MATHEMATICS

Paper 0581/11

Paper 11 (Core)

General comments

In general the candidates showed a good level of knowledge and understanding when attempting the paper. For the majority of candidates time was not an issue. Candidates were weakest on equations of lines, bearings, angles and converting square centimetres into square metres. Topics which were answered well included time calculations, ordering fractions, decimals and percentages, and negative numbers. The majority of candidates showed working, but the importance of showing working must be stressed to all candidates, as some lost marks due to writing answers only. Candidates should show their working below the question as instructed on the front of the paper.

Comments on specific questions

Question 1

Candidates were generally able to write the correct arrival time of the ferry.

Answer: 10 18

Question 2

(a) Most candidates ordered the numbers correctly.

(b) About half the candidates chose the correct expression.

Answers: **(a)** $41\% < 0{\cdot}43 < \frac{4}{9}$ **(b)** $0{\cdot}3 < \frac{1}{3}$

Question 3

This question was generally correct, although a small number of candidates misread the question and gave the probability of a student going by bus rather than **not** going by bus.

Answer: $\frac{3}{5}$

Question 4

Few candidates scored both marks on this question. However, many earned 1 mark for either 4*x* or –3. A small minority wrote an expression rather than an equation by omitting the left hand side.

Answer: $y = 4x - 3$

Question 5

Very few candidates were able to correctly answer this question. Despite the question paper stating the diagram was not to scale, it was evident that some candidates had attempted to measure the angle. The common error was to subtract 107 from 180 and give the answer 73.

Answer: 287°

Question 6

(a) Weaker candidates subtracted 2 from 5 instead of 5 from -2.

(b) The difference between -2 and 11 was generally correctly found.

Answers: **(a)** -7 **(b)** 13

Question 7

Stronger candidates often scored full marks on this question. Weaker candidates who did not understand percentage reduction just subtracted 15300 from 17000.

Answer: 10

Question 8

(a) Many candidates were able to collect the expressions together, but did not score the mark as they had not written "= 52". It is important that candidates read the question carefully and fully answer the question.

(b) Many candidates who answered **part (a)** correctly went on to score both marks here. Of those who did not, many scored 1 mark for getting either $4x$ or 56.

Answers: **(a)** $x + x + 3 + 2x - 7 = 52$ (or better) **(b)** 14

Question 9

Well attempted with many candidates scoring at least 1 mark for writing $\pi r^2 = 19.7$. Several went on to score full marks. Common errors were to use πd or to just find the square root of 19.7.

Answer: 2.5(0)

Question 10

(a) The majority of candidates were able to answer this question correctly. The most common error was writing p^{12}.

(b) This part was less well answered than **part (a)** although many candidates did score both marks. Several other candidates scored 1 mark for either $4q^n$ or kq^6. A common error was 4^6.

Answers: **(a)** p^7 **(b)** $4q^6$

Question 11

Stronger candidates were able to answer this question using a full method. Some candidates realised that the angle on the right was 20°; this was often written on the diagram and scored 1 mark. Many candidates just wrote an incorrect number on the answer line without any method to indicate where the answer had come from, so could gain no credit.

Answer: 18

Question 12

(a) Several candidates were able to correctly answer this question. Common incorrect answers were 100 and -100, not appreciating the meaning of the negative index.

(b) This part of the question was the part which more candidates were able to do, with many correct answers seen.

(c) Many correct answers were seen. It appeared that not all candidates had or knew ... calculator. Common incorrect answers were 55.56…, apparently from multiplying $\sqrt{343}$ ...

Answers: **(a)** 0.01 or $\frac{1}{100}$ **(b)** 1 **(c)** 7

Question 13

Several candidates showed clear, correct answers. Most attempted elimination, but errors often occurred by not consistently adding all the terms when *y* was to be eliminated, or subtracting when *x* was eliminated. Some candidates became confused by subtraction with negative numbers and wrote -3*y* rather than −11*y.*

Answer: $x = 4$, $y = -1$

Question 14

(a) This part was the best attempted of this question, with many correct answers.

(b) This was the least well answered part. Many candidates appeared not to realise triangle COA was isosceles.

(c) Many candidates appeared not to know angle CAB was a right angle.

(d) Many were successful in this part, either by giving the correct answer or following through from their answer to **part (c).**

Answers: **(a)** 90° **(b)** 72° **(c)** 90° **(d)** 36°

Question 15

A very well answered question with candidates being slightly more successful in **part (b)** than **part (a).**

Answers: **(a)** $\begin{pmatrix} 4 \\ -9 \end{pmatrix}$ **(b)** $\begin{pmatrix} 0 \\ 28 \end{pmatrix}$

Question 16

The lines of symmetry were correct more often than the rotational symmetry. Several candidates only attempted to answer the lines of symmetry, while others gave the order of rotational symmetry as an angle (90° etc.) rather than as a number.

Answer: lines of symmetry 1, 0 order of rotational symmetry 1, 4

Question 17

(a) (i) A significant number of candidates calculated the speed correctly. Of those who did not, the most common incorrect answer was 3.

(ii) Many scored the mark in this part for either the correct answer or for multiplying their answer to **part (a)(i)** by 60. Some candidates did not realise they had to multiply by 60.

(b) Many fully correct graphs were seen. Some candidates drew the horizontal line correctly but then incorrectly drew the diagonal line. A small number had an incorrect horizontal line but gained the mark for a diagonal drawn to their (x +15, 0). A small number of candidates had incorrectly read the question and omitted the horizontal line.

Answers: **(a)(i)** 0.3 **(a)(ii)** 18 **(b)** horizontal line to (30, 3), line from (30, 3) to (45, 0)

Question 18

(a) A significant number of candidates appeared to be unfamiliar with factorising, as many attempt to answer this question.

(b) This part was more successful than **part (a)** and was attempted by more candidates. Many scored 1 mark for correctly multiplying out one bracket. Errors were than made by adding unlike terms or confusion with squaring. Some weaker candidates added the term in front of the bracket rather than multiplying.

Answers: **(a)** $y(3y - 7x)$ **(b)** $4p^2 + 17pr + 2r^2$

Question 19

(a) (i) There were many correct answers, although 75 cm was frequently seen, even though the number of tiles was asked for.

(ii) Many candidates did not understand they needed to multiply their answer to **part (a)** by 10. Several candidates multiplied by 25.

(b) (i) The area of one tile was generally correctly calculated.

(ii) Very few candidates were able to convert from square cm to square m correctly. Common errors were to divide by 100 or 1000, while others multiplied.

Answers: **(a)(i)** 12 **(ii)** 120 **(b)(i)** 625 **(ii)** 0.0625

MATHEMATICS

Paper 0581/12

Paper 12 (Core)

General comments

In general the candidates showed a good level of comprehension when tackling most of the paper. There were clearly very few cases of candidates not having enough time to complete the paper. Since the questions on Paper 1 tend to be testing skills more than applications it is of concern that there were far too many cases of questions being left blank. This indicates that some topics have not been understood or possibly not covered in teaching the syllabus. Candidates should be comprehensibly prepared for the examination in order to have the opportunity to tackle every question on the paper.

There was some concern this year that presentation of the work was weaker and candidates should be aware that clarity of working is important and Examiners can only mark what they can read. Working, in general, was shown but there were cases of answers only, indicating that working had been done elsewhere and just solutions copied onto the paper. Candidates should show their working below the question as instructed on the front of the paper. Where this working is not shown, possible method and other part marks are lost when an incorrect answer is gained.

The questions that proved to be the most difficult were 5**(b)**, 7, 9, 13**(b)**, 16, 17**(a)** and **(c)**, 19**(b)** and 20.

The questions that presented least difficulty were 1, 3, 5**(a)**, 6, 10 and 12**(b)**.

Comments on specific questions

Question 1

It was very rare to find a candidate who did not know that the sum of the angles at a point was 360°. The few errors made were usually calculation errors.

Answer: 119°

Question 2

Candidates are often confused between factors and multiples and this was evident many times in this question. **Part (b)** was often correctly done, although a common fault was to miss out 72 or 96, but a factor, rather than a multiple was often offered in **part (a)**. Quite a number gave factors as well as multiples in **part (b)**. The answer of 24 was often included in **part (b)** but this was not penalised.

Answers: **(a)** 24 **(b)** 48, 72, 96.

Question 3

Although this factorisation question was quite well done, there were a significant number who lost a mark by taking out just one factor. Other errors were taking out 6, leaving 1.5 in the bracket, and taking out the common factor but leaving it still inside the bracket.

Answer: $3p(2m - 3q)$

Question 4

Operations on fractions are required and in a calculator paper working has to be seen to assess t
While many, quite legitimately, converted the fractions of a litre to millilitres, they then needed to co back to a fraction for the answer. Consequently many only gained one of the two marks. All working me that the plus sign was required in 250 + 400 or $\frac{8}{20} + \frac{5}{20}$ rather than just the figures. Unfortunately, quite a number of candidates felt there was some significance in the 3 glasses and involved that number in their calculations.

Answer: $\frac{7}{20}$

Question 5

While most candidates coped well with **part (a)**, a considerable number subtracted the 4 hours or converted to minutes, resulting in errors. Most gave a correct 24-hour clock form ('hours' at the end was the only word or letter accepted).

Once again working out a time period over two days in **part (b)** defeated the vast majority. A common close response was 11 h 55 min from adding the 10 minutes.

Answers: **(a)** 22 10 or 10 10 pm **(b)** 11 (h) 35 (min)

Question 6

Multiplying by the money conversion factor seems to be far more straightforward and consequently this was about the best-answered question on the paper. Only a fairly small number seemed convinced that these questions always had to be the harder division problem, but candidates should always consider whether their answer is meant to be larger or smaller in the new currency. Unfortunately, some candidates rounded to 3 significant figures, which should not be done if the answer is exact.

Answer: 1904

Question 7

Core level candidates do find this topic of bounds extremely difficult. This question also had the additional aspect of changing units. Many simply gave the given upper bound in millimetres and few managed the step of interpreting the question correctly. However, quite a number of more able candidates showed their ability on this question.

Answer: 66.5

Question 8

Change of subject was quite well done but many did not realise that a square root was needed. Surprisingly it was common to see $m - 2$ rather than $m + 2$ for the first step and far too many did not show the first step, which often led to no marks.

Answer: $(\pm)\sqrt{(m + 2)}$

Question 9

Candidates need to understand that bearings are angles measured from a north line in a clockwise direction and they need the skill of using a protractor correctly. Unfortunately, most could not show these in this very straightforward question. Many answers to **part (a)** were obtuse or reflex angles. Measuring angle *DPH* in **part (a)** and angle *DHP* in **part (b)** showed the lack of understanding of this topic.

Answers: **(a)** (0)34° to (0)36° **(b)** 286° to 289°

Question 10

The question was very well done with many fully correct responses. In **part (a)** the negative sign sometimes ignored giving an answer of 14. Answers of 480 and 2520 were seen in **part (b)** from subtr 20 and multiplying 5 by 10 before squaring, respectively.

Answers: **(a)** 6 **(b)** 520

Question 11

There are still quite a number of candidates who have not grasped the topic of scatter diagrams and correlation. For the great majority this was well done with most producing a line of fit within the generous boundaries allowed. Strangely some thought that a line meant a series of lines producing a zigzag effect. Again those who understood types of correlation almost always gave negative and went on to an appropriate description in the last part.

Answers: **(a)** Correct line of fit by eye **(b)** negative **(c)** Older children run faster

Question 12

Part (b) was very well done with the main error being some candidates giving the power alone rather than the full expression. In contrast **part (a)** caused more problems as simply '*x*' was asked for. The negative power also, as usual, caused a problem and the answer of 3 was often seen.

Answers: **(a)** –3 **(b)(i)** p^5 **(b)(ii)** m^{-4} or $\frac{1}{m^4}$

Question 13

A lot of errors were made in this straightforward calculation. By typing it in as it stood the result 0.751796 was found and other incorrect order of operations were evident.

With a follow through it was expected that **part (b)** would score well but this was not the case. Rounding was often truncating when clearly over the halfway point, but the more significant error was putting the number into standard form. The negative was not observed in many cases as well as a lack of numbers between 1 and 10.

Answers: **(a)** 0.08259(……) **(b)** 8.26×10^{-2}

Question 14

There is an improvement in the responses to simultaneous equations and it was pleasing to see a lot of clear, correct answers. Most attempted elimination, but errors often occurred by not consistently adding all the terms when *y* was to be eliminated or subtracting when *x* was eliminated. Errors here invariably gave unlikely decimal answers and candidates should then have realised there was an error. Substitution was used successfully but in many cases an error was more likely. Occasionally solutions without working were seen but could then only gain full marks if completely correct, otherwise it was zero.

Answer: (x) = 7, (y) = 3

Question 15

Many did not answer this question even though the topic of nets is clearly stated in the syllabus. With most of the net given, nearly all who answered the question gained the mark for the side piece. The other rectangles were a bit hit and miss if done at all. They could go at the top, or bottom or one at each of these but the order needed to follow the prism. However, there were a lot of fully correct answers, drawn clearly.

Answer: Accurate net

Question 16

Many still have not fully appreciated the difference between simple and compound interest, and a si number gave a simple interest solution. Those who did understand compound interest generally made progress. Unfortunately many of those did not observe the question and simply gave the amount afte years. Only a small proportion took the extra step of subtracting 2500 to get the interest. Others quite correctly found the two separate interests correctly but then quoted the second year's interest rather than the sum for their answer. The compound interest formula, while not required in the syllabus, can be used but many who did try to use it did not recall it correctly.

As this concerned money, candidates should give 2 decimal places for the answer. Many rounded too much but more than two decimal places were not penalised as the question concerned investment

Answer: 282.56(…..)

Question 17

This was perhaps an unfamiliar way of testing recognition of graphs of lines and curves and it was not done well. **Parts (b)** and **(d)** were best done but many candidates did not score or just got one correct, perhaps by chance. Candidates should realise the equation difference between a line and a curve graph as well as recognising the coefficient of x to be the gradient on a linear graph.

It was particularly disappointing that many did not even attempt this question, indicating no idea of the relationship between equations and their graphs.

Answers: **(a)** D **(b)** E **(c)** G **(d)** F

Question 18

This was well answered in general, as transformations are generally well-understood. Most understood the translation required a vector but the components were one out at times as some candidates counted the starting point. A correct rotation was very common but many did not rotate about the origin resulting in an incorrect position for the flag, most commonly from rotating about the base of the flag. Only occasionally was the flag rotated anti-clockwise.

Answers: **(a)** Translation $\begin{pmatrix} 7 \\ -6 \end{pmatrix}$ **(b)** Correct rotation

Question 19

This was a very challenging question and was not well done. Most did find the area of the rectangle in **part (a)** but then added the area of a circle or used the diameter as a radius.

Many did not attempt **part (b)** but those who did realised that multiplying by the figure 2 was needed. However, most could not cope with the change of units and multiplied by 2 or 0.02 or even 20 rather than 0.2. Many gained some marks due to the split of sections of the door and follow through in **part (b)**.

Answers: **(a)** 98.1 **(b)** 19.6

Question 20

By taking the familiar context of a running track it was hoped that candidates would know the basic shape of the boundary that was required. Unfortunately most candidates did not use this and a great variety of incorrect boundaries resulted, many not even being a complete circuit. Of those who found the basic shape, many made the straight-line sections too long and the semicircles did not join at a correct place. Some allowance was made for inaccuracies but clearly many did not fully realise that this was a construction question.

In **part (b)** two 40 cm lengths were often included and most did not realise the curved part was just the circumference of a circle.

Answers: **(a)** Correct scale drawing **(b)** 391

MATHEMATICS

Paper 0581/13

Paper 13 (Core)

General comments

Candidates made good attempts at answering this paper and there were some very high marks achieved. There were occasions when questions were left blank but this seemed a problem over understanding what was required rather than a lack of time. Candidates must be familiar with the entire syllabus so they can answer all questions as topics can appear on either paper. Candidates lost marks through lack of accuracy often caused by rounding values found mid-way through a calculation. Although the questions on this paper are more skills based than contextual, candidates must make sure they read the questions carefully to make sure they have not missed important information, for example, **Question 3** asks for factors of 48 but only those between 10 and 40. This last stipulation was often missed or ignored. Candidates must make sure that their work is clear and should show the method used as well as the answer. There is little evidence that working was checked.

The questions that proved to be the most difficult were 6, 12, 14**(b)**, 16 and 18.

The questions that presented least difficulty were 1, 2, 8, 11, 19 and 20**(a)**.

Comments on specific questions

Question 1

This was a good start to the paper for many candidates although there were some responses seen that resulted from arithmetic errors.

Answer: 109

Question 2

Here, many candidates showed they could work correctly with time and gave their response in an acceptable form. As this question dealt only with times before midday candidates did not have the problem of expressing an afternoon time in 24-hour notation.

Answers: 10 26

Question 3

Candidates were not told how many answers were expected and some wrote all the factors of 48 whether or not they were between 10 and 40. A partially correct list was given credit but candidates should make sure they have noted all the information they are given so that their response does answer the question asked.

Answer: 12, 16 and 24

Question 4

Some candidates decided that the = symbol was the answer in both cases.

Answers: **(a)** > **(b)** <

Question 5

Generally, this was well done with the majority of candidates gaining at least one mark. Answers 80%, which was the sale price rather than only the reduction, or 25%, finding the discount as a percent the sale price instead of the original price, were seen occasionally.

Answer: 20

Question 6

In previous sessions, Core level candidates have found questions on this area of the syllabus difficult and it was the same with this examination paper as candidates did not handle this question well. Some candidates simply repeated the given equation. Candidates need to know the formula for the equation of a straight line and what each part represents. Candidates who understood the word ‘parallel’ or that the point mentioned was the intercept on the y-axis and related that to the equation of the line got one mark. Any correct equivalent form of the equation of the straight line got both marks.

Answer: $y = 3x - 2$

Question 7

This fraction question given in a context produced many ways of getting to an answer, some in an acceptable form, others not. Candidates had to show workings to support their calculation of the amount of ice cream left. Here, working in fractions was only one route employed by candidates but using percentages or converting to millilitres would work just as well provided all workings were shown as stipulated in the question. Values such as $\frac{29}{40}$ and 0.475 were quoted without any preliminary work. Many candidates were successful at gaining at least one out of the two marks. It is worth noting that if a question makes specific reference to workings, then full marks will not be given to a correct answer without workings shown.

Answer: $\frac{11}{40}$

Question 8

Candidates were very successful in **part (a)**. In **part (b)** the wrong answer of 519 (truncating rather than rounding correctly) was seen. Candidates that gave 520.000 did not gain the mark as zero place holders are only needed to the left of the decimal point. Candidates also gave answers to the wrong number of significant figures. A follow through mark was available to those that gave their answer to **part (a)** correct to three significant figures.

Answers: **(a)** 519.504 **(b)** 520

Question 9

This question on the area of a circle generated a few wrong answers based on the method for the circumference, or half the circumference, giving 23.6 or 11.8 as their answer. A small number of candidates used $\frac{22}{7}$ as their value for π which does not score the accuracy marks in circle questions.

Answer: 44.2

Question 10

In **part (a)** frequent wrong answers given by candidates were 0, 1 or 4. Also, candidates gave answers involving angles such as 360°, 180° or 90°. For **part (b)**, candidates were not told how many letters to pick out, but the candidates could still get one mark if there was only one error or omission.

Answers: **(a)** 2 **(b)** A M T

Question 11

In general, candidates did well with this question scoring at least 1 mark. For **part (a)** some candida wrong answers of m^{-15}, m^{8} or m^{2} showing incomplete understanding of the rules for manipulation of in Other wrong answers included *m* with no power or unfinished correct methods. In **part (b)**, candidates w able to gain a mark for the correct coefficient or the power. Some candidates combined the indices and the coefficients leading to answers such as 120*k* x 6*k*.

Answers: **(a)** m^{-2} **(b)** $5k^{6}$

Question 12

This was one of the questions on the paper which candidates found difficult. Although the first mark for finding the exterior angle of a polygon was straight forward, candidates might not have realised this was one of the possible starting points.

Answer: 12

Question 13

A common first step was for candidates to ignore the brackets. Conversely, a wrong final step in **part (a)** was for candidates to expand correctly and then combine the two terms into answers such as -5*h*. In **part (b)** the most common error was the *d* missed out of the second term.

Answers: **(a)** $15 - 20h$ **(b)** $24d^{3} + 4de^{2}$

Question 14

Part (a) was done quite well with the majority of candidates getting at least one mark. Errors in the method for finding the volume included, adding all the dimensions, multiplying two dimensions only with or without adding on the third dimension. After finding the correct volume, some candidates went on to try and convert units for their answer to **part (a)**. Candidates did not do well with **part (b)** where the conversion from cubic centimetres to cubic millimetres proved beyond many. If candidates find conversions in cubic units difficult, then converting to millimetres first and finding the volume directly in mm^3 might be a better option. Some candidates' answers in mm^3 were numerically smaller that their answers in cm^3, for example the correct answer of 16.1 cm^3 become 0.161 mm^3.

Answers: **(a)** 16.1 **(b)** 16 100

Question 15

Both parts were done well by candidates with **part (a)** being answered more successfully. Some candidates ignored the signs some or all of the time. Occasionally, signs changed to multiplication midway through the calculation. Occasionally, $5f^{2}$ become $5f^{4}$ in the final line. As with the previous algebra questions, what would have been correct answers for either part had their two terms combined into a single term.

Answers: **(a)** $2r + 3s$ **(b)** $g - 5f^{2}$

Question 16

In a similar manner to **Question 9**, candidates did not use the correct formula to calculate what was asked for. The previous comment about the value used for π also applies here. Some candidates found the volume of the can of beans instead of the curved surface area. Others, found the total surface area by adding on the area of two ends (occasionally, candidates added the area of only one end).

Answer: 276

Question 17

For this pair of simultaneous equations it was only necessary to add the two equations to eliminate *y* candidates tried to multiply both equations in order to eliminate *x*. Some chose to express *y* in terms o vice versa) then substitute into the other equation. Some did this question by guessing numbers or inspection with no working. Candidates seem unaware that fractional or other bizarre answers are probably not correct and by checking, should realise this. Not many candidates did do a check in the other equation which would have shown whether their answers were wrong.

Answer: $x = 4$ $y = 7$

Question 18

This question was not handled well by candidates. Common wrong answers for **part (a)** include, 35° (angle *PQO*), 55° (assuming angle *RQO* = angle *PQR*), 110° (assuming angle *RQO* was half of angle *PQR*) and 125° (180 – 55). For **part (b)** 55° (assuming *RO* = *RQ*) and 62.5° (*RQ* = *QO*) were seen. **Part (c)** was the best answered part of this question with a follow through mark being available for an answer of half candidates' **part (b)** answer.

Answers: **(a)** 90° **(b)** 70° **(c)** 35°

Question 19

This question was very well answered. Most candidates achieved at least two out of the four marks. If a candidate had problems, they occurred when dealing with the negative numbers and the subtraction in **part (b)**.

Answers: **(a)** $\begin{pmatrix} 18 \\ 0 \end{pmatrix}$ **(b)** $\begin{pmatrix} -5 \\ 8 \end{pmatrix}$

Question 20

Most candidates were able to pick up some marks with this question. Candidates did better with **part (a)** than the other two parts. In **part (a)** candidates showed a wide variety of wrong methods to find the speed but most included the figure 90, read from the graph, as the distance to the garage. For **part (b)**, wrong answers such as 1, 1.3, 2, 3, 3.5, 4 and 15 hours were seen. Candidates made various errors in completing the travel graph both of a numerical and conceptual nature. The horizontal line representing the time in the café was sometimes missing or the wrong length. The sloping line representing the journey back to the factory was sometimes a continuation of the first part of the return journey line or finished at any point on the time axis. However, some candidates went back in time to the factory at (0, 0) or changed direction at the café and returned to the garage. Most graphs were drawn with a ruler.

Answers: **(a)** 45 **(b)** 1.5 **(c)** correct travel graph

Question 21

Although this was the last question candidates did not appear to see this as the hardest question on the paper. **Part (a)** was answered better by candidates than **part (b)**. A small number of candidates used long alternative methods to find the length of side *AD*, for example use of Sine to find angle *DAB* and then Tangent or Cosine with angle *DAB* to get to *AD*. Candidates should look carefully to see if they can find a simpler way to solve a question before launching themselves into a method that could be prone to errors or inaccuracies due to rounding in the middle of a calculation. Alternative long methods will not be given credit unless all the steps can be seen. In **part (b)** candidates often gave their answer to 2 significant figures when the rubric on the front says to use three.

Answers: **(a)** 13.2 **(b)** 8.22 to 8.23

MATHEMATICS

Paper 0581/21

Paper 21 (Extended)

General comments

The level of the paper was such that all candidates were able to demonstrate their knowledge and ability. There was no evidence at all that candidates were short of time as almost all attempted the last few questions. Failure to show clear working and in some cases any working at all remains a concern this year. Failure to give answers to the correct degree of accuracy continued to be a concern also. Candidates need to read the general rubric carefully at the start. They also need to make sure that they have noted the accuracy requirements of particular questions in their checks at the end of the paper.

Comments on specific questions

Question 1

This was generally well answered. Some candidates misunderstood the meaning of the inequality sign and had their answers reversed but fewer than in previous years. Some candidates used an insufficient level of accuracy when converting to decimals and therefore were unable to compare the numbers correctly.

Answer: $3.14 < \pi < \frac{22}{7} < \sqrt{10}$

Question 2

It was clear that candidates knew what was required by this question on exchange rates and generally they gained marks on it. The main errors were reversing the multiplying and dividing stages in the working or subtracting 600 from their answer of $650, presumably working out the profit rather than how many dollars he received.

Answer: 650

Question 3

Generally well answered, however a large number of candidates believe 51 is prime. Divisibility tests are a useful tool here for determining if larger numbers are prime or not. There was a welcome absence of even prime numbers over 50. Of those who did not score 2 marks many scored a method mark for correctly identifying one of the primes.

Answer: 44

Question 4

This question was answered well by only about half of the candidates with the other generally scoring no marks at all. In many cases the layout of working was poor and difficult to follow and award method marks to. A surprising number of candidates tried to convert km to m by multiplying by 100 instead of 1000. Most understood the need to divide by 60^2 or 3600, although some divided by 60^3.

Answer: 30

Question 5

This question was generally well understood. Common errors included multiplying both the 6 and th the 5 or not converting the final answer to standard form.

Answer: 3.2×10^4

Question 6

There were a wide variety of wrong answers here although this was generally well attempted by about half of the candidates. Some candidates attempted to simplify before typing into their calculators for example $\frac{1}{2}\sqrt{\frac{1}{2}+\frac{1}{2}\sqrt{\frac{1}{2}}}$ was incorrectly simplified to $\frac{1}{2}\sqrt{1\sqrt{\frac{1}{2}}}$. Other candidates typed into their calculators without the use of brackets therefore calculating $\frac{1}{2}\sqrt{\frac{1}{2}}+\frac{1}{2}\sqrt{\frac{1}{2}}$ instead. There was confusion when rounding to 4sf as some candidates treated the first 0 as a significant figure.

Answers: **(a)** 0.461939 **(b)** 0.4619

Question 7

Most candidates understood how to find the area of the rectangle and that this answer needed to be added to their quarter circle. There were fewer attempts at perimeter this year. A disappointing number of candidates failed to recall the formula for the area of a circle and fewer still then divided this by 4.

Answer: 1.62

Question 8

Part **(a)** was generally well answered with a small number of reversed answers. Part **(b)** caused more problems as a large number of candidates either did not understand what a plane of symmetry was at all or treated the base as a square rather than a rectangle.

Answers: **(a)(i),(ii)** Correct diagrams **(b)** 2

Question 9

This was generally well answered by many candidates. However some failed to understand that a day of the week was required and a few had some difficulty converting 97 hours into 4 days and 1 hour and were unable to deal correctly with the decimal answer to $97 \div 24$.

Answer: Sunday (May) 25 1045

Question 10

This question proved difficult for about half of the candidates. Quite a number did not understand the requirements of the question with many attempts at area evident. Some candidates incorrectly counted the number of pieces of wood of length 1.5 and of length 3.5. Quite a few candidates failed to realise Pythagoras' Theorem was required to find the diagonal length.

Answer: 24.3

Question 11

This question on rearranging was generally well done, although the subtraction method mark was no by many. The common error was for candidates to believe that 2cw – 4w = -2cw. Another commo was for candidates to incorrectly deal with the denominator of 2w, with quite a few attempts to simply div only the 4w by the 2w (and often this came to an answer of 2w) leading to a common incorrect first line o working of c = 5d + 2w.

Answer: $\frac{2cw - 4w}{5}$

Question 12

Of those who attempted this question it was generally well answered with many candidates scoring 1 or 2 marks. Most found the 10 in the intersection. However the final mark was often lost due to repetition of numbers or incorrect labels or missing labels. A few candidates did not attempt this question.

Answer: Correct Venn diagram

Question 13

About two thirds of scripts had correct solutions, whichever method candidates chose to use to solve these simultaneous equations. The fact that the simultaneous equations were given as fractions caused a few problems this year. The most frequent errors were when candidates attempted to clear the denominator of 2. Candidates often multiplied by 4 on the left and 2 on the right of the equals sign. Therefore the incorrect equations of 4x + 2y = 14 and 4x - 2y = 34 were frequently seen. Some attempted to cancel the 2 with just one of the terms in the numerator to give x + y = 7 and x - y = 17.

Answer: x = 12 y = -10

Question 14

This remains a generally poorly answered topic. A large number of candidates could not deal with the inverse and the square in the same question. Those candidates who scored well on this used the standard structure of $y = \frac{k}{x^2}$ followed by substitution to find k. However this was rarely seen.

Answer: 3.84

Question 15

Part **(a)** was generally well answered although candidates found part **(b)** more difficult. Many were able to correctly find the gradient although there were some dividing x-step over y-step or there were errors in the sign of the answer with 2 or -½ being common incorrect gradients. A large number of candidates were able to obtain a method mark for correctly substituting their gradient and a point into either y = mx + c to find the intercept, or $y - y_1 = m(x - x_1)$ to find the equation of the line.

Answers: **(a)** 4 **(b)** y = -2x + 9

Question 16

In this indices question about half of the candidates failed to apply the laws of indices to simp expressions correctly, although in both parts candidates were often able to score 1 mark. 12 was a p wrong denominator for **(a)**. In **(b)** a number of candidates failed to simplify the powers leaving the answer as $\frac{3^2}{2^3}q^{-1}$. Candidates need to be extremely careful how they present their answers, for example $\frac{9}{8q}$ is correct but $\frac{9}{8}q$ is not, therefore $9/8$ q presents an ambiguity. Using horizontal lines for fractions is advisable here.

Answers: **(a)** $\frac{p^3}{8}$ **(b)** $\frac{9}{8}q^{-1}$

Question 17

Parts **(a)** and **(b)** were generally well answered by the majority of candidates. In part **(c)** however, hardly any candidates knew that the angle at the centre is twice the angle at the circumference and instead of finding angle CED to be 19, many found angle CED to be 38 and consequently few found the required angle, with a common wrong answer of 52 here. Part **(c)** was the question more candidates struggled on than any other question on the paper.

Answers: **(a)** 52 **(b)** 64 **(c)** 71

Question 18

Many candidates understood the words congruent and similar although some had these answers reversed or had missing or extra triangles. Part **(a)** was generally answered better than part **(b)**.

Answers: **(a)** E, G **(b)** A, B

Question 19

Part **(a)** was generally well answered with the majority of candidates scoring full marks. The points were generally well plotted although a large number of candidates plotted the points using the wrong scale. They used 1 square to represent **p** or **q** ignoring the presence of the length of **p** and **q** marked on the diagram. Most candidates were able to make a correct statement for part **(b)(ii)**.

Answers: **(a)** 2**p** 3**p** + **q** 5**p**+ 3**q** **(b)(i)** Points plotted correctly **(b)(ii)** Points lie in a line

Question 20

There were a number of misconceptions displayed in this question. For example in part **(a)** by far the most common error was to work out f(-1) x g(-1) instead of fg(-1). Similarly in part **(b)** candidates believed that gh(x) means g(x) x h(x). As well as misconceptions in method there were a number of numerical errors such as in part **(a)** quite a few candidates believed $(-2)^2 = -4$ and in part **(b)** a large number thought $(3x)^2 = 3x^2$. There were similar problems in part **(c)** with a number of candidates working out $(f(x))^{-1}$ instead of $f^{-1}(x)$ or making errors in the rearranging of $x = (y-1)^3$ with $f^{-1}(x) = \sqrt[3]{x+1}$ being an extremely common wrong answer either arising from the incorrect order of operations or arising from believing that $(y-1)^3 = y^3 - 1^3$. There were quite a few candidates who did not attempt any working for part **(c)**.

Answers: **(a)** 27 **(b)** $9x^2$ **(c)** $\sqrt[3]{x} + 1$

Question 21

About half of the candidates were able to correctly answer part **(a).** Of those that did not, AB and common incorrect answers as were A^2, B^2 and C^2. In part **(b)** a large number of candidates were a obtain the correct determinant of $\frac{1}{32}$ but then went on to multiply by this determinant instead of dividing it. The fact that the determinant was a fraction and not a whole number was the biggest problem here. Some candidates found the determinant in decimal form then prematurely rounded this, for example multiplying by $\frac{1}{0.0313}$ (or worse) instead of $\frac{1}{0.03125}$. There were also some errors in finding the adjugate matrix, for example reversing the wrong diagonal or changing the signs of the wrong diagonal. In part **(c)** candidates were sometimes struggling to realise the significance of the determinant being zero and a large number of candidates did not answer this part.

Answers: **(a)** **CB** and **BA** **(b)** $\begin{pmatrix} 8 & -24 \\ -4 & 16 \end{pmatrix}$ **(c)** the determinant is zero

MATHEMATICS

Paper 0581/22

Paper 22 (Extended)

General Comments

The level of the paper was such that all candidates were able to demonstrate their knowledge and ability and the marks ranged from 0 to 70. There was no evidence at all that candidates were short of time and most candidates attempted all of the questions. Failure to give answers to the correct degree of accuracy continued to be a problem but there was some evidence that this is becoming less of a concern than last year. An unwelcome new development this year was to make assumptions about lengths and angles in diagrams. Candidates should appreciate that all relevant information is provided in the question and that they should not assume that lengths are equal without there being good geometrical reasons for it. The same applies to the size of angles in diagrams.

Particular Comments

Question 1

This question was quite poorly done, with many candidates ignoring the rectangles and only focusing on the star.

Answers: **(a)** 1 **(b)** 1

Question 2

Most candidates knew what was required, but frequently rounding errors meant that the correct answer was not achieved. Candidates must work with all the figures available in their calculator to achieve the correct answer.

Answer: 0

Question 3

The few candidates that had a problem with this question evaluated the last number incorrectly as (2 – √3)/2 instead of 2 – (√3/2).

Answer: 2 – √3 < 2 – (√3/2) < 2/√3 < √3

Question 4

This question was quite well done. The most common error was to write 15a + 32 as 47a. The second common mistake was to ignore the requirement to write the answer as a **single** fraction.

Answer: $\frac{15a + 32}{40}$

Question 5

This question was reasonably well done but about a quarter of the candidates multiplied the bases together and then added the indices. A few candidates decided to work out the value of 1024 but could not then write this as a power of 2.

Answers: 2^{10}

Question 6

About half of the candidates were unable to answer this question correctly. The understanding t units are the square of length units was not evident in these cases, so that 64 × 1000 was the common

Answer: 6.4×10^7

Question 7

Many candidates scored 1 or 2 marks on this question. The most common error was to confuse the two symbols $\cap$ and $\cup$ for each other so that $A' \cup B' \cup C'$ was a common error in part **(a)**. Generally the complement symbol was understood. Some ingenious alternative forms of the correct answer were seen and scored full marks.

Answers: $(A \cup B \cup C)'$ $(A \cup C)' \cap B$

Question 8

This question was poorly done by over half the candidates who appeared to just guess at numbers. Many tried to use trigonometry instead of the graph to answer this question. Those that did use the graph correctly generally scored full marks.

Answers: **(a)** 43 to 47 **(b)** 64 to 68

Question 9

A distinct improvement in working with limits was noted this year, with almost a complete absence of recurring nines. Two common mistakes were evident this year. The most common one was to write 32 × 2 = 64 and then write the lower bound for 64 as 63.5. The other error was to give limits for the number of pieces of wood.

Answers: 63.84

Question 10

Most candidates scored one mark on this question for $Px = x + 3$. A few more then collected the x terms correctly but then failed to factorise this expression. Only about a third of the candidates were able to complete this question correctly.

Answers: $x = \frac{3}{P-1}$

Question 11

Most candidates got part **(a)** correct although quite a few did not understand the significance of "write down" and tried to do lengthy calculations often involving Pythagoras. In part **(b)** many candidates assumed non-existent right angles and were carrying out Pythagorean calculation on the wrong triangle or were assuming that PC = 10.

Answers: **(a)** 10 **(b)** 9.80

Question 12

This question was very well done and very few candidates chose the wrong trigonometric ratio. The very common error in part **(b)** was to obtain the 200 seconds but to then convert this into 3 min 33 seconds. Some candidates thought that they had to give the answer in minutes **and also** in seconds which is not the intended meaning of the phrase "minutes and seconds".

Answers: **(a)** 440 **(b)** 3 minutes 20 seconds

Question 13

This question was generally well done by over half of the candidates. The most common error wa the answers as 2-by-2 matrices and therefore fail to simplify the terms of their expression.

Answers: **(a)** $\begin{pmatrix} 6x-3 \\ 4x+5 \end{pmatrix}$ **(b)** $(6x^2 + x + 5)$

Question 14

This question was very well done, with almost all candidates scoring some marks and a very large number scoring full marks. A number of candidates omitted to write the letter R in any region and similarly some candidates left several regions unshaded. It appeared also that some candidates may have been shading the required region despite the instructions in the question and in the syllabus.

Answer: correct region identified

Question 15

This question was generally well done with the exception of the final part where only the most able knew how to find the equation of the required line.

Answers: **(a)** (2, 4) **(b)** (6, 0) **(c)(i)** (4, 2) **(ii)** $y = -3x + 14$

Question 16

Most candidates were able to find the area under Alonso's graph correctly but for some reason then failed to equate it to the area under Boris's graph. Instead they reverted to distance = speed × time which is never appropriate to these sorts of questions unless the graph is horizontal.

Answer: 16¼

Question 17

It was clear that candidates knew what was required by the question and generally gained marks on it. However, Examiners reported a lack of clear working so that marks were difficult to award when answers were wrong. There was a more than usual confusion between area and length with many less successful candidates using their answer in part **(a)** in part **(b)**. Part **(a)** was very well done by most candidates but incorrect formulae, wrong radius and multiplying by 3 instead of 4 were all reported as common errors in part **(b)**.

Answers: **(a)** 201 **(b)** 88.0

Question 18

This question was generally well done. In part **(a)** the common errors were to multiply the functions or to fail to simplify $3(1 - 2x) - 2$ correctly. In part **(b)** most candidates scored 2 marks for the correct use of the formula but many were unable to find the answers to the required degree of accuracy. Those that failed to score these marks were usually making mistakes with the negative signs.

Answers: **(a)(i)** 11 **(ii)** $1 - 6x$ **(b)** –1.65 and 6.65

Question 19

This was one of the best answered questions on the paper. However some candidates completely ignored the point (0, 0) and failed to plot it or draw their graph through it. Others struggled to draw a **smooth** curve.

Answers: **(a)** 6 30 70 **(b)** correct smooth curve through the points **(c)** 82.5 **(d)** 108

MATHEMATICS

Paper 0581/23

Paper 23 (Extended)

General comments

The level of the paper was such that all candidates were able to demonstrate their knowledge and ability and the marks ranged from 0 to 70. There was no evidence that candidates were short of time as almost all candidates attempted the last few questions. It was evident that some candidates had been inappropriately entered for the extended level when the core level would have been more suitable for them.

Candidates failing to give answers to the correct degree of accuracy continued to be a concern this year. The general rubric must be read carefully at the start of the examination and candidates must ensure that they have noted the accuracy requirements of particular questions.

Candidates should show all their working in the answer space provided. There were a very significant number of candidates who failed to use the available space in the answer booklet to show the necessary calculations for obtaining their answers. When there is just an incorrect answer on the answer line and no relevant working, the opportunity to earn method marks is lost.

Comments on specific questions

Question 1

Part **(a)** was the best answered question on the paper and it was exceptionally rare to see an incorrect answer. Part **(b)** was well answered by those candidates who understood the term *range*. A response frequently seen was -5 ~ 6 or -5 to 6 and this did not earn the mark.

Answers: **(a)** -5 **(b)** 11

Question 2

This question was one of the best answered questions on the paper but when it was wrong, the decimals were not usually seen, resulting in no method marks being earned. There were a small number of candidates who failed to note the word 'largest' and wrote the numbers in reverse order, starting with the smallest.

Answer: $\frac{53}{11}$ 4.80 $\sqrt{23}$ 48%

Question 3

The majority of candidates successfully answered this question. After obtaining the correct answer of $500, a small number incorrectly proceeded to subtract their answer from $600.

Answer: 500

Question 4

In this question there were frequent errors with the multiplying factors. It was not unusual to see 100 used instead of 1000 and 60 used instead of 60 x 60.

Answer: 70

Question 5

This reverse percentage question was one of the worst answered questions on the paper. T common error was to reduce (or even increase) 21.60 by 20%.

Answer: 18

Question 6

This question was also one of the worst answered questions on the paper. The candidates who could convert 9^4 to 3^8 usually proceeded to obtain the correct answer. After a successful conversion there were a few candidates who went on to give an incorrect answer of $n = 8x$. The most common incorrect answer that was seen was $n = x + 4$, where candidates chose to ignore the different base numbers.

Answer: $x + 8$

Question 7

The majority of candidates shaded the correct region in at least one of the diagrams. No uniform misconception across either diagram was noted.

Answers: correct shaded regions

Question 8

This question was one of the best answered questions on the paper. For those who did not achieve full marks, a common error was to multiply through by 6 leaving an answer of $5x – 3$. Sometimes the expression $3(x – 1)$ was incorrectly reduced to $3x – 1$. Some candidates obtained the correct answer and then spoilt it by incorrect cancelling of the 3 and the 6 to give $\frac{5x-1}{2}$.

Answer: $\frac{5x-3}{6}$

Question 9

This was generally well answered but a few candidates failed to follow the instruction to give their answer in standard form, leaving their final answer as 500 000. Often one or more of the multiplying factors, $\frac{1}{60}$ and $\frac{1}{10^6}$, were incorrectly applied.

Answer: 5×10^5

Question 10

The majority of candidates understood the demands of the question and the number 73.5 was often seen in solutions. However a significant number of candidates did not understand the accuracy required and it was not unusual to see 220.5 being rounded to 221. When calculating an upper or lower bound it is not correct to then round the value.

Answer: 220.5

Question 11

Some candidates did not understand the term ‘angle of elevation’ and the angle was incorrectly positioned at P. Calculating AP and then using Pythagoras was seen, usually with accuracy errors due to premature rounding.

Answer: 16.8

Question 12

A significant number of candidates lost marks in this question because of the lack of use of bracket working out. The expression $-(2x - 3)^2$ was frequently incorrectly replaced by $-4x^2 - 12x + 9$. A common error was to replace $2(x - 3)^2$ by $(2x - 6)(2x - 6)$.

Answer: $9 - 2x^2$

Question 13

Parts **(a)** and **(b)** were well answered. The most common incorrect answers for part **(a)** were 1 and for part **(b)**, 4 or 180°.

Part **(c)** was one of the worst answered questions on the paper and caused difficulty for a number of candidates with their planes not being clearly defined. Incorrect common answers involved a single line or a plane diagonally across the cuboid. A few candidates made no attempt to answer part **(c)**.

Answers: **(a)** 0 **(b)** 2 **(c)** plane across centre of shape

Question 14

This question was well answered, although $y = 7½$ and $y = 10½$ were common incorrect answers.

Failure to multiply all terms by 2 was common.

e.g.	$3y - 12 + \frac{y}{2} = 9$	leading to	$3y - 12 + y = 18$
or	$3y + \frac{y}{2} = 21$	leading to	$3y + y = 42$.

Answer: 6

Question 15

Part **(a)** was well answered by the majority of candidates although some had the reverse vector **h** – **g** for their answer. Another common incorrect answer was **h** + **g**.

Part **(b)** was one of the worst answered questions on the paper. Candidates would have found it helpful to start from a vector equation $\overrightarrow{ON} = \overrightarrow{OH} + \overrightarrow{HN}$ or equivalent. A common error was to suggest that the ratio GN:NH = 3 : 1 implied $\overrightarrow{HN} = \frac{1}{3}\overrightarrow{HG}$. Some candidates ignored the instruction to give the answer in its simplest form.

Answers: **(a)** **g - h** **(b)** $\frac{1}{4}\mathbf{g} + \frac{3}{4}\mathbf{h}$

Question 16

This was one of the best answered questions on the paper. Those candidates who multiplied by 5, divided by *r* and then subtracted 2 usually achieved the correct answer. The candidates who chose to expand $r(y + 2)$ tended to have more difficulties with making *y* the subject of their equation. Some candidates, having achieved the correct answer, then went further by incorrectly cancelling each *r* in the numerator and denominator thus reducing their answer to $y = 5A - 2$.

Answers: $\frac{5\mathbf{A}}{\mathbf{r}} - 2$ or $\frac{5\mathbf{A} - 2\mathbf{r}}{\mathbf{r}}$

Question 17

Part **(a)** was well answered. Some candidates, however, showed no working and gave an answer which did not earn any marks. In part **(b)** an answer of 3.91 was not uncommon where candidates omitted the 2 radii for the total perimeter.

Answers: **(a)** 10.9 **(b)** 15.1

Question 18

In part **(a)** a common error was to say $f(-2) = -2^2 + 2 = -2$, which led to an incorrect final answer of 0.

In part **(b)** many successful solutions were seen where candidates first determined the inverse function $h^{-1}(x)$ whilst others equated $h(x)$ to 22. A few candidates incorrectly took $h^{-1}(x)$ to be the reciprocal of $h(x)$.

Answers: **(a)** 64 **(b)** 9

Question 19

In part **(a)** the vast majority of candidates knew the acceleration was achieved by finding the gradient of the speed-time graph during the first four seconds and were therefore successful.

In part **(b)** candidates knew that they had to divide by 15 but it was not always clear how their numerator was achieved. Common errors included area = $\frac{3}{2}\times(15+9)$ or area = $\frac{1}{2}\times4\times3+15\times3$ i.e. using the incorrect length for the rectangle.

Answers: **(a)** 0.75 **(b)** 2.6

Question 20

The equations for the lines $y=\frac{1}{2}x$ and $y=4-x$ were often presented by candidates, however it was not uncommon to see the equation $y = 0$ representing the y-axis. Some candidates presented their final equations using strict inequalities. A relatively small number of candidates had little idea how to approach this question.

Answer: $x\geq0$ $y\geq\frac{1}{2}x$ $x+y\leq4$

Question 21

In part **(a)** the vast majority correctly applied the sine rule. However in some cases, candidates were unable to make sin R the subject of the equation $\frac{50}{\sin R}=\frac{100}{\sin 140}$.

In part **(b)** it was clear that some candidates were unsure which angle was required. A common error was to calculate 360 – **(a)**.

Answers: **(a)** 18.7 **(b)** 261

Question 22

This was one of the worst answered questions. The requirement 'nearer to AB than to AC' i.e. the bisector of angle A, was better answered than the requirement 'nearer to A than to C' i.e. the perpendicular bisector of AC. A number of candidates determined the mid-point of AC then constructed a perpendicular to AC at that point, using only one set of arcs. A common error was to determine the bisector of angle B (as opposed to angle A). The required area was shaded correctly in nearly all cases where the two required loci had been determined.

Answer: correct shaded region

Question 23

In part **(a)** it was not unusual to see a 2 × 1 matrix rather than a 1 × 2 matrix in the answer space.

In part **(b)** an incorrect determinant of 8 was often seen, mainly on account of the minus signs involved in calculation.

Part **(c)** was less well answered. Candidates failed to appreciate that lengthy calculation would not be necessary for just 1 mark. In such instances, an incorrect answer was often in evidence.

Answers: **(a)** $\begin{pmatrix} -5 & 7 \end{pmatrix}$ **(b)** $\frac{1}{4}\begin{pmatrix} 2 & 1 \\ 2 & 3 \end{pmatrix}$ **(c)** $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$ or I

MATHEMATICS

Paper 0581/31

Paper 31 (Core)

General comments

The paper gave candidates an opportunity to demonstrate their knowledge and application of Mathematics. Most candidates were able to complete the paper in the allotted time, but there were some candidates who omitted part or whole questions. The standard of presentation was generally good, however there were occasions when candidates did not score as they did not show clear workings. Centres should continue to encourage candidates to show formulae used, substitutions made and calculations performed. Attention should be paid to the degree of accuracy required in each question.

Comments on specific questions

Question 1

(a) The majority of candidates were able to perform the calculation required, and scored well. Occasionally candidates calculated the number of adults in the village instead of the number of children.

(b) (i) This part was generally correct. Common errors were to use the fraction 2/7 or to apply the ratio to the age 60 instead of the number of people over 60. Some candidates, having performed the correct calculation, did not identify the correct number, leaving an answer of 80:280.

(ii) This part was generally correct, with most candidates able to identify the starting point of 360/2250 and able to simplify this some way even if they did not get to the lowest terms.

(c) This was well done. Common errors were to take the 18% away from 2250, or to calculate the increase but not to add it on.

(d) Many candidates knew they needed to have "something" times 10 to "some power" and there were various combinations given e.g. 225×10^1 or 22.5×10^2.

(e) This part was found to be more difficult. Common errors were to give a range e.g. 1760 to 1770, or to give 1760.

Answers: **(a)** 720 **(b)(i)** 80 **(b)(ii)** 4/25 **(c)** 2655 **(d)** 2.25×10^3 **(e)** 1765

Question 2

This question proved testing for many candidates.

(a) (i) Most candidates attempted this and many were successful. Some were uncertain which measurements they needed to add together with various combinations of the measurements given tried.

(ii) This proved quite difficult, although candidates were often able to gain part marks by calculating the area of part of the face e.g. the rectangle 13 × 10 or the triangle 0.5 × 6 × 10. 190 was a common incorrect answer where the candidate omitted to "remove" half the triangle. Those who appeared to know the formula for the area of a trapezium were often unable to calculate it properly, appearing confused about which operation to perform first.

(iii) This part was omitted by many candidates, although even those who had not scored well in part **(ii)** could sometimes follow through to correctly multiply that answer by 42.

(b) This part was not successfully answered although many gained credit for being ab through from the earlier part multiplying by 4, or being able to divide by 1000 to co kilograms.

Answers: **(a)(i)** 122 **(a)(ii)** 160 **(a)(iii)** 6720 **(b)** 26.88

Question 3

(a) Generally well done by most candidates. Marks were lost for omission of points rather than incorrect plotting.

(b) A surprising number of candidates did not attempt this or did not think there was any correlation.

(c) (i) Many candidates were successful, but a large number left the answer as “10 – 2”.

(ii) This was reasonably well done. Marks were lost for rounding to 6, 5.9 or incorrectly rounding to 5.91. Many candidates did not show their workings, and division by “9” (being the number of unique values) was seen fairly often.

(d) (i) Candidates were generally able to find the mode.

(ii) This was less successfully completed. Candidates often identified the values “23” and “24” but then either left both as the answer, or chose one of them.

(e) (i) The majority of candidates used fractions to state their probabilities, although percentages were also seen. The use of ratios or words was rare. This was generally well done with 12 as the denominator. Occasionally 4 was given as the numerator, including the two values of “8” minutes in the calculation.

(ii) Generally well done, though again 4/12 was a common error when candidates included the pair of values (4, 23).

Answers: **(a)** 6 points plotted **(b)** negative **(c)(i)** 8 **(c)(ii)** 5.92 **(d)(i)** 26 **(d)(ii)** 23.5 **(e)(i)** 2/12 **(e)(ii)** 3/12

Question 4

(a) (i) The application of trigonometrical methods proved testing for many candidates. Many did not directly use the information given in the question but performed additional calculations to enable them to use a different ratio than the obvious one. Many could correctly state the ratio with the values in the question but were then unable to manipulate it to produce the correct answer. Marks were again lost for not showing the workings and incorrect/premature roundings.

(ii) Again many could state the ratio but were unable to process it.

(b) Many candidates who attempted the question recognised it as an application of Pythagoras, however many failed to apply it correctly and added the squared numbers instead of subtracting them. They could then square root their answer giving 15.9 as their solution.

Answers: **(a)(i)** 4.77 **(a)(ii)** 50.1^{o} **(b)** 10.2 to 10.3

Question 5

This question showed a generally good understanding of transformations with most candidates at two out of the three transformations that were to be drawn. Careful reading of the question would eliminated some common errors.

(a) (i) Many candidates were successful on this question and were able to perform the correct translation.

(ii) This proved the most difficult of the three transformations. Many candidates were able to produce the correct shape, size and orientation but were unable to locate it accurately on the grid.

(iii) Many candidates were successful on this part. Those who were not tended to position the reflection correctly but were unable to reflect the “flag” correctly. Very few reflected in the *y*-axis or in an incorrect horizontal line.

(b) Many candidates were not successful as they did not describe a **single** transformation, often giving a reflection and a translation as their answer. The line of reflection also proved problematic with a lack of clarity as to what was equal to “–2” e.g. *x*, *y*, *x*-axis, *y*-axis etc.

(c) Again many incorrectly gave a rotation **and** a translation as their solution. Those who correctly gave only rotation as their answer did not always fully describe it; the centre of rotation was often omitted.

Answers: **(a)(i)(ii)(iii)** Correct diagram drawn **(b)** reflection, $x = -2$ **(c)** rotation, origin, 90^{o}

Question 6

(a) Generally well done by most candidates.

(b) Many candidates plotted the points and drew the curves successfully. Most candidates understood that the curves did not cross the axes. The points which caused the most difficulty were (–2.5,–1.2) and (2.5, 1.2) where the y coordinate was placed at +/–1.4.

(c) This was well done by those who attempted it.

(d) Generally well done. Common errors were the values –2,0,2.

(e) The points from part **(d)** were generally correctly plotted, and many candidates drew the correct line.

(f) Many candidates found the correct points of intersection.

Answers: **(a)** –1.5, –10, 10, 6, 1.2 **(b)** graph drawn **(c)** 0.4 to 0.5 **(d)** –3, –1, 1 **(e)** line drawn **(f)** (–1.5, –2) and (3,1)

Question 7

This question was well answered and in many cases clear workings were shown, enabling candidates to score part marks even if they did not get the final answer correct.

(a),(b) Both parts, on substituting values into the given expression, were generally well done.

(c) Many candidates could at least partially manipulate the formula e.g. could divide by 4 or take the “*a*” from each side. A common error was to write “$S + a$”.

Answers: **(a)** –3 **(b)** 8 **(c)** (S-*a*)/4

Question 8

The instruction to give all answers to 2 decimal places seemed to be understood by many candidates.

(a) Most candidates could calculate the simple interest for the 4 years at 39.6, but many did not then add it to the 275 to obtain the answer. Those that did often lost marks by omitting to put 314.60, leaving the answer as 314.6 or putting 315.

(b) Candidates found compound interest more difficult and many applied simple interest, giving the answer 702. Some seemed to apply the interest for 4 years, indicating that they had not read the question carefully enough.

(c) (i) Generally well done though occasionally candidates divided by 0.7857, giving 509.10 as their answer.

(ii) This was more challenging for candidates, with most multiplying the 400 by 0.6374 giving a solution of 254.96.

Answers: **(a)** 314.60 **(b)** 703.04 **(c)(i)** 314.28 **(ii)** 627.55

Question 9

(a) (i) The line AC was generally measured correctly.

(ii) Many candidates were successful but a significant number gave the answer 45^{o}.

(b) Many candidates did not draw a complete circle, either drawing a few arcs or some part of the circle. Those that did draw the complete circle were generally accurate. Many candidates did not attempt the question, indicating either a lack of understanding or possibly a lack of the correct equipment.

(c) Candidates were more successful with this part. Even if they had not drawn the circle they were able to measure the angle and then measure the length of the line *CX*. Many candidates measured *BCX* as an obtuse angle.

(d) This was well done by many candidates who were able to measure their line even if they had not scored in the earlier part.

(e) All but the best candidates found this part challenging, either not comprehending what was asked or unable to carry out the task. Some were able to measure the angle bisector without constructing it. Some constructed the perpendicular bisector of *CX* and a surprising number constructed the perpendicular bisector of *BX*.

Answers: **(a)(i)** 8.9 to 9.1 **(ii)** 53 to 55 **(b)** correct circle drawn **(c)** correct line drawn
(d) 9.3 – 9.9 **(e)** correct angle bisector

Question 10

In general candidates used the letters given in the question and did not try to make their expressions into equations, which was an improvement on previous years.

(a)(i),(ii) and (iii) Many candidates were able to write the correct height of the next diagram, of diagram 10, and the height of diagram *n*.

(b) (i) The width of the next diagram was usually given correctly.

(ii) The width of diagram 10 was often given correctly.

(iii) The width of diagram *n* proved more challenging, with 2n + 1 sometimes given.

(c) **(i)** Many candidates successfully gave the number of squares in the next diagram.

(ii) Many candidates were able to recognise the link between the height and width and relate to the number of squares.

(iii) This proved difficult for all but the best candidates. Most were unable to recognise the connection between their previous answer and the expressions in parts **(a)(iii)** and **(b)(iii)**.

Answers: **(a)(i)** 5 **(ii)** 10 **(iii)** n **(b)(i)** 9 **(ii)** 19 **(iii)** $2n - 1$ **(c)(i)** 45
(ii) 5x9 **(ii)** $n(2n-1)$

MATHEMATICS

Paper 0581/32

Paper 32 (Core)

General comments

The paper gave candidates an opportunity to demonstrate their knowledge and application of Mathematics. Most candidates were able to complete the paper in the allotted time, but there were some candidates who omitted part or whole questions. The standard of presentation was generally good, however there were occasions when candidates did not score as they did not show clear working. Centres should continue to encourage candidates to show formulas used, substitutions made and calculations performed. Attention should be paid to the degree of accuracy required in each question.

On construction questions candidates should clearly show all construction lines and arcs. Centres should also continue to encourage candidates to show clear working in the answer space provided.

Comments on specific questions

Question 1

Generally a well answered question although a minority did not recognise or appreciate the definitions used.

(a) (i) Generally correct although sometimes the lack of a systematic method often led to the omission of one factor, generally 18.

(ii) Generally correct although a small minority gave common multiples as their answer rather than common factors.

(b) Generally correct although a small minority gave answers of 5 squared, 6 squared, 7 squared or just 5,6,7, rather than the square numbers required. Other common errors included listing all even numbers or multiples of 5 within the given range.

(c) This part proved more difficult with few candidates listing the prime factors of 56 before identifying *p* and *q*. A common error was *p*=8, *q*=7.

Answers: **(a)(i)** 3,4,6,9,12,18 **(ii)** any two of 3,6,9,18 **(b)** 25,36,49 **(c)** *p*=2, *q*=7

Question 2

(a) Generally well answered with many candidates able to score full marks. However incomplete solutions were also common although the first method mark for calculating 18 or 88 was often attained. A common error was an answer of 27 coming from the incorrect working of 18 ÷100 x 150.

(b) This standard ratio question was generally well answered. A small minority were unable to complete the first method line of 15+7+11=33.

(c) This part caused more difficulties in the setting up of the fraction to be simplified. 11/2 was a common incorrect answer.

(d) The majority of candidates correctly found the initial 8% but a significant number then failed to add it on as an increase. Few candidates used the alternative single method of 108÷100x150.

Answers: **(a)** 12 **(b)** 60 **(c)** 2/11 **(d)** 162

Question 3

Throughout this question the conversion of minutes to fractions of hours caused initial problems a led to incorrect answers following the application of the speed/distance/time formulae. This usually in the incorrect use of 100.

(a) Poorly answered with common errors being 8/15, 8/0.15 or 8/15 x100. The more successful responses came from using “15 minute is ¼ hour” leading to working of 8x4=32.

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

(ii) As part **(a)** with common errors being 12/36 x100 and 36/12, but the more successful using the basic approach of “1/3 of an hour is 20 mins”.

(iii) Generally well answered showing good understanding and use of travel graphs, particularly on a follow-through basis.

(c) (i) As part **(a)** with common errors being 20÷12x100, 1 hour 33, 1 hour 30 and 15/20.

(ii) Again well answered with follow through applied.

(iii) Well answered with the majority using their graph to find the time difference. A small number correctly used their time calculations.

Answers: **(a)** 32 **(b)(i)** 1415 **(ii)** 20 **(iii)** Correct lines drawn **(c)(i)** 1 hour 20 mins **(ii)** Correct line drawn **(iii)** 15

Question 4

This proved to be a difficult question for many candidates with some confusion over definitions of mean/ mode/median but more often incorrect misinterpretation of the data provided.

(a) Generally correct interpretation of the given bar chart.

(b) (i) Those candidates who identified the correct row to total to find the number of goals were usually successful. However a significant common error was 36 coming from the total of the first row “number of goals per game”.

(ii) Although the majority of candidates knew the correct method to calculate the mean a lot of errors were seen, including the use of an incorrect value from **(i)**, division by 9, 4 or 36. The use of a “common sense” approach to check this answer would have allowed the candidates to discount a number of incorrect and unrealistic answers.

(iii) Again the method of calculating the median was often recognised with an ordered list commonly seen. However this was often incomplete with, say, 9 values shown.

(iv) This part was poorly answered and the lack of need to show working made it difficult to analyse the problem. Common errors were 8, 20 and 0.

(c) (i) This part was well answered by the vast majority.

(ii) Completing the pie chart was well answered although a significant number of candidates were unable to attempt this part.

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

(ii) Also well answered although a common error was 5/40.

Answers: **(a)** 7,8,6,7,5,4; 0,8,12,21,20,20 **(b) (i)** 103 **(ii)** 2.575 **(iii)** 2 **(iv)** 1 **(c) (i)** 5 **(ii)** correct pie chart drawn **(d) (i)** 23/40 **(ii)** 35/40

Question 5

(a) (i) Despite the help given in the wording of the question many candidates were unable to apply a trigonometrical method to solve this part. The setting up of a right-angled triangle a subsequent use of 40° was not recognised. However those candidates who did so were gener successful.

(ii) Generally well answered on a follow through basis although a common error was applying 12 x10.

(b) Many found it difficult to set up the required linear equation involving the perimeter, with $x + x + 2 = 38$, $x + 2 = 38$ being the common errors. Those who set up an equation were usually able to earn 1 method mark by showing a correct first step in their algebraic manipulation.

Answers: **(a) (i)** 6.43 **(ii)** 77.16 **(b)** 8.5

Question 6

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

(ii) Many candidates gave the answer of 8 through a variety of methods; those who did not, often showed no method at all. The clear use of 360÷45 from “number sides= 360÷ size of exterior triangle” was rarely seen.

(iii) This was generally well answered with a follow through applicable.

(b) Many candidates were able to score well in this part showing good knowledge of the required geometric theorems. However all expected common errors resulting from the incorrect use of 360, 180 and 90 were seen.

Answers: **(a) (i)** 45 **(ii)** 8 **(iii)** octagon **(b)** $x=90$ $y=26$ $z=116$

Question 7

A significant number of candidates were able to score well on this question although it was noted that a number were unable to attempt part or all of this question.

(a) Point F was generally positioned correctly although a significant number omitted the construction arcs thereby losing one of the available marks.

(b) The perpendicular bisector was generally positioned correctly although a significant number were inaccurately constructed.

(c) The angle bisector was less well done and a number of construction arcs were difficult to identify.

(d) (i) Although L and M were not always correctly positioned, a follow through basis allowed the majority of candidates to achieve this mark.

(ii) Again the majority were able to score this mark on a follow through basis.

(e) Many candidates were able to demonstrate that they knew the formula for the area of a triangle but had problems using consistent and accurate units in their calculations.

(f) This part was the least successful of the entire question with many candidates leaving it blank. The recognition of the correct locus to draw caused problems and those who did draw an arc centred on D often used the wrong radius.

Answers: **(a) (b) (c)** correct construction drawn **(d) (i)** 6.8-7.3 **(ii)** 136-146
(e) Correct follow through area calculated **(f)** Correct construction and labelling drawn

Question 8

(a) Very well answered with all values generally correct.

(b) Generally the plotting of these points was good, although errors were often made in plotting (1 (-18,-1) and (-3,-6). Two smooth correct curves were generally seen, although as in previous years, common errors included a series of straight lines, “thick” lines, “bumpy” curves or loops. Most candidates knew the required shape and did not draw across the y-axis.

(c) Generally correct although the common errors of 0, 1,180° and “reflection” were seen.

(d) Many correct graphs seen and the points of intersection were usually correct following through from their graph. However a significant number of candidates omitted this part.

(e) Many candidates omitted this part. Some reflections of the curve were seen, with others reflecting just the first quadrant section.

Answers: **(a)** -1,-2,-3,3,2,1 **(b)** Correct graphs drawn **(c)** 2 **(d) (i)** $y=x$ ruled
(ii) (4.2.4.2), (-4.2,-4.2) **(e)** $y= -x$ ruled

Question 9

(a) (i) Generally well answered although the like terms were not always correctly collected together.

(ii) More problems were caused in this part with the term in y often incorrect.

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

(ii) More problems in this part with the expansion proving difficult, particularly in the first part.

Answers: **(a) (i)** $3k + 4p – 7$ **(ii)** $x-2y^2$ **(b) (i)** $12 + 21g$ **(ii)** $25m^3 - 5mt^2$

Question 10

(a) (i) Most candidates applied Pythagoras correctly; however answers of 9.4 were common, thereby losing the accuracy mark.

(ii) The use of trigonometry was generally recognised. Those candidates who used the tangent ratio directly with the data given in the question tended to be more successful. Weaker candidates often assumed the angle to be 45°.

(b) (i) Although the correct answer of ‘similar’ was often seen, common errors included ‘congruent’ and ‘proportional’.

(ii) The majority recognised this as an enlargement but often failed to give the full description with the centre often omitted or given as the origin.

(c) This was well answered by the vast majority.

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

(ii) This part seemed to be more successfully answered than in previous years, although common errors were n+2 and 47.

(e) Many correct answers were seen here often from a pattern continuation. The common errors resulted from using 2 x 47 + 1 instead of solving $2n + 1 = 47$ for example.

Answers: **(a) (i)** 9.43 **(ii)** 32.0 **(b) (i)** Similar **(ii)** Enlargement, SF=2, centre A **(c)** 9,11
(d) (i) 21 **(ii)** $2n + 1$ **(e)** 23

MATHEMATICS

Paper 0581/33

Paper 33 (Core)

General comments

This paper gave the opportunity for candidates to demonstrate their knowledge and application of Mathematics. The majority of the candidates were able to use the allocated time to good effect and complete the paper. The majority of candidates answered all of the questions with some omitting a few part questions. The standard of presentation and amount of working shown was generally good apart from showing all construction lines in **Question 6**. Centres should continue to encourage candidates to show clear working in the answer space provided, and show the formulae used, substitutions and calculations performed.

Comments on specific questions

Question 1

(a) Candidates generally gave the correct number of paperbacks, although 250 and 1000 were seen.

(b) Most candidates found the number of non-fiction books correctly.

(c) This part was generally correct, although equivalent fractions such as 33/275 were seen.

(d) This part was generally well answered. However, subtracting 14% rather than adding was seen.

(e) Many candidates found this part difficult and assumed 10 dollars had to be subtracted or 5 dollars added.

(f) This part was generally well answered, although common errors of 35×10^3 and 3.5×10^{-4} were seen

Answers: **(a)** 1750 **(b)** 660 **(c)** 3/25, **(d)** 3135 **(e)** 9475 **(f)** 3.5×10^4

Question 2

(a) (i) Although generally correct, occasionally marks were lost in this part for giving one inaccurate value.

(ii) This part was generally correct, with 28 and 84 often seen. However, some candidates did not understand that the numbers had to be a common multiple of both 4 and 7.

(b) (i) This part was generally well answered, although 16 was a common error.

(ii) Many candidates did not understand the need to use the two concepts of prime and square.

(c) This part was generally well answered, although 64, the value of n^3 rather than n, was seen.

(d) This was the least successful part of the question. Candidates sometimes ignored the fact that k and m should be prime and tried to find any two numbers (sometimes decimal numbers) which would satisfy the equation.

Answers: **(a)(i)** any five multiples of 7 **(a)(ii)** two multiples of 28 **(b)(i)** 25 **(b)(ii)** 17
(c) 4 **(d)** (k =) 2, (m =) 19

Question 3

The plotting and drawing in this question was of a good standard.

(a) The majority of candidates were able to complete the table successfully and to score full marks.

(b) The plotting of points and the drawing of the curve was generally good, with few straight line segments seen.

(c) This was less successfully answered with a significant number of candidates offering no answer or giving the intersections with the *x*-axis rather than *y* = 2.

(d) (i) As in part **(a)**, the majority of candidates were able to score full marks by completing the table.

(ii) Most candidates drew the correct line on the grid.

(iii) This part was less successfully answered; many candidates tried to read the gradient from the graph but used the number of squares rather than the values to determine the rise over the length.

(e) The coordinates of intersection of the two graphs was generally given correctly.

Answers: **(a)** 3, 5, -1 **(b)** correct curve drawn **(c)** their curve's intercept with *y* = 2
(d)(i) -7, -1, 5 **(d)(ii)** correct ruled line **(d)(iii)** 2 **(e)** (-3, -7) and (2, 3)

Question 4

(a) Many correct answers were seen here. The main errors were to incorrectly multiply out brackets (for example to write 3*x*+1) or subtracting a coefficient of *x* rather than dividing by it.

(b) Many correct rearrangements were seen in this part. Common errors were an answer of (*g*+7)/5 or an initial wrong first step such as *g* – 5 = 7*f*.

(c) Although many candidates scored full marks in this part, there were a number who had only one of 2 or *y* as a common factor.

Answers: **(a)** 7.5 **(b)** (*g*+5)/7 **(c)** 2*y*(3*x*-5*z*)

Question 5

In this question on trigonometry, some candidates lost method marks for not showing any working.

(a) Very few candidates gave the correct answer here. The most common incorrect answers given were similar, same, equal or no answer given.

(b) Many candidates understood the calculation required. However, some did not use the trigonometric functions correctly. A common error seen was tan*DBC* = 11/8.

(c) (i) The majority of candidates understood they needed to use ½ × base × height. A common error was to use the incorrect value of *x* and write ½ × 8 × 11.

(ii) Many candidates understood that the total area was twice that of the triangle so gained the mark.

(d) Candidates did not appear to understand how to formulate the necessary equation as a considerable minority did not attempt this part. Those that did attempt it and wrote down a linear equation were usually able to simplify it.

Answers: **(a)** congruent **(b)** 36.0^{o} **(c)(i)** 20 **(c)(ii)** 40 **(d)** 14

Question 6

This question involved constructions and most candidates made a good attempt. There was a lack... construction arcs and misreading of angles which caused some candidates to lose marks.

(a) The vast majority of candidates were able to construct the triangle. In a few cases the lengths o... *AC* and *BC* were interchanged.

(b) Many candidates measured the angle correctly. A common error was to measure one of the other two angles in the triangle or the supplementary angle.

(c) (i) This construction was poorly attempted by many candidates even though they understood the requirements to bisect an angle. The main error was inaccuracy.

(ii) This construction was also poorly attempted. Besides inaccuracies, the other common error was to create a perpendicular where the angle bisector crossed *AC*. In this part some candidates misread the question and created a 'correct' perpendicular bisector of another side of the triangle.

(d) (i) Candidates whose points *P* and *Q* were on *AC* gained the mark.

(ii) This part was very poorly answered. Candidates did not generally understand which region had to be shaded. Some candidates who did understand, lost the mark because they did not completely shade the area, stopping at a construction arc instead.

(e) The majority of candidates understood how to use the scale but missed the fact that there was a need to make the units the same. Consequently 5 was the most common answer.

Answers: **(a)** correct triangle drawn **(b)** 46^{o} **(c)(i)** correct angle bisector drawn with construction arcs **(c)(ii)** correct perpendicular bisector drawn with construction arcs **(d)(i)** 0.7 to 0.8 cm **(d)(ii)** region of triangle between their constructions **(e)** 500

Question 7

The concept of sequences was well understood by the vast majority of candidates. Working out the value of lower position terms in a sequence was seen as straightforward. However, the ability to determine and use *n*th term formulae was poor.

(a) (i), **(ii)**, **(iii)** Most candidates wrote the next term and the 8th term correctly, but found the *n*th term more difficult, often writing $n+4$.

(b) (i) Very well answered with nearly all candidates gaining the mark.

(ii) Although many candidates obtained the correct answer, a similar number gave an answer of 2 with no working.

(iii) Surprisingly many candidates did not use their value from **(b)(ii)** in the formula to gain an answer.

Answers: **(a)(i)** 21 **(a)(ii)** 33 **(a)(iii)** $4n+1$ **(b)(i)** 40 **(b)(ii)** 3 **(b)(iii)** 10300

Question 8

Candidates appeared to understand the general concept of calculating probabilities well but were le about converting a probability into the number of cars. An error amongst some candidates was to as the total contained just the red and blue cars, i.e. 29 instead of 50 cars.

(a) (i) Many candidates gave the correct probability that the car was red.

(ii) Many candidates also gave the correct probability that the car was red or blue.

(iii) This was less well attempted; some candidates assumed that not blue was equivalent to red so gave the same answer as **(a)(i)**.

(iv) The majority of candidates understood that no yellow cars was equivalent to a zero probability.

(b) This part was less successfully answered, with an answer of 1/50 often given.

Answers: **(a)(i)** 19/50 **(a)(ii)** 29/50 **(a)(iii)** 40/50 **(a)(iv)** 0 (**b)** 50

Question 9

(a) The majority of candidates were able to gain full marks in this part. The common error was to give the total number of visitors, 469, and not divide by 7 to give the average.

(b) This part was not attempted as well as part **(a)**. The concept of range did not appear to be fully understood. Common errors were to quote the range as 34-96 or to state either the maximum or minimum value.

(c) The bar chart was generally well attempted, but marks were lost for inaccurate plotting and not labelling the axes.

Answers: **(a)** 67 **(b)** 62 **(c)** correct labelled vertical scale and correct bar chart

Question 10

Candidates lost marks in this question for not giving their answers to two decimal places as stated in the question. Marks were also lost because some candidates interchanged the formulae for simple and compound interest.

(a) (i) The change from dollars to euros was generally well done. A common error was to divide by 0.6513 instead of multiplying by it.

(ii) The change from euros to dollars was similarly well done. A common error was to multiply by 0.6513 instead of dividing by it.

(b) For those candidates that attempted simple interest, the main error was to not include the zero as the second decimal place.

(c) If candidates used the method of calculating the interest for one year, adding it to the original amount to give 583.00 and then repeating for the second year, many went on to give just the interest in the final year or added together 583.00 and 617.98.

Answers: **(a)(i)** 325.65 **(a)(ii)** 460.61 or 460.62 **(b)** 349.70 **(c)** 617.98

Question 11

This question showed a generally good understanding and appreciation of transformations with the of candidates able to attempt a description of the given transformations and able to attempt to d translation and enlargement.

(a) (i) Many candidates gave the correct transformation. A common error was to give the line of reflection as $x = 0$ instead of the x-axis.

(ii) Candidates tended to omit one of the three necessary parts of the transformation, usually the centre of rotation. Some candidates gave the answer as two transformations.

(b) (i) Many candidates correctly drew the translated shape.

(ii) Drawing an enlargement proved more difficult than the previous part. The common error seen was to enlarge about a wrong centre of enlargement.

Answers: **(a)(i)** reflection in the x-axis **(a)(ii)** rotation about the origin, 90^o
(b)(i) correct translation **(b)(ii)** correct enlargement

MATHEMATICS

Paper 0581/41

Paper 41 (Extended)

General Comments

This paper was well received by the majority of candidates. There was sufficient time for everyone to attempt all questions. It was clear that some candidates had not been prepared for all the topics tested. In **Question 3**, transformation geometry, many candidates could do all parts and scored 14 or 15 marks but many others scored 0 or 1 mark. In **Question 5**, many scored full marks for some routine trigonometry problems whilst others scored poorly. In **Question 9** many scored very heavily on the algebra but others scored very few marks. The linear programming in **Question 10** was easily dealt with by the few who were prepared for it but was totally beyond those who were not.

Comments on Specific Questions

Question 1

(a) In this part, the common factors needed to be removed for the simplest form. Those who tried for the forms 1 : *n* or *n* : 1 were not rewarded.

(b) Here, some candidates used proportional division and tried to divide by 11 but the question was much simpler than that.

(c) This part was well done by most, although a few confused the number of boys and the number of girls, whilst some candidates could not do proportional division.

(d) This part was well done, but a few missed the essential point that 35% of the 500 candidates would buy tickets and they only calculated 35% of $1.60.

(e) This part suffered from the usual error of making last year's cost 10% less than this year's cost, not recognising the reverse percentage situation.

Answers: **(a)** 11 : 14 **(b)** 50 **(c)** 12 **(d)** 280 **(e)** 240

Question 2

(a) Just a few candidates thought that the mode was 17 in part **(a)(i)**. In part **(ii)**, many thought that the median was 4.5, using the middle value of the table rather than the middle of the whole distribution. In part **(iii)**, correctly finding 4.75 was awarded full marks even if an answer of 5 was given, although it would be preferable to see an understanding of mean values not needing to be integers, even if they refer to people.

(b) This part was badly done by the majority of candidates. The idea that 3*n* people were added to the original 190 was not understood.

Answers: **(a)(i)** 4 **(ii)** 5 **(iii)** 4.75 **(b)** $\frac{190+3n}{40+n}$

Question 3

(a) Many candidates scored the 2 marks for the correct enlargement of *T,* but many also only scored 1 mark for the correct scale factor of $\frac{1}{2}$ but an incorrect centre of enlargement.

(b) The matrix product was usually correctly calculated and the image correctly drawn. In describing the reflection, candidates were required to be precise about the line of reflection and vague references such as "the *y* line" were not accepted.

(c) In part **(i)**, the translation was accepted with statements such as "10 units left and 10 units down" but it should be pointed out that the column vector notation is preferred. In part **(ii)** a fully correct description of the rotation was common.

(d) The 2 × 2 matrix was also usually correct.

There was a significant number of candidates who had little or no idea of how to do any part of this question, suggesting a lack of full syllabus coverage.

Answers: **(a)** Vertices at (1, 4), (4, 2), (4, 4) **(b)(i)** $\begin{pmatrix} -8 & -8 & -2 \\ 4 & 8 & 8 \end{pmatrix}$ **(ii)** Vertices at (– 8, 4), (– 8, 8), (–2, 8) **(iii)** Reflection, $x = 0$ (or *y*-axis) **(c)(i)** Translation $\begin{pmatrix} -10 \\ -10 \end{pmatrix}$ **(ii)** Rotation, 90° clockwise, (0, 0) **(d)** $\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$

Question 4

(a) Box B was invariably chosen in this part, but the fact that it contained an extra white ball was an insufficient reason. The white balls had to be related to the number of black balls in some way. The safest way was to state the two probabilities.

(b) The tree diagram in part **(i)** was usually correctly completed. In parts **(ii)** and **(iii)** those who understood probability theory scored well but many candidates had no ideas in these two parts.

(c) This part was interesting in that there had to be a rejection of box A, together with a non-replacement situation with box B. This defeated most candidates, with only the better ones scoring.

Answers: **(a)** Box B, $\frac{2}{5} > \frac{1}{4}$ **(b)(i)** $\frac{1}{3}, \frac{3}{4}, \frac{2}{5}, \frac{3}{5}$ **(ii)** $\frac{1}{2}$ **(iii)** $\frac{7}{10}$ **(c)** $\frac{1}{30}$

Question 5

(a) Those candidates who quoted $\frac{1}{2}ab\sin C$ succeeded. Some worked a little harder with 24sin 40° as the height, sometimes suffering by approximating prematurely.

(b) This was a straightforward test of the cosine rule and most candidates scored highly in this part. There were some candidates who worked much harder by using the perpendicular from *D* to *AB*.

(c) This was a straightforward test of the sine rule, using angle $C = 110°$.

(d) Many candidates knew which length was required and some could see it was *BC*sin 40°. Many managed all of this for full marks. However, weaker candidates assumed that angles *A* and *D* were each 70° or worse still *A* or *D* was 90°.

Some candidates had no idea of trigonometrical methods, suggesting an inadequate syllabus coverage. Future candidates should ensure their calculator is set up for degrees.

Answers: **(a)** 201 **(b)** 17.2 **(c)** 12.8 **(d)** 8.21

Question 6

(a) It was essential to use the mid-interval values in this part. Using values elsewhere in the interval could only score a maximum of 2 out of the 4 marks.

(b) Many drew the histogram perfectly but many did not fit the intervals to the given horizontal scale. There were frequent errors with the heights of the bars and many candidates did not attempt this part.

Answers: **(a)** 32.5 **(b)** heights of 1, 1.5 and 2.

Question 7

(a) Many knew the basic formula for the volume of a cylinder but others were unsure and extra factors such as 2, $\frac{1}{2}$, $\frac{1}{3}$ and $\frac{4}{3}$ were occasionally seen. The units were found difficult to handle and those who worked in centimetres had problems in converting to cubic metres. Many did not try to change the units. The candidates who converted the radius to metres were more likely to reach the correct answer.

(b) The marks were available for multiplying their answer to part **(a)** by 0.8.

(c) Part **(i)** generally did not score highly. Simply stating $\frac{1}{3}$ of 360° was not sufficient, neither was joining *DE* and assuming the base angles were each 30°. The candidate needed to extend the two sides to form a quadrilateral containing 90°, 90° and 60°, or alternatively, they could draw the internal equilateral triangle with a vertex at *C*, giving 90°, 90° and 60° again making the reflex angle *DCE* = 240°. In part **(ii)**, candidates were reluctant to find $\frac{1}{3}$ of the circumference of the circle of radius 0.31 metres. They should have realised that, even if they had no faith in their demonstration that angle *ECD* = 120°, they were entitled to assume this fact. Some candidates used trigonometry, presumably to find the straight line length *DE* and some found $\frac{1}{3}$ of the area of the circle. This part was generally not well done. Part **(iii)** was also poorly answered, with the three straight lines often taken as 3 × 8 radii, instead of 3 × 6 radii. Part **(iv)** was manageable as it was simply their **(iii)** × 15.

Answers: **(a)** 4.53 **(b)** 3.62 **(c)(ii)** 0.649 **(iii)** 7.53 **(iv)** 113

Question 8

(a), (b) Candidates mostly filled in the spaces in the table correctly.

(c) Quite remarkably, up to 25% of the candidates had no idea how to plot and draw the graphs. This could be the result of not associating $y = f(x)$ and $y = g(x)$ with the f(x) and the g(x) on the previous page. Others drew graphs of varying quality, many giving excellent presentations.

(d) The intersections in parts **(i)** and **(ii)** were well recognised but part **(iii)** proved to be much more testing.

Answers: **(a)** 0.25, 8, 16 **(b)** – 5, 4 **(d)(i)** 3.2 to 3.4 **(ii)** 0.3 to 0.4 and 2 **(iii)** 3.1 to 3.4

Question 9

(a) In part **(i)** candidates were reluctant to remove the denominator; the idea of multiplying both sides by $w(w+1)$ appeared to be unknown to them. Many who did multiply did not use brackets for $5(w+1)$. This part was poorly answered.

In part **(ii)** the elegant way of writing $(y+1) = \pm 2$ was rarely seen, as many expanded and tried to solve the resulting quadratic equation, not always successfully. $y^2 + 1$ was seen rather too often.

Part **(iii)** was correctly done by only a few candidates. Many more knew how to solve this equation but made bracket errors and sign errors.

(b) This part offered the chance to solve a quadratic equation by factorising and, of course, Many could not obtain the correct factors in **(i)** and indeed did not seem to know what facto large number did not link parts **(i)** and **(ii)**, with many solving part **(ii)** using the formula.

(c) Here, many formed the correct equation using equal areas and many scored the second mark correctly expanding $(x+1)(x+2)$. The conversion of their equation to the printed one was usually convincingly done. Part **(ii)** saw the formula working well but often with slips in the working. – *b* was often – 3, $b^2 = -3^2 = -9$ was a frequent error as was a short line under the numerator. There were also incorrect roundings of the decimals. In part **(iii)** many knew what was required to calculate one of the areas.

Answers: **(a)(i)** – 2.5 **(ii)** – 3, 1 **(iii)** 9.5 **(b)(i)** $(u-10)(u+1)$ **(ii)** – 1, 10
(c)(ii) – 0.56, 3.56 **(iii)** 12.7

Question 10

Candidates who knew the linear programming topic in the syllabus did this question well. They obtained the correct inequalities and drew the appropriate lines on the grid. Many indicated the correct region for the possible distribution of the vehicles and used it to find part **(d)**, the maximum number of trucks. They also used the region to optimise the parking fees and find the total income.

Sadly, the large majority were not prepared for this question and scored very few marks.

Answers: **(a)** $20x+110y \le 1200$ **(b)(i)** $x+y \ge 40$ **(ii)** $y \ge 2$ **(c)** $x+y=40$, $y=2$ drawn and required region **(d)** 5 **(e)** 50, 2, 270

Question 11

Candidates handled this set of problems very well and many scored full marks.

(a) The diagram was nearly always correct and then by counting or by analysing the sequences listed, candidates also obtained the numbers of dots and lines.

(b) By following the sequences, candidates obtained the correct numbers.

(c) This usually continued into successfully obtaining correct expressions for the *n*th diagram.

(d) In this part, a number of candidates could not see that when $n = 1$, $3k$ would be 6, or when $n = 2$, $7k$ would be 14.

Even the weaker candidates enjoyed solving these “puzzles”.

Answers: **(a)** 25, 13, 62 **(b)** 64, 19, 146 **(c)** n^2, $2n + 3$ **(d)(i)** 2 **(ii)** 20202

MATHEMATICS

Paper 0581/42

Paper 42 (Extended)

General comments

The topics which proved to be challenging were vector geometry, probability of combined events and transformation matrices. Topics where candidates scored highly were interest, percentage, ratio, statistics and solving linear and simultaneous equations in context.

Almost all candidates were able to finish in the allotted time and blank spaces were an indication of inability to do a question as opposed to being unable to finish.

It now appears to be the norm that candidates are writing their working and answers in the correct parts of the paper. The working space proved to be more than sufficient for almost all candidates

Most candidates proved to be very accurate with their working, either by keeping values in their calculator or working with 4 or more significant figures.

The "show that" questions again posed more problems and candidates are encouraged to practice these more and realise that they have more to do than when a question asks for an answer. If an answer is given, then the credit is for steps clearly arriving at the answer and not for the answer itself. The candidate should read these questions carefully and decide on exactly what is required.

It is refreshing to report on the good work of so many candidates who demonstrated skills, knowledge and the ability to interpret as well as the potential to go further in this subject. There was a small number of candidates who were not familiar with the extended syllabus for whom the core level would have been a more appropriate examination.

Comments on individual questions

Question 1

Generally this was a good source of marks, but parts did cause real difficulty thus making it a discriminating question.

(a) It was very rare for candidates not to earn the mark here. The main error seen was to concentrate on ratios, with 240 being ignored.

(b) (i) About half of the candidates initially took the interest as $99 leading to an answer of 55%. At that point many of them realised that the answer was not sensible and they scribbled over the surplus "9" and "5". Unfortunately some just changed the answer, so they had a correct answer from wrong working.

(ii) This reverse percentage was often well answered but a very common error was to calculate 60% of $99. Sometimes candidates then added $99 to this answer.

(c) Simple interest was very rarely seen so this question was well attempted. Some candidates did not appear to understand "exact". After $162.24, the final answer was given as either $162 (3 s.f.) or $162.2. There were quite a few candidates who used the formula for compound interest but did not use it correctly. The formula is not on the syllabus and candidates who performed a year by year calculation were also successful.

(d) (i) $120 was usually correct for simple interest but a number of candidates went no fu common to subtract $120 but many ignored the original investment of $150, leading to answer of $208.67.

Once again correct answers were spoilt by ignoring "exactly", so 3 s.f. answers of $58.7 w common.

(ii) This part was generally well attempted, but a significant number of candidates believe that a percentage cannot be greater than 100. They preferred to find $150 as a percentage of $328.67.

A few subtracted $150 from $328.67 and then found $178.67 as a percentage of $150 [119%].

Answers: **(b)(i)** 5 **(ii)** 165 **(c)** 162.24 **(d)(i)** 58.67 **(ii)** 219

Question 2

Most candidates scored highly in part **(a)(i)** but found part **(b)** extremely difficult.

(a) (i) Almost all candidates were able to multiply a vector by a scalar and then add the two vectors in column form.

(ii) The modulus of a vector notation was often not recognised and answers of 23 and 7 were quite common, the result of adding or subtracting the components. Another error seen was $|\mathbf{p}| + |2\mathbf{q}|$.

(b) Vector geometry often proves to be a challenging part of the syllabus and this question was no exception. Candidates should be encouraged to show their "route" first, not necessarily in terms of the given vectors, and marks are often available.

(i) Many candidates did not realise that $\overrightarrow{CM}$ was a half of $\overrightarrow{CV}$, whilst others thought that $\overrightarrow{CV}$ was the same as $\overrightarrow{VC}$. A careless error seen was $\frac{1}{2}\mathbf{v} - \mathbf{c}$.

(ii) A large number of candidates did not realise that a position vector is from the origin, some even thinking that it was a column vector.

(iii) Only those candidates who had already managed some success in the earlier parts were able to progress to this part.

Answers: **(a)(i)** $\begin{pmatrix} 15 \\ 8 \end{pmatrix}$ **(ii)** 17 **(b)(i)** $\frac{1}{2}\mathbf{v} - \frac{1}{2}\mathbf{c}$ **(ii)** $\frac{1}{2}\mathbf{v} + \frac{1}{2}\mathbf{c}$ **(iii)** $\frac{1}{6}\mathbf{v} - \frac{1}{2}\mathbf{c}$

Question 3

Probability again proved to be a topic which many candidates find difficult. A few easy marks were usually attained, but where the question involved two or more events many candidates did not score any marks. It is pleasing to report that ratios were rarely seen (they are not accepted) and most candidates did not convert to decimals or percentages, realising that it was unnecessary in this question.

(a) (i), (ii) and (iii) were found to be straightforward and the diagram usually led to correct answers here. In part **(iv)**, some candidates added the probability of two events which were not mutually exclusive and even left answers greater than 1.

(b) (i) This part was quite well answered, although $\frac{1}{6} + \frac{1}{6}$ was seen regularly. $\frac{1}{6} \times \frac{1}{5}$ was also seen at regular intervals.

(ii) This part was badly answered since candidates did not realise that there were 2 ways of scoring 11. Consequently the answer was often given as $\frac{1}{12}$.

(c) In part **(i)**, although many correct answers were seen there were also a number of candidates who did not appreciate the conditional nature of the question and so gave the answer $\frac{2}{6}$. In part **(ii)** the error $\frac{4}{6}$ was seen.

(d) This was a challenging question that allowed the very best candidates to excel. Many candidates either did not attempt this question at all or experimented with variations of $\frac{16}{243} \div \frac{1}{3}$ leading to $\frac{16}{81}$ and then 5.0625 (If this was rounded to 5, no marks were awarded as it was clearly an incorrect method.), or 243 ÷ 16 leading to 15.

Answers: **(a)(i)** $\frac{4}{6}$ **(ii)** $\frac{3}{6}$ **(iii)** $\frac{2}{6}$ **(iv)** $\frac{5}{6}$ **(b)(i)** $\frac{1}{36}$ **(ii)** $\frac{6}{36}$ **(c)(i)** $\frac{1}{4}$ **(ii)** $\frac{1}{2}$ **(d)** 5

Question 4

Parts of this question were found to be very straightforward but the final part proved to be a good discriminator.

(a) This was answered well in both parts. Occasionally in part **(i)** candidates translated the triangle correctly in one direction but not the other, and in part **(ii)** the wrong centre of rotation was sometimes used or the triangle was rotated 90° anticlockwise rather than 90° clockwise.

(b) A few candidates gave multiple transformations which did not score, but part **(i)** was answered well with the majority giving a reflection with an occasional error being $y = x$ for the mirror line. Part **(ii)** was more often incorrect; shear or enlargement rather than stretch was often given or an incomplete invariant line e.g. invariant in x rather than the x-axis. Answers such as the x-axis or parallel to the x-axis were not accepted as invariance was not clear. It was encouraging to see more candidates using the correct terminology however. The scale factor was often correct.

(c) There were many that adopted a simultaneous equation approach to finding the elements of the matrix and these longer methods often led to errors. The working spaces provided and the number of marks available should have indicated that such long methods were not expected. The more able candidates either recalled the correct matrices or used the unit matrix approach and were successful in all parts of **(c)**. For others answers appeared to be guesswork.

(i) This part was the best answered of the question but there were errors with the placement of the -1 and zero elements of the matrix.

(ii) This part was quite well answered.

(iii) This part saw the predictable incorrect answer of $\begin{pmatrix} 1 & 0 \\ 0 & -3 \end{pmatrix}$.

It is surprising to see such a large number of candidates who appear to be unaware of the unit vector method.

Answers: **(a)(i)** Vertices (– 4, 4), (– 1, 4), (– 1, 6) **(ii)** Vertices (1, – 3), (1, – 6), (3, – 6)
(b)(i) Reflection, $y = -x$ **(ii)** Stretch, x-axis invariant, factor 3 **(c)(i)** $\begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix}$
(ii) $\begin{pmatrix} 1 & 0 \\ 0 & 3 \end{pmatrix}$ **(iii)** $\begin{pmatrix} 1 & 0 \\ 0 & \frac{1}{3} \end{pmatrix}$

Question 5

All candidates were able to access some parts of this question but many found parts **(c)** and **(e)** diffic

Many candidates appeared to be very well practised with the cosine and sine rules, scoring highly in parts and **(d)**, but found the calculation of a distance east using a right-angled triangle more difficult. This reflects the extra challenges of context.

A number of candidates took risks by doing all their working on a calculator and only writing down a final answer. A simple error during the process or a rounding error can then be very expensive with such a strategy.

(a) Almost all recognised the use of cosine rule to justify the angle. Many made the correct substitution but most then went straight to an answer of 25 or 25.0 without giving a more accurate value from their working. A few used the cosine rule in its ‘implicit form’ for the angle and made errors in transforming the terms to obtain the angle. Some attempted to find the incorrect angle.

The “Show that it rounds to 25.0°” wording of the question was to rule out a reverse process with the 25.0°, but particularly to tell the candidates to find an answer more accurate than 25.0°. The 25.0° was given to make sure candidates were using a correct value in parts **(b)** and **(c)**. As stated in the introduction, many candidates did not quite grasp these interpretations.

(b) The first bearing of 125° was answered well but part **(ii)** was often incorrect with errors such as 330°, 55°, 285°.

(c) This was the least well answered part of the question, with many unable to make any progress. Many candidates omitted this part. Some candidates drew a horizontal line from *H* to below *A* and then added 90 km – thinking that *HT* was due east – while others confused the angles of 55° and 35° within an attempted trigonometrical method.

(d) This was very well answered, with most recognising the use of the sine rule and applying the method correctly to the problem. It was pleasing to see candidates realising that they could do this part even if they had been unable to attempt part **(c)**. A few either approximated their values too early or truncated to 47.8 without showing a more accurate value to lose the final mark. For some reason, a few candidates even gave 48 as their only answer. Some weaker candidates confused the angles within the sine rule or mixed the sides with the angles.

(e) Only a few noted the change of units between cm and km to obtain the correct answer. Many recognised the need to divide but gave an answer of 20. A few divided the values the wrong way round.

Answers: **(b)(i)** 125 **(ii)** 305 **(c)** 147 **(d)** 47.9 **(e)** 2 000 000

Question 6

Mensuration questions are often found to be more difficult than anticipated and this question proved to be no exception. In some cases the context may have been responsible but most parts involved straightforward calculations involving volume or surface area.

It is not appropriate on this calculator paper for candidates to use $\pi = \frac{22}{7}$ or 3.14 and if they do so they may obtain a final answer that is outside of the acceptable range. Mark schemes will always accommodate 3.142 but candidates are urged to always use the π button on their calculator.

(a) Almost all candidates substituted correctly into the given formula but the accuracy mark was often lost as the majority wrote down the answer of 57.9 given in the question. It is important for candidates to understand that if they are required to show how to obtain an answer that is given in the question and is not exact, then a more accurate answer is needed for full marks. In this case an answer to 4 significant figures was sufficient.

(b) (i) This was often answered very well although some candidates used the radius rather than the diameter for one, or more, of the dimensions. The answer of 7.2, 4.8 and 2.4 cm was a frequent.

(ii) The volume was usually calculated correctly but a number of candidates did not understand what was required for the volume of the box and added the volume of the six balls in this part. These candidates then usually gave the answer to this part in part **(iii)**. It may have been that what was being asked for in part **(iii)** was the cause of the confusion.

(iii) Apart from the error referred to above this part was well done. Some candidates subtracted 57.9 rather than 6 × 57.9.

(iv) This was answered well with most candidates using a correct method. Some omitted one, or more of the faces and a few calculated the area of the three different faces but did not multiply their total by 2.

(c) (i) Most candidates attempted to use the appropriate formula but some used $2\pi r^2 h$ for example. Not all candidates identified the correct height but those that did usually went on to find the correct volume. However those candidates that reversed their answers to **b(ii)** and **b(iii)** often made a similar error in this part and **(c) (ii)**.

(ii) Apart from those who made the same error as in **(b) (iii)**, most answered this correctly.

(iii) Many calculated either the curved surface area or the area of one or both of the two ends correctly, but only the better candidates calculated the total of all three areas to earn full marks. There were rounding errors by candidates who found the individual parts to only 3 figures.

Answers: **(b)(i)** 14.4, 9.6, 4.8 **(ii)** 664 **(iii)** 315 or 316 or 317 **(iv)** 507 **(c)(i)** 521
(ii) 173 or 174 **(iii)** 470 to 471

Question 7

This question was generally well answered and weaker candidates were able to score reasonably.

(a) This part was well done by almost all candidates. The majority used the correct midpoints with just a few using 5, 10, 15,… or 0, 5, 10,… or 3, 8, 13,… etc. The occasional arithmetic slip still resulted in 3 of the 4 marks being earned. Candidates seemed to have been well drilled on the method and the majority of them showed appropriate working.

(b) This was almost always correct.

(c) Most candidates plotted points accurately but a few candidates mis-plotted (5,12) and a further occasional error noted was to plot (30,150) instead of (30,155). Several candidates from some Centres plotted all the points at the mid-interval points. Although a few histograms or bar charts were seen, generally the quality of the curves was very good.

(d) This part was sometimes omitted but otherwise was usually correct.

(e) The candidates who had a correct curve generally did well on all four parts. In parts **(i)** and **(ii)** a few candidates gave answers just outside of the acceptable range. In part **(iii)** a few used 64 on the cumulative frequency axis rather than 128 and gave an answer of 17.5, or similar. Many candidates answered part **(iv)** correctly with just a few using 100 rather than 200 to give an answer such as 38.

Answers: **(a)** 21.9 **(b)(i)** 155, 180 **(e)(i)** 22 to 23 **(ii)** 13.5 to 14.5 **(iii)** 25.5 to 26.5
(iv) 136 to 140

Question 8

This three part algebra question proved to be a valuable source of marks for many candidates and very weak candidates scored poorly in this question. In parts **(b)** and **(c)**, the context was dea extremely well.

(a) Probably about half of the candidature were successful in this part. The square of $p + q$ was often dealt with correctly (with $p^2 + q^2$ a not too common error), but candidates then struggled to place the 5 correctly. The inequality symbol also made frequent appearances in the answer space, for example, $(p+q)^2 < 5$.

(b) This was very well answered with most candidates clearly stating the equation and then going on to solve it correctly. Having found *x* correctly some candidates unfortunately went on to multiply *x* by 6. This question required an equation to be set up and candidates who used trial and improvement could only score a maximum of 1 out of 4 marks.

(c) This was also very well answered both by candidates choosing to use an algebraic method and by those using trial and improvement. Full marks were very frequently awarded but of those candidates that were not successful, almost all of them had tried the trial and improvement approach. Solution of simultaneous equations was excellent.

Answers: **(a)** $(p+q)^2 - 5$ **(b)** 5.20 **(c)** 35, 17

Question 9

This question allowed for the full range of ability but was particularly challenging in part **(c)**.

(a) In part **(i)**, it was pleasing to see so many candidates using the correct term 'similar' – an improvement on previous years. Some used enlargement, which was accepted. Errors included 'proportional' and 'congruent'.

In part **(ii)** many were successful. The most common error was to give an answer of 6 cm or 9 cm.

Part **(iii)** was less well answered – many incorrectly used the linear scale factor of 1.5 to arrive at 9 cm. The more successful candidates showed clearly the square of the scale factor before multiplying by 6 cm². Some candidates did a lot of trigonometry for a maximum of 2 marks but such long methods produced many more errors in the working.

In part **(iv)**, the large majority of candidates who understood that an algebraic expression was required (the weaker candidates tried to work out the angles and gave numeric answers) had *AXB* correct as either 180 – (*x* + *y*) or 180 – *x* – *y*, although some omitted the bracket and had 180 – *x* + *y*. The expression for *XDE* was answered less well and a common error was to give the answer '*x*', possibly misreading which angle was wanted. Other errors included 180 – *y*. This part was also often omitted.

(b) This part contained a mix of responses. Those who did not answer part **(i)** correctly usually recognised that the angle *PRS* in part **(ii)** was half of the angle in part **(i)** and were given credit. Errors in part **(i)** and **(ii)** combined included 103° and 51.5°, 90° and 45°.

Part **(iii)** was well answered – those that made errors with part **(ii)** often realised that they needed to subtract their answer from 145° in part **(iii)** and were given credit.

Part **(iv)** was also well answered although 42° was sometimes seen.

(c) This part proved to be the most challenging part for candidates. Some more ab... answered correctly either intuitively or used the efficient method of finding the exterior ... $8x + x = 180$ and then dividing this into the sum of the exterior angles, 360, to find the answer. Surprisingly few adopted this approach however with the majority opting to reca... interior angle sum of a polygon and then attempting to set up a more complicated equa... involving $\frac{180(n-2)}{n}$. Those that tried to form and solve this equation often got the relation 8 times the exterior angle the wrong way round or those that formed it correctly were then unable to manipulate the algebra correctly to a solution.

Many candidates did not attempt this part, which proved to be one of the discriminators on the paper.

A small sketch showing x and $8x$ on a straight line would have been helpful but this was very rarely seen.

Answers: **(a)(i)** Similar **(ii)** 4.5 cm **(iii)** 13.5 cm^2 **(iv)** $180 - x - y$, $180 - x$ **(b)(i)** 96 **(ii)** 48 **(iii)** 97 **(iv)** 35 **(c)** 18

Question 10

Almost all candidates gained some marks in this question, especially in the first parts involving the naming of two shapes and numerical sequences.

(a) This was well done by most candidates with the name of one of the polygons only omitted occasionally. Almost all candidates identified the pattern for the total number of diagonals and so gave the correct answer.

(b) This was also well done as the majority were able to continue the sequence they had identified in part **(a)**.

(c) (i) Generally candidates found this part difficult. Many of the candidates who gave the correct answers often appeared to use a trial and improvement method rather than solving a pair of simultaneous equations. Many substituted a value of n into $\frac{1}{p}n(n-q)$ but then did not equate it to the appropriate number of diagonals. Those that were able to write down a correct equation often did not understand that a second equation was required in order to find p and q. A few candidates were able to recall the correct formula presumably from investigational work that they had carried out. These candidates were not always able to make the connection between the formula and the values of p and q.

(ii) Many of those candidates who gave answers to part **(c)(i)** were able to substitute these and $n = 100$ into $\frac{1}{p}n(n-q)$.

(iii) The candidates who put their expression equal to 170 were not always able to solve the resulting quadratic equation, although some were able to write down a solution (either 20 or 17). The most common error was to substitute $n = 170$. The question was set with the hope that most candidates would use intuition, looking for a pair of numbers whose product was 340, thus not requiring a more formal quadratic equation.

(d) This part was often omitted, with candidates not intuitively spotting a simple pattern from the differences in the third column of the table. Those who tried to obtain a quadratic equation gave themselves a lot of work for a single possible mark.

Answers: **(a)** Pentagon, octagon, 20 **(b)(i)** 35 **(ii)** 54 **(c)(i)** 2, 3 **(ii)** 4850 **(iii)** 20 **(d)** 31

MATHEMATICS

Paper 0581/43
Paper 43 (Extended)

General comments

This paper was well received by the majority of candidates. There was sufficient time for everyone to attempt all questions.

Some candidates rounded early and thus lost marks because their final answer was out of range. In the questions where they were required to show a result, some failed to show sufficient steps of working. Some also showed no working in some questions and just stated the answer so when it was not in range they scored zero. There were also those who did not give the answer to the accuracy required.

The probability question was answered better than in the past but some still had little idea how to deal with combining probabilities.

Some centres did not appear to have covered transformations in any detail and the candidates often lost a lot of marks.

Comments on specific questions

Question 1

Overall, candidates scored well on this question.

(a) (i) It was rare to see a wrong answer for this part. Occasionally a candidate failed to simplify and left the answer as 8:12.

(ii) This was also nearly always correct but some methods were much longer than necessary.

(iii) Candidates had little problem finding the percentage. A few found the percentage Daniella received.

(b) Most candidates obtained 31.83 and scored all 3 marks. Some did leave it as 31.827 or rounded to 3 s.f. A few who did it year-by-year spoilt the answer by adding the second year interest of 0.927 to 30 rather than 30.9. Only a very small number wrongly used simple interest.

(c) This part was not answered as well. Some candidates confused interest and amount, using 32.25 as the interest. Some forgot to multiply by 100 and gave an answer of 0.015. Others tried to do a type of compound interest.

Answers: **(a)(i)** 2:3 **(iii)** 60 **(b)** 31.83 **(c)** 1.5

Question 2

Overall there was a mixed response to this question. Most candidates had no problems and obtained full marks. However others found parts **(b)** and **(c)** difficult, including a few who did not attempt either of these parts.

(a) Very few candidates had a problem with this part, although some lost a mark by leaving the answer as $\sqrt{34}$ or 5.8 rather than 5.83. A few subtracted rather than added the two squares and obtained an answer of 4.

(b) Most of the candidates correctly used the cosine rule and successfully obtained the co... Occasional errors were seen with the use of the cosine rule and this normally occurre... they started with the implicit version i.e. $11^2 = 8^2 + 5^2 - 2 \times 5 \times 8 \cos ACD$, and then, in rea... ended with 0.4 rather than -0.4. Some confused the angle required and found *CAD* instead. ... attempted to find the perpendicular from C to AD and then find the angle in two parts. Most ma... wrong assumptions in order to do this and earned no marks.

(c) Good candidates normally scored full marks here and many others at least earned the method marks by working out $\frac{1}{2} \times 3 \times 5 + \frac{1}{2} \times 8 \times 5 \times \sin$ (their *ACD*). There were also some attempts at Hero's formula, many of them correct.

Answers: **(a)** 5.83 **(b)** 113.6 **(c)** 25.8

Question 3

Many candidates earned full marks on this probability question. A few weak candidates did not attempt parts **(c)** and **(d)**.

(a) This was almost always answered correctly even by weaker candidates.

(b) Both parts of **(b)** were usually correct.

(c) (i) Whilst many correctly obtained the correct answer, some multiplied 0.2 × 0.2 and gave an answer of 0.4. There were also some who used the method of "without replacement" in this part and also in the rest of part **(c)** and **(d)**, giving answers involving 9ths.

(ii) Apart from those who used "without replacement", most obtained the correct answer. Some only chose (1 and 3) and (2 and 2), missing out (3 and 1). Others chose (1 and 3) and (3 and 1) and (2 and 2) and (2 and 2). These answers did score 1 mark.

(d) This was mostly correct except for those who used "without replacement". A few tried a very long method of listing all the possible combinations. Usually they missed some out.

Answers: **(a)** 0.4, 0.1 **(b)(i)** 1 **(ii)** 0.7 **(c)(i)** 0.04 **(ii)** 0.03 **(iii)** 0.12 **(d)** 0.147

Question 4

This was a question where some candidates mostly obtained full or nearly full marks. Other candidates had little knowledge of transformations and made only a minimal response to this question. In fact some did not make any real effort at parts **(c)**, **(d)** and **(e)**. There were very few candidates who gave more than one transformation in any part.

(a) This part was well answered. Most candidates correctly reflected the triangle in $y = 6$, although a few reflected in $x = 6$ and even fewer in $y = 0$.

(b) This part was also well answered, although there were more errors in this part. Most translated the triangle but some by the wrong amounts. The most common error was to translate 6 right and 4 down.

(c) Most candidates described the translation correctly. Some gave the movement in words but the most common error was to give the vector as $\begin{pmatrix} -4 \\ 6 \end{pmatrix}$.

(d) (i) Most candidates gave the transformation as enlargement, but marks were often lost by failing to give the centre or getting the scale factor wrong. Common wrong values were 2, -2 or $-\frac{1}{2}$.

(ii) Many correct but even some of the otherwise excellent candidates gave this answer as $\frac{1}{2}$.

(e) (i) This was the most testing part of the question. Shear rather than stretch was a co[...] There was again a problem with the scale factor with the same wrong answers as i[...] being quite common. Also many failed to state that the *y*-axis was invariant. It was quite [...] to say *y* invariant or parallel to the *x*-axis instead.

(ii) The correct answer was often given here even after a wrong part **(i)**. Some showed no working bu[t] others did a lot of matrix multiplication. There were also many whose matrix followed through from a wrong scale factor in part **(i)** and thus earned the marks.

Answers: **(a),(b)** correct images drawn **(c)** translation, $\begin{pmatrix} 4 \\ -6 \end{pmatrix}$ **(d)(i)** enlargement, centre (4,6), factor 0.5

(ii) 0.25 **(e)(i)** stretch, *y*-axis invariant, factor 0.5 **(ii)** $\begin{pmatrix} 0.5 & 0 \\ 0 & 1 \end{pmatrix}$

Question 5

There were many very good answers to this question but some candidates had little grasp of circle geometry.

(a) (i) This was mostly answered correctly. Wrong answers seen included congruent, same and proportional.

(ii) This part was also mostly correct. Only a few mixed up the ratios and worked out $3.6 \times \frac{4}{3}$. A few worked out 4 - 3.6 = 0.4 and then subtracted 0.4 from 3.

(iii) This part caused more problems. There were a lot of correct answers but some did a long method involving finding the angle *ABC* = *AQP* and then using $\frac{1}{2} \times 3 \times 2.7 \times \sin AQP$ to find the area. This method is of course correct and could earn full marks but many prematurely rounded and thus failed to obtain the exact answer of 3.15. A few failed to realise the need to square and calculated $5.6 \times \frac{3}{4}$.

(b) A lot of candidates obtained full marks in this part but some of the weaker candidates did not attempt it or only answered parts **(i)** and **(ii)**.

(i) Nearly all who attempted this part answered it correctly.

(ii) This was also answered correctly by many but some gave an answer of 75.5^o obtained by failing to recognise that *TRH* = 90^o but instead treating triangle *RHT* as an isosceles triangle.

(iii) Those who attempted this part generally gave a correct answer or an answer that followed through correctly from part **(ii).**

(iv) Most candidates correctly subtracted the previous answer from 180^o but some doubled their part **(iii)**.

(c) (i) Most gave the correct answer, although a few answered 4^o or 24^o.

(ii) The more able candidates had little trouble with this part. However errors included using 360^o or 540^o instead of 720^o or obtaining an answer of 100^o from 720/6 - 20.

Answers: **(a)(i)** similar **(ii)** 2.7 **(iii)** 3.15 **(b)(i)** 29 **(ii)** 61 **(iii)** 61 **(iv)** 119 **(c)(i)** 20 **(ii)** 110

Question 6

This was generally well answered with many fully correct solutions, although weaker candidates fou **(c) (d)** and **(e)(iii)** difficult.

(a) Nearly everyone completed the table correctly.

(b) The points were mostly correctly plotted and reasonable curves drawn. A few joined with straight lines and there were some who joined the two branches.

(c) This was not answered as well as the previous parts. Many stated $k = 0$ but failed to give the other two integer values.

(d) Most able candidates had no problem with this part but amongst the weaker candidates some did not attempt it, some included 0.5 or -0.5 in the inequalities, and some wrote the inequalities the wrong way round.

(e) (i) The correct line $y = 2x + 1$ was usually drawn, although a few did not attempt this part.

(ii) Most who answered **(i)** correctly also identified the points needed to find the solutions which were acceptable, but many did not draw a line vertically to the *x*-axis from these points.

(iii) Some of the weaker candidates failed to multiply through by x correctly and some failed to arrive at an equation of the form $x^2 + bx + c = 0$. Those who did usually found the correct values for *b* and *c*.

Answers: **(a)** -2.5, -2, 2, 2.5 **(b)** correct curve **(c)** -1, 0, 1 **(d)** $x<-1$ and $x>1$ **(e)(i)** correct line **(ii)** indication on graph **(iii)** 1, -1

Question 7

There were many all correct solutions to this question.

(a) Very few candidates confused mode, median and mean and most gave the correct value for all three. The most common error was to take the middle value as the 63rd rather than the 63.5th, so giving the median as 12 rather than 12.5.

(b) (i) The histogram was interpreted very well with the majority finding the correct missing values. A few did make errors here and some did not attempt this part.

(ii) The estimate of the mean was mostly calculated correctly by those who had found the values in the table. There were still a few who added the midpoints and divided by 6 but fewer made this error than previously.

Answers: **(a)** mode = 11, median = 12.5, mean = 12.8 **(b)(i)** 15, 27, 30 **(ii)** 9.67

Question 8

This question caused more problems than most. Not many candidates achieved full marks and some of the weaker candidates scored very little.

(a) Only a handful of candidates scored 2 marks in this part. The majority used a volume calculation thinking that this was equivalent to showing that 16 cuboids fit in the box. They did earn 1 mark.

(b) This was nearly always correct.

(c) (i) There were many different answers to this part. The majority did obtain 23640 but a variety of mistakes were made. The most common were failing to add 600 or not multiplying 180 by 8 and 16.

(ii) Most correctly changed their answer in grams to kilograms.

(d) (i) A lot of good answers were seen here but a significant number failed to add togeth areas. 156 from 4 × 10 × 3 + 2 × 6 × 3 was very common.

(ii) Most candidates earned a mark for multiplying the previous answer by 16 and 25 but fa change correctly from cm^2 to m^2. Some divided by 100 and a few did not seem to realise th needed to change the units.

(e) Many candidates used the correct method for this part but often lost accuracy marks by premature approximation. They often rounded 104.7 to 105 and then subtracted from 180 giving an answer of 75 rather than 75.3. There were also a few who tried to subtract from 216 rather than 180.

(f) This part proved difficult and only the stronger candidates scored well. Failing to divide by 20 at the start was quite common and many also failed to show their working. This did not matter if they arrived at the correct answer of 0.842 (or better). However if an answer of 0.84 appeared without working there was no way to tell if they had done the correct calculation. This meant that they would not get the marks for this part.

Answers: **(b)** 180 **(c)(i)** 23 640 **(ii)** 23.64 **(d)(i)** 216 **(ii)** 8.64 **(e)** 75.3 **(f)** 0.842

Question 9

The more able candidates found this question very straightforward, but weaker candidates scored very little.

(a) This part was well answered. Most candidates were able to set up the equations and the majority managed to solve them. A few made errors when eliminating one variable either by not multiplying every term by the same amount or by subtracting wrongly. A few tried trial and improvement rather than using simultaneous equations. If this resulted in the correct answers then they scored the marks but if the answers were wrong they earned zero.

(b) (i) Good candidates had no problem with this part, showing sound ability to set up and manipulate algebraic equations. For the less able this caused all sorts of difficulties, not least not knowing how to find the time given distance and speed. Quite a large number made little or no attempt at this part.

(ii) Most candidates factorised this correctly but a common wrong answer was $y(y – 13) + 12$.

(iii) Those who factorised correctly usually answered this correctly. A few others started again and used the formula to solve the equation.

(iv) This again was mostly correct. A few answers of 12 appeared and weaker candidates often did not answer this part.

(c) This was very well answered, even by some weaker candidates. The most common error was to get the first sign wrong in the formula and thus the answers had wrong signs.

Answers: **(a)** water 1.05, juice 1.80 **(b)(ii)** $(y – 1)(y – 12)$ **(iii)** 1, 12 **(iv)** 8 **(c)** -1.56, 2.56

Question 10

Good candidates nearly all scored full marks, and some otherwise weak candidates often scored highly here as well.

(a) Surprisingly, some excellent candidates missed this part. Practically everyone who attempted it did so correctly.

(b) Nearly all candidates filled in the first two columns of the table correctly. A few made a slip. In the third column, most candidates correctly answered n^2 and $4n$, but slightly fewer correctly filled in the final space. A few did not attempt this column.

(c) (i) This was mostly correct.

(ii) Again, this part was nearly always correct.

(iii) In this part there were also many correct answers but a few candidates did a lot of working and never arrived at 12 and a few gave the answer as 11.

Answers: **(a)** dots correct **(b)** 16, 25, 16, 41; 25, 41, 20, 61; n^2, $4n$, $n^2 + (n+1)^2$ **(c)(i)** 79 601 **(ii)** 800
(d) 12

MATHEMATICS WITH COURSEWORK

Paper 0581/05

Paper 5 Coursework (Core)

General comments

As in previous years, the standard of the coursework submitted this year is high. In general, Centres have given a choice of coursework tasks to their candidates. This has enabled candidates to submit work in a topic area of strength and interest. Many candidates are very proficient in algebra and were able to score high marks with traditional investigations such as 'T shapes' and 'Counting Triangles'. Other candidates explored topic areas not covered on the syllabus through statistical tasks, such as testing goodness of fit for data collected in geography lessons.

One note of caution, particularly where ICT packages are used to calculate and display work, candidates must provide a commentary about what they are doing and why they have chosen a particular set of input parameters. Of equal importance is the analysis of the output and the justification for choices made. For example, whether it is appropriate to use the median or the mean which, in turn, determines the type of statistical diagram to use.

Overall, candidates made good progress with their coursework tasks this year and few candidates struggled to make any progress at all.

A small number of Centres submitted large quantities of work, often more than fifty pages. Centres must ask themselves the question whether this is an effective use of candidates' time considering that the majority of the marks are usually gained within the first fifteen pages.

It was pleasing to find that all Centres now ask their candidates to complete diagrams and tables within the write-up rather than attach these as appendices. This enables the commentary to flow well and ensures that the reader knows exactly which diagram or table the candidate is referring to. Graphs, attached to the write-up in the appropriate place, occasionally had useful instructions written on them telling the reader how to open them!

In most cases the controlled element was a written test. Surprisingly, some candidates scoring 3 or 4 marks in each of the four other strands scored 0 or 1 mark here. This was particularly noticeable at Core level. Although a written test for all candidates seems the fairest method, some Centres may be advised to differentiate their approach and provide some candidates with a one-to-one interview.

Assessment of the tasks by Centres was excellent. Most of the tasks were annotated by the teacher to show omissions or incorrect calculations. These annotations, together with the comments provided on the mark sheet to justify the marks in each strand, were very helpful.

MATHEMATICS WITH COURSEWORK

Paper 0581/06

Paper 6 Coursework (Extended)

General comments

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