Examiners' Report June 2008

GCSE

GCSE Mathematics (Modular) 2544

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1.1. GENERAL COMMENTS

1.1.1. Most candidates attempted all questions on the paper.

1.1.2. It was encouraging to see that most candidates showed their working.

1.1.3. There was some weakness in reading and interpreting information from graphs and diagrams.

1.2. INDIVIDUAL QUESTIONS

1.2.1. Question A1

The first two parts of this question were well answered with about 99% of candidates giving correct answers. Part (c) proved to be much more of a challenge with a large proportion of candidates giving "6" as their answer. This seemed to indicate confusion between the mean and median or the mean and mode. A small but significant number of candidates gave the sum of the ages (35) as their answer. Some candidates gave "31.8" as their answer here without working, which seemed to indicate a misuse of their calculator.

1.2.2. Question A2

92% of the candidates correctly identified both of the two days when Karen spent more time than Andrew watching television. 5% of the candidates correctly identified only one of the two days. In part (b) most candidates recognised the processes needed to answer the question but many answers were spoilt by careless errors. About 7 in every 10 of candidates were awarded two marks here. A significant number of candidates misread either the question or the graph and attempted to work out the total amount of time Karen spent watching television. A generous mark scheme enabled examiners to award these candidates some credit.

1.2.3. Question A3

About two thirds of candidates scored full marks by giving a fully correct and complete two-way table. 7% of candidates scored 2 marks (for 4 or 5 correct entries) with a further 12% scoring 1 mark (for 2 or 3 correct entries).

1.2.4. Question A4

60% of candidates scored at least one mark for either giving a question with a time frame or for giving at least 3 non-overlapping response boxes. About 2 in every 3 of these candidates scored both marks. Despite there being several similar questions on recent examination papers, there were still a substantial number of candidates who drew up a data collection sheet or frequency table. Vague labels for the response boxes – for example “rarely”, “quite often”, “often” and “very often” were commonly seen.

1.2.5. Question A5

Just under 60 % of the candidates scored full marks in this question. However, “0.35” was often seen, apparently derived by candidates using a number sequence approach or one based on symmetry. A significant minority of candidates, who did not have access to a calculator or preferred not to use one, and who recorded a fully correct method, were able to gain 1 mark. These candidates were often unable to add the three given probabilities or subtract their total from 1 with accuracy.

1.2.6. Question B1

Over 97% of candidates scored at least half marks in this question. In part (a) completion of the frequency table was done well though a further check might have saved some candidates from losing a mark through inaccuracy. Nearly all candidates were able to either give the correct answer to part (b) or obtain the mark from a follow through from their frequency table. It is encouraging to note that most candidates appeared to realise that the highest frequency was the key to identifying the mode in part (c). However, unfortunately a large proportion gave “7” as their answer and not “USA” as required.

1.2.7. Question B2

Over 60% of the candidates scored all 3 marks available for this question. Whilst the vast majority could match up the first statement with the correct word, a large number of candidates thought it “impossible” for a number less than 7 to be scored when an ordinary six-sided die is rolled once. This may have been due to the candidate’s lack of care in reading the statement given. This question proved to be a good discriminator.

1.2.8. Question B3

This question was often badly answered, even by candidates achieving success in the other four questions in this section. The success rate for each part of the question was about 40%. It seems that some candidates are unfamiliar with using a stem and leaf diagram. Common errors in part (a) included identifying 0 and 9 as the smallest and largest marks rather than 25 and 64, identifying 62 as the largest number and the inability to subtract 25 from 64 accurately. “41” was a commonly seen answer.

In part (b) many candidates tried to find the mode rather than the median and as a result “56” and “6” appeared frequently as incorrect answers.

1.2.9. Question B4

This question was well answered with 70% of candidates scoring 2 marks. A small minority of candidates described the likelihood of taking a black pencil, or gave a word or phrase instead of the answer ($\frac{3}{8}$ or equivalent) required. It is good to report that few candidates gave the probability in an unacceptable form or as a whole number.

1.2.10. Question B5

Almost a half of the candidates scored full marks on this question. Parts (a) and (b) of this question were well done with a good proportion of candidates able to express the relationship between height and weight in words or describe the relationship as “positive correlation”. Some candidates gave “positive” or “positive relationship” as their answer. This was insufficient. Lines of best fit were usually drawn within the acceptable tolerance and only a small number of candidates joined the points. Part (c) was quite well answered though many candidates appeared not to have fully understood the vertical scale on the graph and gave 158 cm as their answer when 156.5 was indicated by marks they had made on the graph.

2. PRINCIPAL EXAMINER'S REPORT – HIGHER PAPER 9

2.1. GENERAL COMMENTS

2.1.1. Candidates appeared to be able to complete both sections of the paper in the time allowed.

2.1.2. It is heartening to report that most candidates showed their working in the space given.

2.1.3. Many candidates lost marks in questions involving graphs because of a lack of care or understanding of the scale used on the vertical axis.

2.1.4. In section B of the paper the more able candidates usually scored full marks on the first 3 questions but few were able to gain full credit for their answers to the last question.

2.2. INDIVIDUAL QUESTIONS

2.2.1. Question A1

This question was well answered. In part (a) the vast majority of candidates (94%) were successful with only a small minority of weaker candidates extending a perceived number sequence to give "0.35" as their answer. Other candidates were unable to add probabilities or subtract their total from one accurately and so did not gain full credit for their answer to this part of the question. Not quite as many candidates (77%) successfully completed part (b). Some candidates gave the answer "25" apparently either dividing the total frequency into 4 equal parts or using the answer to part (a) rather than the "0.35" required from the table. "35/100" appeared fairly frequently and was awarded one mark.

2.2.2. Question A2

This question was answered well with 76% of candidates securing both marks. The main errors seen included overlapping response boxes and questions which did not focus on asking "how often people shop at Valerie's supermarket". Data collection sheets were seen frequently and received no credit. The most successful answers centred upon a simple set of response boxes such as "0-2, 3-4, 5-6" , etc, rather than wordy ones. Some responses seemed to allow for the possibility of the shopper visiting the supermarket many times each day. Students should be discouraged from using inequality signs in a question which requires a discrete answer.

2.2.3. Question A3

It appears that many candidates are not familiar with the context of moving averages. Part (a) was answered correctly by over 70% of candidates but a surprising number used the 3-point moving averages already given to calculate the moving average required. A few candidates treated the problem as a sequence and attempted to find a pattern in the moving averages given. Answers to parts (b), (c) and (d) were disappointing. Most candidates plotted the moving averages though a significant minority failed to understand the vertical scale and plotted the points incorrectly. Many candidates did not understand the need to draw a straight line in part (c) despite a similar question appearing on a recent examination paper. Often candidates mistakenly thought that joining the points would suffice. In part (d) the meaning of the word “trend” was missed by many candidates who merely described the fluctuation in the moving averages rather than the overall trend. Any answer indicating an “increase” or “upward trend” was acceptable here. A description of correlation was often given. This, on its own, was not acceptable.

2.2.4. Question A4

Just under half of candidates gained some credit for their answers to this question. Either 6 or 7 were accepted for full marks. A surprising number of candidates worked out how many girls there should be in a sample of 50 year 9 students (27). Even more found how many girls there should be in a sample of 50 girls from the school (12) rather than meeting the requirement of the question. Absurd answers such as 167 were not uncommon.

2.2.5. Question A5

More able candidates with a good understanding of histograms found this question straightforward. Over 40% of candidates were awarded full marks. However many candidates cited “34” as their answer suggesting that they had used the height of the bars as proportional to the frequencies. Incorrect answers of 17, and 7 (from adding how many 2 block bar widths there were), were also often seen.

2.2.6. Question B1

All parts of this question were very well done with 87% of candidates scoring all three marks. There were some candidates who didn’t understand the concept of a ‘line of best fit’ and instead, joined the points in part (b). A few candidates gave only 2 digits (e.g. 55) as their answer to part (c) of this question.

2.2.7. Question B2

79% of candidates were able to give a fully correct answer to this question. Some candidates may have avoided careless errors by using the space provided to construct an unordered stem and leaf diagram before presenting their answers in the framework given. Some candidates did not give a correct key.

2.2.8. Question B3

This question proved to be a good discriminator. A majority of candidates were able to identify that the question involved non-replacement and secured the first available mark for sight of "$\frac{2}{7}$". Over a third of candidates went on to give the correct answer $\frac{6}{56}$ or equivalent. However, for others, the inability to manipulate fractions let them down. For example, candidates often used a correct method but ended their answer with "$\frac{3}{8} \times \frac{2}{7} = \frac{5}{56}$" Some candidates accounted for several different outcomes in their answer.

2.2.9. Question B4

29% of candidates scored full marks on this question. This is a pity on a question involving standard procedures. The cumulative frequency table in part (a) was completed successfully by nearly 90% of candidates. However, it is a pity that there were still many candidates who did not check that their table was consistent with the information given in the stem of the question – in this case that there were 100 cars in total. The cumulative frequency graph was quite well done but there were still a good number of candidates who did not plot the data at the upper boundary of each interval. Attempts to find the median and inter-quartile range were disappointing, with little working seen in part (d).

3. PRINCIPAL EXAMINER'S REPORT – FOUNDATION PAPER 10

3.1. GENERAL COMMENTS

3.1.1. These papers were more accessible than those of similar papers of the 2007 series.

3.1.2. All questions on this paper proved to be most accessible for the greater proportion of the candidature. However many candidates found questions A8, B6, B9 and B10 quite challenging.

3.1.3. Coverage of the specification was good.

3.2. INDIVIDUAL QUESTIONS

3.2.1. Question A1

All parts were generally answered correctly. The most common incorrect answers were 800, 870 and 860 in part(a), two thousand and five in part (b) and part (c) was rarely incorrect.

3.2.2. Question A2

Most candidates were able to recognise and name the kite although a significant number offered alternatives, the most common being rhombus, parallelogram and quadrilateral.

3.2.3. Question A3

Ordering of whole numbers in part (a) was confidently and accurately carried out. Occasionally 5201 and 5210 were reversed and sometimes one or two of the four numbers were placed under the answer line making the ordering ambiguous. In such cases the mark could not be awarded. Part (b) was less well done and often 0.7 was not seen to be the smallest number, however the most common incorrect order seen was 0.7, 0.75, 0.705; three decimal places being considered greater than a number with two or one.

3.2.4. Question A4

In part (a), the most common errors were 16 (the sum of the squares around the outside of the given rectangle) and 8 (the area) although the great majority gained the mark.

Part (b) was answered better with only a few candidates confusing area and perimeter and giving an answer of 12.

3.2.5. Question A5

The whole of this question was , in general, answered well. Very few failed to gain the award in part (a) although some did reverse the coordinates to give an incorrect answer of (4, 1). In part (b) these candidates usually plotted their point Q incorrectly at (-2, 5). Many candidates in part (c) correctly quoted the coordinates of the midpoint but then failed to indicate its position on the diagram.

3.2.6. Question A6

In part (a), many candidates gained full marks; errors tended to be in the substitution of $x = -1$, where $y = -1$ was the most common mistake. In part (b), most candidates were able to score at least one mark for correctly plotting 4 or 5 points from their table of values.

Many gained full marks and a significant number should have done but for failing to actually join up 5 correct points. A few candidates recognised that the line intercepted the *y*-axis at −3 but then failed to draw a correct gradient.

3.2.7. Question A7

Many candidates gained full marks in this question, often without showing any working. This is a high risk strategy as the alternative is no marks for an incorrect answer with no working. The usual method employed was to first find the size of the angle at the apex of the triangle and then find *p* using the sum of the angles in a triangle equal to 180^o.

Occasionally arithmetic errors were made but the most common error was to assume the triangle to be isosceles giving $p = 180 - 70 - 70 = 40$.

3.2.8. Question A8

Many candidates at this level were confused by the demands of each of the parts to this question. In part (a), those candidates with the slightest understanding of HCF often failed to quote sufficient factors of 44 and 77 to gain any credit. In part (b) many just listed product pairs of 200 (eg 100 x 2, 50 x 4, etc.). Some attempted to use a factor tree method but got confused in its construction, often using the sum of two numbers instead of the product. Many more able candidates failed to score maximum marks by failing to quote their answer in product form; 2,2,2,5,5 or 2+2+2+5+5 or $2^3 + 5^2$ were not uncommon.

3.2.9. Question A9

Those candidates who showed some intermediate working out usually went on to gain full marks in the calculation in part (a). Many candidates, preferring to compute the calculation with one visit to the calculator, often made mistakes by applying an incorrect order of operations, usually resulting in an answer of 2.465246763…It was also not uncommon to see an answer of 0.03699 (the inverse of the correct answer). In part (b) candidates were able to gain the mark irrespective of their accuracy in part (a). Indeed many with 2.465246763… in part (a) correctly rounded to give 2.5 to gain this award. However a significant number wrote 2.4. With the correct answer of 27.0343336 in part (a), many gave 27, 27.03 or 27.00 for their answer to part (b), all gaining no credit.

3.2.10. Question B1

The correct answer of 12 (for two marks) was the most common answer seen although 11 and 10 (for one mark) were also seen. Many candidates who tried to show some working out usually failed to score any marks, 4 x 2 x 2 = 16 being a common error, attempting to find the volume of a cuboid. An answer of 18 was also not unusual, found by simply counting the number of visible faces.

3.2.11. Question B2

Most candidates correctly quoted Oslo as the city with the lowest temperature in part (a), however in part (b) whilst ±13 was the modal answer, 7 (10 – 3) was the offering of many candidates. Many of those who failed to find the correct temperature difference were able to pick up one mark for showing a number line from -3 to 10.

3.2.12. Question B3

Ounces, pounds and kilograms were the most common errors in (ai) whilst inches and metres were sometimes seen in the more successfully answered (aii).

In part (b) 700 and 70 were the most often seen mistakes

3.2.13. Question B4

In part (a), the most candidates correctly gave 3 as the next term in the sequence, although a significant number worked backwards and gave 27 as their answer. Whilst understanding the error, candidates must realise that a sequence is always quoted from the first term reading left to right.

Many candidates simply gave the difference between consecutive terms without actually explicitly stating how they found their answer to part (a). Any explanation relating to the subtracting of 4 gained the mark.

3.2.14. Question B5

The most common errors here were; 16 in part (a), 50, 25, 1000 or 10000 in part (b) and 25, 2.5 and 15 in part (c). This final part was particularly poorly answered.

3.2.15. Question B6

The more traditional methods for long multiplication usually yielded a correct or near correct result, often one arithmetic slip only was made and thus just one mark lost; although, even here, confusion with place value lost all of the marks. The matrix (table) method was then the next most popular approach, however many mistakes were made in the multiplication of pairs of numbers in completing the table; 700 x 20 = 1400 was a common error. Addition errors, particularly using this latter method, often spoiled otherwise accurate work. Those candidates electing to use a Napier's bones approach often made errors in the setting up of their table.

3.2.16. Question B7

Many candidates gained at least one mark here for selecting at least one correct expression from the four alternative answers.

3.2.17. Question B8

Most candidates showed an understanding that speed is equal to distance divided by time, although 48 (24 x 2) and 5 (120 minutes ÷24) were often seen.

3.2.18. Question B9

Many candidates were clearly confused by the letter outside of the bracketed expression rather than a number in part (a). $cd + 4$ and $4cd$ were the most likely incorrect answers to be seen. In part (b), many candidates were able to score one mark for the correct expansion of either of the bracketed terms, but a great many failed to do even this with $3x + 5 + 2x - 1$ leading to an answer of $5x + 4$ and sometimes $5x + 6$ in many cases. Some candidates quoted the correct answer of $5x + 13$ but then gave $18x$ as their answer by further attempts to simplify. This loses one of the two marks.

3.2.19. Question B10

Although a pleasing number of candidates were able to correctly label both of the required points, very many failed to even locate one point. If just one point was labelled correctly it would be more likely to be the point B.

4. PRINCIPAL EXAMINER'S REPORT – HIGHER PAPER 11

4.1. GENERAL COMMENTS

4.1.1. These papers were a little more accessible than those of similar papers of the 2007 series.

4.1.2. All questions on the papers proved to be most accessible for the greater proportion of the candidature. However many candidates found difficulty in understanding the demands of A8b and B9

4.1.3. Coverage of the specification was generally good.

4.2. INDIVIDUAL QUESTIONS

4.2.1. Question A1

Full marks was the modal score on this question, however a significant number of candidates gave 80 as their value for x followed by the same value for y. In such cases one mark was awarded for recognising that x was equal to y.

4.2.2. Question A2

Those candidates who showed some intermediate working out usually went on to gain full marks in the calculation in part (a). Many candidates, preferring to compute the calculation with one visit to the calculator, often made mistakes by applying an incorrect order of operations, usually resulting in an answer of 2.465246763…

In part (b) candidates were able to gain the mark irrespective of their accuracy in part (a). Indeed many with 2.465246763… in part (a) correctly rounded to give 2.5 to gain this award. With the correct answer of 27.0343336 in part (a), many gave 27, 27.03 or 27.00 for their answer to part (b), all gaining no credit.

4.2.3. Question A3

Although the majority of candidates accurately calculated the area of the given triangle in part (a), very many disappointingly gave an answer of 36 (6 x 6). Full marks were still however available in part (b) for accurately calculating 10 x their answer in (a).

4.2.4. Question A4

It was pleasing to see so many candidates scoring full marks for a correct expression of $2x + 3y$, although a significant number equated this to $5xy$ and consequently lost one mark.

Weaker candidates often picked up a mark for sight of either $2x$ or $3y$, but some just wrote $x + y$ or xy and gained no marks. Any attempt to put the correct expression into a formula was not penalised provide the subject of the formula contained neither *x* nor *y*.

4.2.5. Question A5

The greater majority of candidates drew their own table of values in order to draw the graph of the given function. Many accurately completed this method to gain full marks, however errors in the substituting of negative values of *x* often prevented this. 1 or 2 marks could still be awarded for some correctly plotted points. A number of candidates recognised that the line intercepted the *y*-axis at −3 but rarely then drew the line with correct gradient. This was awarded 1 mark.

4.2.6. Question A6

Some of the weaker candidates at this level were confused by the demands of each of the parts to this question. In part (a) some just listed product pairs of 200 (eg 100 x 2, 50 x 4, etc.). Some attempted to use a factor tree method but got confused in its construction, often leaving it incomplete. Some candidates failed to score maximum marks by failing to quote their answer in product form; 2,2,2,5,5 or 2+2+2+5+5 or $2^3 + 5^2$ were not uncommon.

In part (b), most candidates scored at least one mark (usually for an answer of 11) and many the full 2 marks.

4.2.7. Question A7

Most candidates knew to apply their taught method for expanding the product of a pair of bracketed linear expressions, however a surprising number failed to correctly work out the product of 2*x* and 5*x*; 10*x* or 7*x* being the most common errors. In addition, many made sign errors when collecting terms for the final answer.

4.2.8. Question A8

In part (a) the majority of the more able candidates correctly found 30 to be the value of *x*, however explaining their reasons in part (b) proved far too difficult at all levels. Those that realised that angles *ABO* and *ACO* where 90^o could not always correctly explain why; 'the angle from a circle (centre) to a tangent is 90^o' or 'tangents meet circles at 90^o' being two of the better efforts yet still gaining no credit.

4.2.9. Question B1

Most candidates showed an understanding that speed is equal to distance divided by time, although 48 (24 x 2) and 5 (120 minutes ÷24) were sometimes seen.

4.2.10. Question B2

In this type of question most candidates do, in general, realise that the required answer is using the digits of the third of the numerical term. In part (a) this understanding usually lead to a correct answer of 17.01, however in part (b) performance was much less good; 4.86 and 48.6 being very common incorrect answers seen.

4.2.11. Question B3

Most candidates scored at least one mark, and usually two, for get one or both coordinates correct. On e mark was also awarded for an answer of (2, 3).

4.2.12. Question B4

Some of the weaker candidates were clearly confused by the letter outside of the bracketed expression rather than a number in part (a). $cd + 4$ and $4cd$ were the most likely incorrect answers to be seen. In part (b), many candidates were able to score at least one mark for the correct expansion of either of the bracketed terms. A number of candidates made careless mistakes in collecting terms for the final answer.

4.2.13. Question B5

Although a pleasing number of candidates were able to correctly label both of the required points, some many failed to even locate one point. If just one point was labelled correctly it would be more likely to be the point B.

4.2.14. Question B6

In part (a) the most common incorrect answer given by candidates with some understanding of factorisation was $2(a + 6)$. However answer of $8a$, $8 + a$ and $12a$ were commonplace. In part (b) the more able candidate often failed to gain full marks as a result of just partial factorisation whilst an answer of $15x^3y$ or $15x^2y$ was often seen from weaker candidates.

4.2.15. Question B7

14×10^6 and 14^6 were the most common errors made in part (a). In part (b), it was not uncommon to see answers of 0.007, 0.70000, 70000 and 70^{-4} instead of 0.0007

4.2.16. Question B8

In this question part (i) was quite well answered, although answers of 0 and 5 where often seen. Parts (ii) and (iii) were less well done , ±16, −8 and 2 being the most common errors in (ii) and 50, 150 and 100.5 in (iii).

4.2.17. Question B9

The majority of candidates attempted just arbitrary cancelling processes without really any understanding of how to simplify this algebraic fraction in part (a). Often, many of the more able candidates sought to simplify either the numerator or the denominator but rarely both.

It was pleasing to see a good number of candidates attempting to find a common denominator in their efforts to add the two algebraic fractions. Often the product of (x + 4) and (x – 4) was incorrectly expanded and many times a complete method was never followed often leaving an incorrect answer such as $\frac{3}{(x+4)(x-4)}$

5. PRINCIPAL EXAMINER'S REPORT – FOUNDATION PAPER 12

5.1. GENERAL COMMENTS

5.1.1. The paper proved to be accessible to most candidates with the majority of the candidates attempting all questions.

5.1.2. Candidates appeared to be able to complete the paper in the allotted time.

5.1.3. Candidates are advised to make sure that their pencil marks in constructions and diagrams are clearly visible, particularly when the paper is marked online.

5.1.4. It was encouraging to note that most candidates did try to show their working out and this led to many method marks being scored in questions 4 and 12 when the answer was incorrect. However, solving algebraic equations was not, in general, well set out with many trial and improvement attempts seen.

5.2. INDIVIDUAL QUESTIONS

5.2.1. Question 1
Although there were many correct responses (73%) many candidates left out the cost of one roll of wallpaper. A common error was to halve the total cost of the tins of paint reaching £7.25 which then led to the grand total of £46.25 which scored the final mark for "total for the tins of paint" + £39. A common incorrect response for the total cost was £58 as some candidates lacked the skill in adding 29 + 15 + 24. This proved to be a good question to start to the paper with only 2% not scoring any marks.

5.2.2. Question 2
Measuring the length of the line did not pose too much of a problem. However, writing in the correct unit was less encouraging. Rather than 8 cm or 80 mm it was not unusual to find 8 km or 8 m. It was pleasing to note that over 86% of the candidates scored both available marks.
Locating the mid-point of the line was done accurately by 93% of the candidates although some appeared to rely more on judgement as opposed to making a measurement.

5.2.3. Question 3
Candidates at this level did struggle with the application of directed numbers but on the whole over 60% of the candidates scored all 3 available marks. Part (a) proved to have a higher success rate than the other two parts with a 76% success rate on part (a).

5.2.4. Question 4

Where candidates realised that the easiest way forward was to work out the cost of one pen (scoring the first method mark) and then to multiply this by 5, most then went on to work out the total cost of £1.50 73% of the candidates were able to get this correct answer. Those who did not go down this route tended to multiply 60p by 5 which then earned them 1 mark but as they then went no further, the maximum they could score was 1 mark. £1.80 was a common incorrect answer. Those obtaining it by stating 5×30 = £1.80 were awarded 2 marks. £1.80 was also obtained by doing 3×60 which earned no marks. This is another reason why students must show their working and not scribble it out. Only 6% did not score any marks.

5.2.5. Question 5

The recognition that 5 is a factor of both 5 and 15 in the ratio 15 : 5 was a clear starting point with the simplified ratio 3 : 1 being produced. Care was needed, however, to retain the colon between the values and it was not uncommon to see it written as 3.1 or 3,1. 46% of the candidates got this part correct.

Converting and interpreting the ratio of 5 : 3 in part (b) to obtain a fraction was dealt with less confidently. The addition of the 3 and the 5 was a crucial first step to achieving the result of 5/8. There were many combinations of 3 and 5 that led to an assortment of fractions. Reward was given for correctly identifying the numerator as 5 and the denominator as 8 as long as the final fraction was less than 1 with 5 % scoring 1 of the 2 available marks and 34% scoring both marks. The most common incorrect response was $\frac{3}{5}$.

5.2.6. Question 6

It was disappointing to find that only 26% of the candidates got both parts correct although 48% did manage to score 1 of the available marks. The most common incorrect response to both parts was 180° with candidates clearly not reading part (b) with care.

5.2.7. Question 7

Over 97% of the candidates could reflect the shaded shape in the given line which was most encouraging. It was also pleasing to note that 95% could draw in the line of symmetry on the diagram. The most common incorrect response to (b) was to treat the triangle as equilateral rather than isosceles which led to 3 lines of symmetry being drawn.

5.2.8. Question 8

Working out 1/5 of 30 in part (a) was handled well by 2/3 of the candidates.

In part (b) finding ¾ of 20 also resulted in many correct answers (66%). Some chose to find ¼ of 20, which was awarded a method mark, but then forgot to use this to calculate the value of three-quarters. For the most part there was a realisation that a multiplication, rather than any other arithmetical rule, was needed to secure the value. Many realised that they needed to divide 20 by 4 (using the same method as part (a)) but then failed to continue, with 5 being the most common incorrect answer.

5.2.9. Question 9

This question involved calculating the missing angle of a quadrilateral. The three given angles were usually added together to produce a sum of 300º although some had difficulty arriving at the correct sum. The value of angle *y* was often written directly on the answer line without the need to evaluate 360º–300º as a subtraction sum. The 360º, however, was not always a known fact and this became 380º leading to the loss of the accuracy mark. An alternative approach was to write *y* = 180º–120º coming from the fact that two of the angles in the quadrilateral took care of one of the 180º's out of the 360. 78% of the candidates scored both marks on this question with 2% scoring 1 of the 2 marks for a valid method.

5.2.10. Question 10

The travel graph of a journey was generally well interpreted allowing all four parts of the question to be attempted. Over 70% of the candidates scored all 3 marks for parts (a) and (b). The final part proved to be the most demanding as this required an understanding of the scale being used on the horizontal axis with a correct time of 11:20. The addition of either 'am' or 'pm' was acceptable. Many wrote 11 10 or 11 15 with 79% writing the correct answer of 11 20.

5.2.11. Question 11

Most candidates (70%) could express 24 as a fraction of 36 scoring at least one mark. However, although many could simplify this fraction by dividing both by 2 or 3 or even dividing both by 6, only 33% of these candidates were able to write the fraction in its simplest form.

Candidate struggled with part (b) and seldom chose a valid method for changing the fraction to 0.6 A few did attempt division but many divided 5 by 3 reaching an answer of 1.666 Those that changed the fraction into tenths were more successful but the vast majority of the candidates wrote their answer as 3.5 or 0.35 or even 0.035
Only 22% of the candidates got this part correct.

5.2.12. Question 12

Essentially this question was about multiplying £5.40 by 24 although setting it within a wages calculation should have alerted students to the reasonableness or otherwise of their calculated weekly pay. Methods of performing the multiplication were numerous with some producing the correct weekly wage of £192.60. Many treated it as '540 × 24' and were then unable to deal with the amounts in pounds and pence often combining them together incorrectly.

Whichever method was used to perform the multiplication an element of carelessness crept in. Finding '4 × 4 = 8' or '4 × 5 = 9' were not as uncommon as they should have been. Those who used grid methods often did not score any marks as their confusion with the decimals led to many conceptual errors.

Those who felt confident about tackling the multiplication created neat solutions which contrasted with those who wrote £5.40 a total of 24 times and then tried to add them together; it did earn a method mark but what a challenge to arrive at a correct outcome! 44% of the candidates scored all 3 marks with 12% scoring at least one mark for a complete method with relative place value correct where a multiplication error was condoned.

5.2.13. Question 13

62% of the candidates were able to measure the size of the angle marked *x* within the tolerances.

In part (b) candidates earned a method mark for measuring the length of *AB* in centimetres (large tolerances were allowed) and then multiplying this by 50. Those that just wrote down an answer often failed to score the method mark as the examiners could not see what they had done. It was not uncommon to see an answer of 250 or 350 without working which scored no marks. A common incorrect response was to take their answer to (a) and multiply this by 50 demonstrating a complete lack of understanding of scale drawings. 78% of the candidates scored both marks in part (b).

Candidates at this level often struggle with bearings and this year was no exception with only 15% of the candidates scoring both marks in part (c). However 30% were able to score 1 mark generally for drawing a cross 7 cm from *B* although some did score 1 mark for a bearing of 60°. A common error was to measure 60° from point *A* instead of *B*. This did not score any marks.

5.2.14. Question 14

Candidates still are not familiar with operating fractions. It was disappointing to note that only 21% of the candidates got part (a) correct with 54% getting part (b) correct. By far the most common answer to part (b) was $\frac{2}{15}$ showing a real lack of understanding of how to add fractions.

5.2.15. Question 15

In part (a) simplifying $t \times t^2$ was asked for and some correct results of t^3 were seen. Generally though it did appear that the topic of dealing with indices is one that perhaps needs more practice. Solutions like '*t t t*'' , '2*t*' or '2*tt*' indicated a lack of being able to apply a power rule. Maybe writing $t \times t^2$ as $t \times t \times t$ initially might have point them in the right direction. By far the most common incorrect response to (a) was $2t^2$.

Simplifying $m^5 \div m^3$ in part (b) proved to be equally challenging. Here the most common incorrect responses were m^8 and $\frac{m^5}{m^3}$. Only 20% of the candidates got both parts correct with a further 29% getting just one part correct.

5.2.16. Question 16

Candidates were not put off by seeing an equation and it was encouraging to note that 96% solved part (a) correctly and 92% got part (b) correct. A common incorrect response to part (b) was to write 4 + 4 which did not score the mark. There was less success in part (c) with 12% scoring one mark, generally for sight of –6, and a further 30% writing the correct answer of –3.

It was rare to see the correct answer in part (d) with only 19% reaching an answer of 5. Most of these candidates showed very little algebraic working with many using a trial and improvement method. Trial and improvement is fine if you get the correct answer but if not, no method marks can be scored.

5.2.17. Question 17

It was evident that many candidates either did not have the use of a pair of compasses or did not realise that they had to use them to construct an equilateral triangle even though the question clearly stated that they should be used. 28% of the candidates constructed the triangle accurately using compasses whilst 47% scored one mark, generally for drawing a triangle within the guidelines without any construction lines shown. A very small group of candidates scored 1 mark for drawing arcs of equal length from the end of the given line. Constructing the triangle using a protractor allowed the candidate to earn 1 mark. Some candidates then attempted to earn the second mark by drawing the arcs freehand but this was easy to identify so only 1 mark was awarded.

5.2.18. Question 18

Many candidates (23%) were able to score 1 mark mostly for writing 4 out of the 5 required integers with 15% scoring both available marks. Most candidates did only write integers as part of their answer but it was clear that many did not understand the difference between $<$ and $\leq$.

5.2.19. Question 19

Although many candidates demonstrated that they could rotate shape *P*, around 11% scored both marks. 16% scored 1 mark, generally for drawing triangle *A* in the correct orientation. Many candidates rotated the triangle by 90° clockwise but failed to score a mark as they then did not use the correct centre of rotation with many drawing the right angle at the given centre of rotation.

It was evident that candidates did not know what was required in part (b) with many candidate either leaving it blank or rotating shape *P*. Many others translated shape *P* 6 squares to the right but then did not continue with moving it 1 down.

There was a mixed response to part (c) with 46% of the candidates getting the reflection correct and a further 5% scoring one mark generally for the correct orientation but with the triangle translated one square from the correct position. The most common incorrect response was to draw the reflection with one of the sides 4 cm in length parallel to the *x*-axis and another side 2 cm in length parallel to the *y*-axis.

6. PRINCIPAL EXAMINER'S REPORT – FOUNDATION PAPER 13

6.1. GENERAL COMMENTS

6.1.1. The majority of candidates entered for this paper found it accessible.

6.1.2. The vast majority of candidates attempted nearly all the questions, as blank responses were seen very infrequently.

6.1.3. There was evidence that more candidates are showing their working. This was gratifying to see as about one third of the marks on this paper were for showing a correct method.

6.1.4. Candidates were, in general, unable to answer correctly the questions on algebra as they often wrote expressions incorrectly. They also made errors in writing money and dealing with fractions but they had more success with questions that involved calculations with number.

6.1.5. It is still apparent that some candidates did not appear to have calculators, or did not use them, as they often had the correct numbers to multiply together but then made errors. There was also a lot of evidence of non-calculator methods being used in the paper.

6.1.6. Questions that were answered with the most success: - 1 – 10, 15a, 17.

6.1.7. Questions that were only rarely successfully completed: - 12, 13a, 18, 19.

6.2. INDIVIDUAL QUESTIONS

6.2.1. Question 1

Part (a) this question was well understood with 64% of candidates gaining full marks. A small percentage of candidates (8%) scored no marks as they thought triangle A was right-angled and triangle G was isosceles. This was probably to do with the orientation of the given shapes. Part (b) was also well done with 80% of candidates obtaining the mark though a some candidates thought that triangles G and D or A and C were congruent.

6.2.2. Question 2

This question was also well understood with a success rate of 96% for part (a) with only a very small percentage of candidates writing –13 as the highest temperature. In part (b) the success rate was 88% and this showed a good understanding of temperature difference. Candidates that wrote –8 were also awarded the mark. In part (c) the success rate was only 81% with many candidates writing +1ºC rather than the –1ºC, which was the correct answer.

6.2.3. Question 3

Most candidates understood that they had to write two numbers, one above the other as a fraction and 55% gave a fully correct answer. 30% of candidates gained one mark usually for writing a fraction out of 29 (usually $\frac{16}{29}$) or for identifying that there were 13 boys in the class. Having established that the no. of boys was 13 a significant number of candidates turned $\frac{13}{29}$ into the fraction ⅓ whilst some added 16 and 29 and made the denominator 45.

6.2.4. Question 4

Candidates understood this question but fully correct answers were seen in only 56% of cases. The digits 83 needed to be seen for the award of 2 marks and £0.83 or 83p needed for the units mark on this paper. This occurred in 14% of cases. An answer of £0,83 or £0.83p was also awarded full credit. A significant number of candidates had the correct response of 0.83 but failed to write this correctly as money giving their answer as 0.83p

6.2.5. Question 5

This question was well attempted with 59% of candidates getting at least 1 mark for either dividing 200 by 5 or multiplying 200 by 3. Full marks were obtained by 52% of candidates.

6.2.6. Question 6

It was gratifying to see 68% of candidates obtaining full marks in this question. Almost all candidates realised they needed to find the elapsed time though a few tried to multiply the actual times by 12p and gained no marks. Many candidates were unable to find the time difference between the two times given in the question, often adding the 11 and the 57 together to obtain 68 minutes. Another significant number of candidates realised they had to multiply their elapsed time by 12p and they then scored 2 marks if went on to write their answer correctly as money. Obviously full marks were awarded for the correct answer of £5.52 but if candidates wrote the correct digits 552 they could obtain 3 of the 4 marks available. This occurred in 8% of cases.

6.2.7. Question 7

This question was quite well answered as 79% obtained the correct answer to part (a) and in part (b) the correct answer was given by 82% of candidates. In part (c) this success rate reduced to 49% as 2.5 was often seen as an incorrect answer.

6.2.8. Question 8

This question was well understood and the success rates were very high 84% for part (a) and 90% for part (b). The few candidates that did not gain marks made the mistake of rounding their answer to the nearest 10 or 100 rather than using the reading from the graph.

6.2.9. Question 9

This question was answered correctly by 92% of candidates with a further 7% gaining 2 marks because then made 1 or 2 errors. Only 1% of candidates scored 1 or no marks.

6.2.10. Question 10

This question was answered well with fully correct answers for part (a) and (b) having a 75% success rate overall. In part (a) the most common error was to add the hourly rate of £7 to the standing charge of £30 and then multiplying by 4 giving an incorrect answer of £148; this scored no marks. In part (b) the most common wrong answer was 7 hours obtained by dividing £51 by 7, the hourly charge. Candidates were awarded a mark if they realised they had to take £30 away from £51 leaving £21 and a further mark for showing they had to divide by 7.

6.2.11. Question 11

The correct answer to this question had a success rate of 57%. It was well understood by candidates. Where it was answered incorrectly, this was usually because the number of degrees in a triangle was written as 160° or 280° or 360° or 90°; the other common mistakes were to subtract 23° from 180° only once to get 157° and some then went on to divide 157 by 2 having understood that an isosceles triangle had 2 equal angles.

6.2.12. Question 12

There were varied responses to this question. Some candidates tried to change the marks into percentages, others turned them into decimals and others tried to work in equivalent fractions whilst a sizeable minority tried to work on the number of marks that students got wrong and another sizeable minority thought they could change the second mark into a percentage by doubling. Another common error made by the candidates was to add 50 to the 42 and then 50, or 40, to the 48 in an attempt to make them out of 100. Fully correct solutions were seen by 27% of candidates whilst those candidates that dealt with one mark correctly obtained 2 marks; this was gained by 12% of candidates. 48% of candidates did not score any marks in this question.

6.2.13. Question 13

There were many and varied responses to this question. Only 29% obtained a fully correct solution to part (a) with $P = n^3$ or $n \times n \times n$ being a common incorrect response. It was also common to $P + n + n + n$ which obtained no marks as it was not a formula though if $n + n + n$ was seen on its own one mark was awarded. In part (b) candidates were more successful with 57% obtaining both marks and a further 11% gaining 1 mark for using their formula correctly.

6.2.14. Question 14

This question was well understood with 68% giving the correct answer of 5 for the scale factor in part (a) whilst in part (b) 68% obtained both marks for a fully complete enlargement and a further 19% obtaining one mark for getting at least 3 enlarged lengths correct.

6.2.15. Question 15

Candidates understood what they had to do with part (a) and 76% of candidates correctly gave the correct change of £3.50. Some candidates made simple arithmetic errors and so lost marks. The most common of these errors was to obtain £22.5 by calculator and then call this £22 and 5 pence for the purposes of the final answer giving £3.95 as a common incorrect answer. Another incorrect common answer was £4.50 where candidates showed the actual correct subtraction (50 – 46.5) but failed to calculate it correctly. Very few candidates (5%) scored no marks. Parts (b) and (c) were not so well understood with success rates of 48% and 44% respectively. The most common errors were to halve when they should have doubled and doubled when they should have halved showing that candidates at this level do not understand the concept of scales. Some candidates did not realise it was a question about scales and tried to change units by multiplying and dividing by assorted powers of 10.

6.2.16. Question 16

Ratio too is not well understood topic for most foundation candidates and only 29% of candidates obtained full marks. 16% of candidates obtained one mark for not writing the ratio in its lowest terms of for reversing the component parts of the ratio.

6.2.17. Question 17

This question was well understood with 73% of candidates obtaining full marks. The 25% of candidates who scored no marks often made copies were of the original diagram and frequently side elevations and plans were seen. When candidates made an error of one square or made an enlargement of the front elevation they were awarded one mark; this occurred in 2% of cases.

6.2.18. Question 18

This question was not very well understood by candidates on this Foundation paper. Only 5% of candidates obtained full marks but some candidates did pick up some marks for expanding the bracket correctly or for dealing with both the variable and the constant terms. A small minority of candidates were successful in obtaining the correct answer of 2.5 from trial and improvement methods. 86% of candidates scored no marks in this question.

6.2.19. Question 19

This standard Pythagoras' theorem question had a success rate of only 14% for a fully correct answer of 10.63 to 10.631 inclusive. The most common wrong answer was 15, obtained by either adding the two sides 7 + 8 or from subtracting $8^2 - 7^2$. Candidates were awarded 1 mark for showing they needed to add the squares of 7 and 8 and a second mark if they showed they were going to square root their answer to $7^2 + 8^2$. Some candidates lost a mark as they wrote 10.6 on the answer line having not written $\sqrt{113}$ as 10.63… in the working space. An answer of 10.6 on the answer line with no working was awarded one mark. 80% of candidates scored no marks on this question.

7. PRINCIPAL EXAMINER'S REPORT – HIGHER PAPER 14

7.1. GENERAL COMMENTS

7.1.1. All questions on this paper proved to be most accessible for the greater proportion of the candidature. However many candidates found questions 14c, 15, 16 and 17 quite demanding.

7.1.2. Question 2, long multiplication involving decimals proved to be quite challenging for all levels of ability.

7.1.3. It is pleasing to note that only a very few candidates failed to answer questions 6 (construction) and 9 (transformations) due to lack of the necessary equipment.

7.1.4. Coverage of the specification was good although a number of candidates do seem to have been entered at an inappropriate tier.

7.2. INDIVIDUAL QUESTIONS

7.2.1. Question 1

Part (a) was generally answered correctly. The most common errors were to either multiply 300 (*ml* of milk) by either 8 or 24. Some candidates attempted to find the amount of milk required for 1 pancake, but inaccurate arithmetic in dividing 300 by 8 caused many to lose the final accuracy mark, although a method mark was awarded. In part (b), the correct answer of 180 g was found by most candidates, however a significant number simply multiplied 120 (g of flour) by 24. It was not uncommon for candidates to misread this part of the question, assuming the amount of milk for 12 pancakes was required. Answers of 450 were common. Again poor arithmetic in calculating 120 ÷ 8 prevented many from gaining full marks.

7.2.2. Question 2

Many candidates still find difficulty when finding the product of two numbers using long multiplication methods, particularly when multiplying decimal numbers. Many candidates found success in using 'traditional' methods of long multiplication although, in many cases, an answer of 1296 (or 129.6) was given as a result of ignoring or misplacing the decimal point. Matrix and multiplication table methods were also popular approaches, however many failed to demonstrate a complete method in their inability to correctly work out 0.4 × 0.2 and 0.4 × 0.04, incorrect answers of 0.8 and 0.16 were commonplace, showing a lack in the understanding of place value.

An incorrect answer of 1016 was common from weaker candidates who simply calculated 50 x 20 = 1000 and 4 x 4 = 16.

Napier's bones method is still popular, however this often leads to candidates making errors with the digits in the diagonals or getting the diagonals to face the wrong way.

7.2.3. Question 3

Most candidates found the correct solution of $x = -3$ in part (a) either by formal algebraic manipulation or by trial and improvement. Those failing to get this answer often gained one mark for their attempts to subtract 7 from both sides of the equation, although $2x = 6$ was a common error. Part (b) was less well done. Errors of $2t = 2$ (giving $t = 1$) and $8t = 2$ (or 10) were often seen. Candidates should be encouraged to check their solutions when solving equations.

7.2.4. Question 4

In part (a), only a few candidates failed to accurately substitute into the word formula. Part (b) was also done well, although simple arithmetic mistakes of the form 120 -- 50 = 80 (or 60) were not uncommon. Some candidates tried to use their answer to part (a), using £22.50 (£90 ÷ 4) as the daily rate.

It was pleasing to see so many candidates able to accurately derive the required formula in part (c). Candidates should be encouraged not to include units in their formula; in this instance full marks were still awarded for formulae such as £$C = 10n + 50$. A significant number of candidates transformed their formula to make n the subject. This gained just one mark unless the correct answer had previously been seen.

$C = n$ was a common error of weaker candidates and gained no marks.

7.2.5. Question 5

In part (a) $4d$ and d^3 (misread) were the most common errors here in an otherwise confidently answered question. In part (b), an answer of t^2 was often seen, candidates clearly interpreting $t \times t^2$ as $t^0 \times t^2$ and then finding the sum of 0 and 1. In part (c), m^8 was the usual error but in general this was well answered.

7.2.6. Question 6

Very few candidates failed to score any marks in this question although many were only awarded one mark for an accurate drawing of the equilateral triangle instead of an actual construction using compasses. A number of candidates constructed the perpendicular bisector of the given line and then measured the remaining two lines of 6 cm instead of using compasses to locate the apex of the triangle.

7.2.7. Question 7

The five correct integers were usually seen; errors tended to be either the omission of –2 and/or 0 or the inclusion of 3.

7.2.8. Question 8

The weaker Higher level candidates still find addition and subtraction of fractions difficult particularly, as in this case, when the calculation involves mixed fractions. Those candidates dealing with the whole numbers and the fractions separately often gained success with the subtraction of $\frac{3}{4}$ from $\frac{4}{5}$, although a significant number added $\frac{16}{20}$ and $\frac{15}{20}$ and consequently failed to gain the final accuracy mark.

Many candidates chose to convert the mixed fractions to improper fractions. This often resulted in errors, sometimes arithmetical but more often conceptual.

In part (b), most candidates realised that the explanation revolved around the recurring nature of $\frac{1}{3}$ and gained the mark. Some recognised that 0.3 written as a fraction is $\frac{3}{10}$ and so also gained the mark.

"$\frac{1}{3}$ is not equal to 0.3" and "$\frac{1}{3}$ is bigger than 0.3" where common explanations seen which gained no marks.

7.2.9. Question 9

(a) This part was generally well done. Those candidates failing to score both marks often gained one mark for either rotating P about (-1, 1) through 90^o (or 270^o) instead of 180^o or for rotating P through 180^o about another centre.

(b) The vector notation of the translation caused many candidates concern here. The most common error was either to translate P a total of 7 (6 + 1) units in a horizontal direction or to translate P 6 units up and 1 unit in the negative *x*-direction.

(c) It was pleasing to see so many candidates accurately reflecting the given triangle in the line *y* = *x*. Those failing to score full marks could gain one mark by drawing a triangle in the correct orientation.

A common error was to plot the triangle at (1,3), (1,4) and (3.5, 4).

7.2.10. Question 10

In part (a), many candidates correctly calculated 140^{o} as the size of angle *BOD*, however the reason for this was less well done, candidates electing to explain their calculations or giving reasons such as "angle *BOD* is double angle *BAD*", instead of a geometric explanation. A significant number of candidates referred to an "arrow head rule/theorem" It would appear that many candidates have found this from the website MyMaths. The "Butterfly rule" was also mentioned. Centres should be clear that these are NOT an acceptable reasons and are given no credit.

Many candidates still offer an explanation of the arithmetic process they have performed in arriving at their answer and again this receives no credit.

In part(b), many candidates were unable to find the correct size of angle *y*, the most common errors included, 40^{o} (taking *OBCD* to be cyclic) and 70^{o} (assuming that opposite angles were equal). Reasons given in (ii) often related to their incorrect answer in (i) and therefore scored no marks. Many candidates stated that the sum of the opposite angles in a quadrilateral is 180^{o} without mentioning the cyclic nature of the quadrilateral.

7.2.11. Question 11

Many weaker candidates employed trial and improvement methods, which usually failed, and gained no marks. Those spotting that to simply add the two equations lead to the elimination of *y*, the most efficient way to solve these simultaneous equations, usually went on to gain full marks. Those who subtracted the equations, again in a genuine attempt to eliminate *y*, writing $x = -9$ gained no marks.

Attempts to eliminate *x*, often lead to errors in algebraic manipulation. The correct doubling of the second equation was often followed by, for example, $\pm 3y = \pm 18$. If just one error was made following this sequence then method marks could still be earned.

7.2.12. Question 12

Those candidates applying the rules of BIDMAS and initially expanding the bracketed term, gained one mark for a correct expansion. In many cases this was the only mark awarded as poor algebraic manipulation often followed.

$t = \frac{y+5}{2}$ was a common error by candidates transforming the formula in their heads and usually showing no working at all. Many candidates correctly wrote $2t = y + 10$ after correctly expanding the brackets but then went on to make errors with their simplification.

7.2.13. Question 13

Many candidates were able to score a minimum of one mark for at least one correct entry in the table of values in part (a), usually at (4, 2). Substitution of x = –1 into the quadratic expression proved, predictably, to be the most demanding, y = –1 and y = 5 being the most common errors. In part (b),the plotting of points from the table was very good and most candidates attempted to draw a smooth curve through their points even when some points were clearly wrong. Full marks were gained by many candidates in this question.

7.2.14. Question 14

In part (a), only a minority of candidates showed any understanding of negative indices; ±9 and –6 being the most common answers. Many candidates, in part (b), gained at least one mark for writing $\frac{7^6}{7^3}$ however a great many went on to simplify this incorrectly to 7^2.

Some weaker candidates wrote $\frac{49^6}{7^3}$, whilst others tried to evaluate each of the powers of 7 and then wasted valuable trying to compute a solution using long multiplication and division. A correct answer of 343 would have gained full marks but this was rarely the result of this method.

In part (c), many candidates correctly expanded the brackets but then failed to accurately collect resulting terms. Answers of 3 (2 × 1) and $\sqrt{6}$ (2 × $\sqrt{3}$) were common errors in the expansion.

7.2.15. Question 15

Understanding of trigonometric functions was not good and only the most able gained marks on this question. The most common answer seen in part (a) was 2.5 applying a scale factor of 5 (300 ÷ 60) on 0.5. In part (b), –60 was the most common error, in both cases, candidates ignoring the graph and just trying to use the given information.

7.2.16. Question 16

All parts of this question were poorly answered, even in part (ai) many candidates failed to recognise any connection between **a** and the vector $\overrightarrow{MB}$. Often in (ii) errors of sign $\frac{1}{2}\mathbf{a} + \frac{1}{2}\mathbf{c}$ and $\frac{1}{2}\mathbf{c} - \frac{1}{2}\mathbf{a}$ followed correct answers to (i).

Whilst many candidates were able to gain one mark for $\overrightarrow{CA} = \mathbf{a} - \mathbf{c}$, rarely was the proof completed accurately through an inability to recognise that CA was a multiple of the of MN. Many candidates just drew parallel lines joining CA and MN and stating they must be parallel, without referring at all to vectors.

7.2.17. Question 17

Many candidates were able to quote the correct formulae in terms of the dimensions of the given cylinder and cone, but few were able derive a formula for the value of *h* in terms of *x*. Many just stated the formula for the cone in terms of *x* and h, or the cylinder in terms of x, and stopped there. It did not occur to them to equate the formulae and try some simplification.

A significant number of candidates assumed the two solids to be 'mathematically similar' and employed ratio techniques. Surprisingly many of the stronger candidates who correctly equated the two formulae and competently cancelled common variables were unable to simplify their final equation of $h = \frac{2x}{1/3}$ and so failed to score the final accuracy mark.

8. PRINCIPAL EXAMINER'S REPORT – HIGHER PAPER 15

8.1. GENERAL COMMENTS

8.1.1. Candidates should be reminded to write in black pen. Pencil should only be used for diagrams or graph work.

8.1.2. Despite the fact that this was a calculator paper there was clear evidence of poor arithmetic. This was particularly noticeable in questions 2b, 9a and 9b. Candidates should be reminded to check their working out carefully. Candidates need to check their adding, check their answers are sensible and check that they have read the question correctly.

8.1.3. Candidates should be reminded to write down all stages of their working.

8.1.4. Candidates should be encouraged to write down the full answer from their calculator in the working space provided for each question before writing an appropriately rounded version in the answer space.

8.1.5. There were a number of instances where candidates did not appear to be able to use calculators effectively. Familiarity with a calculator is a valuable tool in completing complicated formulae quickly and accurately; candidates need to ensure that they are familiar with the calculator that they bring into their examination.

8.1.6. Trial and improvement methods were frequently seen for questions 5, 7, 8a, 8b, 9a, 9b, 16, 17 and 18. Candidates should be encouraged to use more appropriate methods of solutions. A trial and improvement approach will either score full marks if the correct solution is found or no marks.

8.2. INDIVIDUAL QUESTIONS

8.2.1. Question 1

Unsurprisingly, part (a), this was very well answered with over 96% of candidates providing the correct scale factor. A correct enlargement in part (b) was drawn by the vast majority of candidates. Errors, when these were seen, usually occurred with the diagonal lines although a very small minority of candidates drew an enlargement of scale factor 3 rather than 2 as required.

8.2.2. Question 2

Part (a) was answered correctly by 96% of candidates. Candidates were less successful in part (b) despite having a calculator to assist them with their calculations. The most consistent error was to substitute the given values correctly and realize that the sum -12 + 30 had to be evaluated but then work this out incorrectly as 42. Weaker candidates were unable to cope with the substitution o a negative number and would either ignore it completely or else would omit the multiplication signs and attempt to evaluate 3 – 4 + 5 + 6 instead of the correct sum. A number of candidates showed no substitution and just wrote down the result of the multiplications; errors were often made the most frequent being 16 and 35

8.2.3. Question 3

Just under 84% of candidates were able to provide the correct answer. The most common incorrect answer to this given calculation was 122.277…which comes from failing to evaluate the numerator and denominator separately before carrying out the division (or using brackets appropriately). The question did ask for all figures on your calculator display to be written down. Some candidates ignored this and gave their answer simplify as 11.9 If this was the given answer then, unless the correct full answer was shown in the body of the script or a value for the numerator or denominator was shown, candidates taking this approach scored no marks.

8.2.4. Question 4

A sketch of the correct 3-D shape was provided by approximately 81% of candidates. Many candidates were able to recognize and provide a sketch of either a cuboid or a pyramid. Another common error was to draw a triangular prism on top of a cuboid. There were a significant number of candidates that drew a “house” shape. Candidates who failed to gain any marks generally drew a net.

8.2.5. Question 5

A fully correct solution was seen from just over three quarters of candidates. The most successful approach was an algebraic one. A number of candidates used a trial and improvement method; this either resulted in full marks or no marks. The most popular incorrect answer was 4 which candidates arrived at by adding 3 to 5 and then dividing by 2 rather than carrying out these operations in the reverse order. A number of candidates successfully used an inverse method to calculate the answer, i.e. 5 ÷ 2 + 3. One of the most frequent errors seen was an incorrect attempt at expanding the bracket which often resulted in $2x$ - 3. If the bracket was expanded correctly, a common mistake in calculation was to subtract 6 instead of adding.

8.2.6. Question 6

Approximately 31% of candidates gained full marks for this question with a further 42% of gaining 3 out of the 4 available marks. Candidates who dropped just one mark generally did so for one of two reasons; they either gave their answer to a greater degree of accuracy than was required or they failed to carry out a final test (using a value of x to two decimal places) to show that the solution to the equation is closer to 2.7 than 2.8. Despite being told to show all their working a small minority of candidates did not show any evaluations; in this case no marks were awarded. Candidates who evaluated $x = 2$ first, and wrote $2^3 + 2\times2$, then sometimes went on in their workings to evaluate $x^3 + x^2$.

8.2.7. Question 7

This questions was very poorly done with just over one quarter of candidates gaining full marks. The majority of candidates were unsure what figures to use to come up with a percentage the fractions 85/91, 6/176, 85/176, 91/176, 6/176 and 6/95 were all popular incorrect starting points.

8.2.8. Question 8

In part (a) many candidates wrote down an expression for the sum of the angles and so failed to give an equation. Of those candidates that attempted an equation many knew that the sum of the angles in a quadrilateral was 360^o and so used this but a number failed to use this fact despite demonstrating their awareness of this fact in part (b). Simplification errors were frequently seen in part (a), the most common being to write $2x + 2x$ as $4x^2$ or $2x^2$ if a correct unsimplified expression for the sum of the angles was seen then a mark could be given but the candidates who wrote down, for example, $4x^2 + x + 60$ failed to gain the available mark. Candidates would frequently have an incorrect or partially correct equation in part (a) but would then go onto find the correct value for x in part (b). Many examples of trial and improvement were seen. Again, these resulted in either full marks or no marks being awarded in part (b). In both parts 180^o was frequently seen as the sum of the interior angles rather than the correct 360^o.

8.2.9. Question 9

Part (a) was correctly answered by 82% of candidates. The most common error was to give the ratio 10 : 35 as the answer and so fail to indicate which number referred to the number of British cars. Some poor arithmetic was seen here with the statement 2 + 7 clearly evaluated as 8 or 10.

In part (b) those candidates that used a method appropriate for a calculator paper were generally more successful than the candidates who used a non-calculator method and so attempted to evaluate 10%, 5% and 2 ½% and then sum the found values. This is clearly a valid method but so many arithmetic errors were seen even from candidates who found the correct values of 8, 4 and 2 but then summed these to get 16 or 12. The other error that occurred frequently was to correctly work out 10%, 5%, 2%, 0.5% as 8, 4, 1.6, 0.4 but then add these incorrectly to get 13.64. A significant number of candidates correctly found the VAT as £14 but then failed to add this onto £80 and so scored only one out of the three available marks; a significant number of candidates didn't understand the concept of VAT and did 80 – 14 to get £66. Candidates who failed to score any marks generally did so because they were unable to cope with finding 17.5% of 80; common incorrect methods included to divide 80 by 17.5 or just to add the two numbers together.

Candidates were just about evenly divided in their approach to part (c) in that they either used the correct method and arrived at an answer of £7680 or they deducted 40% of £12000 and so gave the answer incorrectly as £7200. Once again, some fully correct methods of solution were spoiled by careless arithmetic errors particularly in the final subtraction from those candidates who used a two-stage approach. A significant number of candidates failed to understand the word depreciation and added on instead of subtracting. Surprisingly on a higher paper, some candidates thought that used 12000 ÷ 20 to work out 20% of 12000, so subtracted 600, and repeated the process for the second year.

8.2.10. Question 10

Success in this question was dependent on candidates being able to recall the correct formula for the volume of a cylinder. Many incorrect formulae were seen.; these generally involved the circumference rather than the area of a circle, the use of the formula for the volume of a cone or the area of a rectangle. A minority of candidates wrote down the correct calculation but then used their calculator incorrectly. A number of candidates neglected to calculate the volume, having found the area of the circle correctly. There were a few who correctly found the surface area of the cylinder; a more complicated process than calculating the volume.

8.2.11. Question 11

Part (a) was answered well with about 64% of candidates gaining full marks. A number of candidates failed to gain the available accuracy mark by giving the answer to a lesser degree of accuracy without writing down the full answer from their calculator. Errors occasionally came from an incorrect attempt to evaluate the square root of 113.

The success rate for part (b) dropped to 33%. The most efficient method of solution in part (b) was to use $\tan^{-1}(32/46)$. Many candidates took this approach and scored full marks. Some candidates opted to use Pythagoras' Theorem to work out side *DF* and then the Sine rule (or another trigonometric ratio) to evaluate the required angle. Candidates who took this approach were generally successful in finding the correct value for *DF* and then substituted this and the other appropriate values into the Sine rule but then rearranging this correctly in order to find the required angle was beyond most candidates. Those that were able to continue generally failed to gain the accuracy mark due to premature rounding.

8.2.12. Question 12

With a question such as this, candidates are well advised to use the diagram provided. ‘Turn’ is not correct mathematical language; candidates must describe the transformation correctly as a rotation in order to gain full marks. Many candidates were able to correctly describe the transformation; the most common part of the description to be omitted or given incorrectly was the coordinates for the centre of the rotation (or enlargement) this was often given as the line $x = 1$, point (0,1), (0,-1) or the origin. A disappointing number of candidates could not plot triangles B and C correctly, placing them in the first and second quadrants, consequently their answer for the transformation was a translation of some form.

8.2.13. Question 13

Just under 19% of candidates correctly identified both expressions that could represent area with 46% of candidates correctly identifying one expression.

8.2.14. Question 14

The majority of candidates could evaluate the area of the complete circle correctly although a significant number did use the formula for the circumference. About 37% of candidates were able to find the area of the given sector correctly. Many candidates were unable to deal with the 150^{o}. The most common errors were to find the area of $^{1}/_{3}$ or ¼ of a circle or to simply divide the area by 150. A minority of candidates evaluated the area of a segment rather than the sector.

8.2.15. Question 15

The vast majority of candidates simply divided the given numbers. A number of these candidates having carried out this division then attempted to find a bound for their answer. Of those candidates that recognized the need to use bounds, the most popular decision was to use both the upper bounds. Only about 16% of candidates were able to gain full marks for this question. A useful strategy used by a number of candidates who gained full marks was to find 4 answers by using every combination of UB and LB then looking for the highest result, thereby avoiding the error of doing UB/UB.

8.2.16. Question 16

The algebra involved in this question was beyond most candidates. Around 40% of responses gained 1 mark, generally for the correct expansion of $5(2x + 1)$. Following this the vast majority of candidates were unable to get any further. Common errors included multiplying both sides by 3 to get $30x + 15 = 12x + 21$ or multiplying just part of the expression on the right hand side by 3 rather than the complete expression. Even if the candidate got to $10x + 5 = 12x + 21$, they could not manipulate this correctly to get the correct answer.

8.2.17. Question 17

Those candidates that recognized the need to use the quadratic formula generally scored one mark for correct substitution into the formula. Following this the most common error was to evaluate the discriminant incorrectly. Candidates also lost marks by only dividing their discriminant by 6. Some candidates lost marks by saying that 2a was 2×13. Even candidates who were able to evaluate this correctly then frequently made errors when using their calculators for the final evaluation. A number of candidates used a trial and improvement method but generally only found $x = 1.22$ and so put $x = -1.22$ as their other solution; this approach only gained one mark for one correct solution. A fully correct solution was seen from approximately 13% of candidates.

8.2.18. Question 18

Very few candidates were able to begin to start this final question. 5% of candidates gained full marks and 7% of candidates gained one mark from correctly substituting the given coordinates into the equation of the curve.

9. PRINCIPAL EXAMINER'S REPORT – PAPER 5507 / 7A

9.1. GENERAL POINTS

It is somewhat disappointing that in the final year of this component that the administration of centres was not up to the previous high standards of the other years. It was necessary in 25-30% of the centres moderated this summer for the moderator to contact the centre regarding some matter regarding administration.

I must, however, offer my sincere thanks to those centres that did everything correctly and according to the regulations, sent the documentation, coursework in correct numerical order and with authentication complete, on time to the moderator.

The areas where the administration was lacking usually fell into one of the following categories:

- A failure to have the necessary authentication for the candidate's work. This is a QCA regulation but many candidates had not signed the necessary forms.

- Incorrect addition by the teacher-assessors of the individual strand values which meant that the marks were then incorrect on the Optems forms.

- Centres failing to include the highest and lowest scoring candidates work if these were no already a part of the original sample.

- A lack of annotation on the candidate's work. Often there were just strand values recorded on the front page of the work and nothing on the rest of the script.

- Incorrect transfer of marks from the Candidate's Record Form on to the Optems. Where this was recognised by the moderator then the centre was informed. However, this would automatically mean that the centre's mark and the moderators marks would differ even where the initial moderation at the centre was agreed.

- Errors in the candidate's work that had no been recognised by the centre. In AO1 this was often incorrect algebra and in AO4 it was often incorrectly drawn diagrams and statistically incorrect comments that the candidates had made. In all cases these caused differences in the marks awarded by the centre and the moderator.

There also appeared to be an increase in the number of cases where the centre had given too much help to the candidates in the form of ‘help sheets’. Some of these offered too much undue help to the candidates and these were always referred to the Compliance Section of Edexcel for possible further action.

In coursework the candidates are supposed to be ‘making decisions of their own’ which enhances their work. This element has been removed from the candidates where the centre tells them what to do. Some ‘help sheets’ actually gave the candidates the answers, which is certainly beyond the help permitted by the regulations.

9.2. REPORT ON ASSESMENT

9.2.1. A01: COURSEWORK

In the vast majority of cases these tasks were well assessed but it was reported by the moderators that the number of cases where the assessments in the centres was too generous had increased. It was not just the work at the higher awards where this generosity occurred but right across the whole spectrum of marks.

One of the main areas is the candidate’s apparent inability to justify their results, other than numerical substitution. Numerical substitution is a mark 4 award in strand 3 and not in the higher awards. This results in the candidates not being able to guarantee that any results obtained will hold true in all cases and not just those that they have tested.

The areas where inaccuracies occurred were:

- Incorrect work marked as correct. There was evidence that this was more apparent this year. If this happens then the centres marks have to be adjusted, as errors cannot be allowed to gain credit. More details relating to certain tasks will be highlighted later in the report.

- Inconsistent, undefined symbolism. This has been mentioned every year but the work submitted still has variables undefined and candidates using different letters to represent the same variable. It is in the General Criteria that all symbolism must be defined and consistently used at mark 6 and above.

- Insufficient rigour in certain tasks where generalisations just appear without any derivation of justification. Candidates then perform a numerical check and this process is given undue credit.

- Inconsistencies relating to internal standardisation particularly where the centre does several different tasks. There were cases where the centres assessments of a particular task were too generous within the several different tasks submitted and this affected the whole centre's marks irrespective of the other tasks. There is no mechanism to take individual tasks or teachers into account.

- Candidate's failure to use the structure of the task to help justify any generalisations given in the work. This is particularly important in the higher awards but also at mark 5 in strand 3.

AO1 Tasks.

There are a considerable number of tasks that centres could submit. I have concentrated, in my report, on the popular tasks submitted by centres.

THE FENCING PROBLEM

This is another very popular task with centres. Most centres are assessing this task well but there are more and more cases where candidates are omitting a very important part of the process. The essence of this task is the establishment of the regular case. Without this then it is not possible to 'provide a reasoned convincing argument' as required at mark 7. Candidates cannot bypass the earlier work and hope to gain full credit at the higher awards. We have emphasised this point in past reports to centres but there is increasing evidence that centres are not heeding the warnings given and the marks awarded by the moderator's differ from those awarded by the centres. This means that the justification for the general formula is flawed as the basic criteria for its justification has not been fulfilled. It is the justification for the triangular case that was often omitted by the candidates. They often just draw a few triangles and state the equilateral has the largest area. Where is the justification? This cannot be done graphically as the graph is not symmetrical as in the case for the square. It is amazing how many candidates can use their graph to show that the maximum occurs at 333.333 when their horizontal scale goes up in increments of 50/100.

The award of mark 7 in strand 2 is for the candidates deriving the general formula. There were cases this year where the formula just appeared. This is not a convincing reasoned argument. Mark 7 in strand 3 requires the candidates to give a commentary in support of their graph. A graph on its own is not sufficient for this award. There also has to be a sufficient range of polygons before this graph/ commentary has any meaning.

The work, at mark 8, in this task requires the candidates to discuss 'limits'. It is not sufficient for them to simply do a numerical approach demonstrating the circle area is always just larger than the polygons. They have to demonstrate, in general not numerical terms, that the formula for an n-sided polygon approaches that of the circle in the limiting case.

GRADIENT FUNCTION

This task maintains its popularity with many centres as an introduction to Calculus for their higher-level candidates.

However, it does not mean that the process of deriving the generalisations can be side stepped. Initially, the candidates use the method of drawing tangents to curves. They then need to introduce another approach to support and enhance the results already obtained. This is normally using 'small increments' to establish the generalisation.

Some candidates assumed the generalisation and then used small increments to test the generalisation worked. This task is not a predict and test mentality. Where did the candidates obtain the generalisation that they tested? The initial part of the task is to establish this.

At mark 7 the candidates did not always use negative/fractional values with small increments and so the 'convincing argument' was lacking.

At mark 8 many of the better candidates adopted a totally algebraic approach to the task to produce a very good piece of work. Again this has to be for other values than just positive values of the power.

It was pleasing to note that, this year, fewer candidates stated that *' ∂x equals 0'* in the limiting case. Where this did occur the candidates were penalised. Some centres did award mark 8 in all strands where this did happen, even when the candidates actually divided by nought.

HIDDEN FACES

This task was very popular with candidates at the Foundation Tier of entry. Most of them were able to systematically draw the shapes and correctly tabulate the results and obtain the generalisations. It was the awarding of mark 5 in strand 3 where centres were generous as the candidates could not really explain why it was '*3n and –2*', by reference to the structure of the task.

Some of the better candidates were then able to progress the task into the general cuboids case and obtain the correct generalisations.

NUMBER STAIRS

This task has increased in popularity with the centres. Again the assessments are very good up to awards of mark 6/7. The awards at mark 8 are then, often, generous.

Most candidates are able to generate formulae of the type:*' T= an +bg +c'*, where *'n'* is the stair number and *'g'* is the grid size. For the award of mark 6 in strand 2 the candidates need two of these formulae, or three of the type '*T=an +b'* where the coefficient of '*n*' changes. The candidates do often fail to clearly define 'g' and hence the award of mark 6 in strand 2 is not warranted. Candidates should also be warned that the use is IT can cause problems with 'consistent' symbolism. They often end up using *'N and n'* for the same variable

At mark 7 the candidates should be looking for an overall generalisation. Many of the candidates now use the differencing technique. Whilst this is an appropriate technique it can never be used to provide 'a concise reasoned argument', or used as justification. This approach would have a limit the marks to 7-7-6. Some centres are still awarding marks of 8 for the differencing technique in spite of the comments in past reports and advise given at any Inset /Feedback meetings. A concise argument cannot be produced using this technique as the approach is based upon a finite set of numbers unless the candidates can guarantee that the sequence of numbers would continue.

The more able candidates attempt to use Sigma Notation. However, they base their use of this notation upon a pattern spot of the coefficients of *'n and g'* this is not concise. Can they 'guarantee' that their sequences will continue? Without this then the argument does not hold true. Often the work shows that the candidates do not understand the notation, particularly in correctly writing the limits.

T-TOTALS

This is still a very popular task and the assessments, by centres, are very good up to a mark of 6. Beyond this mark there is often generosity in the awards.

At mark 7 and above the candidates have to be considering any investigation in total general terms and not just looking at specific instances. The vast majority of the candidates move on to consider transformations at this level. When they do so they must be considering all possibilities and in general terms. For rotations, this means rotating the general T-shape'*5n – 7g'* about a general point *(a,b*) on the grid. For reflections, looking at reflecting the general T-shape in lines parallel to the axis and at an angle of 45 degrees. Again the line of reflection has to be a general distance away and not just on the shape itself. For Translations, looking at the effect of translating the general T-shape, using a general vector. And for enlargements, looking at enlarging the general T-shape by a ratio for the whole T-shape and not just the stem or the crosspiece.

For the award of mark 7 in strand 3 the candidates have to consider the constraints placed upon their variables so that the T-shape will remain on the grid following their chosen transformation.

For an award of mark 8 the candidates must consider the relationship between all of their variables for their shapes to remain on the grid. Without this, any argument put forward is flawed as they have situations where their shapes would not fit on to the grid. This also applies to the situation where candidates attempt to explain how their combination of transformations can be represented by a single transformation.

One of the major errors in this task and not recognised by the centres is where the candidates incorrectly label the cells in the general grid case. This is a conceptual error and cannot gain any credit. The result cannot gain credit either as this is only correct, as the two errors made by the candidates have cancelled each other out.

Many centres failed to spot this when marking the work and awarded marks of 6 in all three strands. This was incorrect as the candidates should not be awarded any credit.

BEYOND PYTHAGORAS

This task maintains its popularity but the work does not often address the needs of the task. This task is all about families of Pythagorean Triples based upon the relationships between the sides of the triangle. Candidates were often just treating the task as a process of repeated differencing techniques to derive generalisations.

The better work looked at the relationship between the sides ‘a b and c’ and what happens as the relationship between ‘b and c’ changes. Which family derives when *‘$c = b + 1$; $c = b + 2$’ etc*.

Finally looking at the generalisations $2ax$, $a^2 - x^2$, *and* $a^2 + x^2$, and the different families that are derived dependent upon the value of ‘x’

Again the assessments up to mark 6/7 were generally fine but generous at the higher awards. Mark 7 requires the candidates to consider different families of triples and not just multiples of the original set given in the task. Mark 7 in strand requires the candidates to justify that their generalisations fulfil Pythagoras’s Theorem for their two new families.

BORDERS

This is another popular task with centres. As with the Numbers Stairs task the assessments are generally accurate up to marks of 6/7. Candidates were capable of producing a systematic list of results, tabulated and pattern spot for the marks in the 4/5 regions. However, mark 5 in strand 3 cannot be awarded for this approach. Many were able to demonstrate an understanding of the structure of the task as they show the manipulation of the squares to generate two other larger square of sides '*n and (n+1)*. If the candidates clearly define their variables as a physical feature of the shape and not the pattern number then mark 6 in all three strands could be awarded. This is not the same as candidates who 'spot' that the number of squares is ' $a^2 + b^2$ '.

There is still a reliance on the differencing technique to obtain the quadratic. Where ti is the case awards of 6-6-4 are made but, as above, only with a correct definition of the variables. No higher awards in strand 3 can be made for this approach, as differencing is not justification.

Moving the task into mark 7 and above requires the candidates to show a clear understanding about the structure of the task and to demonstrate that the 3-D case is made by building up 'layers' of the 2-D cases. This is necessary for the award of mark 7 in strand 1, not just drawing 3-D shapes and counting cubes. As with Number Stairs many candidates now applied the differencing technique to generate the cubic result. As with Number Stairs this approach has a ceiling of 7-7-6.

Candidates need to carefully define their variables in this task. They have to define their variable as a physical feature of the shape and NOT as the pattern number. They have to be able to demonstrate, that given any shape, they could quickly and efficient know the value of the variable without recourse to drawing previous shapes. This point has been highlighted in many previous reports to centres but it is still one of the causes for work being marked down by the moderators. There cannot be a 'convincing reasoned argument', which is the requirement at mark 7 without this careful definition of variables. Mark 8 requires the candidates to consider in general terms the summation of these various layers leading to the 3-D case. There was some very good work where the candidates had considered the algebraic sequences based upon the initial 2-D case.

THE OPEN BOX PROBLEM

This task is primarily about investigating the maximum 'cut-off' from a rectangular piece of card so that the resulting box would have the maximum area. It is not an exercise in calculus to obtain a formula for the volume of a box. Calculus can be used in the task but as a 'tool' to help the investigation.

The best pieces of work in this task were where the candidates considered the ratio of the sides as always being in the form '*1: n*'. The candidates then varied the value of '*n*' and used a spreadsheet to show that the optimum 'cut-off' was a sixth for the square case up to the maximum of a quarter for the rectangular case.

OPPOSITE CORNERS

Centres were generally very good in their assessments of this task up to marks of 5-5-5, where candidates were able to label a grid algebraically and then correctly expand brackets of the type '*n(n+a) and (n+a)(n+b)*' to show the difference for various sizes of rectangles. At mark 6 there is a need to introduce another features as an alternative approach to the work, which moves into the situation of a general sized grid. It is not awarded for repeating the previous skills. Some centres did the square case on the grid first and then moved to the rectangular case. The techniques used are the same and so there is no alternative approach. Candidates should have realised that the square case was a special case for the rectangular situation.

EMMA'S DILEMMA

This task continues to be popular with centres but the same pitfalls in the candidates work are still evident and the marks awarded were not justified. Previous reports have made it very clear that there has to be justification at every stage of the tasks development. Once the justification is flawed then any further progress is just not possible as the task develops stage by stage. The candidates have to be able to guarantee that their results will hold true in all situations and not just those that the candidates have 'tested'. Far too many candidates adopt a 'listing and pattern spotting approach' towards this task and this has limiting marks in the region of 6-6-5.

At mark 7 and above there should not be any need for the candidates to do any listings, as they should be working in purely general terms.

As with many previous years this task was far too generously assessed by centres and where submitted it is the main reason that a centres marks are out of tolerance.

9.2.2. A04: HANDLING DATA PROJECT

It is disappointing to have to report that after 5 years of this component the assessments by many centres are far too generous. The assessments in these centres are normally based around a technique led project rather than a project that should be 'using and applying' techniques in the context of an investigation. It was also noticeable that many centres now enter their candidates for GCSE Statistics and double enter the coursework. However, there were many occasions where the marks for GCSE Statistics was recorded on the candidate's work as grade C/D but this same work became Grade A* for GCSE Maths data-handling. Often increased in the data-handling assessments because of the techniques used even though the quality was no better.

It must be reported, however, that the majority of centres this year marked their candidates work diligently and with great accuracy. The marks were realistic and not over-inflated. The work was assessed on its quality and not the candidate's tier of entry/expected overall grade in mathematics.

Where centre's assessments were too generous was often a result of the following:

STRAND 1

- Have multi-hypotheses. The data-handling project is supposed to be a single project and not a series of smaller ones unless these are all linked together. If the candidates do several hypotheses then these have to be assessed individually, if not linked together, and the best overall mini tasks marks are awarded. The number of hypotheses does not determine whether the task is a particular mark in strand 1. t was noticeable that several centres had their own 'marks schemes' for AO4 and these included, as a part of the marks to be awarded in strand 1, the number of hypotheses that had to be included.

- The above point was very important in the awarding of marks of 7/8 in strand 1. Many candidates submitted projects that had multi-hypotheses and treated each of these separately. The produced, therefore, several substantial tasks and not a demanding one as required at mark 7/8. This has been mentioned before in the Principal Moderator's Reports to centres but it is apparent that the advise, in many cases, has not been heeded.

- Sample sizes are also very important in the AO4 project. Many candidates are still using stratified sampling as the norm rather than for any valid reason and this often gives rise to very small sample sizes in certain groups of data. This means that candidates were using samples sizes of 4/5/6 to draw box plots, calculate standard deviation and then attempted to draw valid inferences from the results. Where is the quality of use and understanding in this type of work?

- Centres were often making automatic awards in strand 1 for certain aspects of the candidate's work. Many centres automatically awarded mark 7 in strand 1 where candidates did stratified sampling or a mark of 8 for a pre-test. No consideration was given to the rest of the planning or whether the task itself was substantial or demanding. The latter determine the marks in strand 1 and not the techniques being used.

STRAND 2

- The awards in this strand are for the quality of use and understanding shown by the candidates when using a particular technique. This is often reflected in the way that the candidates are interpreting and discussing their results.

- Many centres this year awarded automatic marks, on sight, for techniques. The most popular automatic awards were:

  1. Mark 5 for lines of best fit irrespective whether there was any correlation or not.

  2. Mark 6 for cumulative frequency curves/box plots.

  3. Mark 7 for Histograms.

  4. Mark 7/8 for any technique from beyond the National Curriculum.

  Very often there was no consideration about the way the candidate had interpreted the results from these techniques but the mark was for 'doing' the technique. The marks were still awarded where the techniques were not even used. This is not correct, as techniques must be used if they are to gain credit. Even after five years, several candidates' marks were recorded by the centres as; 6-6-2, 4-7-4 and my best this examination session was 3-8-2. Hopefully, these centres will not want any further explanation when their marks are possibly regressed this year.

- Centres were awarding very high marks for techniques from beyond the National Curriculum even though the candidates had not used these techniques fully and with understanding. If candidates are using such techniques then they must realise that these come as a package. The candidates cannot, if they want to be awarded the higher marks, simply use part of the technique. The classic one this year was the use of Correlation Coefficients. Candidates were happy to talk about the numerical values and what this meant in terms of a strong/weak correlation but unfortunately there was no reference AT ALL to the sample sizes,. When sample sizes were considered the comments/interpretations made by the candidates were incorrect and so the high marks awarded by the centres were generous as the quality of use and understanding required in this strand was lacking.

- Many centres gave credit to candidates who drew lines of best fit onto scatter diagrams even when there was no correlation and the candidates often then proceeded to uses this Line o0f Best Fit to make further predictions. Quality and understanding, again, lacking in the work.

STRAND 3

- To gain credit for the techniques used the candidates must interpret their results. Centres were awarding too much credit where candidates simply quoted numerical values. These mean little without interpretation. This also applies where candidates make comments such as: 'My result confirm my hypothesis/ My result show that boys are taller than girls'.

- The candidates must look at evaluating their work at mark 5, seeing if there are any limitations to the techniques/samples used for mark 6 and then seeing how statistically significant their results are at mark 7. Many centres award high marks where candidates just state that a larger sample size would have been better. This aspect, for the higher-level candidates, should really have been thought about in the planning stages.

Many centres, as mentioned earlier, had designed their own mark scheme for their staff to use. These were often very prescriptive and taken literally by the person marking the work. With data handling this is not the situation because everything has to be taken together in the whole project. It must be noted that some of these 'mark schemes' did not take into consideration the minimum requirements of the Elaboration Document for the assessment of AO4. This is the document that all centres should be using to assess their candidates work.

9.2.2.1 A04: ASSESSMENT

The assessment of the AO4 projects this year was more realistic than previous years. Centre are beginning to understand the nature of the tasks that have to be undertaken and the requirements of the assessment criteria in relation to the middle strand.

Centres are beginning to understand that the AO4 project is all about 'Using and Applying' and not about the 'doing' of techniques.

The Data Handling Project has to reflect this using and applying, with doing as a supporting role. There has to be planning in the work showing some thinking. Every technique has to be used for a purpose and there has to be clear understanding shown by the candidates in their interpretations/discussions.

Pointers that centres need to remember in the Data Handling Project are:

- Do not do a technique because you can.
- Where there is, for example, no correlation at all, why is there the necessity to use a correlation coefficient to confirm this.
- Do not make claims that cannot be supported by you work/results.
- Consider carefully the techniques that you are using bearing in mind the type of data that you are using.
- There are no automatic awards in any of the strands for the Data Handling Project.
- Pre tests only add value if they inform and they have to be a part of a Demanding Task.
- Only use multi hypotheses if they can be linked together to form one overall project. Remember the Data Handling Project is meant to be ONE project and not a series of mini projects.

The main problem encountered from some centres is the idea that it is the technique that determines the nature of the task. Therefore, where candidates had employed techniques from beyond the National Curriculum there were automatic awards of marks 7/8 in all strands. This is not correct.

Some centres assessments were very good up to awards of marks of 6/7 but then, possibly because a candidate was in a higher set, the awards shot to marks of 7/8 without the work warranting such an award.
This over assessment of the candidates at the higher awards was often the primary reason for the marks going outside the permitted tolerance. Once the work is outside this tolerance then the marks of the whole centre could be affected.

The assessment of the Data Handling Project should be completed using ‘ The Elaboration Document For the Assessment of AO4’ issued by QCA and the examination bodies. Where centres have ‘their own’ assessment grids then they must encompass this document. If not, then the centre may be consistent in their assessment but not applying the criteria correctly. This is most evident in strand 2 where some centres still give credit for techniques being ‘done’ whether they are used in the task or not. Remember the award in strand 2 has to reflect a ‘ quality of use and understanding’ about the technique not just the ‘doing’

MAYFIELD HIGH SCHOOL

This is by far the most popular database used by centres. There are many different avenues considered by the candidates but the majority of the candidates attempt by far a consideration of Height/Weight/Gender.

Most candidates look towards investigating the difference in height/weight from different year groups or comparing the same features across different age groups. It is a pity that they cannot then link these together into one overall project for the higher awards.
Other aspects relating to this database concern IQ/KS results.

NEWSPAPERS

Fewer centres attempted this year. One of the problems is the amount of time taken to collect the necessary data.. At marks 4/5/6 candidates looked at aspects of comparing different newspapers in terms of word length od sentence length. This was generally fine for awards at this level.

At the higher awards their has to be some element of 'thinking' by the candidates. If candidates simply look at 'sentence length' across three different newspapers then this is not a demanding task. They should be considering all of the elements that affect readability and trying to formulate a plan to bring their ideas together into one project. This could be done by comparing different newspapers or by looking at different aspects of one newspaper.

CAR SALES

More centres used this database this year. Candidates set up comparisons of different models in terms of depreciation. Comparisons across different engine sizes and price were also considered. In fact they considered a considerable number of different approaches.

The more able candidates were then able to link together these features into a 'mathematical model' to determine the depreciation of different makes of cars based upon their variables.

OTHER DATABASES

Some centres used their own database, or primary data that had been collected in their centre. This is to be encouraged as there are not any limits on the type of database that has to be used.

9.3. OVERVIEW

In conclusion can I thank the vast majority of our centres who did everything correctly from the basic task of getting the candidates to complete the work through the administration and assessment for the moderation process. On behalf of myself, and my team of moderators I offer you my sincere thanks and congratulations on a job well done. In addition, I would also like to personally thank the many centres that have chosen and supported Edexcel over many years. Coursework will no longer be a part of the Specification and I know that some centres are celebrating its passing whilst others are not so convinced. My hopes are that the aspect of using and applying Mathematics never vanishes from the curriculum as I personally feel that this is what Mathematics is all about.

I would also like to add my thanks to the many moderators who have supported me in the past and in particular Peter Jolly and Stuart Bagnall. Stuart is Principal Examiner for 5507/7B this year, but I know that he would also wish to offer his best wishes and thanks for your support over the past years.

Malcolm Heath
Principal Moderator

10. PRINCIPAL EXAMINER'S REPORT – PAPER 5507 / 7B

10.1. GENERAL POINTS

The overwhelming majority of centres submitted their work inside the deadline and had used the correct forms. In some cases, the general 'authentication form' had been used instead of the specific mathematics 'candidate record form'. On 5507B this did not constitute a problem. In the very best examples, each piece was securely fastened once, all the candidates had been submitted in candidate number order and the candidate record forms had been completed with teacher signature, candidate signature, centre name and number, candidate name and number. However, in too many cases, important information was omitted. It is a QCA requirement that all work is authenticated as the student's own, with awarding bodies permitted to award zero marks when these signatures are not present.

Once again, a significant proportion of the work submitted by centres indicated that collusion in some form had occurred, either by candidates copying each other's work or, much more often, through a centre based approach where the entire cohort had followed very prescriptive routes and techniques. Some centres had produced very structured templates or worksheets that led candidates through a task or project, resulting in work that was very similar and in some cases identical. It is regrettable that the centres who had adopted this approach often hindered the progress of their candidates as, from mark 5 onwards on AO1 and AO4, candidates should be choosing, justifying and following their own ideas. Guidance upon what constitutes accepted good practice and permitted guidance is available through Edexcel's publications and INSET support. Cases where 'copying' had occurred were forwarded to Edexcel's compliance department where further action is carried out.

10.2. REPORT ON ASSESMENT

10.2.1. A01: COURSEWORK

THE FENCING PROBLEM

Candidates produced some fine examples of the use of Pythagoras and Trigonometry to evaluate the areas of their shapes. However, central to this piece is establishing that the regular case, for a given number of sides, will give the greatest area for a fixed length of perimeter. All too often this was not derived or stated. It is essential that the values to each side of a stated maximum are examined to determine that they are a maximum. It is insufficient to state that, for example, the square case of 250 by 250 is the maximum when the closest other examples are 240 by 260. The candidate has no evidence that the 251 by 249 case is less without examining this. An argument based upon the symmetry of the rectangle is sufficient to avoid repetition of calculations. However, with a triangle this is not the case and a more rigorous examination and verification of the maximum is required. Too many stated that the equilateral triangle and the square were the maximum without any evidence to justify it. Such an argument is 'built upon sand' and severely restricts progress in the third strand. Many candidates were capable of producing several polygons with correct trigonometry; although it was often obvious that they were following a set algorithm with little understanding. Indeed, many failed to produce a sufficient range of polygons from which to make any inferences at all. As a rule, a range beyond a decagon, perhaps extending into polygons with 10, 20, 100, 1000 sides etc would yield results where the limiting case of a circle could be justified. We all know that the limiting case is a circle. Unfortunately too many think that this fact without justification is sufficient for credit at grade A. It is not! Production of a graph asymptotic to the area of a circle does not convince, especially when only based upon 4 or 5 sets of regular shapes. The best candidates were able to adopt an argument based upon the development of the general equation for the area as the number of sides increased. The very best moved away from a numerical argument, which can never be convincing, towards a general symbolic argument.

NUMBER STAIRS

This task enabled candidates to produce a systematic list of results, tabulate their results and spot patterns. A pleasing number of candidates now offer a 'linking commentary' explaining why they have put the data into a table. Most were capable of explaining why the expressions worked and where the co-efficients came from. An increased proportion was able to label their stairs algebraically and add their expressions to arrive at the general expression for a particular stair size. Candidates then, typically, changed a feature such as the grid size and repeated their earlier approaches. A large number of candidates failed to define their variables correctly or, much more commonly, used a variety of letters to stand for the same variable. Commonly, N,n and G,g were used to stand for the same variable. This lack of algebraic rigour has increased this year, with candidates seemingly unaware that such things are important when creating, manipulating and interpreting algebra. It is hoped that the 'texting generation' can be prevented from destroying the correct and rigorous use of algebra as they are doing with the English language! More worryingly, perhaps, was the pattern for candidates to make the same labelling errors at the same stages, implying that there was a collective approach and that the labelling error was made by the originator of the work. To make progress in this task, candidates needed to link the co-efficients obtained across several general expressions. Too few were capable of forming this link, despite having enough evidence to do so. The very best candidates achieved an array of expressions quickly, spotting and generalising the 'triangular numbers' pattern and explored the other co-efficients through sophisticated labelling of the stairs and colouring of the key constituents, collating through the use of colour to produce a highly effective mechanism for displaying their structure.

Concise general arguments made use of published summations for sequences. However, at the top end, attempts that were made at using sigma notation often failed because of the correct use of the notation rather than the lack of understanding.

BORDERS

Candidates experience little difficulty in reaching the award of 4,4,3, producing a systematic list of results, correctly tabulating them and spotting and communicating patterns. A pleasing number of candidates now offer a 'linking commentary' explaining why they have put the data into a table. Their understanding of why the pattern worked was weak, with few demonstrating an understanding of the structure of the patterns that they had drawn. Many were able to symbolise their pattern, but once again, this tended to rely upon a mechanism such as differencing rather than an awareness of the link between the symbolic and the physical situation. Consequently, many candidates did not score well in strand 3, registering a mark profile in which the last strand score was well below the first two. Symbolism was often poorly defined. It is essential to link the numerical pattern to the physical situation it describes. A generalisation based on a numerical sequence i.e. 'shape number 1, shape number 2..' etc does not allow the candidate to solve a general arrangement of borders without referring to which position the particular arrangement would be in <u>their</u> sequence. Two different candidates starting their sequences, therefore, with different numbers of black and white tiles, would generate different expressions. Where candidates had indicated the link between their 'pattern number' and the dimension, however, this lack of generality was overcome. The simplest way to overcome this problem is through labelling a dimension of the 'borders shape' as *n* and adopting a structural argument based upon this dimension. In extending the 'borders shapes' into cubes, and hence extending into 3-D, candidates were able to 'explode' their diagrams and illustrate that the full generalisation comprised several arithmetic sequences. It should be noted, however, that many lost marks by not explaining or illustrating where their results for the 3D shapes came, with too many merely producing a numerical sequence without any evidence of its creation. Skilful (and concise) amalgamation of these complex expressions gained full marks on this task.

10.2.2. A04: HANDLING DATA PROJECT

The candidates who produced the best projects had work that was well planned, succinct and well presented. Candidates who stated what they expected to find, used and justified appropriate skills only and gave full reasoned results invariably achieved the better marks at their level. In the worst of cases, often fro candidates who clearly had ability, a lack of a plan severely handicapped their progress.

Achievement in this component varied considerably across centres, with some centres showing thorough preparation for the project whereas others showed little or none. The use of templates to help candidates set up their projects is encouraged but teachers must guard against becoming prescriptive. To achieve a mark 5, candidates must exercise choice of their own, in choosing appropriate data, appropriate techniques and diagrams. In many centres, candidates had clearly used a template provided by the centre indicating the data sampling techniques to be used, the diagrams that the candidate should draw for certain marks and the techniques and calculations that they should attempt. In all cases such as this, the work became too formulaic and failed to address the main objective of the project. It was clear that candidates did not generally understand the requirements of this project. There was an increase in the amount written in the projects, with far too many taking pages to write detailed explanations as to the different types of, for example, sampling methods. In addition, too many explained how each of their techniques should be carried out rather than why it was appropriate for them to be used in their context. Consequently, many read like textbooks rather than concise projects; a waste of both the candidate's and the examiner's time!

There is still, despite a biannual statement in the Principal Examiners' and Moderators' reports explaining that it is not so, an (incorrect) assumption that marks would be awarded for the use of skills, resulting in far too many diagrams and calculations occurring rather than candidates selecting the most appropriate and effective skill. It was common for candidates to list many hypotheses which were unrelated and then to explore each in isolation. There appears to be a misapprehension that three hypotheses are required to achieve mark 7. This is not what is required. Candidates need only investigate one hypothesis, which could be divided into smaller inter-related statements. Separate, unrelated hypotheses were treated by examiners as separate mini projects and were marked accordingly. It was therefore common to award 14 or 15 marks for each of the separate mini-projects when, it was clear, the candidate thought that their approach was worthy of more. The lack of any link between the separate hypotheses or any attempt to synthesise the information in answering their original investigation was a common occurrence.

The best work came from candidates who analysed a complex problem comprising a single hypothesis but with several sub factors. These were then explored independently and then fused to produce a single analysis. The best candidates had spent time producing a clear plan, with clear statements of expectation, full pre-analysis of what they expected to do and why. Sampling was well thought through and justified. The techniques were accurately carried out. Their results were discussed thoroughly and possible inconsistencies discussed.

A04: ASSESSMENT

MAYFIELD HIGH SCHOOL

This title remains the most popular on this examination. Many centres submit work which is well thought through, investigations involving height against weight being the most popular and successful. A worrying number still use TV hours against IQ or Weight against IQ as their area for investigation. No amount of higher level or sophisticated skills can hide the fact that there is no connection and, frankly, it is heartbreaking marking work where the candidate trawls through a variety of skills, diagrams and calculations to reach that conclusion. Better initial guidance would avoid this chronic waste of able candidates' time. Successful starting points were height v weight v age, IQ v SATs performance.

NEWSPAPERS

It is pleasing to report an improvement in attainment on this starting point. Many more candidates are choosing to use sentence length <u>and</u> word length as indicators of 'readability', have realised that different types of articles in the newspaper attract different writing styles and that this can be quantified and compared with techniques that are readily understood. The very best work, once again, compared beginnings and ends of articles, the perceived target gender, 'intelligence', age and reading difficulty. It is always a pleasure to read pieces that are exploring an idea that is unusual and that, however controversial and politically incorrect their premise, they are using data handing skills to try to resolve. It is extremely tedious to read tens of (and sometimes well over 100!) pages of repetitive skills, many duplicating their intended measure e.g. range, IQR <u>and</u> standard deviation on simple ideas. I have no idea what it must feel like to be creating these tombs, but it is certainly not fostering an appreciation and love of mathematics that it should.

USED CAR SALES

This project title had been added for the new specification, but few centres had attempted the project.

11. STATISTICS

11.1. MARK RANGES AND AWARD OF GRADE

Unit/Component	Maximum Mark (Raw)	Mean Mark	Standard Deviation	% Contribution to Award
5542F/08	30	21.3	6.2	10
5542H/09	30	17.0	6.2	10
5543F/10	50	29.6	8.7	20
5543H/11	50	25.3	11.8	20
5544F/12F	60	35.1	10.5	25
5544F/13F	60	37.6	11.4	25
5544H/14H	60	36.3	11.0	25
5544H/15H	60	33.9	12.1	25
5507/7A	48	29.1	7.9	20
5507/7B	48	27.5	6.0	20

11.2. GRADE BOUNDARIES

The table below gives the lowest raw marks for the award of the stated uniform marks (UMS).

- **Module Tests**

	A*	A	B	C	D	E	F	G
UMS (max: 41)				**36**	**30**	**24**	**18**	**12**
Paper 5542F				27	22	17	13	9
UMS (max: 60)	**54**	**48**	**42**	**36**	**30**	**27**		
Paper 5542H	29	25	19	13	9	7		

	A*	A	B	C	D	E	F	G
UMS (max: 83)				**72**	**60**	**48**	**36**	**24**
Paper 5543F				41	33	25	18	11
UMS (max: 120)	**108**	**96**	**84**	**72**	**60**	**54**		
Paper 5543H	47	38	29	20	12	8		

- **Terminal Papers**

	A*	A	B	C	D	E	F	G
5544F_12				46	37	29	21	13
5544F_13				49	39	30	21	12
5544H_14	54	46	36	26	14	8		
5544H_15	53	45	34	23	12	6		

	A*	A	B	C	D	E	F	G
UMS (max: 209)				180	150	120	90	60
5544F				95	76	59	42	25
UMS (max: 300)	270	240	210	180	150	135		
5544H	107	91	70	49	26	14		

GCSE Maths (Coursework)								
	A*	A	B	C	D	E	F	G
UMS (MAX 120)	**108**	**96**	**84**	**72**	**60**	**48**	**36**	**24**
5507 (A&B)	43	37	31	26	22	18	14	10

11.3. UMS BOUNDARIES

	A*	A	B	C	D	E	F	G
UMS	540	480	420	360	300	240	180	120