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

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MATHEMATICS

Paper 0580/11
Paper 1 (Core)

General comments

Overall the paper was tackled well by candidates. The higher marks gained this year indicate slightly easier questions but also better preparation by Centres of candidates for the examination. This year there were relatively few very low marks, enabling the vast majority to be awarded a grade showing some degree of competence in the subject.

While in most scripts working was evident, there are still too many cases of questions with more than 1 mark where working was not seen. There is still a belief among some candidates that being allowed to use a calculator excuses them from producing any evidence as to how their answer has been obtained.

In some questions, premature rounding caused a loss of marks, again due often to lack of working shown, with just a 2 significant figure answer evident, when 3 figures is the minimum requirement.

Significant numbers of candidates still have no understanding of the difference between compound and simple interest. This topic was introduced to the syllabus in 2006.

There was no significant evidence of lack of time.

Comments on specific questions

Question 1

This was generally very well answered but the common error on order of operations, usually producing an answer of 35, was often seen. Also careless use of the calculator resulted in 11 + 9.33…

Answer: 13.

Question 2

The answer of 2 hours 56 minutes from subtraction and the error of 100 minutes in 1 hour was seen a number of times and 3 hours instead of 2 hours was also seen.

Answer: 2(h) 16(min).

Question 3

Nearly all responses were correct, but 193, 190.3 and 190.6 were seen a number of times.

Answer: 196.

Question 4

This straightforward percentage question was well done by the majority of candidates. Errors resulted from subtracting 3 from 30 giving 27 or 0.9 or 90%. Careful reading of the question was needed here.

Answer: 10(%).

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Question 5

Most candidates managed to order correctly but it was common to see $\frac{1}{3}$ as the first item, probably resulting from putting the fraction as 0.3 or 0.33. Again careless reading of the question meant the reverse order was seen.

Answer: 33% < $\frac{1}{3}$ < 0.35

Question 6

Some candidates did not include the negative sign, but otherwise this question was very well done.

Answer: −14.

Question 7

Most candidates understood standard form and only a few had the 10 small and elevated as displayed on some calculators. Errors were mainly in missing the negative in the power and reducing to the 2-figure 3.6.

Answer: 3.62×10^{-3}

Question 8

The ellipse in the middle rather than a circle confused candidates resulting in infinity being a quite common response. However, most gained the marks in both parts, although 4 was seen in **part (a)** and a lack of understanding of rotational symmetry was seen at times in **part (b)** with answers of 180° and 0.

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

Question 9

This was found to be one of the most difficult questions on the paper. Many candidates simply multiplied the fraction by the amount without regard to the question and the fact that the answer needed to be more than the sum quoted. Some who understood what was required unnecessarily approximated the fraction to 0.2 but division by 0.22 would give the method mark. The exact answer was required for full marks.

Answer: ($)1278.

Question 10

It was encouraging that this usually poorly done question was much better this year. The upper limit as 12.4 was sometimes seen and there were errors such as 10 and 12 and 10 and 15.

Answer: 11.5 ≤ (h) < 12.5

Question 11

This proportion question was tackled better than **Question 9** but was still not very well done. Some seemed to have little idea of ratio even though this was the most straightforward type of question. Some made progress but just divided by 7 or gave the amount for the brother.

Answer: ($)1.40

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Question 12

Part (a) was not as well done as **part (b)** but overall most candidates got each part correct. $\frac{11}{13}$ was seen in **part (a)** and $\frac{9}{20}$ in **part (b)**. A few candidates changed to decimals or percentages, even though the question asked for fractions.

Answers: **(a)** $\frac{13}{24}$; **(b)** $\frac{11}{20}$.

Question 13

This question was not well done, in most cases due to not halving the base in the area of the triangle. Many had difficulty interpreting the question and made no progress.

Answer: (h =) 7.5

Question 14

In **part (a)** many used the formula for area instead of circumference. Rounding the answer in **(a)** was also seen even though the question specified a full answer. Many gained the mark for **part (b)** by follow through, although some gave an answer to 1 decimal place or 3 significant figures. Answer depends on value of pi taken.

Answers: **(a)** 35.81415(6….) or 35.8188; **(b)** 36(cm).

Question 15

It was clear that many candidates did not understand how to reflect in the line $x = 3$. There were many varieties of lines in which to reflect and an assortment of resulting shapes, though most were parallelograms. A few used $y = 3$ or only completed the left hand side or even drew a shear. However, there were a lot of very well drawn, correct parallelograms.

Answer: Ruled parallelogram with vertices (3, 1), (5, 1), (2, 4) and (0, 4).

Question 16

Most candidates understood Pythagoras and applied it correctly, although a few added the side lengths or found the triangle's area. Lack of or incorrect 3 significant figures often lost a mark with 4.6 and 4.57 seen at times. Some candidates forgot to find the square root.

Answer: 4.58

Question 17

Certain questions on the paper required decisions on processes to be made and this one caused difficulties for many candidates. The cost of a pack was often multiplied by 4 and many could not put the alternative methods of purchase into the same units. Some candidates worked on 1 packet and 4 single batteries. Truncating 5.44 to 5.4 also spoiled otherwise correct solutions.

Answer: ($)1.14

Question 18

The factorising question was very well done. There were some gaining only 1 mark with partial factorisation, with a small minority producing single term answers.

Answer: $3x(2 - 3xy)$.

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Question 19

(a) These were done well, only a few in **part (i)** gave a positive answer. In **(ii)** 144 was seen a number of times due to multiplying before squaring. Most, however, seem to have relied on the calculator to resolve this problem.

(b) Naturally this was not so well done but there were still many correct solutions from applying the rules of indices. Many did not attempt it, however, and numerical answers were much in evidence.

Answers: **(a)(i)** –27; **(ii)** –48; **(b)** z.

Question 20

There were many fully correct answers to the question, but some candidates wrote down their choice from the list without the square root sign. **Part (a)** was often given as √14 and **part (c)** as $\sqrt{36}$. It was clear that many did not know the term irrational number. Sadly some candidates did not understand that they were being asked for only one number in each part, and so gave more than one answer in some parts.

Answers: **(a)** $\sqrt{4}$ or 2; **(b)** $\sqrt{81}$ or 9; **(c)** $\sqrt{64}$ or 8; **(d)** $\sqrt{14}$ or 3.7(4…)

Question 21

Parts (a) and **(b)** were most often correct. Naturally, **part (c)** was not done as well, though there were many who did quote the correct formula. A common incorrect answer was $x + 3$ and many omitted this part.

Answers: **(a)** 25; **(b)** 43; **(c)** $3n + 10$

Question 22

(a) Most candidates read the time through the roadworks correctly but a few answers of 22 minutes, were seen. An answer of 27 was also seen at times.

(b) Many were confused about whether to multiply or divide to find the speed and some of those deciding on division did 12 ÷ 10. A decimal of 0.83 or better was acceptable. **Part (ii)** was often gained by a follow through although division by 60 was seen resulting in a speed in km/h being far less than km/min.

(c) This was poorly done with many inexplicable answers seen. An understandable incorrect answer of 70 was common from adding 24, 34 and 12.

Answers: **(a)** 12; **(b) (i)** 0.83 or $\frac{10}{12}$ or equivalent; **(ii)** 49.8 to 50; **(c)** 46.

Question 23

(a) As referred to in the general comments, many candidates did not seem to understand the difference between simple and compound interest. Although the presentation of the question was a little different, it was clearly stated that A was simple interest and B compound interest. Those who understood this generally could manage this part, but others tried to do year by year adding on the interest. Other errors were to only work out 1 year or quoting the total amount rather than the interest.

(b) This was less well done even by those who had done the first part successfully. Many repeated a simple interest calculation and others subtracted the interest found. Another error was to find a year of interest at a time and add the second year to the original amount instead of the new amount after the first year. However, there were a lot of correct, well developed solutions with many using the compound interest formula, even though not a requirement of the syllabus. Again some found the total amount rather than interest.

Answers: **(a)** ($)1020; **(b)** ($)1038.85

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Question 24

(a) Most, provided they understood vectors were successful on this part, although there were slips made by some in the manipulation of directed numbers.

(b) This was not so well done, although most who attempted it usually gained 1 mark for recording the vector $\begin{pmatrix} -2 \\ 4 \end{pmatrix}$ or plotting the correct position of Q without the vector drawn. Drawing the line from P to (–2, 4) was a common fault.

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MATHEMATICS

Paper 0580/12
Paper 1 (Core)

General comments

Overall the paper was tackled well by candidates. The higher marks gained this year indicate slightly easier questions but also better preparation by Centres of candidates for the examination. This year there were relatively few very low marks, enabling the vast majority to be awarded a grade showing some degree of competence in the subject.

While in most scripts working was evident, there are still too many cases of questions with more than 1 mark where working was not seen. There is still a belief among some candidates that being allowed to use a calculator excuses them from producing any evidence as to how their answer has been obtained.

In some questions, premature rounding caused a loss of marks, again due often to lack of working shown, with just a 2 significant figure answer evident, when 3 figures is the minimum requirement.

Significant numbers of candidates clearly still have no understanding of the difference between compound and simple interest. This topic was introduced in 2006.

Also Examiners recorded a considerable number of 'no responses' (this is now recorded 'NR' as distinct from 0 for a question) which could indicate some lack of coverage by teachers.

There was no significant evidence of lack of time.

Comments on specific questions

Question 1

This was generally very well answered but the common error on order of operations, usually producing an answer of 33, was often seen. Also careless use of the calculator resulted in 12 + 6.6

Answer: 9.

Question 2

The answer of 3 hours 69 minutes from subtraction and the error of 100 minutes in 1 hour was seen a number of times and 4 hours instead of 3 hours was also seen.

Answer: 3(h) 29(min).

Question 3

Nearly all responses were correct, but 193, 190.3 and 190.6 were seen a number of times.

Answer: 196.

Question 4

This straightforward percentage question was well done by the majority of candidates. Errors resulted from subtracting 8 from 40 giving 32 or 0.8 or 80%. Careful reading of the question was needed here.

Answer: 20(%).

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Question 5

Most candidates managed to order correctly but it was common to see $\frac{1}{3}$ as the first item, probably resulting from putting the fraction as 0.3 or 0.33. Again careless reading of the question meant the reverse order was seen.

Answer: 33% < $\frac{1}{3}$ < 0.35

Question 6

Some candidates did not include the negative sign but otherwise this question was very well done.

Answer: −9.

Question 7

Most candidates understood standard form and only a few had the 10 small and elevated as displayed on some calculators. Errors were mainly in missing the negative in the power and reducing to the 2-figure 3.6.

Answer: 3.62×10^{-3}

Question 8

The ellipse in the middle rather than a circle confused candidates resulting in infinity being a quite common response. However, most gained the marks in both parts, although 4 was seen in **part (a)** and a lack of understanding rotational symmetry was seen at times in **part (b)** with answers of 180° and 0.

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

Question 9

This was found to be one of the most difficult questions on the paper. Many candidates simply multiplied the fraction by the amount without regard to the question and the fact that the answer needed to be more than the sum quoted. Some who understood what was required unnecessarily approximated the fraction to 0.3 but division by 0.27 would give the method mark. The exact answer was required for full marks.

Answer: ($)1012.

Question 10

It was encouraging that this usually poorly done question was much better this year. The upper limit as 12.4 was rarely seen and there were errors such as 10 and 12 and 10 and 15.

Answer: 11.5 ≤ (h) < 12.5

Question 11

This proportion question was tackled better than **Question 9** but was still not very well done. Some seemed to have little idea of ratio even though this was the most straightforward type of question. Some made progress but just divided by 9 or gave the amount for the brother.

Answer: ($)1.25

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Question 12

Part (a) was not as well done as **part (b)** but overall most candidates got each part correct. $\frac{12}{17}$ was seen in **part (a)** and $\frac{7}{20}$ in **part (b)**. A few candidates changed to decimals or percentages, even though the question asked for fractions.

Answers: **(a)** $\frac{17}{29}$; **(b)** $\frac{13}{20}$.

Question 13

This question was not well done, in most cases due to not halving the base in the area of the triangle. Many had difficulty interpreting the question and made no progress.

Answer: (h =) 13.5

Question 14

In **part (a)** many used the formula for area instead of circumference. Rounding the answer in **(a)** was also seen even though the question specified a full answer. Answer depends on value of pi taken. Many gained the mark for **part (b)** by follow through, although some gave an answer to 1 decimal place or 3 significant figures.

Answers: **(a)** 32.67256(3….) or 32.6768 or 32.656; **(b)** 33(cm).

Question 15

It was clear that many candidates did not understand how to reflect in the line $x = 3$. There were many varieties of lines in which to reflect and an assortment of resulting shapes, though most were parallelograms. A few used $y = 3$ or only completed the left hand side or even from a shear. However, there were a lot of very well drawn, correct parallelograms.

Answer: Ruled parallelogram with vertices (3, 1), (5, 1), (2, 4) and (0, 4).

Question 16

Most candidates understood Pythagoras and applied it correctly, although a few added the side lengths or found the triangle's area. Lack of or incorrect 3 significant figures often lost a mark with 4.5 and 4.45 seen at times. Some candidates forgot to find the square root.

Answer: 4.46

Question 17

Certain questions on the paper required decisions on processes to be made and this one caused difficulties for many candidates. The cost of a pack was often multiplied by 4 and many could not put the alternative methods of purchase into the same units. Some candidates worked on 1 packet and 4 single batteries. Truncating 5.44 to 5.4 too spoiled otherwise correct solutions.

Answer: ($)1.14

Question 18

The factorising question was very well done. There were a some gaining only 1 mark with partial factorisation, with a small minority producing single term answers.

Answer: $3x(2 - 3xy)$.

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Question 19

(a) These were done well, only a few in **part (i)** gave a positive answer. In **(ii)** 576 was seen a number of times due to multiplying before squaring. Most, however, seem to have relied on the calculator to resolve this problem.

(b) Naturally this was not so well done but there were still many correct solutions from applying the rules of indices. Many did not attempt it, however, and numerical answers were much in evidence.

Answers: **(a)(i)** −64; **(ii)** −144; **(b)** z.

Question 20

There were many fully correct answers to the question, but some candidates wrote down their choice from the list without the square root sign. **Part (a)** was often given as $\sqrt{14}$ and **part (c)** as $\sqrt{36}$. It was clear that many did not know the term irrational number. Sadly some candidates did not understand that they were being asked for only one number in each part, and so gave more than one in some parts.

Answers: **(a)** $\sqrt{4}$ or 2; **(b)** $\sqrt{81}$ or 9; **(c)** $\sqrt{64}$ or 8; **(d)** $\sqrt{14}$ or 3.7(4…)

Question 21

Parts (a) and **(b)** were most often correct. Naturally, **part (c)** was not done as well, though there were many who did quote the correct formula. A common incorrect answer was $x + 3$ and many omitted this part.

Answers: **(a)** 25; **(b)** 43; **(c)** $3n + 10$

Question 22

(a) Most candidates read the time through the roadworks correctly but a few answers of 22 minutes, were seen. An answer of 27 was also seen at times.

(b) Many were confused about whether to multiply or divide to find the speed and some of those deciding on division did 12 ÷ 10. A decimal of 0.83 or better was acceptable. **Part (ii)** was often gained by a follow through although division by 60 was seen resulting in a speed in km/h being far less than km/min.

(c) This was poorly done with many inexplicable answers seen. An understandable answer of 70 was common from adding 24, 34 and 12 .

Answers: **(a)** 12; **(b)(i)** 0.83 or $\frac{10}{12}$ or equivalent; **(ii)** 49.8 to 50; **(c)** 46.

Question 23

(a) As referred to in the general comments, many candidates did not seem to understand the difference between simple and compound interest. Although the presentation of the question was a little different, it was clearly stated that A was simple interest and B compound interest. Those who understood this generally could manage this part, but others tried to do year by year adding on the interest. Other errors were to only work out 1 year or quoting the total amount rather than the interest.

(b) This was less well done even by those who had done the first part successfully. Many repeated a simple interest calculation and others subtracted the interest found. Another error was to find a year of interest at a time and add the second year to the original amount instead of the new amount after the first year. However, there were a lot of correct, well developed solutions with many using the compound interest formula, even though not a requirement of the syllabus. Again some found the total amount rather than interest.

Answers: **(a)** ($)1332; **(b)** ($)1350.26

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Question 24

(a) Most, provided they understood vectors were successful on this part, although there were slips made by some in the manipulation of directed numbers.

(b) This was not so well done, although most who attempted it usually gained 1 mark for recording the vector $\begin{pmatrix} -2 \\ 4 \end{pmatrix}$ or plotting the correct position of Q without the vector drawn. Drawing the line from P to (–2, 4) was also a common fault.

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MATHEMATICS

Paper 0580/21
Paper 2 (Extended)

General Comments

The level of the paper was such that almost all candidates were able to demonstrate their knowledge and ability. The paper was again challenging for the most able this year with less candidates scoring over 65 marks and very few scoring full marks. There was no evidence at all that candidates were short of time. The general level of performance was about the same as last year with most candidates finding some questions that they could do. Examiners reported very few candidates who should have been entered for the Core paper although there were still some candidates scoring under 10 marks.

Particular Comments

Question 1

This was generally very well answered but many candidates were only able to state one prime number correctly and then gave an odd number for the other value.

Answer: 53 59

Question 2

This was generally well answered by most candidates. A few tried to use 3 as a denominator and some tried to solve an equation but otherwise most candidates were able to do this question.

Answer: $\frac{11}{18}x$

Question 3

Candidates did not like the percentage being greater than 100% and many Examiners saw evidence that the candidates were inverting the answer in the working. There was some evidence that candidates were not reading the question carefully and some subtraction was taking place before the percentage was calculated.

Answer: 150

Question 4

Part (a) was generally well done but **part (b)** was not well understood. Some candidates repeated the formula in the question and others tried to find a formula from the sequence, not appreciating the connection with the given sequence.

Answers: **(a)** 2870 **(b)** $(n + 3)^2 + 1$

Question 5

Most candidates knew how to do this question but only the more able seemed to be able to round their answer to the nearest cent. It may, however, have been a case of not reading the question carefully for the required accuracy.

Answer : $231.13

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Question 6

This was very well done. The candidates that failed to do well either failed to evaluate the fractions to enough decimal places to compare them or else calculated 698/701 incorrectly.

Answers: $\frac{598}{601}$ $\frac{399}{401}$ $\frac{698}{701}$

Question 7

This question was not well answered, with large numbers of candidates gaining no marks. In **part (a)** truncation and additional zeros were seen. **Part (b)** was even more badly done with either 2 digits only or four zeros after the decimal point being reported by Examiners.

Answers: **(a)** 1045.28 **(b)** 1000

Question 8

Most candidates were able to determine the power of x but less than half the candidates were able to find the constant correctly.

Answer: $9x^2$

Question 9

This was reasonably well answered; the loss of marks was often due to poor arithmetic with the directed numbers. The most common error was a gradient of 2 instead of ½. Many candidates missed the fact that the intercept was given in the question and worked it out with the other co-ordinate. Those not using $y=mx+c$ made a number of errors in trying to simplify the "A" level formula.

Answer: $y = ½x + 5$

Question 10

This topic, of similar shapes, continues to be a problem for most candidates. Very few understood that the connection between volume scale factor and length scale factor is the cube root. Many candidates found the volume of each shape and then found the ratio of the volumes, not realising that they had been given that information in the question.

Answer: radius 18 cm height 42 cm

Question 11

Whilst most candidates understood that this was a cosine rule question, all but the most able were unable to square the lengths correctly or simplify the resulting equation. A very common error was to use the cosine rule as being $a^2 = (b^2 + c^2 - 2bc)\cos A$ even though they had written it down correctly in the first line of working.

Answer: 7.94

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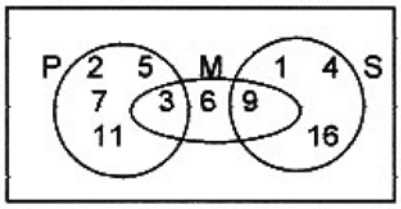
Question 12

Part (a) was generally well done, with a few candidates duplicating numbers in different regions or else omitting the Universal set. **Part (b)** however was very badly done, although it was clear that most knew where the region was. The very common error was to list the elements or else add up the elements. It was not understood by most candidates that the n(*A*) notation means the number of elements in the set *A*.

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



Question 13

This was generally very well done, with most candidates scoring at least 2 marks. The common errors were failing to expand the brackets correctly, omitting the negative sign or more usually failing to reverse the inequality when dividing by a negative number.

Answer: $x < -23.5$

Question 14

The quality of the drawings was unusually poor this year. Usually the bisector was correct but the 2.5 cm line was often too long and drawn all the way across the rectangle. The 1/4 circles were often semicircles and centred on the middle of the window.

Answer:

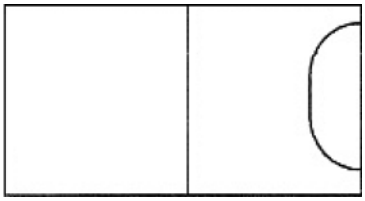


Diagram not to scale

Question 15

This was generally well done. Many candidates made errors in calculation although some managed to produce (3×3) or (1×1) matrices as an answer. Candidates do need to check the expected size of the answer to make sure they have the correct manipulation of rows and columns.

Answer:

$$\begin{pmatrix} -11 \\ -11 \\ -14 \end{pmatrix}$$

Question 16

Most candidates knew exactly what was required in this question. Those that failed to gain full marks lost the marks through careless errors rather than inability to cope with the question.

Answer: (1, 3)

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Question 17

Candidates that were able to set up the correct equation (370 + x) / (500 + x) = 75/100 generally scored full marks. The most common error was to start with (370 + x) / 500 = 75/100. There were some unusual methods employed to solve this question and these were often quite successful.

Answer: 20

Question 18

This was reasonably well answered with most candidates scoring good marks and clearly understanding the question. In **part (a)** a few candidates confused the notation with the inverse function. In **part (b)** some candidates tried to multiply the functions together while others tried to find fg(x). In **part (c)** a very common mistake was to change the sign when transferring the negative term to the other side of their equation.

Answers: (**a)** –14 **(b)** $2x^3–6x^2 + 12x – 9$ **(c)** $\frac{x+1}{2}$

Question 19

The whole question was reasonably well answered but many errors in arithmetic or omissions of key information in the description were seen by Examiners.

In **part (a)(i)** many candidates were guessing what the matrix represented and drawing a corresponding answer. Many thought that it was a rotation and drew a triangle in the 4th quadrant. In **part (ii)** most other candidates decided that it was a reflection and about half of them also got the correct line of reflection. In **part (b)** a number of candidates used simultaneous equations which, while a valid method, is very time consuming and prone to error.

Answers: **(a)(i)** triangle at (–1, –2), (–1, –3), (–3, –2) **(ii)** reflection in $y = –x$ **(b)** $\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$

Question 20

Parts (a) and **(b)** were two of the best answered questions on the paper. A few candidates worked with 80 m and 50 m whilst others worked with 160 – 100 = 60 metres to find an area. Very few candidates used the circumference formula. However the remaining two parts were very badly done with, in **part (c)**, the vast majority trying to convert with a factor of 10^3 or 10^6 instead of 10^9 and in **part (d)** using 2 mm or 2.5 mm instead of 1.5 mm. Quite a large number of candidates ignored the instruction to give answers in standard form.

Answers: **(a)** 12900 **(b)** 23300 **(c) (i)** 2.33×10^{13} **(ii)** 1.55×10^{13}

Question 21

This question was a good discriminator and only the most able scored full marks. Many candidates could not identify the correct angles in either part. Most candidates appreciated that Pythagoras and trigonometry were required and were able to score some part marks. Most candidates understood that the bearing was 180 + an angle.

Answers: **(a)** 11.3 **(b)** 233

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MATHEMATICS

Paper 0580/22
Paper 2 (Extended)

General Comments

The level of the paper was such that almost all candidates were able to demonstrate their knowledge and ability. The paper was again challenging for the most able this year with fewer candidates scoring over 65 marks and very few scoring full marks. There was no evidence at all that candidates were short of time. The general level of performance was about the same as last year with most candidates finding some questions that they could do. Examiners reported very few candidates who should have been entered for the Core paper although there were still some candidates scoring under 10 marks.

Particular Comments

Question 1

This was generally very well answered but many candidates were only able to state one prime number correctly and then gave an odd number for the other value.

Answer: 59 61

Question 2

This was generally well answered by most candidates. A few tried to use 3 as a denominator and some tried to solve an equation but otherwise most candidates were able to do this question.

Answer: $\frac{13}{18}x$

Question 3

Candidates did not like the percentage being greater than 100% and many Examiners saw evidence that the candidates were inverting the answer in the working. There was some evidence that candidates were not reading the question carefully and some subtraction was taking place before the percentage was calculated.

Answer: 140

Question 4

Part (a) was generally well done but **part (b)** was not well understood. Some candidates repeated the formula in the question and others tried to find a formula from the sequence, not appreciating the connection with the given sequence.

Answers: **(a)** 1240 **(b)** $(n + 4)^2 + 1$

Question 5

Most candidates knew how to do this question but only the more able seemed to be able to round their answer to the nearest cent. It may, however, have been a case of not reading the question carefully for the required accuracy.

Answer: $308.41

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Question 6

This was very well done. The candidates that failed to do well either failed to evaluate the fractions to enough decimal places to compare them or else calculated 698/701 incorrectly.

Answers: $\frac{598}{601}$ $\frac{399}{401}$ $\frac{698}{701}$

Question 7

This question was not well answered, with large numbers of candidates gaining no marks. In **part (a)** truncation and additional zeros were seen. **Part (b)** was even more badly done with either 2 digits only or four zeros after the decimal point being reported by Examiners.

Answers: **(a)** 2045.28 **(b)** 2000

Question 8

Most candidates were able to determine the power of x but less than half the candidates were able to find the constant correctly.

Answer: $8x^3$

Question 9

This was reasonably well answered, the loss of marks was often due to poor arithmetic with the directed numbers. The most common error was a gradient of 2 instead of ½. Many candidates missed the fact that the intercept was given in the question and worked it out with the other co-ordinate. Those not using $y=mx+c$ made a number of errors in trying to simplify the "A" level formula.

Answer: $y = ½ x + 7$

Question 10

This topic, of similar shapes, continues to be a problem for most candidates. Very few understood that the connection between volume scale factor and length scale factor is the cube root. Many candidates found the volume of each shape and then found the ratio of the volumes, not realising that they had been given that information in the question.

radius 24 cm height 36 cm

Question 11

Whilst most candidates understood that this was a cosine rule question all but the most able were unable to square the lengths correctly or simplify the resulting equation. A very common error was to use the cosine rule as being $a^2 = (b^2 + c^2 - 2bc)\cos A$ even though they had written it down correctly in the first line of working.

Answer: 7.21

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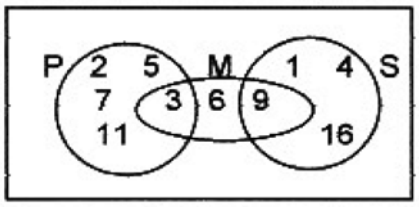
Question 12

Part (a) was generally well done, with a few candidates duplicating numbers in different regions or else omitting the Universal set. **Part (b)** however was very badly done, although it was clear that most knew where the region was. The very common error was to list the elements or else add up the elements. It was not understood by most candidates that the n(*A*) notation means the number of elements in the set *A*.

Answers: **(a)**



(b) 4

Question 13

This was generally very well done, with most candidates scoring at least 2 marks. The common errors were failing to expand the brackets correctly, omitting the negative sign or more usually failing to reverse the inequality when dividing by a negative number.

Answer: $x < -23.5$

Question 14

The quality of the drawings was unusually poor this year. Usually the bisector was correct but the 2.5 cm line was often too long and drawn all the way across the rectangle. The 1/4 circles were often semicircles and centred on the middle of the window.

Answer:

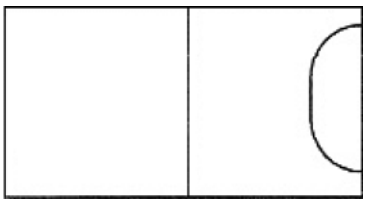


Diagram not to scale

Question 15

This was generally well done. Many candidates made errors in calculation although some managed to produce (3×3) or (1×1) matrices as an answer. Candidates do need to check the expected size of the answer to make sure they have the correct manipulation of rows and columns.

Answer:

$$\begin{pmatrix} -11 \\ -11 \\ -14 \end{pmatrix}$$

Question 16

Most candidates knew exactly what was required in this question. Those that failed to gain full marks lost the marks through careless errors rather than inability to cope with the question.

Answer: (1, 3)

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Question 17

Candidates that were able to set up the correct equation $(370 + x) / (500 + x) = 75/100$ generally scored full marks. The most common error was to start with $(370 + x) / 500 = 75/100$. There were some unusual methods employed to solve this question and these were often quite successful.

Answer: 20

Question 18

This was reasonably well answered with most candidates scoring good marks and clearly understanding the question. In **part (a)** a few candidates confused the notation with the inverse function. In **part (b)** some candidates tried to multiply the functions together while others tried to find $fg(x)$. In **part (c)** a very common mistake was to change the sign when transferring the negative term to the other side of their equation.

Answers: **(a)** –17 **(b)** $2x^3 - 6x^2 + 12x - 17$ **(c)** $\frac{x+3}{2}$

Question 19

The whole question was reasonable well answered but many errors in arithmetic or omissions of key information in the description were seen by Examiners.

In **part (a)(i)** many candidates were guessing what the matrix represented and drawing a corresponding answer. Many thought that it was a rotation and drew a triangle in the 4th quadrant. In **part (ii)** most other candidates decided that it was a reflection and about half of them also got the correct line of reflection. In **part (b)** a number of candidates used simultaneous equations which, while a valid method, is very time consuming and prone to error.

Answers: **(a) (i)** triangle at (–1, –2), (–1, –3), (–3, –2) **(ii)** reflection in $y = -x$ **(b)** $\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$

Question 20

Parts (a) and **(b)** were two of the best answered questions on the paper. A few candidates worked with 80 m and 50 m whilst others worked with 160 – 100 = 60 metres to find an area. Very few candidates used the circumference formula. However the remaining two parts were very badly done with, in **part (c)**, the vast majority trying to convert with a factor of 10^3 or 10^6 instead of 10^9 and in **part (d)** using 2 mm or 2.5 mm instead of 1.5 mm. Quite a large number of candidates ignored the instruction to give answers in standard form.

Answers: **(a)** 12900 **(b)** 23300 **(c)(i)** 2.33×10^{13} **(ii)** 1.55×10^{13}

Question 21

This question was a good discriminator and only the most able scored full marks. Many candidates could not identify the correct angles in either part. Most candidates appreciated that Pythagoras and trigonometry were required and were able to score some part marks. Most candidates understood that the bearing was 180 + an angle.

Answers: **(a)** 11.3 **(b)** 233

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MATHEMATICS

Paper 0580/03
Paper 3 (Core)

This year's paper was felt to be comparable to previous years and gave candidates the opportunity to demonstrate their knowledge of Mathematics in a positive way. The vast majority were able to use the allotted time to good effect and were able to complete the paper to the best of their ability with few questions not attempted. The standard of presentation and amount of working to show the methods used was generally good although as usual there is still room for improvement in this area. Working was considered essential in **Questions 1(a)** , **4(a) (b)** , **6(b)** , **7(a) (b)** and useful in **Questions 1(b) (c)** , **3(a) (b)** , **5(a) (b)** , **6(a)** and **7(c)** . Method marks were available in these questions. **Questions 3**, **5** and **7** proved to be the most demanding whilst **Questions 1**, **2** and **8** were the high scoring questions. A detailed breakdown of individual questions follows.

Question 1

(a) Candidates do need to be aware that if a question asks them to "show that" a result is true, the calculation has to be done as if the result is not known and then a statement of the required result is also written down. Hence both parts of the working, 0.68 450 and 450 + 450 + 306, were required (or the alternative 2.68 450) and not just 1206 – 900 = 306 or 900 + 306 = 1206. The majority of candidates who did use and show an appropriate method did so correctly.

(b) Whilst many ratio questions ask for the individual amounts to be found given the total amount, this question involved finding the total cost and proved more difficult for all but the better candidates. The common error was to divide 1206 by 14

(c) This was generally well answered with only a few candidates making the error of 500 ÷ 9.91.

(d) The addition of a time period seemed to cause confusion for weaker candidates. A significant number used 16 hours 80 minutes instead of the correct value of 1720. A certain number attempted to change the final time to the 12 hour clock system despite this not being a requirement, often leading to incorrect answers of 11.20 am or just 11.20

Answers: **(a)** 1206 correctly shown **(b)** 2814 **(c)** 4955 Yuan **(d)** 2320

Question 2

This question on transformations was not answered as well as expected with many incomplete descriptions.

(a) Translation was recognised by the majority of candidates but a significant number did not know how to describe the movement, with common incorrect values of 4 and -8 seen (obtained by counting squares).

(b) Again the transformation was generally recognised as a reflection but there was confusion over the line of reflection with x-axis, y-axis, $x=0$ and $y=0$ all seen.

(c) This was generally well answered although the centre of rotation was often omitted

(d) Few candidates were able to identify the single transformation required as an enlargement with a negative scale factor, and many attempted a combination of enlargement and rotation but lost the one mark available for an incomplete description.

Answers: **(a)** translation with column vector 2 and -4
(b) reflection in $x=0$ or y-axis
(c) rotation, 90º anticlockwise, about the origin.
(d) enlargement, scale factor of -2, centre of enlargement at (0,0)

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Question 3

(a) (i) Unfortunately a number of candidates failed to appreciate that the additional 20 results had to be added to the tally chart before completing the frequency column. Follow through marks were available for the rest of the question.

(ii) This was generally well answered, particularly with a follow through from **part (i)** allowed.
As in previous years a small number got the three averages of mode, median and mean mixed up.

(iii) This was generally well answered with the mode correctly identified.

(iv) This was less successful with the common errors of 3.5, from 1,2,3,4,5,6 and 9 from 6,8,9,9,11,17 often seen.

(v) A significant number of candidates did not appear to know how to calculate the mean from a frequency table. Common errors were 60/6 and 209/6.

(b) This was reasonably well answered although a number of common errors were seen. These included 5/60 360, 360/5, 360/11, use of 180º and the calculation of percentages rather than angles. The two standard methods of 11/60 360 and the ratio method starting with 60 people "=" 360º were equally used and successful.

Answers: (**a) (i)** 6,17,8,9,11,9 **(ii)** correct bar chart drawn
(iii) 2 **(iv)** 3
(v) 3.48 **(b)** 66º

Question 4

(a) (i) This was generally well answered with the majority of candidates able to show the 2 algebraic steps required to solve the given equation. A small but disappointing number used a trial and improvement method.

(ii) This was slightly less successful with the common error being $y/5 = 2-1$ as the first line of working.

(iii) The majority showed that they knew the correct method to use in order to solve this more advanced equation but unfortunately many made sign errors when multiplying out the brackets or when collecting the like terms.

(b) (i) (ii) This was generally well answered, although a small number were unable to write the given conditions as algebraic equations.

(iii) Those candidates that applied either of the standard methods of elimination or substitution were generally successful though again a disappointing number used trial and improvement.

Answers: **(a)(i)** $x=6$ **(ii)** $y=9$ **(iii)** $z=1.5$
(b)(i) $p+q=12$ **(ii)** $25p+40q=375$ **(iii)** $p=7$, $q=5$

Question 5

(a) (i) Those candidates who were able to recall and then apply the correct formula for the area of a circle were usually successful although 3 figure accuracy was not always used. The full range of incorrect formulae was seen.

(ii) The majority of candidates failed to recognise the connection between **parts (i)** and **(ii)** and resorted, often unsuccessfully, to using the particular formula for the volume of a cylinder (or multiple variations) rather than the generic formula for the volume of a prism.

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(b) (i) The common error here was to simply use the number of tins to calculate the dimensions of the given box. Those who did correctly apply the given radius of 3.7 cm often then forgot to double their previous answer to find the height of the box.

(ii) This was generally well answered, particularly with the follow through values fully credited.

(iii) Again the link with **part (a) (ii)** was not always appreciated and so the simple initial calculation required of 430 12 to find the total volume of the tins was not often seen. Few candidates were able to show a full, clear and correct method.

Answers: **(a) (i)** 43.0 **(ii)** 10
(b) (i) 22.2, 14.8, 20 **(ii)** 6570 **(iii)** 78.5 %

Question 6

(a) (i) This was generally well answered.

(ii) This was generally well answered though a significant number interpreted the isosceles triangle incorrectly by taking *y* to be equal to *x*.

(iii) This was generally less well answered with little evidence of working or method shown.

(b) (i) Candidates need to be aware that if a question asks them to "show that" a result is true, the calculation has to be done as if the result is not known and then a statement of the required result is also written down. Hence both parts of the working, 360÷8 and 180 - 45, were required (or the alternative 6x180 and 1080÷8) and not just a circular argument using the given value of 135. The majority of candidates who did use and show an appropriate method did so correctly.

(ii) Whilst a lot of good attempts at this scale drawing were seen a significant number lost the accuracy mark.

(iii) This was generally measured correctly and accurately.

(iv) This was generally well answered though not all candidates appreciated that **part (iii)** was to be used. Others omitted the ½ from the required formula.

(v) This was generally well answered though again not all candidates appreciated that **part (iv)** was to be used in that the octagon consisted of 8 identical triangles. Others made errors concerned with the scale used.

Answers: (**a) (i)** 63 **(ii)** 54 **(iii)** 134
(b) (i) 360 8 and 180 – 45 or 6 180 and 1080÷8 **(ii)** octagon drawn
(iii) 4.7 to 5.0 **(iv)** 9.6 **(v)** 76.8

Question 7

Data inconsistency within this question led to different answers in **part (b)** though full credit was given for answers following correct working and method.

(a) (i) Candidates do need to be aware that if a question asks them to "show that" a result is true, the calculation has to be done as if the result is not known and then a statement of the required result is also written down. Hence the working tan QPR = 10.3 / 7.2 was required (or any long alternative method) and not just a circular argument using the given values of 55 and 27. The majority of candidates who did use and show an appropriate method did so correctly. A significant number failed to identify that trigonometry was to be used and simply tried to apply angle properties.

(ii) This was generally poorly answered suggesting that the term "bearing" was not well known to candidates. The simple calculation of 180 – 55 was rarely seen or used.

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(b) (i) This was better answered with candidates using the 'angles on a straight line' properties. Those very few candidates who used a correct trig. method leading to an answer of 21º were credited with the mark.

(ii) Again a significant number failed to identify that trigonometry was to be used and simply tried to apply angle properties. Those who used the expected method of applying the sine ratio to get 13.5xsin27 generally did so correctly and scored both marks available. A significant number choose long yet valid methods, often involving a double application of Pythagoras, with the data inconsistency meaning that 4.9, 5.0 or 6.4 could be credited with full marks dependent on the method used and shown.

(iii) This was generally well answered, particularly with full follow through applied.

(c) The common error here was to divide by 4.3

Answers: **(a) (i)** 55º **(ii)** 125º **(b) (i)** 125 – 98 = 27 or 180-55-98 = 27
(ii) 6.13 or alternatives **(iii)** 37.1 **(c)** 8.24 to 8.25

Question 8

(a)(i) The use of "expression" appeared to confuse many candidates with 3x being a very common error.

(ii) This part was slightly better answered with a follow through answer allowed. However, this mark was then often lost by poor and incorrect notation such as x x $x+3$.

(iii) Very few understood the connection between the parts of this question. The common error was to attempt to solve the equation. The required 3 lines of x x $(x+3) = 7$, $x^2 + 3x = 7$, $x^2 + 3x - 7 = 0$ were rarely seen.

(b) (i) This was generally well answered although weaker candidates did encounter problems with the negative values of x used.

(ii) Many good well drawn graphs were seen particularly with follow through plotting credited. As in previous years it was disappointing to see a number of graphs completed with a series of straight lines or a horizontal line joining (-2,-9) to (-1,-9).

(c) (i) This was generally well answered although a significant number were unable to attempt this part despite having a valid graph to use.

(ii) Only the more able candidates were able to see the connection for the length and could relate back to the first part of the question and thus simply add 3 to their positive intersection with the x-axis.

(d) (i) Few correct lines were seen with the common incorrect lines having intercepts of 2 or -2.

(ii) There was limited evidence of $y=mx+c$ being correctly used though $m=2$ and c equal to a follow through intercept were seen and credited with full marks.

Answers: **(a) (i)** $x+3$ **(ii)** $x(x+3)$ **(iii)** correct justification seen
(b) (i) –3,–9,–3 **(ii)** correct graph drawn
(c) (i) 1.6 , -4.6 **(ii)** 4.6
(d) (i) correct line drawn **(ii)** $y = 2x - 3$

Question 9

(a) (i) Most candidates correctly identified the polygon as a pentagon, though a wide range of alternatives was seen including the fivetagon and fiftagon.

(b) (i) This was generally well answered although a small number did not use the scale for the actual length, whilst for others careless measuring led to answers of 60 m.

(ii) Most candidates were able to draw the arcs required to find the point E although again inaccuracies let some down.

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(c) (i) (ii) With the 2 required constructions stated in the question this part was answered reasonably well although a significant number were unable to attempt them. The perpendicular bisector of line *BC* met with more success than the bisector of angle *ABC.*

(d) This was generally well answered by those candidates who had drawn the correct constructions.

(e) This was generally poorly answered with many candidates giving lengths of *PQ* unrelated to the question. The correct width was seen but rarely in the correct position. The most able candidates first bisected *AB* and then found the positions for *P* and *Q*.

Answers: **(a)** pentagon
(b) (i) 61 to 63 m **(ii)** E correctly drawn
(c) (i) (ii) correct constructions seen with correct arcs seen and used.
(d) region M correctly marked
(e) PQ correctly drawn

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MATHEMATICS

Paper 0580/04
Paper 4 (Extended)

GENERAL COMMENTS

There was an attempt to make this year's paper more accessible than recent ones and this aim was achieved. The marks attained by most candidates were considerably higher than last year.

More than half of the candidature scored more than 80 out of 130 and about 70% scored more than half marks. There were many more candidates scoring more than 100. Weak candidates could usually score more than 30.

All ten questions appeared to be within the ability of most candidates and almost all candidates were able to finish the paper.

The presentation of work was generally of a high standard and it is hoped that this will improve further from May 2009, when answers are to be written in the question paper booklet. There are always some candidates who work in two columns on a page and their work can become untidy and crammed, but hopefully they are less likely to do this with next year's new format.

Most candidates showed their working clearly, fully understanding the availability of method marks, even when answers are incorrect. The graph question was well done, with almost all candidates using the correct scale together with the accurate point plotting and graph drawing. Most candidates adhered to the accuracy rules, although there seem to be certain situations which lead to candidates choosing to give an answer to 2 significant figures, when 3 are needed. These will be mentioned in the individual question comments. Efficient use of calculators was demonstrated, especially during calculations of more than one step. However, some candidates approximated too much during the working and lost final accuracy marks.

Quite a number of candidates still cross out working when they think it is incorrect and do not go on and replace it. The best advice is to leave it for the Examiner to mark, as there may be some credit for the method.

A number of candidates seem to overlook the number of marks available for a part question. This was frequently seen in **Question 2(a)(ii)**, which had only 1 mark, as the answer came directly from **part (i)**, but often these candidates did this 1 mark part as though it was a new question. Similarly, if a question carries more marks, then candidates should expect to have quite a bit to do, as was the case in the calculation of a mean from a frequency table in **Question 4**.

Overall, it was pleasing to mark work of candidates who clearly have the potential to go further in mathematics. The basics of algebra were fully demonstrated by good marks in **Question 2** and the ability to interpret situations and apply the appropriate mathematics was demonstrated in several questions.

Difficult areas for candidates were frequency density, areas of similar figures, linear inequalities representing boundaries and algebraic representation of patterns. These topics and one or two small parts of other questions did differentiate between candidates.

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COMMENTS ON INDIVIDUAL QUESTIONS

Question 1

(a) (i) This part was rarely incorrect.

(ii) This was very well answered. Multiplying by 5/52 was seen occasionally, along with a few misreads.

(iii) This was also well done, although many candidates gave the answer to 2 significant figures (which was exceptionally allowed here) and answers of 6% or 106% were also quite common. Another fairly common error was to divide by 2600 instead of 2450.

(b) (i) This was usually correct and there was very little confusion between 8 and 12.

(ii) Those finding 8 and 12 usually went on to find the time, though many confused 7.2 hours and 7 hrs 20 min. Some candidates divided 20 by both speeds then added, and some divided 20 by the sum of the speeds.

(iii) The calculation was usually the correct one, but too many answers were left as 2.77 and, as in **part (a)(iii)** a 2 figure answer was given, which was not given credit in this part. (3 + 2.5)/2 = 2.75 was a very common error.

(iv) This was usually well answered but 4 07(without the pm) and 04 07 were too often seen.

(c) This part was not well answered. Very few candidates showed a full correct method and the answer of 0.25 was the common response, as a result of dividing. Another error was an answer of 4, which was the result of not changing units and doing the division the wrong way round. The overlooking of units was a very common error.

Answers: **(a) (i)** \$250 **(ii)** \$2600 **(iii)** 6.1(2)%
(b) (i) 12 km **(ii)** 7 hours 12 minutes **(iii)** 2.78 km/h **(iv)** 16 07
(c) 25 000

Question 2

(a) Most candidates scored all 3 marks, with the pair of numbers with a product of –20 and sum of –1 being easily found. Quite a number of candidates found the factors in **part (i)** and then used the formula to get the solutions in **part (ii)** for just one mark. A few used the formula to find the solutions to find the factors and a few others had sign errors in the factors.

(b) The use of the quadratic formula was generally well done, although $(–2)^2$ caused problems, usually because of a lack of care in how things are written. It is pleasing to report that most candidates, but not all, gave their answers to the required accuracy and there were fewer candidates who had a short line in the formula. There were still some candidates who failed to quote the correct formula and some of the weaker candidates seemed to try to solve the equation by re-arranging it into $3x^2 = 2x + 2$ and somehow finding an answer. A small number of candidates used the method of completing the square and were usually successful as they tended to be the stronger candidates.

(c) (i) This was generally well answered, although a surprising number of candidates gave the answer of $(m – 2n)^2$.

(ii) This was very well answered, almost always by substituting into the formula and not spotting the difference of two squares leading to $10 \times – 1.2 = – 12$.

(iii) This part proved to be more difficult than expected. $(2x + 3)^2$ was frequently seen as $4x^2 + 9$ and $(x – 1)^2$ as x^2 + (or –) 1. Multiplying the second expansion by –4 brought about many sign errors. Even from those who reached $20x + 5$, quite a number gave a final answer of $4x + 1$. Quite a few candidates created an equation by putting the expression equal to a value, usually 0.

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(iv) The transformation of quite a complicated formula would have been expected to have been more difficult than expanding brackets but there was much more success in this part than **(iii)**. However there were frequent errors of taking the square root of separate parts of an equation and losing the negative sign from the 4. $\sqrt{y} = m - 2n$ was quite a common error made by the weaker candidates and many of the better candidates only took the square root of the numerator in the last step.

(d) (i) This was very well answered, although 16 was quite a common answer.

(ii) Most candidates could partially factorise, realising the connection with **part (i)**, but very few connected one of the factors at this stage with their answer to **part (c)(i)**. Some candidates tried to factorise using fractional indices.

Answers: **(a) (i)** $(x+4)(x-5)$ **(ii)** $-4, 5$
(b) $-0.55, 1.22$

(c) (i) $(m-2n)(m+2n)$ **(ii)** -12 **(iii)** $20x + 5$ **(iv)** $n = \sqrt{\dfrac{m^2 - y}{4}}$

(d) (i) 4 or -4 **(ii)** $n(m-2n)(m+2n)(m^2+4n^2)$

Question 3

(a) (i) There were very few incorrect answers to this part.

(ii) This was also very well answered. It was clear that the tree diagram was helpful at this stage.

(iii) This part caused more difficulty, as there was confusion over what to do with the two products.

In both **parts (a)(ii)** and **(iii)** there were some surprising weaknesses in multiplying and adding fractions, which undermined the knowledge of the more advanced concepts of probability.

(b) Many candidates did not know enough to tackle these parts. There were trivial answers as though only one ball had to be picked out. The fact that no diagram was given seemed to cause more problems in understanding the situation of the question

(i) Many candidates could not find the correct 3 fractions, with all three denominators often being 10. Some of those who did find them chose to add.

(ii) Many candidates did not see the connection between the 2 parts and must have overlooked that this part only carried one mark. Some attempted to find the probabilities of all the events with at least one green ball, usually omitting at least one of them. Also 0.7 × 0.7 × 0.7 and simply 0.7 were quite common.

Answers: **(a) (i)** $\frac{1}{3}, \frac{3}{8}, \frac{6}{8}, \frac{2}{8}$ **(ii)** $\frac{5}{12}$ **(iii)** $\frac{2}{3}$
(b) (i) $\frac{1}{120}$ **(ii)** $\frac{119}{120}$

Question 4

(a) All four parts were very well answered, although 180 was often seen as the answer to **(iv)**. Some weaker candidates gave the median as 100, the upper quartile as 150 and the inter-quartile range as 150 – 50 = 100.

(b) (i) This was usually well answered. There were some incorrect answers but they usually added up to 20, though some values of p and q defied logical explanation.

(ii) The calculation of an estimate of the mean was well answered as usual. The main error seen was using the upper class boundary (or even the interval width) instead of mid-values. There were a few candidates who added or even subtracted 0.5 to or from the mid-value, when the table clearly showed continuous data with inequalities leaving no gaps. Answers of 36 were sometimes seen, which were accepted for full marks, if some correct working preceded the answer, but without any working scored zero since the median was also 36. Candidates are strongly advised to show their

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methods and not just run numbers through their calculator and only give an answer. Weaker candidates produced the usual errors of using upper boundaries or interval widths or even dividing the sum of the frequencies by the number of intervals.

(c) There was an improvement seen in this challenging part of the syllabus. More candidates seemed to understand frequency density and gained full marks. Many only had the answer of 11.4 correct, by simply comparing with the given value. In a number of cases, the candidates' thinking was really very muddled, and their working was impossible to understand. Answers of 24.6, 11.4 and 15 were common and, to a lesser extent, frequency densities were given as answers. Premature approximation in working proved to be expensive for several candidates when at least two of their answers were outside the accepted accuracy.

Answers: **(a) (i)** 36 **(ii)** 50 **(iii)** 29 **(iv)** 20
(b) (i) 16, 4 **(ii)** 36.1
(c) 8.2, 11.4, 5

Question 5

(a) This question was answered more successfully than anticipated, with many candidates realising that they must use the information given about the regular polygon and not assume what they are trying to prove. On occasions the 1080° appeared without explanation, probably from multiplying the given 135° by 8. Also, the initial assumption that APH was 90 was a common problem, but many recovered from this in **(ii).**

(b) In recent papers, the mensuration question has often been found to be difficult but it is pleasing to report that this question was a good source of marks, with many candidates achieving the maximum score. There were rounding errors and 2 significant answers given in several parts, especially **part (i)**. Candidates should be more aware of the risks of using rounded answers in later working. Most candidates used the shortest methods to find *PQ* and the area of triangle *APH* but many did not use the structure of the whole of **part (b)** to be guided into subtracting the four triangles *APH* from the square in the diagram. The regular polygon was divided in several different ways and it was often difficult to see what candidates had done as all that was shown was a series of calculations without explanations or diagrams. The better candidates did provide explanations of their working and such an approach usually led to a fully correct answer. Eight times the area of triangle *OBA* was an efficient alternative method and this had the advantage of having the radius for **part (c);** but using rectangles and trapezia often led to errors and such long methods were far too long for the three marks to be gained in this part. One concern was the attempt to trivialise the question by assuming, in **part (i)**, that PH was either 12 or 6. When trying to find the area of the triangle, some candidates used trigonometry or Pythagoras and obtained a value for *AP* to be totally different from their *PH*.

(c) It was pleasing to see that weaker candidates were often still picking up marks at this stage of the question, earning marks in both parts. Common errors included using an area previously found equal to the area of a circle and finding the radius from this and, in **part (ii)**, finding the difference in the areas as a percentage of the area of the pentagon. Another error was to use *OA* as the radius, thus finding the area of the circumcircle of the polygon.

Answers: **(b) (i)** 8.49 cm **(ii)** 29.0 cm **(iii)** 36 cm^2 **(iv)** 695 cm^2
(c) (i) 14.5 cm **(ii)** 94.8%

Question 6

(a) This part was found to be very straightforward and was very well answered. Occasionally the answers to the two parts were not identical and 2 by 2 matrices sometimes seen. The main problem was incorrect notation and it is worth pointing out that the question asked for column vectors and, although other correct vector forms were accepted this time, candidates should be careful in giving answers in the required form. Co-ordinates and 'fractions' inside a pair of brackets were not accepted.

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(b) This part was also very well answered. Occasionally, either type or detail was not given although mis-spellings were generally tolerated. Translocation, however, should not be used. Descriptions such as 4 units vertically down were accepted but, as in **part (i)**, the most appropriate form was a column vector. Some candidates thought that it was a reflection in the line $y = 0.5x + 2$ and a common error from those who knew it was a translation was to give a y – component of 4 instead of – 4.

(c) This was one of the few parts of the whole paper found to be difficult, but it gave the stronger candidates the chance to show what they could do. There were mixed responses with some omitting this part. However most candidates appreciated that *OA* and *CD* were the most straightforward inequalities and wrote these down correctly. The expected errors were seen frequently, which included getting the x and y the 'wrong way round' and writing down the incorrect inequality sign. Many candidates found it difficult to write down the equation for *OD*. Many of these failed to associate the given inequality with *BC* (quite a number gave this as one of their four answers). Thus they did not use the fact that the *OD* is parallel to *BC* to help them write down the equation of *OD* and often were not able to give the gradient directly from the diagram. Many candidates also found the equation of *AB* difficult. The most common error was $y \leq -2x + 4$. As with the first two inequalities the 'reversed' inequalities were seen regularly for *OD* and *AB*. Some candidates simply gave a list of inequalities all in the form $y = mx + c$ and no simpler ones.

Answers: **(a) (i)** $\begin{pmatrix} 2 \\ 1 \end{pmatrix}$ **(ii)** $\begin{pmatrix} 2 \\ 1 \end{pmatrix}$

(b) Translation $\begin{pmatrix} 0 \\ -4 \end{pmatrix}$

(c) $y \geq 0,\ x \leq 2,\ y \geq \frac{1}{2}x,\ y \leq 2x + 4$

Question 7

(a) There was an error on the paper in this part and CIE apologises for this. The angle (*BCT*) of 40° both in the diagram and in the stem of the question should have been 45°. If centres plan to use this question as part of candidate exam practice, this angle should be corrected.

As a result of this, the mark scheme included lists of possible answers, depending on how candidates did the several parts. Fortunately, almost all candidates did do the question without realising there was a problem and picked up most of the marks in this part. However, all scripts of candidates who seemed to be affected by this part of the question were looked at very closely and even answers not shown below were considered. Many candidates gave an obtuse angle in part **(iv)** where a reflex angle was required. The answers given below are based on angle *BCT* being 40°, 45° or even 50° (for those candidates who did not do **part (ii)** in the order expected). The most common set of answers in **part (ii)** was $x = 40°$, $y = 25°$ and $z = 115°$. In **part (iii)** the usual answers were 80° or 90° and in **part (iv)** the common answers were 230° or 130°.

A surprising number of candidates did not know the word cyclic or concyclic.

(b) (i) This was well answered, although "proportional" and "congruent" were seen regularly.

(ii) Many candidates successfully displayed the use of the square of the ratio, but nevertheless, 14 was a very common incorrect answer. The correct answer usually came from the expected method, but doing (iii) first was seen quite regularly.

(iii) This was generally well answered, although often omitted, probably through not realising that the length required was the height of the triangle whose area was given.

Answers: **(a)(i)** cyclic **(ii)** x any one of 40°, 45°, 50°
y any one of 20°, 25°, 30°
z any one of 105°, 110°, 115°

(iii) any one of 80°, 85°, 90°

(iv) any one of 210°, 215°, 220°, 225°, 230°

(b)(i) similar **(ii)** 9.8 cm^2 **(iii)** 4 cm

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Question 8

This question was not typical of graph questions on recent papers as it addressed a topic from another syllabus area and not simply algebraic functions. In spite of this, the question was generally well done by almost all candidates, who are to be complimented on reading and interpreting the information given in the question. Many candidates scored full marks.

(a) This was generally well answered, although simple interest was a frequent error. Many candidates had read through the whole question and used the formula given in **part (b)**. Those who did use simple interest were able to do the rest of the question.

(b) This was very well answered.

(c) Scale errors were rare, although scale reading was careless at times; consequently there were quite a number of incorrect points plotted. These errors did not usually affect the shape of the curve or the answers in following parts. Most candidates scored the mark for a good curve. There were still centres using 1 mm graph paper and it must be pointed out that this is a disadvantage to the candidates.

(d) Both parts were usually well answered but a common error in **part (ii)** was not giving the answer as an integer.

(e) (i) Most candidates were able to demonstrate the use of simple interest, either by using the formula or by clearly showing a percentage calculation. Others somehow contrived methods to arrive at \$240.

(ii) This was usually successfully answered, although \$480 was quite a common misunderstanding.

(iii) Full marks in this part depended on a correct **(ii)**, although there was a mark for plotting the points. Many of the candidates who had 3 correct points drew a freehand line.

(f) This mark was usually gained by those who had drawn the two graphs accurately.

Answers: **(a)** \$108.16 **(b)** \$148, \$324
(d) (i) \$265 – 270 **(ii)** 17 or 18
(e) (ii) \$380 **(f)** 27 – 29

Question 9

This was perhaps the most disappointing question on the paper with many candidates apparently ill-prepared for tackling vector question with reasonably straightforward parts. The concept of direction seemed to be beyond a large number of candidates.

(a) The first three parts were reasonably well answered (although there were quite a number of sign errors), but the position vector in **part (iv)** was often $0.5r$ or simply not attempted or even put into a column form. Candidates seemed to think that the request for a position vector meant it had to be in a different form. As in **Question 6**, it is important to stress the notation of vectors and this particular question was not about column vectors.

(b) (i) This was quite well done, but failing to use brackets was a common error as was $\frac{3}{2}$ + their answer to **(a)(iii)**. A correct expression still with $\frac{3}{2}$ in front of a pair of brackets was accepted as an answer in this part.

(ii) This part proved to be much more difficult as candidates failed to connect previous parts. Expressions tended to appear from nowhere, with routes rarely given. It is worth noting that a correctly stated route usually gains a method mark. The instruction about simplest form was occasionally ignored, leading to the loss of a mark here and again in **part (c)**.

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(c) Although the answer was "straight line" or a similar statement, it did need to come from an appropriate answer from **part (b)**, i.e. a multiple of the vector **p**, and not be just a guess. A common error was to state that there were parallel lines.

Answers: **(a) (i)** $\mathbf{p} + \mathbf{r}$ **(ii)** $-\mathbf{p} + \mathbf{r}$ **(iii)** $-\mathbf{p} + \frac{2}{3}\mathbf{r}$ **(iv)** $\mathbf{p} + \frac{1}{2}\mathbf{r}$

(b) (i) $\frac{3}{2}(-\mathbf{p} + \frac{2}{3}\mathbf{r})$ or $-\frac{3}{2}\mathbf{p} + \mathbf{r}$ **(ii)** $-\frac{3}{2}\mathbf{p}$

(c) lie on a straight line

Question 10

There was quite a lot of reading for candidates but even the weaker candidates were able to pick up several easy marks for the numerical answers. There seemed to be candidates with little experience of investigative questions, although the structure provided did help many.

(a) Both parts on understanding a table and performing simple calculations were very well answered.

(b) (i) Candidates who connected the relationships between the numbers in **part (a)** were usually correct in this part but quite a common error was to make up expressions in terms of x, which only worked for x equal to 8. Some answers included another variable.

(ii) and **(iii)** Solutions were often either numeric or partially numeric. Able candidates were able to fully simplify algebraic expressions (although there were often sign errors), but others were using calculations to arrive at 4 and 24.

(c) This was usually well answered but not quite as well as **part (a)**, because many thought **(ii)** was 24 again.

(d) (i) This part was well answered as many had by now realised that this constant would always be 4.

(ii) This was, as anticipated, the most challenging part of **Question 10**, and only the stronger candidates were successful. Those who had not succeeded in **part (b)** were not going to obtain expressions here.

(iii) Those who had correct answers in **part (ii)** succeeded in this part, as did others who had spotted the pattern, even though their algebra in **parts (b)** and **(d)(ii)** was incorrect. Guesses of 20 or 24 were quite frequent.

However many candidates omitted the whole of **part (d)**.

Answers: **(a) (i)** 4 **(ii)** 24

(b) (i) $x+12, x+14$

(c) (i) 4 **(ii)** 20

(d) (i) 4 **(ii)** $x+2n, x+2n+2$ **(iii)** $4n$

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