MATHEMATICS

Paper 0580/01

Mathematics

General comments

The vast majority of candidates were of an appropriate standard to be entered for the core level of the examination. However, there were an appreciable number who did not seem to have adequately covered the syllabus or shown sufficient understanding of the topics to gain a positive achievement on this paper. At the other end of the scale, Examiners were finding fewer candidates with very high marks. In general, candidates found the paper more demanding this year.

The presentation of work was generally of a high standard and there were few reports of illegible scripts. However, teachers should continue to stress to candidates the importance of writing figures and words clearly, since marks will be lost if the Examiner cannot understand a response to a question. Cases were seen of a dot being used for multiplication, and while this may be a useful notation in algebra at higher levels it can cause a lot of confusion with decimal points and so should be avoided at this level.

The guidelines for rounding were noticeably not observed in a number of cases. Teachers need to stress the rubric of working to a minimum of 3 significant figures and 1 decimal place for angles, unless the question specifies the accuracy.

A particular concern this year was the lack of working shown. Candidates should not use rough paper, but should show all working on the question paper. Far too often, candidates were losing method marks when probably only an arithmetic error had been made. At the very least, candidates need to demonstrate what calculations they are performing.

Most candidates did not appear to check their answers; they should be encouraged to do this. Careful re-reading of a rather wordy question may well enable candidates to correct a previous misunderstanding. Few candidates appeared to have time difficulty on the paper, so checking should have been possible.

It was felt that some candidates failed to turn over to the last side, page 8, despite the fact that there was a clear instruction to turn over at the bottom of page 7.

Comments on specific questions

Question 1

The question was answered correctly by the vast majority but there were a significant number of responses of 3, -3 and 27.

Answer. -27

Question 2

Again this was well answered by most candidates. The most common error was to include 0.9 as one of the three. It was surprising to see occasionally some responses not having one each of fraction, decimal and percentage.

Answer. 0.09 9% $\frac{9}{100}$

Question 3

This question was poorly done. While many realised that the answer was not 100, it was most common to see the answer 1000. Quite a number realised it was 100^2 which was not far enough for the mark.

Answer. 10000 or $1(.0) \times 10^4$

Question 4

(a) Most candidates understood what a factor was and consequently this was well done

(b) In contrast, relatively few understood multiples and the answer for **(a)** was very often repeated here. Of the infinite number of possible answers 70 and 490 were the most common

Answers. (a) 7; (b) Any multiple of 70

Question 5

Only the most able candidates seemed to understand the need for a cube root. Many gave one-third of 20 or three times 20. Some did realise that $l^3 = 20$ was the key to the question but did not relate this to the cube root. Unfortunately, some who did understand the question rounded incorrectly or approximated prematurely to give an answer of 2.7 or 2.72.

Answer. 2.71(4….)

Question 6

(a) Questions on use of the calculator should be straightforward, but core level candidates in particular should calculate the numerator and denominator separately before doing the division. 7.597 was a very common incorrect answer.

(b) Many did gain this mark with a follow through but there was a lot of confusion between significant figures and decimal places.

Answers. (a) 0.075976(….); (b) (0).076

Question 7

There was a better response to this question than in previous examinations, although many just added and subtracted ten thousand. A few carelessly put the correct answers the wrong way round.

Answers. 345000 355000

Question 8

This was quite well answered although many did only a partial factorisation. Candidates could be well advised to multiply out their answer to see if it checks with the question.

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

Question 9

(a) Probability was answered well, although there is still a tendency for some candidates to give a ratio. Probability must be given as a vulgar or decimal fraction or percentage. Various explanations were given for part **(a)(ii)** but most gave the value 0, often with denominator 10.

(b) The wrong fraction $\frac{5}{12}$ did occur a noticeable number of times; but overall this was a very well done question.

Answers. (a) (i) $\frac{4}{10}$ or equivalent (ii) 0 or zero or nil (b) $\frac{7}{12}$ or equivalent

Question 10

On the whole this was quite well answered, but there was some confusion between parts **(a)** and **(c)** with deciding when to add or multiply the indices. Part **(b)** was not so well done, understandably, as it required subtracting a negative number as well as understanding the rules of indices.

Answers. (a) p^5 (b) q^7 (c) r^6

Question 11

Although the small syllabus changes introduced this year were well advertised it was clear that many candidates did not have an understanding of compound interest. Consequently, although part **(a)** was generally done well, many simply found a simple interest of 550 in part **(b)**. Also some of those who understood compound interest lost a mark by not reading that the total amount and not the interest was required.

Answers. (a) ($) 25; (b) ($) 551.25

Question 12

(a) The lines in the first diagram were most often correct, but some candidates only put 1 line or added vertical and horizontal ones. Many more missed some lines on the hexagon.

(b) Wrong answers were far more common than expected on rotational symmetry, which is a topic usually done extremely well. Answers of 1 and 4 were common.

Answers. (a) A has 2 correct diagonal lines; B has 6 lines; (b) 2

Question 13

Generally speaking if candidates gained the method mark then all 3 marks were awarded. Many did not take the obvious route of simply adding the equations and consequently errors often developed in their solutions. Substitution was not uncommon but again usually led to errors. There was very little evidence of candidates checking their answers by feeding them back or realising that answers with unlikely fractions were going to be wrong.

Answer. (x =) 5 (y =) -3

Question 14

(a) An answer of 7 hours 10 minutes was more common than the correct answer for some Centres. Candidates should be careful using calculators on time problems since it so often results in errors.

(b) Most either knew how to find a percentage or could work out the time period of 9 hours and hence gain one mark, but most could not do both. The percentage 'not in bed' was seen quite often as was only giving a whole number answer rather than significant figures.

Answers. (a) 6 (h) 50 (min); (b) 37.5

Question 15

(a) This was well done by most but clearly some candidates had little or no understanding of vectors.

(b) Very few stated parallel or even an equivalent description. While many stated that one vector was three times the other, few indicated the required connection with length or even size of the vectors.

Answers. (a) $\begin{pmatrix} -3 \\ 12 \end{pmatrix}$; (b) Parallel or equivalent and **CD** is 3 times as long as **AB** or equivalent

Question 16

(a) This was very well done and only a few errors were seen. Occasionally wrong values, usually 100 and 35 were given but only occasionally were two values given not totalling 135.

(b) Only rarely was the mark not awarded, even if only as follow through from (a)

(c) Surprisingly there were an appreciable number who did not recognise the term 'modal sport', although this question as a whole was the best done on the paper.

Answers. (a) 105 30; (b) Correct line on the pie chart (±2°); (c) Football

Question 17

(a) This was not the typical ratio question where the total amount is given. Consequently many were caught out resulting in a common wrong answer of 33.75. Some multiplied by $\frac{5}{3}$ instead of $\frac{3}{5}$ giving an answer of 150, which by observing the diagram had to be wrong for the width.

(b) The response to this part was better than part **(a)** but the area formula rather than circumference was often seen. Also common was dividing by π instead of 2π, as well as poor use of the calculator by performing $57.5 \div 2 \times \pi$. Over-approximation was also seen here with an answer of 9.2 without a 3 significant figure solution seen first.

Answers. (a) 54; (b) 9.15 to 9.16

Question 18

(a) Many candidates did not understand the term 'net' and so could make no progress. Many left the box as open (only 5 rectangles) although there was no suggestion of this. There was a lack of care in the size of the rectangles with many having 3 or 4 of size 4 cm by 3 cm.

(b) Although follow through marks meant a reasonable standard on this part, there were many who did not understand surface area. A volume calculation was quite common.

Answers. (a) Net of the cuboid; (b) 52

Question 19

The question was well answered and many gained full marks. The first part, Joseph's share, caused most problems, often by not simply just multiplying by 7 and dividing by 12. Finding a percentage was well known by nearly all and the final mark was usually gained even if the follow through had to be applied.

Answers. 17.5(0) 9(.00) 3.5(0)

Question 20

(a) Most candidates knew they had to multiply and obtained a value having figures 113. However, putting this into correct standard form was beyond many.

(b) It was quite common to see multiplication again here although most often division was done. However, the division was often the wrong way round. Changing to standard form too was again a major problem in the question even though a follow through mark was available provided the power of 10 was negative. An example of lack of working and poor rounding losing marks was seen at times in this question for the following reason. $1 \div 25 = 0.04$ and $25 \div 565 = 0.04$ to 1 significant figure. Simply an answer of 0.4 without working then was not going to even get a method mark. When only 4×10^{-2} was seen then for the above reason 0 marks were awarded.

Answers. (a) 1.13×10^{6}; (b) $4.42(\ldots.) \times 10^{-2}$ or $4.42(\ldots.) \times 10^{-3}$ cm

MATHEMATICS

Paper 0580/02

Paper 2

General comments

The level of the paper was such that most candidates were able to demonstrate their knowledge and ability. The paper was more challenging this year with fewer candidates scoring over 65 marks and very few scoring full marks. However, there was no evidence that candidates were short of time.

Particular Comments

Question 1

This was generally well answered but 4496 x 10^6 was a common error. Some candidates rounded or truncated the give number, often incorrectly.

Answer: 4.496×10^9

Question 2

This was not very well answered, a large number of candidates thought that 91 was prime. There were some candidates who gave even numbers and numbers below 89.

Answer: 97

Question 3

A large number of candidates did not know the meaning of the word range. Some worked out the mean and most others gave a range of values. Part **(b)** was well done.

Answer: (a) 590 (b) Neptune

Question 4

Most candidates knew what was required but many were rounding their working or answers and failing to achieve sufficient accuracy. Others were not using their calculator correctly and obtained 0.821.

Answer: 1.73

Question 5

This question seemed to be very challenging. Many candidates did not know the ½absinC formula and found the height of the triangle by trigonometry. There were a large number of incorrect answers.

Answer: 21.3

Question 6

Candidate response to this question was very varied with many mistakes, once the initial work had been done, in simplifying the expression.

Answer: $\frac{x+5}{x(x+1)}$

Question 7

This question was poorly done, the common error being the use of 100 ml in a litre instead of 1000 ml

Answer: 20

Question 8

This was generally well done

Answer: $1/\sqrt{2}$, sin 47, ¾, π/4

Question 9

This was badly done this year. Most candidates multiplied by 12 and the found the limits instead of the other way round. Some candidates multiplied by 6 instead of 12. There were quite a few answers that involve the use of a 40 instead of a 50 at the right hand end of the limit.

Answer: 75000 76200

Question 10

This question was either very well or very badly answered. Many candidates gave n + 1½ whilst others were using the formula $u_n = a + (n-1)d$. Some gave the next term 13. Part **(b)** was usually correct.

Answer: (a) 4 + 1½n (b) 154

Question 11

Part **(a)** was well done. Some candidates could not tell the difference from part **(a)**. For those that could there was generally a problem solving the equation in part **(b)**.

Answer: (a) 13 (b) -4

Question 12

As always this remains a question that most candidates can answer.

Answer: x = 10 y = 3

Question 13

This was generally very well done. There was a wide variety of approaches and there is a common idea that both the top and bottom of the fraction should be multiplied when clearing a number from the denominator. Brackets were often incorrectly removed where, for example, 3(x – 2) often became 3x – 2.

Answer: -5.2

Question 14

This question differentiated well between most candidates and the very able. Few candidates knew what was required to answer part **(a)**.

Answer: (a) 55 40 (b) 16/25

Question 15

Part **(a)** was another question, which separated the most able candidates from the rest. Many candidates could answer part **(b)** correctly by ignoring part **(a)**.

Answer: (a) 500 + 170x (b) 11

Question 16

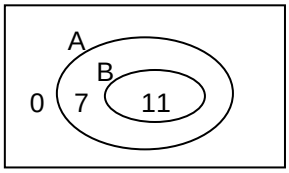
Less than half the candidates were able to answer part **(a)** correctly whilst part **(b)** was generally well done.

Answer: (a) 6000 (b) 12.5

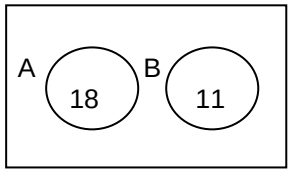
Question 17

This was generally badly answered with very few candidates scoring full marks. In part **(a)** many candidates failed to label their sets, whilst others had A inside B. In part **(b)** disjoint sets were rare with many assuming that the diagram in part **(a)** could be used.

Answer: (a)



(b)



Question 18

This was very well answered but very few candidates scored all 4 marks, usually due to an error in finding w

Answer: w = 30 x = 22 y = 30 z = 52

Question 19

This was generally well done. There were very few attempts to solve an equation this year.

Answer: (a) (2x – 3)(2x + 3) (b) x(4x – 9) (c) (4x – 1)(x – 2)

Question 20

Most candidates scored marks on this question and part **(a)** was very well done. In part **(b)** the shading for the line y = x + 2 caused most problems.

Answer: (a) m = –1 c = 8 (b) quadrilateral with vertices (1,4) (1,7) (3,5) and (2,4)

Question 21

This was generally well done. Part **(b)** was not known by a large number of candidates.

Answer: (a)(i) square 5 on top row or square 2 on bottom row (ii) square 5 on bottom row
(b) one of the 3 planes of symmetry
(c) 3

Question 22

The value of p was often found correctly but for q candidates compared AE to ED instead of AD and 14.4 was a common error. In part **(b)** very few candidates used the volume multiplier of 64 and tried to remember, usually incorrectly, the volume of a sphere.

Answer: (a) p = 7.2 q = 6.4 (b) 2304π

Question 23

This remains an area of study in which most candidates are not comfortable. Many non-vector answers were seen including the use of square roots and products such as ab. There were very few fully correct answers with part **(a)(iv)** and part **(b)** causing most difficulty. Few candidates understood the meaning of the term position vector.

Answer: (a)(i) $\mathbf{a} + \mathbf{b}$ (ii) $\mathbf{a} - \mathbf{b}$ (iii) $3\mathbf{a} + \mathbf{b}$ (iv) $1\frac{1}{2}\mathbf{a} + \frac{1}{2}\mathbf{b}$ (b) 4

MATHEMATICS

Paper 0581/03

Paper 3 (Core)

The majority of candidates were able to attempt all of the questions set, and were able to do so in the allotted time. Most papers were well presented and legibly written. A significant number of candidates lost marks for showing no working; no credit can be given for a wrong answer, but correct working when shown can earn method marks even when the answer is wrong. Method marks were available in **Questions 2**, **3**, **4**, **5**, **6**, **8** and **10** and working was expected in these questions. It is also preferable that this working is by the relevant question in the paper rather than on spare paper provided by the Centre. Candidates should read the rubric on the front page of the question paper with particular reference to the use of significant figures in their answers. Candidates should also answer the graph questions set on the paper and should not be given separate sheets of graph paper unless in exceptional circumstances. An individual breakdown of questions follows:

Question 1

(a) The descriptions were generally well done, although marks were often lost through incomplete statements, in particular the centre of enlargement was omitted. There were few instances of multiple transformations used.

(b) Most candidates were able to draw a rotation but common errors included rotations drawn clockwise, or about a different centre of rotation.

(c) Again the majority of candidates were able to draw a reflection, but common errors were reflections drawn in the incorrect lines of $x = 0$, $x = -2$, and $y = 0$

Answers: **(a) (i)** translation $\begin{pmatrix} -7 \\ -4 \end{pmatrix}$ **(ii)** enlargement, SF=3, Centre (0,0)
(b) correct R **(c)** correct M

Question 2

(a) The majority of candidates were able to substitute into the given formula. However a significant number did not observe the instruction of rounding to the nearest cubic centimetre.

(b) The required division by 0.8 was generally recognised although the conversion of this answer to hours and minutes caused many problems possibly due to over-reliance on calculators.

(c) Only the better candidates were able to correctly answer this question. The majority of candidates who attempted this part did so by using the volume and failed to appreciate the "spaces" left around the candles. The expected method of: width = "8 candles" (from 24/3), giving length = "12 candles" (from 96/8), leading to length = 36 cm (from 12×3) was rarely seen.

(d) (i) This was generally well done, although common errors were a failure to convert dollars/cents, or to give the profit for just one candle.

(ii) Again, this was generally well done although a common error was to use the selling price of \$33.60 instead of the cost price of \$25

Answers: **(a)** 141 **(b)** 2 hours 56 minutes **(c)** 36 **(d) (i)** 8.60 **(ii)** 34.4

Question 3

(a) This was generally well done although the negative signs caused some problems.

(b) The equation was generally solved correctly.

(c) This question involving the kite was split into 3 parts to guide the candidate through the required methods but a significant number failed to see the connections.

(i) A significant number appeared not to understand the term of perimeter and a number of answers included squared terms in j and k

(ii) The majority were able to equate their answer to 72

(iii) Only the better candidates were able to substitute k=2j and then solve the resulting equation. A number used a numerical approach rather than the expected algebraic method with varying results.

(d) (i) The intention of this part was to test subtraction and division of fractions. Changing to decimals led to inaccuracies since two of the fractions were non-terminating. There were some good answers by those who understood fractions but many, even if staying in fractions, failed to show the method required despite the clear instruction given in the question to " show all your working clearly "

(ii) Rearranging a given formula, a regular topic, was answered poorly with few candidates understanding what was required and many attempting to answer numerically. Those who did use an algebraic method often went wrong after the correct first line of wr = s – t, or gave the incorrect answer of s = w – t/r

Answers: **(a)** 4p – 3q **(b)** 7 **(c) (i)** 2j + 2k **(ii)** 2j + 2k = 72 **(iii)** 24
(d) (i) 1/3 (ii) s = wr + t

Question 4

(a) This was generally correct.

(b) This was generally correct from a variety of methods.

(c) This was less successful with n+5 or 6n being common errors.

(d) This was generally correct though little evidence of c) being used.

Answers: **(a)** 16,21,26 (b) 101 **(c)** 5n + 1 **(d)** 37

Question 5

(a) It was expected that the first average speed would be gained by seeing, from the graph, that the train had gone 200 km in the first hour of the journey. However this rarely happened and most candidates attempted to use the formula of distance divided by time. Incorrect or inaccurate conversions into hours gave unrealistic or inaccurate answers for the speed of a train. A number used the time of day rather than a period of time taken.

(b) (i) This was generally well done although common errors were failing to represent the stoppage time and/or ending the journey at 10,00.

(ii) The correct follow through time was generally given although a small number misinterpreted the scale.

(c)(i) This was generally well answered although a significant number reversed the direction and gave this second journey as going once again from Madrid.

(ii) The majority of candidates were able to correctly interpret the graph and give the correct follow through answer.

(iii) The second average speed was again poorly answered for the same reasons as in (a). In addition the distance was often taken as 340 or 500 km.

Answers: **(a)** 200 **(b) (i)** correct lines drawn **(ii)** 0933 **(c) (i)** correct line from (0730,470) to (0945,0) **(ii)** 280 **(iii)** 209

Question 6

(a)(i) This was well answered with just a few numerical errors

(ii) This was not so well done with a number finding the median, mode, or simply giving the largest value.

(b)(i) The 7 points of the scatter graph were generally plotted correctly.

(ii) The line of best fit was less successful with a significant number joining all points in a series of straight lines or a curve

(iii) The correct follow through answer was generally seen.

(iv) This was generally correct, although all 3 given answers plus others seen.

(v) This was generally well answered although the incorrect use of the term "proportional" was a common error.

Answers: **(a) (i)** 163.4 **(ii)** 24 **(b) (i)** correct points plotted **(ii)** a correct line of best fit drawn **(iii)** correct follow through height **(iv)** positive **(v)** a correct statement (larger hand is greater height etc.)

Question 7

(a)(b) Very few candidates were able to interpret the y = mx + c form of a straight line

(c) The required table of values was generally correct.

(d) The points were generally plotted correctly. The drawing of the resultant curve was less successful with the common errors of a series of straight lines, too thick sketches and "looped" curves all seen.

(e) The problem here was misreading the scale.

Answers: **(a)** m **(b)** y = 2x + 5 **(c)** 8,12,3 **(d)** correct graph **(e)** (-3.8, -2.7) (1.8, 8.7)

Question 8

(a)(i) This was generally correct (pentagon) although hexagon and quadrilateral were common errors. A full variety of other geometric terms were also seen.

(ii) Surprisingly, few realised the straightforward method of 360/5. Common errors included 360/3, 180/3 and 360/6

(iii) Again this was poorly answered although a number were able to gain the correct follow through answer from their part **(ii)**.

A considerable number of candidates seemed not to understand the 3-letter notation for angles.

(b) Those candidates who know and understand the properties of parallel lines had little difficulty with this part and were able to score full marks. Weaker candidates appeared to guess almost at random using the two given values, or to assume the existence of isosceles triangles or right angles often leading to angles y and z being equal.

Answers: **(a) (i)** pentagon **(ii)** 72 **(iii)** 108 **(b)** x=35, y=64, z=81

Question 9

(a) Both measurements were usually accurate and correct although a small number failed to use the scale in (i) and/or gave the answer of 108 in (ii) from incorrect reading from the protractor.

Although the clear instruction on the question paper was to "leave in all your construction lines" many candidates did not, or were unable to, do so and so often lost accuracy and/or method marks. Better candidates were often able to score full marks however.

(b) (i) The required angle bisector was generally recognised although as stated the lack of any construction lines often resulted in the loss of one of the available marks.

(ii) This measurement was usually followed through correctly.

(c) The required locus here was less successful, partly for the reasons already given. In addition a significant number incorrectly joined the mid point of the line AC to the vertex B.

(d) Most candidates had a grasp of where to label the region G.

Answers: **(a) (i)** 85 **(ii)** 72 **(b) (i)** correct angle bisector **(ii)** 83
(c) correct perpendicular bisector **(d)** correct region G

Question 10

(a) This was generally correct although 50,40 and 45,45 were common errors. Not all candidates recognised the hint given here that this meant that the given triangle was right angled and implicitly suggested the methods to be used in the rest of the question. The fact that the right angle was at the top of the diagram and not at the bottom seemed to confuse a small number of candidates.

(b) This was generally well answered by the better candidates. The full range of trig. ratios was seen with tan= 17/13 being common.

(c) This was more successful although subtraction rather than addition was a common error.

(d) A surprising number of candidates failed to realise that the simple formula of Area = ½ x Base x Height could be used, with a number of complicated and convoluted methods attempted. Those who did use this formula often used the wrong pair of sides.

(e) Few correct answers were seen to this part. Only the very best candidates appeared to appreciate the follow through method to be used was 360 – (50 + b), and that no further calculations were needed.

Answers: **(a)** p=40, q=50 **(b)** 37.4 **(c)** 21.4 **(d)** 110.5 **(e)** 272.6 or 273

MATHEMATICS

Paper 0580/04
Paper 4 (Extended)

General comments

The majority of candidates found all nine questions to be accessible. However, there were more parts of questions that caused difficulty than has generally been the case in the past. As a consequence, fewer candidates scored very high marks.

Once again, marks ranged from single figures to full marks. The number of very weak candidates continues to be low, but for these candidates the Core level examination would be more appropriate. There was little evidence of candidates having time difficulties with the paper.

Candidates usually, but not always, gave answers to the required accuracy. If part of a question asked for specific accuracy, then the final answer was expected to be to that degree of accuracy. Use of the calculator was good, and it was pleasing to see how rarely RADS or GRADS were encountered.

The year-on-year improvement in presentation of work continued, with relatively few candidates not showing their working. More Centres instructed their candidates to start a new page for each question, and this assisted these candidates in organising their work. There were still some Centres, however, that were encouraging their candidates to work in 2 or even 3 columns on a page. This made it difficult for candidates to organise their work, and it made marking the work and recording the marks more difficult for Examiners.

Examiners often experienced difficulty in accessing work where booklets and graph paper were secured by staples or paper fasteners. It would be appreciated if treasury tags could be used to loosely fasten all the answer materials together.

Inappropriate graph paper was still being given to candidates in some Centres. This must have made it difficult and time consuming for candidates to answer the questions.

Comments on specific questions

Question 1

This was based on an unusual topic for the first question on the paper, and it also carried more marks than usual. More able candidates adapted quite well and still got off to a good start, but many weaker candidates found the question difficult.

(a) (i) Almost all of the candidates knew how to calculate the time. Most of them got 10.625 hours, but many then gave the final answer as 10, 10.6 or 11 hours. The exact answer had been asked for.

(ii) This was answered better than part **(i)**, with many candidates recovering the accuracy lost earlier.

(b) (i) This was usually well answered. The usual mistake was to give the answer as a length of time instead of a time of day.

(ii) This was well attempted, but weaker candidates tended to divide by 10.48 instead of 10.8.

(c) (i) This was usually correct, though many candidates found difficulty in distinguishing between "increasing more slowly" and "slowing down". Some candidates wrote about A to B and/or C to D as well, which sometimes made their responses confusing.

(ii) This part was not as well answered. Many candidates were confusing speed and acceleration.

(iii) This was answered quite well, though a common misconception was to divide 10 by 1.8. The main problem, however, was inaccurate reading of the scales.

(iv) This was also well answered, though weaker candidates tended to find one area (usually 30 or 200) and then go no further.

(v) It was rare to get a response that properly explained that the areas on each side of the broken line were approximately equal. Candidates could usually see no further than to say that it made the calculation easier or that the line was "a line of best fit".

(vi) Almost all of the candidates knew to divide their distance by 10, but the subsequent unit conversion was either ignored or inaccurate.

Answers: **(a)(i)** 10.625 hours **(ii)** 10 hours 37 mins 30 secs
(b)(i) 6 08 **(ii)** 78.7 km/hr
(c)(i) Increasing **(ii)** Decreasing **(iii)** 12.5 metres/sec^2 **(iv)** 170 metres
(vi) 61.2 km/hr

Question 2

This was not a difficult question for an organised candidate, but far too often the responses were spoilt by careless errors. For example, BC was often used as 12 cm.

(a) Most candidates found the length of arc AB correctly, but then many answers were spoilt by failing to add four correct edges.

(b) Again, the sector area was usually correct, but then there were many careless errors in trying to find the area of the L-shape.

(c) Most candidates either got the correct answer or a follow through answer from part **(b)**. The remaining candidates almost always treated the prism as a cuboid.

(d) On the whole, candidates made very hard work of this part. Most candidates multiplied their answer to part **(b)** by 2, but very few then multiplied their answer to part **(a)** by 40. Instead they chose to start again and tried to work out the areas of the individual faces. Unfortunately they usually forgot one or more of the faces or used incorrect dimensions.

Answers: **(a)** 74.8 or 74.9 cm **(b)** 365 cm^2 **(c)** 14 600 cm^3 **(d)** 3720 or 3730 cm^2

Question 3

This question was well answered, though the more difficult parts differentiated between abilities.

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

(ii) There were a few more errors in this part.

(iii) This part caused much more difficulty, with ⅓ being a common wrong answer.

(b) (i) It was very unusual to find any error in the values of r, s and t.

(ii) Problems with the scales were very rare.

(iii) The point plotting and the curve drawing were of a very high standard. Some candidates did spoil the curve by drawing the final section as a ruled line.

(c) (i) The ruled line was usually correct, though some candidates did not draw the full line as requested. Unfortunately, freehand drawing of the linear graph was seen occasionally.

(ii) This was usually correct, but it was often spoilt by the inclusion of the y coordinate. Some answers lacked accuracy, with 1.5 being seen regularly.

(iii) Only the more able candidates got this part correct. Quite often it was not attempted. Some candidates gave a range because they did not know what an integer was, whilst others gave a list of extra integers.

Answers: **(a)(i)** 1 **(ii)** -1 **(iii)** 1.5 **(b)(i)** 0.25, 1, 8 **(c)(ii)** 1.51 to 1.57 **(iii)** 1

Question 4

Generally this question was well attempted, with many candidates obtaining full marks. Many other candidates knew what was required, but they showed insufficient care in ensuring that their diagram was accurate.

(a) This part was well answered. A few circles had incorrect radii, and some of the smaller circles were drawn freehand. The main problems were not ensuring that AB and CD were perpendicular and making the lines parallel to the roads 0.5 cm apart.

(b) (i) The necessary arcs were often seen, but a significant number of candidates failed to draw in the locus as instructed.

(ii) Most candidates marked T correctly, though some marked T elsewhere even though they had drawn an angle bisector. The position of T was not always clear. It is not good practice to put the letter over the position of the point, which happened far too often.

(c) Most candidates were looking to find the perpendicular bisector of their TB, but, as in the previous part, the required line was not always drawn even though construction arcs could be seen. The major error, however, was that a large number of candidates chose to construct a second angle bisector.

(d) It was almost inevitable that those with correct diagrams measured TP correctly and wrote the correct units.

Question 5

The performance of the candidates varied more on this question than on any other question on the paper. Candidates regularly scored full marks, but zero was also seen, though not quite as often.

(a) Far too many candidates failed to convert the inverse proportionality into an equation with a constant. Consequently $y = 1/x^2$ and $y \propto 1/x^2$ were common. Those candidates who obtained the required general equation often failed to state explicitly where the 120 came from. When verification is required, it is important that candidates show every possible working step.

(b) This part was very well answered.

(c) This part was well attempted, though some candidates gave 3.5 as the answer without showing a more accurate version. $\sqrt{12}$ was not acceptable as a final answer.

(d) More difficulty was caused by this part. Some candidates found the equation in x, but made no attempt to solve it. Once again, 4.9 was seen regularly as an answer without a more accurate version being shown.

(e) A large number of candidates thought that y would be halved. There were many candidates who knew the correct answer, but had trouble expressing it in words. Consequently expressions such as “decreases 4 times” or “4 times smaller” were accepted.

(f) This was much more difficult than the previous part. “Increased by 64%” was a common wrong answer. More candidates than expected managed to find the correct answer.

(g) This was usually well attempted, but many candidates lost the second mark because they did not ensure that the square root sign covered the whole fraction and not just the numerator.

Answers: **(b)** 30 **(c)** 3.46 **(d)** 4.93 **(e)** Divided by 4 **(f)** Increases by 25% **(g)** $\sqrt{(120/y)}$

Question 6

Many candidates had difficulty in visualising the triangle that they needed to use for a particular calculation. Consequently many wrong triangles were used and incorrect assumptions were being made about the length of sides. Some candidates only learn one version of the Cosine Rule(side explicit) and errors were common when trying to transpose this to calculate an angle. This was made worse by some candidates using the Cosine Rule (or the Sine Rule) when a right-angled triangle was available.

(a) This was well attempted, but PE was sometimes calculated from an assumed value for CE of 3, 4 or 6. If CE was used as 5, PE was regularly assumed to be the hypotenuse.

(b) The working for this was usually correct.

(c) This part was well attempted. A variety of methods were available, though many candidates chose to ignore the right angled triangle and use the Cosine Rule.

(d) Many candidates used the 13, 13, 8 triangle in error. When PM or PN were calculated in a correct triangle, premature approximation was a problem leading to an inaccurate final answer.

(e) (i) This was well answered, perhaps because most candidates were able to identify the appropriate triangle. Some problems were caused by the use of a slightly accurate PN, or use of the Cosine Rule when it was not necessary.

(e) (ii) Weaker candidates invariably assumed that KBC was a right-angled triangle. Some candidates had repeatedly used the Cosine Rule unnecessarily in earlier parts, but these candidates failed to use it when it was required.

Answers: **(a)** 12 cm **(b)** 192 cm^3 **(c)** 67.4° **(d)** 36.9° **(e)(i)** 76.7° **(ii)** 6.40 cm

Question 7

The performance of the candidates was very Centre dependent. Those candidates who were more familiar with the work were able to score quite well.

(a) (i) (6, 2) was a common wrong answer from an attempt to multiply.

(ii) Quite often candidates got part **(i)** correct, but ended up with (4, 4) here.

(b) Able candidates had little problem in finding the correct matrix. Many candidates became involved in long and unnecessary calculations, when one only has to consider the reflection of the base vectors.

(c) This part of the question was only successfully completed by potential A* candidates. Some other candidates were able to select a value for k, and then justify what happened numerically rather than algebraically. Weaker candidates did not attempt this part.

(d) Those candidates who found **M** in part **(b)**, almost always got this part correct. If **M** was incorrect in part **(b)**, there was a chance to get some credit for trying to find their inverse. This was often unsuccessful because they either struggled to evaluate the determinant or failed to manipulate the elements of the matrix correctly.

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

(ii) For candidates from some Centres, this was three easy marks. Many candidates thought that this was a reflection.

Answers: **(a)(i)** (5, 3) **(ii)** (3, 5) **(b)** $\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$ **(d)** $\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$ **(e)(i)** $\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$

(e)(ii) Rotation, Centre (0, 0), 270°

Question 8

This question was well attempted. It was pleasing to see the continued improvement in the standard of the algebra produced by the candidates.

(a) (i) Most candidates were able to set up the initial equation. A few candidates forgot to use the 62, but the main problem was the careless collection of the numeric terms, usually to get –98. Some candidates ignored the instruction to simplify the equation until later in part **(ii)**.

(ii) Virtually all of the candidates who factorised the quadratic equation had no problems, but some candidates did insist on using the formula and consequently more errors were seen.

(iii) Those candidates with correct solutions from part **(ii)** had no problem in choosing the correct one.

(iv) Most of the candidates were able to demonstrate a correct method of finding the area, either by using the trapezium formula or by splitting up the shape. Very occasionally a candidate would highlight an incompatibility in the dimensions of the trapezium. They were able to use x = 8 to show either that the vertical height of the right-angled triangle was 9.17 or that the base of the right-angled triangle was 6. These cases were very rare, but, when seen, appropriate credit was given.

(b) (i) This part was well attempted, with many candidates being able to verify the equation by showing all the necessary steps without error. Weaker candidates tended to not attempt this part.

(ii) Most candidates had no problem solving the equation. Some of the candidates, however, were confused over the signs when substituting into the formula. Consequently, −8 was seen instead of –(−8) and $\sqrt{40}$ instead of $\sqrt{88}$. Answers were usually accurate to two decimal places as requested.

(iii) Almost all of the candidates were able to demonstrate that they could use one of their values to find the area.

Answers: **(a)(i)** $x^2 + 4x – 96 = 0$ **(ii)** 8 and –12 **(iii)** 8 **(iv)** 176 **(b)(ii)** 4.35 and –0.35 (**iii)** 13.8

Question 9

(a) The whole of part **(a)** was usually correct, and even weaker candidates earned some marks.

(i) This was almost always correct.

(ii) Well answered, but some candidates carelessly gave 2.5, which then affected part **(iii)**.

(iii) This part was also well answered.

(iv) This part was rarely wrong.

(b) (i) This part was answered extremely well by most candidates. Some candidates felt that they did not need to show their working. If the answer was correct they got full marks, but if it was incorrect they got zero.

(ii) Only the most able candidates had any idea how to tackle this. Common responses were 15/100, 15/100 x 14/100, and15/100 x 15/100.

(c) (i) **p** and **q** were usually correct, even though they were sometimes difficult to find.

(ii) The second and third columns of the histogram were usually correct, but the drawing of the first column lacked accuracy. If more candidates had calculated the frequency densities, then more of them would have been able to get the height between 3.2 and 3.4 cm high.

Answers: **(a)(i)** 1 **(ii)** **3** **(iii)** 4 **(iv)** 9 **(b)(i)** 38.2 **(ii)** $\frac{7}{330}$ **(c)(i)** p = 20 q = 72

MATHEMATICS

Paper 0581/5

Coursework

General comments

Many candidates produced well presented and organised work this year, with standards remaining very similar to those seen in previous years. Some Centres have taken advantage of being able to print tables, diagrams and graphs using IT and to stick these into the assignments at appropriate points. This smoothed the flow of the written work and avoided the need for clumsy appendices.

Most Centres presented work of a suitable length, but a few Centres took advantage of the "open" nature of guidance on time and presented very long assignments. In many of these cases candidates did not use their time effectively and may have gained similar marks on much shorter submissions. It is suggested that Centres whose candidates regularly produce assignments more than 16 pages long may want to review their practice.

A good range of tasks was offered to candidates covering both investigative and practical applications of mathematics. The best Centres differentiated how assignments were specified to different ability groups. For example, a group of candidates entered at the Core level were given a lead into an investigation to guide them. This was in contrast to their more able peers, entered at the Extended level, who were simply given the problem to investigate.

Statistical assignments were more commonplace this year. One advantage with this type of task is that it usually allows candidates to select their own topic to research and analyse. However, candidates who collect vast quantities of data (usually from the Internet) and only have time to analyse a very small proportion will score very few marks against the assessment criteria.

Although only a few cases were seen, it is worth pointing out that high level techniques used in practical applications of mathematics do not automatically gain high marks - the use of a high level technique must have a direct bearing upon the problem. This was most prevalent at the Core level where some candidates used, for example, a cumulative frequency curve to display their data but failed to make any use of their diagram to comment on the median or interquartile range.

Some very good practice was seen this year by Centres using well documented investigations, such as the T investigation. This particular investigation was used by several Centres and it provided ready access for candidates entered at the Core level. It was pleasing to see candidates of all abilities using algebra to support their solutions with the more able going on to prove formulae linking the height, width and position of the T on an (n × m) grid.

The controlled elements seen this year were appropriate to the coursework assignments and this aspect of the work was carried out competently by teachers.

In general, teachers' applied the assessment criteria well. There were still a few cases though where high marks seem to have been awarded for enthusiasm on the part of the candidate rather than for the mathematical content of the work. Assessments in all 4 strands were very consistent within the vast majority of Centres pointing to the fact that internal moderation worked well and produced a reliable distribution of marks.

MATHEMATICS

Paper 0581/6

Coursework

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