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MATHEMATICS

Papers 0580/01 and 0581/01
Paper 1 (Core)

General comments

The presentation of work on the scripts was in general very good, with most candidates clearly showing their methods of solution. There were a surprisingly large number of errors made due to calculators being in radian or grad mode. Teachers should stress this point to candidates.

There was no significant evidence of candidates being short of time or any questions which stood out as not being attempted. The three-figure accuracy for answers where no specific accuracy is demanded was not followed by some candidates; premature and over approximation was seen quite often.

The vast majority of candidates taking this Core Level Paper exhibited positive achievement.

Comments on specific questions

Question 1

Very few errors were made on this question. Most candidates showed a clear understanding of cubes and squares. A small number added the two parts or did 4 – 5 followed by taking that to the power of 1.

Answer: 39.

Question 2

The vast majority of candidates achieved the correct answer, although a significant error was to subtract the numbers, even though bold type was used to emphasise below and above. Lack of units was not penalised.

Answer: 842 m.

Question 3

(a) Many candidates could quote the answer without working but it was common to see $\frac{75}{100}$ left unsimplified. Also 0.75 was seen from some candidates.

(b) The most common error was $\frac{7}{10}$ but the correct answer was generally found.

Answers: **(a)** $\frac{3}{4}$; **(b)** $\frac{7}{100}$.

Question 4

This question was not done as well as expected, particularly part **(b)**. Many candidates did not seem to understand square and/or prime numbers. Also there were many instances of more than one answer given from the list, or even not in the list, which was always marked wrong.

Answers: **(a)** 49; **(b)** 31.

Question 5

Many candidates lost a mark by not converting 450 centimetres to 4.5 metres. It was also evide significant proportion of candidates, on seeing a ratio, automatically assumed that they had to work w sum, namely 26.

Answer: 4.5(0).

Question 6

Many candidates found this question difficult. Either converting to $\frac{9}{4}$ or multiplying by $\frac{2}{1}$ was generally done, but very often not both. It was pleasing that there was little evidence of candidates simply using the fraction key of the calculator and writing only the answer. Working needed to be shown to gain marks.

Answer: $4\frac{1}{2}$ or $\frac{9}{2}$ or $\frac{18}{4}$ or $4\frac{2}{4}$.

Question 7

This topic is found to be a difficult concept for many candidates although there were considerably more correct answers this year.

Answer: 141.5, 142.5.

Question 8

Many candidates did not understand the word 'factorise' and produced a 'simplified' expression. Many factorised only partially.

Answer: $2x(2y - 3z)$.

Question 9

The answer of 200 x 1.05 was evident quite often but the majority of candidates adopted the correct method. The wording of the question allowed 190 dollars to be correct but otherwise two decimal place answers were expected. This was a money question on conversion and it is unrealistic to give more than 2 decimal places or just 1 decimal place. Truncating or rounding to the nearest cent were allowed.

Answers: 190.48 or 190.47 or 190.

Question 10

(a) Answers of 2 and 4 were common.

(b) Many candidates gave the answer 1 showing a lack of understanding of rotational symmetry. Some gave an answer of 180°.

Answers: **(a)** 0; **(b)** 2.

Question 11

Candidates experienced a lot of difficulty with this question by not realising that the triangle was isosceles. Many assumed that angle *POQ* was a right angle and so found the answer to be 55°. The diagram is clearly marked 'NOT TO SCALE' and candidates are asked to calculate the angle, so they should not assume or measure the size.

Answer: 110.

Question 12

(a) This part was quite well done but an answer of 4 was seen quite often.

(b) Many candidates knew this result but the answer of $y = 1$ was seen quite often.

Answers: **(a)** 3; **(b)** 0.

Question 13

This question was poorly done.

(a)(i) Many candidates gave values unrelated to the question, for example 2 ÷ 4, while values to 2 significant figures were also common for 218.

(ii) Candidates were expected to give an approximate value, which was obtainable without the use of a calculator. Many put the calculator answer or a value with several decimal places.

(b) This was a simple calculator and rounding exercise for the original calculation but many candidates did not do this or did not round correctly. Teaching should stress that 5.60 is 3 significant figures and not 2 significant figures.

Answers: **(a)(i)** 200 40, **(ii)** 5; **(b)** 5.6.

Question 14

This is a question on proportion and there are several ways of finding the best value for money. The common error was to compare two bottle *A*'s with one bottle *B* and come to a conclusion, which was at sometimes *A* and at sometimes *B*. A correct proportion method did not always lead to the correct conclusion. Working had to be seen in this question for the possibility of any marks.

Answer: *B* (with correct working).

Question 15

For those candidates having a reasonable knowledge of trigonometry this was a straightforward question. Most of the candidates used sine and followed the correct method. An accuracy of 3 significant figures was required to gain full marks. Truncating to 2.64 was penalised. With calculators in use there should not be such premature approximations as sine 32° = 0.5.

Answer: 2.65.

Question 16

(a) Some candidates did not appreciate that '*bc*' meant *b* x *c* but generally this part was well done. Other errors were ignoring the negative or adding before multiplying.

(b) While the number of correct answers was encouraging many do find difficulty with this topic. A variety of confused solutions were seen and some candidates thought a numerical solution was required.

Answers: **(a)** 13; **(b)** $\frac{y-a}{b}$ or $\frac{y}{b}-\frac{a}{b}$ or $\frac{a-y}{-b}$.

Question 17

This was a very straightforward question. The few errors were mainly not starting the scale at zero, a non-linear scale or a careless slip on one of the heights.

Answer: Correct bar chart.

Question 18

(a) This question seemed to confuse many candidates. After achieving the method of 50 x \$0.25 (or 25 cents) for the sale, many did not take the step of subtracting 8 (or 800) for the profit. The alternative route of profit on one orange similarly often failed at the stage of finding the profit on all 50 oranges.

(b) This part was not well done with relatively few candidates realising the profit had to be divided by \$8, the cost price.

Answers: **(a)** 4.5(0); **(b)** 56.3 or 56.2

Question 19

(a) Although this question was quite well done some thought that the area in this part he multiplied by 80. Most candidates, but not all, knew the formula for the area of a circle.

(b) In general, most candidates realised that the area in part **(a)** should be multiplied by 80. However a significant number decided a different formula was needed. The change to litres was also often ignored or incorrectly done.

Answers: **(a)** 2830; **(b)** 226.

Question 20

Many candidates who had not done well on the paper achieved marks on this question.

(a) The main error was to subtract 5 from 31, resulting in $x = 6.5$.

(b) It was pleasing that most candidates were able to multiply out the brackets correctly but once again subtracting the 20 was the most common error. Almost no candidates divided by 4 as a first step.

Answers: **(a)** 9; **(b)** 14.

Question 21

Many candidates did not score well on this question.

(a) Incorrect answers of 12 15(without am) and 24 15 were often seen.

(b)(i) It was intended that part **(a)** would assist the candidates for part **(b)(i)** but many counted on from 21 15 rather than 0015 to find the length of time. Many other variations were given in which it was difficult to understand what the candidates had done.

(ii) Most candidates were unable to convert their minutes to a decimal of an hour. Hence 7 hours 30 minutes often became 7.3 hours. The importance of clearly stated method was vital here for follow through marks as so many errors were made early in the question.

Answers: **(a)** 00 15; **(b)(i)** 7h 30min or $7\frac{1}{2}$ hours or 7.5 hours, **(ii)** 749.

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. But concern was expressed by Examiners at the continuing number of candidates who lose marks as a result of failing to show working, or not working to the required degree of accuracy. There was no evidence that candidates were short of time. The general level of performance was good.

Comments on specific questions

Question 1

This was generally well answered but 15h 20m and 20h 40m were common errors.

Answer: 3h 20m.

Question 2

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

Answer: 10.9.

Question 3

Most candidates were able to attempt this question, but many failed to notice the question required put the smallest number first.

Answer: $0.5^3 < 0.5^2 < \sqrt{0.5}$.

Question 4

Most candidates knew what was required but many failed to handle both operations correctly. p^{10} and $\frac{1}{2}^{20}$ were common errors.

Answer: $\frac{1}{2}p^{20}$.

Question 5

There were a large number of poor attempts at this question with the –2 causing some of the problems. $x - 8 = -8$ and $x = 6/4$ were very common errors in manipulation.

Answer: 24.

Question 6

Candidate response to this topic is now very good and large numbers of correct answers were seen. 6384 was a common error at the upper bound.

Answers: 6375 6385.

Question 7

This question was generally well answered. Those who appeared to have used a calculator often had wrong answers.

Answer: 7.

Question 8

Part **(a)** was generally well answered but the rotational symmetry seems to have been confused with rotation by many candidates and answers of 90° and 45° were often seen.

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

Question 9

Many candidates confused this with compound interest and the other common error was to find the total amount of money rather than the interest.

Answer: 450.

Question 10

This question was not very well answered with many candidates not understanding 1 significant figure. Common errors were 70000 and 78000. Most candidates can now write numbers in standard form correctly but some candidates used the original number in the question rather than the number in **(a)**.

Answers: **(a)** 80000; **(b)** 8×10^4.

Question 11

Examiners reported varied responses to this question. Many Centres had large numbers of candidates scoring full marks whilst other Examiners were reporting a very poor response from other Centres.

Answers: $x = 8$ $y = 1$.

Question 12

The protractor work was very poorly done. The 12° angle for Northern Ireland was variously meas 10°, 10.2°, 11° and 13°. Similar errors were made on the other sectors. The reflex angle for Englan caused difficulty.

Answers: 50, 5, 3.

Question 13

Generally well done. The importance of rearranging the formula in the correct order was not appreciated by many candidates who tried incorrectly to move the k or the $\sqrt{}$ first. The other major error was the careless use of the $\sqrt{}$ sign which often only covered part of the numerator or was simply written at the front of the expression in a very casual and usually incorrect way.

Answer: $\sqrt{\frac{c-e}{k}}$.

Question 14

Even the weakest candidates were able to gain marks on this question, which was very well answered by most candidates. Very few candidates used the formula for the circumference instead of the area.

Answers: **(a)** arc centre P radius 4 cm, inside the garden, across the grass and path; **(b)** 12.6.

Question 15

This question separated the most able from the rest of the candidates. There were very few correct solutions, with most candidates not understanding the connection between the ratio of areas and the ratio of lengths. 1.33 was the most frequent incorrect answer.

Answer: 4.

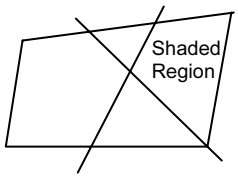
Question 16

Generally **(a)** and **(b)** were well answered but at least half of the candidates were unable to do **(c)**. There was much less use of Pythagoras and other non-vector notation this year

Answers: **(a)** $\mathbf{a} + \mathbf{c}$; **(b)** $\mathbf{a} - \mathbf{c}$; **(c)** $-\frac{1}{2}\mathbf{a} - \frac{1}{2}\mathbf{c}$.

Question 17

This was generally well answered with very few candidates failing to score marks. The angle bisector was marginally better done than the perpendicular bisector. Some candidates were a little careless with their shading whilst others failed to show the construction process. Some Examiners were reporting that candidates did not have the correct equipment to attempt this question.



Question 18

The trigonometry was very well understood by most candidates. They also appreciated the connection with bearings but a large number of candidates were not sure which angle they were required to find and also failed to show enough working to gain part marks. Well over three quarters of the candidates failed to give the answer to the required degree of accuracy.

Answers: **(a)** 114; **(b)** 047.

Question 19

The topic of functions is not well understood. This question was well done by the more able candidat other candidates often failed to score any marks because they misunderstood the nature of gf(x) multiplied the two functions together. Those that were using the correct method were often unable to simp the algebra correctly. The concept of the inverse is understood but most candidates were unable to solve the equation correctly.

Answers: **(a)** 11; **(b)** $x + 2$; **(c)** 3.

Question 20

The factorisation was not well done with many candidates missing the difference of two squares. The expansion was generally well done with common short cut errors of $x^2 \pm 9$. Few candidates connected part **(ii)** with part **(i)** and generally only the more able scored marks on this part of the question.

Answers: **(a)** $3(2x - y)(2x + y)$; **(b)(i)** $x^2 - 6x + 9$, **(ii)** $p = 3$, $q = 1$.

Question 21

Parts **(a)** and **(b)** were well done by most candidates. Many candidates scored at least one mark in **(c)**. However, a large number of candidates misread the vertical and horizontal scales, a top speed of 14, 19, 20, and 28 were very common and a journey time of 44 seconds nearly as frequent despite the 45 seconds written in the question. Some candidates thought that the two triangles were equal in area.

Answers: **(a)** 1.8; **(b)** 450; **(c)** 13.

Question 22

This was generally well answered but there was little evidence that candidates knew how to check if matrix multiplications are possible by looking at the order of the matrix. The multiplication was very well done but in the last part of the question many candidates did not know the connection between a matrix, its inverse and the identity matrix despite the hint in the question.

Answers: **(a) BA**; **(b)** $\begin{pmatrix} 38 & 0 \\ 0 & 38 \end{pmatrix}$; **(c)** $\frac{1}{38}\begin{pmatrix} 4 & 6 \\ 5 & -2 \end{pmatrix}$.

Papers 0580/03 and 0581/03

Paper 3 (Core)

General comments

The paper allowed all the candidates to show some knowledge of mathematics, and there were several questions that discriminated well between the best and weaker candidates. Time did not appear to be a problem.

The working was often neat and easy to follow except where candidates did not really know what they were doing.

In general candidates need to read the questions more carefully to find what they are actually being asked to do, rather than making instant assumptions. They should also look at their answers more critically as often wrong answers can be corrected in the light of subsequent work in the question.

Comments on specific questions

Question 1

(a)(i) This was straightforward for most of the candidates.

(ii) A mark was available in this part of the question for demonstrating that the numbers needed to be ranked to find the median. Some of the candidates did not know how to deal with the median of an even number of items. Some gave 48.5 as their answer, and too many used their calculators incorrectly to calculate (48+50)/2, and, without brackets, found 48+25=73.

(iii) There were some careless additions of the numbers, and some candidates divided by 2 or 9 instead of 10, but on the whole this was well done.

(b)(i) A common error was to treat the numbers of students as percentages and use 3.6 instead of 4 as a multiplier, leading to a total of 324 instead of 360. These candidates would benefit from practice with different multipliers, and using the total combined with the 360^{o} complete turn. A simple multiplier can be expected at Core Level.

(ii) Many candidates drew a neat and accurate pie chart with the correct labels. Others were able to pick up follow through marks for their angles and labels from their tables.

(iii)(a) This was reasonably well done, but it should be noted that rounding 4/9 to 40% or equivalent is not acceptable.

(b) The same applies to this part, and an answer of 30% with no working could not gain any marks. The weaker candidates did not understand the significance of this part of the question, and many gave two separate fractions for their answers. The method mark was awarded for a demonstration that these two fractions had to be added.

Answers: **(a)(i)** 51, **(ii)** 49, **(iii)** 46; **(b)(i)** 20, 60, 160, 80, 40, **(iii)(a)** 4/9, **(b)** 1/3.

Question 2

(a) There were many correct answers to this part of the question, but also many completely irrelevant calculations, such as $3^2+3^2=18$.

(b)(i) Similar odd calculations were presented in this part of the question.

(ii) A follow through mark was available here for multiplying their previous answer by 3, but not all candidates achieved this.

(c)(i) The method mark was awarded for multiplying the length of each piece of wood by its width, with both either in centimetres or in metres. This question revealed a weakness in the conversions of units. In general those candidates who changed the 20 centimetres to metres before multiplication were the most successful.

(ii) Both methods for calculating the total number of pieces of wood were given method marks, but most chose to divide their answer to **(b)(ii)** by their answer to **(c)(i)**.

(d) As in part **(c)(i)**, the conversion of units was a problem for many of the candidates. The most successful candidates converted the centimetres to metres before multiplication.

(e) Most candidates scored some marks in this part of the question, although some completely unreasonable totals should have alerted candidates to earlier misplaced decimal points.

Answers: **(a)** 9; **(b)(i)** 6, **(ii)** 18; **(c)(i)** 0.6, **(ii)** 30; **(d)** 0.02; **(e)** 4.80, 9.00, 14.40, 2.10, 30.30.

Question 3

(a) The most common error was to make $y = 9$ when $x = -1$.

(b) This was well done, apart from those who would not plot a point in a square, but felt it had to be on the nearest line. They were not penalised this time, but it would perhaps be beneficial to give the candidates practice using different graph paper grids.

Many who had made the error above in part **(a)** plotted the point (−1, 9), then ignored it when drawing a correct parabola. They gained the follow through mark for the point, and the accuracy mark for the curve, thus losing no further marks in part **(b)**. However, very few then thought of going back to check their table and correct it in part **(a)**.

Those who tried to include the wrong point in their curve lost the mark.

Most of the curves were smooth with fewer straight line segments than in previous years. However, many were thick and sharper pencils would have allowed a further improvement.

(c) This was not so well done, and needs further practice.

(d) This was usually correct, apart from the occasional (−3, 11).

(e) As in part **(c)** there was a follow through mark for plotting their points. Full marks were awarded for a correct, ruled, straight line.

(f) Evidence of an attempt to calculate $\Delta y/\Delta x$ was rewarded. Many candidates knew the form $y = mx + c$, although this is not at present in the syllabus at Core Level.

(g) The usual error of giving x and y coordinates when asked only for the x-coordinates appeared many times. The candidates need to read the questions a little more carefully rather than assuming that questions will always be in exactly the same form.

Answers: **(a)** 7, 8, 4, −1; **(c)** −2.8, 2.8; **(d)** −1, 5; **(f)** 2; **(g)** −3, 1.

Question 4

(a) This was usually correct.

(b) Although many candidates did answer this part correctly, a large number failed to add t and $2t$ to give $3t$, and gave an answer of 105.

(c)(i) Many correct answers, but a common error was $x + 2y = 50$.

(ii) This was often correct.

(iii) A method mark was awarded for almost any demonstration that the candidate had some idea of simultaneous equations and how to solve them.

Most candidates had given some sort of answer to the previous two parts, and were thus able to gain at least one mark for attempting the simultaneous equations. However candidates who could not answer the first parts correctly often had no idea at all how to proceed. A straightforward subtraction to eliminate one variable would have been appropriate whatever the numbers were on the right hand sides of the two equations.

Answers: **(a)** 120; **(b)** 70; **(c)(i)** 130, **(ii)** 100, **(iii)** 70, 30.

Question 5

(a) This was usually correct.

(b)(i) Mention of the radius and tangent was sufficient for the mark, but this was not common.

(ii) This was reasonably well done.

(iii) The weaker candidates began to have difficulties here. When Pythagoras Theorem was used it often involved addition of the squares of the two sides. However, a mark was available for indicating a square root independently of the previous mark. Some candidates tried to use trigonometry without success. Others lost an accuracy mark by truncating rather than rounding their answer to the three significant figures asked for in the general instructions.

(iv) Many candidates used either 8 kilometres or 200 metres as the height of the triangle, and others failed to give their answer correct to two significant figures.

It would probably have helped candidates if they had written their findings on the diagram as they went along, for example showing the right angle and the length of *PC*.

Answers: **(a)** 0.2; **(b)(ii)** 8, **(iii)** 1.78, **(iv)** 6.9.

Question 6

(a)(i) This was quite well done. A mark was lost if the vector was given in the wrong form, for example as coordinates, or as a fraction. Some candidates did not count the squares accurately, and gave 9 instead of 10 in the *x* direction.

(ii) The problem for the candidates in this part of the question was to see the rotation as a single transformation, and many rotated and then translated the shape, which was not worth any marks. Practice with tracing paper could help here.

(b)(i) A reflection in the *x*-axis was worth one mark, so most candidates were able to gain one or two marks on this part of the question.

(ii) Most candidates were able to draw an enlargement, scale factor 2, but many did not understand the significance of "centre (0, 0)". Those candidates who drew rays to find the enlargement were less likely to produce accurate images and would have been well advised to check that each side was twice the length of the original, and that they had drawn a similar shape.

Answers: **(a)(i)** translation $\begin{pmatrix} 10 \\ -2 \end{pmatrix}$, **(ii)** rotation 90° (anticlockwise) about (0, 0).

Question 7

(a)(i) There were plenty of correct answers here, "hexagon" being the most common wrong answer.

(ii) This part of the question tested those who do not read the question carefully, but just go automatically to use a formula. A few did not know the difference between internal and external angles.

(iii) Candidates who had calculated the interior angle in part **(ii)** did not know what to do next, so often went on to find the exterior angle. However, some marks were available for those who showed some correct working over the two parts, even if they had confused their final answers.

(b)(i) There were plenty of circular arguments here which were not worth anything. Some mention of parallel lines or alternate angles gained one of the marks, and mention of angles on a straight line or adding up to 180° gained the other. Alternatively some candidates referred to "angle B" as being 110° (parallel lines), and all the angles at B adding up to 360°, which was equally acceptable for full marks. Candidates probably need more practice with stating facts briefly for this type of question.

(ii) The weaker candidates could not manage the trigonometry required for this part of the question.

(iii) Follow through marks were available for these two parts, but many candidates did not know anything about three figure bearings.

(iv) A follow through was available for a demonstration of the understanding of back bearings.

Answers: **(a)(i)** pentagon, **(ii)** 540, **(iii)** 108; **(b)(ii)** 50.2, **(iii)** 120, **(iv)** 300.

Question 8

(a)(i) This was a straightforward measurement, and should not have caused any difficulty.

(ii) This was reasonably well done.

(iii) Again, a very simple measurement and scale factor conversion.

(b) Many of the weaker candidates did not attempt this locus. Some merely drew a 1 centimetre circle, or several 1 centimetre circles with no straight lines joining them.

(c) Some candidates knew that the mediator was required, but were very casual about accuracy, and lost marks unnecessarily. Those who did use arcs often made them the wrong size. Using *AB* as the radius meant that one intersection of the arcs was off the top of the page, while using arcs that were of radius exactly half *AB* did not give the required two intersections either.

(d) Many only drew part of the required circle.

(e) The correct position for the airport was often marked without any of the loci asked for in the first part of the question being shown. These candidates must have had some knowledge of what was required, but lost all the previous marks. Parts **(b)**, **(c)** and **(d)** clearly ask for loci to be drawn, and, for example, the whole of the circle should have been shown, and both lines 1 centimetre from the road should have been drawn. Some labelled the position of the airport at the intersection of the circle and the mediator rather than the intersection of the mediator and the lower of the two lines parallel to the road.

Answers: **(a)(i)** 6, **(ii)** 10, **(iii)** 75.

Question 9

(a)(i)(ii) Most candidates gave correct answers to these two parts.

(iii) This was not so well done. Many candidates tried to make some sort of equation in n or x.

(b)(i) Again, **(a)** and **(b)** were quite well done.

(ii) A mark was available for showing that the 12th diagram has 144 squares, and some were able to complete the calculation. Others merely calculated 4×144.

(iii) As before, a mark was available for showing that the 10th diagram has 40 dots, and the second mark was for completion.

Answers: **(a)(i)** 12, **(ii)** 20, **(iii)** $2n + 2$; **(b)(i)** 20, **(b)** 25, **(ii)** 48, **(iii)** 100.

Papers 0580/04 and 0581/04

Paper 4 (Extended)

General comments

Once again, the full range of marks was seen. There appeared to have been fewer very weak candidates entered this year, but there were still some candidates who would have had a better opportunity to show positive achievement at Core Level.

There was no evidence of candidates having time difficulties with the paper, and most candidates organised and presented their work clearly. The candidates, who showed no working, relied on getting the correct answer, and usually any error meant that all the marks were lost on that part of the question.

Some Centres appeared to encourage their candidates to divide the answer page into 2 columns. This makes marking and the recording of marks difficult for the Examiner, as well as giving the candidates insufficient room on each line for their working. Candidates should be told *not* to divide the page in this way.

There are still candidates losing accuracy marks unnecessarily by rounding or truncating in the calculation. In addition, sine and cosine values and square roots taken from the calculator often 2 significant figures. Candidates should retain as much accuracy as possible throughout the calcula then do the necessary rounding to get the final answer.

Comments on specific questions

Question 1

The question was answered well, with full marks being quite common.

(a)(i) It was unusual for any error to be made. Almost always \$72 was obtained, but it was occasionally spoilt by adding on something other than \$60.

(ii) Again, errors were unusual. Sometimes the answer was given as 10%, which was counted as an error, but 10% *extra* after seeing 110% was condoned.

(b) The reverse percentage calculation appeared to cause less difficulty than in previous years, but it was still the most common error in the question. Finding 14%, 114% or 86% of \$159.10 were the usual mistakes.

(c) Calculating the frame size of the bike caused little difficulty, but some very unorthodox methods were seen.

(d)(i) A few candidates found $\frac{9}{20}$ of 36 instead of $\frac{11}{20}$ of 36. Quite often both were calculated, but that was acceptable as long as it was clearly indicated which was which.

(ii) Some candidates chose to use $\frac{2}{3}$ instead of $\frac{2}{23}$, presumably because they thought that this was a misprint on the paper.

Answers: **(a)(i)** \$132, **(ii)** 110%; **(b)** \$185; **(c)** 48 cm; **(d)(i)** 19.8 km, **(ii)** 414 km.

Question 2

This question was a good source of marks for most candidates. They coped well with having to draw two curves on the same axes.

(a)(i) The values of q and r were almost always correct, but p was seen as 3, -3, -9 and –15.

(ii) The scales for the graph were rarely wrong, and the accuracy of the point plotting was very good. Usually a curve was attempted, and it was pleasing to see that a series of straight lines was hardly ever seen. Occasionally errors in the value of p were corrected on the graph, but it is disappointing how often candidates do not recognise the basic shape of a quadratic curve.

(iii) Finding the gradient proved to be quite a challenge for many candidates. A tangent drawn at $x = -1$ was the "suitable line". It was only rarely drawn elsewhere, though a substantial number drew the line $x = -1$. Unusually, the scales on the axes were identical. The gradient had to be calculated to within 0.5 of its true value, but a large number of candidates failed to recognise that the gradient was negative.

(b)(i) u was regularly calculated as 5.67 or with insufficient accuracy as 6.3.

(ii) Again, the point plotting and curve drawing were good.

(c)(i) The simplification of $f(x) = g(x)$ caused difficulty for many candidates, usually because they could not multiply through by 3.

(ii) The final mark was often lost by giving the answer as coordinates, instead of just giving the value of x as requested. Some candidates made this part of the question very difficult by drawing two separate graphs.

Answers: **(a)(i)** $p = 9$, $q = -3$, $r = 9$, **(iii)** –3.5 to –2.5; **(b)(i)** $u = 6.33$, $v = 6$; **(c)(ii)** 2.3 to 2.7.

Question 3

This question appeared to be relatively straightforward, but about half of the candidates, many of th… able, decided that they would use 400 as the number of days in the year. This oversimplified the first s… of the question. A large proportion of these candidates reverted to using 365 days after three parts of … question, but hardly any of them thought about going back and correcting their costly error in the earlie… parts. 365 days is clearly stated on the first line of the question, and the top of the curve is plotted at 365 days.

(a)(i) The common incorrect answer was 38.

(ii) The common incorrect answer of 22 was obtained by subtracting 27 from 49.

(iii) The common incorrect answer of 34 was found by reading the graph at 160 instead of 146.

(iv) Some candidates read "at least 25" as "less than 25". This gave incorrect answers in the range 84 to 90.

(b)(i) The justification of the values of p and q proved to be quite difficult, with many candidates producing circular arguments. 350 – 303 and 365 – 350 (or equivalents) were required.

(ii) Those candidates who knew how to work out the estimated mean rarely made an error, but there were whole Centres where candidates had no idea where to start.

(c) A substantial majority of the candidates had no difficulty in working out the first missing height as 2.9cm. Most of them then got the second height as 7.35cm, because they ignored the fact that the column width was 30 and not 20.

Answers: **(a)(i)** 36 to 37, **(ii)** 19 to 21, **(iii)** 32 to 33, **(iv)** 275 to 281; **(b)(i)** p = 350 – 303, q = 365 – 350, **(ii)** 35.8; **(c)** 2.9 cm 4.9 cm.

Question 4

This question was well attempted, with only the final part causing any real difficulty. There were, however, still a few candidates who treated all triangles as being right angled.

(a) The use of the cosine rule provided most of the candidates with full marks. It was pleasing to see fewer cases of candidates combining the terms incorrectly.

(b) Most candidates treated this as a calculation, when just mentioning "cyclic quadrilateral" would have been sufficient. The calculation showing 180 - 70 was acceptable, but circular arguments starting with 33 were not accepted.

(c) The calculation of AD using the sine rule was also well answered. Those candidates who got it wrong usually used 37°, and they effectively calculated CD.

(d)(i) This was very well answered.

(ii) This final part of the question was a good differentiator, allowing able candidates to demonstrate clear mathematical thinking. There were very many ways of getting to the final answer. The two common methods were to calculate EC or EA, and then use $\frac{1}{2}ab\sin C$, **or** to calculate a perpendicular height of the triangle, and then use ½ x base x perpendicular height. Many candidates found the area of triangle ABC, presumably because they thought that the two triangles were equal in area.

Answers: **(a)** 11.9 cm; **(b)** cyclic quadrilateral; **(c)** 6.89 cm; **(d)(i)** 70°, **(ii)** 50.5 cm².

Question 5

It was fortunate for most candidates that this question carried only 9 marks, because only the mos them were equipped to score full marks. In the first two parts of the question, it was essentia candidates had a clear understanding of the relationship between speed, distance and time. About ha the candidates did not have this understanding.

(a) About half of the candidates got the correct answer.

(b) Some candidates who got $10/x$ in the first part of the question, could not get $10/(x+1)$ here. Even if they did get both terms correct, the equation usually contained 30 instead of ½. Subsequent attempts to simplify such equations involved elaborate "fiddles".

(c) Most candidates were now facing something much more to their liking, and they were able to attempt to solve the quadratic equation. Factorisation was the usual method used, but those who chose to use the formula were much more likely to make a mistake. Both solutions are needed at this stage.

(d) In this final part, the positive solution from the previous part should have been used to calculate the time. The negative solution had to be rejected, either implicitly or explicitly.

Answers: **(a)** $\frac{10}{x}$; **(b)** $\frac{10}{x}-\frac{10}{x+1}=\frac{1}{2}$ (or equivalent) is the initial equation; **(c)** - 5 *and* 4; **(d)** 2.5 hours.

Question 6

In all questions it is important for working to be shown, and that applies particularly to questions like this one. In the final part, a large number of candidates earned 3 method marks, even though accuracy had been lost at earlier stages.

(a)(i) The required formulae for the calculation of the volumes were given. Unfortunately, many candidates divided the volume of the hemisphere by 2. Presumably they were confusing sphere and hemisphere.

(ii) Candidates needed to multiply their previous answer by 0.94, convert the answer to kilograms, and finally give the answer to 1 decimal place. The first step was usually successful, but many divided by 100 or forgot to round to 1 decimal place.

(b) The candidates who attempted to find the sloping height using Pythagoras' Theorem usually went on to calculate the curved surface area correctly. Unfortunately, a considerable number of candidates assumed that the sloping height was 13.

(c) Most candidates found the curved surface area of the hemisphere, and then added it to their curved surface area of the cone. They usually went on to divide 411.58 by their total. Less able candidates often did not have a total, or they divided by 411.58, or they occasionally multiplied.

Answers: **(a)(i)** 1384.7 to 1386 *or* 1380 *or* 1390 cm³, **(ii)** 1.3 kg; **(b)** 324 to 326 cm²; **(c)** \$0.649 to \$0.652.

Question 7

Some able candidates achieved full marks on this question, but the average and weak candidates were liable to make errors throughout the question. No credit is given for ratios as answers in probability questions, so it was pleasing to see that they have virtually disappeared. In the second half of the question, there was considerable confusion over whether probabilities should be added or multiplied.

(a)(i) On the Venn Diagram, answers were permitted in numeric or algebraic form. This was well attempted.

(ii) Here a numerical answer was required.

(iii) Candidates found some difficulty in establishing 12 as the numerator, but they ignored the students who did neither subject, and repeatedly used 27 as the denominator.

(iv) This was not as well answered as the previous part. Usually the denominator was 30 or 27.

(b)(i) This was often correct, but 3/9 + 4/10 *or* 7/19 were seen regularly.

(ii) The candidates who subtracted the previous answer from 1 were usually successful. The of candidates, however, chose to start again. Unfortunately a high proportion of them considered two of (black, white), (white, black) and (white, white), instead of all three.

(iii) It was very common for 2 pairs of probabilities to be multiplied and then added, instead of evaluating the product of all 4 probabilities.

(iv) Few candidates were successful in this final part. Credit was given for working out the probability of choosing 4 black beads, but exactly the same error was made as in the previous part. Consequently the correct final answer evaded all but the most proficient in probability. Very occasionally a candidate would try to find the probabilities of the other 14 possible outcomes, but they were never successful.

Answers: **(a)(i)** 12, 8, 7, 3 *or* 20 - *x*, *x*, 15 - *x*, 3 on a Venn Diagram, **(ii)** 8, **(iii)** $\frac{12}{30}$, **(iv)** $\frac{12}{20}$; **(b)(i)** $\frac{12}{90}$, **(ii)** $\frac{78}{90}$, **(iii)** $\frac{900}{6480}$, **(iv)** $\frac{5508}{6480}$.

Question 8

This question appeared to be accessible to all candidates. Their answers when describing transformations were much improved. Fewer candidates gave answers involving multiple transformations, when a single transformation had been asked for. In addition, the use of “translocation” or “transportation” to describe a translation was very rarely seen.

(a)(i) This was answered very well. “Turn” was occasionally used instead of “rotation”, but it was not acceptable.

(ii) This was answered very well.

(iii) This caused more difficulty, with many candidates thinking that the transformation was a rotation.

(iv) This was well attempted, though some candidates thought that it was a reflection.

(v) This caused little difficulty.

(vi) This caused great difficulty. Many candidates did not attempt it, and others confused “shear” and “stretch”. The ones who got shear were very uncertain about the invariant line. Any mention of scale factor was ignored.

(b) *B* was correctly identified by about half of the candidates. The remainder did not appear to use the columns of the matrix to identify **I´ and J´**, and thus know what had happened to the base vectors.

(c)(i) This was not particularly well answered. Many candidates spent considerable time and effort in forming elaborate and unnecessary simultaneous equations. Usually it got them nowhere. Had they just considered what happens to the base vectors under the transformation, then they would have had the columns of the required matrix.

(ii) This was even more badly answered. Again, much time and effort were wasted. Considering the base vectors, would have formed the required matrix quite quickly.

Answers: **(a)(i)** Rotation of 90°, **(ii)** Translation $\begin{pmatrix} -2 \\ -5 \end{pmatrix}$, **(iii)** Reflection in $y = -x$, **(iv)** 180° Rotation, (1, -1), **(v)** Enlargement, scale factor 2, **(vi)** Shear, *y* axis invariant; **(b)** *B*; **(c)(i)** $\begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$, **(ii)** $\begin{pmatrix} 1 & 0 \\ 1 & 1 \end{pmatrix}$.

Question 9

This was the first linear programming question on this paper for some time. Whilst able candidates g made good attempts at this question, many others seemed unfamiliar with the topic. They usually mai however, to persevere long enough to accumulate a handful of marks.

(a) $15x + 25y \leqslant 20$ was a common incorrect starting point, because of the inconsistent units.

(b) Answers were often correct, but many candidates got the wrong sign between x and y.

(c) Again, answers were often correct, with the usual mistake being to replace y by x.

(d)(i) The scales were almost always drawn correctly.

(ii) $3x + 5y = 400$ was usually attempted, but it was sometimes slightly inaccurate where it met the x-axis. In many cases it was in completely the wrong place. The other 2 lines, $y = x$ and $y = 35$, were reasonably well drawn, but the final shading was rarely correct.

(e) Most candidates were able to answer this correctly.

(f) This part of the question caused great difficulty. Evidence of looking at an *enclosed* region was required, but the correct point of (75, 35) was hardly ever identified. Credit was given for the profit at a point identified by the candidate.

Answers: **(a)** $15x + 25y \leqslant 2000$; **(b)** $y \leqslant x$; **(c)** $y \geqslant 35$; **(e)** 38; **(f)** \$6.20.

Papers 0581/05 and 0581/06

Coursework

General comments

The coursework submitted this year was completed competently by most candidates and the work seen was of a similar standard to that from previous years. Again, a variety of tasks was seen ranging from algebraic investigations to practical problems involving trigonometry or statistics. Most candidates scored similar marks on both tasks submitted.

The majority of candidates entered at the Extended Level produced sustained work. The investigative tasks were characterised by good manipulation of algebraic expressions and justification of generalisations. The practical tasks were characterised by clear presentation and good analysis. In both types of task candidates should be encouraged to produce a clearly written method or plan.

At the Core Level many candidates tackled the tasks enthusiastically, producing some good quality work. At this level a number of candidates made good use of ICT to process data enabling more time to be spent in analysis and drawing conclusions.

Centres are advised to consider the following points.

- Develop methods to help candidates plan their strategies (and write the plan).
- Help candidates to develop clear aims which should be stated at the beginning of the write-up.
- Make use of ICT to collect and process data, particularly for statistical tasks.
- Justify decisions taken, i.e. why is one technique better than another.
- Select techniques appropriate to the task and the ability of the candidate.
- Diagrams, tables, graphs, etc. are usually essential to the explanation of a task. It is helpful if these are included at the point in the write-up where they are relevant. This enables candidates to make more meaningful references to evidence. A large volume of evidence included at the end of the task and not referred to in the write-up is redundant.

The assessment of candidates' work was completed accurately by all Centres. It was most h... clear comments on assessment sheets highlighting what evidence in a candidate's work was use... a particular mark. Appropriate controlled elements were used to assess candidates' ability and, in ... this aspect was carried out well. Moderation between teachers at a Centre was clear and was carri... appropriately.