RECOGNISING ACHIEVEMENT

GCSE

Mathematics C

General Certificate of Secondary Education **J517**

Report on the Units

June 2009

J517/MS/R/09

Oxford Cambridge and RSA Examinations

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REPORT ON THE UNITS

Chief Examiner's Report

General Comments

This was the second summer of aggregating two-tier GCSE mathematics, although the first occasion that coursework was not part of the specification.

In comparison with last summer, teachers and candidates seemed more aware of the structure of the terminal papers, that 50% of the marks are targeted at the bottom two grades of the tier. This year good candidates were losing fewer marks on the easier work which they will have first met some time previously.

The pattern of entry for the two terminal papers was continued from last year, with more sitting the higher tier than the foundation tier. Likewise, the trend of increased entries for the higher modules has continued as this specification gives the opportunity for strong candidates to show what they can do at a high level, (as well as having plenty of modules for the smaller entry of weaker candidates). Hence the overall percentages of candidates gaining a grade C and a grade A have shown a small increase for this first aggregation of J517 compared with last summer's J516.

In the first year without Key Stage 3 tests, there was also an increased number of year 9 students sitting their first module this summer. Centres should note that year 9 candidates who sit module tests next year will only be able to count them towards their GCSE if they aggregate J517 by January 2012.

Of course the J517 modules can be used as a stand-alone replacement assessment for KS3 if centres wish, for year 9 students aiming for GCSE aggregation in June 2012. Many centres this year used the March examinations for their year 9 cohorts, as the receipt of results in late April helps inform setting decisions for GCSE and assessing students' levels at the end of KS3.

The draft specifications (for teaching from September 2010) are currently awaiting feedback from Ofqual and these specifications and the draft specimen assessments may be viewed on the OCR website at www.ocr.org.uk – the new Mathematics B specification (J566) is the successor to J517.

B271: Module M1

General Comments

Performance was similar to that on the equivalent module sat last summer. There was a wide spread of marks in both sections of the paper, but overall candidates tended to do better on Section B than Section A, with an average (and statistically significant) margin of about 0.5 marks. This margin increased to 3 marks for the least capable, but was negligible for the most capable.

There were relatively few instances of questions not being attempted. In terms of omissions Questions 2(d), 3(b) and 7(c) were the worst with omission rates ranging from about 15% to 30%. There were no obvious instances of candidates misinterpreting the rubric, although there was some evidence that in Question 4(b) some candidates focused on ‘write down any measurements you use’ and gave the length of one side of the pentagon as their final answer. The overall standard of presentation was generally satisfactory, both number work and handwriting were legible in the great majority of cases. Candidates completed the paper within the time allowed.

In common with previous years there were candidates who failed to write down working and as a consequence failed to gain any of the available method marks; this was particularly evident in Questions 2(b) and 14.

Areas where candidates appeared to have improved on their performance compared with last summer included: recall of number facts (Question 5), listing outcomes (Question 9) and finding the value of unknowns (Question 12).

Areas which candidates found particularly challenging were: points of the compass (Question 2(c)), interpreting some aspects of multiple bar charts (Question 6(b)), indentifying parts of a circle (Question 7(c)) and converting between different metric units (Question 2(d)).

Areas where candidates performed best overall included: interpreting tables (Question 1(a)(i)), recall of number facts (Question 5(a)), coordinates (Question 7(a)), listing possible outcomes (Question 9) and finding unknowns (Question 12).

Comments on Individual Questions

Section A

1 (a)(i) A very well answered question, with over 90% of candidates gaining full credit. Those who gave depth and location rather than name gained full credit.

(ii) A liberal approach was taken to candidates’ less than perfect spelling. A few responded with ‘one-six-zero-two’, but overall a very well answered question.

(iii) This was found to be challenging by the least capable, with only about a fifth of these able to give the correct response. Common wrong answers included ‘1740’, ‘30’ and ‘700’.

(b) A relatively common wrong answer was '80' and there were a noticeable number of instances where candidates subtracted the two depths resulting in an answer of '40'. Partial credit was available when it was clear that the sum of '25' and '65' was attempted. Some candidates who merely gave the answer '80' may well have lost this credit as only a few percent of all candidates gained this partial credit.

2 **(a)** A common wrong response was '14', but this gained partial credit. There were a few instances of candidates wrongly adding up the total number of caves. Over half of the least capable gained at least partial credit.

(b) Candidates tended to show very little working and as a result lost the chance of any partial credit for incorrect answers. Almost a quarter of all candidates failed to gain any credit. Overall the vast majority of candidates used the correct money notation.

(c) Found challenging by many, with almost two thirds of all candidates failing to gain any credit.

(d) As in previous sessions conversion between different decimal measures was found very challenging; only about 25% of candidates were successful. Most realised that a power of ten was involved, but were unsure which one. Common wrong answers included '2800', '1400·00' and '140000'.

(e) A frequent wrong response was '50 minutes'; the result of incorrect addition or merely repeating the question. All commonly used time notations were allowed.

3 **(a)(i)** A common wrong answer was '4', possibly a result of adding the dots and interpreting the bars as representing addition.

(ii) In common with part (i), '2' was a frequently seen wrong answer.

(b) A popular incorrect answer was '18 dots', with the suggestion that the horizontal bars represented addition. The least capable found this part question too great a challenge, with only one in ten of them being successful.

4 **(a)** Many candidates appear to regard any polygon having more than 4 sides to be a hexagon and fewer gave 'octagon'. Nevertheless the majority of candidates were successful.

(b) Many candidates gave '4' as their answer, possibly as a result of wrongly interpreting the instruction 'write down any measurements you use'. Very few gained partial credit for showing that the answer required a '×5'.

(c) As might have been predicted there were a number of instances of candidates confusing perimeter and area. Some of the more capable found this part question a challenge.

5 **(a)** It was evident that a number of candidates were insecure in their recall of the multiplication tables. However, well over three quarters of candidates were successful.

(b) A variety of methods were seen, but this fairly direct question was not as well answered as expected. Just under two thirds of all candidates gained the mark.

Section B

6 **(a)** Well answered, but with ‘42’ as a common error, probably resulting from reading the higher bar or wrongly assuming that each graduation represented two medals.

(b) The most commonly seen wrong answer was ‘1996’, but a well answered question by candidates of all level of capability.

(c) There was a tendency for candidates to merely list ‘35, 30 and 29’ with no further working in evidence. Answered correctly by just over half the candidates.

7 **(a)** A very well answered question – by all capabilities.

(b) Reverse coordinates (i.e. assuming that Jade was correct) was by far the most common error. However, poor number writing sometimes lead to confusion between ‘5’ and ‘3’. Over half of all candidates gained full credit.

(c) Found challenging despite rather wide error margin given for the measurement. It was apparent that a large number of candidates were not secure in identifying parts of a circle. There was no consistent evidence that candidates were confused between ‘radius’ and ‘diameter’. Almost three quarters of all candidates failed to gain even partial credit; for least and average capability candidates this rose to almost nine tenths.

8 **(a)** A fairly well answered question. The most popular wrong answer was ‘11’ – more than likely a misread of ‘directly above 11’ or ‘directly beneath 16’; perhaps a result of assuming the tower block was only 3 floors high.

(b) The great majority of candidates realised that ‘5’ was involved and it was pleasing to note a number of candidates, albeit a small proportion, mentioning ‘multiples of 5’. On the whole a moderately well answered question.

9 A very well answered question, but with instances of adding numbers not given in the question or copying down the two arrangements already given – despite the strong suggestion that not all spaces would be needed (writing the arrangements with ‘1’ leading fills all six rows).

10 A well answered question but with a notable number of instances where candidates either did not use or did not have access to rulers. However, credit was given providing there was clear intent.

11 **(a)** Just under a half of all candidates gained full credit. Many candidates merely write down some odd numbers ignoring the instruction that they must be divisible by 5.

(b) Marginally better answered than part (a), with similar errors but for even numbers.

12 **(a)** A very well answered question, with ‘24’ the most common wrong response.

(b) Very well answered, but not quite as well as (a). The two most common wrong responses were ‘7’ and ‘6’, possibly originating from errors in counting on.

13 Less than a quarter of all candidates gained full credit, but the great majority gained partial credit. 'At least one marble' (certain) and 'one marble' (unlikely) tended to be the most popular correct matchings.

14 Just over a third of candidates gained full credit. A relatively large number of candidates showed no working, and so may well have lost any available partial credit should their answer have been incorrect. Nevertheless some good examples of clear, logically laid out working were seen. The reverse subtraction was seen a number of times. A common wrong answer (but with partial credit available if there was evidence of correct identification of cheapest and/or most expensive sunglasses) was '£17·19'. This was no doubt a result of merely finding the differences in the individual digits rather than performing the correct calculation.

B272: Module M2

General Comments

Candidates scored a full range of marks on this paper and all questions appeared accessible to the majority of candidates.

There was the usual tiny minority of candidates who made no attempt at any question but the number who left some questions completely blank was pleasingly small (with the particular exceptions outlined below).

Many candidates attempted to show some working although this was sometimes haphazard and revealed a lack of comprehension of standard processes. Examples of this are the repeated addition of 6 to accomplish 18 × 6 and trial and improvement of possible answers to replace division.

Centres would be advised to:

- Practise questions in which a diagram or table has to be added to or completed
- Reinforce efficient methods for multiplication and division
- Encourage the use of rulers
- Practise reading questions that require extended answers and deciding upon and structuring strategies to answer these.

Comments on Individual Questions

Section A

1 **(a)(i)** Some candidates realised that 25% was the same as ¼ and attempted to divide £6·20 by 4 through the mechanism of division by 2 and then 2 again. £3·10 was sometimes seen but the subsequent £1·55 was much less common. Dividing £3 by 2 (with some additional pence) clearly represented a major challenge.
No candidates appeared to attempt 10%.

Some candidates wrote apparently unrelated numbers, such as £4·10, without working.

(ii) Most candidates simply repeated the answer from part (a)(i).
Where subtraction was attempted basic errors were often made.

(b) Many candidates gained some marks by halving £234 (= £117). Even this caused many problems and £112 was a common wrong answer.

Few candidates went on to successfully share the remaining amount between the five friends. Where a candidate did realise that the cost needed to be divided, the attempt was frequently made by summing five numbers to get near to the expected amount.

Centres need to practise the re-reading of questions to highlight steps in a possible solution and to reinforce the process of division.

2 **(a)** This question was commonly left blank despite the demand being placed immediately below the row that needed completing.

It is quite common for candidates to fail to complete an aspect of a table (or graph) and centres should highlight such requirements to learners.

(b) Many scored full marks although 'Elvis Presley' was a common incorrect answer to the question '...earned the most money in 2006'. (Maybe caused by misreading part (a))

(c) Many understood that the middle term was required but not that the numbers had to be in order first. As a result 58 was a common error.

(d)(i) This question was quite well answered, although the addition of 3·7 and 12·6 did cause some problems.

(ii) This was often less well answered, possibly because subtraction was involved. Candidates who had shown working in part (i) often failed to show working here. 9, without working, was a common wrong answer.

3 **(a)** One of the first two answers was frequently correct (although a temperature rather than a place was often written) but many failed to read the final sentence to the end and wrote $^{-}8$.

(b) A disappointingly large number wrote 'anticlockwise'.

(c) Many answers of 108 were achieved, often by VERY inefficient methods. Candidates gained a mark for 18 × 6 but those who attempted to add eighteen sixes often lost count. Grid methods (usually the most successful) were rarely seen.

24 (18 + 6) was a common wrong answer.

Section B

4 **(a)** This was well answered although 'cone' and, less often, 'cuboid' were both seen.

(b) Candidates were much less successful with part (b) than part (a). The mode mark was 1. Candidates reversed cone and cylinder, often saw the cylinder as a cuboid and regarded the top solid as a triangle.

5 **(a)(i)** A significant minority of candidates could not spell 'Octagon' with oxygen and oxtagen being just some of the spellings.

Hexagon was a common wrong answer.

(ii) This was reasonably well answered although many shaded the cells at the bottom of the shape to give a shape that would have rotation symmetry.

(b) Many candidates struggled to find the correct reflection.
Questions 4 and 5 highlighted a general difficulty with spatial concepts.

6 **(a)** A surprisingly large number of candidates continued each sequence but did not select the second one as the correct sequence. This seemed to show that candidates saw what looked like a 'continue the sequence' question and did not read all the instructions. Some even ticked 'she is wrong'.

(b) This was well answered. A common error was to think that the sequence decreased by 4 (counting the numbers between the stated terms).

(c) This part was also well answered (although quite a number of slips were made in calculating one of the terms). Many clear descriptions were seen.

7 **(a)** This was well answered although 12 and, sometimes, ¼ were seen.

(b) 3 was often given although many candidates were not able to justify this.
A common wrong answer was, 'Because she wants to shade 3 and she cannot shade 0…' (From 0·3).

(c) Eight squares were frequently selected. These were usually shaded (roughly or scribbled) and not drawn as a complete shape. These cases did not gain full marks.

Where a perimeter was drawn a ruler was very rarely used.

(d) A large number of correct answers were seen. However, many added 4 and 3 and did not multiply them. Many gained a mark for dividing a number by 2, showing use of one part of the formula.

8 The best candidates scored 4 marks. However, although many candidates could identify B, few gained more than 2 marks.

9 **(a)** Many correctly selected 'black' but a frequent wrong answer was 'blue and purple'.

(b)(i) Candidates often scored 1 mark, usually for identifying that it was impossible to select a green pen.

C was a common wrong answer for selecting a purple pen.

(ii) This part, where a diagram had to be added, was another case in which some candidates gave 'no response'. Where P was placed between A and B the placement was done without apparent use of a ruler.

B273: Module M3

General Comments

The full range of scores was seen from candidates on both sections of this paper. The majority were able to complete each section in the available time. However some candidates clearly found this module very challenging and, having been entered at too high a level, made little or no attempt to answer any of the questions.

Many candidates failed to gain marks as they had not shown working.

The areas of strength were reading and interpreting graphs, and one step equations.

There was evidence of real difficulty dealing with decimals, multiplying and dividing by ten and a hundred. Many candidates had the correct digits, but incorrect place values.

Some candidates appeared not to have access to a calculator for section B.

Comments on Individual Questions

Section A

1 **(a)** Many failed to understand place value. 3·15 and 45 were common incorrect answers.

(b) Reasonably well answered. Common errors were 2750 and 2·750.

(c) Rarely correct. Some answers of 24 were seen while others attempted multiplication.

(d) Reasonably well answered. Some weaker candidates gave answers greater than 40. 5 was a common incorrect answer.

(e) Many candidates scored 1 mark for showing either 5 or 15. Some candidates then added these together to give the answer 20.

2 **(a)(i)** Mainly correct.

(ii) Mainly correct. Of those who were incorrect 10 and 12 were the most common answers.

(iii) Mainly correct. Candidates should be encouraged to use a ruler when drawing a straight line.

(b) Very few correct answers. Candidates used a variety of techniques: adding all the numbers, or finding the mean or median.

(c) Poor. Candidates again had difficulty with place value. Common errors were; 2·6800 and 3·68.

(d)(i) Generally well answered. There were a small number of candidates who gave the answer 12·95. Several candidates drew clock faces to help them.

(ii) Generally well answered.

3 **(a)** Many candidates scored 1 mark. Several appeared not to understand enlargement and reflected the shape.

(b) Vague descriptions, ‘too big’, ‘too many squares’ prevented many candidates scoring marks. Others were trying to use scale factor 2 rather than 3.

4 Very few candidates scored all 4 marks. Many scored 1 for 130. Others only attempted to find 20% of the child’s price. A lack of working prevented several candidates from scoring marks. Many were unable to work out 20% and merely subtracted 20.

5 **(a)** Many correct answers. 10 was a common incorrect answer as some candidates had read from the wrong axis.

(b)(i) Generally correct.

(ii) Many candidates used \$60 rather than £60. Some stated ‘double the amount in dollars’, while others stated ‘halving’. A small number of candidates had understood what was expected, but many tried to visualise an extended graph.

Section B

6 **(a)** Many correct responses. Several candidates did not attempt this question, which may have been due to not having a calculator. Common errors were multiplying by 2 to get 34, and 4·1 from working out the square root.

(b) Again several did not attempt this question. Of those who did many correct answers were seen. A small number found the square rather than the square root.

7 **(a)** Generally well answered. A small minority used incorrect form or words. Some wrote only the numerator.

(b) Generally well answered.

8 **(a)** Generally well answered. The majority of candidates scored at least 1 mark.

(b) Poor. Many candidates did not understand how to use isometric paper, many drew a horizontal line. Others did not placed vertices on the dots.

9 **(a)** Generally correct.

(b) Generally correct.

(c) Generally correct. A small minority substituted the correct value into the equations but then wrote only the original answer on the answer line in all parts. Candidates need to understand the value of x should be written on the answer line.

10 36 and 30 were common incorrect answers. Many candidates clearly did not understand that they had to divide by 6; of those that did many failed to realise they had to multiply the answer by 5.

11 **(a)** Generally well answered by candidates of all abilities. 63 was the most common incorrect answer.

(b) Many lost marks by not showing working. Several students had attempted to find the median. Some candidates had added the numbers, but then appeared not to know what to do. 328 and 3280 were common incorrect answers.

(c) Many candidates had correctly measured the length but were unable to apply the scale. 3·5 and 7 were common incorrect answers.

(d) Poor. Several candidates did not know they needed to divide by 1000. 48·5 and 485 were often seen. Others thought they had to divide by 2.

12 **(a)** Well answered by candidates of all abilities.

(b) Fewer candidates appeared to know what to do in this part. Several candidates merely substituted *d* for 7 and did 37 + 5 = 42.

(c) Many candidates were unable to explain their reasons. Some just stated yes or no. Of those who converted to 250 ml many did not always back this up to score the second mark. ¼ of a litre was often incorrectly converted to 25ml or 40ml. Several did correctly add and scored 1 mark for 1100, but failed to explain that 1100ml was more than 1 litre.

B274: Module M4

General Comments

A full range of scores was seen from candidates and they had sufficient time to complete the paper. Most candidates attempted most of the questions indicating that they had been well prepared for the module.

Many candidates struggled with the explanations required in some answers; this was rarely related to poor language skills, but more often a failure to use or understand mathematical terminology.

Omission of working caused candidates to lose method marks. Answers often suggested that they had been attempting to use the correct method, but with no working seen this could not be credited.

Comments on Individual Questions

Section A

1 **(a)(i)** This was well answered, although some candidates omitted, or misplaced, the decimal point.

(ii) Multiplication was found harder than addition, and grid methods were common here. Arithmetic errors were often seen and the decimal place was sometimes omitted or misplaced.

(b) Candidates found it easier to identify the smallest number; those who got this wrong often selected 0·45. The largest number was commonly given as 0·504 by candidates who thought that three decimal places meant that the number was larger.

2 **(a)** Candidates were usually correct with dishwasher for the first answer, but had more problems with the second. Answers of mobile phone, dishwasher and computer appeared regularly.

(b) Some good explanations were seen here where candidates quoted figures from the bar chart or compared the sizes of the bars. Those who used numbers usually estimated as 35 and 65 and did not have problems with the approximate nature of the doubling. Candidates who did not score often gave an explanation that repeated the question, mentioned bars being bigger or smaller without being more specific or gave a descriptive answer about changes in computers over time.

3 **(a)** Some candidates did very well here but there was a significant minority who appeared not to have been taught this topic. There was some confusion with order of rotation symmetry 1, with some candidates giving this as 0. Many candidates appeared to have counted lines of symmetry rather than finding the order of rotation symmetry. Shapes numbered 1 to 6 and attempts to name the shapes were also seen.

(b) Many candidates correctly found the perimeter of the quadrilateral and reached a correct equivalent to $9a$, but few included the $P =$, so lost one of the marks. Weaker candidates felt that a numerical answer was required. Answers of $9P$ were also seen, which did not score.

(c) The most common answer here was 38, where candidates had worked out the perimeter rather than the area. Answers of 19 were also common. Very few candidates scored the method mark, as if they knew how to work out area, they could do it correctly or they did it incorrectly mentally showing no working.

4 **(a)** Generally very well done, with many candidates drawing the further patterns and counting the number of sticks correctly. Common incorrect answers were 12, 16, 20, which used the correct difference, or 13, 18, 23, which assumed that the number in the first pattern was added on each time.

(b) Candidates who drew out the pattern or continued the table were usually correct. Some candidates misunderstood the question and tried to calculate the number of sticks in the 33rd pattern.

5 **(a)** This was generally well answered, although 3, 15, 20 and 30 often appeared as common factors. There was some confusion between factors and multiples seen.

(b) This was very poor, with most candidates not knowing what a prime number was. The most common answer here was 25, showing confusion with square numbers, although most numbers between 20 and 30 were seen as answers. Some candidates gave a prime number that was not in the given range, so did not score.

(c) Candidates performed better in this part, although many did not realise that when the question required an example, they were only required to give an even multiple of 5 rather than giving a more general explanation of the properties of multiples of 5. Some weaker candidates confused odd and even and stated that 5 was even. Many listed a series of multiples of 5, but only scored if they identified clearly which were even.

6 **(a)(i)** Almost all answers were correct.

(ii) Candidates found this part very difficult and appeared to have no concept of the relationship between speed, distance and time. Answers of 45 and 60 were common.

(b) There were many incorrect answers to this part with many candidates clearly struggling to interpret the scale on the graph. 1 hour 10 minutes or answers greater than 2 hours were common.

(c) More correct answers were seen in this part, although answers of 11·40 and 11·50 were also common.

Section B

7 **(a)** The majority of candidates were correct here, with only very few reversing the coordinates.

(b) Again the majority of candidates were correct.

(c) Few candidates correctly reflected in the given line, with most reflecting the point in the *y*-axis.

(d) Candidates who had correctly drawn a kite in (c) could not always name it. Candidates who had produced a trapezium in (c) by incorrect reflection sometimes followed through with the correct name. Incorrect answers of rhombus, parallelogram, isosceles, triangle were also common.

8 **(a)** Most candidates gave the answer in the correct form, although answers of 5/7 were commonly seen. Weaker candidates gave a probability word or simply the answer 5, which did not score.

(b) This part was not answered as well, with answers of 4 more common than the correct answer. Very few method marks were awarded in this part, as candidates had generally just written down an answer with no working.

9 This was another question where many candidates lost marks for showing no working although their answers suggested that they might have used a correct method, for example having answers such as 115 in (a) and 63 in (b). Stronger candidates knew the required angle facts and used them correctly. Some candidates used either 360 or 180 as the angle sum in both parts and others measured the angles or made incorrect assumptions such as (b) being an isosceles triangle.

10 **(a)(i)** Many candidates knew that the median involved putting the numbers in order and scored a mark for this, but many struggled with finding the median of an even number of items and selected either 15 or 17, or omitted one of the numbers from their list. Few candidates gave the correct answer of 16. As is usual with questions on averages, mean, mode and range were also often seen as the answer. Weaker candidates found the 'median' from the unordered list.

(ii) Again candidates struggled with range, some errors in calculation were seen but answers of 29 (the biggest number) and mean, mode, median and total were also common.

(b) Few correct explanations were seen, with most candidates using both median and range in their answers so failing to score – in particular adding the median and range then comparing them was common. Some candidates chose Carlos, but were unclear in their reason about which average they were referring to. Some candidates also felt that a lower median meant a slower time.

11 **(a)** This was reasonably well done, although some candidates failed to score as they had an answer of 500 without changing the units to grams. 3 was a common incorrect answer.

(b) Candidates did better in this part, as those who had an answer of 500 in (a) were generally correct here as there was no change of units required. Those who had 3 in (a) generally followed with 2400 here.

(c) Many candidates scored full marks here. When there was a misunderstanding between the number of servings required and the multiplier for the recipe, candidates got an answer of 4 and this was common. Common workings seen were repeated addition of 500 ml to make 2 litres, although working was not always clear. Candidates who did not score often thought that 1000ml = 2 litres.

12 **(a)** Many candidates gave vague explanations here so did not score. They did not understand that ‘show that’ meant that they needed to do the calculation and give its answer. There was some confusion with adding and answers of 20·5 were also seen.

(b) Candidates who knew how to do trial and improvement generally scored well here although many weaker candidates omitted this part completely. Candidates who did not score often kept the 10·5 constant or did not keep a difference of 0·5 between the two numbers. Some candidates failed to score the final mark, as they did not select the correct answer by completing the answer line.

B275: Module M5

General Comments

The full range of marks was seen on this paper and most candidates attempted all of the questions and appeared to have enough time.

Many candidates showed little method so lost the opportunity to gain these marks, particularly in the unstructured Question 4 and in Question 5. Although the difficulty of the paper was appropriate for the target group, many appeared unable to apply the skills required for Questions 9 and 10.

Comments on Individual Questions

Section A

1 (a) About half gave a correct answer. Common errors were 4 or an attempt at angles 90° or 180°. Clockwise and anticlockwise were also common errors.

(b) Many students created reflection symmetry. Almost all followed instructions and only added 3 squares. Some were getting the top right hand square incorrect then rotating this error correctly in the other 2 quadrants. Of those who were correct many had started creating a reflection and then changed to a rotation suggesting they had checked their work for errors.

2 (a) Proved difficult for many candidates with just a third scoring. Common errors were 9 and 81; others seen were 3^3, 8, 18, and 24.

(b) A fair number got this but a lot of candidates gave 16 as the answer and too many lost the mark by writing $2^4 = 16$. Other errors were 8, 4×4, 2^3, 4^2, $2^2 \times 2^2$.

(c) Well done by half of the candidates. Others attempted a partial simplification leading to a wide variety of wrong answers e.g. $\frac{5}{10}$, $\frac{10}{15}$, $\frac{1}{5}$, $\frac{1}{3}$, indicating that many could not seriously achieve this. Some just copied the given fraction on the answer line.

(d) Good, but some errors due to an inability to multiply giving $\frac{3}{24}$ or $\frac{4}{28}$. Some cross-multiplied to give $\frac{7}{12}$. A few candidates tried to cancel after $\frac{3}{28}$.

(e)(i) Well answered by many, $^-4$ was a very common error.

(ii) More correct answers seen here than in the previous question with about two thirds scoring. 8 was the most common error, others were $^-6$ and $^-2$.

3 (a) Weaker candidates normally got the number of faces correct; edges caused more of a problem. Incorrect answers for edges were often 8, but also 6, 9, 10, 11.

(b)(i) Well answered by many, generally without working. A few think $3 \times 2 \times 5 = 25$. Some confused surface area with volume and a variety of partial attempts at surface area seen e.g. $2\times3 + 3\times5 + 2\times5 = 31$, $2\times3 + 5\times5 = 36$. Others multiplied each dimension by 4 then added (40) or just added the 3 given lengths (10).

(ii) Two thirds of candidates achieved at least 1 mark. Most common errors were due to size, drawing a correct net of 3×3×5 or 3×5×1 or missing out one face, most commonly the top surface. A few drew a 3D diagram and there was a mixture of freehand and ruled responses given. A common non-scoring response was the open box with height 1.

4 Very mixed answers with the full range of marks scored. Good candidates used good methods for both 'Jenny' and 'Ana' with plenty of clear working shown. For weaker candidates not all working was shown, and sometimes it was chaotic, so the opportunity for part marks was often lost. Finding 30% seemed to be easier and using the 10% = method was common. Many then went on to score the mark for a correct subtraction. Finding 2/5 proved more difficult, evident in responses where this fraction was equated to 20% or 25%. Some candidates approached percentages by using a method of finding 50%, 25%, even 12·5%, but then got stuck because they needed to find 30% and 40%.

5 (a) 9*a* was seen very often but fewer students could cope with the negative value, so 2*c* was often left as 3*c* − *c* or simplified incorrectly to give 9*a* + 3, 9*a* – 2*c*, 9*a* + 4*c* or 9*a* – 4*c*. Some left out the sign between the terms, 9*a* and 2*c* and some attempted to combine them into a single term, 9*a* + 2*c* = 11*ac*.

(b)(i) Very well answered by over three quarters of candidates. Some embedded answers and a common error was 20.

(ii) Candidates really struggled to pick up 1 mark; although they knew 6 + 5 = 11 they did not equate this to 2*x*. A number went on to give 11 as the answer and just a third scored 2 marks. Trial and error was used by some, but most didn’t go past integer values of *x*. Of those that got as far as 2*x* = 11 a significant number gave answers of 5·1 or 5r1. Fewer candidates used reverse flow diagrams this time.

Section B

6 (a) A very well answered question, usually systematically listed. Weaker candidates tended to list randomly and were therefore more likely to miss rows or have repeats.

(b) Over half used the correct form, however quite a few candidates knowing the correct answer lost the mark for using the wrong form, e.g. 1 in 12, 1:12. Common errors included $\frac{1}{2}$, $\frac{4}{12}$, $\frac{1}{4}$ or $\frac{2}{3}$. Some weaker candidates gave an answer in words, e.g. unlikely.

7 (a) Poorly attempted by two thirds of candidates, many looking for a pattern rather than using substitution, e.g. *y* = 2, 5, 8 or 4, 6, 8 or 0, 4, 8.

(b) Point plotting was generally very good but many failed to join their points, even when correct. A significant number did not attempt this part even though they had given values in (a). Some plotted just (2, ⁻4), presumably from the values in the equation, especially when (a) was not attempted. Some weaker candidates plotted their values up the *y*-axis.

(c) Very poorly answered by three quarters of candidates. Many made no attempt at an answer and of those that scored most used substitution in the equation rather than using the graph, as ⁻3 often followed an incorrect (b).

8 **(a)** Almost half the candidates struggled with this substitution. $H = 4s$ was a common non-numerical answer.

(b) Also difficult for half of the candidates. Of those that scored from showing 15 and/or 6·2, many were unable to combine them correctly, often attempting 6·2 × 15. A very common error was to take the values given and either add, 5 + 3·1 = 8·1,or multiply, 5 × 3·1 = 15·5, often with no working shown.

9 **(a)** Very well answered, the most common error was to round down to 5400. Other errors were 5000, 500, 5470.

(b) Very few correct answers and far too many candidates included the decimal point and a variety of numbers to follow, suggesting a general lack of understanding of integers. Many that rounded the numbers correctly added ·000 at the end. A wide range of incorrect answers included 3451·8(00), 3451·9(00), 3000.

(c) Very little working shown in this question. 8·3% or 96% were common wrong answers. Of those who gave working 800 ÷ 96 = 8·3(33..) and 800 – 96 = 704 were common methods seen. The method 800 = 100%, 400 = 50% … seen by a few candidates generally led nowhere.

10 **(a)(i)** Candidates found this question very difficult. Many seemed not to understand what they were asked to show and gained the mark by identifying 90° or ¼, but as many lost the mark because they also answered ‘No’. There was general confusion between angle/percentage/no. of people, highlighted by answers such as ‘No because it was 90 people’ or ‘50% is half of 100’.

(ii) Another explanation question that found most floundering. As in (a)(i) very few measured any angles or made any connection between angle/percentage and fraction/Conservative. The most common incorrect response involved thinking that Conservative was $\frac{1}{5}$ because it was 1 out of 5 sections on the pie chart.

(iii) Only a third gave the correct answer. Virtually no working was shown in this question and quite a wide variety of incorrect answers were given, including fractions e.g. 20, 30, $\frac{1}{3}$, $\frac{1}{4}$. A number of candidates gave the angle, 45, as the number of people.

(b)(i) The table was usually attempted but just a quarter of candidates scored. Common errors were 2·9 from attempting to find a relationship between mean and range, and 4·3 or 4·4 from misusing the given distances.

(ii) Many scored a follow through from their incorrect table with Shurghall and Range. This appeared to be better answered than in previous series as half of candidates identified they needed to use range rather than mean. However, there was still a significant number incorrectly choosing mean.

11 **(a)** The compass arcs mark was most commonly lost with only the better candidates showing clear evidence of compass use. Trial and error seemed the most common way of positioning the 2 lines so although many managed to score 2 a fairly large number only achieved one side in the correct range. Some candidates found the correct position and then drew freehand arcs. Arcs used were often rubbed out or were very faint. Some constructed 2 equal line lengths and a few constructed an equilateral triangle.

(b) Very few could measure the angle correctly including those scoring full marks in (a). There was a lack of accuracy in measuring as 80° was common even when the actual angle was as far off as 76°. Misreading the protractor scale was a common error, e.g. an angle of 87° being read as 93°. A wide variety of wrong answers, some over 90° and some very small values, indicate that candidates were not checking to see if their answers were reasonable or were guessing because of a lack of equipment.

B276: Module M6

General Comments

The candidates were well prepared for this unit and it appeared that they had sufficient time to complete the paper. Most candidates attempted all questions. They were prepared to show working and give reasoning, although the working was often set out in a haphazard and disorganised manner. The diagrams were neat and lines were usually ruled. In Section B it was obvious that many did not have the use of a calculator. Some who had a calculator are using the 'new' natural ones which display the answer as a fraction even when the demand is for a decimal and they need to learn how to use these calculators correctly.

Comments on Individual Questions

Section A

1 **(a)(i)** Many correct answers seen. Common errors were to use the wrong order of operations such as $(2 \times 5)^2 - 4 = 96$, or to calculate 10^2 as 200 and 196 given as the answer, and $2 \times (5^2 - 4) = 42$ or 5^2 calculated as 10 and answers of 12 or 16 seen.

(ii) This was answered even better than part (a)(i) and the most common error was the doubling of the square number so leaving 196 or 16 as the final answer.

(b) Those who did use the correct method usually failed to cancel before multiplying and would leave the answer unsimplified. Some attempted addition so they would correctly form the fractions with a denominator of 40 and then either add or multiply the numerators.

2 **(a)** There are still some candidates who believe this to be an equation and so solve it giving an answer of 3. Most attempted to remove the bracket and, of those, many would write $5x – 3$ as the answer.

(b) Many did not understand what factorising meant and so $21y$ was given as the answer. Those who did factorise, extracted a common factor of 3, 4 or 12 and very often did not include the second term so answers like $3(4y + 9)$ were seen.

3 **(a)** Some wrote the unordered table in the answer space and the ordered table to the left and in this instance they were awarded the marks. However, many left their table unordered. It was common to see one or two errors which would include digits in the wrong row or missing digits. A few wrote the stem in the table as well.

(b)(i) It was common to see an answer of 6 with the stem left out. Many tried to follow through their unordered table or even write out an unordered list. There was some confusion with range and 41 was seen as the answer.

(ii) The (ii) was usually answered better than (i), as many candidates referred back to the original figures. Usual errors were 49 – 9 = 40 or given as a range, such as 8 – 49.

4 The term ‘plan’ was not well understood and it was quite common to see either the front view or both the front view and the plan view. Those who understood the terminology usually answered the question well.

5 **(a)** This was well answered although some gave the answer as a ratio such as 1:2. There were also answers of 3 and 4.

(b) Few drew the ‘rays’ so most relied on guesswork and therefore worked out the answer incorrectly as (0, 2) or (1, 3). Many placed the centre inside one or both of the triangles T and U.

6 **(a)** Despite the statement saying that the dice was unbiased, many candidates ignored this and stated that the probabilities should all be the same (0·25) or that the probability of 4 should not be less than 3. Others stated that the dice should have 6 sides or that probabilities should be written as fractions not decimals. Those that had the correct idea tended to write ‘add to a whole number’ instead of ‘add to 1’.

(b) The most common error was to divide by 3 instead of 4 and some gave both numbers 120 and 40 without any clear indication of which was the required answer.

(c) There were very few correct answers as most knew what to do but made errors. Some used one calculator, but of those who calculated the cost of 6 calculators the most favoured multiplication method was repeated addition. Some used the doubling method but usually found the cost of 8 like this. The subtractions were not written correctly and many counted from one to the other with errors common in the pounds or ten pence columns by one digit. The final operation of division was found to be the most demanding as most did not have a method to do this. It was common to see trial and improvement or halving three times as the most successful. Some did manage to do the more traditional division method.

7 There were a lot of correct answers with ‘Z angle’ and ‘F angle’ given as the reasons, many not knowing the terms alternate or corresponding. Some confused the letter with the term so Z-angle and corresponding would be given as the answer to one part. The term opposite was used incorrectly by many referring to where the equal angle was to be found, so ‘it is equal to the angle on the opposite side’ was seen.

Section B

8 In the first part many stated that they continued at the same speed, reading the vertical axis as speed. In the second part they wrote 2, 3 or 2·30 for 2½ and in the final part they would write 470 or 480 as the total distance or 275 as the distance from when they had stopped.

9 **(a)(i)** This was usually correct with M and N as the most common wrong answers.

(ii) This was usually correct with face KLMN as the most common wrong answer.

(b) Many did not write down the measurements they used. The most common correct method was to find the area of each of the 6 faces and add them; some found the area of each of the three different ones and doubled them. A few found the area of ABMN and added the two '6' areas. The most common errors were to calculate the volume or the perimeter which were both 42.

10 **(a)** There were few errors in this part, 4 and 5 were the most common incorrect answers.

(b) Some plotted the coordinates the wrong way round; many plotted the coordinates correctly but failed to draw the line connecting them whilst a few 'bent' the line to go through the origin.

11 Use of calculators with natural display led to fraction answers. Many correctly obtained the numerator and denominator and then did not divide them but added, subtracted or multiplied them. Some did not do the operations in the correct order so $4{\cdot}7 + (32{\cdot}53 \div 12{\cdot}08) \times 0{\cdot}58$ was the order they used. Those that did obtain the correct answer often failed to write it to the required accuracy and answers such as 5·31 were commonplace.

12 Many had a reasonable idea of how to solve the equation but the execution was often faulty. The most common error was to subtract the 1 from the 6 so $2x = 5$ was seen. There were some who added the $5x$ and the $3x$ to get $8x = 5$ or 7. At the final step some divided the wrong way round so $2x = 7$ became $x = 2 \div 7$. There were attempts at trial and improvement but these are becoming noticeably more infrequent.

13 **(a)** There were problems for some reading the horizontal axis and they thought that each line was 1 as it was on the vertical scale. The points for 4 and 16 were therefore incorrectly plotted.

(b) Most gave the correct term or used an acceptable description. Some stated positive or just good, weak or none.

(c) This was answered well, although some drew a positive gradient through the origin whilst others drew the line too steep or too short.

(d) Some read from 9 rather than 12 and some read the vertical scale wrongly or did not use their line at all. Others gave the answer as a range.

14 **(a)** Common errors of formula use were $4{\cdot}2\pi$ or $2\pi r$. 4·2 was often doubled to 8·4 instead of squared or answers of just 8·4 or 17·64 were given.

(b) The most common error was the failure to divide by 2, whilst others calculated the hypotenuse using Pythagoras' Theorem. Answers of 13 were seen from the addition of the two lengths or attempts at the perimeter.

B277: Module M7

General Comments

The majority of candidates attempted all questions but the standard of performance varied considerably. Many coped well and achieved high marks but many more fared very badly, often with scores in single figures. Most papers were well presented and candidates seem to have had enough time to complete each section, although it would seem some did not have access to a calculator in Section B.

Candidates continue to struggle with questions requiring reasons with many writing down their calculations rather than the geometrical properties they are using. Errors in basic numeracy caused many candidates to lose marks. Some examiners commented on the poor presentation and handwriting of far too many candidates. Answers were often haphazard with some written diagonally, round the edges, etc. Poor writing made numbers 1, 2, 4, 7 and some text difficult to decipher on many scripts.

Comments on Individual Questions

Section A

1 **(a)** On the whole candidates successfully completed the line of best fit, the most common error involved incorrect gradients (in particular ones which were too steep). A number of candidates offered a positive line of best fit through the origin. There were only a handful of lines which were not ruled.

(b) The most common error involved the misreading of the scale on the horizontal axis, reading from 2·15 rather than 2·3 litres. A small minority did not use their line to estimate the fuel economy.

(c) Most candidates stated ‘negative’. Some said the greater the engine size the lower the fuel economy and a few wrote ‘positive’ despite having drawn a line with a negative gradient.

2 **(a)** Many candidates realised the symmetry involved in the table and offered the same response in both spaces. Too often though this was not $^{-}1$. Common mistakes were 1, 1; 2, 2 and $^{-}2$, $^{-}2$. It was difficult to discover where errors had occurred as few candidates showed any working.

(b) The quality of the graphs varied considerably. Some were drawn well with sharp pencils, accurately going through all of the points whilst others were extremely poor. Many candidates lost out on a mark either by failing to join up the points or by joining the points with straight line segments.

(c) This question was poorly answered by many of the candidates. For those who realised the link between the given equation and the graph there was significant confusion between the *x* and *y* axes. Some gave correct solutions but could not say what to do in words. Generally many did not know or could not remember how to use their graph appropriately.

3 **(a)** Many candidates either scored 2 marks for x = 55° or earned one mark for finding one of the other appropriate angles. However, very few earned the reason mark. The majority offered calculation rather than reasoning thus losing the final mark. Alternate and corresponding angles were stated as reasons for calculations but often the related angles were not identified, or on some occasions incorrectly identified. Others simply stated parallel lines in the hope that this was sufficient reasoning. A number of candidates offered 56·5° as the answer presuming that the two remaining angles on the straight line were equal. Errors in basic numeracy caused a significant number to lose the mark for calculating x with answers such as x = 65 being common.

(b) There appeared to be significant confusion between definitions for diameter, radius and circumference. Many candidates stated that AB was a circumference and therefore couldn't be a diameter; others said that a diameter only went half way across the circle whilst some suggested that diameters only went horizontally, never vertically, across a circle. Those who did use angles of a triangle just said that 90 + 54 + 31 = 175 which could not be correct.

4 **(a)** Many candidates divided the powers rather than subtract them and 7^3 was a very popular answer. Others started correctly but gave the answer as 6^7 instead of 7^6. A significant number gave $\frac{63}{21}$ as an answer whilst several attempted to work out the value, although rarely obtaining 117649.

(b) Better candidates did well with this. Many reached x = 4 or 2^4 but found y = 1 more difficult. Many scored 1 mark for a good factor tree. There was some evidence of trial and improvement being used, but rarely successfully.

(c) Many candidates struggled with reciprocal with roughly 1 in 3 scoring the mark. Many just gave answers such as 0·5, 50% or $\frac{2}{4}$.

5 **(a)** A lot of candidates could multiply out the brackets and on the whole could then go on to work out the correct answer. However, some candidates became muddled with having x on both sides and many used the wrong operation to eliminate the terms they did not want and $11x = 8$ was a common error seen. Many only made one error and hence went on to score 2 marks. There was some evidence of trial and improvement being used, but rarely successfully.

(b) A low scoring question. Although many gained a mark for 5, few gained both marks. Even those who reached $x > 5$ in the working tended to write $x = 5$ on the answer line.

6 **(a)** Many gained 1 mark for 8 and/or 0·2 seen but very few could go on to divide 8 by 0·2 to reach 40. Other common errors were rounding 0·21 to 0 and giving the square root of 65 as 32.

(b) As with other questions requiring an explanation many candidates were unable to express their thoughts in any meaningful way. Many thought that the given answer was too low whilst others thought that there were insufficient decimal places in the answer.

7 No working was seen from the majority of candidates. Answers of $\frac{7}{12}$ in most cases scored 1 mark, but many did not recognise $\frac{4}{9}$ as a recurring decimal. All of the fractions which gave a terminating decimal were often chosen wrongly as producing recurring decimals. When working was shown it was obvious that many candidates converted a fraction to a decimal wrongly by dividing by the numerator.

Section B

8 **(a)** Many disappointing responses were seen with fewer than half of candidates scoring the mark. Some common wrong answers were 52, 3·84 and ¼.

(b) Less than half of the candidates earned the mark and, in general, tended to state that the spinner was not fair, focusing their explanation on the large differences in the frequencies. Those who said the spinner was fair usually focused on the closeness of the frequencies to 50 or references to chance. There was clear evidence that candidates had a lack of understanding of the situation. Many referred four spinners whilst others thought fairness depended upon the number of trials.

9 Stronger candidates usually picked up all four marks whilst the weakest struggled to score any. Truncating the exchange rate led to small errors in the final answers and a loss of marks. In many such cases a lack of working made it difficult to award method marks when the final answers were incorrect.

10 **(a)** Many correct responses were seen. Some candidates earned one mark for an expression instead of a formula or for the correct term $24n$.

(b) This was poorly done with relatively few candidates picking up both marks. Weaker candidates simply swapped the letters whilst others struggled with the sign when rearranging the 15. Others rearranged the 30 by subtraction rather than division.

11 Most candidates made an attempt at this question but less than half earned both marks. Some earned a mark for three terms correct often resulting from an error with the signs.

12 Most candidates made an attempt at this question with many picking up all four marks. About a quarter of candidates struggled and scored no marks at all. Where errors were seen they usually involved division by 4, instead of 50, or summing the midpoints and then dividing by 4.

13 **(a)** Pythagoras was used by most candidates with some using $13^2 + 10{\cdot}4^2$. Some rounded their decimal values before taking the square root and lost marks. Weaker candidates subtracted, added or found the mean of the given sides. Some attempts to use trigonometry were seen but failed to score any marks.

(b) Better candidates had no problem but over half had any understanding of the lower limit of a rounded number. Answers of 50, 53, 54, 53·6, etc were very common.

14 **(a)** This was poorly answered by the majority of candidates. Few were able to distinguish between area and circumference of the cross-section and use them correctly to find the total surface area. For the curved surface many simply found the area of a 10 by 12 rectangle. Many others simply calculated the volume of the cylinder.

(b) About one in three candidates knew how to convert the units. Many answers had the figures 85 but varied from 85 000 to 85. Some divided by 3 whilst others found the cube root or cubed.

B278: Module M8

General Comments

A full spread of performance was seen on this module and generally candidates did better on Section B than Section A. Most candidates attempted every question but some seemed unfamiliar with trigonometry, constructing an equation and recognising the dimensions of a formula. Overall candidates performed well on addition of fractions, construction of box plots and applying rotations and translations. It was disappointing that a large number of candidates were unable to apply lower level skills including drawing the graph of $y = x + 2$, multiplying two 2-digit numbers and rounding to 2 significant figures.

Candidates showed working for most questions but there was often little order in their presentation. Candidates should guard against over-writing their responses as it is often difficult to identify which is their chosen response. It is preferable to draw a single line through errors and replace the answer.

Comments on Individual Questions

Section A

1 **(a)** Many candidates made a reasonable attempt at the enlargement, but only about a quarter were successful in gaining full marks. Some candidates lost a mark through inaccuracy as they generally drew in enlargement rays, and in many cases inaccurately, then failed to check their solution by ‘counting squares’.

Other candidates were able to draw a trapezium of the correct size but failed to use the given centre of enlargement. A few candidates used the centre of enlargement correctly, but used the wrong scale factor, typically SF 2.

(b) Most candidates knew what to do but many were unable to do the multiplication correctly – errors in working, such as $2 \times 8{\cdot}8 = 16{\cdot}16$, were common. A few candidates did make attempts without using the scale factor, such as trying to make measurements from the diagram, but these were not successful.

2 **(a)(i)** The majority of candidates drew the line $x = 1$ correctly. The line $y = 1$ was a common error.

(ii) A minority of candidates drew the line $y = x + 2$ correctly. Errors included $y = x - 2$, $y = 2$, $y = 2x$ and $x + y = 2$.

(b) A small minority of candidates identified the correct region but many scored only one mark by identifying the correct side of 2 lines. In some cases it was difficult to establish the region identified by the candidate.

3 The majority of candidates scored full marks for this question. Most realised they needed to convert the fractions to fifteenths and then add them. Some took the harder route and converted to top heavy fractions first and consequently were more likely to make errors either in the initial conversion or in going back to a mixed fraction. As always a few added 1/3 and 2/5 to get 3/8 or 5/15 to 6/15 to get 11/30.

4 About a third of candidates selected the correct expression and about half of those were able to provide an adequate justification involving lengths. Incorrect answers generally involved a^2 or b^2 as 'the area of a circle involves π and r^2'.

5 **(a)** The majority correctly read the median. Common incorrect answers were 3·2 and 6.

(b) The majority of candidates were able to draw the box plot, some correcting their error in (a) by drawing directly from the curve.

(c) Most candidates were able to make at least one sensible comparison of the distributions but few were able to score 2 marks, mainly because they did not include the context or wrongly interpreted their readings. Many said that a wider range of results (or greater maximum distance) for students travelling to the Beeches school meant that students from Beeches travelled further. Others thought that a wider IQR meant there were more students. Sometimes the second reason was just a complement of the first reason, such as 'Beeches had a bigger range' followed by 'Highlands had a smaller range'. Comments such as 'more people travel further at Highlands' did not score as it could not be assumed that the two schools had the same number of students.

6 **(a)** Most candidates were able to correctly order the numbers.

(b) Only the more able candidates scored full marks in this part. Many candidates who reached $1{\cdot}784 \times 10^7$ failed to round correctly and truncation to 2 figures was common. A small minority who correctly rounded failed to determine the appropriate power of 10.

(c) A minority of candidates gave an acceptable answer in this part. 2 or 10 were common wrong answers but answers ranged from 0·5 to 20 000.

7 Over half the candidates scored some marks in this question but only a few scored full marks. Some candidates factorised but did not find the solutions. A common mistake when factorising was to give $(x - 20)(x + 1)$.

Section B

8 **(a)** Many correctly rotated A by 180° but not always about (0, 2), so B was often in the correct orientation but wrong position. An incorrect centre of ($^-1$, 2) was common.

(b) Many candidates correctly translated their triangle B. The most common errors were to apply the translations $\begin{pmatrix} 4 \\ ^-2 \end{pmatrix}$, $\begin{pmatrix} ^-4 \\ 2 \end{pmatrix}$ or $\begin{pmatrix} 2 \\ 4 \end{pmatrix}$.

A few candidates enlarged triangle B.

(c) About half the candidates correctly described the transformation but a significant number gave more than one transformation despite the emphasis on the word 'single' in the question.

9 Students who treated this question as a two-stage process usually managed to score some marks with correct answers seen on a regular basis. Some candidates subtracted 4 first and then multiplied the resulting $y - 4$ by 2. Some weaker candidates rewrote the equation by simply swapping the x and y over in the original equation.

10 The majority of candidates failed to recognise that this was a reverse percentage question. Most scored 0 or 3, since 1·175 or 117·5 were seldom seen within an incorrect solution. By far the most common wrong method was to find 82·5% of 493·50 (407·13 or 407·14). Also 493·50 × 1·175, 493·5 ÷ 1·75, and 493·50 × 0·175 were seen. Some broke 493·50 down into 10%, 5% and 2·5%, which did not help them answer the question. Candidates often made multiple attempts and the intended final solution was not always made clear.

11 **(a)** The majority of candidates wrote a correct equation but inelegant algebra such as $a \times 8$ and £8 × a. Errors included $a + c = 2300$, $8x + 5x = 2300$ and $8a + 5c = 370$.

(b) About a quarter of the candidates scored full marks and others who had written an equation in (a) scored a mark for multiplying $a + c = 370$ by 5 or 8. A significant number of candidates did not attempt to solve algebraically but used trial and improvement, sometimes ignoring their answer to (a) and going back to the information given in the question.

12 **(a)** About half the candidates scored full marks on this question. Candidates tended to answer this in one of four ways: (i) those evaluating $95 \times 0{\cdot}96^5$ in one step invariably obtained the correct answer; (ii) those breaking it down into repeated multiplications by 0·96, with intermediate answers written down and re-entered onto the calculator, often reached the correct answer but some repeated the process 4 or 6 times, or introduced premature rounding; (iii) those using repeated calculation and subtraction of 4% had similar success and problems; (iv) those who merely found or subtracted 5 × 4% (or 20%).

13 **(a)** Almost all candidates scored both marks. Incorrect notation was very rare.

(b) The majority of candidates identified the correct pair of branches and then attempted to multiply the fractions, usually successfully. A considerable number attempted to add their two probabilities and were not concerned by an answer greater than 1. Some chose to convert to decimals or percentages and these were generally correct.

14 About half the candidates recognised the need to use the cosine rule. Having identified cosine they usually found the correct angle although some stopped at $\cos x = 9{\cdot}8 \div 13{\cdot}5$ either not being able to find the inverse cosine or not knowing they had to. A few thought the ratio was 13·5 ÷ 9·8 and then floundered.
A few used either sine or tangent and earned the M1 for an inverse trig function. Some attempted Pythagoras not always correctly then either tried to use the tan ratio or thought their answer was the required angle.

B279: Module M9

General Comments

The majority of candidates were able to demonstrate positive achievement on this paper, and there were some excellent responses – especial congratulations to those who gained full marks. There was, however, a significant minority who seemed not to have met much of the content of the unit and were gaining 5 marks or fewer in each section.

Layout was generally quite good from these higher level candidates and most showed sufficient working for part marks to be awarded if their answer was incorrect. In questions needing a calculator, using rounded answers in further working sometimes led to unacceptable answers.

Time was not an issue and all candidates had time to attempt all questions. However, question 3(a) was an issue and complaints were received from a few centres about this. We do sometimes set harder questions on module criteria from the preceding module where it is relevant to the material in the current module, and in 3(a) a hard question testing A8.3 was set – solving a linear equation with fractional coefficients. In this case, we now accept that the relevance of the question to the content of M9 is not strong enough to justify its inclusion, and we will ensure that this does not happen again. But, in looking at scripts, we found that the majority of candidates had made attempts at this question in line with their attempts at the rest of this paper. In fact, there were other questions on the paper with a lower facility rate. In these circumstances it was felt that the best way to be fair to all candidates was to amend the mark scheme so as to give credit for part marks at an earlier stage than usual, and to take account of the issue in determining the grade thresholds.

Comments on Individual Questions

Section A

1 (a) Most candidates attempted the appropriate calculation in this standard form question but many had difficulty in obtaining the correct power of 10, so it was common to see $4{\cdot}2 \times 10^3$ as they made an error in the subtraction of a negative number ($6 - {}^{-}3$). Some candidates rounded the 8·4 to 8 prior to the calculation, giving e.g. 4×10^9. A few did not give their answer in standard form so occasionally answers such as 4200 were seen. $16{\cdot}8 \times 10^3$ or $16{\cdot}8 \times 10^9$ were other fairly common responses.

(b) Many candidates showed a good knowledge of fractional, negative and zero indices in this question, with the negative index being the least well done. Some of the weaker candidates, however, gained none of these marks.

2 (a) Virtually all candidates completed the tree diagram correctly, with very occasional errors on the second set of branches.

(b) Many candidates answered this well, mainly using the probabilities of three branches, 0·6 × 0·9 + 0·6 × 0·1 + 0·4 × 0·9, to obtain a correct response although a few used the shorter method of 1 – 0·4 × 0·1. Quite a number of candidates had problems multiplying the decimals, particularly 0·6 × 0·1, which was often given as 0·6. Those using fractions tended to make fewer errors. The expected mistake of omitting the 'both practise' branch was common, whilst a few candidates only used this branch. There were also some who identified the correct pairings but added the probabilities i.e. 0·6 + 0·9 etc. Those who obtained an answer of a probability greater than 1, usually through poor multiplication of decimals, rarely seemed to notice this was an impossible result for a probability.

3 **(a)** In this question solving the linear equation with fractional coefficients, many candidates made errors in multiplying out brackets and/or signs, so that those who had a correct method often did not reach the correct solution. Quite a number of candidates made a serious error at the first step by multiplying the wrong numerator by 2 or 5. Some dealt with the left-hand side only, when multiplying, and failed to multiply the right-hand side by 2 and 5. The worst efforts usually involved trying to gather terms in the numerator with no regard for the fraction at all e.g. $^{-}10x + 4$. Those who attempted the alternative method of eliminating the fractions by division often gave $x + 3{\cdot}5$ but were less successful in obtaining $2{\cdot}4x \pm 0{\cdot}6$, although those who did were then well placed to continue successfully.

(b) As usual, some candidates made sign errors when factorising, giving answers such as $(3x + 1)(x - 2)$. A large number with the correct factors did not give the correct solutions. Some simply wrote the factors in the answer space and others gave $x = 2$ and $x = 1$, forgetting to divide 1 by 3.

4 Many candidates did not appreciate that the gradient of the parallel line was the same as the given line so answers such as $y = 3x + 11$ were seen quite frequently along with a variety of other coefficients of x. The y-intercept was regularly given as 11. However, quite a few candidates with the wrong gradient managed to calculate c correctly so that their line passed through (3, 11). Some candidates used the method for perpendicular lines so equations such as $y = {}^{-}\tfrac{1}{2}x + 12{\cdot}5$ or $y = {}^{-}\tfrac{1}{2}x + 11$ were seen. Those who did use a gradient of 2 did not always obtain the correct value of c giving answers such as $y = 2x + 11$, $y = 2x - 6$ or $y = 2x - 8$.

5 **(a)** Many candidates gave a correct first step with either $y = \frac{k}{x}$ or $10 = \frac{k}{2}$. Some however wrote down statements such as $10 \propto \tfrac{1}{2}$ without any further correct work and gained no credit. A surprising number of candidates did not solve the equation $10 = \frac{k}{2}$ correctly, with $k = 5$ seen frequently. Of those who correctly obtained $k = 20$, many did not follow it with a correct equation relating y and x.

(b) As in part (a), this was answered well by many of the competent candidates but poorly by the weaker ones. However, some candidates who had done part (a) correctly wrote down $y = 20 \div {}^{-}4$ but then made an arithmetic error with answers such as 5 or $^{-}80$ seen. A follow through mark was allowed in this part provided that at least one mark had been earned in part (a).

(c) Many candidates either omitted this question or drew a straight line. Some candidates only gave one branch of the curve in the first quadrant and a few gave two branches but in the wrong quadrants.

Section B

6 Overall most candidates identified the need to use a cube root. Their order of operations was usually correct. Quite frequently candidates lost a mark, either through deliberate incorrect positioning of the cube root symbol, or through careless positioning. It needs to be emphasized to candidates that such signs need to extend below the division line, in taking roots of fractions.

7 (a) Many candidates were able to obtain the correct angles, particularly the angle at the centre, but expressing the reasons was much more poorly done. In the first reason some candidates referred to the 'arrow-head' theorem, but most errors were for using terms such as edge or top instead of circumference. In the second reason a few students successfully quoted the alternate segment theorem, although some clearly did not understand this rule since they gave an incorrect angle for this reason. Many candidates attempted to explain using their other knowledge of angles, but the most common error here was in not referring to the isosceles triangle − most of these candidates did mention the tangent and 90 degrees.

8 The most common answer for the size of the sample was 55, where candidates simply calculated the percentage of girls in year 11 (66/120 × 100) and so did not understand the question. Some candidates found the percentage of year 11 within the school (120/750 × 100) to obtain 16% and the used this to find 16% of 66 girls giving 10·56 and the rounded up to 11. A few candidates tried to use all the numbers given, with some cancellation or repeat of previous steps. Better candidates saw they could use 66/750 × 100 directly, and the majority who chose this calculation then knew to round to the nearest whole number, giving the correct answer of 9.

9 (a) It was more common to award 1 mark, rather than 2, for this question. This was usually for knowing to divide the upper bound by the lower bound. The mark for 'speed = distance ÷ time', was seldom given for a direct quote, but was earned indirectly. This was for complete statements, such as 'the furthest distance travelled divided by the smallest amount of time taken'. Did some candidates assume that 'speed = distance ÷ time' was unnecessary to state? The usual failing of poor descriptive prose in giving reasons was again evident, with words describing speed such as, 'fastest' and 'quickest' being used in describing the smallest amount of time.

(b) This question was mostly attempted well, although there was some confusion over identifying the numbers to give the lower bound, such as choosing the lower bound for the numerator and the lower bound for the denominator for their calculation. A few candidates were unclear and calculated a series of combinations before choosing the correct answer. Nearly all candidates gave an answer to two decimal places, as requested.

10 Many fully correct histograms were seen, but also, a large number of barcharts. The latter meant that the candidate scored at most 1 mark, for correct widths of the bars. There was confusion between calculating frequency density and the mid-value × frequency. The scale most often chosen was the sensible one of 2 cm to 1 unit and there were only a few errors in drawing the correct heights of the frequency densities. The bar widths were invariably correct, except for a small number of candidates who started the 5-10 bar at 0 instead.

11 **(a)** Few candidates obtained all three coordinates correctly, with the majority obtaining two; of these the most frequent errors occurred with the *x* and *y* coordinates.

(b) The most common error was in candidates performing one calculation with 2D Pythagoras, apparently thinking they had done sufficient work and leaving it at this, having found the length of the diagonal of one of the faces. Most candidates who did complete the question performed Pythagoras in two 2D stages, and some of these candidates incurred rounding errors in their answer. The most successful were those who used 3D Pythagoras. The presentation of the work was sometimes disordered.

12 Most candidates found the area of a circle correctly, although a few used circumference or the formula given in the question paper for the surface area of a sphere. Although most candidates coped well, with over 50% gaining all three marks, some were confused as to how to find the fraction of the circle to find the area of the sector. Some obtained 150/360 and correctly multiplied, some obtained 360/150 and divided and multiplied equally.

13 The most common answer by far was 55, with over 60% of candidates, giving this as their answer. Many knew that a scale factor of 5 existed between the volumes, but failed to realise that the linear scale factor required $\sqrt[3]{5}$. Consequently, only a small percentage of correct answers were seen. $\sqrt{5}$ was seen on a few occasions. Premature approximation spoiled otherwise correct attempts when $\sqrt[3]{5}$ was given as 1·7, leading to a final answer of 18·7. The alternative method on the mark scheme was seen on only a few occasions and invariably led to the correct answer.

B280: Module M10

General Comments

On the whole the range of scores seen from candidates for this paper was skewed slightly towards the lower end of the mark range. There were as usual some excellent scores from the more able candidates but also some candidates were clearly out of their depth at this level, demonstrated by an unusually high number of omitted parts.

Working out was usually shown. Section B appeared to be tackled with more success than Section A. On Section A there were a significant number of parts of question that were omitted. The stronger topics were probability, completing the square, solving quadratic equations by factorising, use of simple exponentials and interpreting histograms.

The weakest topics were vectors, transformations of graphs and interpreting trigonometric graphs, and solving equation with algebraic fractions.

Comments on Individual Questions

Section A

1 **(a)** Many candidates found this first part difficult and almost $\frac{1}{6}$ of them made no attempt. Where a short division of numerator by denominator was used, candidates were usually successful in obtaining the correct answer. Many did not know how to convert a fraction into a decimal however. Some common errors included answers of 7·5, 0·075, 0·12, 0·3 and 1·333 ….

(b) Some very good answers were seen where students were precise in their reasoning. Many other candidates correctly found the prime factors of 80 but then were vague or incorrect in their explanation that prime factors of only 2 and/or 5 in the denominator always result in a terminating decimal. Some confusion was also seen over the terms 'multiples' and 'factors'.

2 **(a)** Many scored 3 or 4 marks here. Most attempted to draw a tree diagram, before selecting the two options required. Most recognised the need to multiply each pair of fractions before adding. There were, however, a large number of computation errors seen and some candidates could not multiply 3 and 2 or 8 and 7 correctly. Many could not add correctly, adding the denominators for example or even being unable to add the numerators of 56 and 6 correctly. There were others that failed to see that the two events were dependent.

3 **(a)** The topic of Vectors remains an area that candidates struggle with. This part was the best answered in the question, although errors such as $\mathbf{p} - \mathbf{q}$, $\mathbf{pq}$, or even use of Pythagoras' Theorem with $\mathbf{p}$ and $\mathbf{q}$ were often seen. Notation remains an issue with some using the vertices to describe the vectors and not using $\mathbf{p}$ and $\mathbf{q}$.

(b) For candidates that were successful in part (a), a common error was to give an answer of $\frac{2}{3}\mathbf{p} + \mathbf{q}$. A follow through mark was allowed from part (a), but this was seldom earned.

(c) Only a few were successful here. In many cases, this part was omitted although some who made an error in part (b), e.g. $\frac{2}{3}$ **p** + **q**, were able to score a follow through mark in this part.

4 **(a)** Part (a) was generally answered well by all but the weakest candidates. The majority scored at least 2 marks although there were errors for some in giving the + 19 part of the expression, with + 28 and + 37 sometimes seen.

(b) The candidates scoring 3 marks in part (a) were nearly always successful in this part. For those that had an incorrect expression but of the correct form in part (a) a follow through mark was available in both this part and part (c), but it was only occasionally earned. The answer 28 was a common error and some gave a coordinate such as (3, 19) rather than the minimum value required.

(c) A large number of candidates omitted this part or simply repeated the original equation given in the question. Less than 5% of the candidates were successful here.

5 **(a)** There were some excellent answers that used the symmetry of the graph and the information given for sin x. There was evidence, however, that many tried to estimate from the curve rather than calculate using 24°, and they had answers close to the required ones of 204° and 336°. Other common errors included giving the negative angles $^-24$, $^-204$ etc.

(b) This did cause many problems for candidates. Common errors included giving the values 3, 30 or 60 and thus not recognising the significance of the number of periods over the range 0° to 360° to the value of k. Those that gave the correct answer 6 were able to give appropriate reasons for this answer.

6 **(a)** This was generally well done by those that attempted the question; almost $\frac{1}{5}$ of candidates made no attempt. Many scored 3 marks convincingly. A few arrived at the expression required making errors along the way usually in the expansion of $(2x + 1)^2$. A number omitted this part or attempted to find the intersections of the line and the circle, which was required in part (b).

(b) This was reasonably attempted. Many obtained the correct factors, but then fewer were able to give both solutions correctly. Errors usually came from the $(5x + 9)$ factor giving incorrect answers, such as $^-\frac{5}{9}$, $\frac{5}{9}$, 9 , $^-9$ or $\frac{9}{5}$. Some used the formula but were then less successful in completing the problem to find a solution; usually the square root of 196 was the stumbling point.

Section B

7 **(a)** There were many correct answers found by using the cosine rule, but the requirement for an appropriate degree of accuracy was misunderstood by most candidates who were consequently unable to score the fourth mark.

The cosine rule was sometimes miscopied from the formula page e.g. $b^2 + c^2 - 2bc - \cos A$, $b^2 + c^2 - 2 + b + c + \cos A$, were seen.

Some gave answers such as 186·(...) from $(b^2 + c^2 - 2bc)\cos A$, using the wrong combination of terms.

Other common errors included the assumption of a right-angled triangle where Pythagoras' Theorem and sometimes trigonometry was used.

(b) Answers were mixed. More able candidates had few problems but many others, when using the ½ *ab* sin *C* approach, were confused over the correct combination of sides and which angle to use. Many attempted longer methods, for example finding angle *C* using the sine rule, and these were usually unsuccessful. Others had little idea and tried the ½ base × height approach with two lengths.

8 **(a)** The correct value of 85°C was often given, although an error of 83·14 was very common and this was from either using $m = 1$, rather than $m = 0$, or from the error $0{\cdot}97^0 = 0{\cdot}97$.

(b) Almost all were able to answer this correctly.

(c) Most candidates showed a trial and improvement technique; although many do need to show clear trials and accurate evaluations in order to score method marks and not just write a comment about 'too big' or 'too small'. The majority of candidates gave the answer 42 which leaves the temperature above 40°C. Only a few interpreted the requirements of the question to give the time in minutes when the temperature went below 40°C.

9 Only a very small number of candidates were able to obtain all seven marks. The majority did not know where to begin. Some recognised the need for a common denominator and were able to multiply the numerators of the fractions by the required factors, although brackets were not always used. Most were then unable to remove the fraction by multiplying both sides by the denominator, and for many the question was abandoned at that point. A few others did go on to obtain either a correct or an incorrect quadratic expression as a result of their earlier work and then obtained method marks by substituting their values into the quadratic formula. Errors with negative numbers were very common at this point, however, in both the substitution and then in the evaluation.

10 Most kept the graph the same size and shape, roughly, but the common errors were to move the curve 2 units to the left or 2 units down. Of those that did translate the graph to the right, a translation of 4 units rather than 2 was often seen.

11 **(a)** There were many correct answers although a few made numerical errors in calculating the areas of each bar. The most common error was to add the frequency densities to give 3. A few took the widths of the bars into consideration but not the vertical scale given and gave 47 as the answer.

(b) Many gave correct reasons referring in various ways to the fact that the exact waiting times were not given. It was very common, as well, for candidates to write incorrectly of values greater than 50 or to refer to the situation – a surgery waiting room or the fact it was on one day.

(c) Those that answered part (a) well or gave an answer of 47 in part (a) were usually successful in this part. If the students did not understand the frequency/area relationship on the histogram then they were unable to gain marks here.

The two approaches seen were to find 80% of 235 and then compare this with 170 or to calculate the percentage $\frac{170}{235}$ and then compare this with 80%. Some who obtained 47 in part (a) used a ratio idea and were also successful. Follow through marks were available for both marks for those that had made slight errors in part (a).

B281: Terminal Paper (Foundation Tier)

General Comments

A good spread of results was seen on this paper with few candidates appearing to be inappropriately entered. Most candidates appeared to be adequately equipped and diagrams were generally completed neatly. Working out was evident for most questions in Section A but few statements of calculation were made in Section B.

It was particularly pleasing to note the improvement in giving geometrical explanations, although candidates struggled with the algebraic and data explanations.

Candidates continue to confuse area and perimeter, perform division calculations and to rely on informal methods for solving equations and ratio problems.

Candidates are tending to overwrite many answers rather than crossing out errors. This can lead to a loss of marks as it is not clear which is their selected answer.

Comments on Individual Questions

Section A

1 **(a)** Most candidates performed this subtraction correctly. Errors included 159, 171, 261, 271 and 259.

(b) Only the weakest candidates failed to score in this part.

2 **(a)** This was almost always answered correctly.

(b) Similarly this part was very well answered.

(c) This was well answered. The only common error was $^{-}4$.

3 About two-thirds of candidates answered this correctly. Weaker candidates gave answers of 86 and 14. Sometimes candidates retained the variables and recorded answers such as 26*ab*.

4 **(a)(i)** This was almost always correct.

(ii) Similarly this was generally correct.

(iii) This was well answered, but 50 was sometimes seen.

(b)(i) Most candidates identified the correct newspaper, although some selected the Independent, the next lowest.

(ii) Most candidates were able to round to the nearest million.

(iii) Rounding to the nearest thousand proved more problematic, with common errors of 800 000 and 830 000 and 832 000.

(c)(i) Most candidates correctly identified the mode but the median proved more problematic. Some scored for ordering the data but were then unable to cope with the two amounts in the middle.

(ii) Very few candidates were able to fully justify why the median was a better average to use and many just said because the median was lower. Many just defined the terms and failed to refer to the data.

5 **(a)** Most candidates correctly calculated 25% of £600 although a few then proceeded to subtract from £600.

(b) Most candidates realised that they had to multiply 49 by 12. Those who used the grid method were generally successful whereas repeated addition was rarely error free. More able candidates proceeded to solve the problem correctly but weaker candidates tended to fail to add on their answer to part (a).

6 **(a)** There was a wide range of responses to this part. A common error was to multiply by 1·5. Few attempted a formal division, preferring to ‘step off 1·5 to reach 9 and 12. Although a significant number of candidates reached 6 and 8 they then sometimes added to reach 14 or 28.

(b) More able candidates found 108 but then had difficulty dividing by 3. Others found the perimeter. Some did find a third of 9 or 12 and then proceeded to 36 but others found a third of both and so gave an answer of 12.

7 **(a)** The majority of candidates correctly answered this part but some omitted it and others gave an answer of 1.

(b) Most candidates reached 26 and the majority then proceeded to 13.

8 **(a)** Some of the more capable students were able to write the correct expression. A large number of candidates wrote $n + 2$ or $n^3 + 3$.

(b) The mark for this part was rarely awarded.

9 **(a)** The majority of candidates correctly answered this part.

(b) More able candidates completed this part successfully. The most common error was to divide by 4 rather than 5.

(c) Many candidates scored 1 mark for completing a first stage such as 48 : 80 or 240 : 400 but relatively few complete simplifications were seen.

10 **(a)** About half the candidates were able to insert brackets correctly in the first calculation but very few were successful with the other two calculations.

(b) About a third of candidates were able to correctly expand the brackets. Weaker candidates tended to just insert multiplication signs or to give a numerical answer such as 11.

(c) Some of the more able candidates completed a partial factorisation but few completely correct answers were seen.

11 **(a)** This was omitted by many candidates. Others completed the table without any evidence of calculation and incorrect pairs (e.g. 4, 4) were often seen.

(b) Many candidates scored a mark for correctly plotting their points. Few then attempted a smooth curve. Many failed to join the points and others used straight lines.

(c) Very few candidates scored this mark, despite 'follow through' being available.

Section B

12 **(a)** Most candidates answered this part correctly. Some candidates positioned B correctly but A at various incorrect positions (1, ¯2), (1, 2), (¯1, ¯2) (¯2, ¯2).

(b) The majority of candidates correctly identified the midpoint.

(c) Most candidates recorded the coordinates correctly.

13 **(a)(i)** Almost all candidates were able to find the next number in the sequence.

(ii) Similarly, candidates were able to describe the rule. Some candidates stated $n + 4$ and on this instance they were given the mark.

(b)(i) Candidates were slightly less successful in this part. Errors included 30 from halving 60 rather than 160, 0 from subtracting 160 or 2560 from doubling 1280.

(ii) Some weaker candidates were unable to describe the rule for this sequence. Errors included 'double' or 'taking away the number before'.

14 **(a)** Only about a quarter of candidates scored full marks for this part. Many candidates found the area of the rectangle or appeared to have counted squares and then doubled their answer.

(b) The majority of candidates stated the correct direction. Errors included East-South, East or South.

(c) Most candidates scored at least 1 mark here. Many answered between 4 & 5, some with km but more often km^2. Many scored a mark for being within the range 3 to 3·9 and very occasionally 5·1 to 6. There were rarely workings and so few marks were gained for seeing 8 to 10 cm. Some scored for km with an incorrect number.

(d) This was very well attempted with most responses correct and others often just having slips in calculations, marring correct methods. Most recovered from slips in the 240 or 81 by correctly calculating the change from £5 for their total.

(e) The majority answered this correctly, but 67 was a very common incorrect answer generally without working indicating that a calculator had been used.

15 This was very well answered. Usually small numbers were used with many showing more than one example of each, but some picked very large numbers for their proof, with success. A few gave explanations in words instead of numerical examples and a few confused negative numbers and odd numbers.

16 **(a)** Almost all candidates correctly completed the symmetrical pattern.

(b) Candidates were far less successful with identifying the order of rotation symmetry. A significant number left this part blank or gave a response in degrees. The most common error was to ignore the shading and so a response of 4 6 5 was common.

17 **(a)** Over half the candidates scored full marks for this part. About a quarter failed to score, generally as they had found the median. The remainder lost marks for not giving an answer in thousands or misuse of the calculator, reaching an answer of 651 000.

(b) Full marks were gained by about a third of the candidates. Many seemed to have estimated the angles and so often only the 90 degrees was correct. Few showed any calculations as to how they obtained their angles. Some candidates used the frequencies as angles thus leaving half the pie chart blank. Most ruled their lines and labelled the sectors.

18 Candidates answered this better than similar questions in the past. Most candidates understood that they were required to give geometrical reasons rather than simply showing calculations. Some failed to explain the rule concerning quadrilaterals fully (commenting that all the angles added to 360), but the straight line property was generally expressed correctly. Some weaker candidates just guessed or measured the angles.

19 **(a)** About half the candidates correctly calculated the volume. The most common incorrect response was 29 from adding the dimensions but area of faces and attempts at total surface area were seen.

(b) More able candidates found the correct height for Q. Some realised that they needed to find the area of the base but then subtracted their area from 600. Candidates who found 29 in part (a) generally gave an answer of 19 in (b).

20 **(a)** Very few candidates were able to construct the correct enlargement but about half were able to draw an enlarged shape using scale factor 3.

(b) Many candidates omitted this part. Those that appeared to have some idea either omitted or misplaced the negative sign, inverted the 5 and 2 or counted to the wrong point on the triangle and so were 1 unit out.

21 **(a)** Almost all candidates completed the table correctly.

(b) The majority of candidates followed through to 57/100 or sometimes 0·57 or 57%.

(c) Only about a third of candidates answered this part correctly. Answers with a denominator of 100 were common.

(d) About half the candidates scored on this part. Some omitted it completely. Marks were lost by candidates giving overlapping categories, too few boxes or failing to use hours, preferring to ask when glasses were worn and offering choices such as reading, watching TV and so on.

22 A significant proportion of candidates omitted this question. Of those who attempted it very few earned marks. Some did not record their results, just wrote down the calculation they were attempting (usually unsuccessfully). Of those who mastered the calculator technique required, many failed to gain full marks because they ignored the negative signs. Few candidates demonstrated any sort of system, or had set their work out in tabular form. Some candidates solved the equation correctly but gave their answer to 2 decimal places and so failed to obtain full marks.

B282: Terminal Paper (Higher Tier)

General Comments

This paper differentiated well between the candidates, with the full range of marks scored. There were some excellent performances seen from strong candidates, whilst examiners felt that some of the weakest candidates would have been better off on Foundation Tier with more questions they could attempt.

Candidates answered the questions on ratio, graphing and solving equations best in Section A and on two-way tables, efficient use of a calculator, percentage increase, standard form and similar triangles in Section B. Most candidates could achieve something on the simpler numerical questions (Q1, Q13, Q16) and those involving the most basic ideas of statistics and probability (Q7, Q12), but much of the paper involves rather more sophisticated techniques, for example involving quadratic algebra, transformational geometry and trigonometry. Very many of the weaker candidates seem to have no real understanding in these areas.

In general, the performance on Section A appeared poorer than on Section B. Errors in basic numeracy in Section A reduced the marks gained for some, with even some higher scoring candidates making errors, for example when multiplying 3 by 2 to get 5 in the probability question. The standard of the construction of the angle bisector in question 4 was particularly poor.

Explanation questions are a problem for some candidates, who seem unfamiliar with the need to use mathematical language/reasons in geometrical explanations, for instance.

Time did not appear to be a problem, with all candidates having sufficient time to attempt the questions they could make a start on, although it was evident that the weakest candidates did not attempt several of the later questions.

Comments on Individual Questions

Section A

1 **(a)** This was correctly answered by the majority of candidates. The most common wrong answer of 80 was found by sharing 100 in the ratio 1:4.

(b) Most candidates divided 800 by 5 to give the correct answer of 160. A few were let down by poor arithmetic. Others divided by 4 to give the wrong answer of 200.

(c) Virtually all realised what had to be done for this question and attempted to simplify 480 : 800. Some failed to reach the simplest form while others made numerical errors.

2 **(a)** In answering this question about the order of operations, many placed the first pair of brackets correctly but very few candidates scored further marks. Many put the brackets in the same place each time. A common error was to include the index 2 in the second set of brackets.

(b) This question on expanding brackets was well answered, only a few gave wrong answers. $8x – 20$ and $15x – 5$ were among the wrong answers seen.

(c) Most spotted that 3 or x was a common factor and were able to factorise partially but only the better candidates factorised fully. Some automatically set up two brackets for this problem. A few of these higher tier candidates appeared to be unfamiliar with the term 'factorise'.

3 **(a)** Many candidates added the numbers to obtain the correct answer of $3n + 3$. A variety of wrong answers were seen, with the most common being $n^3 + 3$.

(b) Many candidates attempted to explain without using correct mathematical terms and many only explained that $3n$ could be divided by 3 and failed to mention that 3 could also be divided by 3. Very few candidates used the approach that the expression could be factorised to $3(n + 1)$.

4 **(a)** This was very disappointing. Few correct constructions were seen. Some clearly used a protractor then put in arcs incorrectly later. Many omitted the question – did they not have geometrical instruments or did they not know what to do? A surprising number did not use the angle B at all. Many randomly drawn arcs with no bisector drawn, or the perpendicular bisector of AC, were among common wrong answers. Candidates usually appear more familiar with bisecting a line rather than an angle and the responses in this question demonstrated this.

(b) Since the majority scored zero for (a) they scored no marks in (b) too. Those who did the construction correctly were usually in range here, although some measured the wrong line.

5 **(a)** The majority of candidates calculated the correct values to complete the table for this quadratic graph.

(b) The points were generally plotted correctly but the standard of graphs was quite poor. A few drew a straight line between (1, 5) and (2, 5) but most did attempt a curve for the rest of the graph. As always there were those who made no attempt to join their points to complete the graph.

(c) This was quite well answered with most candidates knowing that the values were where the curve cuts the x-axis. Some, however, only gave one of the values or failed to realise the first root was negative.

6 **(a)** Many scored 3 marks and were well prepared for this question. A significant number followed $4x = 6$ with $x = \frac{4}{6}$ or made an error in dividing 6 by 4. There were the usual sign errors in collecting the terms on either side of the equation.

(b)(i) There were variable wrong answers to this question as candidates did not know when to add or multiply, $12a^6b$, $7a^5b^2$, $12a^5 \times 2b$ were among the most common wrong answers although many candidates did achieve the correct answer of $12a^5b^2$.

(ii) Again there was confusion as to whether 3 and 4 should be added or multiplied. The common wrong answer was x^7, although $4x^3$ also featured.

7 **(a)** The majority of candidates achieved the correct answer of 3·7, although a few misread the scale to give 3·54, 3·85, 3·9 or 3·95. Sometimes the range or the IQR were given instead of the median.

(b) There were varied answers to this question; candidates read the scales wrong or found the upper and lower quartiles as 5·05 and 4·55, but did not subtract correctly. A few left their answer as 4·55 − 5·05 and did not attempt the subtraction. Many, however, did get a correct answer.

(c) As always, candidates found it difficult to write clear comparisons of the distributions. Most were able to gain at least one mark for one correct comparison but failed to gain a second mark as both comments said effectively the same thing or neither included any context. Some tried to refer to the number of boys and girls taking part, which is of course unknown, or just compared the highest or the lowest result, which is not sufficient to compare distributions.

8 **(a)** The majority got 106°. They were, however, unable to give geometric reasons using the language of circles required. Terms such as edge, origin, middle, outside were often used. New this summer, to an extent not seen before, was the quotation of 'arrow theorem' by some candidates − this may be a useful teaching tool to help students recognise the situation but is not accepted as a reason.

(b) This was less well answered. Candidates who achieved the correct answer of 82° obviously used 'angle between tangent and chord is equal to the angle in the alternate segment', but relatively few stated it. Alternate angles and corresponding angles were sometimes wrongly quoted. Not all bothered to explain that they had also used 'angles on a line' or 'angles in a triangle' to get to 82 so the full 3 marks were infrequently gained.

9 **(a)** Most completed Sarah's probabilities correctly. Many forgot that it was sampling without replacement so used the same probabilities again. Weaker candidates often gave numbers rather than probabilities.

(b) Most selected the correct pair of probabilities but some added rather than multiplied. Some could not multiply fractions correctly. Some candidates having used numbers on their tree diagram went on to recover and use probabilities in this part.

(c) Most candidates found this question difficult and failed to identify all the correct branches. P(apple, apple) was often missed. Those who did identify the correct branches and realised that they needed to multiply and then add were sometimes let down by numerical errors.

10 Very few correct answers were seen. The common method was to try to draw graphs or tabulate. Those who started with $x + 4 = x^2 + 7x + 9$ often had difficulty in reaching the correct quadratic. Those who did reach $x^2 + 6x + 5 = 0$ usually went on to gain full marks. Those who tried to substitute for x rarely reached the correct quadratic. A number of candidates omitted this question.

Section B

11 **(a)** The majority of candidates correctly enlarged the triangle by scale factor 3. However, only a minority centred the enlargement on the given point. Some used the origin whilst many others used point (1, 1) or (2, 0), misinterpreting the given coordinates. There was evidence of candidates using the correct centre of enlargement but using a different scale factor, in particular scale factor 4 (presumably the distance from A to the image was '×3', thus making the distance from the centre '×4'). Of those who used a 'ray' method almost all gained all three marks and most of the use of scale factor came from this method as well.

(b) For this translation there was some confusion between *x* and *y* coordinates and, in particular, the negative aspect of *x*. Many candidates correctly identified a movement of 5 and one of 2, but too often they were unable to express these as a correct translation vector, so all versions of 2, 5 and +/− were seen.

12 **(a)** Almost all candidates completed this two-way table correctly, though there was occasionally evidence of poor arithmetic, especially the '28' in the top most cell.

(b) Nearly all candidates obtained the correct probability.

(c) This part was found to be the most challenging part of the question, but, nonetheless, the majority of candidates were successful. Common errors included offering $\frac{15}{43}$ and $\frac{15}{100}$.

(d) The open ended nature of this question led to a multitude of different responses. The majority, though, correctly indicated categories in hours, or fractions of hours, and offered sufficient tick boxes to meet the requirements of the question. A few candidates listed reasons for wearing glasses, e.g. reading, watching TV etc and consequently lost marks. The most common cause of lost marks was overlapping of times. The better candidates tried, in the most part successfully, to use inequality symbols or suitable wording. Those who used many boxes (more than 6) tended to have a higher frequency of overlaps than those with fewer boxes, but those with fewer boxes tended to omit values, usually the lower ones such as 2 or 3. A few candidates did not write a question despite being asked to in the question.

13 This was a straight forward calculator question which was done well by a high proportion of candidates. The majority knew how to use their calculators and rounded their answer correctly to obtain both marks. Some wrote down an interim stage for the calculation and used a rounded answer for the rest of the calculation, resulting in an inaccurate answer.

14 There were many good answers to this trial and improvement question. Solutions were occasionally spoiled by candidates giving the answer to more than 1 decimal place, or trying to get a solution that gave 0·0 to 1 decimal place. The most common error was to omit the negative sign in the trial for 2·3 and some did not write down a final answer. A few candidates had no idea what to do and the layout of some solutions was very poor.

15 The modal mark in this density question was 3 out of 6 for finding the correct volume. It was surprising how many thought that they had finished at this stage. The 'density = mass ÷ volume' formula was not seen very often, with many candidates just writing down calculations using mass and volume, often wrongly. The common errors were 'volume ÷ mass' or 'volume × mass', and these were very common. It tended to be the stronger candidates who used the density formula correctly, and fully correct well presented solutions were seen from such candidates. Some candidates used the surface area of a cylinder rather than the volume, whilst the weakest candidates who attempted the question tended to omit π in their calculations.

16 **(a)** Overall this percentage question was answered very well by many candidates, although some lost a mark for giving their final answer as £61·6 instead of £61·60.
Many knew the '× 0·88' method whilst others successfully found 12% and subtracted. There were very few arithmetical slips, although several divided by 1·12 and the occasional candidate added on 12%.

(b) Unsurprisingly, this reverse percentage question was done less well with 492 × 1·20 the most common error, possibly even the modal response.

17 **(a)** Finding the mean here was often done well but weaker candidates were frequently confused as to what they had to divide by what. The main errors of 108/28 (the correct number of people but divided by the total of the first column), 108/7 (dividing by the number of groups), 30/7 (total of frequencies divided by the number of groups) were far too common. Some candidates, perhaps drilled too strongly for the 'midpoint' situation, did not know what to do here so attempted midpoints. Some attempted cumulative frequencies.

(b) This standard form question was often well done with the majority scoring both marks. There was some good evidence of sensible calculator use, but also a lot of errors introduced by the long method. Some weaker candidates had no idea what to do.

18 Many knew how to find the requested side in this similar triangles problem, with use of the scale factor 2·4 being by far the most common approach. Occasionally, attempts using trigonometry or Pythagoras' Theorem were made, but the only false method that examiners saw with any regularity was one where the difference between the sides 9·6 and 8·4 was calculated and applied in the other triangle. This gave the wrong answer of 2·8.

19 This was possibly the least well answered question with few realising that trial and improvement was a good option to cope with the exponentials. Correct answers were quite rare and those who obtained the correct value of *t* often didn't show any working. Many students divided both sides by 5 then by 0·2 to attempt this question. Part marks were rarely awarded – it was usually 2 or 0.

20 **(a)** In general, the rearranging was done well but there were difficulties with the direction of the inequality sign here. It was common to see just 1·5 or $y = 1{\cdot}5$.

(b) This question was done well with the majority of candidates gaining both marks. The main error was the position of the square root symbol so that it only included C – this could occur because of the wrong order of operations or because of careless writing of the symbol.

(c) Only the best candidates managed to complete the square successfully and gain full marks. The use of $a = 8$ was common so $(x - 8)^2$ was often seen, whilst some used $a = \sqrt{8}$. As expected, candidates found it easier to get the value of a but struggled to find b, where 5, 11 and 21 were the common answers.

21 **(a)** Some of the weaker candidates managed to salvage something in question 21. This part was quite well done with many scoring both marks. Omission of calculation detail was sometimes a problem, since the answer was given. Some did not spot the 8 and tried Pythagoras' Theorem with 16. And '17 – 16 = 1 so 16 – 1 = 15' was an attempt by a few who had no idea, though some omitted this altogether.

(b) Very few knew how to obtain the volume of a pyramid. A variety of inappropriate formulas were used, such as ½ × base^2 × height; length × width × height; $\frac{1}{3}\pi r^2 h$.

(c) This last part on trigonometry was well done with many correct answers. Some who had an incorrect ratio to start with were able to pick up a mark for showing they had used an inverse function to obtain the angle. Some lost a mark through rounding the decimal version of their ratio before applying the inverse function. Those who used the sine or cosine rules were sometimes successful but often made errors in rearranging. Weaker candidates guessed at 60, 30, 45, or 90 or omitted the question.

Grade Thresholds

General Certificate of Secondary Education
Mathematics C (J517)
June 2009 Examination Series

Unit Threshold Marks (Module Tests)

Unit		Maximum Mark	a*	a	b	c	d	e	f	g	p	u
B271	Raw	50								28	14	0
	UMS	59								40	20	0
B272	Raw	50							37	23	15	0
	UMS	70							60	40	30	0
B273	Raw	50							27	12		0
	UMS	79							60	40		0
B274	Raw	50						39	24	14		0
	UMS	90						80	60	50		0
B275	Raw	50						28	13			0
	UMS	99						80	60			0
B276	Raw	50					32	18				0
	UMS	119					100	80				0
B277	Raw	50				28	14					0
	UMS	139				120	100					0
B278	Raw	50			32	16						0
	UMS	159			140	120						0
B279	Raw	50		28	14							0
	UMS	179		160	140							0
B280	Raw	50	31	15								0
	UMS	200	180	160								0

Unit Threshold Marks (Terminal Papers)

Unit		Maximum Mark	a*	a	b	c	d	e	f	g	u
B281	Raw	100				69	57	45	34	23	0
	UMS	279				240	200	160	120	80	0
B282	Raw	100	86	69	52	35	21	14			0
	UMS	400	360	320	280	240	200	180			0

Notes

The table above shows the raw mark thresholds and the corresponding key uniform scores for each unit entered in the June 2009 session. Raw marks in between grade boundaries are converted to uniform marks by a linear map. For example, 28 raw marks on unit B278 would score 135 UMS in this series.

For a description of how UMS marks are calculated see:
http://www.ocr.org.uk/learners/ums_results.html

For a spreadsheet designed to calculate UMS scores for this specification, please visit the GCSE Maths C e-community at:
http://community.ocr.org.uk/community/maths-gcse-ga/home

The grade shown in the table as ‘p’ indicates that a candidate has achieved at least the minimum raw mark necessary to access the uniform score scale for that unit but gained insufficient uniform marks to merit a grade ‘g’. This avoids having to award such candidates a ‘u’ grade. Grade ‘p’ can only be awarded to candidates for B271 (M1) and B272 (M2). It is not a valid grade within GCSE Mathematics and will not be awarded to candidates when they aggregate for the full GCSE (J517).

Statistics are correct at the time of publication.

Specification Options

Foundation Tier

	A*	A	B	C	D	E	F	G
Overall Threshold Marks				460	380	300	220	140
Percentage in Grade				20.2	24.4	20.1	19.4	12.3
Cumulative Percentage in Grade				20.2	44.5	64.6	84.0	96.3

The total entry for the Foundation Tier was 27 348.

Higher Tier

	A*	A	B	C	D	E	F	G
Overall Threshold Marks	700	620	540	460	380	300		
Percentage in Grade	9.6	20.9	29.4	30.0	9.1	0.9		
Cumulative Percentage in Grade	9.6	30.5	59.8	89.8	98.9	99.8		

The total entry for the Higher Tier was 31 774.

Overall

	A*	A	B	C	D	E	F	G
Percentage in Grade	5.3	11.5	16.2	25.6	15.9	9.5	8.7	5.5
Cumulative Percentage in Grade	5.3	16.8	33.0	58.6	74.5	84.0	92.7	98.2

The total entry for the examination was 59 122.

Statistics are correct at the time of publication.

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