Examiners' Report Summer 2009

GCSE

GCSE Mathematics (Modular) 2381

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1.1. GENERAL COMMENTS

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

1.1.2. The vast majority of candidates attempted nearly all the questions, as blank responses were only rarely seen for any questions.

1.1.3. It was good to see almost all candidates turning up to the exam with the correct equipment with few comments on papers such as “didn’t have a calculator” or “no ruler”.

1.1.4. Questions 1a, b,2a, b, 3a, and 4a in Sections A and questions 1a,b, 2b,4c and 5 in Section B were tackled with the most success.

1.1.5. Questions 2c, 3b, 4b in Section A were less successfully completed whilst in Section B candidates struggled with the data collection sheet in question 3 also in plotting the extra value in Question 4b.

1.2. REPORT ON INDIVIDUAL QUESTIONS

SECTION A

1.2.1. Question 1

Part (a) in this question was almost always answered correctly with 80% of candidates scoring this mark. In part (b) candidates were allowed marks for writing similar responses e.g. London is colder than Majorca and Majorca is hotter than London. The question which is notionally set at a low tariff on the foundation tier was trying to elicit any reasonable comments on this dual bar chart. It was interesting to see that 63% of candidates scored 2 marks and 24% scored 1 mark.

1.2.2. Question 2

This question was well understood by most of the candidature though inevitably some candidates mixed up the concepts of range and median with many candidates also tying to calculate the mean instead of the range and the median.

In part (a) 63 % gained full marks for writing 13 whilst partial success of one mark was gained by 1.7% who wrote the highest and lowest number of points with some idea it was between them.

In part (b) the mark for the median was gained by 80% of candidates with many candidates writing 9.2, which was the mean.

The mark for part(c) was only gained by 41% of candidates and it was quite normal to see responses such as 9 – 11 or 9 – 12 with an answer of 10.5 for those candidates who forgot to put the 11 in the correct place in the ranking.

1.2.3. Question 3

On this paper we did not test the drawing of a pie chart, instead we gave candidates a pie chart and asked them to interpret it.

Parts (a)(i) and (ii) were both correct in 35% of cases. The mark-scheme was set up to accept answers written as fractions, decimals and percentages but 1 mark compensation was given for those candidates that wrote both answers as 1 out of 4 and 3 out of 4. We also allowed one mark in part (a)(ii) for those candidates that wrote an answer that was 1 – their answer to a(i). No marks at all were awarded for those candidates that wrote any of their probabilities as ratios as a ratio of 1:4 or 3:4 are probabilities out of 5 and 7 respectively.

In part (b), only 30% of candidates scored full marks for an answer of 72. One mark was awarded for a method that realised that 30° was a twelfth of 360° or one person was represented by 5° or for a partial method to add at least 3 correct frequencies out of the five; 8% gained this method mark which more candidates could have gained this method mark if they had shown their attempt to add.

1.2.4. Question 4

In this question part only 12% gained full marks for the correct answer of 15 for the mode and 13.5 for the mean. 33% of candidates gained one mark for gaining at least 2 out of the 5 products of number of tracks multiplied by the frequency but only 6% of candidates gained the mark for dividing their total by the total number of CD's (10). A very common response was 27, obtained by dividing the total number of tracks by the number of groups. This only gained any credit if their totalling of the number of tracks on a minimum of 2CD's was shown. A special case, which gained 2 marks, was allowed for candidates who thought that 13 × 0 was 13 and made no further errors resulting in an incorrect average of 14.8.

SECTION B

1.2.5. Question 1

This question was well understood with 98% of candidates obtaining the correct answer for part (a) and 97% of candidates for part (b). In part (c) candidates were rewarded with 1 mark for probabilities with a denominator of 4 or a numerator of 2 or for writing the probability as 2 out of 4 or 1 out 2. 66% of candidates gained 2 marks and 13% gained 1 mark. Common incorrect answers included ¼, ¾, 4/7 and 2/5. A small number of candidates appeared to not understand the question and gave answers such as "coupe" or "saloon".

1.2.6. Question 2

This question too was well understood but only 35% of candidates obtained 2 marks for marking both probabilities on the probability scale correctly. One mark was obtained in part (a) for marking the probability scale between a quarter and a half and nearer to a half then a quarter. Many candidates thought that 5/11 was actually ½ and marked it on the halfway point or marked the point between a half and one so did not score the mark. Many candidates placed their 5/11 mark at or beyond the ½ mark on the scale. In part (b) the success rate was much higher with 58% gaining the mark for marking the probability near zero.

1.2.7. Question 3

The responses to this question were disappointing. This is a standard question if one is looking to collect data from a number of people. We were expecting to see responses where candidates gave a range of newspapers, made a tally of the number of people they asked and there was a total for each newspaper. Only 31% of candidates gained 3 marks whilst 21% gained 2 marks and 1 mark was obtained by 35% of candidates. Many candidates tried to draw a graph to collect their data and some even made up a question with tick boxes; these candidates did not score many marks.

1.2.8. Question 4

This question was well understood with most candidates (90%) gaining the mark for positive correlation or for an explanation of how the weight increased as the length increased. In part (b) fewer candidates (18%) gained the mark for plotting the given point on the grid correctly as they could not read the scale correctly but in part (c) 30% of candidates gained the two marks for an answer in the range 12 to 17 kg inclusive. 32% of candidates did gain a mark for showing a line of best fit or attempting to draw a vertical line at 65kg.

1.2.9. Question 5

This question proved to be very successful with 55% of candidates being able to write out the missing 17 combinations successfully. One mark was obtained by 25% of candidates that could give an additional 6 outcomes but 20% scored no marks. Interestingly a significant number of candidates thought there were only 3 numbers on the dice since only 1, 2 and 3 were shown in the diagram. The most successful candidates gave their combinations in an ordered fashion, either by all the greens followed by all the blues followed by all the reds or by all the ones, all the twos etc.

2. PRINCIPAL EXAMINER REPORT – HIGHER PAPER 6

2.1. GENERAL COMMENTS

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

2.1.2. The vast majority of candidates attempted nearly all the questions, as blank responses were only seen in a few questions.

2.1.3. Questions 1 and 2 in Section A and questions 1 and 2 in Section B were tackled with the most success.

2.1.4. Question 4 in Section A was only rarely successfully completed whilst candidates struggled with the reading the integer value in question 2(e) and gaining all four marks in Question 3 in Section B.

2.2. REPORT ON INDIVIDUAL QUESTIONS

SECTION A

2.2.1. Question 1

In this question 44% of candidates gained full marks for the correct answer of 13.5. 24% of candidates gained one mark for gaining at least 2 out of the 5 products of number of tracks multiplied by the frequency, but only 6% of candidates gained the mark for dividing their total by the total number of CD's (10). A very common response was 27, obtained by dividing the total number of tracks by the number of groups. This only gained any credit if their totalling of the number of tracks on a minimum of 2CD's was shown. A special case, which gained 2 marks, was allowed for candidates who thought that 13 × 0 was 13 and made no further errors resulting in an incorrect average of 14.8. Other instances of poor arithmetic often lost the accuracy mark.

2.2.2. Question 2

This question was very well understood with 76% gaining all four marks in part (a) and (b). Partial credit was given for those who wrote their probabilities incorrectly and for those who thought that 1 – (0.35 + 0.1+ 0.3) was 1 – 0.39 and wrote 0.61 as their answer for part (a) and that 0.35 + 0.1 was equal to 0.36 in part (b). However, a number of candidates showed no working, and so a wrong answer of 0.61 in part (a) scored no marks. In part (b) the most common error was to multiply 0.1 and 0.35 together instead of adding. There were also a significant number of candidates who hadn't read the question carefully enough, and added the probabilities for green and red, rather than yellow and red. In part (c) the question was well answered by most candidates with 78% scoring both marks whilst those that wrote 0.3 × 200 scored 1 mark as did those who wrote the answer as

60/200. The vast majority of those who scored no marks did so because they divided 200 by 0.3, instead of multiplying.

2.2.3. Question 3

Working out a moving average is becoming a regular visitor to the calculator section of this paper but only 54% of candidates obtained the correct answer of 634. It was very common to see candidates trying to make a number sequence out of the 3 given moving averages and writing 645 for their answer. Other candidates wrote down 3 numbers, obviously thinking that a 3 point moving average needed 3 numbers. In part (b) candidates did not seem to realise that the trend should be based upon the moving averages rather than on the original data. Only 27% of candidates scored the mark in this part as candidates often wrote it went down in 2001 and then back up until 2004 and then dropped again. Another common error in this part was to comment on correlation rather than trend.

2.2.4. Question 4

Candidates did not perform very well on this histogram question. Only 31% of candidates scored all 3 marks for a fully correct histogram with correctly labelled and scaled frequency density axis. For this question they needed to work out the frequency density for each of the groups and then draw appropriate bars. Many candidates (about 40%) drew a bar chart and they received no marks. Marks for partial success were awarded to those candidates that could work out the frequency density or who could draw bars of correct the height but omitted the scaling on the frequency density axis. Insufficient heed was paid to the x-axis values with some candidates extending the first and last bars to cover values outside of the ranges given. There was a disappointing tendency for candidates to simply multiply or divide various values given, finding mid points etc, indicating that they were trying to apply poorly remembered rules rather than demonstrating understanding.

SECTION B

2.2.5. Question 1

This question was well understood with most candidates (70%) gaining full marks. Candidates lost marks for writing positive rather than positive correlation and there were a few ambiguous uses of the word ‘bigger’, without defining what was bigger. In part (b) candidates lost the mark for plotting the given point on the grid correctly with the scale on the *y* axis providing the most trouble, but in part (c) almost all candidates gained the two marks for an answer in the range 12 to 17 kg inclusive and those that did not gained a mark for showing a line of best fit or attempting to draw a vertical line at 65kg Only 1% of candidates failed to score any marks at all in this question.

2.2.6. Question 2

This cumulative frequency question was very well understood by the majority of candidates with success rates of over 75% in parts (a), (b) and (c). The most common incorrect response in part (a) was stating the frequency of 9 rather than the class interval and in (b) the incorrect responses centred on finding the median of the frequency numbers, and 0.75 – 100 as it was in the middle of the table). Candidates were slightly less successful in part (d) where they had to draw the cumulative frequency curve. Line segments were accepted but many candidates lost a mark for poor plotting or plotting the points in the middle or at the beginning of the class interval. In part (e) the success rate dropped even more to 10%. Candidates could score 1 mark for an integer answer of 9, 10 or 11 without showing their working or for showing their working but then forgetting to take their cumulative frequency reading from 30. Candidates also struggled to interpret the horizontal scale, and it was often difficult to ascertain evidence of their line at 0.9. A small minority of candidates chose 4 for their answer, the number of groups with a value equal or higher than 0.9

2.2.7. Question 3

This was a fairly standard, but non-trivial, probability question. Many successful candidates drew correct probability tree diagrams and used them properly. 21% of candidates knew that they had to multiply the probabilities together as they worked along a set of branches starting with the root and a further 36% of candidates knew they had to be to add the resulting 3 fractions to get the right answer. However, there were a large number of errors due to inability to tackle the arithmetic of fractions correctly. These were of the following general types:

- carelessness, exemplified by one of $\frac{3}{9}\times\frac{2}{8}=\frac{5}{72}$ or $\frac{2}{9}\times\frac{1}{8}=\frac{3}{72}$
- confusion over multiplication, exemplified by all of $\frac{4}{9}\times\frac{3}{8}=\frac{7}{72}$, $\frac{3}{9}\times\frac{2}{8}=\frac{5}{72}$ and $\frac{2}{9}\times\frac{1}{8}=\frac{3}{72}$
- confusion over multiplication as exemplified by $\frac{3}{9}\times\frac{2}{8}=\frac{42}{72}$ or $\frac{3}{9}\times\frac{2}{8}=\frac{432}{72}$
- confusion over addition as exemplified by $\frac{6}{72}+\frac{2}{72}+\frac{12}{72}=\frac{20}{216}$

Many candidates made life harder for themselves by calculating the correct fractions for the cases OO, AA and TT, cancelling them and then making an error on the addition of the three fractions with different denominators.

Some candidates treated the problem as one of replacement and were rewarded as they had essentially the correct method.

Some candidates thought the total of bottles was 8 or 10 rather than 9 and ended up with a fraction over 56 or 90 and there were also some candidates who tried to drink 3 bottles or convert to decimals.

Other candidates gave fractions such as probability(2nd is O) = $\frac{2}{9}$ rather than $\frac{2}{8}$.

Some candidates drew out the whole equally likely sample space for the case with replacement and obtained the answer $\frac{29}{81}$

There were, of course many candidates who tried to draw a probability tree but could not get its structure correct (generally they did not have 3 branches from every node) and many others who could not get as far as that.

I t was pleasing however to see that fully correct solutions were given in 30% of cases though 44% of candidates scored no marks.

3. PRINCIPAL EXAMINER REPORT – FOUNDATION PAPER 9

3.1. GENERAL COMMENTS

3.1.1. It was encouraging to see that most candidates attempted all questions on the paper.

3.1.2. Working was usually shown in the spaces provided for that purpose on the question paper.

3.1.3. Candidates seemed to fare less well in questions which involved interpreting and drawing diagrams.

3.2. REPORT ON INDIVIDUAL QUESTIONS

3.2.1. Question 1

The first part of the first question on the paper was answered well with a success rate of over 80%. "26" was the most frequently seen incorrect response. Parts (b) and (c) provided more of a challenge. In part (b) only about one quarter of candidates could give a correct answer. The incorrect answer "0·15" was more commonly seen. In part (c) the fraction "$\frac{2}{7}$" was seen almost as often as the correct answer "$\frac{27}{100}$". Here, just over a half of candidates were awarded the mark available.

3.2.2. Question 2

Counting centimetre cubes, including 2 hidden cubes, was the approach expected of candidates in this question. A large proportion of the candidates attempted to do this but accuracy was not a strong point and "9", "10", "11" and "13" were frequently seen. 47% of candidates scored both marks in this question with a further 5% gaining 1 mark. Many candidates attempted to calculate the volume by working out lengths, sometimes more than 3, and multiplying them together.

3.2.3. Question 3

It was disappointing to see that just over a half of the candidates were able to draw a diameter in the circle. As it was not the intention to assess accurate drawing in this question, freehand drawing was usually accepted as long as the intention was clear. Unfortunately, many candidates drew a radius or more than one radius and some drew a radius and a diameter. This could not be accepted unless the diameter was labelled. Some candidates attempted to draw a freehand circle inside the given circle given whilst other candidates did not attempt the question at all.

3.2.4. Question 4

55% of candidates were able to give the correct answer in part (a) of this question. Common incorrect responses included "98" and "38416" presumably obtained by dividing by 2 and squaring respectively. In part (b) just under 36% of candidates gave the correct answer. "21" was the most common incorrect answer seen.

3.2.5. Question 5

Most candidates (74%) were able to simplify "$m + m + m$" to give "$3m$" or "$m3$" both of which were accepted in part (a). However, a significant minority of candidates gave the incorrect response "m^3". In part (b), 40% of candidates gave the correct answer "y^2". Perhaps not surprisingly,"$2y$" was the main incorrect response seen.

Part (c) of the question was poorly done. Examiners could award full marks to only just over one in ten candidates. A further one in three of candidates could give one correct term, either "$5a$" or "b". Incorrect responses usually included one or more of the terms "a" and "$-9b$". "$1b$" and "$b1$" were accepted as alternatives to "b".

3.2.6. Question 6

Relatively few candidates used their calculator efficiently to complete this question. 39% of candidates gained some credit for their answers, usually 2 marks. Many candidates used the method of working out 10% and 5% of 240 first. Candidates who attempted to use 25% and 10% were less successful, usually because they tried to work out 10% from their 25% rather than dividing 240 by 10. Of the large number of unsuccessful attempts, many candidates simply multiplied 35 by 240 to give 8400 as their answer. A significant minority of candidates decreased 240 by 35%. Where working was shown, credit was given for this answer.

3.2.7. Question 7

This question was well done by stronger candidates who could correctly interpret the information given, work out the size of the angle and accurately describe a reason for their answer. 31% of candidates scored full marks. On the other hand, there was a large number of candidates who stated that the size of angle x was 52° and gave their reason that the triangle "was equilateral". 42% of candidates were unable to score any marks.In cases where candidates were awarded partial credit, this was usually for giving the correct angle size followed by a vague or incorrect reason or merely a repeat of their working out from part (a) – for example "52 + 52 = 104, 180 − 104 = 76". In some cases candidates gave several reasons which contained contradictions. These candidates could not be awarded the mark in part (b). Examiners did not accept comments such as "B and C are the same" or "it adds to 180°" and which failed to refer to "angles" or "triangles". Many candidates continue to confuse the notation for two equal lengths on the diagrams with that which would be used for showing lines are parallel to each other. This often spoiled their answers to part (b).

3.2.8. Question 8

The most successful attempts at drawing the line on the grid were from those candidates who drew up a table of values first. Only 15% % of candidates gained full marks for this question. Some candidates failed to join their points with a straight line and others did not extend their line to cover the full range of values. A further 15% of candidates scored 1 or 2 marks for calculating or plotting 1 or 2 correct points. There was little evidence of candidates entered for this tier using the gradient-intercept method for drawing the line. A disappointingly large number of candidates plotted the points (3, −2) and (−1, 3) then joined them, showing little understanding of this topic.

3.2.9. Question 9

Almost one third of candidates answered this question successfully, many of whom did not show any working. The question was a good discriminator and many candidates who did not give the correct answer were awarded 1 mark for demonstrating that they could correctly evaluate at least one of "$3{\cdot}4^2$" or "$2{\cdot}6^2$". Perhaps, not surprisingly, many candidates failed to ensure that the numerator was fully evaluated, either by using the brackets function on their calculator or by writing down intermediate working, before dividing by 1·6. Of the 48% of candidates who could not be awarded any marks, most multiplied by 2 rather than squaring or worked out "3·4 − 2·6" rather then "$3{\cdot}4^2$ − "$2{\cdot}6^2$". These errors usually lead to the incorrect answers "1" and "0·5".

3.2.10. Question 10

This question was well answered by the more able candidates with many calculating the average speeds correctly before making the correct conclusion. Other methods such as considering the distance covered by each of John and Kamala in 30 minutes were often employed successfully. A significant number of candidates divided the time taken by the distance travelled but were then unable to convince examiners that they understood what they were doing by making the correct conclusion. Weaker candidates often multiplied the distance travelled by the time taken. No marks could be awarded to candidates who failed to show any working.

4. PRINCIPAL EXAMINER REPORT – HIGHER PAPER 10

4.1. GENERAL COMMENTS

4.1.1. It appears that candidates had sufficient time to complete all questions on the paper in the time allowed.

4.1.2. There was a significant number of candidates who could make little headway with questions in the second half of the paper and these candidates may have been better suited to entry at the Foundation Tier.

4.1.3. Good answers were seen to all questions on the examination paper.

4.2. REPORT ON INDIVIDUAL QUESTIONS

4.2.1. Question 1

This question was answered well with 72% of the candidates being awarded full marks. Some candidates did not evaluate the numerator before performing division by 1·6. The evidence suggests that these candidates had not realised the need to use the brackets keys on their calculator or to record intermediate working. A generous mark scheme enabled the candidates to gain one mark for correctly evaluating at least one of $3{\cdot}4^2$ and $2{\cdot}6^2$.

4.2.2. Question 2

Nearly all candidates were successful in part (a) of this question. However, although a good proportion of candidates were able to state that 50° and *x*° were alternate or Z angles, many reasons were expressed too vaguely. For example, some candidates stated the angles were "opposite" to each other or that the two angles were "between parallel lines". Some candidates quoted "corresponding angles" or "angles on a straight line add up to 180°", reasons which are incorrect by themselves. In this type of question the correct use of mathematical terms is needed. 96% of candidates scored at least one mark but only just over a half of the candidates could be awarded full marks in this question.

4.2.3. Question 3

Many candidates (57%) found this question straightforward and scored all 3 marks. However, there was a significant minority of pupils who plotted the points (3, −2) and (−1, 3) sometimes joining them. It is disappointing to report that such responses were seen from candidates entered for the Higher Tier. Some candidates attempted to use the gradient-intercept method to draw the line but only scored 1 mark because they did not relate the gradient to the different scales used on the *x*- and *y*-axes.

4.2.4. Question 4

Candidates should have found this to be a simple application of the formula for working out the volume of a prism, given on page 2 of the question paper. Two thirds of candidates were awarded both marks. Unfortunately some candidates who wrote down "18cm^2 × 5·8cm" in the working space then proceeded to work out "18^2 × 5·8" revealing an apparent lack of understanding of the notation used for the area of cross section. Some candidates appeared to be trying to work out surface areas.

4.2.5. Question 5

Only about one in three candidates scored full marks in this question. In part (a) most candidates were able to expand at least one of the expressions "3(2*x* + 3)" and "2(*x* + 1)" successfully to gain 1 mark. However, it is disappointing to report that it was common to see candidates then attempting to multiply "6*x* + 9" and "2*x* + 2" or incorrectly combine them in some other way. Perhaps surprisingly, just as many candidates were successful in part (b) as in part (a). In this part of the question, in cases where a candidate could not be awarded both marks, examiners were often able to give one mark for either 3 out of 4 correct terms in their expansion or for 4 terms with some incorrect signs.

4.2.6. Question 6

About two thirds of responses to this question were awarded at least one mark with just over a half of candidates achieving full marks. Many candidates demonstrated that they knew that the tangent and radius met at 90°. However, a significant number of candidates gave "4°" as their answer – obtaining this from doubling 86 and subtracting from 180° before halving or from subtracting 86° from 90°. The candidates who gained one mark often worked out that angle ABP was 47° but could go no further.

4.2.7. Question 7

This question proved to be a good discriminator with each of the marks 2, 1 and 0 being awarded to about one third of the candidates. Of the two thirds of candidates who could not be awarded full marks, about half were able to use their calculator correctly to evaluate the product (but were unable to give their answer in correct standard form) or give a partially correct answer in the form $1·5 \times 10^n$ ($n \neq 3$). The responses 1500, $1·5 \times 10^{11}$ and $1·5 \times 10^2$ were commonly seen.

4.2.8. Question 8

Just over a quarter of candidates were able to give a full, clear and correct proof to gain both marks. This needed to include multiplying by an appropriate power or appropriate powers of 10 and subtracting, and then linking this with $\frac{17}{99}$. Many candidates gave answers suggesting they had remembered some elements of the necessary proof but not enough to convince examiners to give them any credit. Many candidates tried to "fudge" their proof or simply stated that when 17 is divided by 99 using a calculator the required recurring decimal is given. Long division was carried out by a small number of candidates. Where this method was employed it was often possible to award one mark where enough remainders were clearly shown, but candidates rarely tried to explain why the decimal would recur.

4.2.9. Question 9

About one in seven candidates gained all 3 marks in this question. Only the better candidates realised the need to factorise the two quadratic expressions before any attempt at simplification is made. Of those who did realise this but were unable to complete the question successfully, some were credited for being able to factorise at least one expression correctly, usually the one which appeared in the denominator. Many candidates attempted to "cancel" individual terms which appeared in both the numerator and denominator without factorising.

4.2.10. Question 10

Over 60% of candidates were awarded at least one mark for their responses to this question. These candidates were able to find the mass of the juice or of the combined drink to gain one mark. However, relatively few candidates could make any further progress. Only about one in eight were able to complete the question successfully. Of those candidates who scored no marks on this question, a significant minority worked out 15 ÷ 4 and 300 ÷ 1 or 315 ÷ 5.

5. PRINCIPAL EXAMINER REPORT – FOUNDATION PAPER 11

5.1. GENERAL COMMENTS

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

5.1.2. Candidates should be reminded that diagrams, in general, are not accurately drawn, and that this is indicated by the diagram.

5.1.3. Candidates should be advised that when asked to describe a transformation the number of marks indicates the number of things required in the description.

5.1.4. It is disappointing that about half the candidates were unable to score at least 1 mark for multiplying two relatively simple numbers.

5.2. REPORT ON INDIVIDUAL QUESTIONS

5.2.1. Question 1

This question was done well by most candidates. Common errors include: incorrectly adding the 16 and the 9 to get 24 and subtracting this correctly from 30 to get 6; incorrectly subtracting 25 from 30 to get 15; measuring the length of part C; subtracting 9 from 16 (only) to get 7.

5.2.2. Question 2

Many candidates were able to score at least one mark for part (a) of this question. This was usually for obtaining a 7 in the unit column of their answer. A significant number of candidates were unable to obtain the correct answer. Common incorrect answers here were 217, 117 and 393. In part (b), many candidates were able to take 9 from 4 to get -5. A very common incorrect answer here was 5. Part (c) was done well by most candidates. Common incorrect answers here were 15 and 2. Part (d) was done well by the majority of candidates It was rare to see this calculation set out as a long division- many just simply wrote down the answer. Common incorrect answers here were 60 and 250.

5.2.3. Question 3

Part (a) was done well by virtually all the candidates. Part (b) was done well by most candidates. Many realised that they needed to find a quarter of 20, but some were unable to do this accurately. Of the few candidates that showed any working in this question, a popular approach was to divide 20 by 2 and then divide their answer by 2 again.

5.2.4. Question 4

This question was answered well by many candidates. Most were able to calculate the output 17, and just over half were able to find the input 15. A very popular method to find the unknown input value was to use trial and improvement. Some of those candidates who adopted this approach and who arrived at the correct equation $15 \times 2 - 3 = 27$, did not then transfer the15 to the answer line. Common incorrect answers here were 12, 16, 60 and 30.

5.2.5. Question 5

Parts (i) and (ii) were done well by virtually all the candidates. Part (iii) was done well. Common incorrect answers here were D and C. Only about half the candidates were able to get part (iv) correct. A common incorrect answer here was B.

5.2.6. Question 6

This question was done well by the vast majority of candidates. Common errors in part (b) were –5 and –7. Common errors in part (c) were Edinburgh and London.

5.2.7. Question 7

This question was done well by the vast majority of candidates. Few candidates showed any working, most simply wrote down an answer. A common error in part (b) was 16. A common error in part (c) was 31.

5.2.8. Question 8

This question was generally done well. In part (a), most candidates were able to read the bus time table correctly to find the appropriate arrival time at Alton. Parts (b) and (c) were done well by about three quarters of the candidates. A common incorrect answer for part (b) was 23.

5.2.9. Question 9

Part (a) was not done well. The majority of candidates were able to score 1 mark for drawing an angle of 60º at A, but many had difficulty in drawing the 30º angle at B. Candidates should be advised that diagrams are given for guidance and, in general, are not accurately drawn. In part (b), it was evident that relatively few candidates measured the size of their angle at C. Many simply wrote down the answer completely independently of their diagram (or lack of diagram) in part (a). For a significant number of candidates a common incorrect answer was to draw an equilateral triangle in part (a) and then to write down 90º in part (b).

5.2.10. Question 10

Part (a) was done well by more than three quarters of the candidates. The most common incorrect answers here were 42.5 (from incorrectly interpreting the vertical scale) and 20 (from reading the wrong scale). Part (b) was done well by the vast majority of the candidates. In part (c), just over half the candidates were able to score both marks for changing 100 euros to dollars. A common inaccurate approach here was to start with 60 euros (= $90), and then to add $10 for every 5 euros increase.

5.2.11. Question 11

This question was not done well. More than two thirds of the candidates scored 0 marks in this question. By far the most common incorrect approach was to simply add the numerators and add the denominators to get $\frac{4}{12}$. A significant number of those candidates using the tabular approach got confused somewhere in their method.

5.2.12. Question 12

This question was done well. More than two thirds of the candidates were able to score 2 marks for this question. Common errors in this question include: adding or subtracting the two areas; finding the perimeter of shape D; writing the final answer as 4×4, 4^2, $\frac{4}{4}$ or 4 : 4.

5.2.13. Question 13

This question was not done well. About half the candidates were unable to show sufficient understanding of place value in the multiplication of two numbers to score any of the marks. A very common incorrect answer here was $36 \times 24 = 30 \times 20 + 6 \times 4 = 624$. Many of those candidates using a tabular method (which was perhaps the most successful of the methods used) made errors in their calculations, such as $30 \times 20 = 500$ and $6 \times 3 = 16$.

5.2.14. Question 14

Many candidates were able show how the trapezium tessellates. Most drew at least 6 trapeziums (including the one on the grid) as required, but some of those who drew more than this, sometimes spoiled their answers by including incorrect shapes or inappropriate spaces between them.

5.2.15. Question 15

Just over a third of the candidates were able to find the given test score as a percentage. Relatively few started their answer by first writing down the calculation $\frac{14}{20} \times 100$. A common incorrect method was to correctly working out 75% of 20 to get 15 and then incorrectly subtracting 1 to get 74%. Another common incorrect method was $\frac{14}{100} \times 20$. Partitioning methods were rarely successful.

5.2.16. Question 16

This question was generally done well. Most candidates attempted to add the three given angles and subtract the result from 360°. Repeated subtraction from 360 was less common. Some candidates had difficulty subtracting 318 from 360. Common incorrect answers here were 32, 52 and 62. A significant number of candidates thought that the sum of the angles in the quadrilateral was 380°.

5.2.17. Question 17

This question was not done well. In part (a), just over a third of the candidates were able to score 2 marks for the correct rotation of the shape. A significant number of candidates lost a mark by incorrectly positioning the shape after the 90° clockwise rotation, or by embedding their answer within other rotations- typically all three of 90°, 180° and 270° rotations. In part (b), very few candidates were able to write down the name of the transformation or describe accurately how this should be done. A common incorrect answer here was 3 ‘across’ and 1 down.

5.2.18. Question 18

About two thirds of the candidates were able to score at least 1 mark for this question. Many candidates realised that they needed to increase the ingredients by half. Many scored 2 marks for getting only one of the ingredients correct (usually 300), but then accompanied this with often wild values for the other ingredients.

5.2.19. Question 19

Many candidates were able to score at least 1 mark for this question. In part (a), few candidates drew a 2 × 2 square for the side elevation of the solid shape, but many were able to score a mark for a drawing an acceptable rectangle. In part (b), Many candidates were able to score at least 1 mark for an acceptable sketch of the solid shape. Some had difficulty in maintaining the same perspective throughout the whole sketch. Common incorrect answers here include sketches of triangular prisms, cubes, cuboids and nets.

5.2.20. Question 20

A significant number of candidates were able to score at least 1 mark in this question.

In part (a), only the best candidates were able to add and simplify the three expressions to get the correct perimeter for the triangle. Common errors include: not recognizing that the coefficient of *x* by itself is 1, so that $x + 2x + 3x$ was simplified to 5*x*; ignoring the negative sign so that $(+6) + (-3) + (+1)$ was simplified to 10; adding the constant terms to the terms in *x*, so that e.g. $6x + 4$ was simplified to 10*x*; incomplete simplification (usually to $6x + 7 - 3$); unnecessary division by 2, so that $6x + 4$ was the simplified to $3x + 2$.

In part (b), few candidates put the expression they obtained in part (a) to form an equation in *x*. Of those that did, many had difficulty in dividing 33 by 6. A significant number of candidates used trial and improvement in the diagram to arrive at the correct answer for this part.

6. PRINCIPAL EXAMINER REPORT – FOUNDATION PAPER 12

6.1. GENERAL COMMENTS

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

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

6.1.3. Candidates are advised to make sure that their pencil marks in constructions and diagrams are clearly visible, particularly when the paper is marked online. At times it was hard to see the boundaries of the candidate's net in question 8.

6.1.4. 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 2 and 6 when the answer was incorrect. However in question 11 candidates did not set out their work as clearly which made it hard to follow what the candidate was attempting to do.

6.2. REPORT ON INDIVIDUAL QUESTIONS

6.2.1. Question 1

Conversions involving fractions, decimals and percentages were not as well handled as would be expected for the opening question with around two-thirds of the candidates having success on each part except for part (c) which only had a 57% success rate. Practice might have eliminated some misunderstandings of the type '$\frac{9}{10}$ = 9.10', '$\frac{3}{4}$ = 34%' and '23% = $\frac{2}{3}$'.

6.2.2. Question 2

Adding £4.90 and £5.85 together by first selecting the information from the table gave little cause for concern, especially on this calculator paper with over 90% getting this correct. The most common error was to add together all three amounts with some going wrong by adding together the incorrect two amounts.

Some struggled to formulate a method in part (b) to determine how many adult tickets were bought. On a calculator paper evaluating 60.55 ÷ 8.65 should have been a relatively easy task. In part (c) writing down the method is good practice, as this allows for the award of method marks, although, in some instances, it was not that clear as to how the answer had been achieved. Many did not write £20 − their total and so often could not be awarded the second method mark when their answer was incorrect. Candidates need to be aware that even though we may suspect the method is correct, we cannot guess what they have done. Eg seeing £18.45 and then having an answer of £2.55 would not score the second method mark even though we suspect the candidate has done £20 − £18.45 It was pleasing to note that over ¾ of the candidates scored all 5 marks in the last two parts.

6.2.3. Question 3

Recognition of mathematical shapes and the use of the correct mathematical name was often evident with over 70% of the candidates scoring in each part. In part (i) the cone was often referred to as a pyramid or circular pyramid whilst in part (ii) the cylinder, with all its spelling variations, was sometimes referred to as a tube or a cuboid.

6.2.4. Question 4

Nearly 80% of the candidates were able to measure the length of the line with a high degree of accuracy as well as mark the mid-point within acceptable tolerances. The most common error was to merge the two parts of the question and give the distance to the mid-point. Others wrote down 3.2 in (a), not realising that the length of the whole line was required.

6.2.5. Question 5

Stating the size of the angle in the equilateral triangle was a widely known fact and produced many accurate results (74% success rate). Candidates who measured the angle using a protractor and gave an answer other than 60º, eg 59º or 61º, did not score. Other common errors were 90º and 120º.

The explanation required in part (b) gave rise to a variety of complex ideas whereas using a simple fact could have easily earned the mark. Recognition that a right-angled triangle should contain an angle of 90° was sufficient.

6.2.6. Question 6

The first part of this question just needed a straightforward arithmetical approach and there was evidence that many were working on the correct lines with ¾ of the candidates scoring all 5 available marks for this question. Seeing (6 × 3) and then + 4 produced the total cost. Part (b), involving calculating the number of days, was less obvious, but again there were some well set out solutions leading to the correct answer. Realising that 52 – 4 was the first step in the calculation was essential to arriving at the final correct value.

6.2.7. Question 7

Working out 10% of £7200 in part (a) led to £720 in many cases. However, it is important to stress the importance of reading the question carefully as it was not unusual to see the amount given as £6480 as the answer to part (a) … this being the answer to the second part of the question. £72 as the answer also appeared representing 1% of the sum rather than the required 10%. A follow through in part (b) allowed for an earlier error in the calculation not to be penalised twice. Just under 20% failed to score on this question and around 50% scored all 3 marks. Many candidates wrote the same answer in both parts, generally £720 or £6480

6.2.8. Question 8

Drawing an accurate net of the cuboid generally fell into two categories, those who produced a ruled accurate diagram and those who simply drew the same 2-D shape again on the squared outline provided. In between there were many nets with just five faces which were partially rewarded if the accuracy was there. Those candidates who ignored the given dimensions but drew an accurate net of a cuboid were awarded 1 mark. It was disappointing to note that nearly half the candidates failed to score any marks at all on this question.

6.2.9. Question 9

Writing down the correct letters of the two shapes that were congruent resulted in a 79% success rate for part (a). Use of tracing paper would have ensured accuracy.

In part (b) there appeared to be a fairly good understanding of the word ‘congruent’ with just over half the candidates drawing a shape that was identical to the given one. It would have been sufficient to merely draw the shape again a few squares to the right to earn full marks. However, for some reason, possibly because they did not understand what was required, many inverted the shape, rotated the shape or reflected the shape which resulted in the task being made much more demanding.

6.2.10. Question 10

Adding a square to achieve a pattern with one line of symmetry and a pattern with rotational symmetry of order two appeared to be well understood and with over 60% getting both fully correct. The most common error was to reverse the question with the solution to (a) appearing in (b) and vice-versa.

6.2.11. Question 11

Calculating how many students went to the chemistry revision class involved being able to handle the $\frac{1}{6} \times 36$ and $\frac{2}{9} \times 36$ confidently. The first stages in the working might have been to work out $\frac{1}{6} \times 36 = 6$ but this result become less convincing when the second fraction was used as $\frac{2}{9} \times 36 = 18$ $(2 \times 9 = 18)$. Another approach was to add together the two fractions first and then to multiply by 36 but once more it was not unusual to see this evaluated incorrectly as $\frac{1}{6} + \frac{2}{9} = \frac{3}{15}$. Manipulation of fractions does seem to be an area of arithmetic which causes considerable difficulties for the students with nearly half the candidates failing to score any marks at all. Around a third of the candidates scored 2 or 3 marks.

6.2.12. Question 12

Using the temperature conversion formula proved to be somewhat challenging, especially as the value given for *C* was negative with over 60% of the candidates scoring no marks in both parts. The starting point of replacing *C* in the formula was rewarded but a misunderstanding crept in when it came to evaluating it. From 1.8×-8 it was not unusual to see this given as −6.2, thus ignoring the fact that the two numbers needed to be multiplied together not subtracted. For part (b) the formula needed to be rearranged using the given value of *F* to find *C*. Those who managed to deal with this produced some elegant lines of working but the majority struggled to make any headway.

6.2.13. Question 13

Converting from pounds sterling to euros and the reverse seemed to be well within the experience of the students with nearly half the candidates changing both values correctly. It appeared to come down to knowing whether to multiply or divide. In part (a) writing down 325×1.68 helped to reinforce the fact they would be getting numerically more euros than the pounds they were exchanging. Similar thinking applied in part (b) gave rise to a division. However, there did appear to be more correct answers to part (b) than part (a).

6.2.14. Question 14

Drawing an enlargement using a scale factor of 2 in part (a) produced many all correct diagrams (75%) with a good degree of accuracy, often drawn using a ruler. Some used a scale factor of 3 and this was partially rewarded as was a diagram with two lengths correct using the intended scale factor of 2. The unsure just continued with a step diagram failing to appreciate what was being asked of them.

Part (b) requiring a description of the transformation produced some weird and wonderful ideas. The word 'flip' seemed to dominate despite the fact that it is not a mathematical name used to describe a transformation. The phrase 'mirror image' was ever present along with variations on the same theme. In reality it was a simple 'reflection in the *y*-axis', both parts being required to obtain full marks. It was extremely disappointing to note how many candidates were not familiar with the term 'reflection' or even related terms such as 'reflect', 'reflected' etc. Over 75% of the candidates failed to score on this question.

6.2.15. Question 15

There was a good understanding of the word 'ratio' and two thirds of the candidates were able to gain at least the method mark in the first part of the question. The two most common errors were to state the ratio in the wrong order or to make a mistake in simplifying it.

There were fewer marks awarded in part (b) as the method required seemed to elude them. with only 40% scoring any marks at all. For those with determination, working through a list seemed to be the only option as they began with the given ratio of 1:5 and worked up by multiplication to 9:45; although they did not always understand what they had achieved when they arrived at that ratio.

6.2.16. Question 16

In part (a) there was great confusion between indices and multipliers. Many candidates had coefficients before t eg $2t^6$, $12t$, etc. Often the indices were written too large, and answers could only be interpreted as $t8$. Others left room for doubt between $t8$ and t^8. The most common incorrect answer was t^{12}.

In part (b) there were similar difficulties and noticeably fewer correct answers than (a). Many tried to divide the powers and then had difficulty with 8 ÷ 3. The most common incorrect response was m^{11}. In both parts there were relatively few blank responses and the success rate was 47% for (a) and 32% for (b).

6.2.17. Question 17

The penultimate question on the paper proved to be a challenge for most of the students with nearly 80% of the students failing to make a valid start on this question. Finding half the circumference of a circle was recognised as in $\pi \times 8$ and then dividing this result by 2. It was the next stage that seemed to lie outside the experience of the student as they failed to grasp that they needed to add on the diameter in order to find the perimeter of the tile. There were a number of candidates who used πr^2 to find the perimeter, scoring no marks. Others showed $\pi \times 4$ but then proceeded to divide this by 2, clearly showing they did not know which formula to use.

6.2.18. Question 18

Showing the inequality on the number line was not done well with the majority unable to gain either of the two marks. An open circle was needed to be drawn on the line, or close to it, at the position indicated by -2. A line with an arrow was then required to show the direction in which the valid values lay. Lack of attention to detail in drawing both was a contributory factor in the loss of marks.

Solving the algebraic equation in part (b) did allow students with a flair for algebra to demonstrate their ability and there were some exceptionally good correct solutions. However many students still struggle with trying to solve equations. Many scored the first mark by correctly expanding $5(y + 2)$ but then failed to complete their solution correctly. The most common error was to write $5y - 7y$ or $7y - 5y$ which resulted in no more marks being scored. A few used flow diagrams which were not appropriate for this type of equation.

Overall, 67% failed to score any marks on this question with a further 18% scoring just 1 mark.

7. PRINCIPAL EXAMINER REPORT – HIGHER PAPER 13

7.1. GENERAL COMMENTS

7.1.1. There was a disappointing lack of arithmetical ability shown by candidates doing this paper. This was evident in standard procedures such as the multiplication of fractions but also in basic multiplication and division of whole numbers. Answers to the rotation and 3D questions were generally fine and good work was shown in the setting up and solution of linear equations.

7.2. REPORT ON INDIVIDUAL QUESTIONS

7.2.1. Question 1

There were many good answers to this question. Most candidates managed to get the 300g for the self-raising flour, but then there was a noticeable tailing off in success. Those candidates who added half as much again onto the weights given generally seemed to be the most successful. Many candidates tried to use the unitary method, but then came unstuck when dividing by 8. This was particularly true when the division would have led to a decimal answer, for example, the 60g of butter. It was also disturbing to see the number of candidates who could not successfully multiply 25 by 12.

7.2.2. Question 2

A standard, context free fraction multiplication with no cancelling required. As with question 1 there was a great deal of evidence pointing to poor arithmetical as well as conceptual/ process skills. The major error was where the multiplication process is confused with addition, so the candidates write $\frac{12}{20} \times \frac{5}{20}$,making the denominators the same and then go on to work this out as $\frac{60}{20}$ or 3. (Of course, $\frac{60}{400}$ was an acceptable answer). Further common wrong answers were $\frac{17}{20}$ from adding the numerators of the equivalent fractions and $\frac{4}{20}$ from possibly 3×1 = 4, or from simply multiplying the denominators of the original fractions and adding the numerators. Some clearly confused the methods required for multiplication and division and turned the second fraction upside down before multiplying to reach $\frac{12}{5}$

A few candidates replaced the fractions by decimals. They were allowed full marks on a correct decimal answer.

7.2.3. Question 3

Many candidates were able to reach a correct simplified answer for a question that has now become common. Some candidates did not know the difference between a formula, and expression and an equation. Answers to part (a) of the form $P = 6x + 4$ (a formula) or $37 = 6x + 4$ (the start of part (b)) were not penalised, but $0 = 6x + 4$, $180 = 6x + 4$ and $x = 6x + 4$ all were.

Answers to part (b) were again marred by a lack of arithmetical skill. The main stopping block being the division of 33 by 6, which often yielded 5.3 and where answers of 5 remainder 3 were not considered acceptable. Most candidates knew that they had to apply their answer to part (a) and set it equal to 37. Some used no algebra at all but showed a process that was clearly equivalent to subtracting 4 from 37 and the dividing the answer by 6. They got full marks if 5.5 or equivalent was obtained

7.2.4. Question 4

Once again a surprising number of candidates could not apply the appropriate arithmetical skills correctly. The major problem came with 16 × £1.50 with many candidates failing to see that the most direct way of working this out was to do 16 + half of 16. Some candidates were confused by the context and worked out one fifth of 15 and then used that answer in various inventive ways. Others found one fifth of 20 as 4 and then used that to get £6 as the profit, in this case ignoring most of the information given in the question. Many failed to complete the final step of the question which was performing a subtraction to calculate the profit.

7.2.5. Question 5

Part (a) was well answered with the vast majority of candidates putting the image in the correct place. There were a few inaccuracies - usually the correct shape a square out as well as some confusion over the sense.

Candidates were generally less successful with part (b). There was a lack of knowledge of the technical vocabulary required, so answers such as ‘moved along’ were very common. Translation was often given as ‘transformation’ and ‘transportation’. Candidates could give answers in vector form or as a movement parallel to the axes. Of those that opted for the latter, many lost marks through vagueness by writing such as ‘3 along the x direction and 1 down the y direction’ because they had to specify the sense. ‘3 to the right along the x direction and 1 down’ was acceptable for 1 mark. Of those that used vectors, some transposed the x and y components or wrote the x and y components as a fraction, presumably having an idea of gradient in their heads. Lastly there was some confusion evident in using the vector as the name of the transformation or in writing the vector as coordinates.

7.2.6. Question 6

Part (a) was generally well done with the majority of candidates expanding the bracket correctly and then going on to solve the equation

Part (b) was also dealt with correctly by most candidates, although again a small number were let down by the arithmetic and could not go correctly from 2x = 11 to a final answer.

7.2.7. Question 7

Candidates who had a strong feeling for Bidmas generally were successful on this question. They divided by 2 and the spotted that 6 squared is 36. Those candidates who tried to find a square root first got nowhere. A few candidates tried trial and improvement with mixed degrees of success as they also had a problem with Bidmas, often doing the doubling of their trial first. Candidates who followed this route successfully were given full marks. Otherwise they received no marks.

7.2.8. Question 8

The table in part (a) usually yielded at least 1 mark. As anticipated, the major error was with dealing with x = –1, where the answer –5 often appeared, presumably from 1 – (2 + 4). Other incorrect values looked as if they came from squaring –1 and getting –1.

Candidates were generally successful in transferring the table values onto the graph and most drew a smooth curve through their points to pick up the final two marks, although there were still some who joined their points with straight line segments.

7.2.9. Question 9

There were many good answers to part (a) although some candidates thought the required elevation looked like the plan or like the front elevation.

Answers to part (b) were generally successful.

7.2.10. Question 10

There was a large spread of marks on this question. Many candidates scored at least 2 marks by showing that the required region must lie inside the arc of radius 4 cm centre B. Responses to the second condition were more varied with many candidates putting in the altitude from A or the median from A.

7.2.11. Question 11

The sensible way to solve this pair of simultaneous equations is to double the second and then add to get 13x = 39, from which x = 3. In many cases the candidate started well and made the coefficients of y equal and opposite (or x equal and the same). After this stage however, things began to unravel, often with the wrong operation being carried out – although it was nice to see STOP (Same Take, Opposite Plus) and SSS (Same Signs Subtract) being used as mnemonics. Of course many candidates could not really make a start on the question. There was very little sign of the substitution method.

7.2.12. Question 12

Many candidates interpret these inequalities as equations and come out with t = 5.5. Generally they were able to go on and give the correct answer for part b. There was more trial and improvement seen but this often led to no marks, either because the 5.5 was not spotted or the answer was given as 5.5 rather than t < 5.5. Only the correct answer got the marks with trial and improvement. Anything else scored zero marks.

7.2.13. Question 13

A straightforward circle theorem question in which most students got 170^o. A few got themselves confused and thought this was about cyclic quadrilaterals and others worked out the reflex angle instead as 170^o. Explanations were good but still in many cases focussing on the particular ('angle AOC') rather than the general ('angle at the centre').or using reference to the 'arrowhead'.

7.2.14. Question 14

Apart from some cases of trial and improvement where the x = 9 was found, this proved to be inaccessible for many candidates. As calculators were not available, most successful candidates tried to factorise the left hand side. Those that did try the quadratic formula generally could not handle the number work, even if they had substituted in correctly.

Common errors which scored marks were based on incorrect factorisations of the quadratic expression to, for example, $(x-9)(x-5)$ or $(x+9)(x-5)$. A very common and disappointing error was to write the factorised form as the answer on the answer line – so the candidates were presumably unaware of the requirement from the key word 'solve'

7.2.15. Question 15

The most common answer to part (a) was '18', although some candidates did get 6. A few determined candidates worked out 36 squared.

Part (b) was much more demanding, although candidates were rewarded for method such as recognising that negative powers imply reciprocal and/or fractional powers imply roots. Few candidates had any idea how to structure the answer to this question.

7.2.16. Question 16

This proved to be difficult for most candidates. Few had a clear idea of what a congruence proof entails and were content to appeal to symmetry. Better candidates were able to marshal some ideas although many made the assumption (they are not told it in the question) that the perpendicular to the base of an equilateral triangle bisects the base), This fact would of course be a consequence of the proof and as such cannot be part of the proof. Other candidates assumed that proving that the triangles were equiangular would do, or quoted SAS when A was not the included angle.

7.2.17. Question 17

This proved to be very tough except for the very best candidates. Many got to $\frac{1}{u}=\frac{1}{f}-\frac{1}{v}$ but then were not able to progress in any meaningful way.

7.2.18. Question 18

There were a refreshing number of correct or nearly correct answers to this question. Many candidates could expand the brackets more or less correctly and then go on to collect terms. Common errors were to evaluate $\sqrt{3}\times-\sqrt{3}$ as zero and to make sign errors on the expansion.

There were frequent examples of poor notation for example: where 7√3 was written as the 7th root of 3, $\sqrt[7]{3}$, or -2√3 was written as 2-√3 and there were many cases of 7√3 = √21.

7.2.19. Question 19

The sector is, of course, in this case one third of its circle so the fraction demand was reasonable for a higher tier paper, although some candidates assumed it was a quarter of a circle.. Many candidates used the area formula and thus scored no marks. Of those that used the correct formula many could not simplify completely the expression for the arc length. Those that did get the arc length, did, however often go on to add 12 to get an expression for the perimeter although a few spoiled things at the end by writing $12+4\pi=16\pi$.

8. PRINCIPAL EXAMINER REPORT – HIGHER PAPER 14

8.1. REPORT ON INDIVIDUAL QUESTIONS

8.1.1. Question 1

This was a standard currency exchange question and it was pleasing to see so many candidates carry put the correct operation s and get the correct answer. There were a few candidates who did the operations the wrong way round for the two parts but they were in a small minority. A few candidates did not read the second part carefully enough and divided by the currency rate from the first part.

8.1.2. Question 2(a)

This was a straightforward question for this tier and consequently very well done.

8.1.3. Question 2(b)

It was surprising and disappointing to see so many wrong responses from candidates for this transformations question. Not all candidates could use the vocabulary for the type of transformation correctly, so that 'flip' appeared far too often,. Of those that knew the transformation was a reflection the detailed description was often incorrect. This mainly involved an incorrect description of the y-axis as y = 0 or referring to the origin so that 'a reflection in *O*' or 'reflection by 90^o in *O*' were often seen so the transformation was being described as a rotation -which of course it could be when referring to 3D.

8.1.4. Question 4

A well answered question with the vast majority of candidates who were very comfortable using the unitary method. A few unorthodox approaches were also seen involving the idea of 19+12 or 38 – 7. A few candidates when for halving, presumably under the misapprehension that 19+8+4 gives 31 – which it does, but 8 is not half of 19. They got no marks.

8.1.5. Question 5

This formula involving negative numbers and decimals proved a challenge for many candidates. The main issue appeared with the interpretation of the expression obtained when -8 was substituted for C and then the expression written and interpreted as 1.8 - 8 + 32 = 25.8. It is probably no accident that those candidates who wrote $1.8 \times -8 + 32$ tended to show more success.

Part (b) also caused problems with the order of operations required to find the value of C. However many candidates did work out 68 – 32 rather than go for the division and so picked up the method mark and then the accuracy mark.

8.1.6. Question 6

Both parts of this question were very well answered. A few candidates wrote the ratio as 9:6 for their final answer in (a) or wrote the final answer as 2:3.

8.1.7. Question 7

A standard trial and improvement question which most of the candidature were able to show some method on. The setting out of the trials was generally good, making it a lot easier for markers to award marks and also for candidates to follow their own progress towards the root. As usual, many candidates got 3 out of the 4 marks for trials at 2.6, 2.7 and then putting down 2.6 as it gives a trial closer to 71. However, many candidates knew they had to evaluate a trial at 2.65 bad picked up all 4 marks. Some candidates did further trials and wrote down (often wrong) answers correct to 2 or more decimal places. They were not awarded the final mark as they had not demonstrated they fully understood the logic of the algorithm, which should be based on the bisection method or on decimal search.

8.1.8. Question 8

Most candidates knew what the term 'angle bisector' meant but in many cases could not carry out the required construction. There were some cases where a candidates found the perpendicular bisector of the bottom arm of the angle or where the ends of the arm where joined and the midpoint of that line found to get the candidate's angle bisector.

8.1.9. Question 9

Successful candidates saw that they had to find half the circumference and then add on the diameter to get the base. The others unusually fell into 3 categories and gained 2, 1 or 0 marks as appropriate. Firstly, there were those who found the arc length correctly, but did not add on the base (2marks). Secondly, there were those who found the circumference of the full circle, but then did nothing else (1 mark). Thirdly, were the candidates who either confused perimeter with area or confused the formula for the circumference of a circle with the formula for its area. (0 marks).

8.1.10. Question 10

The majority of the candidates were successful on this question, either by using a sophisticated calculator which allows direct entry of expressions of this sort, or by initially working out the numerator and denominator separately first. A few candidates had a calculator display in fraction form which they gave as their answer. This was allowable as the question did not specify which form, fraction or decimal, the answer had to be in.

8.1.11. Question 11

Parts (a) and (b) were very successfully answered.

Part (c) produced a wise variety of responses. As well as the correct $8x^3$ there were $8x$, $2x^3$, $6x^3$ as well as the incomplete $2x \times 2x \times 2x$. Full marks were awarded to $8 \times x^3$

Part (d) also yielded a wide variety of responses apart from the correct $12a^7h^5$. A common error was to regard the power in *h* as zero and offer the answer $12a^7h^4$. Even more common was to add the coefficients to get $7a^7h^5$.

8.1.12. Question 12

A standard Pythagoras question involving squaring and subtracting, which many candidates could comfortably carry out. A few candidates squared and added.

8.1.13. Question 13

There were 2 successful approaches evident in this question. One was the year by year method where the candidate finds 4% of the principal and adds it on to £4500 for the value of the investment (£4680) at the end of the first year. For the second year, 4% of this value is added on to £4680 to get the value of the investment at the end of the second year. This was the approach of many candidates. Also seen was the more direct use of the multiplier 1.04^2 to get the answer in one line. Candidates who doubled the first year's interest and added it on to get £4860 got 1 mark. Many candidates wrote the final answer as £4867.2 instead of the correct £4867.20.

8.1.14. Question 14

This was a standard right-a angled trigonometry question involving cos. Not all candidates could access the question with a lot of confusion over rules and misuse of the correct function - for example, $\cos 5 \div 8$, which would have given an error on the calculator, or cos 0.625, which gives a plausible answer albeit close to 90°.

8.1.15. Question 15

Most candidates did not have a clear idea of completing this unstructured question. The most successful approach came from candidates who started with $P = \frac{k}{d^2}$ and then went on to find the value of *k*. They usually completed the question to get the correct answer of 2500. A few candidates tried to deal with the squares directly without finding an algebraic formula. Many of these were just confused and completed the question by multiplying by 4 rather than dividing by 4 presumably from considering the problem as one of direct proportion.

8.1.16. Question 16

Part (a) was a standard quadratic equation. Many candidates tried factorisation despite the hint that the answers should be correct to 2 decimal places. Others did not use the formula with sufficient care or precision so often the ‘b’ term was detached from its denominator. Candidates who used completing the square were often successful.

Part (b) was intended to tease out whether candidates understood that multiplying through any equation by a constant leaves the solutions unchanged. Many candidates took the opportunity offered by the working space to use whatever method they had used (often unsuccessfully) in part (a). Few saw the connection despite the instruction in the question that is was a ‘write down’.

8.1.17. Question 17

Some candidates where able to write down a correct expression for the vector *AB* in terms of **a** and **b**. Part (b) proved to be a challenge, even for those who scored in part (a). The key ideas were to understand that *OP* = *OA* + *AP* by the triangle law and that $AP = \frac{3}{5}AB$.

Those that did usually were able to expand the brackets correctly and achieve the correct given answer.

8.1.18. Question 18

In part (a), many candidates understood that the required answer involved a translation along the *y*-axis. However, many of them fixed on the −4 as a position indicator rather than a translation indicator and drew the vertex of their parabola at
(0, −4). In part (b), most candidates did not know the significance of the $\frac{1}{2}x$ and in many cases tried a translation parallel to the *y*-axis, usually by half a unit.

9. STATISTICS

9.1. MARK RANGES AND AWARD OF GRADE

Unit/Component	Maximum Mark (Raw)	Mean Mark	Standard Deviation	% Contribution to Award
5381F/05	30	17.9	6.0	20
5381H/06	30	19.2	6.8	20
5382F/07	25	14.5	3.9	15
5382H/08	25	12.1	4.6	15
5383F/09	25	10.5	5.9	15
5383H/10	25	13.1	6.0	15
5384F/11F	60	36.0	11.4	25
5384F/12F	60	32.8	11.5	25
5384H/13H	60	31.9	11.7	25
5384H/14H	60	35.1	10.8	25

9.2. GRADE BOUNDARIES

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

Unit 1 – 5381

	A*	A	B	C	D	E	F	G
UMS (max: 55)				48	40	32	24	16
Paper 5381F				23	18	14	10	6
UMS (max: 80)	72	64	56	48	40	36		
Paper 5381H	28	24	17	11	7	5		

Unit 2 Stage 1 – 5382

	A*	A	B	C	D	E	F	G
UMS (max: 41)				36	30	24	18	12
Paper 5382F				19	16	13	10	7
UMS (max: 60)	54	48	42	36	30	27		
Paper 5382H	20	16	12	8	7	6		

Unit 2 Stage 2 – 5383

	A*	A	B	C	D	E	F	G
UMS (max: 41)				36	30	24	18	12
Paper 5383F				17	13	9	5	1
UMS (max: 60)	54	48	42	36	30	27		
Paper 5383H	23	19	13	8	5	3		

Unit 3- 5384

	A*	A	B	C	D	E	F	G
5384F_11F				48	38	29	20	11
5384F_12F				45	35	26	17	8
5384H_13H	54	43	32	21	11	6		
5384H_14H	55	45	35	26	15	9		

	A*	A	B	C	D	E	F	G
UMS (max: 139)				120	100	80	60	40
5384F				93	74	55	37	19
UMS (max: 200)	180	160	140	120	100	90		
5384H	109	88	67	47	26	15		

9.3. UMS BOUNDARIES

Maximum Uniform mark	A*	A	B	C	D	E	F	G
400	360	320	280	240	200	160	120	80

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