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MATHEMATICS

Paper 0581/01

Paper 1 (Core)

General comments

Candidates performed well again this year with very few candidates scoring under 5% but the Paper was sufficiently challenging for the more able with very few scoring over 95%. There was no evidence at all that candidates were short of time. The general level of performance seemed to be at the same level as the very good standard attained last year. Most Examiners reported a large increase in the number of candidates showing no working and also giving their answers to the wrong level of accuracy. It is vital that candidates understand the importance of the general instructions on the front cover of the Question Paper or risk losing marks.

Comments on specific questions

Question 1

A large number of the candidates were not clear about how their calculators worked since many gave an answer to the calculation $\left[\sqrt{7.1}^3\right] + 2.9^3$ which is a misunderstanding of how the √ sign operates.

Answers: **(a)** 19.55249...; **(b)** 19.55.

Question 2

Part **(a)** was very well done but most candidates were unable to get a correct answer for **(b)**.

Answers: **(a)** 3.5; **(b)** -0.9.

Question 3

Candidates answered this question well. The most common error was to not cancel down the fraction in **(b)**.

Answers: **(a)** 33/50, 67%, 0.68; **(b)**17/25.

Question 4

Generally very well answered by about half the candidates. The common error was $72/7 or $72/5.

Answer: 42.

Question 5

Many candidates found 42% of 550000 and gave that as the answer or else subtracted this amount.

Answer: 781000.

Question 6

This question was poorly answered and the most common mistake was to divide by 3.75 instead of multiplying by it. Other candidates subtracted 2.40 riyals after converting the $100 into riyals.

Answer: 366.

Question 7

This question was badly answered even by the more able candidates. Many tried to use a calculator but were unable to extract a fraction from the decimal display at the end of the calculation.

Answer: $\frac{4}{9}$.

Question 8

Generally well done.

Answers: **(a)** -30; **(b)** $v(4u - 3)$.

Question 9

Generally well understood but many candidates went from $4x = 2$ to $x = 4/2$.

Answer: $\frac{1}{2}$.

Question 10

This question was generally very poorly answered with many candidates dividing 500000 by 2. Only the more able candidates were successful with part **(a)**. However, standard form was well done this year.

Answers: **(a)** 0.004; **(b)** 4×10^{-3}.

Question 11

This question was surprisingly poorly answered this year despite the simplicity of the equations. All combinations of adding, subtracting and multiplying equations were seen as methods.

Answer: $a = 3 \quad b = -1$.

Question 12

There were some signs of improvement in the handling of this topic but there are still a large number of candidates who do not understand the topic at all.

Answers: **(a)** 88; **(b)** 85.5 86.5.

Question 13

Part **(a)** was well done but **(b)** was not so well done by about half the candidates, many of whom started **(ii)** without reference to **(i)**. It remains a common misconception that there are 100 minutes in an hour.

Answers: **(a)** 20 05; **(b)(i)** 0.4, **(ii)** 24.

Question 14

Most candidates were able to attempt this question and generally speaking the question was well understood. Some candidates had difficulties as a result of trying to use a calculator on this question.

Answers: **(a)** $\frac{3}{6}+\frac{4}{6}=\frac{7}{6}$; **(b)** $\frac{6}{5}\times\frac{7}{4}=\frac{21}{10}$.

Question 15

All candidates knew what to do but many of them carried out the operation incorrectly. The most common errors were 8 x 7 = 56 for the area of the square and failing to use a $\frac{1}{2}$ in the area of the triangle. Very few candidates were able to name the solid correctly.

Answers: **(a)(i)** 28, **(ii)** 176; **(b)** pyramid.

Question 16

About a half of the candidates assumed that the triangle was isosceles and gave the answer as 100. This did not prevent them using trigonometry or Pythagoras in **(b)**. The area of the circle was well done.

Answers: **(a)** 90; **(b)** 7.71; **(c)** 113.

Question 17

Part **(a)** was generally well done but only the most able of the candidates were able to complete the question. Bearings is not well understood by most candidates and a common error was to find a bearing at *Q* rather than *P*. Again the triangle was often assumed to be isosceles and 45 was a common value for the angle in the triangle. Examiners also report a lack of any meaningful working being shown and also rounding errors causing loss of marks.

Answers: **(a)** 9.59; **(b)** 210.

Question 18

Generally candidates were able to pick up some marks here but many did not appreciate that alternate angles were involved in **(a)** and assumed that the triangle *ABX* was isosceles. Trigonometric attempts at **(c)** were frequent despite the absence of a right angle.

Answers: **(a)(i)** 35, **(ii)** 25; **(b)** similar; **(c)** 11.

Paper 0581/02
Paper 2 (Extended)

General comments

In general candidates performed well on this Paper, and there was no sign that time was a problem. Some candidates penalised themselves by not showing working, but most provided adequate working. Premature approximation and truncation of answers continue to be a problem with some candidates, who then lost accuracy marks.

Comments on specific questions

Question 1

This question was well answered. For full marks Examiners needed to see 5% or equivalent, not just 5. A method mark was available for changing the fraction to a decimal.

Answer: $0.049 < 5\% < \frac{5}{98}$.

Question 2

(a) This did not cause much of a problem.

(b) Some candidates used €0.9 **=** £0.6 which was not sufficiently accurate, while others changed £90 to Euros.

Answers: **(a)** 7.85 to 8; **(b)** 56.25 to 57.5.

Question 3

Many candidates did not know how to handle this conversion. Common mistakes were multiplying by 60 instead of 3600, dividing by 60 or 3600, and multiplying by 10, 100 or 1000.

Answer: 194.

Question 4

The most common error in this question was to make –9 – –2 = – 11.

Answer: $\begin{bmatrix} -4 \\ -7 \end{bmatrix}$.

Question 5

This was a testing question. Many candidates supposed that the total number of students and teachers was 665, and divided by 37 instead of 35. This led to an incorrect answer of 35.9….. which was then rounded to 36.

Answer: 38.

Question 6

Some Centres did not appear to have covered this topic, but candidates who were familiar with it gave good answers, generally showing all their working.

Answer: 201.25.

Question 7

Most candidates were able to score at least one mark by getting $x < 6$, but many failed to obtain the lower limit. The 5 was added to the right-hand side only, and then either both sides were divided by 2, or only the right-hand side. Thus the two common wrong answers for the lower limit were $1.5 < x$ or $3 < x$.

Answer: $4 < x < 6$.

Question 8

Most candidates scored at least 2 marks here. The common mistake was to write –49 instead of 49.

Answers:

11	–	1331
14	196	–
–7	49	–

Question 9

(a) Well answered, with the occasional incorrect answer 6.

(b) Many candidates did not realise that the gradient is the tangent of the required angle, and attempted to extend BA and the negative x-axis. This tended to give $\tan^{-1}$ 2/11 instead of $\tan^{-1}$2/12.

Others drew a line from A to (5,0), calculated the correct angle but then doubled it.

Some used Pythagoras Theorem to calculate AB and then used sine or cosine to find the required angle. The danger in these long methods is that premature approximation usually leads to lack of accuracy, which can gain the method mark but loses the accuracy mark.

Others measured the angle, giving 10° as the answer, and losing both the method and the accuracy mark.

Answers: **(a)** 1/6; **(b)** 9.5°.

Question 10

Many, but not all of the candidates understood the method required in this question. The errors frequently involved the poor use of brackets and negative signs. Thus a common error was to obtain an answer with $x + 5$ in the numerator instead of $x + 11$. Another common error was to cancel erroneously.

Answer: $\dfrac{x+11}{(x-3)(x+4)}$.

Question 11

The response to this question was disappointing. A common error was to place 4/17 with the irrational numbers, indicating a lack of understanding of the meaning of 'rational number'. The 2.6 was usually placed in the correct position, except by those who guessed the answers.

Answer: integer: $\sqrt{112/7}$ rational numbers: 2.6, 4/17 irrational number: $\sqrt{12}$.

Question 12

(a) There was a mixed response to this question. Some candidates assigned a multiple of p to the angle ABC. Many assumed that $2p + 3p = 180$, possibly thinking of a cyclic quadrilateral.

(b) There were many errors and misconceptions in this part of the question. Some candidates involved p in their calculation. For example $2p + q + 5q = 180$ was common. This ignores the fact that ABCDE is a pentagon, rather than a quadrilateral.

Answers: **(a)** 18; **(b)** 30.

Question 13

This whole question was quite well done.

(a) The most common error was 1 cm^2 represents 4 patients.

(b) This was usually correct, even following a wrong answer in part **(a)**.

(c) The first rectangle was usually correct, while the second was often 2.4 cm high instead of 2.2 cm. Some candidates drew the first rectangle 6 cm high, and the second off the scale. Others put a step in the second bar so that it was no longer a rectangle.

Answers: **(a)** 100; **(b)** 1200.

Question 14

(a) Many scored full marks here, others had an error, which reduced their marks to one, most commonly –24 instead of 0. Most of the rest had no idea how to tackle the question.

(b) The common error in the calculation of the determinant was to obtain ±22 instead of 2. Sometimes the entries in the matrix were incorrectly transposed.

Answers: **(a)** $\begin{matrix} 10 & 17 & 4 \\ -6 & -9 & 0 \end{matrix}$; **(b)** $\dfrac{1}{2}\begin{bmatrix} -2 & -4 \\ 3 & 5 \end{bmatrix}$.

Question 15

(a) Once again premature approximation prevented some candidates from obtaining full marks. Their sequence of working was:

$$\frac{7087000}{4714900} = 150.3\% \approx 150\%$$

150% –100% = 50.

This gained method, but lost accuracy marks.

The answer 50 without working gained no marks.

Many expressed the increase as a percentage of the 2000 population, or the 1950 population as a percentage of the 2000 population.

(b)(i) Too many candidates employed successive rounding to produce 4720000 as their answer. Others gave 471 as their answer. A correct answer in standard form was acceptable.

(ii) Common wrong answers were 7.087×10^{-6}, 7×10^{6}, 7.1×10^{6} and 7.08×10^{6}.

The correct answer to three significant figures, 7.09×10^{6}, was acceptable.

Answers: **(a)** 50.3; **(b)(i)** 4710000, **(ii)** 7.087×10^{6}.

Question 16

This whole question was very well answered with few candidates losing any marks.

(a) Occasionally wrong answers involved using grads or rads, but this is not as common as it once was. The answer of 25 with no working scored no marks.

(b) This was usually correct, with occasional misreads, particularly exchanging 3 and 4.

Answers: **(a)** 24.7; **(b)** 46.2.

Question 17

Some Centres had not covered shears and stretches sufficiently.

(a) Some drew a shear with (0,2) mapping to (1,2). Others drew a translation with (0,2) mapping to (3,2), or a stretch or a shear with the *y*-axis invariant.

(b)(i) Judging by the answers to this question some candidates need to be reminded that their answer needs to be communicated to their Examiner. There were many very faint or almost invisible pencil lines drawn for this stretch which made it difficult to mark.

(ii) There were few correct answers to this question, and candidates would benefit from further work on the topic.

Answers: **(b)(ii)** $\begin{bmatrix} 1 & 0 \\ 0 & 3 \end{bmatrix}$.

Question 18

(a) The most common answers were 1 : 10 or 1 : 100. The correct answer was rarely seen, and this was often the question that prevented very good candidates from obtaining full marks.

(b)(i) The perpendicular bisector of AD was usually seen, though not necessarily with the correct arcs.

(ii) The angle ‘bisector’ was often drawn using D and B as centres for the arcs. This meant that T was too inaccurate. Others drew the perpendicular bisectors of CD and CB.

Answer: **(a)** 1 : 1000.

Question 19

(a) Most candidates were able to write down $20x + 80y$, which gained one mark, but many lost the second mark by equating to 3600 instead of writing an inequality.

(b) Conversely, in this part of the question many used an inequality sign. A fairly common error was to write $25x + 4 \times 50y = 3000$, for some reason carrying the $4y$ through from part **(a)**.

(c)(i) There were many correct graphs, although some candidates only drew part of the line.

(ii) The scale was often misread, leading to an answer of 50 cars and 30 trucks.

Answers: **(b)** $x + 2y = 120$; **(c)(ii)** for example: 60 cars and 30 trucks.

Question 20

This question was particularly well answered.

(a) The table was usually correct, apart from a few where the 0.58 was truncated to 0.5.

(b) Some candidates were not able to use the scale correctly, while others plotted negative values of y for $x < 0$.

(c) Misreading the scale occasionally led to a wrong answer here.

Answers: **(a)** 0.1 0.3 0.6 1 1.7 3; **(c)** $1.6 < x < 1.65$.

Paper 0581/03
Paper 3 (Core)

General comments

Candidates found this Paper provided a fair assessment of their ability, used the time available wisely, and demonstrated their knowledge and understanding of Mathematics at this level. The amount of working and methods shown was satisfactory although a significant number of candidates denied themselves the possibility of method marks by its omission. Working was particularly expected in **Question 1 (c)**, **(d)**, **(e)**, **(f)**, **(g)**, **Question 3 (c)** and **Question 6 (a)**, **(b)**, **(c)**. Candidates should also take care when giving answers to an appropriate level of accuracy. The use of rulers and geometric instruments should also be used in graphical and construction questions.

Comments on specific questions

Question 1

(a)(b) These were generally well answered.

(c) A significant number of candidates mixed up the 3 types of average asked for in this part of the question. A common error was in not realising the significance of the 50 (number of students) when calculating both the median and mean. $68 \div 8$ not $415 \div 50$ was a common error when calculating the mean for example.

(d) This was generally poorly answered with 3.6 cm being a common error. This arose from using the number of answers (5) instead of the number of students (4), i.e. $2/5 \times 9 = 3.6$ instead of the correct method of $2/4 \times 10 = 5$.

(e) This was generally well answered although a similar confusion over the number of students (50) led to $11/50$, or $5/11$ used instead of the correct $5/50$.

(f) This was generally well answered.

(g) This was generally well answered although a significant minority included those with 7 correct answers.

(h) This was generally well answered with the majority using fractions to show the probabilities.

Answers: **(a)** 7; **(b)** 42; **(c)(i)** 9, **(ii)** 8, **(iii)** 8.3; **(d)** 5; **(e)** 36; **(f)** 7.50; **(g)** 22; **(h)** $6/50$, $14/50$, 1.

Question 2

Generally a well answered question by the majority of candidates although a small number misread the scale particularly when giving the intersection points. Care should be taken to draw a smooth curve, and rulers should be used for a straight line. Part **(g)** proved more difficult with a variety of methods used ($y = mx + c$, rise/run, using the intersections) but often leading to an incorrect answer.

Answers: **(a)** 120, 24, 20; **(c)** 1.7; **(d)** 120,0; **(e)** (1.3,94) (4.7,26); **(g)** –20.

Question 3

(a) This was generally well answered, although more success was seen in the numerical parts than in the algebraic – although the vast majority were able to do 25 x 7 = 175 in part **(i)** they did not see the algebraic connection for 25 x b = 25b in part **(ii)**.

(b) The majority were able to rewrite c as the subject of the given equation, although $c = Tn$ was a common error. A variety of answers for the representation of 'c' were seen: cost, chocolate, change, with a significant number failing to give a full answer, i.e. the 'cost of one bar'.

(c) There was a similar response to part **(a)** with the numerical parts **(i)** and **(ii)** generally correct but candidates unable to apply algebraic skills to essentially the same problem in **(iii)** and **(iv)**.

Answers: **(a)(i)** 175, **(ii)** 25b, **(iii)** 1.75, **(iv)** $\frac{25b}{100}$ or equivalent; **(b)(i)** $\frac{T}{n}$, **(ii)** cost of one bar; **(c)(i)** 4.50, **(ii)** 4.20, **(iii)** $\frac{y}{x}$, **(iv)** $\frac{(y-7)}{(x-1)}$.

Question 4

A good majority were able to provide correct diagrams for the transformations in part **(a)** with the obvious occasional errors: translating in the wrong direction, reflecting in different lines, rotating in wrong directions, enlarging about a different point. Part **(b)** was generally well answered although a significant number failed to give a full description or did not appreciate the scale factor of $1/2$. **(c)** was generally well answered.

Answers: **(a)** **P** at (4,11) (2,11) (2,12); **R** at (7,7) (7,5) (6,5); **Q** at (9,7) (11,7) (11,8); **S** at (7,7) (3,7) (3,9); **(b)(i)** translation of $\begin{pmatrix} 3 \\ -4 \end{pmatrix}$, **(ii)** enlargement of SF = $1/2$ from A; **(c)(i)** 90°, **(ii)** (3,3).

Question 5

This was a poorly answered question with few clear, correct, and accurately drawn diagrams seen, although candidates who understood the terms used and produced a correct diagram using geometric instruments were able to score full marks. The arcs needed for part **(a)** should have been clear on the candidates answers. The use of the work 'tangent' in part **(c)** appeared to confuse many candidates.

Answers: **(c)(iii)** 6.8 to 7.2.

Question 6

In part **(a)** a significant number of candidates failed to 'show the area is 13.5' and its implication for the necessity of full working. One correct method is (9 x 1) + (1.5 x 1 x 3) = 9 + 4.5 = 13.5.

In part **(b)** many candidates failed to use this given value for the area of cross-section of the prism, with others failing to convert the length from metres to centimetres.

Part **(c)** was generally well answered although a significant number were unable to convert their answer from **(i)** into cubic centimetres with x 1000 being a common error. Part **(c)** gives a good example of method and follow-through marks being available if the working is shown.

Part **(d)** was generally well-answered although the concept of rotational symmetry of order 1 in part **(e)** proved less successful.

Answers: **(a)** (9 x 1) + (1 x 1.5 x 3) = 13.5 for example; **(b)** 3780; **(c)(i)** 1.92, **(ii)** 1,920,000, **(iii)** 507; **(d)** order 1.

Question 7

This question was generally well answered with only a small minority misreading the scale. Part **(d)** caused a few problems with the common error being 'the temperature halved'. A significant number failed to connect part **(e)** with the given graph.

Answers: **(a)(i)** 84°, **(ii)** 22°; **(b)** 11; **(c)** 16°; **(d)(i)** 32, 8, 4, **(ii)** fall in temperature is halving; **(e)** 20 or 21.

Question 8

This question was well answered by the vast majority of candidates with the only significant error occurring in **(b)** with the algebraic use of the *n*th diagram. The majority appeared to count the triangles in part **(d)** with 8,10,11 being the common errors, rather than using the patterns generated.

Answers: **(b)** 6, 7, $n + 2$; **(c)** 15, 21, 55; **(d)** 12.

Paper 0581/04
Paper 4 (Extended)

General comments

The standard of the Paper remained substantially the same as last year and as always there was a complete range of marks seen. There were still some doing very little of this Paper who may have been able to show more positive achievement at the Core level.

Time did not seem to be a problem and very few candidates did not make some attempt at all the questions. Unlike the other mathematics papers, candidates should *not* write anything on their Question Papers. If this has happened then the Question Paper should be sent in with the candidate's Answer Paper. Scripts are occasionally seen which say "*answered on question paper*" and the Question Paper is not there, which means any marks are obviously lost.

There are always a few candidates whose calculators are set in "Grad" or "Rad" mode instead of "Degrees". This invariably produces wrong answers in questions where trigonometry is used and results in the loss of the final accuracy mark.

Only the mean value in **Question 8** had a specific accuracy request within the question. Elsewhere exact answers, such as $x = 15$, are fine but inexact answers require a minimum of 3 significant figures to earn the final mark. Those who overround or truncate figures in their working cannot expect to reach the necessary accuracy in their answers and thus needlessly lose marks.

Most candidates did show their working and there continued to be a pleasing standard of work seen this year.

Comments on specific questions

Question 1

Most candidates scored well on this question.

In the first part some found \$1970 and \$1520 and then stopped, without finding the *total* cost.

The value of n was usually found correctly.

Many good solutions were seen for the simultaneous equations. Those who used substitution to find x and y were slightly more prone to errors than those who solved by multiplying one equation by 10 or 16 and subtracting. Poorer candidates were unable to form two equations and used the given numbers and letters in random order.

Few found any difficulty with the direct percentage but the predictable wrong answers of \$7.50 and \$12.50 were quite common for the last part.

Answers: **(a)** \$3490; **(b)** 153; **(c)** $x + y = 319$, $10x + 16y = 3784$, $x = 220$, $y = 99$; **(d)** \$13.60; **(e)** \$8.

Question 2

The majority of candidates knew the cosine and sine rules and used them well. The cosine rule proved the more troublesome, where a sign error or a lost square prevented x being found correctly. Some could quote the implicit sine rule but then strange things happened. The "sin" could disappear altogether, or sin60 could suddenly appear. Those with the correct method sometimes lost the final mark by not being in "degree" mode, overrounding or premature approximation in the working, causing inaccuracy.

The bearing of A from C was not affected by any wrong value of x or y.

The bearing of B from A did depend upon the value of x and full marks were available for any candidate whose answer was (405 – their x)º.

Answers: **(a)** 130(.0)º; **(b)** 40.4º; **(c)(i)** 225º, **(ii)** 275º.

Question 3

The tree diagram was usually copied and completed correctly. Sometimes it was missing – presumably filled in on the Question Paper despite the clear instructions in bold type. Weaker candidates did not understand that the total probability for any related pair of branches had to be 1 and usually just repeated the given figures.

The probability for "GO, GO" was rarely wrong provided the candidate understood enough to multiply the probabilities together.

The most common error in the next part was to include this "GO, GO" probability when asked for exactly one "GO" signal. Partial credit was given for a correct method for either "GO, STOP" or "STOP, GO" seen in the working.

The quickest method for the final probability was to use "1 – P(STOP, STOP)" which was independent of the previous answers. Provided the method used to obtain the first two answers was correct, then the method of adding them together for the third answer was also correct.

Finding the time in minutes produced a variety of wrong answers. The correct 0.3 hours sometimes became 20 minutes or 0.005 minutes and some never got 0.3 hours anyway. Those with 18 minutes sometimes only added 3 minutes instead of 6 to Damon's time before calculating his average speed.

Elsa's time was also sometimes correct in hours but inexact in minutes. (The answer 22 minutes 30 seconds was accepted although not strictly what was asked for.)

The answer to the final part was the probability that Damon had 2 "STOP" signals and had to relate back to the initial probabilities for that. Some wrongly thought that there were 3 (or 4) options and therefore the probability was $\frac{1}{3}$ (or $\frac{1}{4}$).

Answers: **(a)** 0.6, 0.35 and 0.55 on appropriate branches; **(b)(i)** 0.26, **(ii)** 0.41, **(iii)** 0.67; **(c)(i)** 18 minutes, **(ii)** 30 km/h; **(d)(i)** 22.5 minutes, **(ii)** 0.33.

Question 4

Most candidates do follow the scale instructions for their graphs. Plotting has to be exact and not enough care was always taken with the harder points. One relatively common error was to plot (–3, 4.5) at $y = -4.5$. The majority knew not to use a ruler to join their curve.

Solving $f(x) = 0$ often resulted in good candidates giving two solutions and omitting $x = 0$ whilst poor candidates *only* gave $x = 0$. All three solutions were needed for full marks.

The line $y = x + 1$ should be ruled and should not have any bends! This was usually done well although sometimes the line was incomplete.

The values for g(1), fg(1) and $g^{-1}(4)$ could be done with or without the graphs. The answer for g(1) was usually correct but fg(1) was usually wrong or omitted. A common wrong answer was – 11 from f(1) × g(1), instead of f(2).

$g^{-1}(4)$ was often correct and usually seen from algebra rather than reading the *x*-value from the line graph where $y = 4$.

The positive solution *only* was required for $f(x) = g(x)$. Not all of those who knew to use the point of intersection of their graphs realised it was the *x*-value *alone* which was required.

Those who drew a tangent at $x = 3$ usually knew how to find the gradient, although some used the scales incorrectly or made mistakes with the arithmetic.

All the answers in this question which depended on the graphs had to be within an acceptable range and correct for the candidate's graphs.

Answers: **(b)** $-3.6 \leqslant x \leqslant -3.3$, $x = 0$, $3.3 \leqslant x \leqslant 3.6$; **(d)(i)** 2, **(ii)** – 8, **(iii)** 3, **(iv)** $3.75 \leqslant x \leqslant 3.9$; **(e)** $5 \leqslant \text{gradient} \leqslant 10$.

Question 5

More marks were lost in this question than in any other through carelessness with accuracy.

Initially the answers of 50 and 43.5 cm^2 were common. Those finding $\frac{1}{2}(10 \times 10)$ could have no credit. Those who approximated their perpendicular height to 8.7 cm in the working had the correct method but lost the final accuracy mark.

Many earned the method mark for using $2\pi r = 10$, but then some only gave 1.6 cm as the radius, which is not accurate to 3 significant figures.

Something similar to "triangular" had to be seen with "pyramid" for the solid's name if the word "tetrahedron" was not given. The word "pyramid" alone would suggest a square base. Most knew the surface area was 4 times their answer to part **(a)** and were allowed the marks for this.

The word "cylinder" was usually seen and its equivalent of "circular based prism" was accepted. The volume formula was usually used correctly although $\frac{1}{3}\pi r^2 h$ or $2\pi r^2 h$ occurred occasionally, or 10 × 10 × 10 was sometimes added to destroy the method.

The cone (or circular based pyramid) was well-known, but unfortunately Examiners did not feel able to accept “ice cream” instead! Those who could picture the 3-dimensional shape had little problem using Pythagoras’ Theorem to find the height. Those who did not usually tried πrl. Again correct method was sometimes followed by lack of accuracy in the answer.

Answers: **(a)** 43.3 cm^2; **(b)** 1.59 cm; **(c)(i)** Tetrahedron or Triangular based pyramid, 173 cm^2, **(ii)** Cylinder, Volume between 79.35 and 79.65 cm^3, **(iii)** Cone, 9.87 cm.

Question 6

Only a very few could *not* write down the volume of the cuboid and most could expand their brackets correctly but too many went on to spoil their answer by ÷ 2 or wrongly combining terms.

The internal dimensions caused problems for many – some subtracted 2 cm from all three dimensions and others 1 cm from all three. Some were happy to leave a dimension as $x + 4 - 2$ and never at any stage simplified this expression. Most realised they should subtract the internal volume from their external volume to find the volume of wood but a lot of “fiddling” was seen to produce the quoted answer. No credit was given to those who subtracted the given $8x^2 + 12x$ from their external volume to find the internal volume and then subtracted their internal volume from their external volume to produce $8x^2 + 12x$!

Probably less than half the candidates derived the given quadratic from $8x^2 + 12x = 1980$ but the equation was solved well by factorising or formula. Credit was given for choosing the positive solution and using it to find the 3 dimensions of the box, even when the solutions had been incorrect.

Answers: **(a)(i)** $2x(x + 4)(x + 1)$ cm^3, **(ii)** $2x^3 + 10x^2 + 8x$ cm^3; **(b)(i)** $2x - 2$ cm, $x + 2$ cm, x cm, **(ii)** Internal volume = $2x^3 + 2x^2 - 4x$ cm^3; **(c)(i)** $x = 15$ or -16.5, **(ii)** 30 cm × 19 cm × 16 cm.

Question 7

Many candidates showed a reasonable understanding of vectors in the first part of this question. Some sign errors occurred and sometimes correct answers were then “simplified” by cancelling by 2, for example.

The value of $|\mathbf{b}|$ was usually correct – often with an explanation that there was an equilateral triangle – but the value of $|\mathbf{a} - \mathbf{b}|$ was invariably given as zero. There was no understanding at all that this was asking for the size of *BA*, another side in the same equilateral triangle. This was by far the worst answered part of the whole Paper, with very very few correct answers.

The transformations were much better known although the centre and scale factor of the enlargement were not always stated. The mirror line for the reflection was not always given, or sometimes thought to be $y = -x$.

It was very surprising to find the majority of answers for the number of lines of symmetry and the angle of rotation were wrong, when this seemed to be such a relatively simple question. Common wrong answers were 2, 3, 4, 7 and 12 for the number of lines and 45º, 90º, 120º and 180º for the clockwise rotation angle.

Answers: **(a)(i)** 3**a**, **(ii)** **b** – **a**, **(iii)** **a**, **(iv)** 2**a** + 2**b**, **(v)** 2**a** – 2**b**; **(b)(i)** 5, **(ii)** 5; **(c)(i)** Enlargement, SF 3, Centre *O*; **(ii)** Reflection in *CXF*; **(d)(i)** 6, **(ii)** 60º.

Question 8

The modal class was usually correct. When mention was made of the frequency 54 then it had to be very clear that 60 – 80 was the required answer, as 54 is not.

The mean amount had to be calculated using the midpoints of each class which must be multiplied by their class frequency, not the class width. The final answer had to be correct to 2 decimal places as the question specified and many threw this mark away by only giving one decimal place. (Even without the specification, any non-integer *amount of money* ought to be given to two decimal places.)

The cumulative frequency “table” was usually correct with the cumulative frequencies but wrong in the sense that they were listed against classes, (e.g. $80 < x \leqslant 100$, 180) instead of against upper class boundaries (e.g. $\leqslant 100$, 180).

The result of this was that a fair minority of candidates proceeded to plot their cumulative frequencies at class midpoints. Once this happened the only possible marks available are for the interquartile range and the method mark for finding the number of shoppers spending \$75 or more.

Those who plotted their points correctly could join them by line or curve, from (0, 0) to (140, 200).

The answers read from the graph had to be within the correct range *and* correct for the candidate's graph, which meant reading the graph scales correctly. Most knew how to find the median and upper quartile. Some confused the lower quartile with the interquartile range. Most could take a reading at \$75 but did not subtract it from 200 to find the answer for the last part.

Poorer candidates drew frequency polygons or bar charts rather than a cumulative frequency graph and could not earn any subsequent marks.

Answers: **(a)(i)** \$60 – \$80, **(ii)** \$ 64.40; **(b)** 10, 42, 90, 144, 180, 200 listed against upper class boundaries; **(c)(i)** 63 – 64, **(ii)** 82 – 84, **(iii)** 38 – 41, **(iv)** integer 67 – 72.

Question 9

Too many candidates scored poorly on this question. The majority probably treated it too casually and did not give it the consideration it needed. The first three diagrams were nothing to do with similar figures and only the first had 25% shaded. A knowledge of areas for parallelograms and symmetry in kites was needed. In diagram 4 the shaded trapezium could be seen as the lower part of a triangle which is similar to the small unshaded triangle.

In Diagram 5 the obvious 20º was sometimes divided by 360 or multiplied by πr^2.

Answers for Diagrams 6 and 7 were sometimes calculated but left uncancelled, earning method marks but not the final mark.

Diagram 6 is certainly easily done by considering similar figures and squaring the 1 : 5 radius ratio. Diagram 7 also lends itself to this approach, considering similar sectors and squaring the 2 : 3 radius ratio before adjusting for the shaded area.

Some who answered little on the rest of the Paper did well with this question and others scoring well throughout had little success here.

Answers: **(a)** 25%, $12\frac{1}{2}$%, $37\frac{1}{2}$%, 60%; **(b)** $\frac{1}{9}$, $\frac{1}{25}$, $\frac{5}{9}$.

Papers 0581/05 and 0581/06

Coursework

General comments

The quality of coursework this year compares favourably with that seen in previous years at both the Core and Extended levels. In general, the standard achieved by most candidates is fairly high.

Most striking this year is the emphasis being placed on planning. Over the last couple of years this aspect has been improving and Centres are to be commended for encouraging their candidates to do this. There is ample evidence to show that candidates who follow a well written plan, seldom waste time on producing irrelevant tables and diagrams and spend more time analysing the problem, hence scoring higher marks against the criteria.

The best candidates outlined their own strategy, explaining why they had chosen a particular line of enquiry and explaining work as it progressed. It should be noted that mathematics should be overt with a commentary to link tables, diagrams or derivation of algebraic formulae together.

It is pleasing to see that a number of Centres are using coursework as an integral part of their mathematics courses, in some instances to support and extend topics covered in lessons and in other cases to allow independent research into a topic not yet covered.

Assessment of the tasks by Centres was carried out competently; however, certain questions, detailed below, should be asked when awarding marks.

Overall design and strategy

Has the student summarised the task so that you know what it is about? Is there a clear strategy for working on the task? Has the student followed the plan and produced generalisations? Has the student extended the task in his or her own way?

Mathematical content and accuracy

What is the level of mathematics within the task? If it is low level, then the outcome must be a low mark in both these strands. Are variables defined? Does the student use mathematics competently? Are correct techniques employed or is there redundancy in some of the calculations? Has the student checked any generalisations produced?

Clarity of argument and presentation

Has the student linked the work together with a commentary explaining the processes used? Are reasons given and is the interpretation correct? Are algebraic statements derived correctly? Does the initial work enable the student to make progress in the task? Has the student outlined the limitations of their solution to the task?

Conclusion

The controlled elements seen this year were appropriate to the coursework tasks and, in general, assessment of this aspect by Centres was carried out well.