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Report on the Examination

Mathematics Specification A

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Mathematics Specification A

Report on the Examination

Paper 1F

General Comments

The standard of work was better than last year, with the majority of candidates finding enough straightforward questions at the start of the paper, and questions 1 to 10 being a good source of marks for nearly all candidates. Most candidates attempted nearly all of the questions and appeared to complete as much as they could in the time available. There were very few poor scripts, with most candidates scoring between 20 and 70 marks.

The work was generally well presented, with most candidates giving their answers on the answer line and with few candidates writing in pencil. As reported last year, centres should discourage candidates from writing answers only, as a considerable number of method marks could well be lost. It was evident that a small, but significant number of candidates did not possess the necessary mathematical equipment required for the examination, especially in question 9 where candidates were expected to use a protractor.

The standard of written English was often poor, with the spelling of mathematical words particularly weak, especially in question 7, where a considerable number of ways was seen for the spelling of *equilateral* and *hexagon.*

Centres should be aware that, from the November 2005 papers, it will be the practice to indicate to candidates where they are required to state the units of their answer. At present this requirement is un-prompted.

Topics that were well done included:

- Rounding to the nearest 1000
- Congruent shapes
- Symmetry
- Angles in a quadrilateral
- Probability

Topics which candidates found difficult included:

- Multiplication of decimals
- Finding a fractional amount of a quantity
- Simplifying algebraic expressions
- Solving equations
- Addition of fractions
- Transformation geometry
- Dividing an amount in a given ratio

Question 1 *(a) 16000 (b) Barton, Carton, Arton*

Part (a) was nearly always correct, with only a few candidates rounding to 15000 or 1600. A handful of candidates wrote down the towns in reverse order in part (b).

Question 2 *parallelogram, kite, trapezium*

The majority of candidates scored at least one mark for this question, usually for identifying the kite. The parallelogram was often identified as a rhombus or even a square. Despite being drawn on the adjacent page, the trapezium was identified as a parallelogram or a rhombus by a considerable number of candidates.

Question 3 *(a) any two multiples of 4 (b) any two multiples of 7 (c) any multiple of 28*

Many candidates scored well on this question, with the most common error being the confusion between multiples and factors. This led to answers of 1 and 4 in part (a) and 1 and 7 in part (b).

Question 4 *(a) 847 (b) 328 (c) 1056 (d) 0.08*

Apart from careless arithmetical slips, most candidates scored well on this question. In part (b) some candidates were unable to cope with the carrying or borrowing, and correct answers to part (d) were rare, with the most common incorrect answers being 0.8 or 0.6.

Question 5 *B, E and F*

There was a good response to this question with a good proportion of candidates recognising all three congruent shapes. A small, but significant number of candidates gave the answer as C and D, clearly showing a lack of knowledge of the term *congruent.*

Question 6 *(a) 9 and 11 (b) odd numbers (c) (i) 1 4 9 16 25*
(ii) add on the next odd number or equivalent

Part (a) was usually correct, but some candidates identified the numbers as prime, or on occasions as even in part (b). Most candidates correctly completed the first three numbers in the table in part (c) (i), but were then unable to complete the pattern. The most pleasing responses in part (c) (ii) were from the candidates who recognised the square numbers in the table.

Question 7 *(a) (i) equilateral (ii) regular hexagon (b) (i) 3 (ii) 3 lines of symmetry drawn*

The correct spelling of equilateral in part (a) (i) was rarely seen and in part (a) (ii) the regular hexagon was sometimes identified as a pentagon or an octagon. Part (b) was usually well done, but some candidates only drew the vertical line of symmetry on the equilateral triangle.

Question 8 *(a) true (b) false (c) true (d) false*

The majority of candidates got parts (a) and (b) correct but a considerable number thought that part (d) was true.

Question 9 *(a) $30° \pm 2°$ (b) acute*

It was evident that a good number of candidates did not have a protractor for part (a) and guessed the size of the angle, with 60° being a common incorrect answer. In part (b), many candidates knew that it was an acute angle, but responses such as ‘obtuse’, ‘right angle’ or even ‘left angle’ were very common, incorrect answers.

Question 10 *(a) correct frequencies to total 15 (b) 3 (c) (i) $^{2}/_{15}$ (ii) $^{6}/_{15}$ or equivalent (d) it would have more letters or equivalent*

In part (a), a sizeable number of candidates misinterpreted the question and gave the number of letters in the first eight words in the frequency column, for which some credit was given if the total for their frequencies was correct. Even so, some of the candidates who used this method, then proceeded to give the correct answers for parts (b) and (c) and gained full marks for these two parts. In part (b), the mode was often given as the frequency value, or attempts were made to calculate the mean. It was pleasing to see that the majority of candidates are now writing probabilities as fractions. The common mistake in part (c) (ii) was to include the 5. Nearly all candidates answered part (d) correctly.

Question 11 *(a) 48 (b) £17.44 (c) £2.56*

It was surprising how many candidates knew the answer to part (a) was 6 × 8 but then gave incorrect answers such as 40 or 54. In part (b) various methods, including repeated addition, were seen for the calculation of 2.18 × 8; often ending up with a wrong answer. Quite a number of candidates worked out 2.18 × 6. However, in part (c), most candidates then proceeded to give a correct answer from their total in part (b).

Question 12 *(a) 16 (b) 9*

In part (a) the most common incorrect answer was 8, and in part (b) candidates often gave answers such as 9 × 9, 162 or 40.5.

Question 13 $w = 6, x = 8, y = 5, z = 4$

The majority of candidates gave pleasing responses to this question and showed some understanding of what they were being asked to do. Some candidates thought that the numbers at the side of the table were the values for each of the letters and others stated their answer as 9 4 2 1, from counting the number of times each letter appeared in the table.

Question 14 *£63*

Candidates, including some of the weaker ones, coped well with this question, although it was surprising how many wrote down £42 + £21 = £64.

Question 15 *105 °*

This question was done well by the candidates who knew that the sum of the angles in a quadrilateral is 360°. Quite a number subtracted the sum of the three angles from 300° or 380°.

Question 16 *12 and £60*

Candidates generally coped well with this question, but quite a number wrote down 48 ÷ 16 = 4 and then proceeded to complete the question correctly using their wrong answer, for which credit was given. However, some candidates were looking for a pattern in the two columns and gave incorrect answers of 18 and £24.

Question 17 *50 mph*

Those candidates who wrote down 'speed = distance ÷ time', usually obtained the correct answer, but 200 ÷ 4 proved to be difficult for some. The most common incorrect answers were 70, 80 and 800. A few candidates omitted or gave the wrong units for speed and hence lost a mark.

Question 18 *£24 and £22, so 60% of £40*

Many candidates knew that they had to find 60% of £40 but were unable to perform the calculation correctly. A good number tried to use the method from question 14, but were usually unsuccessful. Very few candidates could find $^2/_5$ of £55 and often attempted to change the fraction into a percentage; again with little success.
Despite being instructed to show their working, a good number of candidates simply wrote down an answer and hence did not gain any credit.

Question 19 *(a) 4x (b) 3x + 7y (c) 12a*

This question was a good discriminator for the more able candidates. The majority had little or no idea how to simplify an algebraic expression. In part (a) $5x - x$ was a common answer; in part (b) some candidates wrote down $3x + 7y$ and then simplified this to $10xy$; and in part (c) a very common response was $7a$. In some cases, candidates substituted their own values into the expressions and gave numerical answers.

Question 20 *(a) correct table (b) $^6/_{16}$ or equivalent*

There were some good attempts at this question, with a quite a number of candidates scoring full marks. It was mystifying how some candidates obtained the numbers in their table for part (a). In part (b), candidates sometimes read 'less than 9' as '9 or less'.

Question 21 *(a) correct reflection (b) correct rotation*

This question was poorly done by the majority of candidates. In part (a), it was extremely common for candidates to reflect the triangle in the y-axis and in part (b) rotations of every description were seen with some rotating their triangle B.

Question 22 *(a) 3 (b) 9 (c) 0.7 or equivalent*

This question proved to be beyond the capability of nearly all the candidates, and very few scored more than two marks. The majority either guessed or tried using a trial and improvement approach, which sometimes worked for part (a) but extremely rarely for the other two parts.

Question 23 *Correct method leading to $^5/_6$*

Despite being told that the calculation was wrong, a good number of candidates still gave an answer of $^2/_5$. Those candidates who realised that a common denominator was required often then wrote down fractions with a numerator of 1. Correct answers to this question were few and far between.

Question 24 *(a)Bob £50 Mary £200 (b) 80%*

This question was very poorly done by the vast majority of the candidates. In part (a), most candidates either divided £250 by 2 or by 4 and then in part (b) gave answers of 50% or 25%. It was rare to see the correct answers for both parts.

Question 25 *correct enlargement*

Many candidates knew how to enlarge the triangle by a scale factor of 2, but it was rarely drawn in the correct position, with most candidates drawing it with a vertex at the origin.

Question 26 *(a) 88 (b) the higher the mark on Paper 1, the higher the mark on Paper 2 or equivalent (c) line of best fit drawn (d) correct mark (± 1) from line drawn*

This question defeated all but the more able candidates. There were many answers of 84 in part (a), from reading the scale incorrectly, and the relationship in part (b) often compared the difficulty of the two papers. Correct lines of best fit in part (c) were often seen and drawn with a ruler, but some candidates joined together all the points in a zigzag pattern. Very few candidates knew how to use the line of best fit to answer part (d), and tried to use a point already plotted on the scatter graph.

Paper 1I

General comments

The paper proved slightly more accessible than last year with the majority of candidates attempting most questions and many scoring marks throughout the paper. One possible reason for the improved performance was the reduced numerical demand compared with previous non-calculator papers, particularly in the easier questions in the first half of the paper. This meant that fewer candidates than usual faltered in a question when the arithmetic became too difficult for them; however, there were still a significant number of candidates who were let down by poor numerical skills.

The paper contained a sufficient number of straightforward questions that enabled most of the weaker candidates to display their knowledge and skill; relatively few scored below 30% with the majority scoring between 40% and 60%. Candidates who scored less than 20% would have been more appropriately entered at the Foundation tier.

Relatively few candidates scored above 80% suggesting that some of the harder questions were more difficult than usual. Overall, the paper differentiated well and allowed candidates at all levels to display their mathematical ability. In general, presentation was good and most candidates attempted to show their method and scored marks even when final answers were incorrect.

Centres should be aware that, from the November 2005 papers, it will be the practice to indicate to candidates where they are required to state the units of their answer. At present this requirement is un-prompted.

Topics that were well done included:

- Ratio and proportion
- Speed
- Finding a simple percentage
- Basic algebra
- Simple probability
- Simple equations
- Enlargement
- Angles and parallel lines
- Interpreting a scatter graph
- Approximations
- Solving a multi-step angle problem
- Simultaneous equations.

Topics which candidates found difficult included:

- Explaining an angle property
- Lower bound
- Quadratic graph
- Estimating the mean from a grouped frequency table
- Estimating the interquartile range from a cumulative frequency graph
- Pythagoras' theorem and trigonometry with no calculator
- Dividing by a decimal
- Factorising a quadratic
- Reverse percentage.

Question 1 *12 and £60*

Almost all candidates scored full marks for this multi-step question. A minority showed no understanding of the concept involved and gave answers based on addition and subtraction (48 − 36) or the patterns in the table (18 pupils for Tuesday and £24 for Wednesday). A number of candidates knew what to do but could not work out £48 ÷ 16 accurately.

Question 2 *50 mph*

This was the "units" question. It was very well done and virtually all candidates scored full marks with the units almost always being given. Those who failed to score full marks often converted time to minutes and then could not cope with 200 ÷ 240. These candidates also tended to give units that were not consistent with the units in their method. A minority could not work out 200 ÷ 4 accurately and some calculated the speed as 200 × 4.

Question 3 *£24 and £22, so 60% of £40*

This was well done on the whole with a lot of fully correct answers. Candidates had more success in finding 60% of £40 and many scored both marks for this, using a variety of methods. However, both arithmetical errors and incomplete methods were seen, particularly when candidates were attempting to move from a correctly found value for 10% or 20% of £40. A minority of candidates used the multiplier 0.6 but could not handle 0.6 × 40. For many candidates finding $^2/_5$ of £55 caused a problem. A lot attempted to convert $^2/_5$ to a percentage first but could not do this accurately; some interpreted $^2/_5$ as 2.5.

Question 4 *(a) 3x + 7y (b) 6 (c) 16*

Part (a) was answered quite well and nearly all candidates scored at least 1 mark for one correct term with the majority of answers being fully correct. Most errors were caused by the "minus" sign with $3x - 7y$ and $7x - 7y$ being seen frequently. Some candidates lost marks by attempting to rewrite correct x and y terms as a single term (e.g. $10xy$). Part (b) was again done quite well with most appreciating that $5p$ meant 5 multiplied by p. The negative value caused a problem for some; for example, 2×-7 sometimes became 14 and $20 + -14$ either -6 or 34. Some did not use the correct order of operations and worked out $(5 \times 4 + 2) \times -7$. Some weaker candidates lost a mark by including the letter symbols in their answer giving, for example, $20p - 7q$. Part (c) was answered well by the majority. Some of the weaker candidates thought that $u^2 - v^2$ meant $2u - 2v$ giving $10 - 6 = 4$ and some used a power greater than 2. A number of candidates failed to read the question properly and added the squares, gaining only 1 mark; $5^2 - 3^2 = 2^2$ was seen occasionally.

Question 5 *(a) correct table (b)* $^6/_{16}$

In part (a) almost all candidates scored full marks. In part (b) again almost all candidates scored full marks including those who had made errors in the table in part (a). Incorrect notation for probability was penalised but it was rarely seen.

Question 6 *Correct patterns drawn*

This was a reasonable source of marks for the majority, but it was rare for a candidate to produce fully correct patterns in both of parts (a) and (b). Candidates in most centres found part (a) easier than part (b). Success in part (b) possibly depended upon whether or not a candidate had access to tracing paper.

Question 7 *(a) 3 (b) 9 (c) 0.7 or equivalent*

Part (a) was well done with many solving the equation "by inspection". Some who tried to rearrange to give $4x = 12$ made errors with $4x = 13$ being seen as well as $7 - 5$ and $5 - 7$. Part (b) was also done well with many again "spotting" the solution. Candidates who attempted a rearrangement method often made errors particularly when expanding the brackets. In Part (c), incorrect rearrangement to give $4z = 11$ was fairly common; however, a lot of candidates managed to find either $10z$ or 7 and gained 1 mark. Many who obtained $10z = 7$ did not proceed accurately from there with $^{10}/_{7}$ being a common incorrect answer.

Question 8 *Correct method leading to $^{5}/_{6}$*

This was a using and applying mathematics question that required candidates to show a clear method. Many candidates had no appreciation of what was required to add two fractions and some clearly thought that $^{2}/_{5}$ was the correct answer to $^{1}/_{2} + ^{1}/_{3}$ even though they were told otherwise in the question. Candidates who found $^{5}/_{6}$ generally managed to show enough method to score full marks. Those who ignored the instruction in the question and gave the correct answer with no method gained 1 mark only. Some candidates found $^{3}/_{6}$ and $^{2}/_{6}$ but gave an answer of $^{5}/_{12}$ while others found a correct common denominator but showed no appreciation of equivalent fractions. A minority converted the fractions to decimals or percentages. This was accepted as a valid method but a clear indication that the accurate answer involved a recurring decimal was required for full marks and this was rarely seen. A common response was to multiply the fractions rather than add.

Question 9 (*a) Bob £50 Mary £200 (b) 80%*

In part (a) many candidates scored full marks. The most common error was to divide by 4 instead of 5. Some candidates gave reversed answers. Those candidates who were successful in part (a) tended to score full marks in part (b), generally working from their answer in part(a) rather than the original ratio. Unsuccessful candidates tended not to show their method clearly and if they did they often used the numbers involved and 100 in the wrong way. A minority used a correct method but were let down by their arithmetic.

Question 10 *Correct enlargement*

The majority of candidates scored 2 marks for this question by enlarging the triangle with scale factor 2, but drawing it in the wrong position (frequently with the right angle at the origin).

Question 11 *(a) 112° and corresponding angle (b) 50°*

Part (a) was a using and applying mathematics question that required candidates to provide a mathematical reason for their answer using correct vocabulary. Most candidates gave 112° but hardly any knew either of the terms "corresponding" or "F angle" which was considered to be an acceptable alternative this year. (Centres are advised that in future marks will not be given for alternative vocabulary such as "F angle"). In part (b) the majority of candidates gained full marks.

Question 12 *8.8475 km*

Very few candidates managed to cope with both of the skills required to successfully answer this multi-step question and completely correct answers were rare. However, many candidates scored 1 mark for converting to km with 8.8 … accepted as a valid indication of this. There were many errors in attempting to do this; for example, some candidates divided by 100 instead of 1000 while others multiplied by 1000 instead of dividing. Fewer candidates gained 1 mark for the correct digits for the lower bound and many interpreted this instruction as an invitation to round their answer with 9 often being seen.

Question 13 *(a) 88 (b) Positive correlation (c) line of best fit drawn (d) correct mark (±1) from line drawn*

Full marks were rarely scored on this question but, overall, the majority of candidates did well.

Part (a) was a using and applying mathematics question that required candidates to interpret a point on the graph. Most candidates correctly gave 88 but values of 81, 84 and 89 were occasionally seen. Part (b) was reasonably well done with many candidates giving an acceptable description either using the term "positive correlation" or a valid alternative to this. In part (c) candidates generally made a fairly good attempt at drawing a line of best fit but sometimes produced a line outside the fairly strict limits required. Very few candidates drew a straight line; some simply joined the points. Part (d) was well done by all candidates apart from the minority who misread the scale or who did not use their line of best fit as required, but gave the answer 45 from the point (56, 45) on the graph.

Question 14 *40 or 41*

This was a using and applying mathematics question that required candidates to use a mathematical concept to solve a problem in context. There was a mixed response to this question with a significant number of candidates clearly not appreciating what was required; many of these simply added 2, 5 and 8 and gave the answer 15. Some candidates showed some awareness of the concept involved and tried to show the drum beats in a diagram but failed to link this to the number of beats. Successful candidates generally listed the multiples of 2, 5 and 8; some listed sequences that started with 1 (the 1st beat) with differences of 2, 5 and 8. This led to the answer 41, which in the context of the question was a valid solution and given full marks.

Question 15 *(a)* w^8 *(b)* x^{-2} *(c)* y^6

Most candidates answered part (a) successfully. Part (b) caused a problem for many candidates; a common incorrect answer was x^2. As expected, part (c) was the least well answered of the indices questions. Common incorrect answers were the fairly predictable y^5, y^9 or $2y^3$.

Question 16 *(a) 5 and –3 (b) correct plot and smooth curve (c) (i) intersection with x-axis (ii) –0.2*

This question was done badly with very few candidates scoring more than 1 mark and many showing no appreciation of the shape of a quadratic graph.

In part (a) correct values in the table were rare with even the best candidates faltering. Strategies such as using the shape of a quadratic graph to check how sensible values were or using given values to check on calculation methods were not evident. Errors were predictable: $2x^2$ was calculated by multiplying by 2 and then squaring and the square of the negative value remained negative. These explained the most common incorrect answers of –1 for both of the required values, giving an impossible graph with a flat bottom in part (b). As expected, the value of y that was most frequently correct was obtained from the positive value of x.

In part (b) most candidates obtained one mark by plotting the points from their table, although there were some who appeared unfamiliar with this routine and others who did not manage it accurately. Relatively few went on to gain the second mark that required a smooth curve to be drawn through their points with many candidates joining the points with straight lines. Overall, a large variety of incorrectly shaped graphs were seen; some candidates managed to concoct straight lines with no supporting reason.

The first part of part (c) was a using and applying mathematics question that required candidates to explain a mathematical method. Candidates were more successful in **using** the method in part (ii) rather than **explaining** the method in part (i) of the question. Overall, the question proved too difficult for a significant majority of candidates and was often not attempted.

Question 17 *(a)3.8 km (b) (i) 3.4 to 3.5 km (ii) 3.3 to 3.6 km*

Many candidates showed no appreciation of any of the routines involved in this question.

In part (a) those candidates who managed to produce a correct method for estimating the mean invariably scored 3 marks only, because they could not handle 190 ÷ 50 correctly with 3 remainder 40 often becoming 3.4. Some candidates managed to show the method to get to 190 but did not always do this accurately because of multiplication and addition errors. Others knew the routine but used the wrong midpoints, usually the upper class boundaries. A large number of candidates either added the frequencies, the cumulative frequencies or the midpoints; dividing by 5 instead of 50 was another common error. In part (b) the median was often correct but there was less success with the interquartile range. Candidates who knew what to do often lost marks because of misread scales or inaccurate drawing. In their method for the interquartile range, some candidates put their quartiles in the wrong position, for example at 10 and 40, others added the quartiles and some simply gave the lower quartile. A common error was to work from the horizontal axis to the vertical for both the median and the quartiles.

Question 18 *(a) √125 cm (b) 37.5 cm (c) 11.92 cm*

Only the stronger candidates tackled this question with any degree of success.

In part (a) many candidates did not appreciate that they needed to use Pythagoras' theorem for this question; of those that did a significant proportion chose to add the squares rather than subtract. Many candidates faltered in their attempt to work out 15^2 even though this is one of the square numbers that the specification (reflecting the national curriculum) expects them to know. Some candidates reached 125 and stopped, scoring 2 marks only. Others got to √125 and then tried to evaluate it but were not penalised for this.

Part (b) was not often correct. Some candidates scored 1 mark for finding the scale factor but did not know how to use it and those that did often could not work out 2.5 × 25 correctly. A common incorrect answer was 30 coming from 15 + (25 – 10).

The non-calculator trigonometry question in part (c) was a using and applying mathematics question that required candidates to select and use a value from a given table. Candidates either knew that trigonometry had to be used or they had no idea. Some were able to identify the tangent but then stopped; others went on from there but used an incorrect combination of tan 40 or tan 50 and 10. Calculating 10 × tan 50 was a problem for some with 10 × 1.192 × 50 being seen regularly. A number failed to choose the tangent but did everything "perfectly" with the wrong ratio; this scored no marks.

Question 19 *6000*

The majority of candidates gained 1 mark for using two valid approximations with an appropriate rounding of 0.198 causing most problems with 0, 1 or 2 seen often. Many candidates went on to gain a second mark for three valid approximations and the first stage of the calculation done correctly. Virtually all candidates who got this far then failed to divide by 0.2 accurately; this meant that a fully correct solution was rarely seen. Hardly any candidates attempted a calculation without approximating first.

Question 20 *$(x - 5)^2$*

This was a harder question designed to allow better candidates to show their mathematical ability. There was a mixed response with a number of otherwise strong candidates making no attempt, suggesting that they had no previous experience of the topic. Most candidates did not know what to do and many responses that ignored the basic rules of algebra were seen. Those who had a good idea of what was involved often made an error with the signs.

Question 21 *30°*

Many better candidates produced an economical and mathematically valid response to this relatively complex multi-step question. Weaker candidates were also regularly successful although their answers were often more disorganised and harder to follow. Candidates who failed to obtain 30° rarely scored more than 1 mark although the full range of marks from 1 to 4 was available. There were many ways of tackling this question; the most common were $0.5 \times \{360 - (250 + 50)\}$, $100 - 70$ and $180 - (125 + 25)$ although other methods were seen. Many candidates lost marks by making incorrect mathematical assumptions; for example, answers based on using $\angle BAE = 90°$, $\angle ADC = 100°$ or assuming that triangle *ADE* was isosceles were seen regularly. Some candidates made no attempt or just guessed.

Question 22 *500g*

Correct answers to this question were infrequent. Predictable incorrect responses were £480 or £720 obtained by subtracting or adding 20% of £600. Candidates who appreciated the link between 120% and £600 could not always use this fact to make progress and those who could and showed the full method sometimes made errors in their calculation. Use of the decimal multiplier, 1.2, was not seen. Some candidates arrived at £500 by an inspection method.

Question 23 *$x = {}^1/_2$ and $y = 4$*

This question was answered better than previously with a significant number of candidates able to demonstrate the routine required to solve straightforward simultaneous equations and then deal with the arithmetic required to find the correct solution. However, many could get no further than finding equations with equal x or y coefficients, following this with an error in elimination made usually by adding the equations rather than subtracting. Fewer candidates than usual used trial and improvement or guesswork; if they did they invariably failed to find the correct solution for both x and y. A small minority attempted to find a solution using a substitution method but were not successful.

Question 24 *(a) 1.75×10^6 (b) 8.2×10^{-3} (c) 0.049 (d) 2.6×10^6*

Full marks were rare but stronger candidates did well and there was some success for many who had otherwise scored few marks in the later part of the paper. Marks were mainly scored in parts (a) to (c) with part (d) proving a challenge to all. The idea that 0.1 was 10^{-1} and that dividing by this meant that the power increased by 1 was beyond the majority with 2.6×10^4 a common incorrect answer.

Question 25 *Kite 2 and sum of opposite angles = 180°*

This question was a using and applying mathematics question that required candidates to provide a mathematical reason for their answer. Very few candidates knew that the sum of the opposite angles of a cyclic quadrilateral was 180°.

Paper 1H

General comments

The paper was a fair test of candidates' ability. It was quite easy to accumulate marks in the first part of the paper (up to question 10) but there were some fairly challenging questions in the latter half, making really high marks (85%+) less easy to attain than last summer. Almost all candidates seemed to be appropriately entered for the Higher tier paper, there being very few marks below 20%. There was no evidence that the paper was too long, all candidates seemingly able to do as much as they were capable of and, on the whole, presentation was good with not too many instances of working all over the page. When this did happen it made it difficult/impossible to pick out that which might be creditworthy.

An area of candidate weakness is in answering questions which ask for explanations, of which there were four or five examples on this paper. Candidates need to appreciate the need for clear and correct use of mathematical language. Proofs need to be done 'formally' i.e. using mathematical techniques and logical reasoning. Offering numerical verification of a result (e.g. Qu.19c) is not a proof and scored no marks; as will be the case if this happens on future questions of this nature.

There are still some issues regarding numeracy. Poor manipulation of number, decimals and fractions was evident, especially on the estimation question (Qu.3), the sampling question (Qu.17b), the upper/lower bounds question (Qu.21) and the probability question (Qu.22). Question 21 was an example of a question which, if tackled correctly, was relatively straightforward, but if tackled wrongly the arithmetic proved to be most unpleasant. Candidates should have realised that on a non-calculator paper any numerical manipulation required is going to be of a reasonable degree and will be within their grasp; warning bells should ring when the arithmetic gets out of hand.

Centres should be aware that, from the November 2005 papers, it will be the practice to indicate to candidates where they are required to state the units of their answer. At present this requirement is un-prompted.

Topics that were well done included:

Finding the LCM
Indices
Standard form
Changing the subject
Mean and cumulative frequency
Pythagoras' theorem/Enlargement/Trigonometry
Identifying graphs
Factorising/expanding.

Topics which candidates found difficult included:

Division by a decimal
Equation of a perpendicular line
Recurring decimal
Quadratic graph theory
Condition for a stratified sample
Algebraic simplification
Formal proof
Completing the square/quadratic equation by formula…handling surds…
Upper/lower bounds.

Question 1 *40 or 41*

This question was well done by most candidates. A few started their count at 1 beat, giving an answer of 41, which gained full marks.

Question 2 *(a)* w^8 *(b)* x^{-2} *(c)* y^6

This question was well done, making it a very successful first page for most candidates. There were a few mistakes such as y^9 in part (c) but at least 2 marks was commonplace.

Question 3 *6000*

Depending on the approximation used for 316, alternative answers were acceptable. The only problem with this question came when candidates tried to divide by 0.2, highlighting the inability of most to be able to cope with division by a decimal.

Question 4 *(a) formula 2 (b) product of two lengths, hence area*

It is regretted that the diagram used in this question was not what it should have been. The fact that *a* and *b* were twice as long as they should have been did not, in fact, hamper most candidates who were able to spot that a product of two lengths, as in formula 2, was the 'correct' solution. Those who did realise that something was amiss, usually by saying that the area of the surrounding rectangle was *ab* and so none of the formulae was appropriate because they would give too big an answer (or, in desperation, selecting the first one as being likely to be the smallest) were given full credit for this reasoning and awarded 2 marks.
The most common false reasoning came from those who selected formula 3 … 'because it has squares in which means it must be an area'.

Question 5 *(a)* 1.75×10^6 *(b)* 8.2×10^{-3} *(c) 0.049 (d)* 2.6×10^6

There were many correct answers for the first three parts. Only part (d) seemed to cause any problems with the most common mistakes being 10^4 or failing to give an answer in standard form.

Question 6 $p = (t - 40) \div 5$

Usually well done, with no ambiguity for division by 5. Those making a sign error in rearranging were still able to pick up 1 of the 2 marks. Failure to divide throughout by 5 (e.g. $p = t \div 5 - 40$) resulted in no marks.

Question 7 *(a) 5 and −3 (b) correct plots and smooth curve*
(c) intersection with x-axis (d) − 0.2

The first answer of 5 was sometimes 7 or 1 or −1, the second of −3 was sometimes −1 or −2,although there were many completely correct entries in the table of values. Plotting points was usually accurate and many made good attempts to draw a **smooth curve** through their points. The 'flat bottom' graph … usually coming from three or four values of −1 in the table … was still too common and there was evidence of use of a ruler to draw some (especially the longer) sections. All of these minor indiscretions meant slippage of marks.

Parts (c) and (d) were quite well done, some candidates carelessly leaving out the negative sign in part (d).

Question 8 *(a) 3.8 km (b) (i) 3.4 to 3.5 km (ii) 3.3 to 3.6 km*

Part (a) was well done by many, with a few dropping a mark by rounding their total of 190 to 200, taking the word 'estimate' in the question rather too literally. There were some who used class widths or tried involving cumulative frequencies but this type of question has appeared many times in recent years and is usually well done despite the inevitable slips in arithmetic. It was necessary to include 'km' to pick up the units mark.
In part (b) (i) there was some misreading of the horizontal scale but this was less common in part (b) (ii) where the vast majority picked up 2 marks.

Question 9 *(a) √125cm (b) 37.5cm (c) 11.92cm*

Overall a very successful question, many scoring the full 9 marks.
Part (a) was the part most likely to cause trouble. There were frequent wrong statements of Pythagoras' theorem and even when the theorem was stated correctly $15^2 - 10^2$ did not always result in 225 – 100. It is a requirement to be familiar with the squares of integers up to and including 15, but this proved to be the stumbling block for quite a number.
Part (b) was very well done, almost always by calculating 15 × 2.5, and part (c) saw it's fair share of fully correct solutions. There were some, however, who could not cope with 10 × tan50º and it became, rather worryingly, 10 × 1.192 × 50 on too many scripts. The sine rule was a perfectly acceptable method in part (c) although the final step of having to calculate 7.66 ÷ 0.643 proved to be beyond most who used this method.

Question 10 *C D B*

There were many fully correct solutions, the most common error being selecting A for the last answer.

Question 11 $y = -1.5x + 5$

This was not well done. The connection between the gradients of lines which are perpendicular would seem to be a little known fact to all but a handful of candidates. Of those who did manage to get the correct gradient some forgot to include the correct constant term. Note also that an equation is asked for, $-1.5x + 5$ scored only 1 mark. Correct notation ($y = \ldots$) was essential.

Question 12 *(a) x = 0.5858…, 100x = 58.5858…, subtraction to give 99x = 58*
(b) A choice of several methods including 10x = 1.5858…,
1000x = 158.5858…, subtraction to give 990x = 157, hence x = $^{157}/_{990}$

Part (a) was quite well done with weak 'wordy' offerings of 'recurring decimals mean division by 9 or 99 etc.' cropping up infrequently.
Part (b), however caused far more problems not the least of which was the misreading of the recurring decimal in the question, as 0.158158158… Hence the all too frequent final answer of $^{158}/_{999}$. There were some elegant solutions but, alas, only from the more able candidates.

Question 13 *(a) correct geometric reasoning i.e. isosceles triangle base angles followed by angles in the same segment (or equivalent statement)*
(b) (i) 116º (ii) 42º

In part (a) we were looking for candidates who could describe a logical chain of reasoning using the correct mathematical terminology. Needless to say many adequately described the angles of 32º in the isosceles triangle *PQR* (sight of these on the diagram was deemed to be enough). Earning the second mark proved to be more difficult. It was necessary to equate angles *QPR* and *QSR* by using correct language. Describing them as 'angles in the bow-tie', and other such phrases, whilst being graphic is non-mathematical. Candidates are required to learn the correct words and phrases. There were some who thought that the triangles *PQR* and *SQR* were congruent and so tried to argue that angle *QRS* was 116º hence the other two angles in that triangle were both 32º.
Part (b)(i) was nearly always done correctly (244º was acceptable since it is the value of the reflex angle) but part (b)(ii) was not answered in a way which inspired confidence. Many candidates were putting in any angles they could find on the diagram (48º at angle *CA(X)* did earn an easy mark) but much of the reasoning was faulty. Using 'alternate' angles was not uncommon, finding angle *ACB* and halving it or assuming that this angle was 90º were also common misconceptions. Using the alternate segment theorem to obtain angle *ACB* as 74º then subtracting 32º was the most successful method.

Question 14 $b = -2, \ c = -15$

This was a new style of question testing the 'using and applying' aspect of the specification, and proved to be too difficult for many. Nonetheless, it is heartening to see candidates who can 'think on their feet'. The best method was to realise that the given values of −3 and 5 were the solutions of the associated quadratic equation. More popular by far, but also less successful, was to substitute the values of −3 and 5 into the equation of the curve, effectively setting up a pair of simultaneous equations. These ought not to have been too difficult to solve but in practice they were.
It is possible (but quite a difficult concept) to obtain a solution by considering the curve as being a transformation of the curve $y = (x - 1)^2$ (using the fact that $x = 1$ is a line of symmetry). This solution, although rare, was seen.

Question 15 $(4\pi + 18)$ *cm*

This was a question which again highlighted shortcomings in basic arithmetic. Many candidates scored 1 or 2 of the 3 marks on offer but answers were often muddled and it was sometimes quite difficult to follow working which was spread liberally about the page.
Common mistakes were: πr^2 was used for circumference; $^{80}/_{360}$ was simplified to $^1/_4$, when 360 ÷80 yielded 4.5 it was sometimes used as a multiplier rather than in the denominator of the expression. Even those who did obtain the correct expression for the arc length more often than not forgot to add 18.

Question 16 *(a)* $(2n + 3)(n + 1)$ *(b)* 23×11

There was a mixed response to part (a), many with correct factors, many with the 1 and 3 in the wrong brackets and many with a factor of $(n + 2)$. A correct solution to part (a) was, however, no guarantee of two correct prime factors in part (b), very few realising the connection between the parts and 'starting afresh'.
There were several instances of 23 × 11 but also plenty instances of 1 × 253 among other wrong answers.

Question 17 *(a) 1 selecting from within each group a number proportional to the number in that group*
2 selection from within each group should be representative or selection from within each group to be made randomly
(b) 4, 7, 16, 13, 10

In part (a) many candidates failed to be precise enough in their choice of words. Phrases such as 'pick at random' or 'pick the same number of boys and girls' or 'avoid bias', seemed to be used more in the hope that they might be appropriate rather than with any real conviction. The idea of the sample from each group being proportional to the group size was given by a reasonable number of candidates but, it was less common to find accurate enough descriptions of the fact that from within each group the sample needs to be representative or selected at random. Far too many answers were too general and not particularly directed at stratified sampling.
In part (b) most candidates knew that they needed $^1/_8$ of each group of people (or at least that the calculation was ??? $\div 400 \times 50$) but the standard of basic arithmetic was often very poor. Answers need not have been done to full decimal place accuracy but the skill of rounding to the nearest integer is one which should not have presented too much difficulty.

Question 18 *(a) (i)* $(x-5)^2$ *(ii) 8 (b)* $\frac{x-3}{x}$

Part (a) (i) was usually well done, there being many correct answers and the rest often had no more than a sign error in one bracket. The link between parts (a) (i) and (ii) was usually missed, the preferred method being to expand the brackets, tidy up the expression and solve the resulting quadratic equation. Needless to say this usually resulted in a sign error somewhere along the line and no marks. Substitution of $(y-3)$ for x paid dividends for those alert enough to see it and 2 marks was then usually forthcoming.
The simplifying of the expression in part (b) was not performed well. This was deliberately left as an unstructured question and as such did differentiate between the best and the rest. Cancelling of the x^2 terms was almost the norm and even when the correct factorisation was done, followed by cancelling of the common bracket to get the correct solution it was not uncommon to see the x terms cancelled to leave a final answer of −3. This has sometimes been deemed to be 'further work' but not in this instance, the accuracy mark was withheld from those unwise enough to carry out this false extra step.

Question 19 *(a) (i) consecutive numbers, hence an odd multiplied by an even, which always gives an even (ii) 2 multiplied by any integer is even, adding 1 makes it odd… or equivalent phrases*
(b) $4n^2 + 4n + 1$ *(c) complete 'algebraic' method with logical deduction*

In part (a) some candidates were confused by positive/negative and odd/even and could not offer any sensible reasoning. Whilst many good answers were seen (usually more for (ii) than (i)) there were also too many 'partial' solutions ie. only considering what happened when n was even and not continuing the argument for when n was odd. Such incomplete answers did not score the mark(s).
Part (b) was well done by the vast majority of candidates; some made a mistake in one of the terms gaining just 1 of the 2 marks. Part (c) was meant to be a test of candidates' ability to handle a 'using and applying' approach. The question did try to lead them into the algebraic approach that was necessary to gain any marks at all but even the most able candidates did not take the hint. There were some correct solutions but they probably number far less than 1% of the total entry. It is important that future candidates are shown the difference between 'verify' and 'prove'.

Question 20 *(a)* $a = 3$, $b = -12$ *(b)* $-3 \pm \sqrt{12}$

Success or otherwise on part (a) seemed to vary as much by centre as by individual candidate. There was often a lot of algebraic expansion floating around, much of it going nowhere. Those who recognised this as a 'complete the square' question were often successful. An answer of $a = 3$ was more often seen than $b = -12$.
There was an obvious link between the two parts of this question, but even those who were able to complete the square in part (a) did not always choose to pursue this route in part (b). Those who did either completed successfully or, at worst, forgot the ± sign in their final answer (and lost a mark for doing so). By far the most popular, and perfectly acceptable, method of solution was to use the quadratic equation formula. There was much good work but also much carelessness. The question asked for answers to be left in surd form. Handling surds always causes problems and those who tried to further simplify the expression but made mistakes in doing so were penalised 1 mark.

Question 21 *50 crates*

This was yet another question testing the 'using and applying' element of the specification. Careful reading of the question will convince the candidate that they must be sure that the cable does not break. This, hopefully, is the clue needed to ensure the use of the minimum strain divided by the maximum crate weight.
There were some who did not appreciate the need for any upper/lower bounds at all, but most candidates did realise the need for this. Marks were given for quoting either limit for crane strain or crate weight but use of an incorrect combination meant no further scoring. There were probably more who picked the wrong combination than the right one. For those who did select the correct combination the resulting easy arithmetic was a just reward.

Question 22 *0.432*

This was a multi-step probability question, and, of its kind, fairly straightforward. However, there was a lot of poor work demonstrated. Handling decimals as 'friendly' as these is a skill all should possess but there were many instances of $0.6 \times 0.6 \times 0.4$ giving almost any answer but the right one. Decimal point errors, answers greater than 1 and $0.6^2 = 0.12$ were just some of the mistakes on view. When 0.144 was obtained it was often left as the final answer, candidates being unaware that there were three possible outcomes. Quite a number failed to multiply three probabilities, just using 0.6×0.6

Question 23 *(a) (i)* $\mathbf{a} + \mathbf{b}$ *(ii)* $\mathbf{b} - \mathbf{a}$ *(iii)* $\mathbf{a} + 2\mathbf{b}$
(b) (i) correct placing of points P and Q (ii) $3\mathbf{b}$

Part (a) (i) was usually correct but there were many mistakes on parts (a) (ii) and (iii) … $2\mathbf{b}$ and $-2\mathbf{b}$ being the most common wrong answers. Placing the points *P* and *Q* correctly proved to be equally challenging for some, *P* at *F* and *Q* at *C* unfortunately becoming familiar.
Unfortunately this could then often lead to the correct answer in part (b) (ii) coming from wrong working, but with no way of knowing whether this was the case or not, the final mark had to be awarded. (When there was contradictory evidence, this mark was withheld.) It was, of course, possible to find the answer in part (b) (ii) by using the given vectors for *OP* and *OQ* and using simple algebraic skills.
Despite all of these comments, there were many candidates for whom this question was a very welcome source of marks at the end of the paper.

Paper 2F

General Comments

Nearly all of the candidates were entered for the appropriate tier and scored between 15 and 75 marks. There were sufficient straightforward questions for all candidates to display their knowledge and skill and time constraint was not a problem. The contexts of questions 5 and 6 caused many problems and this was the main reason for the mean mark to be lower than on last year's paper.

The presentation of work was good but still too many candidates just write down answers without working even with the more involved multi-step questions. If working is shown then marks may well be gained even with incorrect answers. Some candidates did not possess the necessary mathematical equipment required for the examination and consequently suffered in questions 3 and 10(d)(i). Money notation was much better this year with very few candidates writing £4.2 in question 2(b). Explanation questions still cause much difficulty but a significant number of candidates correctly stated that in question 7(d), the mechanic earned much less than the average wage.

Centres should be aware that, from the November 2005 papers, it will be the practice to indicate to candidates where they are required to state the units of their answer. At present this requirement is un-prompted.

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Topics that were well done included:

- Simple application of number: money
- Writing a fraction as a percentage
- Co-ordinates
- Sequences of numbers
- Drawing on an isometric grid
- Rounding
- Measures of average

Topics which candidates found difficult included:

- Vocabulary: tangent and chord
- Formula in words
- Electricity bill
- Conversion of imperial units to metric
- Areas of shapes
- Explanations based on probability
- Correct use of a calculator
- Drawing a straight line graph
- Ratio
- Circumference of a circle

Question 1 *(a) 7 000 000 (b) 7084 (c) 8740*

Part (a) was not well done. Four or five noughts were common. Parts (b) and (c) were usually correct.

Question 2 *(a) 4 (b) £4.20*

This was well done by nearly all candidates, many scoring full marks. When calculating the change some candidates confused £35.8 with £35.08

Question 3 *(b) 8 cm (c) any tangent*

It was a little surprising that so many candidates did not know the meaning of the words tangent and chord as a similar question was set last year.

Question 4 *(a) (i) 20% (ii) 80% (b) $^3/_5$ (c) 0.75*

Weaker candidates simply counted the squares and gave 2 and 8 as their percentage values. However, most candidates correctly gave the percentages, simplified 60% partially to $\frac{6}{10}$ but thought that $\frac{3}{4}$ was equivalent to 3.4

Question 5 *(a) £2.35 (b) 12 miles*

This was poorly answered. The majority of candidates worked out the charge as $7 \times 0.55 = £3.85$

Question 6 *£23.58*

The calculation of an electricity bill was a context that was unfamiliar. Most candidates either added the two readings together or worked out an amount just using the present reading. Less than 10% of candidates obtained the correct amount.

Question 7 *(a) £200 (b) £350 (c) £420 (d) Mechanic only gets £250, which is much less than the average*

Well done in the main, but as usual with weaker candidates there was some confusion between the three measures of average. A common error when finding the median was not to re-order first. Many candidates correctly found the mean, but some just totalled the wages, forgetting to divide by 7

Question 8 *(a) (3,4) (b) (−1,1) (c) (i) 2 lines meeting at (−2,4) (d) (−2,4)*

Very well done. Many candidates scored 3 or 4 marks, the main error being that some drew a trapezium instead of a parallelogram.

Question 9 *(b) 1.7 ≤ number of pints ≤ 1.8 (c) 4.3 ≤ number of litres ≤ 4.8*

Nearly everyone placed the arrow correctly, about half found the number of pints but estimating the number of litres proved more demanding. Many multiplied their answer to part (b) by 8

Question 10 *(a) CD or FE (b) 14cm^2 (c) 18cm (d) (i) 39^o (d) (ii) 10cm^2*

The first three parts were often correct but many candidates are confused between perimeter and area. Similarly in the last part the formula was not generally known.

Question 11 *(a) (i) 11 and 7 (ii) subtract 4 (b) (i) 33 (ii) 13 (iii) −11*

This question was well answered by nearly all candidates, the only real problem occurring with the last part where $-10 - 1 = -9$ was the most common error.

Question 12 *£57*

Answered well on the whole. The question was either completely correct with the non-calculator method of 38 + 19 being most popular or completely wrong e.g. 380 – 15 = £365.

Question 13 *(a) Red (b) $^3/_6$ or equivalent (c) P(Y on first) = $^1/_5$, P(Y on second) = $^1/_6$; therefore less chance on second since $^1/_6 < ^1/_5$*

Parts (a) and (b) were well answered although the incorrect notation 3 in 6 was seen regularly. In part (c) many candidates ignored the words in the bubbles and failed to make a comparison between the spinners.

Question 14 *(a) 13.69 (b) 64 (c) (i) 6.12244(…) (ii) 6 (d) (i) 1.78… or 1.8 (ii) 1.8 or 2*

In part (a) the common answer was 7.4 i.e. doubling instead of squaring. The meaning of the word cube was not well known. A variety of answers were given for the next two parts. Candidates seemed unsure as to which buttons to press or in which order, on their calculator. The rounding of their answers was more successful.

Question 15 *(b) $24cm^3$*

This was well done and many candidates obtained full marks.

Question 16 *3.6cm*

The success rate on this using and applying question was disappointing. The context is not unfamiliar to candidates but many either simply divided the 10.8 by 2 giving a width of 5.4, or subtracted 10.8 from 28.8 giving 18 or 9 as their answer.

Question 17 *(a) £35 (b) 12.5%*

Candidates gained much more success with the multi-step question in part (a) than they did with the electricity bill earlier. A common error was to forget to multiply the £40 by 6 before subtracting whilst other candidates successfully arrived at £210 for the week and forgot to divide this figure by 6. Part (b) was less well done with the majority of candidates unsure as to what to do with the 24 hours.

Question 18 *(a) 80^o (b) $b = 60^o$ $c = 110^o$*

Only the more able candidates were successful with these angle questions. Of those, a significant number gave the last answer as 70^o

Question 19 *straight-line graph from(0, 1) to (5, 11)*

With no table of values to complete most candidates just did not know what to do. Approximately 80% failed to score.

Question 20 *(a) 14 (b) 53 (c) Any k which is a multiple of 4 (d) the sum of 2 and any other prime number*

There were some correct answers for each part, but not that many. In part (a) common errors were:
3 − 2 = 1 + 5 + 4 = 10; −6 +20 = 26; and in part (b): $7^2 + 5$ or $12^2 + 5$. Many tried to find counter examples but in part (c) an even answer was often still produced.

Question 21 *440, 100, 100, 960*

Ratio is a problem area for weaker candidates. They invariably add 12g to each ingredient to make the 12 extra mince pies. Others simply rounded up giving 400, 100, 100, 800 as the new amounts. However, many candidates were successful, but methods were rarely shown and premature approximation caused a lack of accuracy in some final answers.

Question 22 *28.3 cm*

Only about 25% of candidates knew the formula for the circumference of a circle. $9 \times 2 = 18$ cm was a common answer.

Question 23

	R	*Y*	*G*
M	*3*	*2*	*2*
F	*2*	*1*	*3*

Despite being the last question on the paper many candidates made a very good attempt and clearly understood what was meant by a two-way table. A common error was to show the male and female results in two separate tables.

Paper 2I

General Comments

Most candidates were correctly entered for this tier of entry with most scoring between 20 and 80 marks. The standard of presentation was usually good, and there was no evidence that the candidates had insufficient time to attempt all the questions. Many candidates lost marks by not showing any method for many questions, just their incorrect answer. Trial and improvement is still used too much to solve equations which require an alternative method of working resulting, therefore, in candidates usually scoring no marks. Probability notation has improved with fewer ratios or odds used to answer the questions. Candidates were also better this year at explaining answers and giving proofs.

Centres should be aware that, from the November 2005 papers, it will be the practice to indicate to candidates where they are required to state the units of their answer. At present this requirement is un-prompted.

Topics that were well done included:

- Areas and volumes
- Simple probability
- Simple percentages
- Linear graphs.

Topics which candidates found difficult included:

- Ratio and proportion
- Prime numbers
- Bearings and drawings
- Tree diagrams
- Inequalities
- Equations
- Algebra.

Centres should be aware that, from the November 2005 papers, it will be the practice to indicate to candidates where they are required to state the units of their answer. At present this requirement is un-prompted.

Question 1 *3.6 cm*

Most scored well on this question with the usual errors being 28.8 ÷ 10.8 or (28.8 – 10.8) ÷ 2.

Question 2 *(a) 64 (b) (i) 6.12244(.) (ii) 6 (c) (i) 1.78… or 1.8 (ii) 1.8 or 2*

Most scored well on this question. In part (a) common answers were 16 and 256. In part (b) (ii) 6.0 was often seen. In part (c) (i) many missed out the bracket when putting the numbers in their calculators and gave 0.26 but then recovered to get 0.26 or 0.3 in part (c) (ii) which was given credit.

Question 3 $-11,\ -23$

Most scored at least one mark on this question. The sequence $-5,\ -9,\ -17$ was the most common error with some continuing the original sequence to give 33, 65.

Question 4 *(a) $^3/_6$ or equivalent (b) P(Y on first) = $^1/_5$, P(Y on second) =$^1/_6$; therefore less chance on second since $^1/_6 < ^1/_5$*

Most got part (a) correct with $^3/_6$ but many tried to cancel incorrectly and gave $^3/_6 = ^1/_3$. In part (b) many gave one of the two probabilities $^1/_5$ or $^1/_6$ but failed to state which was the bigger. Some tried to compare the colours on the second spinner only.

Question 5 *a = 60°, b = 110°, c = 130°*

This was well answered with most getting part (a) correct, but some tried to measure the angles and gave parts (b) and/or (c) as 120°

Question 6 *440, 100, 100, 960*

Many lost marks by making premature approximations and then only got the answer of 960 correct. Weaker candidates added 12 to each value to get their answers.

Question 7 *(a) £35 (b) 12.5 %*

This was well answered. In part (a) many stopped with an answer of £210 or got £110 from 800 – 350 = 450, 450 + 240 = 690, 800 – 690 = 110. Part (b) was less well answered with common answers being 8 from $^{24}/_3$, 72 from 24 × 3 , and 25 using a 12 hour day.

Question 8 *(b) 24 cm^3*

Most scored full marks on this question, with the usual error in part (a) being to draw the side 3cm or 5cm long instead of 4cm. A few gave part (b) as $^{24}/_3$ or 24^2.

Question 9 *(a) £4.20 (b) 21%*

More got part (a) correct than got part (b) correct. In part (a) many used 7.3 or 8.3 or 8.5, but it was pleasing to see most give the amount as £4.20 rather than £4.2. In part (b) the usual error was an answer of 47.25 from 1.5 × 31.5 and many tried a trial and improvement approach by finding various percentages of 150 e.g. 50%, 20%, 10%, 5% or 1%, but were usually unable to get the answer of 21%.

Question 10 *(a) any k which is a multiple of 4 (b) the sum of 2 and any other prime number*

Most got part (a) correct with only rarely multiples of 2 being used. Part (b) was less well answered with some thinking that 1 and/or 9 were prime numbers.

Question 11 *(a) 130°*

This was answered poorly. In part (a) 310° was a common answer. In part (b) many got the direction west of B, but the direction south west of A was rarely done accurately.

Question 12 *(a) 2 minutes (b) 36 kph*

Practically all got part (a) correct, and in part (b) most made progress as far as $^6/_{10}$ = 0.6 and then often stopped, with other common errors being $^6/_8$ or $^{10}/_6$

Question 13 *£323*

This was usually well answered. Many found 10% and then 5% using the same approach as in question 9 (b) but with more success this time. A few stopped having got £57.

Question 14 *28.3 cm*

Some got confused between the area and circumference formulae and some used $\pi \times 4.5$ or $\pi \times 18$. Some lost marks by giving an answer of 28 or 28.2 usually with no working.

Question 15 *straight-line graph from (0, 1) to (5, 11)*

This was usually fully correct. Some only plotted the points and did not draw the line, and some did not make the line long enough. Some tried to force the line to go through the origin even when they had 5 correct points plotted.

Question 16

	R	Y	G
M	3	2	2
F	2	1	3

This was usually well answered with most knowing that they had to add or tally the totals. Some did separate tables for male and female for which they were penalised. Some did bar charts as well as the two-way table for which they were not penalised.

Question 17 *4.8*

Many scored 2 or 3 marks on this question. Many failed to test a value for x in the range $4.75 \leq x < 4.8$, or trial two values of x in the range $4.7 < x \leq 4.85$ one giving a value >5 and one giving a value <5. Some did fully correct working but then gave a final answer of 4.79.

Question 18 *(a) $^1/_9$ (b) (i) $^5/_6$, $^1/_6$, $^5/_6$, $^1/_6$, $^5/_6$ (ii) $^5/_{18}$ or equivalent*

This question was poorly answered. The addition of fractions was very poor in part (a) with most not using the fraction button on their calculator and answers such as $^4/_6 + {}^2/_9$ common, with $^1/_6$ being the usual answer. Part (b) (i) was better answered with most knowing what to do. Part (b) (ii) was very poor with most not knowing the complete method with $^1/_6 \times {}^5/_6$ being the common answer.

Question 19 *(a) $x \geq -1$ (b) $x < 2$ (c) −1, 0, 1*

This was poorly answered. In part (a) a few got to $2x \geq 1 - 3$ but then wrote $x = -1$.
Most had no idea about part (b) and just invented any inequality, and some wrote < 2 instead of $x < 2$.
Most knew what integers were in part (c) and some scored with −1, 0, 1, 2 having used ≤ in part (b).

Question 20 *Length 23 cm, height 10 cm*

Most scored at least 2 marks. More used the correct formula here than in question 14. The usual error was to subtract the 1cm rather than add it on, but some did $\pi(7 + 1)$ or made truncation errors. Most got the height.

Question 21 *$x = 2y - 1$*

Very few scored full marks on this question. Many got as far as $3x = 6y - 3$ or even $3x = 10y - 3$ but most then only divided one term by 3 or failed to simplify $(6y - 3) \div 3$.

Question 22 *(a) (i) $7x - 2$ (ii) $n^2 + 6n + 9$ (b) (i) $a(2a + 1)$ (ii) $4xy^2(2x^2 - y)$*

Most only scored one mark on this question and that was for expanding the brackets in part (a) (i) but then $7x - 14$ was a common answer. In part (a)(ii) most gave $n^2 + 9$. Most had no idea in part (b) with some trying to cancel the letters with answers such as $2a$ and $2x^2y^{-1}$ but some did score with a partial factorisation such as $4xy(2x^2y - y^2)$.

Question 23

This was poorly answered. Many drew a horizontal line in the correct position but then often drew a vertical line bisecting AB and CD, and many drew arcs with centre at D. Some drew both diagonals AC and BD with no indication as to which one they wanted to use.

Question 24 *(a) 4.07×10^{13} (b) 1580 or 1600 days*

This was poorly answered. In part (a) the number was usually greater than 10 and was rarely given to 3 significant figures. Part (b) was better answered than part (a) with many knowing what to do but getting lost with all the zeros, and a common answer was 3.4 from 298000 ÷ 86400. Most used the original value in part (a) for calculating part (b) rather than their answer to part (a).

Question 25 *20 cm^2*

Most scored at least two marks. Most preferred to use a rectangle and two triangles rather than the large rectangle subtract the trapezium. The usual errors were to forget to divide by 2 when working out the area of the triangles, or to assume the two triangles had the same area. Some attempted to work out the perimeter and so used Pythagoras' Theorem.

Question 26 *3*

This was very poorly answered. Some were lucky and got 3 from trial and improvement and showed that 3 worked in the equation. Most got lost in multiplying by 2 or 4 and a common answer was $x + \frac{1}{2} + x - \frac{3}{4} = 3$, $2x = 2.25$, $x = 1.125$.

Question 27 *Angle C = 180 – x, Angle C = 180 – (z + y), x = z + y or equivalent*

Many scored at least one mark. Some used values for the angles which is not valid for a proof. Some gave partly valid explanations using a lot of words when a more concise explanation using algebra would have saved them time. A few gave a diagrammatic proof by drawing a line through A parallel to BC and identifying the relevant x and z angles.

Paper 2H

General comments

Overall the standard was higher than last years. There were few marks below 20%. On the whole candidates seemed to be well prepared for the multi-step and using and applying mathematics questions. Standards of presentation were good with working being shown where necessary, although many answers still ramble about the page. Basic communication and use of mathematical symbolism is a weak area in presenting a complex answer with many stages. There was some evidence that candidates did not have time to complete the whole paper, but this was often caused by poor strategies on the final questions leading to lengthy and inefficient approaches to questions. It is worth noting that if a question is taking a lot of calculation or algebraic manipulation then it is not being done by the most efficient method. Also candidates must work to the accuracy demanded by the question. Premature approximation is not always appropriate and leads to inaccurate answers.

Centres should be aware that, from the November 2005 papers, it will be the practice to indicate to candidates where they are required to state the units of their answer. At present this requirement is un-prompted.

Topics that were well done included:

- Basic algebra
- Reverse percentage
- Compound interest
- Drawing histograms
- Drawing exponential graphs.

Topics which candidates found difficult included:

- Rounding to 3 s.f
- Inequalities on a number line
- Inverse proportion
- Negative fractional scale factors for enlargements
- Interpreting histograms
- Rationalising denominators
- Scale factors for areas and volumes of similar shapes
- Solving simultaneous equation when one is linear and one is non-linear.

Question 1 *(a) 7.099217566 (b) 7.10*

Part (a) was not well done. Many candidates came up with answers showing that they did not know how to use a calculator efficiently. Part (b) could be followed through but many gave answers to 3 decimal places and of those that obtained the correct answer in part (a) the majority could not round correctly to 3 s.f. A common incorrect answer was 0.2544… where the root of the numerator only was taken.

Question 2 *4.8*

This was well done by all candidates, virtually all of whom scored at least 2 marks. The common errors were not testing a 2 decimal place value to establish which 1 decimal place value was nearest to the root. As 4.8 gave a value of 5.008 many candidates thought this was close enough. However, it is a requirement that a value between $4.75 \le x < 4.8$ is tested to confirm this.

Question 3 *(a)* $^1/_9$ *(b)* $^5/_6$, $^1/_6$, $^5/_6$, $^1/_6$, $^5/_6$ *(c)* $^5/_{18}$ *or equivalent*

This was well done on the whole. Many candidates are unable to manipulate fractions which led to a loss of accuracy marks. Part (c) was the least well done part, the most common error being a failure to consider both cases where just one 4 can be obtained. Also some candidates did not realise that a probability of greater than 1 was impossible.

Question 4 *(a)* $x \geq -1$ *(b)* $x < 2$ *(c)* $-1, 0, 1$

There are still too many candidates who clearly do not understand the concept of inequalities. Solutions using an equals sign were common, which is an acceptable method if the answer is recovered. Unfortunately it rarely was. Part (b) tested knowledge of inequalities represented on a number line. Many candidates invented inequalities. Many others gave the answer $x \leq 2$. Some assumed another "end point" of –4 so lost the mark. Part (c) could be followed through from earlier wrong answers. Correct answers were rare. Some candidates do not think that 0 is an integer.

Question 5 *(a) (i)* $s^3 + 6s$ *(ii)* $7x - 2$ *(iii)* $n^2 + 6n + 9$ *(b) (i)* $a(2a + 1)$ *(ii)* $4xy^2(2x^2 - y)$

This question was well done by the majority of candidates. Part (b) was less well done than part (a) showing that factorisation is still a difficult concept for many. There were some arithmetical errors but the most common errors were $n^2 + 9$ in part (a) (iii) and a failure to fully factorise in part (b) (ii). For example $4xy(2x^2y - y^2)$ was a common wrong answer, which still scored 1 mark.

Question 6 *(a)* 4.07×10^{13} *(b) 1580 or 1600 days*

This question was quite well done but full marks were rare. Part (a) suffered from an inability to round to 3 s.f. 4.065 and 4.06 were seen more often than 4.07, but incorrect rounding or truncation in the correct standard form still scored 1 mark. Part (b) often scored 2 marks for the method of dividing by 298000 and 86400. Many errors were made in calculating the answer accurately. A lot of tolerance was allowed in this question as candidates used the idea of approximation to round numbers to 3 s.f. However, only a handful then rounded the answer to 2 or 3 s.f. Rounding to the nearest day or to 1 decimal place was common.

Question 7 *Length 23 cm, height 10cm*

This question was well done and often scored full marks. Common errors were to add the 1 cm to the diameter before calculating the circumference, adding 2 cm to the circumference for the overlap, or subtracting 1 cm from the circumference. Some also incorrectly rounded to 22.9 so lost an accuracy mark. It is worrying that a few candidates used the area formula. The height of 10 cm was almost always given correctly.

Question 8 $x = 2y - 1$

This question was a pleasant surprise. Well over half of the candidates scored full marks. Many left the answer as $(6y - 3) \div 3$ but the instruction to simplify the answer as much as possible was noted by candidates and most attempted to divide by the 3. $6y - 1$ was a common wrong answer.

Question 9 *£380*

The majority did this correctly showing an improvement on this type of question over previous years. The most common approach was the unitary method. Use of a multiplier of 0.85 was rare. A handful still calculated 15% of £323 and added this on.

Question 10 *4 years with full justification*

On the whole this question was well done. Many candidates worked out the yearly interest and added this on, then did the same for the next year and so on. Not surprisingly they found space limited. Few used the formula 4500×1.032^n. This question only covered 4 years but compound interest questions for periods of time of 10 or 20 years may well be asked in the future. In such a situation use of the multiplier will be the only viable approach. Marks were lost by not showing the value for 4 years, the candidates assuming that 'it's obvious'. Quite a few candidates used simple interest which also gave an answer of 4 years but scored no marks.

Question 11 *(a) −0.25 (b) 3*

Part (a) was well done by a majority of candidates. Careless errors in rearranging the expanded equation were the main cause of lost marks, but if the only error was made in expanding or collecting terms then 2 out of 3 marks were possible. Part (b) was less well done but showed a marked improvement on last year. Many candidates could write a correct expression for the numerator of the left hand side and go on to expand this correctly. However, about half of the candidates who got to this stage failed to combine the denominator of the left hand side with the constant term on the right. Some used a common denominator of 6. Those that managed this step almost always solved correctly. The answer of 3 could be guessed so an algebraic method had to be seen to gain any marks.

Question 12 *0.75*

This was very badly done and varied in quality from centre to centre. Marks tended to be 0 or 3. Candidates did not know how to interpret the initial statement or used $y \propto x^2$ or $y \propto 1/\sqrt{x}$. Those that did interpret the initial statement correctly almost always went on to gain full marks.

Question 13 *Correct transformation*

This was not a popular question and not all attempted it. The quality of response varied from centre to centre. Few candidates scored full marks. Many candidates clearly had no idea what a negative or fractional scale factor meant. A few used (0, −1) as the centre.

Question 14 *(a)(i) Correct histogram with bar areas in proportion (ii) 100 (b) 110*

Part (a) was well done on the whole. Space was left by the table for candidates to add a column to work out the frequency density, which many did. This was usually well done and led to a correct histogram. Marks were lost by not putting a scale on the diagram or by arithmetical errors. Many candidates used a 'key' for the scale which was acceptable. A few candidates used a scaling method, with bar 'heights' of 1, 14, 34, 10, 4 or 25, 350, 850, 250, 100, for example. These were acceptable but the easiest method is to calculate frequency density as frequency ÷ class width. Part (a)(ii) was usually correct. Part (b) was a using and applying mathematics question. There were many correct answers but an equal number of answers that could not be awarded credit as no clear method was seen. Marks were awarded for equating the area below 50 to 60 people and finding a scale factor for the area to people. If 'small squares' are used there are 90 squares below 50 and 165 above 90. This gives 1.5 squares per person leading to 165 ÷ 1.5 = 110. There are many other methods but these often involved recurring scale factors which often led to an inaccurate final answer.

Question 15 *(a) 0.51(2) (b) Correct plotting and a smooth curve*
(c) 1.2

This was well done and full marks was a common mark. Despite this being a 'rare' topic from the specification which may not be taught in depth candidates managed to understand what was required.

Errors were poor plotting, using a ruler to join points, poor drawing of a 'curved' line or misreading of scales.

Question 16 *$\frac{(2\sqrt{3} + 3)}{3}$*

This was very badly done. Marks tended to be 0 or 3. The vast majority of candidates did not know how to start this question. Of the few that did show the multiplication of the numerator and denominator by √3 , many went on to evaluate the numerator as 2 + 3 = 5.

Question 17 *2129.6 cm^3*

This is a topic that candidates found difficult. The majority gave 440 cm^3 as the answer. Basic examination technique should indicate that towards the end of a higher paper, there will be no credit for multiplying by 2.2. The few that understood the concept almost always gained 2 marks.

Question 18 *327 cm^2*

This was a using and applying mathematics question and required candidates to show a logical method and knowledge of the surface area of a cone formula. The marks were awarded for knowing that the slant height of the top cone was 13cm. It is not unreasonable to expect candidates at the A/A* level to know that 5, 12, 13 is a Pythagorean triple. However, only a handful stated this result. The majority used Pythagoras' theorem to work it out. The next two marks were for working out the slant height of the bottom cone using Pythagoras' theorem.
The next mark was for using the formula πrl. Pleasingly many candidates showed a complete method. Marks were lost by using 7.8 as the slant height of the bottom cone leading to an inaccurate final answer. Premature approximation in such questions will lead to inaccuracy. Intermediate values should always be used to at least 4 s.f. Many candidates used 12 and 6 in the πrl formula. Some also included the area of the "common" circle in their working which was ignored unless it affected the final answer.

Question 19 *5.36 cm^2*

This was a using and applying mathematics question. It was pleasing that some students had a strategy which was often clear and well explained. The angle at the centre of the sector (71.4°) needs to be found. Simple trigonometry will do this although the cosine rule was used by many candidates. The more successful were those who found the half angle. Unfortunately they rounded it before doubling it so an accurate final answer was rarely seen. The area of the sector, using the formula $\theta/360 \times \pi \times 36$, and the area of the triangle are then found and the difference calculated. A very common error was to take the angle as 90°. Other errors were careless arithmetic and premature approximation.

Question 20 *(1, 3) and $(-{}^2/_3, {}^4/_3)$*

This is the second year this type of question has been set. It is a new topic in the specification and does not seem to be familiar to many candidates. Candidates who knew how to approach the problem mostly substituted for y in the second equation. A few errors then occurred in rearranging this to a quadratic. Candidates who substituted for x to get $y = 3(y - 2)^2$ and then expanded this to $y = 3y^2 - 12y + 12$, tried to factorise $3y^2 - 12y + 12 = 0$. Both possible quadratics factorise but many tried to solve by the formula, which was not usually successful. For full marks the x and y values needed to be calculated. Many candidates stopped after finding just x or y.

Question 21 *29.8 cm*

This is a multi-step question. The value of AC^2 needs to be found using the cosine rule, then Pythagoras' theorem is used to find *DC*. Many candidates followed this procedure and apart from premature approximation (rounding AC^2 to 97 and *AC* to 9.9 or 10,) scored 4 or 5 marks. A common error was evaluating *AC* as 4cos75 which is caused by calculating $(b^2 + c^2 - 2bc)\cos 75$. Other common errors were using Pythagoras' theorem or trigonometry on triangle *ABC* to get *AC*, or forgetting to add 22 to get the final perimeter.

Question 22 *7.7 cm*

This is another using and applying mathematics question, which has redundant information in that the height of the tank and the depth of the water are not needed. This caused some candidates to work out two volumes and then subtract which was a little unnecessary. However, there were some good solutions which was pleasing to see. Many candidates scored 5 marks. The first two marks were scored by calculating the extra volume as 1912.5cm^3. Many failed to do this. Some simply divided 4.5 by 4 and then equated this to the volume formula which gave an unreasonable answer. The extra volume needs to be equated to the volume of a sphere formula which then needs to be rearranged to make r^3 the subject. Poor algebraic skills lost marks here. Many candidates used $4/3\pi r^2$ as the volume formula.

GCSE Mathematics Coursework

General

Examiners and moderators reported that the majority of candidates were better prepared for this coursework component especially with regard to the handling data task. The using and applying task was invariably better than the handling data task although both tasks suffered from too much repetition and too little development.

Many examiners and moderators felt that candidates were disadvantaged by a lack of understanding about the requirements of the coursework, especially the handling data task. In too many centres, the work followed the same format making use of the same calculations and representations. Many of the tasks set were decided by the centre and not the candidates.

Administration

Examiners and moderators reported that the vast majority of centres were well organised although, an increasing number of centres failed to meet board set deadlines for the submission of the work. For a small, but significant number of centres, there were still problems over incorrect candidate record forms being used or else forms being completed incorrectly; missing names, missing numbers, missing totals and, in a few instances, incorrect totals.

Centres are reminded that:

- all work submitted must be authenticated by the teacher **and** the candidate;
- it is expected that sufficient work is undertaken under the direct supervision of a teacher for the work to be authenticated;
- the use of plastic wallets and elaborate folders to contain coursework is discouraged – treasury tags are much better;
- coursework presented should be sequenced with page numbers and should identify candidate details on each page.

The following comments are offered under each of the three strands for the using & applying task:

1 Making and monitoring decisions to solve problems

This strand is about deciding what needs to be done, then doing it**.** The strand requires candidates to select an appropriate approach, obtain information and introduce their own questions which develop the task further. For the higher marks candidates need to analyse alternative mathematical approaches and apply, independently and extensively, a range of appropriate techniques.

2 Communicating mathematically

This strand is about communicating what is being done using words, tables, diagrams and symbols. Candidates should consider the appropriateness of their chosen presentation and amend this as necessary. For the higher marks candidates will need to use mathematical symbols accurately, concisely and efficiently in presenting a reasoned argument.

3 Developing skills of mathematical reasoning

This strand is about testing, explaining and justifying what has been done and requires the candidate to search for patterns and provide generalisations. Generalisations should then be tested, justified and explained. For the higher marks candidates will need to provide a sophisticated and rigorous justification, argument or proof which demonstrates a mathematical insight into the problem.

The following additional comments from moderators' and examiners' reports might be useful to centres in preparing candidates for the using and applying mathematics coursework:

Making and monitoring decisions to solve problems

- the provision of three correct results is sufficient for an award of mark 3 under this strand;
- candidates should be encouraged to ensure a systematic rather than random approach to their work;
- an award of mark 5 can only be given where the task is independently extended and generates a further solution;
- an award of mark 6 is appropriate where the candidate 'pulls together' their various investigations:
- the inclusion of an algebraic formula is, on its own, insufficient to suggest an award of mark 6;
- an award of mark 7 can only be given for co-ordinating three features or variables;
- an award of mark 8 is appropriate where candidates explore a task independently - similar work is not likely to be independent;
- a fleeting glimpse of calculus is not sufficient for an award of mark 8 as the work must be extensive and sustained for such an award.

Communicating Mathematically

- candidates should not waste time drawing tables and/or graphs unless they are relevant and are commented upon and used in the work;
- candidates should be encouraged to make better use of algebra to provide a commentary;
- an award of mark 5 can only be given (as best fit) where candidates make **use** of algebra rather than making an algebraic statement;
- the use of algebra for proving and justifying must be **accurate and convincing** if it is to be awarded any marks;
- centres are advised to check the accuracy of algebraic manipulation and ensure that all working is clearly shown;
- pattern spotting is not a higher level technique and an algebraic approach to the work is necessary for the higher marks.

Developing skills of mathematical reasoning

- where generalisations are written down it is important that they are adequately explained in the text to confirm the candidate's own understanding;
- testing should only be undertaken on generalisations which arise from the candidate's own work;
- testing should be carried out on new data and include a comment to confirm whether or not the test was successful or not;
- an award of mark 5 can only be given where candidates demonstrate **why** a generalisation works
- an award of mark 7 under this strand can only be given where strand 1 has been awarded a mark of 7 or 8;
- an award of mark 8 would usually require the candidate to give some consideration to the conditions under which their proof remains valid.

The following comments are offered under each of the three strands for the handling data task.

1 Specifying the problem and planning

This strand is about choosing a problem and deciding what needs to be done then doing it. The strand requires the candidate to provide clear aims, consider the collection of data, identify practical problems and explain how they might overcome them. For the higher marks, candidates need to decide upon a suitable sampling method, explain what steps were taken to avoid possible bias and provide a well-structured report.

2 Collecting, processing and representing the data

This strand is about collecting data and using appropriate statistical techniques and calculations to process and represent the data. Diagrams should be appropriate and calculations mostly correct. For the higher marks, candidates need to accurately use higher level statistical techniques and calculations from the Higher tier GCSE mathematics specification content.

3 Interpreting and discussing the results

This strand is about commenting, summarising and interpreting data. The discussion should link back to the original problem and provide an evaluation of the work as a whole. For the higher marks, candidates need to provide sophisticated and rigorous interpretations of their data and provide an analysis of how significant their findings are.

The following additional comments from moderators' and examiners' reports might be useful to centres in preparing candidates for the handling data coursework:

Specifying the problem and planning

- greater consideration needs to be given to planning of the task and the choice of sample;
- little thought was often given to the sample size and why 30 people or 100 words might be an appropriate sample size;
- little detail was given of how the sampling was actually undertaken in order to avoid bias and ensure that it was truly representative;
- many of the hypotheses set were rather simplistic and little consideration given to how the work might be extended/developed;
- candidates are encouraged to pursue one hypothesis in some depth rather than a number of hypotheses superficially;
- an award of mark 5 can only be given if the task is substantial and developed beyond the original task;
- for the higher marks, the work requires careful specification and evidence of extensive, independent thought;
- candidates should be encouraged to make greater use of control groups and/or pre testing.

Collecting, processing and representing the data

- the inclusion of mean, median, mode and range is not always appropriate for all tasks so that calculations need to be considered for their relevance to the problem;
- too many representations were too small or too inaccurate to provide useful information - not all graphical work made use of graph paper;
- calculations should be accurate so that giving the frequency of the mode rather than the mode should not be credited;

- statistical representations and calculations add little to the task unless their inclusion is explained and the outcomes interpreted;
- the use of representations such as box plots and stem and leaf diagrams are appropriate for much of the work seen;
- cumulative frequency diagrams are most appropriate for continuous and/or grouped data;
- the use of standard deviation alone is not an indicator for the higher marks unless it is appropriate, explained and interpreted.

Interpreting and discussing the results

- comments such as "mean =" or "range =" which are related to the task are often worthy of some marks under this strand;
- too often, conclusions provided made little use of the representations and calculations undertaken;
- conclusions provided should always be related back to the original hypothesis;
- suggestions that the hypothesis is proven or disproven need to be backed up with evidence from the candidate's own work;
- comments on representations and calculations were often too descriptive and do not interpret the findings in terms of the hypothesis being investigated;
- candidates are still failing to evaluate their strategy (all of the work) thus limiting their marks under this strand;
- suggestions for improvement often mentioned larger sample sizes but this, alone, is hardly indicative of grade C work;
- for the higher marks, there was little evidence of candidates recognising possible limitations to their strategies.

Option T Teacher-Assessed

General

The tasks set were generally appropriate and allowed candidates to make progress against the criteria on each of them. AQA set tasks were particularly popular especially the 'Number Grid' and 'Read all about It' tasks. However, these tasks occasionally suffered from over-direction from centres so that work followed the same format with little evidence of candidates really understanding what they were doing.

Moderators reported that some centres were still setting inappropriate tasks and, in particular, higher marks were often limited by a number of inappropriate tasks which concentrated too much on the repeated application of a narrow range of (Higher Tier) mathematical techniques. Tasks such as investigating $y = ax^2 + bx + c$ or else investigating the area under a curve often suffered in this way.

Similarly, tasks such as those titled "The Average Student" are not always appropriate for assessment under these criteria as the work often fails to make use of a hypothesis which candidates are expected to pursue. Furthermore, where candidates are given secondary data, there must be sufficient for candidates to undertake sampling covering a number of different possibilities.

Assessing the coursework

Overall, the work was marked accurately against the coursework criteria and the further exemplification provided by AQA which was written in conjunction with the other awarding bodies. In a small number of centres there were difficulties such as generous marking at the top end of the mark range and work which is under-valued at the bottom end of the mark range.

The handling data task was not always marked so accurately and centres attention is drawn to the documentation already provided in the AQA Teachers' Guide as well as the latest information from the Joint Council for General Qualifications (dated November 2003) which was recently sent to all schools.

Centres should be aware that the provision of AQA set mark schemes is intended to provide suggestions for possible routes through the AQA set tasks. The teachers notes provided in the right hand column are not intended as a replacement for the minimum requirements and original criteria against which all tasks should be marked. The AQA mark schemes from August 2002 have now been replaced with the more general "Further Exemplification" documents.

Annotation and further information

Moderators confirmed that information about the tasks was usefully provided by centres who also made good use of the Candidate Record Forms to support and justify their assessment of the candidate's work. Annotation within the script was less evident although, where this was provided, moderators were more easily able to provide useful feedback to the centres.

Option X Externally-Assessed

General

The AQA set tasks allowed candidates the opportunity to make some progress against the given assessment criteria and thus gain credit for their performance. Much of the work received from individual centres was very similar making it difficult to differentiate between the responses of different candidates. Supporting information, where provided by the centre, was always found to be most useful.

In a number of cases, the work presented was more repetitive than developmental so that most of the marks were awarded on the first few pages and subsequent work did little to develop the task further. In particular, the emphasis on collecting information rather than analysing information was particularly prevalent.

The most popular using and applying mathematics task seen was 'Number Grid' but much of the work received from individual centres was very similar in terms of content and routes through the problem. In particular, too many justifications of the generalisation included algebraic manipulation which lacked rigour and correct answers often followed from incorrect working.

The most popular handling data task was 'Read all about it' and candidates made good progress by providing comparisons between different types of newspapers or newspapers and magazines. However the task was rarely extended further to produce a substantial task and, even where candidates considered word length and sentence length, the work was rarely pulled together.

Too much work presented was often repetitious and showed little evidence of any statistical thinking or development. Centres are reminded that it is not a requirement of coursework that newspaper and magazine articles are laboriously copied out by hand – original copies are quite acceptable.

The 'Guestimate' task was also a popular choice, providing opportunities for sampling to take place, but rarely giving sufficient detail on how this took place. 'Pulse rates' and 'Reaction times' were less favoured and centres' attention is drawn to the useful 'Census at School' website which contains a very helpful means of collecting sets of reaction times much more quickly.

Annotation and further information

Annotation is not required for work submitted under this version but any information about how the task was undertaken or any comment to explain the candidate's thinking will be considered by the examiner in the marking of the work.

The following statement has been issued on behalf of all awarding bodies in England, Wales and Northern Ireland:

Last year there was a change to the coursework requirement for all GCSE mathematics specifications in that two tasks are now mandatory. The previous practice of marking the two pieces against the assessment criteria and selecting the better mark in each of the three strands no longer applies and all six strand marks now count (there are new criteria for the handling data task).

Previously the agreed notional grade boundaries for grades A, C and F were 20, 14 and 8 respectively out of 24 and this would suggest revised boundaries of 40, 28 and 16 out of 48 for the current year. In order to alleviate any initial problems encountered by the changes to the coursework requirement all awarding bodies agreed to set reduced boundaries for the June 2003 examinations with A, C and F being fixed at 37, 26 and 14 respectively. These boundaries have been continued for 2004 but it should not be assumed that they will remain at this reduced level in future years.

Further support

Additional support to centres is provided through AQA's network of coursework advisers who are assigned to each centre. Further details and contact details for coursework advisers can be obtained by contacting the AQA (Manchester) office.

Mark Ranges and Award of Grades

In this specification, scaled marks are the same as raw marks

Foundation tier written papers (29765 candidates)

Component	Maximum Mark (Raw)	Maximum Mark (Scaled)	Mean Mark (Scaled)	Standard Deviation (Scaled)
3301/1F	100	100	48.0	16.0
3301/2F	100	100	42.6	16.3

Grade	Max. mark	D	E	F	G
3301/1F scaled boundary mark	100	64	50	37	24
3301/2F scaled boundary mark	100	56	42	28	14
Uniform boundary mark for each written paper	143	120	96	72	48
Uniform boundary mark for the Foundation tier overall	406	300	240	180	120

Intermediate tier written papers (64135 candidates)

Component	Maximum Mark (Raw)	Maximum Mark (Scaled)	Mean Mark (Scaled)	Standard Deviation (Scaled)
3301/1I	100	100	50.9	17.3
3301/2I	100	100	51.7	15.2

Grade	Max. mark	B	C	D	E
3301/1I scaled boundary mark	100	67	49	36	23
3301/2I scaled boundary mark	100	65	49	36	23
Uniform boundary mark for each written paper	191	168	144	120	96
Uniform boundary mark for the Intermediate tier overall	502	420	360	300	240

Higher tier written papers (29515 candidates)

Component	Maximum Mark (Raw)	Maximum Mark (Scaled)	Mean Mark (Scaled)	Standard Deviation (Scaled)
3301/1H	100	100	52.6	17.2
3301/2H	100	100	57.5	19.3

Grade	Max. mark	A*	A	B	C
3301/1H scaled boundary mark	100	71	56	39	22
3301/2H scaled boundary mark	100	78	57	39	22
Uniform boundary mark for each written paper	240	216	192	168	144
Uniform boundary mark for the Higher tier overall	600	540	480	420	360

Coursework (centre assessed) (101266 candidates)

Grade	Maximum Mark (Raw)	Maximum Mark (Scaled)	Mean Mark (Scaled)	Standard Deviation (Scaled)
3301/TC	48	48	28.0	9.0

	Max. mark	A*	A	B	C	D	E	F	G
Scaled Boundary Mark	48	43	37	31	26	22	18	14	10
Uniform Boundary Mark	120	108	96	84	72	60	48	36	24

Coursework (externally assessed) (22149 candidates)

Grade	Maximum Mark (Raw)	Maximum Mark (Scaled)	Mean Mark (Scaled)	Standard Deviation (Scaled)
3301/XC	48	48	24.3	6.7

	Max. mark	A*	A	B	C	D	E	F	G
Scaled Boundary Mark	48	43	37	31	26	22	18	14	10
Uniform Boundary Mark	120	108	96	84	72	60	48	36	24

Provisional statistics for the award

Foundation tier (29765 candidates)

	D	E	F	G
Cumulative %	15.9	47.8	76.0	91.2

Intermediate tier (64135 candidates)

	B	C	D	E
Cumulative %	17.6	54.2	83.7	95.8

Higher tier (29515 candidates)

	A*	A	B	C
Cumulative %	13.0	44.9	82.3	98.2

Overall (123415 candidates)

	A*	A	B	C	D	E	F	G
Cumulative %	3.1	10.7	28.8	51.7	70.8	84.8	91.6	95.2

Definitions

Boundary Mark: the minimum (scaled) mark required by a candidate to qualify for a given grade. Although component grade boundaries are provided, these are advisory. Candidates' final grades depend only on their total marks for the subject.

Mean Mark: is the sum of all candidates' marks divided by the number of candidates. In order to compare mean marks for different components, the mean mark (scaled) should be expressed as a percentage of the maximum mark (scaled).

Standard Deviation: a measure of the spread of candidates' marks. In most components, approximately two-thirds of all candidates lie in a range of plus or minus one standard deviation from the mean, and approximately 95% of all candidates lie in a range of plus or minus two standard deviations from the mean. In order to compare the standard deviations for different components, the standard deviation (scaled) should be expressed as a percentage of the maximum mark (scaled).

Uniform Mark: a score on a standard scale which indicates a candidate's performance. The lowest uniform mark for grade A* is always 90% of the maximum uniform mark for the component, similarly grade A is 80%, grade B is 70%, grade C is 60%, grade D is 50%, grade E is 40%, grade F is 30% and grade G is 20%. A candidate's mark for each component is converted to a uniform mark and the uniform marks for the components are added in order to determine the candidate's overall grade. By agreement with the regulatory authorities, overall grades are restricted to the range available for the tier of entry. Thus, on the Intermediate tier (grade range B-E) a candidate who obtains a total uniform mark above the grade A threshold will receive grade B, while a candidate who obtains a total uniform mark below the grade E threshold will be Unclassified.