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MATHEMATICS

Papers 0580/01 and 0581/01

Paper 1 (Core)

General comments

Overall, candidates tackled the paper well again this year and nearly all have shown some understanding of the subject. The clear presentation of work including methods where appropriate are important, even on this short answer paper. While improvement was evident the importance of clear presentation cannot be too strongly emphasised. Candidates should pay attention to the marks awarded for a question or part of a question. When this is just 1 mark, little or no working is expected, while 2 or more marks suggests that a correct method, even if seen with a wrong answer, could well achieve at least 1 mark.

In using calculators for trigonometry there seems to have been quite a number of candidates this year having grad or rad mode instead of deg mode. Centres should encourage candidates to check their calculators prior to each examination.

Although this paper has relatively little writing in the questions, candidates need to read them carefully. Marks were lost many times particularly in **Questions 11**, **18** and **21** by candidates not reading the question carefully.

Part of a basic mathematics course involves knowing terminology and there was considerable lack of knowledge of this in **Questions 1**, **6**, **13**, **15** and **19**.

There was no evidence of candidates in general being short of time. It was also felt that while there were no exceptionally easy questions for which virtually all candidates gained full marks, neither were there any questions that proved to be beyond the ability of candidates at this level.

Comments on specific questions

Question 1

The question was surprisingly poorly done. Although most candidates rounded the fourth figure to a '3', the three required zeros were often missed off.

Answer: 139 3000.

Question 2

Most candidates achieved the correct solution for the probability. A denominator of 60 was, however, seen at times. Cancelling of the fraction to its simplest form was not necessary to achieve full marks in this case.

Answer: $\frac{9}{30}$ or equivalent fraction, decimal or percentage.

Question 3

This question was very well done although some candidates calculated 20% of 50.

Answer. 40.

Question 4

Ratio with mixed units caused considerable difficulties. Common errors were taking 1 kilogram to be 100 grams and not attempting to change to a common unit. Only a small number of those who managed to overcome those difficulties succeeded in cancelling to the simplest form, which required integer values. Only a small number of candidates attempted 1: *n* or *n*: 1 form.

Answer. 35 : 8.

Question 5

Many candidates realised that 64 came into the answer, but could not correctly interpret the negative index. A common error was to multiply 4 by 3 (or –3). No credit was given for a decimal answer.

Answer. $\frac{1}{64}$.

Question 6

(a) This was usually correct although there was some confusion between factors and multiples.

(b) There was less success on this part indicating a widespread lack of knowledge of the term 'prime factor'. It was common in both parts to see more than one answer given. Candidates need to realise that '**a** multiple' and '**a** prime factor' coupled with only one mark each indicates that there is only one answer.

Answers: **(a)** 12; **(b)** 3.

Question 7

Most candidates were unable to interpret the question and many simply multiplied $\frac{4}{9}$ by 28. Those who did the correct method usually scored the 2 marks, but some introduced an accuracy error by premature rounding if expressing $\frac{4}{9}$ as a decimal. Another error was to interpret \$28 as the whole amount.

Answer: 63.

Question 8

Many candidates gained credit on this question, more often for –27 rather than +18. Although the value of *x* allowed a straightforward calculation, careful use of the scientific calculator could have eliminated the sign errors.

Answer: –9.

Question 9

Responses to inequality questions are improving but there are still many who do not appear to understand the topic. The lower value was often given as 10, the higher as 264 and there were cases of reversed answers.

Answer: $255 \leqslant$ weight < 265.

Question 10

Most candidates realised that sine was to be used and many correct answers were seen. The numbers 12 and 16 were occasionally interchanged and the word 'difference' was sometimes interpreted as if a subtraction was required after '*h*' had been found. An answer of 3.3 without working could not be given credit since $16\sin 12°$ also gives 3.3 to 2 significant figures.

Answer: 3.31.

Question 11

In 2006 the topic of compound interest is on the syllabus. A significant number of candidates attempted it this year. Otherwise this question was well done, although many gave the amount after 3 years as opposed to the requested interest.

Answer: 900.

Question 12

Changing the subject of a formula usually presents difficulties for candidates but this was answered well this year. At Core Level only a very simple change of subject, usually involving only two steps is required; many tried to make this one too complex.

Answer: $(p + q)/t$ or $\frac{p+q}{t}$.

Question 13

(a) Giving a choice of terms resulted in many more correct answers in part **(a)** although many candidates chose either congruent or isosceles.

(b) It seemed that many candidates did not understand the 3-letter notation for an angle, a number of responses were the given angle of 35°. 'not to scale' is an indication that the diagram is not sufficiently accurate to find answers by measurement. However, the diagram is still quite close to the correct size, and candidates should have realised that the required angle is between 90° and 180°.

Answers: **(a)** Similar; **(b)** 145°.

Question 14

The vast majority of candidates found the radius and substituted it correctly into the formula. Unfortunately many then squared at the wrong point, having found πr first.

Answer: Rounds to 1410.

Question 15

(a) This was intended as a hint for part **(b)** and was in the main well answered, apart from the confusion with factors by some candidates.

(b) Working was essential for any marks. A correct attempt at equivalent fractions was needed. Answers without working or decimals did not gain credit.

Answers: **(a)** Any multiple of 24; **(b)** $\frac{11}{24}$.

Question 16

(a) This was almost universally correct; the only slight confusion was to put 27 in the answer space. This was not penalised if the correct answer was seen in the sequence.

(b) Most candidates were able to deduce this term, some recognising the nature of the sequence and others by listing the terms.

(c) The finding of the formula tended to be done successfully by the more able candidates. $n + 4$ was a common wrong answer. Practice in investigational project work would help many more candidates to succeed in this algebraic topic.

Answers: **(a)** 23; **(b)** 43; **(c)** $4n + 3$.

Question 17

(a) The most common error was to give the last term as –12 rather than +12 when expanding the bracket. Also it was common to see the expression $7x + 3x – 5 + 12$ after the correct $7x + 5 – 3x + 12$.

(b) This was more successful but many candidates produced a more complex expression. The 1 mark awarded suggests only one step needed.

Answers: **(a)** $4x + 17$; **(b)** $x(5x – 7)$.

Question 18

The question was done well but not as well as expected. Careful reading was needed to interpret correctly the three stages of multiply, add and then subtract from $5. There were a significant number of candidates who ignored finding the cost of the bananas and yams and simply subtracted $1.25 from $5. Also seen often were responses only finding the amount spent. There was also confusion over cents and dollars.

Answer: 2.45.

Question 19

(a) The numbers were chosen to give a straightforward start to this question, which most achieved provided they understood significant figures. Truncating rather than rounding was done a number of times. Unfortunately the second part was not done well. The answer 7 was very common, from $9 – 3 \times 2 \div 3$ most often presumably from using a calculator.

(b) Understandably, the answer 6.89 was common following from an incorrect **(a)(ii)**, but many getting that part correct were still satisfied with that answer in the final part. Other incorrect answers seemed to have no similarity to the previous correct or incorrect answer.

Answers: **(a)(i)** $\frac{9 – 3 \times 2}{3}$, **(ii)** 1; **(b)** 1.01.

Question 20

(a) This was done well with most achieving the correct answer.

(b) Few candidates showed working for this part but many still achieved the correct answer. Only a few ignored the instruction to give a whole number, but there were many answers of very large numbers totally impossible to the situation, which used actual areas correct to 3 significant figures.

Answers: **(a)** Panama, (Guyana), Colombia, Brazil; **(b)** 5.

Question 21

(a) Most candidates found 35% of $16 but then many wanted to change the question to what they expected; ‘how much did he pay?’

(b) This caused confusion and there were a great variety of answers, some more than the original cost. Common wrong ones were $8 and 35% of $8.

Answers: **(a)** 5.60; **(b)** 2.40.

Question 22

(a) It was expected that candidates would simply double the distance for the first half-hour, but this was not common. Many did gain 1 mark for a sensible interpretation of distance divided by time and the part was better than the equivalent question on previous papers.

(b) Most candidates correctly interpreted the scale of the graph.

(c) The line on the graph was not well done with the most common error being a line from (8.00, 0) to (9.00, 12). Other attempts produced lines seemingly having no connection with the speed given in the question, or not starting at 8.00 am.

(d) This was often gained by following through an incorrect line but many of those showing the two arriving at the same time gave a variety of answers for the time difference. Some candidates managed to work out a correct answer even though their graph was incorrect.

Answers: **(a)** 10; **(b)** 20; **(c)** Straight line from 8 00 through a point between (8 45, 12) and (8 50, 12); **(d)** 10 < time < 15.

Question 23

This question was very well done and many candidates showed a clear understanding.

(a) Although not to scale the diagram clearly suggests the answer, although some candidates did not seem to understand the three-letter notation for the angle.

(b) Some candidates interpreted triangle *CDE* as isosceles, which produced errors, but again most were correct.

(c) Follow-through marks or starting again often produced the marks for candidates who had not gained marks on the previous parts.

Answers: **(a)** 90; **(b)** 65; **(c)** 25.

Papers 0580/02 and 0581/02

Paper 2 (Extended)

General comments

The level of the paper was such that most candidates were able to demonstrate their knowledge and ability. Less than 1% of the candidates scored under 10 marks but concern was expressed by Examiners at the continuing number of candidates who lose marks as a result of not working to the required degree of accuracy. The paper was slightly less challenging this year with a large number of candidates scoring over 65 marks and many scoring full marks. There was no evidence at all that candidates were short of time.

Comments on specific questions

Question 1

This was generally well answered but a large number of candidates gave their answer to part **(b)** to 2 significant figures.

Answers: **(a)** 25/32; **(b)** 0.781.

Question 2

This was very well answered but a large number of candidates again failed to work with sufficient accuracy.

Answer: 0.276.

Question 3

Most candidates were able to attempt this question but some, who knew what to do, failed to write their answers in the formal, correct, standard form notation.

Answers: **(a)** 0.016; **(b)** 1.6×10^{-2}.

Question 4

Most candidates knew what was required but many rounded their answers and failed to achieve the exact value.

Answer: 1.

Question 5

This question seemed to be very challenging. Many candidates did not take account of the colouring when assessing the rotational symmetry and an extra horizontal line was very common in the line symmetry.

Answers: **(a)** 3; **(b)** 3 lines.

Question 6

Candidate response to this question was very varied with many mistakes in the lengths of the sides of the right-angled triangles. Also, the accuracy problem was evident again in this question with premature approximation preventing candidates scoring in part **(b)**.

Answers: **(a)** 5.66; **(b)** 32.

Question 7

This question was generally well answered. There appears to be a common misconception that the upper bound is 22.4 instead of 22.5. The lower bound was usually correct.

Answers: **(a)** 21.5, 22.5; **(b)** 172.

Question 8

This question was very well done, even by low scoring candidates. Those attempting the substitution method had the most difficulty.

Answers: $x = 8$, $y = 6$.

Question 9

Many candidates confused inverse and direct proportion. Many candidates failed to achieve an equation connecting f and w.

Answers: **(a)** $fw = 300000$; **(b)** 500.

Question 10

This question was not very well answered with many candidates ignoring the instruction that 1 is not prime or assuming that 2 is not prime or including 9 as a prime number. There are still a number of candidates giving their answer as a ratio or a percentage.

Answers: **(a)** 8/19; **(b)** 7/18.

Question 11

Examiners reported varied responses to this question. Many Centres had large numbers of candidates scoring high marks whilst other Examiners were reporting a very poor response and often no marks from other Centres.

Answer: 2 8 4 7.

Question 12

Most candidates could answer part **(a)** but very few candidates could manipulate the matrices correctly to find $\mathbf{M}^2$.

Answers: **(a)** $\begin{pmatrix} 2x & 4x \\ 4x & 2x \end{pmatrix}$; **(b)** $\begin{pmatrix} 5x^2 & 4x^2 \\ 4x^2 & 5x^2 \end{pmatrix}$.

Question 13

This was generally very well done. Part **(b)** caused the most difficulty and despite this most candidates were able to answer parts **(c)** and **(d)**, presumably by continuing the series. It is essential that candidates can interpret the *n*th term of a series.

Answers: **(a)** 8 11 14; **(b)** $3n + 2$; **(c)** 182; **(d)** 29.

Question 14

This question differentiated well between most candidates and the very able. Most candidates were able to answer part **(a)** but very few candidates were able to answer part **(b)** correctly. The common error was to divide 310000 by 62000 instead of 248000 by 62000.

Answers: **(a)** 20; **(b)** 400.

Question 15

Another question which separated the most able candidates from the rest. Many candidates could answer part **(a)** correctly but were unable to complete part **(b)**.

Answers: **(a)** 1.5; **(b)** $y = 1.5x - 7$.

Question 16

Candidates scored some marks on this question but the inability to expand $(x + 2)^2$ correctly or the incorrect cancellation of terms prevented most candidates scoring full marks.

Answer: $\frac{4(x+1)}{x(x+2)}$.

Question 17

This was generally well answered with very few candidates failing to score marks. However, the use of 19 instead of 7 was common. Many candidates did not relate the negative sign to the actual problem but commented on the structure of the sine curve.

Answers: **(a)** 0; **(b)** –1.5; **(c)** below the height at midday.

Question 18

Very varied response from candidates. Part **(a)** was usually correct but in part **(b)** many candidates failed to identify the branches required and add them.

Answers: **(a)** 0.4, 0.3, 0.3; **(b)** 0.46.

Question 19

Part **(a)** was generally well done but with a substantial number of candidates misreading 1.2 as 12. In part **(b)** there were many candidates treating this as an equation and a very common answer was $x = -1$. There were also a large number of candidates rearranging the inequality in the wrong order.

Answers: **(a)** –12; **(b)** $x > -1$.

Question 20

Once again candidates were often only working to 2 significant figures. In general this was a good discriminator between candidates. There were some errors connected with the angle *WAG* which was required for the bearing.

Answers: **(a)** 232; **(b)** 175.

Question 21

This was generally well done. The common error in part **(a)** was to assume that angle *AOC* = angle *ACB*. In part **(b)** the common errors were to find the length *AB* and the area of the triangle.

Answers: **(a)** 20, 70; **(b)** 3.49, 8.73.

Papers 0580/03 and 0581/03

Paper 3 (Core)

General comments

A large proportion of candidates scored more than 50%, so the paper was showing achievement. Most papers were well presented and legibly written, though there were the inevitable few who filled up every space with work that was untidy, making it difficult to award marks when the answer was wrong. *Some candidates lost marks for showing no working – no credit can be given for a wrong answer, but correct working when shown can earn marks.*

Comments on specific questions

Section A

Question 1

(a) Most candidates made a good start, and almost all obtained the correct answer 2.8.

(b) Again, most candidates gave the correct answer of £106.50, though a few divided by 0.71, instead of multiplying.

(c) Apart from those candidates who assumed that there are 100 minutes in an hour, most achieved the two correct answers here of 1040 and 1 hour 30 minutes.

(d) A common wrong answer seen here was the time of 0155 instead of 1355.

(e) Many candidates evaluated this correctly, giving the answer 357, though an appreciable number evaluated 15% and gave 63 as their answer.

Answers: **(a)** 2.8; **(b)** 106.50; **(c)(i)** 1040, **(ii)** 1 h 30 mins; **(d)** 1355; **(e)** 357.

Question 2

(a) This was generally correctly evaluated, although common errors were $x = -1$, $y = 0$ and $x = -1$, $y = -1$.

(b) The points were generally correctly plotted particularly with follow-through allowed. A minority lost accuracy due to mis-use of the given scale on the axes. The drawing of a smooth curve was less successful with a small minority of candidates joining their plotted points in a series of straight lines.

(c) Those candidates who recognised that the solutions were obtained from the intersection at the curve with the *x*-axis were generally successful, although the negative sign was often omitted. A significant number were unable to answer this part, whilst others attempted to solve the given quadratic equation.

(d) The majority of candidates were able to draw the correct line of symmetry. Identifying the equation of this line was less successful with common errors being $x = 0$, y = 1, co-ordinates (2, 1) only, or attempting a quadratic form.

Answers: **(a)** –2, 1, 2, –7; **(c)** –0.4, 2.4; **(d)(ii)** $x = 1$.

Question 3

(a) A common wrong answer was to give the Sunday temperatures as 5 and 2, and some continued this into the graph, making the minimum higher than the maximum! The difference between the Thursday temperatures was often given wrongly as 5, and occasionally as 10 (perhaps stepping through 0 twice?). The correct answer is, of course, 9.

(b) Usually both marks were earned for the drawing.

(c) Again most candidates gave the correct answers here; allowance was made for those whose minimum Sunday temperature was positive, so that they were not penalised again for an initial error.

(d) This was poorly done. Many candidates were not able to substitute for C, and simply evaluated $\frac{9}{5} + 32$.

Answers: **(a)(i)** –3 9, **(ii)** 9; **(c)(i)** 3, **(ii)** Sunday; **(d)** 42.8.

Question 4

(a)(b) The translation vectors were generally correctly calculated, although the negative signs sometimes caused errors. Unfortunately the drawings were often drawn half-scale although this was only penalised by the loss of one accuracy mark. A small number of candidates interchanged the directions. The other common error was to start the translated shape at co-ordinates (3, –1) and (–2, 2).

(c) The majority of candidates correctly identified the single transformation of enlargement but a significant number failed to fully describe it and omitted either the scale factor or the centre of enlargement.

(d) The majority correctly identified the number of lines of symmetry and the order of rotational symmetry. The rotation required was normally correctly drawn, although common errors were drawing rotations of 90° or 180° about the point (0, 0.5).

Part **(iv)** was less successful with a number of candidates using a combination of transformations. When the single reflection was recognised often the line of reflection was incorrect.

Answers: **(a)** $\begin{pmatrix} 3 \\ -1 \end{pmatrix}$; **(b)** $\begin{pmatrix} -2 \\ 2 \end{pmatrix}$; **(c)** enlargement, SF = 2, centre (0, 0); **(d)(i)** 1, **(ii)** 1, **(iv)** Reflection in $y = 0$.

Question 5

(a) Part **(i)** was well answered, and part **(ii)** was generally correct. Part **(iii)** was not well done. A very common mistake was to order the frequencies 7, 8, 8, 9, 10, 18 and give the answer for the median as 8.5. Part **(iv)** was not well done. A common wrong answer was 10 – obtained by evaluating 60/6. Despite the instruction, many candidates who reached the answer 3.93… failed to correct it to 1 decimal place.

(b) The first answer of 60 was obtained by most candidates, but the second answer of 3.73 was obtained by only about half of the candidates.

Answers: **(a)(i)** 8, 7, 10, 9, 8, 18, **(ii)** 6, **(iii)** 4, **(iv)** 3.9; **(b)(i)** 60, **(ii)** 3.73.

Question 6

(a) A significant number incorrectly used $3x = 36$ instead of the correct $3x = 18$ or $6x = 36$. Part **(ii)** was more successful with follow-through allowed.

(b)(i) A surprising number of candidates failed to solve this simple equation with a common error of turning it into a quadratic equation.

(ii) This was more successful although a small number failed to use the common length of the rectangle to write down the equation.

(iii) This equation was more successfully solved although a common error was to go from the correct $6z = 3$ to the incorrect solution of $z = 2$.

(c)(i) This was generally well done.

(ii) The elimination method was more popular although subtraction was often erroneously used.

Answers: **(a)(i)** 6, **(ii)** 72; **(b)(i)** 1.5, **(ii)** $4z + 2 = 10z - 1$, **(iii)** 0.5; **(c)(i)** $a - b = 3$, $4a + b = 17$, **(ii)** $a = 4$, $b = 1$.

Question 7

Many candidates found this question the most difficult one – it was certainly the lowest scoring one.

(a) Many candidates did not realise that the angle should be measured from the North, and some thought that a 3-figure bearing was 50.0.

(b) The measuring of 350° defeated most candidates, and the position of *S* was often not on *AC*.

(c) The first answer of 7 cm was generally correct, but very few candidates found the scale as 1:200 000; the most common answer was 1:2 – sometimes 1:2*n*.

(d) The word "locus" seemed to frighten many candidates, though more than half of the candidates realised that they needed to draw a circle centre *A*.

(e) Part **(i)** was often well attempted by candidates who had earned few marks on the earlier parts of the question. In part **(ii)** the common error was to use 12.40 or 40 as the time taken instead of 40/60 hours. Many candidates were not sure when changing to knots whether they needed to multiply their previous answer by 1.85, or divide it.

Answers: **(a)** 0.50; **(b)** diagram; **(c)(i)** 7, **(ii)** 1:200 000; **(d)(ii)** 5 to 6; **(e)(i)** 19, **(ii)** 28.5, **(iii)** 15.4.

Question 8

(a) This was generally well done but a significant number gave only a partial answer omitting one or more of the sides. A small number of candidates used incorrect dimensions.

(b) This was generally well-answered.

(c) The correct line was drawn on the net by the vast majority of candidates. Part **(ii)** was less successful. A significant number failed to realise that this line created a right-angle triangle and therefore suggested the use of Pythagoras. A further common error was to use incorrect lengths, in particular the length of *IC* was not realised.

Part **(iii)** caused similar problems for those candidates who did not use trigonometry to find the required angle. Method marks were available for this question.

Answers: **(a)** 208; **(b)** 192; **(c)(ii)** 12.8, **(iii)** 51.3°.

Papers 0580/04 and 0581/04

Paper 4 (Extended)

General comments

All of the questions on the paper appeared to be accessible to the vast majority of the candidates, though parts of some of the questions were found to be quite demanding.

Marks obtained by the candidates ranged from single figures up to full marks, though both of these extremes were exceptionally rare. Once again the number of very weak candidates was low. Most candidates were entered at the appropriate tier, but there are still some candidates for whom Core Level would be more appropriate.

There was very little evidence that candidates had time difficulties with the paper. The steady improvement in the presentation of work continued, with fewer candidates dividing the page into two columns. Centres should also advise their candidates that the organisation of their work would be improved by starting each question on a new page.

Candidates tended to show more of their working, which means that they were eligible for method marks even though the answer may have been incorrect. Far too many candidates were still losing accuracy marks, because they rounded or truncated numbers part of the way through a calculation.

Some Centres provided their candidates with graph paper, that was inappropriate for examinations, and this made it more difficult for the candidates to answer the questions. Problems included poor photocopies of a sheet of graph paper, graph paper with lines irregularly spaced, paper with the smallest squares being 5 mm squares and paper with rectangles rather than squares.

Comments on specific questions

Question 1

The question was answered very well, with many candidates scoring full marks.

(a) Occasionally the answer was left as 0.95 tonnes, but most candidates did attempt the conversion to kilograms. Unfortunately not all candidates knew the correct conversion. Some candidates took 1.33 tonnes to be the total mass of fruit and vegetables, which gave the common wrong answer of 554 kilograms.

(b) It was unusual to see any errors in this part of the question.

(c) This was well answered, though the common error was to invert the division and calculate the number of kilograms per dollar.

(d)(i) In general, this part caused no problems, though some candidates found 40% of $0.35 and went no further.

(ii) Candidates appeared to have been well prepared for reverse percentage calculations, and the answers were usually correct. The common errors were to multiply $0.35 by either 1.25 or 0.75.

Answers: **(a)** 950 kg; **(b)** $405; **(c)** $0.43; **(d)(i)** $0.21, **(ii)** $0.28.

Question 2

This question was usually a good source of marks, but often candidates did not earn some of the marks because construction arcs had either not been drawn or they had been carefully erased. Many candidates encountered difficulty with part **(e)**.

(a) The line *AB* was accurate in virtually every case.

(b) In order to gain both marks, two pairs of intersecting construction arcs were required. About half of the candidates failed to draw any arcs or only drew one pair of arcs.

(c) The completed trapezium was usually accurate.

(d) The measurement of the angle was usually correct, though some candidates ignored the instruction to give the angle to the nearest degree.

(e) This part was not answered very well. A large number of candidates ignored the instruction to calculate the angle, and they measured lengths from their diagrams, which were then used in a calculation. Consequently their methods were not entirely calculation, and as a consequence the answers lacked the required accuracy. Weaker candidates often chose to ignore this part.

(f)(i) The arc was usually drawn accurately.

(ii) The angle bisector was often accurate, but, in order to gain both marks, valid construction lines were required. Many candidates either did not understand that the angle bisector was required or they had no idea how to construct it. Some candidates bisected the line *AD*, whilst others drew arcs centred on *A* and *C*.

(iii) Candidates who reached this stage with accurate diagrams usually shaded the correct region.

Answer: **(e)** 77.9°.

Question 3

The second half of the question caused some difficulty, so relatively few candidates were able to score full marks. Even though the question clearly asked for "single transformations", some candidates still gave answers as a combination of 2 or more transformations. Many candidates failed to give sufficient detail in **(a)(iii)** and **(a)(iv)**.

(a)(i) Translation was the only acceptable word to describe the transformation. Most of the candidates gained both marks, though the vector was often in unconventional notation.

(ii) This was well answered, though some candidates were convinced that this was a rotation.

(iii) This was well attempted, but the centre of enlargement was often omitted.

(iv) This was the only question in part **(a)** to cause real difficulty. Many candidates confused shear and stretch. If shear was correctly chosen, then the invariant line and shear factor were usually wrong or missing. Some candidates thought that the invariant line was $y = 2$ or said that the shear was in the x direction. A clearly unambiguous statement that identified the x-axis as the invariant line was required. Shear factors of 1.5 and 2.5 were common.

(b) Many candidates spent much time and many pages in working out these two matrices, often with little success. Other candidates were obviously trying to memorise basic transformation matrices. Some candidates were aware of the efficient and reliable method of considering what the transformation does to the base vectors **I** and **J**, with the images **I'** and **J'** forming the two columns of the required matrix.

Answers: **(a)(i)** Translation $\begin{pmatrix} -6 \\ 1 \end{pmatrix}$, **(ii)** Reflection in $y = -x$, **(iii)** Enlargement, scale factor 3, centre (0, 6), **(iv)** Shear, x-axis invariant, shear factor 0.5; **(b)(i)** $\begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix}$, **(ii)** $\begin{pmatrix} 1 & 0.5 \\ 0 & 1 \end{pmatrix}$.

Question 4

The candidates found this question straightforward, and consequently it was well answered. The quality of point plotting, curve drawing and tangent drawing have all improved considerably in recent years.

(a) This was well answered, with errors being quite rare.

(b) This was also well answered, with many graphs of exceptionally high quality being produced.

(c) This was usually correct. Many candidates gave the correct calculated value instead of using the graph, but this was condoned.

(d) Too many candidates tried to describe what they thought was happening, rather than concentrating on looking for a number as requested. Others failed to give an answer, as they did not have any idea of what was required.

(e) It was very unusual for candidates to draw tangents at the wrong value of x. Tangent drawing has continued to improve, but there were still too many candidates drawing tangents that could be interpreted as chords. This was usually linked to a lack of curvature on the graph at $x = 1.5$. It was unusual for the scales not to be used properly in an attempt to calculate the gradient.

(f) The required line was usually correct, though some candidates lost easy marks for either not using a ruler or the line not being long enough.

(g) This value had to be correct for the intersection on the candidate's graph, and it usually was correct. Unfortunately many candidates partially spoilt this by also giving the y coordinate or by giving zero as a second answer.

Answers: **(a)** $p = 0.25$, $q = 1$, $r = 8$; **(c)** 2.75 to 2.85; **(d)** 0; **(e)** Gradient between 1.7 and 2.2.

Question 5

Part **(a)** was badly answered. A number of candidates appeared to have no knowledge of vectors, whilst even more appeared not to have mastered the basics. In part **(b)**, the candidates scored well, though some made this more difficult by not answering the first part correctly. Candidates were given plenty of scope in **(b)** to answer the last three parts in innovative and complex ways. These long methods were where candidates tended to lose the accuracy by a premature approximation at an early stage.

(a)(i) This part was often correct, because it is from the triangle with the two given vectors.

(ii) This was badly answered. There was a method mark available for any correct equivalent in terms of letters from the diagram, but it was rarely awarded. The answer did not need to be in its simplest form, as this was not requested in the question.

(iii) This was equally badly attempted. Once again the answer did not have to be in its simplest form, and a similar method mark to **(ii)** was available. Most candidates were either not aware that *AB* was half the length of *OC* or they could not work it out.

(b)(i) 120° was found correctly by the vast majority of candidates, but answers of 60°, 72°, 90°, 108° and 135° were seen occasionally.

(ii) This part was answered well. Many candidates found *AC* here and used it as part of one of the many longer methods.

(iii) The Sine and Cosine Rules both featured regularly, but they were by no means the only methods employed. Candidates were usually successful regardless of the method used.

(iv) There were many ways of finding the total area, but candidates were usually successful.

Answers: **(a)(i)** $c - d$, **(ii)** $d - 0.5c$, **(iii)** $1.5c - d$; **(b)(i)** 120°, **(ii)** 27.7 cm², **(iii)** 13.9 cm, **(iv)** 167 cm².

Question 6

This question was answered well on the whole, with full marks being achieved regularly. There were a few candidates who used the radius as 0.7 cm consistently throughout the question, but the main problem involved candidates who alternated between 0.35 cm and 0.7 cm. This was another question where candidates regularly lost accuracy because of premature approximation.

(a) This was answered well, though some candidates confused the formulae for the area and the volume of the cylinder. Another error was to treat the pencil as a cone of height 18 cm.

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

(ii) This part was also answered well, though some candidates did try to work out the surface area of the box.

(iii) On the whole, this was well attempted. Some candidates forgot to multiply their answer to **(a)** by 12, but the main error was to find the percentage of the box that was unoccupied.

(c)(i) This was well attempted, though a substantial number of candidates worked to two significant figures and got an answer of 1.5 cm. They did not seem to notice that the vertical and slant heights were now equal.

(ii) Candidates found the circle to be the most difficult aspect of this question. Many totally disregarded the circular end, whilst others found the area of two or three circles. Only well-organised candidates earned all six marks.

Answers: **(a)** 6.54 cm³; **(b)(i)** 4.2 and 1.4, **(ii)** 106 cm³, **(iii)** 74.0%; **(c)(i)** 1.54 cm, **(ii)** 38.4 cm².

Question 7

More able candidates were able to score full marks on this question, whilst weaker candidates were often unable to remember how to find the estimated mean. It was obvious that a large number of candidates were unable to distinguish between bar graphs and histograms.

(a)(i) This was usually correct.

(ii) Most candidates answered this correctly, but those who got it wrong were usually able to identify one of the quartiles.

(iii) This was answered well. The common errors were to misread the scale as 112, leading to an answer of 38, or to leave the answer as 102.

(b)(i) This was usually answered correctly.

(ii) Many candidates were unable to make a constructive attempt at finding the estimated mean, but those who knew what to do rarely made an error. Candidates who failed to get 32 in the previous part often used a total other than 150, despite the graph and the first line of the question indicating a total of 150 cars.

(c) The horizontal scale was often not seen as the blocks were labelled instead, and equal block widths were common. Some candidates were able to calculate the frequency densities, but many of them were unable to convert these figures into a valid histogram. The syllabus refers to both frequency density and the idea of an area scale, but many candidates did not seem to be familiar with either of these.

Answers: **(a)(i)** 46.5, **(ii)** 9.5, **(iii)** 48; **(b)(i)** 32, **(ii)** 46.4.

Question 8

A large number of candidates were still not fully familiar with function notation, but the other candidates found the question to be relatively straightforward.

(a) About half of the candidates evaluated $f(0)$. For the candidates who understood the question, factorisation was a more successful method than use of the formula for solving quadratic equations.

(b) This was quite well answered. The most common wrong answer was $\frac{x}{2} + 1$.

(c) Many candidates were able to form the quadratic equation, and most of them went on to solve it correctly. Far too many candidates failed to get the correct equation, because of elementary mistakes in a simple algebraic rearrangement.

(d) A large number of candidates were obviously unfamiliar with composite functions, and they usually tried to evaluate $g(-2) \times f(-2)$. Most candidates, however, answered this correctly.

(e) Many candidates understood what was required, but wrong answers were common because of carelessness. Correct answers were regularly spoilt by dividing all three terms by 4. Once again, a large number of candidates did not understand function notation, and they usually tried to find either $f(x) \times g(x)$ or $gf(x)$.

Answers: **(a)** 1 and 3; **(b)** $\frac{x+1}{2}$; **(c)** 5.24 and 0.76; **(d)** 29; **(e)** $4x^2 - 12x + 8$.

Question 9

This question was usually well attempted. The starting point was more straightforward than on the previous linear programming question, and Centres had obviously been preparing their candidates for this type of question.

(a) This was often correct, but many answers contained incorrect signs.

(b) This was well answered, but again the sign was often incorrect.

(c) The scales were invariably correct.

(d) The drawing of the lines was usually well attempted, with only the line $5x + 3y = 45$ causing any real difficulty. Incorrect signs in **(a)** and **(b)** still meant that the lines could be drawn correctly. The shading was often on the wrong side of 1 or 2 lines.

(e) Many candidates found either one or two ways by trial and error, without reference to their graphs, which often had incorrect regions. Occasionally candidates gave descriptive responses instead of looking for numeric answers.

(f)(i) It was common for candidates to find just one of the answers, and, as in part **(e)**, these answers were not always obtained from the graph.

(ii) Correct answers were rare, because most candidates just repeated one of the answers from the previous part. The word "profit" in the question was usually ignored.

Answers: **(a)** $x + y \leqslant 12$; **(b)** $y \geqslant 4$; **(e)** 6 super, 5 mini and 5 super, 7 mini; **(f)(i)** \$260 and \$274, **(ii)** \$94.

Papers 0581/05 and 0581/06
Coursework

General comments

The quality of coursework this year compares favourably with that seen in previous years at both the Core and Extended Levels. The evidence seen shows that many Centres have provided a range of tasks enabling candidates of all abilities to demonstrate success in this component. In general the standard achieved by most candidates was high.

The best scripts were succinct. Candidates took advantage of being able to produce tables, graphs and other diagrams using ICT and, in the best cases, these were stuck to the page where the relevant comments had been made. This avoided the need for unwieldy appendices and made the flow of writing more readable.

In many cases candidates outlined the task to be undertaken and followed an explicit plan to reach a conclusion. This process underpins the mark for Overall Design and Strategy and will restrict the mark awarded to candidates whose plan is implicit in the work presented. In the Mathematical Content strand it was pleasing to see that a number of candidates entered for the Core Level had mastered some algebraic techniques from the Extended curriculum, for example factorising quadratic expressions.

In most cases the Controlled Element of the task was a written test. These were usually well written and specifically focused on the coursework task completed. Where a wide range of tasks are available for candidates to choose from, a one-to-one interview with the teacher is often the best way of assessing this strand rather than designing a number of different tests to assess this aspect.

Once again, Centres are to be commended for the quality of their assessments. The detailed comments on the individual candidate record cards were extremely helpful in moderating the work. In terms of administration, Examiners would draw attention to the size of the coursework sample. Where there are ten or fewer candidates, then the work of all candidates should be sent. Where there are between eleven and fifty candidates, then the work of ten candidates should be sent, sampled so that the whole mark range is covered.