MATHEMATICS

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

General comments

The level of the paper was such that most candidates were able to demonstrate their knowledge and ability. There were very few candidates scoring under 10 marks but the paper was sufficiently challenging for the more able with a limited number scoring over 50 marks. There was no evidence at all that candidates were short of time. The general level of performance showed a slight improvement on the very good standard attained last year. Some Examiners were reporting that there seemed to be a decrease in the amount of working shown.

Comments on specific questions

Question 1

Nearly one third of the candidates failed to appreciate that this question was about order of operations, or else were not clear about how their calculators worked since 20 was a very common incorrect answer.

Answer: -1.

Question 2

The most successfully answered question on the paper.

Answers: **(a)** 0.35; **(b)** 1.27.

Question 3

Candidates did not cope well with this question. Most could remove **a** factor but did not factorise completely.

Answer: $4y(2 – 3t)$.

Question 4

Generally very well answered.

Answers: **(a)** =; **(b)** >.

Question 5

Approximately half of the candidates scored no marks on this question. Candidates seemed to be unaware that 1 litre = 1000 ml with 0.5 and 0.05 being common errors. In **(b)** 5^{-3} and 0.5×10^{-2} were frequent errors.

Answers: **(a)** 0.005; **(b)** 5×10^{-3}.

Question 6

This question was very well answered and the only mistake that some candidates made was to find 92% instead of 8%.

Answer: 1.92.

Question 7

This question was badly answered even by the more able candidates. "Cancelling" the *k* was a very common mistake leading to an answer of 2^2. Other candidates had calculated the value of $48^{10} \div 24^8$.

Answer: $2k^2$.

Question 8

This topic continues to be a source of difficulty for most candidates. There were very few correct answers to this question. Attempts at rounding to the nearest 10 and nearest whole number were common.

Answers: 275000 285000.

Question 9

This was generally well understood but many candidates failed to give their answer to the nearest hundred pounds. Failure to show working was very common on this question and a few candidates used division instead of multiplication.

Answer: 7600.

Question 10

This question was generally very poorly answered with many candidates not understanding the word quadrilateral since triangles, semicircles and pentagons were frequently drawn in **(b)**. Only the more able candidates were successful with this question that was often completely correct or completely wrong.

Answers: **(a)** parallelogram; **(b)** a trapezium or a kite.

Question 11

This question was surprisingly poorly answered by nearly half of the candidates. Volume = length × breadth × height being the most common incorrect method. Many candidates included a $\frac{1}{3}$ in their calculations and even more failed to appreciate the significance of the shading of the cross-section.

Answer: 360.

Question 12

Most candidates failed to score the first two marks, large numbers counting squares instead of using the scale on the axes and almost no candidates drawing the line *BC* on the diagram. What marks were scored usually came from the last part of the question.

Answers: **(a)** $\begin{pmatrix} 3 \\ 2 \end{pmatrix}$; **(b)(i)** line from (4,3) to (-2, -1), **(ii)** (-2, -1).

Question 13

Part **(a)** was very well done but with some candidates failing to reduce the fraction to its lowest terms. **(b)** was not so well done as more than half the candidates divided by the time in minutes instead of hours.

Answers: **(a)(i)** 40, **(ii)** $\frac{2}{3}$; **(b)** 12.6.

Question 14

Most candidates were able to answer part **(a)** and generally speaking the rest of the question was well understood. Some candidates seemed to be unaware that the syllabus specifies that they should calculate probabilities as either a fraction or a decimal (not a ratio).

Answers: **(a)** 123, 132, 213, 312, 321; **(b)(i)** $\frac{1}{3}$, **(ii)** 0.

Question 15

One of the best answered questions on the paper. All candidates knew what to do and most of them carried out the operation correctly.

Answer: $c = 2$ $d = 9$.

Question 16

Part **(a)** was generally well done but only the more able half of the candidates were able to complete the question.

Answers: **(a)** right angled triangle with AB as hypotenuse; **(b)** 4510.

Question 17

Part **(a)** was generally well done but only the most able of the candidates were able to complete the question. Division by 5 or 7 instead of 12 were the common errors for those who attempted the question. Examiners also report a lack of any meaningful working being shown.

Answer: **(a)** 90; **(b)** 37.5.

Question 18

Generally the arc was correctly drawn but less than a $\frac{1}{6}$ of the candidates were able to draw the second locus or shade the region correctly.

Answer: **(a)** arc radius 6 cm, bisector of angle *ABC*.

Question 19

A very badly answered question. The usual confusion existed between the formulae for circumference and area and this was compounded by the confusion between radius and diameter. Working was often poor and difficult to follow and candidates did not make it clear whether they were dealing with circles or semicircles. Some candidates tried to incorporate the dotted lines into the perimeter and others ignored the semicircles and treated the shapes as circles. Only about a $\frac{1}{4}$ of the candidates were able to handle this question properly.

Answers: **(a)** 101; **(b)** 658.

Papers 0580/02 and 0581/02

Paper 2 (Extended)

<u>General comments</u>

The more able candidates found this paper very straightforward, and there were many excellent scripts. However, the weaker candidates seemed ill prepared for some of the topics. For example, set notation, inequalities, area scale factors and function notation need more attention. Algebraic manipulation continues to be a problem, particularly as many candidates will not use brackets. As usual, there were candidates who would have been better served by attempting the Core level papers rather than Extended level.

Most candidates showed adequate working for those questions that they could do, and there were few answers without any working.

Time did not appear to be a problem.

<u>Comments on specific questions</u>

Question 1

(a) The most common wrong answer was 415×10^6, otherwise the answers were usually correct.

(b) About half the candidates gave correct answers to this question. Of the rest, most did not round to a whole number.

Answers: **(a)** 4.15×10^8; **(b)** 10.

Question 2

(a) Again, about half the candidates answered this whole question correctly.

(b) Some did not read this part of the question carefully enough and looked for a date in the future.

Answers: **(a)** 2008; **(b)** 1993.

Question 3

(a) There were very few correct answers to this part of the question. Those candidates who made some attempt usually shaded $A \cap B'$, (they did not include the intersection of the two sets). All but the part of *B* that is not in *A* should have been shaded.

(b) This was better, but a common wrong answer was $C' \cup D'$.

Answers: **(b)** $(C \cup D)'$ *or* $C' \cap D'$.

Question 4

This was well answered, the common errors being 54 and 106.

Answers: 34, 126.

Question 5

Common errors were to find the gradient instead of the length of the line, to misuse the negative signs, to find the sums of the *x* and *y* co-ordinates rather than the differences, and to have an error in the formula. Those who drew a diagram and used Pythagoras were usually correct.

Answer: 10.

Question 6

(a) The mark scheme allowed for any representative of the vector $\mathbf{a} - \mathbf{b}$ to be drawn as long as the direction was clear. However many candidates drew $\mathbf{a}+\mathbf{b}$, or failed to indicate the direction.

(b) This was fairly well done, although some gave a column vector.

Answers: **(b)** $-\mathbf{a}+\mathbf{b}$.

Question 7

This was usually correct except for those who did not find the percentage <u>decrease</u>, and thus gave 88 as their answer.

Answer: 12.

Question 8

Most candidates were able to score at least one mark here, but many finished with $x = 15$, $x<15$ or just 15.

Answer: $x > 15$.

Question 9

(a) Some candidates did not understand the point of this question and gave 30 as the minimum length of the rectangle. Some did not read the question carefully enough and found the minimum perimeter.

(b) There were more correct answers to this part. With only one mark available, rounding to 3 or 4 significant figures was condoned.

Answers: **(a)** 28.5; **(b)** 270.75.

Question 10

(a) This was poorly answered, as many candidates did not understand the use of the area scale factor.

(b) Also poorly answered, as candidates often multiplied by 100 or 1000 instead of 10000.

Answers: **(a)** 0.75; **(b)** 7500.

Question 11

Many candidates scored only one mark here. It was common to see $TV + 1 = 5$, followed by $V = 4/T$, or rather surprisingly, $V = (5 - 1)/T$ as the final answer.

Answer: $V = \frac{5 - T}{T}$.

Question 12

This was quite well done. However, some ignored the 90° angle all together and then found the interior angle of a regular hexagon. Others gave 45° as their final answer without any indication as to whether this was the interior or exterior angle of the heptagon.

Answer: 135.

Question 13

(a) There were many correct answers here. Some did not attempt the question.

(b) Those who drew a correct net were usually able to give correct answers to this part of the question.

(c) This was a very straightforward follow on from part **(a)**.

Answers: **(b)** 12; **(c)** 40.

Question 14

(a) Many fully correct answers here, but also about 15% of the candidates gave $x^{\frac{1}{2}}$ as 3, thus losing one mark. It seems likely that they had used their calculators to do the question and had entered $\frac{1}{4} x^y \frac{1}{2}$ using the fraction button. Some calculators require the half to be entered in brackets, otherwise the calculator will assume that a mixed number is being entered with a calculation included in the entry. Thus the above key presses will give $1\frac{4^1}{2}$ which is simplified to 3.

(b) This was a difficult question for many candidates. Most of the successful candidates used -2 as a substitution.

Answers: **(a)** 4, 1, $\frac{1}{2}$, $\frac{1}{16}$; **(b)** $y^3 < y^{-1} < y^0 < y^2$.

Question 15

(a) The quadrilateral was usually correct and correctly named. The common wrong answer was "rhombus".

(b) Again, the quadrilateral was usually correct, but many candidates either did not read the second part of the question carefully and attempted to name the quadrilateral, or did not understand the question and gave an answer such as *GHEF*. Otherwise 180°, or 4 were common.

Answers: **(a)(ii)** kite; **(b) (ii)** 2.

Question 16

(a) Part **(i)** was usually correct, but a common wrong answer for part **(ii)** was 9.

(b) This was not so well done. Candidates either tried to find $g(x)xf(x)$ or made algebraic errors in simplifying, although the mark scheme acknowledged that there was only one mark available and subsequent working after an acceptable answer was ignored.

(c) This was not well understood. There were many answers such as x^{-3}, $-x^3$, $3x$, $x^{\frac{1}{3}}, y^{\frac{1}{3}}, x^{\frac{-1}{3}}$.

Answers: **(a)(i)** 27, **(ii)** 3; **(b)(i)** $2x^{\frac{2}{3}} - 5$; **(c)** x^3.

Question 17

(a) This straightforward question was not well done. The most common mistake in this part was to fail to square the 4, leading to an answer of $4\pi r^2$.

(b) Many candidates did not simplify their answers correctly and here $16\pi r^2 - \pi r^2$ became 16.

(c) Again, simplifying the answer was the problem. $2\pi r+2\pi(4r)$ became $4\pi(5r)$.

In each of the parts of the question the r and r^2 were often omitted, suggesting that candidates did not understand the instruction to give their answers in terms of π and r.

Answers: **(a)** $16\pi r^2$; **(b)** $15\pi r^2$; **(c)** $10\pi r$.

Question 18

(a) This part of the question was well done. Almost all candidates gave the correct answer to part **(i)**, but in part **(ii)** some gave the total rands received instead of the extra rands, suggesting that they had not read the question carefully.

(b) Most of the errors here concerned the period of the investment, and the representation of three months in the formula.

Answers: **(a)(i)** 128, **(ii)** 25.6; **(b)** 24.

Question 19

(a) About half the candidates gave correct answers to this part of the question, others made sign errors. Some did not multiply *B* by 2, and obtained $-3+3x=-15$.

(b) Many candidates understood what was required here, but had difficulty expressing their answer.

(c) Most candidates obtained at least one mark here, but often omitted the factor $\frac{1}{4}$.

Answers: **(a)(i)** $-3 + 6x = -15$, **(ii)** $x = -2$; **(b)** $|C| = 0$; **(c)** $\frac{1}{2}\begin{pmatrix} 5 & 3 \\ 2 & 2 \end{pmatrix}$.

Question 20

(a) Part **(i)** was well done, but in part **(ii)** many candidates gave their answer as $x=5$ and $x=\frac{1}{2}$ or $(x-5)(x-\frac{1}{2})$, suggesting that they may have used their calculators to solve an equation, instead of factorising the given expression.

(b) Many candidates did not see the connection between parts **(a)** and **(b)**, and attempted some incorrect "cancelling" of the individual terms.

Answers: **(a)(i)** $x(x-5)$, **(ii)** $(x-5)(2x-1)$; **(b)** $\frac{x}{2x-1}$.

Question 21

(a) The cosine rule was usually correctly quoted, but often incorrectly used. The most common errors were to lose the second negative sign, or to fail to square root at the end.

(b) Only about half the candidates used the appropriate formula for the area of the triangle. The rest tried to use $\Delta=\frac{1}{2}bh$, either by ignoring the fact that B was not a right angle, or by attempting various, usually incorrect, methods for finding AC and the associated height.

Answers: **(a)** 11.2; **(b)** 26.9.

Question 22

(a) Quite well answered, but a few candidates did not understand the correct notation, and, for example, wrote $l = \frac{1}{2}x+3$.

(b) Some candidates did not read the question carefully, and defined the wrong region. Others were careless in their use of the inequality signs, although on this occasion the mark scheme was lenient in this respect.

Answers: **(a)** $y = \frac{1}{2}x + 3$; **(b)** $x > 2$, $y \leqslant 7$, $y \geqslant \frac{1}{2}x + 3$.

Papers 0580/03 and 0581/03

Paper 3 (Core)

General comments

Candidates appeared to find the paper a fair assessment of their ability, used the time available wisely , and were able to demonstrate their knowledge and understanding. The amount of working and method shown by candidates were satisfactory although the understandable and expected use of calculators did seem to inhibit this process. Working was expected in all questions but especially in **Question 1 (a)(ii)**, **(b)(ii)**, **(c)**, **Question 3 (a)**, **(b)**, **Question 4 (b)**, **Question 6 (f)**, **Question 7 (b)** and **Question 8 (b)**, **(c)**. It is also suggested that candidates read carefully the questions set to avoid simplistic and incorrect assumptions.

Comments on specific questions

Question 1

(a) This was generally well answered although in **(i)** the common error of 1530 occurred through not putting the values in order.

(b) The majority of candidates were able to answer correctly **(i)** with the correct numerical answer to the frequency obtained by a "tally" method incorporated into the given table. A significant number failed to see the significance of this table in **(ii)** and adopted an incorrect method leading to $150 \div 5 = 30$. Those who did find $\sum fx$ and also divided by 24, either from the table or the original list, usually performed the calculation correctly.

(c) A significant number of candidates did not appreciate the significance of the numerical value for the "number of units of energy used" and then attempted to use this value in their calculations. This led to common incorrect fractions of 4/20, 80/685, and 20/150 being used rather than 4/24 etc. The actual drawing of the pie chart even when using these follow-through angles was reasonably well done although the creation of an extra segment in some cases caused problems.

Answers: **(a)(i)** 1440, **(ii)** 1500; **(b)(i)** 3, 7, 11, 2, 1, **(ii)** 28.125.

Question 2

This question was generally very well answered although a small number of candidates still found it difficult to draw a smooth thin continuous curve in **(b)**. Correct values were consistently read off the graphs although inevitably some candidates misinterpreted the scale. However candidates were far less successful when finding the gradient of the line in **(f)** whether using either valid method of using the graph or manipulating the form "$y = mx + c$". A number of definitions were seen but few correct numerical answers.

Answers: **(a)** 10, 5, 3.3, 3, 2.5, 2, 1.1, 1; **(c)(i)** 12.5, **(ii)** 16.7; **(d)** 8, 0; **(e)** (8, 6.25) (32, 1.6); **(f)** -0.2.

Question 3

(a) This was well answered with the vast majority recognising and correctly using Pythagoras.

(b) This was less well answered with a significant number of candidates failing to recognise the use of trigonometry. Those who did so were generally correct although a number used an incorrect ratio or found it more difficult to calculate an angle.

(c) This was generally well answered although a common error was to draw an equilateral triangle of side 4.25 cm, whilst other candidates were unable to accurately construct the point *A*.

(d) These were a variety of answers here, unfortunately with "prism" being as frequent as "pyramid".

Answers: **(a)** 10; **(b)** 36.9; **(c)(ii)** 50°; **(d)** (square-based) pyramid.

Question 4

(a) The majority of candidates were able to score at least 1 mark but the use of negative values appeared to cause problems with $6k\text{-}m$ a common error.

(b) Although the majority of candidates appear to have more confidence with algebra only the better candidates were able to score full marks on this equation due to a lack of thoroughness. The initial multiplication of the brackets was generally well done, and although the subsequent collection of like terms was recognised it was less well done possibly due to the negative values. The same was true for the final transposition. A significant number seemed unwilling to leave their final answer as the fraction 3/7. Follow through marks were available if supported by clear working.

(c) Subsequent incorrect working often leading to $10pe$ spoilt a significant number of correct answers.

(d) Few candidates were able to identify and use the correct sequence with the common error being 8, 14, $2d$.

Answers: **(a)** $6k\text{-}5m$; **(b)** 3/7; **(c)(i)** $7p + 3e$, **(ii)** $(7p + 3e)/100$, **(iii)** \$1.85; **(d)(i)** 16, **(ii)** 128, **(iii)** 2^d.

Question 5

This was generally well answered with the vast majority able to demonstrate some knowledge of transformations. However common errors were:

- rotation about a variety of points , not *P*
- translation to the lines $x = -4$ and $y = -3$
- correct enlargement but with centre (2,2)
- reflection in $x = 4$ or $y = 3$.

Answers: **(a)** correct diagrams; **(b)** $\begin{pmatrix} 4 \\ 3 \end{pmatrix}$.

Question 6

This was generally well answered throughout although part **(f)** caused more problems with 50 often given as the answer.

Answers: **(a)** 180; **(b)** 230; **(c)** 1950-1960; **(d)(i)** 60, **(ii)** -20; **(e)(i)** 420, **(ii)** 428; **(f)** 5.

Question 7

(a) A number of candidates made the incorrect assumption that the quadrilateral was a parallelogram which in turn may have led to errors in calculating the angles *p*, *q* and *r*.

(b) This was generally poorly answered with few candidates able to show a complete and correct method for either part.

Answers: **(a)(i)** 140, 40, 30, **(ii)** trapezium; **(b)(i)** 140, **(ii)** 12.

Question 8

Although the first four answers were exact values of money many candidates felt compelled to round off their answers. Otherwise the question was generally well answered showing a good understanding of the given table and the methods to be used. The percentage in part **(b)(ii)** was least successful with some candidates unwilling to give an answer of more than 100.

Answers: **(a)(i)** 85.17, **(ii)** 7665.30, **(iii)** 1026.30; **(b)(i)** 13021.80, **(ii)** 130%; **(c)** 120 months.

Question 9

This was generally well answered with the majority of candidates obtaining correct answers to the numerical terms and the linear general form of $3n + 2$. The general quadratic terms of $n^2 - 1$ and $(n + 1)^2$ proved more difficult.

Answers: **(a)** 7, 11; **(b)** 17, $3n + 2$; **(c)** 25, 36 24, 35 $n^2 - 1$ 36, 49, $(n + 1)^2$.

Papers 0580/04 and 0581/04

Paper 4 (Extended)

General comments

The paper was of a similar standard to that of last year so it was good to find more candidates with high marks and fewer with very low marks. There was no evidence of time problems and almost everyone produced satisfactory answers to at least some of the questions.

There were still a few who did not understand that answers are not meant to be written on the question paper. Candidates who answer only part of a question before starting the next one should be encouraged to leave a space with the original attempt in case they wish to return to it. Those whose partial attempts at a question are separated by pages of work on other questions make life harder both for themselves and the Examiner. Those who work in two or even three columns down the same page definitely make life harder for the Examiner, who prefers to put a mark in the margin beside the work which earned it.

Accuracy marks continue to be lost in several ways. Some overlook specific accuracy requirements in a particular question and give either too much or too little in their answers. Some use too little accuracy in the working so their answers can never be accurate. Some ignore the overall request for at least three significant figures in an inexact answer where the question has no specific requirement and only offer two or even one significant figure answers.

Most candidates did show their working which makes marks for method available even when the answer is wrong. Overall a pleasing standard of work was seen this year.

Comments on specific questions

Question 1

Most candidates began by finding the correct times in hours. Some then predictably converted the lunch time from 0.75 hours into 75 minutes. The usual error in part **(b)** made by weaker or careless candidates was to use \$855 as the **total** income for all three men. The common method to find the correct fraction in part **(c)** was to multiply \$855 by 52 and start with 2964/44460. Those who divided \$2964 by 52 to compare with the weekly savings began with the easier fraction of 57/855. Often a correct fraction earned the first mark but the final answer was either not in lowest terms or given as a % or decimal. In the final part of the question the method errors of taking \$3500 to be either 100% or 60% occurred. Those who understood that it represented 140% usually had no difficulty finding the correct answer.

Answers: **(a)(i)** 3 hours, **(ii)** 45 minutes; **(b)(i)** \$342, **(ii)** \$513; **(c)** 1/15; **(d)** \$2500.

Question 2

This question was surprisingly badly done by a large minority of candidates. Some wasted time by attempting to use trigonometrical methods to calculate distances or angles. Others ignored the help of the given sketch and decided to orientate *OB* as East-West. Many who drew *OA* were unable to measure 40° and made angle *AOB* 50° instead. The locus of points equidistant from *A* and *B* had to be a perpendicular bisector of *AB* which was long enough to meet the line drawn from *O* at 98° to *OA*. Some actually did this but then did not realise that the intersection gave them *C* and placed *C* somewhere else, often vertically below *B.*

The bearing of *A* from *B* could be calculated using 360° - angle *OAB* or measured on the diagram at *B* provided a North line parallel to *OA* had been drawn.

The donkey needed a 4 cm arc, centre *C*, and shading in the sector bounded by *CB* and the perpendicular bisector of *AB.*

The horse required a line parallel to *AB* and 2 cm from *AB* to be drawn inside the field. (As the complete locus would include a semicircle at *A,* the part nearest *A* should be the start of that arc, but this was *not* insisted upon for this question.) The area between this line and *AB* should be shaded, starting at *OA* and going as far as the perpendicular bisector of *AB.*

Answers: **(b)(i)** Integer answer in range 74 m - 78 m, **(ii)** Integer answer in range 103° - 106°; **(c)** Bearing in range 254° - 258°.

Question 3

This was the best answered question on the paper with many gaining full marks. The tree diagram was usually copied correctly and the required probabilities of 0.4, 0.1 and 0.8 were rarely wrong. Errors in part **(b)** were usually from adding instead of multiplying or vice versa. The tree for Tarek should start with branches of 0.55 and 0.45 for knowing or guessing the answer. The “guessing” branch should continue with branches of 0.2 and 0.8 for the correct or wrong answer. The “knowing” branch did not need to continue, but could do so with branches of 1 and 0 if wished. Most were able to find Tarek’s probability of being correct and continued to give the correct estimates.

Answers: **(b)(i)** 0.54, **(ii)** 0.62; **(c)(ii)** 0.64; **(d)(i)** 62, **(ii)** 64.

Question 4

Only a minority could find all five angles correctly. The usual error was in the value of *e*. Few seemed to realise that *ACDX* was a square so the diagonal *AD* bisected the 90° at *A*. Answers of 55.5° or 39.5° were frequently seen. The mark for *d* was available if it was $^1/_2$(their value for *c*). Most thought the triangles *GBC* and *GAC* were similar or the same but some did manage the required "congruent". The most straightforward way to find *GA* was to use tan21° but any correct method was acceptable. A few tried to fiddle the 195 cm answer by adding 54.3 cm to *GA* but most knew to add the 54 cm radius. The fastest way to find *GW* was to use triangle *GWX* and cos42° but provided longer methods were completely correct they earned full marks. Provided the candidate realised *BG* = *GA* then finding *BW* was a simple subtraction *GW* - *GA*. However some managed to use a variety of ingenious ways to find the correct answer, which still carried only one mark however long the method.

Answers: **(a)** *a* = 90°, *b* = 90°, *c* = 138°, *d*= 69°, *e* = 45°; **(b)** congruent; **(c)(i)** 141 cm, **(iii)** 262 cm, **(iv)** 121 - 122 cm.

Question 5

The required values were usually found correctly and a good graph drawn. The minority with a wrong value which obviously did not fit in with the general shape of the curve never seemed to realise they should go back and check their calculation. Most did place *F* on the curve where *d* = 12 but some used both points and others only the first position where the fish was swimming *towards* Dimitra. A few ignored the "one decimal place" instruction in the question.

Most used *d* = 10 in part **(d)**. The usual error here was to state one of the values of *t* on the curve where *d*= 10 rather than find the difference between the two values.

The final part was where most marks on this question were lost. Many did not understand that the required line should be a tangent at *t* = 2.5 and simply drew horizontal and vertical lines there, calculating speed as 6 metres ÷ 2.5 minutes. Those who did draw the tangent did not always realise the speed was the gradient and reverted to the same 6 ÷ 2.5. Those who calculated their gradient sometimes used the graph scale wrongly or gave the units of their answer as metres per *second*. (There was no penalty for a speed in metres per second provided the gradient had been divided correctly by 60.)

Answers: **(a)** *p*=29, *q*=24, *r*=50; **(c)** *t*=3.6 or 3.7; **(d)** 2.4 to 2.6 minutes; **(e)** Answer in range 2.6 to 3.8 m/min.

Question 6

The explanation for $2x^2 = (12 - 2x)^2$, which looks to be one of the simplest parts of the paper, was very poorly answered in general. Three separate things were required here: a simple explanation that *PQ* = 12 - 2*x*; the word "Pythagoras" or an abstract "$a^2 = b^2 + c^2$" type statement and finally $PQ^2 = x^2 + x^2$. An alternative ingenious method where it was demonstrated that 4 triangles like *PAIQ* could be folded inwards to form a square with side *PQ* and the area of this square was $4 \times x^2/2$ was perfectly acceptable when done properly. Candidates should be aware that when a result is quoted in the question there are no marks for just copying it down.

In the second part, the bracket $(12 – 2x)^2$ had to be seen to be expanded, all the terms collected to one side and no errors made on the way to obtaining the given equation. Often candidates trying to amend their work from the final answer backwards did not trace an error back to its source and thus created a second error. Again with a quoted answer it is every line of the working which is scrutinised and sloppy working costs marks.

Most knew how to use the quadratic formula to solve the given equation but premature approximation in taking the square root of 288 meant that the required 2 decimal place accuracy was wrong. Some ignored this request to their cost.

There were method marks for knowing that the perimeter was 16*x* cm and the area was 144 cm^2 + 4 triangles, although any correct method, however long, was acceptable.

Answers: **(a)(iii)** *x* = 20.49 or 3.51; **(b)(i)** 56 - 56.4 cm, **(ii)** 169 cm^2.

Question 7

This was often well answered. Some gave separate descriptions for $A \to C$ and $B \to D$ which was fine unless they contradicted each other. Descriptions were sometimes incomplete. Matrices were not always understood and some long methods were seen finding the matrix *R*. The direct way is to consider the new position of the points (1 , 0) and (0 , 1) after the transformation and to write the position vectors of these as the two columns of the required matrix. A common error in finding *RM(F)* was to find *MR* rather than *RM.*

Answers: **(a)(i)** Rotation by 90° clockwise about *O*, **(ii)** Reflection in $y = x$, **(iii)** Enlargement by scale factor 2, centre *O*; **(b)** Translation by vector $\begin{pmatrix} 0 \\ -4 \end{pmatrix}$; **(c)(i)** Reflection in $y + x = 0$, **(ii)** (-4, 2); **(d)(i)** $\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$, **(ii)** *A*.

Question 8

There was no accuracy requirement in the wording of this question which meant the overall paper requirement of a minimum of 3 significant figures for inexact answers applied. Those who never used more than 2 significant figures lost accuracy marks. The sector area and arc length were well known. Some reverted to a complete cylinder for the volume and surface area. There were method marks in the surface area for 2 rectangles, 2 sector areas and 5 × the arc length. Those not scoring full marks usually had one or two of these components correct. Those who found the total surface area of a cylinder and then divided it by 18 had lost the two 6 × 5 rectangles.

The common wrong answer in **(c)** was *C* - that *h* was inversely proportional to *r*. Very few candidates decided on *D.* Some offered more than one alternative, which received no credit even if one were *D*. However most gained a mark in the final part because they knew *h* would decrease.

Answers: **(a)(i)** 6.28 cm^2, **(ii)** 2.09 cm; **(b)(i)** 31.4 - 31.5 cm^3, **(ii)** 83 - 83.1 cm^2; **(c)(i)** *D,* **(ii)** *h*/4.

Question 9

A common error was to forget that the median is only the middle value when the numbers are arranged in order. Thus $7\frac{1}{2}$ became the mid-value between 4 and 11 rather than between 8 and 7. Most knew that an extra 8 was needed for the mode and that the total of the six numbers had to be 42. Those not scoring full marks often gained 2 or 3 out of 5.

The midpoints of 5, 15 and 30 had to be used to find the total amount. There were a pleasing number of good answers to this part and comparatively few “fiddles” to arrive at the quoted equation. The explanation for $m + n = 15$ simply required the statement that the area in a histogram represents frequency, but this was not often seen. The final simultaneous equations rarely caused any problems, except those caused by careless errors.

Answers: **(a)** 7, 8 and 12; **(b)(i)** $75+15m+30n$, **(iv)** $m=9$ and $n=6$.

Papers 0581/05 and 0581/06

Coursework

General comments

In general, the quality of work seen this year is high and it compares favourably with the standard of work presented last year. The majority of Centres have given candidates ample opportunity to demonstrate their mathematical ability by setting a wide variety of tasks with adequate scope for extension work. Relatively few Centres offered no choice of tasks to candidates.

Where Centres had candidates entered for both the Core and Extended levels it was pleasing to see that tasks were suitably differentiated in most cases. This was achieved either by setting different tasks or by offering different versions of the same task to allow access to less able candidates.

Many candidates tackled their chosen task enthusiastically producing some well-researched and imaginative solutions, often containing photographic evidence when 3-dimensional models were constructed. The best candidates presented clearly structured and accurate work, making good use of computer technology where appropriate. For example, some candidates made good use of a spreadsheet to calculate successive approximations to the solution of an equation.

Some candidates offered solutions to problems using mathematics beyond the Extended syllabus. This is quite acceptable but care needs to be taken to ensure that undue credit is not given simply because of the level of mathematics used. For example, the use of Calculus does not attract 4 marks under the Mathematical Content strand unless it is relevant to the task and the candidate employs it successfully to explain a feature of the task.

In most cases the controlled element of the task was a written test. It is worth noting, however, that the controlled element need not take the same form for all candidates in a group. A candidate who has not provided a clear written commentary in a task may well be advantaged by a one-to-one interview with the Teacher, rather than being asked to complete a parallel piece of work under controlled conditions.

Once again, Centres are to be commended for the quality of their assessments. The practices of the vast majority of Centres are well organised and efficient, with work being assessed in a professional and conscientious manner.