Rewarding Learning

CCEA GCSE Mathematics
(Summer Series) 2014

Chief Examiner's Report

mathematics

Foreword

This booklet outlines the performance of candidates in all aspects of CCEA's General Certificate of Secondary Education (GCSE) in Mathematics for this series.

CCEA hopes that the Chief Examiner's and/or Principal Moderator's report(s) will be viewed as a helpful and constructive medium to further support teachers and the learning process.

This booklet forms part of the suite of support materials for the specification. Further materials are available from the specification's microsite on our website at www.ccea.org.uk

Contents

Assessment Unit 1: Foundation Tier	**3**
Assessment Unit 2: Foundation Tier	**5**
Assessment Unit 3: Higher Tier	**8**
Assessment Unit 4: Higher Tier	**12**
Assessment Unit 5: Completion Test (Foundation Tier)	**16**
Assessment Unit 6: Completion Test (Higher Tier)	**20**
Contact details	**25**

GCSE MATHEMATICS

Chief Examiner's Report

Assessment Unit 1 Foundation Tier

Most candidates were able to make an attempt at answering most of the questions. Naturally the quality of responses varied according to the ability and understanding of the candidates and the knowledge of the content which had been acquired. There did not appear to be a time pressure on the candidates and the paper served well to allow them to be differentiated across the ability spectrum. The language used appeared accessible to them. It appeared that the specification had been generally well covered in preparation for the examination.

Numeracy skills were tested in Questions 2, 3, 4, 10, 11, 12, 13, 19, 20, 21, 22, 23 and 24. As indicated in detail below, the candidates for whom this paper was particularly targeted performed well in many of the numeracy tasks at their level, showing more aptitude in those also involving functional skills (Questions 4, 10, 12), except where percentage was involved or in problem solving situations (Questions 2, 22, 23), where only stronger candidates were successful. Other questions relating to functional skills, 6, 7 and 27(b) were similarly generally relatively well attempted.

Comments on individual questions follow.

Q1 The introductory grid locations question was very successfully answered by most candidates.

Q2 Most candidates could find the total of the medals won by China, but fewer were able to complete the problem of moving back from totals to find the component parts.

Q3 Many candidates were able to find the numbers described as roots, cubes, multiples or primes, but many others failed to recognise the meaning of any of the descriptions.

Q4 This question about numbers of passengers in buses was generally very well answered, except for the final part which only the better candidates answered correctly.

Q5 Most candidates were able to find the next number in the given sequence, the next pattern in the drawn sequence and count the boxes in each pattern. Fewer recognised that the numbers were triangular numbers.

Q6 The pictogram question was very well answered, with only a minority unable to complete the last part, the completion of the pictogram.

Q7 Very acceptable attempts were made by almost all candidates at drawing the bar chart and identifying the modal value. The majority were also able to calculate the total frequency.

Q8 About half the candidates recognised which triangle was isosceles; fewer could identify another as being right-angled or select the two congruent triangles.

Q9 Calculation of the perimeter of the drawn shape was beyond many. Of those who could calculate this, not all could draw a square of the same perimeter. Often the given shape was drawn again.

Q10 Most candidates knew to divide to find how many packs of six were needed to provide 135 cans, but many did not give an integer answer in context.

Q11 Only stronger candidates could put the three fractions in order of size or write 0.157 as a fraction.

Q12 This question about the cost of buying several items and the change expected was generally well answered.

Q13 Disappointing was the overall response to expressing a fraction (in context) in its simplest terms. Similarly, few were able to find another fraction from the information and then convert it to a percentage.

Q14 This mode, range and median question was generally well attempted with most of the candidates gaining some of the marks available.

Q15 Interpretation of the drawn pie chart was not very well answered. Some confusion was with which units to use for the time spent on different activities, whether minutes, hours or degrees.

Q16 Overall the standard of response on this angle question was very encouraging.

Q17 The more able candidates calculated the area of the drawn triangle. It was disappointing that others were unable to do so, given the grid background for the triangle. More were able to accurately measure the named angle.

Q18 A minority correctly calculated the volume of the cuboid drawn. Most were able to draw part of its net, but many omitted one face or misread one of the dimensions.

Q19 Most completed the calculations to find the missing number in the first part, but fewer were able to work backwards, given the answer in the second part.

Q20 Better candidates named 1.4 as the next number in the sequence 0, 0.2, 0.5, 0.9, while others named 0.14, while the explanation of how to find the next number was very challenging for most.

Q21 The calculations were too difficult for many to complete, even with calculator.

Q22 Similarly few candidates calculated 74% correctly.

Q23 This problem involving the cost of shrubs and an ornament allowed the best candidates to demonstrate their understanding and show good forms of written communication.

Q24 Few could explain the given calculation.

Q25 Range and median from a stem and leaf diagram proved challenging to all but the strongest candidates.

Q26 Most candidates scored one of the two marks available from the decision tree diagram, perhaps assuming each box should contain one answer.

Q27 The third angle in the triangle was reasonably well answered; the length on a scale drawing was well answered but the area in square centimetres from measurements in millimetres was poorly completed (although method shown to gain one mark). Another angle problem was quite satisfactorily attempted.

Q28 Algebraic manipulation was generally poorly done.

Assessment Unit 2 Foundation Tier

In general this paper was very fair and successful in allowing candidates of differing abilities to respond positively to the questions asked. There were some challenging questions which differentiated between candidates and allowed the strong candidates to excel. The majority of candidates attempted all questions. Those questions where candidates had to write explanations such as Question 16(c) and Question 17 proved difficult for some weaker candidates as did the harder algebra Questions 18, 19 and 20. A wide range of topics was tested and there were plenty of opportunities for candidates to obtain marks.

Numeracy skills were successfully tested in Questions 1, 2, 3, 12, 13, 14, 21 and 23.

Report on individual questions.

Q1 **(a)** The vast majority of candidates got the right answer to this question although a frequently seen wrong answer was 2.48 where the candidate had extended the square root over the whole sum.

(b) This was usually correct, although some candidates lost the mark by giving a rounded or truncated answer such as 15.6

Q2 This was usually answered correctly although there are still a sizeable number of candidates who cannot work out a percentage of a number. Some candidates divided 304000 by 10, because the question mentioned that there were 10 airports, before proceeding with their percentage calculation. Other candidates worked out the percentage of flights not on time i.e. 26%

Q3 This was a fairly straightforward question testing QWC and most candidates scored full marks. Some candidates used a trial and error method which was fine as long as they showed their working.

Q4 In this question the most common mistake made by candidates was ignoring the key and as a result they had no decimal point in their answers. In Part (b) some candidates found the mean rather than the median.

Q5 **(a)** Not too many candidates scored full marks here as they thought that there had to be one sport per box so that when they had three boxes filled they erroneously placed 'tennis' in box 3 as it was still empty.

(b) Most candidates have become very successful in drawing the pie chart with the result that many are getting full marks. Those who lost marks usually did so because of a lack of accuracy when drawing the sectors.

Q6 **(a)** There were many correct answers here. A few candidates mistakenly used the sum of the angles in a triangle as 360°

(b) Very few candidates got this question correct. Those who did get it correct usually converted the dimensions to centimetres before calculating the area. Those who calculated the area first usually made the mistake of dividing by 10 rather than 100 in their attempt at converting from mm^2 to cm^2.

(c) There were many successful attempts at this question. Errors sometimes came from attempting to add together the three given angles.

(d) This question was not as well answered as the previous part. Apart from those candidates who used the sum of the angles in a triangle as 360°, there were those who, having subtracted 124 from 180 correctly, then failed to divide the answer by 2 and gave $x = 56$, $y = 124$ as their answers.

Q7 There were a lot of correct answers to both parts, especially Part (a) but it was not uncommon to see $y = 3$ as an incorrect answer in Part (a). In Part (b) it is good to report that $2d = 1$ was not seen that often. Some candidates got to $2d = 9$ but could not finish it.

Q8 This question highlighted the difficulties some candidates have when working with negative numbers.

(a) The addition of negative numbers was a problem for many candidates. Many got the '$9b$' term but were unable to simplify correctly to get the '$-3k$' term.

(b) A number of candidates gave their answer as -6 + 15 failing to write this as 9 Some candidates gave answers which included x and y e.g. $-6x + 15y$.

Q9 The structure of this question helped many candidates. However, some candidates plotted the points correctly but then failed to join them with a straight line. A small number of candidates were unable to complete the table correctly.

Q10 **(a)** There were many incorrect answers to this part, with 70 or 110 often given as wrong answers, due a lack of understanding of bearings.

(b) This part was usually answered correctly.

(c) This part illustrated the difficulty many candidates have understanding bearings or with drawing angles greater than 180° Many candidates had a point H marked but neither bearing line was drawn.

Q11 This question caused problems for many candidates. Many incorrectly multiplied 5 by $\frac{2}{3}$, getting an answer of 3.33 or 3 Some candidates tried repeated addition but were let down by poor fraction manipulation skills.

Q12 This was another question where candidates were let down by being unable to work out percentages correctly. Some candidates tried to work completely in percentages but could often get no further than 84%.

Q13 There were many correct answers given to this question. Some candidates, in working out the cost of Option 2, failed to include either the deposit or the final payment. This resulted in their answer being Option 2 is cheaper, not realising that Option 1 should always be cheaper.

Q14 Many candidates did not understand the concept of percentage loss. They often divided 2350 by 640 Some candidates misinterpreted the question and got an answer of 73%. A lot of candidates did not attempt the question.

Q15 Most candidates scored well in Part (a), (b) and (d). In Part (c) it would help candidates to get a more accurate reading if they were encouraged to draw a vertical line at 7.7 to the line of best fit and then a horizontal line across to the vertical axis.

Q16 **(a)** Most candidates got full marks here but some lost marks by having spaces between their bars. Candidates who drew other types of frequency diagrams got no marks.

(b) The modal class was usually correctly identified although some gave the frequency as their answer.

(c) It was rare to see a completely correct answer to this part, with the task of describing proving difficult for many candidates.

Q17 Many candidates made a good attempt at this question and gained at least 1 mark. Many gained full marks by stating that no boys were asked and that the sample size was too small. Some candidates made assumptions in answers that did not answer the question e.g. parents don't play computer games as they are too busy.

Q18 Many candidates did not understand the meaning of 'write an equation in terms of w' and as a result lost all 4 marks in the question despite working out the correct value for w in Part (b). Candidates whose equation contained a £ sign were penalised 1 mark. The vast majority of candidates probably scored zero in this question.

Q19 **(a)** This part was often poorly answered. Some candidates ignored the 'p' on the RHS and got $3p = 12$ leading to $p = 4$

(b) A lot of candidates got full marks here or at least 1 mark for having $5n$ while many candidates just worked out the next term and gave 23 as their answer.

(c) This part was very poorly answered. Some candidates could not multiply out the brackets correctly while others who did expand the brackets correctly were then unable to simplify their answer.

Q20 There were a lot of blank spaces for this question or answers without any working out. Many attempts at trial and improvement were seen despite the instructions in bold that this would not be accepted. Many candidates failed to write down expressions for the perimeter of each shape. Some candidates just equated the lengths of the shapes that were seen on the diagrams, which by coincidence produced the correct value of L.

Q21 Many correct answers were seen to this question. Some candidates lost marks for writing their answer as a sum rather than a product or for using commas to separate the prime factors or for including 1 as a prime factor.

Q22 This was very poorly answered. Many candidates did not understand what the question meant and had no idea what to do. Those who grasped that the question was about fractions often added $\frac{4}{5}$ and $\frac{1}{2}$ rather than subtracting them with the result that $\frac{13}{10}$ was a common wrong answer.

Q23 The correct answer was very rarely seen. 450 and 850 were the most common wrong answers seen, with candidates working out the interest over a year as £50 and adding it on to 400 or else taking this £50 as a monthly interest and multiplying it by 9 to get 450 before adding it to 400 Very few candidates knew that the 50 had to be multiplied by $\frac{3}{4}$ to deal with the 9 months.

Q24 There were some correct answers seen to this question but most candidates found the topic too difficult and many could not get started.

Q25 Quite often many candidates, who recognised Pythagoras' theorem, applied it incorrectly by adding rather than subtracting with the result that 16.1697 was often seen as a wrong answer. Poor presentation skills were evident in the working of many candidates and quite a few did not even square the numbers.

Q26 Many candidates got 1 mark for working out that the circumference was 220m but most of them got no further. Some candidates worked out the radius but gave this as their answer. QWC was not well handled in this question. Candidates need to understand that, where QWC is being tested, writing $\frac{220}{\pi}$ is not sufficient to gain the mark. They need to state that $d = \frac{220}{\pi}$ or that $\pi d = 220$. There were a number of candidates who got the correct answer for d but very few scored full marks as they failed to get the 2 marks for QWC.

Q27 A lot of candidates scored well on this question with many obtaining full marks. For some reason there were a number of candidates who did the work correctly in the table but who gave their final answers as $a = 10.5$ and $b = 9.5$

Assessment Unit 3 Higher Tier

This T3 paper, whilst addressing many similar topics to previous past papers, also had some novel ways of assessing the material. This often required greater thought on the candidate's part but there was a good response to many of these questions. Question 23 due to its unfamiliarity and Question 27(c) due to its different algebraic arrangement proved the most challenging questions, but a significant number of candidates did secure full marks on these. Such questions could often be approached by a variety of correct methods and this allowed candidates to secure many part marks even when full marks were not secured. The paper was accessible to the range of abilities who would have been entered for this module. There were sufficient straightforward questions where confidence was gained, before progressing to more challenging questions in a variety of contexts. On the whole, this T3 paper differentiated clearly between the different grades candidates would expect to achieve on this paper. There was great improvement in the amount of method/working being shown and this enabled marks to be allocated even when a complete solution was not reached. Pupils are recognising the requirements for QWC, presenting their work in such a way to achieve maximum credit. Any reduction in marks in the QWC questions of Question 19 and Question 24 was due to lack of complete understanding of the questions set, rather than in the presentation of their solutions. In Question 19, the QWC aspect proved excellent in deciphering which candidates were applying the correct mathematics as opposed to those who were manipulating a series of figures. It was crucial for candidates to apply correct formulae, using clear notation for either diameter or radius. Hence this question was a most successful QWC question at this level. Despite fractions, decimals and percentages being standard topics at T3 level, there was evidence that many candidates struggled with the application of these in a variety of problem-solving questions. This was apparent in Question 1, Question 2, Question 4, Question 15, Question 16 and Question 22. There was a positive response to most algebra questions with the level of difficulty increasing as the paper progressed. Unfortunately, there are still too many candidates who ignore the requirement for an equation to be set up as required in Question 8 and Question 14. In general, all data questions were well answered with only the box plot from a list of data rather than a cumulative frequency curve causing some problems; on occasions candidates simply left this question out. There was a positive response to most Geometry and Measure questions. The majority of candidates attempted all questions and there appeared to be adequate time for completion of the paper.

Numeracy skills were tested directly and indirectly (in algebraic contexts) in Questions 9, 10, 20 and 27 and in context in Questions 1, 2, 4, 15, 17, 22, 23 and 24. Questions with a functional element were generally attempted well, with Question 3 and Question 24 being answered very well. Question 19 differentiated well between candidates of varying ability whilst Question 16 was less successfully answered, although part marks were awarded depending on the correct level of response. Literacy and communication were a feature of Questions 5(d), 6(c), 7, 11, and 24 and on the whole candidates responded positively to these questions using appropriate mathematical terminology.

Q1 The opening question, assessing fractions in context was correctly answered by only about half the candidates. For those who knew the correct approach of dividing 5 by $\frac{2}{3}$, most secured full marks by knowing then to round their final answer down. The

vast majority of incorrect attempts involved candidates multiplying 5 by $\frac{2}{3}$ Occasionally, a candidate who knew the method involved division, used a rounded decimal value of 0.6 or 0.66 for $\frac{3}{3}$ and then incorrectly, finished with 8 tanks; however whilst the accuracy mark was lost, the method mark was gained.

Q2 The multistep question involving both fractional and percentage calculations was well interpreted by most. Nearly all knew the three steps needed to answer the question, but a significant number were unable to calculate 24% of 150 for those who walked. Occasionally some misinterpreted the given information and after finding the 90 who came by bus, then tried to find 24% of this figure. Even the non-integer result didn't alert them to their error and so no further marks could be awarded.

Q3 There was a very good response to the financial question on purchasing a car with the vast majority able to secure all 3 marks.

Q4 Finding the percentage change was not as well answered as usual. Many candidates left this question unanswered; many divided 2350 by 640, whilst others subtracted before finding the percentage change. In a small number of cases where the correct method was offered, candidates forgot to give the percentage fall to the nearest whole number as requested.

Q5 There was a good response to the scatter graph with many securing all the available marks. Lines of best fit were generally good but many felt there was a requirement to draw the line through the 'origin'. In Part (d) positive correlation was identified by nearly all.

Q6 Nearly all candidates were able to attempt a reasonable bar chart in Part (a). However, some had gaps between the bars, despite the continuous nature of the data and occasionally the horizontal scale was wrongly labelled. Nearly all were able to identify the modal class in Part (b). In Part (c) only the best were able to articulate their thinking clearly, in describing how to construct a frequency polygon. Most candidates gave vague responses but were perhaps able to secure one of the 2 marks. The requirement was to plot the midpoints of each interval (or the midpoint of the tops of the bars) and then to join the points by straight lines.

Q7 There was a much improved response to the questionnaire with many candidates being able to give two valid reasons why the sample was unsuitable. There are 2 points for improvement here though. Firstly, it was not the actual hypothesis that was to be commented on, rather the sample and secondly it is not enough to simply list the given information again, for example she asked girls, or she asked parents, without commenting on why this was unsuitable for the given survey. A general comment such as the results will be biased, without an explanation as to why, also does not secure a mark. Whilst there was definitely an improvement in the response to this style of question, there was also evidence to suggest some candidates are simply 'learning off' answers to similar questions from previous exam papers. For example, responses such as "the question is a leading question" or "there are no response boxes," which were solutions to questions from previous papers were offered here, despite the fact they did not relate at all to the question set on this paper.

Q8 Yet again the requirement for the formation of an equation in Part (a) was overlooked by a large proportion of the candidates and hence no marks were secured in Part (b) either. This has been emphasised on numerous occasions, yet candidates still seem to think a purely numerical solution will be awarded marks. For those who did form the correct equation in Part (a), (b) posed no further problems and full marks were secured.

Q9 This question assessed a range of algebraic techniques. Expanding the brackets to form a quadratic was reasonably well answered, but there was still confusion in signs for some. The response to the algebraic fractions was much improved with fewer giving a purely numerical response. On occasions some candidates who had correctly converted to equivalent fractions of $\frac{8a}{20}$ and $\frac{5a}{20}$ then responded with simply $3a$, incorrectly subtracting the denominators as well as the numerators. Solution of the linear equation was accessible to most and an occasional error in sign still allowed part marks to be awarded.

Q10 The three factorisation questions were often well answered together or not at all. A surprising number of candidates gave inaccurate responses in Part (a) such as $4(2 – 2x)$ or $2(4 – 2x)$ rather than $4(2 – x)$. In Part (c) a small number struggled to handle the 1 required to complete the second bracket once the common factor of x was taken out. The varying level of difficulty in the questions set here to assess factorisation proved to be good differentiators between those who could execute simple factorisation to those who could handle varying types of numerical and algebraic factors.

Q11 The vast majority of candidates were able to give the correct angle, with many providing the correct reason. Occasionally corresponding was recorded instead of alternate.

Q12 There was an improved response to the bearings question requiring the location of a point. Candidates need to be reminded to draw the bearings clearly from the given point and not simply give the point of intersection to enable full and in less accurate cases, partial marks to be awarded.

Q13 Calculating the area of the circle was answered well, with fewer incorrect formulae being applied. Unfortunately, a significant number of candidates failed to provide the required units on the answer line, thus incurring a penalty.

Q14 This question proved a very good discriminator question. Many candidates were able to set up two correct expressions for the perimeter but struggled with the necessity to equate them and solve the resulting equation. In some cases, weaker candidates equated their triangle expression to 180 and their rectangle expression to 360, confusing lengths of sides with size of angles. The better candidates who formed the correct equation at the outset had no problems solving it to secure all the marks.

Q15 This fractional question also proved a good discriminator. Many candidates struggled to interpret the given information and failed to recognise the need to subtract the fractions. For those who did, again generally all marks were accessed. Too often, incorrect fractional manipulation such as addition or multiplication was offered. In the case of addition, there seemed to be no understanding that a fractional answer of $\frac{13}{10}$ or $1\frac{3}{10}$ was simply meaningless if related back to the question.

Q16 There were very few correct responses to the simple interest question. Dealing with the 9 months proved problematic for nearly all candidates. Any attempt to deal with the 9 appeared to be using it as 9 years. However, in the majority of cases one mark was awarded for the calculation of the interest for a full year.

Q17 There was a mixed response to the polygon question. As is nearly always the case with this topic, candidates are either totally familiar with all the concepts or are not able to apply the correct steps at all and just muddle through a series of calculations. The question required candidates to show their work here, so that only correct knowledge was awarded marks. A variety of correct approaches were used and many did secure the 3 marks.

Q18 The bulk of candidates recognised the requirement for Pythagoras Theorem in Question 18 and many correct answers were seen. The usual misapplication arose with those who simply squared and added both terms, not realising that the given hypotenuse was the longest side and so this particular question required the squares to be subtracted.

Q19 This was the first QWC question on the paper and again was a good discriminator between those who were clear in their approach and those who simply manipulated a series of calculations without clear logic to answering the requirements of the question. Whilst nearly, all candidates were able to access the first mark for the curved lengths to equal 220 (or 110 if halved) there was then confusion as to what these values actually equated to in terms of the circumference or half circumference. Hence it was vital for candidates to present their thinking clearly with correct variables used. Many strong candidates were able to complete the question for the available 4 marks.

Q20 There was a very good response to the flow chart question. Occasionally candidates felt that they needed to work to a greater accuracy than the listed integers and concluded that 10.5 and 9.5 were the required solutions, but the flow chart instructions would not have directed them to these values.

Q21 Most candidates were able to identify the correct class interval which contained the median price. A limited number felt the median was the middle group of the table and recorded $80 < P \leq 120$, whilst strangely others attempted to calculate the mean from a grouped table, with no acknowledgement of the lack of working space or the limited marks available for the question.

Q22 Yet again, there was a poor response to the reverse percentage question, even by the most able candidates, despite it being a standard type of question at this level. Even though the first correct line was often written as $1148 = 82\%$, the majority of responses involved increasing 1148 by 18%, and even the non-integer solution didn't seem to alert candidates to their incorrect approach.

Q23 This question proved problematic for many candidates, although a significant number of correct solutions were given. Generally, where candidates resorted to basics, simply listing the multiples and adapting to suit the requirements of the question, many reached the correct conclusion. Some who had the right idea misinterpreted the 1 short and 1 extra book and applied the reverse thinking, concluding with 49 books, but their work did merit marks. Too many tried to subtract the multiples from 100, whilst others tried to set up algebraic working which was unsuccessful due to the 3 restraints. This question definitely proved a good discriminator, requiring astute mathematical thinking, rather than a repetitive technique encountered on previous exam papers.

Q24 The majority of candidates were able to respond to the question on decreasing debt, articulating their thinking clearly for the QWC aspect of the question. A variety of correct approaches were offered. Unfortunately, some candidates thought the first decrease only came at the end of February and so fell a month short of the correct value. In a minority of cases the incorrect approach of trebling 18%, applying a simple interest approach was given.

Q25 Reading the median and calculating the interquartile range from the cumulative frequency curve was well answered by most. Occasionally, there was a misinterpretation of the horizontal scale. There did however appear to be a significant number of candidates who simply recorded the lower quartile of 22 as opposed to the interquartile range in Part (b).

Q26 Drawing of the box plot from a list of data seemed to cause difficulty for many. Whilst identifying the minimum and the maximum was generally fine, identification of the median and the quartiles was more challenging. Again, as in Question 25 some miscalculating was used when locating values on the grid.

Q27 There was an encouraging response to the trigonometry question, although some did not read the question carefully, where the answer was requested to 1 decimal place. Some weaker candidates, whilst they recognised the requirement for trigonometry to find an angle, worked from the trapezium sides, rather than identifying a suitable right-angled triangle. A small minority joined H to F and assumed a right angle at H, which was an incorrect approach.

Q28 There was an encouraging response to the trigonometry question, although some did not read the question carefully, where the answer was requested to 1 decimal place. Some weaker candidates, whilst they recognised the requirement for trigonometry to find an angle, worked from the trapezium sides, rather than identifying a suitable right-angled triangle. A small minority joined H to F and assumed a right angle at H, which was an incorrect approach.

Q29 There was a very mixed response to the bounds question, with much greater success in Part (a) than in Part (b). Despite the values being given to the nearest centimetre, many could not identify the correct upper and lower bounds. In Part (a) correctly identified bounds, generally led to a correct response, apart from a few who then proceeded to rounding their answer, negating the fact that it had to be the absolute least value for pq. Even those who were correct in Part (a), struggled with the demands of Part (b) where to find the greatest value of $\frac{q}{p}$, required the maximum q divided by the minimum p. Too often, both the maximum values for p and q were used.

Assessment Unit 4 Higher Tier

Generally this paper allowed candidates the opportunity to perform to the best of their ability. Some questions were answered successfully by the majority of the candidates but there were many questions that only those with a better mathematical understanding could answer positively. Numeracy skills were tested directly and indirectly (in algebraic contexts) in Question 1, 5 and 7 and in context in Question 2, 4, 6, 8, 9, 10, 13, 14, 16, 18, 21 and 23. Candidates of all abilities coped well with the demands of numeracy within the early numerical/algebraic questions whilst those also involving functional skills were really only well answered by the more able candidates. Other questions relating to functional skills, included Question 6 and 18 were dealt with well by most students. Literacy and communication were a feature of Question 7, 12, 14 and 20. In Question 7, many candidates struggled to process the amount of information presented and were unable to provide the simple solution. Question 12(b) required more explanation than was produced by the majority of candidates. Only the best candidates were able to provide all the geometric reasons for their answers. Where the knowledge was sound, candidates coped well with the literacy and communication skills necessary to articulate their answers. This was a successful paper in differentiating between the candidates with a full range of marks produced.

Q1 This opening question proved to be more difficult than expected. Many candidates were able to draw the correct box plot but there were many errors seen. Despite the question informing the candidates that there were only 19 pupils, a surprising number of candidates assumed there were 31 pupils and consequently lost marks in finding the median and quartiles. There were also many papers seen where the candidates used an incorrect scale.

Q2 **(a)** This question involving cumulative frequency was very well answered. Most candidates were able to correctly identify the median and interquartile range and the required % in Part (b). Again only misreading scales and forgetting to find the number of adults above 25 minutes caused any real difficulty.

(b) Most candidates managed to find the correct value for the angle HEF. A common error was to forget to give the final answer correct to 1 decimal place. It was also disappointing to see a number of candidates not realising that all they required was a perpendicular from H to the base EF to give the required right angled triangle. They attempted to use trigonometry on the trapezium.

Q3 **(a)** Most candidates managed to find the correct value for the angle HEF. A common error was to forget to give the final answer correct to 1 decimal place. It was also disappointing to see a number of candidates not realising that all they required was a perpendicular from H to the base EF to give the required right angled triangle. They attempted to use trigonometry on the trapezium.

Q4 **(a)** The more careful candidates had no trouble in solving the given simultaneous equations in an efficient manner. Many errors were observed regarding the signs involved. Generally those who added equations were more successful than those who subtracted!

(b) This factorising question was correctly answered by virtually all the candidates.

(c) This fraction equation proved to be one of the more difficult questions on the paper. Considerable difficulty was experienced by many candidates in dealing with the +2 on the right hand side of the equation. Multiplying by a common denominator was a correct start but the +2 was not included.

Q5 **(a)** This part of the question caused very few problems for most candidates.

(b) Unfortunately the requirement to use the largest possible value of p divided by the smallest possible value of q was only seen in the papers of the very good candidates.

Q6 This question on iterative reduction by 18% was very well answered by most candidates. Errors occurred in only calculating two months and not clearly defining that the answer was still greater than £6250 at the end of the period.

Q7 This was the first question that clearly differentiated between the candidates with many achieving no marks. The fact that the number of books required was one short of a multiple of 6 and 8 only required the candidate to consider their common multiples and subtract 1. Of the four choices 23, 47, 71 and 95 only 71 left a remainder of 1 after dividing by 5 A number of candidates misread the question and gave 49 for some marks. Others attempted to form and solve equations with three variables.

Q8 The better candidates answered this question well with careful calculation of the correct gradient. Many incorrect and unfeasible methods were seen for finding gradient with +2 the most common incorrect answer due to forgetting that the line decreased from the left.

Q9 **(a)** Factorising a quadratic expression was very well done by the majority of the candidates.

(b) The expansion of the product of the two expressions provided most candidates with 2 easy marks.

(c) Almost everyone recorded that three was a common factor of the given expression but once again only the top candidates recognised that the remaining factor was a 'difference of 2 squares'!

Q10 With this question on inverse proportion giving the candidate the relationship between the two variables on the first line there were a large majority of correct answers recorded. Simple errors occurred in finding the necessary constant.

Q11 This was the next question which clearly identified the top candidates. A simple well labelled diagram helped them to see clearly that the required answer was just the area of the larger square of side $(p + 2q)$ and the garden square of side p. Some made simple errors in expanding the two squares. Many candidates were unable to score any marks in this question.

Q12 **(a)** It was pleasing to see that many candidates were able to score full marks in this part of the question. Most reasons were clearly explained.

(b) This part proved to be more stretching as full marks could only be achieved by effectively counteracting both reasons outlined in Part (a). Many scored 1 mark but only the better candidates gave the method and the procedure for that method to be as unbiased as possible.

Q13 Many candidates were clearly well prepared for this question on combining two means and scored full marks. Many seemed not to have seen this type of question before.

Q14 The correct answer 'median' was seen on the vast majority of papers together with an explanation of how it gave the required taller players. A disappointing number gave answers such as mode, mean or range and even stranger answers such as length, cm, using a tape measure etc.

Q15 **(a)** **(i)** Very few candidates had any difficulty with this part.

(ii) This part required more careful working to explain how the final answer was produced. Many struggled to explain the meanings of both terms.

(b) Using a calculator here allowed virtually everyone to gain full marks. Better students used the necessary powers of two while weaker ones were able to find the answer using Trial and Improvement.

Q16 The better students realised immediately the need for the Cosine Rule to find the required length. The principal error occurred in using the Cosine Rule in the form $a^2 = (b^2 + c^2 - 2bc)$ Cos A.

Q17 **(a)** Most candidates were able to find the length of the space diagonal BH. Many only calculated a side diagonal for no marks.

(b) With the required angles marked clearly on the diagram most who attempted this question were able to find their values. The angle y proved more difficult to find as it lay in the triangle BAH which was not seen in their working.

Q18 **(a)** The production of the correct histogram was seen in the majority of scripts with marks generally being lost due to simple errors in the use of the candidates' scales.

(b) **(i)** Most candidates correctly identified the required 'sampling fraction' and had no difficulty in finding the number of men in the given range.

(ii) Only a very small number of candidates were able to appreciate that this part of the question required the necessity to work from the sample back to the population. Very few correct methods were seen.

Q19 This question gave the better students an excellent opportunity to use their problem solving skills to select a method to find the required length. Working from the larger triangle and using the Sine Rule to find either RT or ST was the most common successful approach. Simple trigonometry in the small triangle then found the total height and subtracting 80m gave the correct answer 30.5m. Many simple errors were seen in incorrect angles at T and poor use of calculator.

Q20 This question involved a 'geometric proof'. Many were able to identify all the necessary angles required from the diagram. There were only a very small number however who could produce a 'proof' with the correct geometrical statements required.

Q21 **(a)** Rewriting the given expression in the required form proved accessible to many candidates. Many managed one mark with some attempt to convert the given fraction.

(b) With only 2 marks available here, many candidates at all levels managed to gain the first mark by producing 0.63 Only the better candidates were then able to demonstrate how it became $\frac{27}{125}$ In general those who worked with the fraction $\frac{3}{5}$ had more success.

Q22 This question on linear and quadratic equations was very successfully handled by an even larger number of candidates than in previous years showing that more work had been put into this type of problem. Incorrect substitution and careless algebra however was commonly seen. Many quadratic equations were formed but it was disappointing to see candidates in solving them, producing negative discriminants without realising that earlier errors had occurred.

Q23 Despite the fact that a question very similar in nature to this one had occurred in a previous paper only the very best were able to select the correct three consecutive odd integers and then produce the required initial equation. Those who managed this had relatively little difficulty in producing the correct answers.

Assessment Unit 5 Completion Test (Foundation Tier)

There appears to have been a good mix of standard and challenging questions in this 'completion' test and it certainly allowed candidates of all abilities to achieve their potential. Both the non-calculator and calculator papers covered a range of topics from the specification and as always, those who had prepared thoroughly in advance had no difficulty in tackling all the questions asked. Once more it was encouraging to see that the majority of candidates did work their way through the whole of the paper, though weaker candidates did find the latter half of the paper more difficult, and did have the correct equipment with them. There was no evidence of them running out of time before they had attempted all questions and now that online marking has become embedded, it was pleasing to see that instructions to write within the confines of the boxed area were being adhered to. In the T5 Foundation Tier Paper 1 (Non-Calculator), numeracy skills were assessed directly and indirectly in Question 2, 3, 5, 6, 8, 13 and 14 and in Paper 2 (Calculator), in Questions 2, 5, 6, 7, 12, 13, 14, 16 and 17. In general, candidates' performances in these questions were on a par with their level of performance across all topic areas and it is encouraging to note that there was no obvious indication that a numeracy skill shortage detracted from their ability to tackle questions in context. Functional skills were tested in Question 3, 5 and 6 in Paper 1 and in Question 5, 6, 12, 13 and 16 on Paper 2. Again overall performance in this type of question was encouraging with Question 6 on Paper 1 being the most challenging across the two papers. Quality of written communication was assessed in Question 5 on Paper 1 and in Question 8 on Paper 2 and while the responses were in general very good from better candidates, weaker responses tended to produce minimum work and lack of clarity in their reasoning. This is an area which requires continuous work and may prove more challenging for weaker candidates. While the response to QWC questions is improving, continuous work needs to be done in the classroom to ensure that candidates are comfortable with this type of question. The use of pen to draw diagrams is still a problem and I would encourage teachers to remind their pupils to use a 'heavy pencil' such as HB in any construction type question. My last recommendation would be to ask candidates to reflect always on the response that they are giving to questions and ask themselves 'Does this look sensible?'

Paper 1 (Non-calculator)

Q1 This question on symmetry proved to be a nice opener with the majority of candidates scoring well. Errors made were to extend the horizontal line in Part (a) and to draw either just the correct diagonal line in Part (c) for 1 mark or to add extra incorrect lines and lose previous marks gained.

Q2 Again the majority of candidates are now aware that estimation questions require using approximate values to those given and the need to work with them accordingly. In Part (a) the first mark was accessed by writing $\frac{100 \times 100}{2}$ However many errors were made in calculating 100×100 with 1000, 2000 and 20000 common errors seen. Only a few attempted to multiply the values as given and similarly an answer only, without the estimation process, gained no marks.

In Part (b) many candidates picked up this mark, with 8.5 being the most common answer. This type of question traditionally sets a value between two square numbers and candidates should realise that answers of 8 and 9 in this particular case will not gain marks.

Q3 This was another question which was very well done with very few failing to gain at least one mark. A common error was adding 35 and 90 to give 115 or 135

Q4 The majority had no difficulty with this basic probability question and most gained the two marks available.

Q5 Candidates were asked here to compare the yearly incomes of Bill and Bob and it was very disappointing to see that many did not know that there are 52 weeks in a year, with candidates using a variety of possibilities including 48, 54 and 56 Many wrong approaches were taken to finding Bill's pay for the year with the most common being to multiply by 4 (monthly pay) and then by 12 for the year. Some of the long multiplication was particularly poor and wrong answers produced should have been picked up with some sort of checking process for example $1250 \times 12 = 3750$ is obviously wrong given $1250 \times 10 = 12500$ Those who chose to compare monthly earnings gained no marks; however some attempt to compare yearly earnings often picked up at least 1 mark for the weaker candidates who made a correct comparison from their calculations.

Q6 This was a challenging question with only the best candidates scoring full marks and many failing to appreciate the need to use the diameter of the circular disc to help calculate the number of discs that would fit into the tray. Many divided 50 by three and 23 by 3 and then either multiplied or added rounded answers. Some tried to work with the area of the rectangle and then divided their answer by either 3 or 6

Q7 This question proved to a lot more accessible than the last with nearly all picking up the mark in Part (a) for line symmetry. Part (b) however caused problems for those who were unfamiliar with rotational symmetry, with the most common wrong answer being to shade the bottom left square to form a square.

Q8 This was a fairly straightforward BODMAS question that was well answered by practically all candidates. After doing the hard work in Part (b) in getting $10 \div 2$, it was disappointing to see a number of candidates write $11 - 3 = 9$

Q9 Candidates should be aware that a full table of values is not always given at the beginning of a graph based question. It was very disappointing to see in Part (a) many just draw a straight line through (2, 9) but fail to take any other points into consideration. Some knew to plot a few points but drew their line carelessly thus losing an accuracy mark and in a minority of cases no line drawn ruled out the possibility of any marks in Part (b) which required candidates to 'use' their graph. The worst response was just to draw a line from corner to corner on the graph page.

Of those who produced an accurate graph in Part (a), the majority knew to read off their line correctly at 24 in Part (b)(i); however some did not read the scale on the x axis correctly and wrote 4.7 instead of 5.4 In Part (b)(ii) it was often difficult to know if pupils were doing a calculation rather than using their line given that the point (2, 9) could have been used to produce the correct calculation of $9 \times 7 = 63$ Many gained the mark in Part (c).

Q10 The best candidates were able to write down 4 squared = 16 from theory but it was hoped that by choosing particular values for the lengths in rectangle A and multiplying these by four in rectangle B, that a comparison of two correctly calculated areas would produce the 'times bigger' value. However this proved to be a step too far for most with 4 being the most visible wrong choice.

Q11 The vast majority of candidates who completed the table correctly in Part (a) gained full marks in this question. Those who added nothing further to the table lost the chance of scoring in Part (b). These candidates probably did not read the full introduction and did not see Part (a) of the question. Others filled the table by 'mirroring' the values in the bottom half and again received no marks in Part (b). Only the weakest failed to use fractions in Part (b) giving 'word' answers like 'unlikely' and 'evens'.

Q12 This question proved to be a good discriminator and although many correct answers were received, they tended to be from the highest scoring candidates. It was disappointing to see that many believed -3 squared to be equal to -9 and even -6

Most were able to calculate the value inside the bracket as -2 but then did not know how to multiply this by their value for -3 squared, often writing a value with an incorrect sign.

Even -9 – 2 = -11 was seen at times as an answer to the top line or a poor attempt was made to multiply the 4 and 6 inside the bracket with the value outside.
Very few candidates made it as far as $\frac{-18}{3}$

Q13 Despite being told to write down the answer only, many candidates felt the need to use long multiplication in Part (a) and division in Part (b). Unfortunately for them this proved to be very unsuccessful.

Working with the change in place value is a difficult concept but if candidates were taught how to appreciate the 'size' of number and use an estimation process as their guide, I feel they should be able to score marks here.

Q14 Similar problems were faced in Part (a) of this question with many dividing by 2 to get 300 or in recognising that 0.2 was $\frac{1}{5}$, dividing by five to get 120 rather than multiplying to get the correct answer of 3000

In Part (b) many picked up the first mark for 'less than' but then found it very difficult to express unambiguously, why. Some again chose to ignore the instruction not to work out the answer and wasted time on a large decimal calculation.

Increased opportunities must be given in class to allow pupils to explain the 'why' and 'how' of mathematics and to write their answers down.

Q15 It was pleasing to see many correct responses across the full ability range for this rotation question. Candidates did however in some cases rotate about the wrong centre, with the use of the origin being a common error, while others went anticlockwise and a minority used 180° rather than 90°

Q16 In Part (a) the incorrect answer of 0.29 was seen many times. A few did make an attempt to divide 29 by 50 but did not always get 0.58 Jam down was usually the chosen response in Part (b) but only the best candidates gave the mark scheme answer. The whole concept of experimental probability and the significance of relative frequency is a topic that requires further work.

Q17 Although a number of candidates picked up 1 mark in this question for a good attempt at getting to the solution, there were very few fully correct answers. Being able to deal with the $-kx$ was a problem for the majority but this was to be expected as it was the last discriminating question on the paper.

Paper 2 (With calculator)

Q1 This probability question was well done with the majority scoring well. Part (b) caused the only difficulty with some preferring the answer of 'unlikely' to impossible.

Q2 Another well answered question although a number used the values given with their calculator to get a rounded answer of 7 and gained no marks. This question required an estimation process and did ask for work to be shown clearly. A common error was

in the failure to appreciate the pounds and pence and to round 38p to 40p, £2.75 to £3 and then divide the larger number 40 by 3 More work needs to be concentrated on this topic.

Q3 The vast majority of candidates gained full marks in this question. It is obvious that the reading in Part (a) is more than half way and an answer of 55 was not accepted while a generous tolerance in Part (b) allowed nearly all to gain the mark available.

Q4 Part (a) was very well answered by practically all; however Part (b) tended to discriminate between candidates of differing abilities with weaker responses using an incorrect 'counting squares' method and others failing to calculate and add together two areas. Some candidates only worked with half of the shape but picked up a follow through mark.

Q5 There was a mixed response to this question with the best excelling and weaker candidates producing a series of errors. Totally ignoring the fixed charge of £1.50 and dividing £10.50 by 75p was poor while subtracting £1.50 from £10.50 to get 8 was equally incorrect.

Confusion in units resulting in 75p being divided by 9 rather than £9 being divided by 0.75 was another common mistake.

Part (b) proved a lot more straightforward with nearly all matching up the 'word' introduction with the correct formula.

Q6 This 'mail order' appeared to be straightforward, but many simply did not read the question asked. Perhaps the table also put them off but some filled it in as if it was a frequency table by placing values of 1, 2, 3 and 4 in the 'number' column and happily multiplying out and then adding everything up.

A few, given that they were buying 2 different items, felt they needed to add the delivery on twice. Having said all this, the majority scored at least 2 out of 3 marks in this question.

Q7 Part (a) was straightforward and generally the correct answer was achieved. Part (b) proved to be more demanding and the weaker candidates read it as 1 inch = 5cm and gave 75 as their answer.

Those who arrived at 1 inch = 2.5 cm sometimes divided 15 by 2.5 rather than multiplying or multiplied by 2 to get 30 and then did not know what to do with the 0.5 Part (c) proved to be the most demanding part since the conversion factor was not given and candidates had to come up with it themselves. This proved to be beyond all but the most able.

Q8 This outcomes/probability question was answered well by the majority and all abilities seemed to identify the significance of Pam having a repeated digit which in turn made it easier for her to guess the correct combination for her lock.

Q9 Candidates either knew this or not with most scoring at least 1 mark out of the 2 by giving one of the correct answers, most likely, a rectangle.

Q10 This question created some problems with many candidates getting one or other of the parts wrong. There were a variety of wrong answers but given the general response this is a topic which requires more work.

Q11 Many candidates got the correct answer of 1.5 using a trial and error method. Very few did it using algebra and it certainly would be a good example of a question to show pupils in class how efficient the use of algebra would be in solving this problem.

Q12 Many scored well in this money conversion question with common errors being to multiply by 1.2 rather than divide and failure to use correct money notation in giving an answer of £12.5 instead of £12.50

Q13 This question proved to be a good discriminator and correct answers tended to come from the highest scoring candidates. Weaker responses combined the numbers in the question in a variety of ways without very much understanding.

Q14 There were quite a few good answers to Part (a) with obvious classroom practice on how to use the area of a trapezium formula paying off for some. It was very disappointing however to see candidates copying the formula incorrectly with a '× sign' replacing the '+ sign' and others not knowing what to do with the 10.5 outside the bracket. Those who attempted to work with a 'rectangle/triangle' method frequently got caught by their inability to work out the area of a triangle.

There was follow on applied to Part (b) but too frequently it was of no benefit as candidates just multiplied 78 by 20 and left it at that. Candidates familiar with the density formula did calculate the volume correctly, but often divided by 20 instead of multiplying.

Q15 This was a straightforward question for better candidates but the obvious mistakes were made by some. A reflection in either the y axis or the x axis was common and received no marks. Confusion between $y = 1$ and $x = 1$ however, led to the awarding of 1 mark for a correct reflection in the latter.

Q16 This question was well done by many but again there were the usual mistakes made when dealing with ratio. The answer of 252 was common and gained from dividing 840 by 2, then by 5 and subtracting the 2 answers. Candidates who failed to read the question gave Bethany's share of £600 as the answer rather than the amount 'more than Alex'.

Q17 The best candidates picked up the two marks here but many failed to register a score. The term reciprocal is still not comprehended by many even though it has been asked a number of times. The ability to convert 1.4 into a fraction was of course the first stumbling block here. Generally 2 marks or zero marks were awarded.

Q18 Many candidates across all ability ranges managed to pick up this last mark with $k9$ being the most obvious incorrect answer.

Assessment Unit 6 Completion Test (Higher Tier)

Paper 1 (Non-calculator)

This paper was very fair and appropriate for the level of ability. It was very accessible and generally answered very well with few scoring low marks. In general the weaker candidates were able to access marks in the first half of the paper, whilst the questions at the end of the paper allowed the more able candidates to show their strengths. A significant number of candidates gained full marks and very few candidates appeared to be entered at the wrong level. Questions 5, 12, 13, 14 and 16 discriminated well between candidates of differing abilities. The language used in the paper was fine, with no ambiguity and the mark scheme was very easy to follow. There was no evidence to suggest that the paper was too long as virtually all candidates attempted all of the questions.

Numeracy skills were tested directly in Questions 1, 2, 3 and 12 and in context in Questions 4, 5, 8 and 13.

Q1 Squaring negative 3 caused problems for many candidates, giving the common incorrect answer of 6 A few didn't multiply the brackets, writing 9(-2) = 7

Q2 Candidates did well in this mental arithmetic question, with slightly more success in Part (a) than Part (b). 1536 was a common error in Part (a) and 32 was a common error in Part (b). Candidates should be encouraged to use estimation to check these answers.

Q3 **(a)** Many candidates struggled to divide 600 by 0.2 without a calculator. Many did divide 6000 by 2 correctly but then felt they had to divide by 10 giving the wrong answer of 300 Many divided 600 by 5 giving 120 and some proceeded to add this to 600

(b) Most candidates gained at least 1 mark for knowing that 40×0.752 was less than 40, but many were unable to explain why. Some incorrectly said 'because it's multiplied by a decimal'. A significant number didn't read the question properly and answered Yes/No instead of 'less than'.

Q4 This question on finding the area of a rectangle plus a triangle was well answered, but it is still disappointing to see so many who still forget to divide by 2 for the area of a triangle, leading to the wrong answer of 88 There were a number of simple arithmetical errors and some made the question more complicated by splitting it into more difficult areas.

Q5 **(a)** Many candidates struggled with dividing by a third in this speed question, changing it to 0.3, leading to the incorrect answer of 5. It was much easier to treble the distance covered in 20 minutes to get the speed per hour. Many still cannot cope with 60 minutes in an hour and use 100 giving the incorrect answer of 7.5

(b) The majority of candidates only gained 1 mark out of 3 for completing the travel graph. They knew that the speed of 6 km/hr translated to 3 km in 30 minutes but then then went up 3 km in 28 minutes because it said they arrived 2 minutes before 9 am.

(c) Finding the distance from the shop to the school was well done as marks were awarded following their graph, although some worked it out without using the graph. A few only gave the graph reading without subtracting 1.5

Q6 This question on a probability table was well done. When adding the probabilities some used 0.01 instead of 0.1, giving 0.35 in Part (a). A common error in Part (b) was not counting the people who arrive late, giving 0.68 as the answer.

Q7 This anti-clockwise rotation was well done, with only a small number going in the wrong direction. A common error was using the wrong centre of rotation.

Q8 **(a)** Completing the relative frequency table was well done. Common errors were 0.29 and 0.508 instead of 0.58

(b) Nearly all candidates correctly said 'jam down', but many couldn't explain why. Many concentrated on more results leading to better accuracy without understanding the significance of the relative frequency being greater than a half.

Q9 Most candidates gained at least half marks for changing the subject of these two formulae. A common error in Part (a) was $(t - y)/k$ instead of $(y - t)/k$. Many were unable to deal with the fraction in Part (b). A common error in Part (b) was $tp - 1$, instead of $tp - p$.

Q10 **(a)** The majority got the correct answer of m^6, with only a few writing m^9 or $2m^3$

(b) Only the most able candidates gained marks for simplifying this difficult square root involving π. Many just forgot about the square root and some ended up with a more complicated expression than they started with.

Q11 Transferring values from this probability table to a tree diagram was well done, apart from a few who wrote whole numbers. There were some errors in cancelling fractions and some used 43 and 48 in the denominators. Some left out the first two probabilities. Some used 250 as the denominator in all parts. A common error was $\frac{2}{3}$ and $\frac{1}{3}$ for the first two probabilities.

Q12 Many gained part or full marks for changing this recurring decimal into a fraction, but the less able candidates were unable to access these marks, just writing $\frac{145}{1000}$ There were some errors in finding $1000x/100x$ etc. and in subtracting these and many errors in cancelling fractions.

Q13 This question, proving that x must be odd, was only well done by the most able candidates. Many of these only gained the first 2 marks as they then proceeded to use numerical examples to show that $2n + 1$ was odd. Many were unable to square $y + 1$ correctly. A significant number did recognise that they had to use Pythagoras' Theorem, but some tried to involve angles, perimeter and area.

Q14 The more able candidates had no trouble gaining full marks in this probability question. However many misunderstood or misinterpreted the question, treating it as one bag with 14 balls, or using replacement. Many didn't know when to add and multiply probabilities. Some drew good tree diagrams but didn't identify the correct branches. Common errors were $\frac{3}{7} + \frac{3}{7} = \frac{6}{14}$ and $\frac{3}{7} \times \frac{3}{7} = \frac{9}{49}$

Q15 This question on finding the angles from the cosine graph was well done, even by weaker candidates. Accuracy was good; however some subtracted the two answers.

Q16 Only the very able candidates gained 3 marks for solving an equation by drawing an appropriate straight line. Many drew a wrong line or no line.

Paper 2 (With calculator)

This paper was very fair and accessible to candidates at this level, allowing differing abilities to demonstrate their understanding across the targeted grades available. Overall the standard of pupil response was very good with many candidates scoring in the forties. Very few candidates scored in single figures. Questions 9, 10, 12, 13, 14 and 15 discriminated well between candidates of differing abilities. Method marks rewarded many candidates' incorrect responses and led to a more balanced overall range of marks. The language used in the paper was appropriate and the mark scheme was very easy to apply. There was no evidence to suggest that the candidates had insufficient time.

Numeracy skills were tested directly in Questions 4 and 11(a) and in context in Questions 1, 3, 7, 11(b) and 15.

Q1 This question about numbers of rail passengers was generally well done. Some misinterpreted the word 'estimate' and rounded 32 to 30, leading to 62 or 63% of 5000, giving wrong answers of 1984 and 2016

Q2 This question reflecting a triangle in the line $y = 1$, was well done with only a few reflecting in $x = 1$

Q3 The majority of candidates gained 2 out of 3 for finding the speed in a two part journey. Only the minority gained the third mark for rounding to a suitable degree of accuracy. A significant number wrongly found the average speed for each part of the journey and then added these and divided by 2 It is disappointing that so many still cannot deal with time and divided by 3.45 hrs instead of 3.75 hrs.

Q4 This question on odd and even numbers was well answered by all candidates. Most common answers were 2 and 4, 2 and 2 and 1 and 3

Q5 **(a)** Many errors were made in substituting -2 into the quadratic equation, giving answers of 2 or -2 which led to a cubic graph.

(b) The quality of many quadratic graphs was poor, with many not dipping below the two negative 2 points, thus losing a mark here and in Part (c) because they trivialised the question.

(c) Many candidates did not study the scale here and assumed that each square was worth 0.2 instead of 0.4 Some left out the negative in the answer.

Q6 **(a)** Finding the area using the trapezium rule was well done; however a few candidates still multiply the numbers in the bracket. Some used the method of rectangle minus triangle, which led to errors.

(b) Many candidates only gained 1 mark for finding the volume of the prism (23095.8) Many divided by 20 instead of multiplying to get the mass, leading to 1154.79 Some just multiplied 78 by 20 to get 1560

Q7 This ratio question was well done by all candidates with most finding the amount for each person and then subtracting rather than finding $\frac{3}{7}$ of 840 A few arithmetical errors were made.

Q8 This question which involved extracting information from a pie chart and doing some calculations was generally well done. In Part (a) there was some incorrect cancelling and some left the answer as 105 or 525 In Part (b) common errors occurred when candidates rounded $\frac{140}{360}$ to 0.38 or 0.389 or 0.39 or 0.388 leading to inaccurate answers.

Q9 Bisecting the obtuse angle was generally well done. A few candidates bisected the reflex angle and some just drew random arcs. Some even bisected the lines!

Q10 Very few candidates showed any method in this Dimensions question. The majority scored one or two marks, but it was difficult to know how many actually guessed answers.

Q11 **(a)** Finding the smallest number was well done. The most common error was in changing 31×10^{-3} to an ordinary number. This number was often wrongly picked as the smallest.

(b) Finding the time for the oil to flow through the tank was well done. Some common errors were: dividing by 40 cubed, multiplying
$40 \times 108000 = 4320000$ or getting 27, 270 or 27000

Q12 **(a)** The majority of candidates found the volume of the plinth accurately. However a significant number felt the need to use the 60° angle, leading to the wrong answer. Some wrongly divided the answer by 2

(b) Finding the volume of the hemisphere was well done. However some forgot to divide by 2 and some squared the radius instead of cubing it.

(c) Only the most able candidates gained full marks for finding the total surface area. The majority only gained 1 mark for the area of the hemisphere.

Q13 The most able candidates had no trouble with this challenging probability question. The most common error was just writing $0.2 + 0.15 = 0.35$

Other errors were $0.14 + 0.15 = 0.29$, $0.14 + 0.45 = 0.59$ and $0.2 \times 0.15 = 0.03$

Q14 **(a)** The majority of candidates gained no marks for writing $32 \times 2.5 = 80$ Many used the area of the circle to find the radius which they multiplied by 2.5 and then found the area of the large circle gaining answers close to the correct answer.

(b) Most candidates gained 1 mark for $\frac{2450}{32} = 76.5625$ but very few went on to get the correct answer.

Q15 Only a small number of candidates were able to attempt this accurately. Some of these were not able to give an accurate reason. Many candidates believe that recurring decimals are irrational. The most common correct answers were $\sqrt{9.86}$, $\pi - 0.001$ and 0.9999π

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