer. If an answer is given, then the credit is for steps clearly arriving at the answer and not for the answer itself.

The ease or difficulty of topics will be dealt with in the comments on individual questions but the probability question stood out as being difficult for many candidates.

To conclude, it is refreshing to report on the good work of so many candidates. They demonstrated skills, knowledge and the ability to interpret as well as the potential to go further in this subject. However, as usual, there were a small number of candidates who should not have been entered for this examination.

COMMENTS ON INDIVIDUAL QUESTIONS

Question 1

(a) The simple division of a quantity in a given ratio was almost always successful. The few errors included $\frac{9}{4}\times 650$, 650 ÷ 13 only, $\frac{9}{13}\times 800$ and $\frac{4}{13}\times 650$.

(b) (i) The very straightforward percentage calculation was almost always successful.

(ii) A majority of candidates also succeeded in this reverse percentage calculation. However many candidates calculated $37\frac{1}{2}\%$ of \$30; others did use $37\frac{1}{2}\%$ in a reverse calculation but had an incorrect amount for the 100%, often \$120 and occasionally \$150.

(c) There continues to be confusion between simple and compound interest, even tho has been on the syllabus for several years. There was also some confusion over the between interest and amount.

(i) This was usually well done, although as stated above, some candidates did use simple interest. Some candidates arrived at $441 but subtracted $400 giving the interest as their final answer. Another error was adding $400 to $441, the result of thinking that the $441 was the interest.

(ii) If candidates used simple interest in **part (i)**, this trivialised this part and no credit could be given. This question was more demanding but was generally quite well done. The most common error was using the $441 as the interest leading to a rate of interest of 55.1% per year. Other errors were not converting an otherwise correct calculation to a percentage, not dividing by 2 for the number of years and giving an answer to only 2 significant figures.

Answers: **(a)** $450 **(b) (i)** $120, **(ii)** $80 **(c) (i)** $441, **(ii)** 5.125%

Question 2

Parts (a), **(b)** and **(c)** were simple statistics from a frequency table of discrete values. These topics are all core level and yet candidates often made very simple errors here but could do the more demanding statistics in **Question 9**.

(a) This was usually correct although a few candidates gave the frequency as their answer as opposed to the actual value of the mode.

(b) Most candidates were aware that the median is the mid-value but many had difficulty with the total of the frequencies being an even number, with answers of 2 or 3 being often seen. Others ignored the frequencies and gave the median from a list of 6 values, even though they had used the frequencies when finding the mode.

(c) This was generally well done, although there were numerical slips when multiplying the frequencies by the data values. One numerical slip was condoned when awarding the method mark.
As in **part (b)**, some candidates found the mean of the 6 values.

(d) This question was one of the more discriminating parts of the examination and many candidates struggled to find a suitable method, although this type of question has been on previous papers. Many weaker candidates made no attempt at this part.
The incorrect methods included the ignoring of the frequencies or dividing by a frequency. The simple method of multiplying 2.95 by 60, subtracting the 148 from **part (c)**, then dividing by 10 was often overlooked and equations were built up, although usually successfully solved.

Answers: **(a)** 1 **(b)** 2.5 **(c)** 2.96 **(d)** 2.9

Question 3

(a) This was the first of the "show that" questions and, although the question indicated "show all your working", many candidates lost a mark here through incomplete explanations. The question asked candidates to calculate the angle and to show that it rounded to a given 3-figure value. There was therefore a requirement to obtain an answer with at least 4 figures. Whilst not expecting a rigorous proof, there was a need for the candidate to show that he/she was not working backwards from the rounded answer. Most candidates correctly applied the $\frac{1}{2}ab\sin C$ formula and usually attained two of the three marks available.
A few candidates found one of the perpendicular heights and then proceeded to use a right-angle triangle to calculate the required angle.

(b) This was a straightforward cosine rule calculation and most candidates recognise those who found a perpendicular height in **part (a)** realised that it was better to rever triangle.
The calculation was performed well by almost all candidates and usually to the required acc
A few collected the $-2bc$ with the $b^2 + c^2$ and multiplied this result by cos*A* and a few rounded too much before taking the square root. Candidates should be advised to simply hold this value in their calculators and take the square root of this.
There were a small number of incorrect formulae, usually a sign slip but sometimes sin for cos and even the omission of the 2.
A very small number of candidates treated the full triangle as right-angled, using Pythagoras and trigonometric ratios. Such errors were almost always an indication of a weak candidate.

Answers: **(a)** 43.29° arrived at **(b)** 9.60 cm.

Question 4

(a) This was usually recognised as a straightforward sine rule question and most candidates succeeded. As in **Question 3**, the candidates who write decimal values during their working tended to be rounding off too early and ended up with answers out of the accuracy range. $\frac{250}{\sin 126} \times \sin 23$ earned the full method marks. To avoid rounding errors, it should be written down in this form, then run through the calculator and then the final answer written down to the required accuracy.

(b) There was less success in **part (b)**. **Part (i)** was quite successful but many candidates were unable to make a reasonable attempt at **part (ii)** and there was a range of working and answers which did not seem to relate to the situation. Also a large number of candidates did not attempt this part.

With the introduction of the booklet form, candidates may find it useful to enter values of angles on the diagram; this can now be marked as part of the working.

Answers: **(a)** 121 m **(b)(i)** 280° **(ii)** 069°

Question 5

(a) (i) Very few errors were seen in the calculation of the *y*-values missing from the table.

(ii) Candidates benefited from a grid already set up for them. An easy axes/scale mark can not now be earned but there were no simple scale slips which used to be very expensive throughout a graph question.
Generally, accurate plotting was seen, the only errors tending to be with the values 0.58 and 0.83. Good curves were drawn and very few candidates ruled parts of the curve. It is also pleasing to mention that most candidates realised that the graph was made up of two branches.

(b) Most candidates realised that the *x* co-ordinates of the points of intersection with the line $y = 1$ were needed and those who did invariably gave answers inside the tolerance allowed. Some of the weaker candidates gave the intersections with the *x*-axis and some omitted this part.

(c) (i) Although this part was often found to be easy, there were a surprisingly large number who did not draw the tangent at the required point. This topic has been a regular feature of graph questions in many papers. In some cases there was not a straight line and in other cases there was a straight line which either missed the curve or was a chord to the curve.
The calculation of the gradient was performed efficiently, the only errors being some mis-reading of co-ordinates of chosen points or dividing a horizontal distance by a vertical distance.

(ii) There was only one mark here, for realising that the answer was the same as in **part** e number of candidates started this part again giving them much to do for one mark common error was to change the sign of the answer to **part (i)**.

(d) (i) In most cases the drawing of the straight line was either completed correctly or simply omitted.

(ii) Those who succeeded in **part (i)** almost always gained full marks here. A few mis-read the scales and gave –1.5 and 1.5 as their answers.

(e) Candidates either gave $y = x$ as their answer or omitted the part. A few gave other correct answers, including $x = 0$.

As in previous years, weaker candidates were able to pick up several marks in the graph question, although the later parts of the question proved to be discriminating, to a certain extent.

Answers: **(a)(i)** –1.5, 1.5, 3.75 **(b)** $-1.4 \le x \le -1.1$ and $3.1 \le x \le 3.4$ **(c)(i)** 0.8 to 1.2,
(ii) 0.8 to 1.2 **(d)(ii)** –1.3 to –1.05 and 1.05 to 1.3 **(e)** $y = kx$ with $k \ge \frac{1}{2}$ or $x = 0$.

Question 6

(a) (i) Obtaining an equation from given information is one of the more challenging parts of the syllabus. Although a number of candidates omitted this part, there were many fully correct solutions. Some of the candidates separated the triangle *ABC* and found two separate areas in terms of *x*, then added them together and equated the total to 40. Others combined the $x + 6$ and the $x + 2$ but often some brackets were missing and expressions such as $(x + 6) + (x + 2) \times (x + 1) = 80$ were frequently seen. The first approach saw fewer errors, although it involved more steps. Candidates should be practised in different approaches and the need for brackets to make correct statements.

(ii) This question was generally successful and the only common errors were with signs in the factorising or in the answer from the factors.
A large number of candidates used the quadratic equation formula with rather mixed results. The working space, the number of marks and the absence of a rounding instruction should have persuaded these candidates to use their factors.

(iii) This part was quite well done and most candidates applied Pythagoras correctly. The most common error was to obtain an expression for *BC* in terms of *x*, even though the question asked for a calculation.
Many of those who did the calculation gave an answer of 7.8, thus losing an accuracy mark.

(b) (i) There were mixed responses to this question ranging form good work with exact fractions such as $\frac{565}{60}$ or $9\frac{5}{12}$ to those who lost the exactness by using decimals. Answers such as 9 hours 25 minutes = 9.416 hours followed by 9.416 = $\frac{113}{12}$ were not given the mark.

(ii) This part was generally well done with good algebraic fraction skills demonstrated.
A few candidates treated it as an equation and omitted the denominator and some weaker candidates omitted this part.

(iii) By splitting **part (b)** into smaller parts, many candidates were able to pick up their first marks here and the part was very successfully done. Various approaches were seen, all seeming to lead safely to the answer.

(iv) This part was rather disappointing with a large number of candidates either not finding the total distance or apparently using $9y + 16$ as this distance. Sadly, there were still candidates who calculated the average of the speeds.
Some successful methods lost the accuracy mark by giving an answer of 2.5 km/h.

Answers: **(a) (ii)** –9, 4 **(iii)** 7.81 cm **(b) (iii)** 4.5 **(iv)** 2.55 km/h

Question 7

(a) This was generally well done and finding x to be 4.4 or using x = 4.4 were both ac approaches. When candidates had 19.36 in their working, full marks were almost always obta

(b) This was well done by most candidates and the only common error was either not converting to kilograms or incorrectly converting to kilograms by means of an incorrect factor.

(c) This was generally well done, although the majority of candidates used the volume approach rather than the simpler way of 88 ÷ 4.4 = 20 and 120 ÷ 20 = 6 and so there are 6 layers of bars.

(d) (i) The better candidates produced good and full solutions, showing all the steps clearly. However many candidates did not show all these steps, leaving the possibility that they may have used the 0.65 and worked backwards. This was not accepted for any credit as the question asked for a calculation of the radius which would then round to 0.65. For example, if candidates did not show a division by $\frac{4}{3}\pi$ in their working they could only be rewarded with this mark if they had a correct 3 or more figure value for r^3. A similar scheme was in place for the square root.

(ii) Most candidates were successful, although a number lost the mark by giving a 2 figure answer.

(iii) This was quite well done and most candidates collected at least some method marks. Almost all candidates multiplied their answer to **(ii)** by 4200. Some gave the surface area of the bar as 4840, which was the given volume, whilst others omitted one or more faces of the cuboid. For the third method mark, the common error was to find the surface area of the metal bar as a percentage of the surface area of the 4200 spheres. Inaccuracies due to premature approximation often led to answers outside the accepted range.

Answers: **(b)** 42.6 kg **(c)** 26.4 cm **(d)(ii)** 5.31 cm^2, **(iii)** 502 %

Question 8

This question was not terribly successful. A number of candidates lost most or all of the marks by overlooking the fact that the probability was constant. It was very difficult to reward such work as it assumed there were 20 calculators, which contradicted the information given in the question.

(a) Almost all candidates scored this mark.

(b) (i) Apart from the error described above, most candidates were successful.

(ii) Quite well done, although a very common error was to have only one way for one calculator to be faulty.

(c) The same problem occurred as in **part (b)(ii)**, although the method mark was available for multiplying the answer to **part (b)(ii)** by the value of p.

(d) Again, many candidates earned the method mark but lost the accuracy mark for the same reason as in **part (b)(ii)**.

(e) This part was more successful and many candidates gained this mark after losing several or all of the marks in **parts (b)**, **(c)** and **(d)**.

Answers: **(a)** $p = \frac{1}{20}$ $q = \frac{19}{20}$ **(b)(i)** $\frac{1}{400}$ **(ii)** $\frac{38}{400}$ **(c)** $\frac{38}{8000}$ **(d)** $\frac{58}{8000}$ **(e)** 7.25 (or 7 or 8)

Question 9

This proved to be a straightforward question with many candidates scoring full marks.

(a) The readings from the graph were very well done. In **part (iii)** 167 to 179 was occasionally seen instead of 12.

(b) (i) This was generally very well done, apart from a few numerical mis-reads or writi frequencies in the boxes, instead of frequencies.

(ii) This was very well done and usually with good clear working. However a few showed no w and gave an answer of, for example, 170, thus scoring no marks.
A small number of candidates ignored the frequencies and a few used interval widths instead of mid-values.

Answers: **(a)(i)** 174 to 174.25 cm **(ii)** 167 cm **(iii)** 12 cm **(iv)** 37 **(b)(i)** 10, 25 **(ii)** 172.3 cm

Question 10

(a) This was generally well done, with the only common error being in **part (ii)** where -5^2+1 had been calculated rather than $(-5)^2+1$, probably through using a calculator incorrectly.

(b) This was found to be a straightforward inverse function question with very few errors. Some candidates stopped at $\frac{y+1}{2}$ and a few gave the reciprocal of f(x).

(c) This was less successful than expected considering it was only a two step re-arrangement. There was a range of incorrect answers and in some cases it was impossible to understand where the candidate had made the error.

(d) Most candidates obtained gf(x) in a correct form but the errors in expanding $(2x-1)^2$ were alarming.
It was most surprising to see extended level candidates writing $(2x-1)^2 = 4x^2+1$ or $4x^2-1$. It was also disappointing to see candidates divide a correct answer by the common factor of 2.

(e) This was generally well done. A few tried to calculate 2^{512}.

(f) This was quite well done. For some reason quite a number of candidates wrote f(x) = 2x + 1 in this part but had used 2x – 1 in other parts.
Most candidates were able to work on a quadratic equation and to earn two method marks.
More candidates than usual gave their answers to 3 figures when they should have expected the usual 2 decimal places. Fortunately for these candidates, one answer to 2 decimal places was also to 3 significant figures.

(g) This was quite well done, although many candidates were clearly not very familiar with some standard graphs. In **part (ii)** a straight line was quite common and those who had the correct shape occasionally had the vertex at the origin or even below the origin.

Answers: **(a)(i)** –2 **(ii)** 26 **(iii)** $\frac{1}{8}$ **(b)** $\frac{x+1}{2}$ **(c)** $\sqrt{z-1}$ **(d)** $4x^2-4x+2$
(e) 9 **(f)** –4.24, 0.24

Question 11

(a) Most candidates found the sequence obvious and collected 2 easy marks. A few had 37 for the final number in the list.

(b) (i) This was generally well done, although a few candidates used numbers which were not terms in the sequence.

(ii) A surprising number did not know the square numbers and answers such as consecutive, triangle, Fibonacci and integers were seen.

(c) Many candidates found k = 2 and went on to gain full marks in **parts (ii)** and **(iii)**. Those who did not have k = 2 had little chance of any marks in **part (c)**.

(d) (i) Many candidates did not produce an algebraic “show that”, thinking that demonstrati… would suffice. This part was also often omitted.

(ii) As in **part (i)** this part was often omitted. Some of the weaker candidates gave answer of 174… 1741, presumably because of the word consecutive, mixing numbers with terms. The be… candidates realised there was something to do with the square root of 3481 but many then gave answers of 58 and 59, i.e. the positions of the term instead of the values of the terms. A few used algebra, which involved solving a quadratic equation which led only to the position of a term and so, again, 58 and 59 were frequently the final answers.

Answers: **(a)** 15, 21, 28, 36 **(b) (i)** 10+15=25, 15+21=36 etc. **(ii)** square numbers

(c)(i) 2 **(iii)** 16 290 **(d)(ii)** 1711, 1770